A Review and Application of Quantitative Sales Forecasting Techniques

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Abstract
Quantitative sales forecasting has been a subject of investigation by many scholars and practitioners for many decades and it has been applied in several industries (e.g. healthcare, manufacturing, hospitality, restaurants etc), based on the notion that improving forecast accuracy is a prerequisite to miniming forecast errors and improving organisational performance. However, findings from most of the studies revealed that no single forecasting technique performs consistently across different situations and industries. And to date, research effort is ongoing to validate the conditions or methods for the optimal combinations of forecasts. Consequently, this paper reviewed the quantitative sales forecasting techniques that managers of manufacturing companies may consider when forecasting sales. Sales forecast assists managers in planning for the future. Therefore, the need to apply the most appropriate forecasting method cannot be overemphasised. Using the turnover of Guinness Nigeria Plc from 2003 to 2012, the paper examined the factors (year and operating expenses) that predict sales. The analysis revealed that year and advertising/promotion significantly predict sales than distribution and administrative expenses in the company. The implication is that for companies operating in a competitive business environment such as the brewery and soft drink industry, some internal factors or marketing activities such as advertising and promotion are vital in forecasting sales. In such situations, associative forecasting techniques appear to be more appropriate.

Background to the Study

Sales forecasting is an important aspect of planning and control for most profit maximising firms and is an essential aspect of managing any business organisation (Ojameruaye & Oaijhenan, 2001; Chase, Jacobs, & Aquilano, 2006). Sales forecast is an estimate of the demand for a company's goods or services during a particular time period, given a set of assumptions about the environment (Mentzer & Moon, 2005). Its goal is to predict as accurately as possible the quantity of goods and services that will be sold, leading to reduction in the costs of inventory and transportation. It can also be defined as the art or science of predicting future demand by anticipating what consumers are likely to do in a given circumstance (Wales, 2009). For instance, firms might be interested in knowing the level of demand if real incomes increase by 5% or how much demand will likely be if a competitor launches a substitute product. In other words, it is an estimate of uncertain future events by

extrapolating from past and current data. Managers constantly try to predict future activities based on the present decisions so as to assure the continued success and growth of their businesses (Mojekwu, 2012). Therefore, forecasting helps managers to make better decisions in the process of planning and implementing business strategies.

Sales forecasting has applications in almost all the functional areas of business: management, finance, production, human resources, purchasing and marketing (Abhijeet, Ajay, & Ashutosh, 2006). Management allocates resources among functional areas and controls business operations of the company by using sales forecast. The company's finance unit uses sales forecast to decide on capital appropriation, to project cash flows and to establish operating budgets. The production unit uses sales forecast to decide how much the company has to produce and in what time and how best to control inventories while the human resource unit uses sales forecast to plan personnel requirements and also as an input in collective bargaining. The purchasing unit uses it to plan the volume of materials the company needs and in which part of the year/month/week or even day while the marketing unit applies sales forecast in planning marketing and sales programmes and in allocating resources among the various marketing activities.

To forecast sales, a marketer can choose from a number of forecasting techniques depending on the purpose of the forecast, the available data and the technical knowledge of the forecaster. The method could be qualitative or quantitative. Qualitative forecasting techniques are subjective because they are based on the opinion and judgment of consumers and experts and are particularly appropriate when past data are not available (Makridakis, Steven, & Hynndman, 1998). Such techniques are usually applied to intermediate- and long-range decisions. Qualitative techniques are recommended for those situations where managers or members of the sales force are particularly adept at predicting sales revenues (Dalrymmple & DeCarlo, 2004). On the other hand, qquantitative forecasting techniques are used to estimate future demands as a function of past data and are most appropriate when past data are available (Mentzer, 1999).

The growing interest of researchers and practitioners in sales forecasting arises from the idea that it is an important aspect of organisations which relates to the effective development of sales forecasts and the application of these forecasts to the organisation's various functional needs (Dalrymple, 1975; Green, 2001). In general, forecasting is a major aspect of firms' marketing decision support (Armstrong, 2006), and it contributes to better accountability, cost control, profit maximisation, as well as improves customer and employee satisfaction (Green, 2001). Consequently, this recognition has motivated a number of researchers (see, for instance, Rosenstone, 1983; Wind, Green, Shifflet & Searbrough, 1989; Brodie, Peter, Kumar, & Peter, 2001; Sokele, 2009; Graefe, 2011) to apply forecasting techniques in different

industries such as telecommunications, politics, healthcare, hospitality, and restaurants, etc.

Statement of the Problem

Despite the thousands of studies on forecasting techniques, many scholars lament that significant clarification is needed on certain issues, because of the contextual nature of sales forecasting (Armstrong & Brodie, 1999). In the same vein, despite the application of mathematical forecasting techniques that was reported as far back as 1960 by Gleiser (Green, 2001), few other studies have reported its application (Cullen, Swazin, Sisson, & Swanson, 1978). In addition, there is lack of consensus on the control approach into forecasting activities and absence of an established mechanism to obtain the sales force input into the forecasting process (Lowenhar, as cited in Green, 2001).

Similarly, the adoption of structural forecasting techniques and evidence-based techniques are partially recognised and utilised, and their adoption remains a subject of extensive debate (Vaida, 2008; Armstrong & Green, 2012). Some scholars have further claimed that the efficacy of forecasting techniques largely depends on the fit between the techniques adopted and the context (Wright, Lawrence, & Collopy, 1996; Sanders & Manrodt, 2003). Thus, interesting and complex forecasting problems are common in forecasting activities (Baker, 1999), and there is substantial ground to prove that research has not yet validated the conditions or approaches for the optimal combinations of forecasts (Diana, 2011; Armstrong & Green, 2012), because forecasting is an uncertain process that is difficult to predict accurately. Moreover, other researchers emphasised that the forecasting technique adopted does not guarantee accuracy of the forecast (Armstrong, 1987; Mentzer & Bienstock, 1998). As such this paper seeks to fill some of the above mentioned gaps in the literature.

Objectives of the Study

The primary objective of this study is to review the existing quantitative sales forecasting techniques vis-à-vis their advantages and disadvantages. In addition, the paper applies selected quantitative forecasting techniques using data from Guinness Nigeria Plc from 2003 to 2012.

Literature Review

Sales Forecasting: An Overview

Sales forecasting is important for business planning, management and success (Martinovic & Damnjanovic, 2006) and it is an important aspect of a firm's marketing plan (Kotler, 2003). Sales forecasting is the process of estimating the amount of a product or group of products a company expects to sell during a specified period at a specified level of marketing activities (Bearden, Ingram, & Laforge, 2007; Pride & Ferrell, 2008). A company's sales forecast estimates the company's projected sales for a particular period. Common problems in failing companies are improper planning and lack of realistic sales forecasts (Pride & Ferrell, 2008). Businesses use sales forecast for planning, organising,

implementing and controlling their activities and it plays a critical role in production, scheduling, financial planning, inventory management, human resource planning and procurement (Russell & Taylor, 2000).

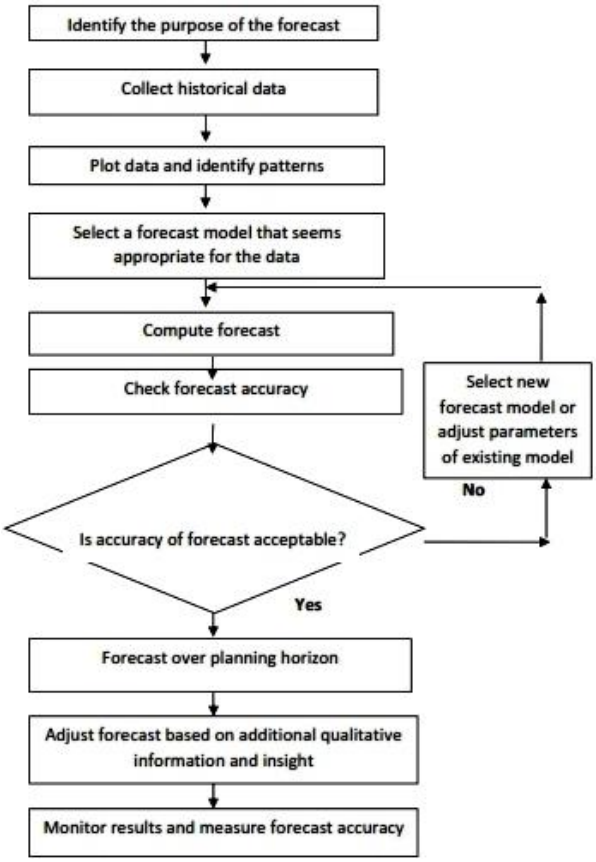
Research interest in forecasting techniques has led a number of scholars and practitioners (e.g. Bails, 1993; McGuigan, 1989; Paterson, 1999 etc) to analyses different criteria on forecasting methods. The findings of these studies offer divergent opinion on the complex application of quantitative and qualitative forecast methods. Researchers such as Kinnear (1996), Recekie (1998) and Kennedy (1999) claimed that qualitativce methods should be used to complement quantitative forecast methods, whereas scholars such as Makridakis, Wheelwright and Hyndman (1998), Godwin (2002) and Green and Armstrong (2007) posited that the integration of quantitative and qualitative forecast methods will guarantee more reliable and informative forecast.

Steps in Effective Sales Forecasting

The steps in forecasting refer to a series of procedures used to forecast sales. In order to achieve effective forecasting, a number of steps need to be taken. According to Stevenson (2009), the following steps are important:

- Determine the objective of the forecast. (What is its purpose?)
- Select the period over which the forecast will be made. (Over what time period will the forecast be? It could be short-term, medium-term or long-term)
- Collect necessary data. (Is it qualitative or quantitative data?)
- Select the forecasting technique to use. (Which forecasting technique is most likely to produce the information the analyst needs?)
- Gather the relevant data to be used in the forecast.
- Prepare the sales forecast.
- Monitor the forecast. A forecast has to be monitored to determine whether it is performing in a satisfactory manner. If it is not, re-examine the method and assumptions and prepare a revised forecast.

The forecasting process is depicted in Figure 1 below:



Source: Russell and Taylor (2000:456)

Figure 1 shows that the forecasting process begins by determining the objective of the forecast. For example, the objective of a forecast could be to predict future sales if the firm embarks on sales promotion for the next two years. The next step is to identify and collect the necessary data to predict sales. After this step, the forecaster should determine the forecast procedure and method for analysing the data as well as the assumptions to be made about the forecast. Thereafter, the forecast is made, finalised and monitored. If the forecast is evaluated and is found to be accurate, then the use of the technique can be continued but if it deviates significantly from actual values, then there is need to select a new forecast technique or to adjust the parameters of the existing technique.

Review of Quantitative Sales Forecasting Methods

Quantitative sales forecasting methods are usually described to as objective or mathematical techniques as they rely more on past and current data and less upon judgment in their computation. These methods rely on quantitative analytical approaches in developing the forecast. The available quantitative sales forecasting methods can be classified into trend analysis and causal analysis.

Trend Analysis (Extension of Past History)

This approach is based on the premise that over the short run future patterns tend to be extensions of past ones and that useful forecasts can be made by studying past behaviour. The forecaster uses historical data to discover a pattern over time without trying to identify causes of the patterns (Pride & Ferrell, 2008; Stevenson, 2009). It is appropriate when past data or a time series is available A time series is a set of observations taken periodically yearly, quarterly, monthly, weekly or daily (Spiegel, 1992). Trend analysis provides tools for selecting a model that describes the time series and uses the model to forecast future events.

A time series is usually characterised by fluctuations or variations. An analysis of these variations is important for the purpose of forecasting (Spiegel, 1992). These variations are classified into four basic components which include secular trend, seasonal variation, cyclical variation and irregular or erratic variation (Mojekwu, 2012).

Secular Trend

The secular trend component accounts for the gradual shifting of the time series over a long period of time. It is a variation in a time series which gives a picture of upward and downward movements of the time series over a long period of time due to labour crisis, etc.

Seasonal Variations

The seasonal component of the series accounts for regular patterns of variability within certain time periods, such as over a year. It is the repetitive seasonal fluctuations that usually occur with some degree of regularity during corresponding months, quarters or within a year.

Cyclical Variations

Cyclical variations describe long-term variations that move up and down about a trend line after a given period, usually several years. They can also be described as booms and depression that tend to repeat themselves after some years.

Irregular Variations

The irregular component of the series is caused by short-term, unanticipated and non-recurring factors that affect the values of the time series. One cannot attempt to predict its impact on the time series in advance. They are the variations that occur due to unpredicted causes of nature such as strikes, election violence, earthquake, flood, wars or any other form of disaster. It is also referred to as random variation as there is no pattern to its behaviour. There are two models for analysing these variations in a time series; the additive model and the multiplicative model.

The additive model assumes that the observed value Y is equal to the sum of the four components. That is,

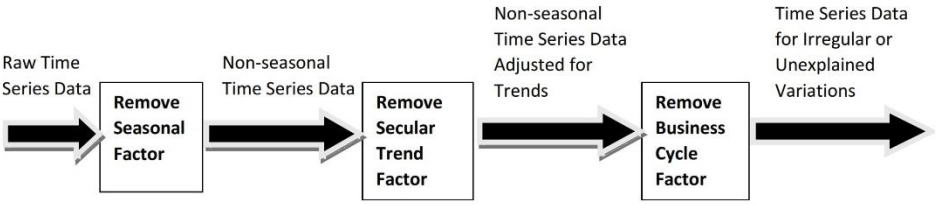
$Y = T + S + I + C.$

Where:

T = Secular Trend
S = Seasonal Variations
I = Irregular Variations
C = Cyclical Variations

However, this is possible only if the four components have no interaction and they are independent of each other. On the other hand, the multiplicative model assumes that the four components are dependent on each other. In other words, although the four components occur due to different causes, they still affect each other. And so, Y = TSIC. Irrespective of the model, all variations in raw data have to be removed to be able to forecast effectively. The process is shown in Figure 2:

Figure 2: Decomposition of Raw Times Series Data



Source: Melnyk and Denzler, (1996:462)

As indicated in Figure 2, a raw time series can be decomposed. Seasonality is addressed with a multiplicative seasonal index. A seasonal index is a set of numbers showing the relative values of a variable during the months of the year (Spiegel, 1992). The data are adjusted by dividing by an index and the adjusted data, which are referred to as deseasonalised data are used to obtain forecasts. Also, secular trends are adjusted by dividing the data by the corresponding trend values.

The forecasting methods that apply trend analysis are moving average, weighted moving average, semi-average method, exponential smoothing, Z-Chart and method of least squares.

Moving Averages

The moving average method consists of computing an average of the most recent *n* data values for the series and using this average for forecasting the value of the time series for the next period. Moving averages are averages that are updated as new information is received and it simply averages the last *n* observations. It is useful for a time series with a slowly changing mean. This forecast model is most useful where the demand level is fairly constant over time (Blocher, Mabert, Venkataramanan, & Soni, 2004*)*. In simple moving average, weights are assigned equally. It is given as:

$$MA = \frac{\sum D_i}{n}$$

MA = Moving Average
D_i = Demand in period i
n = Number of periods in the moving average

For instance, if an analyst wants to forecast sales for April with a simple 3-month moving average, the analyst would simply average the sales of January, February and March. Subsequently, the first month will drop to include the new month. Therefore,

$$F = \frac{D_1 + D_2 + D_3}{3}$$

Where:
D_1 = Latest month's data
D_2 = Data from 2 months ago
D_3 = Data from 3 months ago

The advantages of using the moving average method are that it is easy to understand and compute and that it provides stable forecasts as it smoothens out erratic fluctuations in a time series such as seasonal, cyclical and irregular movements. However, it does not cover the complete period and it can only be used if the trend is linear because it can lag behind the original trend if the trend is non-linear and so may generate cycles or other movements that were not present in the original data. Moreover, it ignores complex relationships in data and is strongly affected by extreme values.

Weighted Moving Average Method

One shortcoming of the simple moving average is the equal weighting of data. For instance, a 5-month moving average weights each of the 5 observations the same. This runs counter to the assumption that the most recent data are the most relevant and so the weighted moving average allows for more emphasis to be placed on the most recent data (Spiegel, 1992; Blocher *et al.*, 2004). The weighted moving average method consists of computing a weighted average of the most recent *n* data values for the series and using this weighted average for forecasting the value of the time series for the next period. The more recent observations are given more weight than older observations. It is given as:

$$WMA = \frac{\sum W_i D_i}{\sum W_i}$$

Where:
WMA = Weighted Moving Average
W_i = The weight for period i
D_i = Demand in period i
$\sum W_i$ = Summation of the weights. For convenience, the weights usually sum up to 1.

Semi-Average Method

The semi-average method involves computing the annual totals and dividing the series into two equal halves. Then the mean value for each half is computed. When the two means are plotted on a graph and the points are joined, a trend line will be produced. With the trend line, a forecast can be made (Mojekwu, 2012). When dealing with an odd-number of observations, the middle observation is added to both halves (Agbadudu, 1994). An advantage of this approach is that it is easy to understand and compute but it can produce inaccurate estimates if there are extreme values in the series and is applicable only if the trend is linear.

Exponential Smoothing

In exponential smoothing, the forecast for the next period is equal to the forecast for the current period plus a proportion (α) of the forecast error in the current period. It is calculated as:

$$F_{t+1} = \alpha Y_t + (1- \alpha)F_t$$

Where:

F_{t+1} = The forecast for the next period

α = The smoothing constant (a number between 0 and 1)

Y_t = The actual data value for period t

F_t = The forecast for period t

The computations are simple because the forecast is determined by only the estimate of the previous period and the current data determine the forecast. However, the method is most useful for a time series with a slowly changing mean. It uses a single weighting factor called alpha (α) and the sum of the weights should be equal to one (Chen, Bloomfield, & Fu, 2003). In addition, it cannot be used for multivariate prediction.

Z-Chart

Another method of trend forecasting is the Z-Chart. The name Z-Chart arises from the fact that the pattern on a graph forms a rough letter Z. Each Z chart represents one year's data and is best applied using monthly sales data (Agbadudu, 1994). For example, in a situation where the sales values for a product or product group for the first ten months of a particular year are available, it is possible, using the Z-Chart, to predict the total sales for the remaining months of the year by making a forecast for the next two months. The limitation of this technique is that it assumes that the basic trading conditions do not alter and that any underlying trend at present being experienced will continue. As such, when it is used to forecast sales for December for those products that generate high sales in that season it will not give an accurate forecast.

Method of Least Squares

If a time series exhibits a linear trend, the method of least squares may be used to determine a trend line (projection) for future forecasts. The method

of least squares is a technique that fits a trend line to a data set of past observations and then projects this line into the future for purposes of estimating future values. It uses a time-series analysis to examine historical data for predictable patterns. Least squares, also used in regression analysis, determine the unique trend line forecast which minimises the mean square error between the trend line forecasts and the actual observed values for the time series. The independent variable is the time period and the dependent variable is the actual observed value in the time series.

Using the method of least squares, the formula for the trend projection is:

$Y_t = b_0 + b_1 t$

Where:

Y_t = trend forecast for time period t

b_0 = trend line projection for time 0

b_1 = slope of the trend line

In computing the regression line, numerical numbers are assigned the given years. If the numbers of the years are odd, then zero is assigned to the middle year and minus one is assigned to a year before the middle one while plus one is assigned to the year after the middle year and so on. If the number of years is even, the two middle years get -0.5 and 0.5 respectively and the remaining years increase or decrease by one depending on their positions (Agbadudu, 1994).

The major problem with trend analysis is that it assumes that what happened in the past will continue in the future without attempting determine what responsible for the sales. Whenever an analyst wants to make forecasts and is also interested in examining the determinants of the forecast variable, then causal forecasting techniques will be appropriate.

***Causal Analysis (Associative Forecast*)**

Causal Analysis is the analysis of data of other variables which are shown to be related to the variable of interest. The approach is used when historical data are available and the relationship between the variable the analyst wants to forecast and other variables that can be observed is known. It considers a great deal of information about the relationship between the variables and so it is the most time-consuming forecasting technique. The causal technique involves developing forecast from the factors thought to be most important in determining a variable. If considerable historical data are available and the relationship between the variables is known, then it is possible to construct a causal forecast. Regression analysis, econometric models, input-output analysis and simulation are usually applied in such circumstances (Bearden *et al.*, 2007).

Regression Analysis

Regression Analysis is a forecasting technique which relates a dependent variable to one or more independent variables. It is similar to the method of least squares, except that the independent variable is not restricted to time. For instance, sales forecast can be derived from equations in which price, distribution, advertising and sales promotion serve as independent variables.

Using this method, the formula for the regression line is:

$Y = b_0 + b_1x$ ---------- one independent variable

$Y = b_0 + b_1x_1 + b_2x_2 + b_nx_n$ ---------- two or more independent variables

Where:

Y = Dependent variable

b_0 = Intercept

b_1- b_n = Slope of the regression line

x_1-x_n = Independent variables

The objective of regression analysis is to develop a mathematical model that accurately describes a relationship between a company's sales and one or more variables. Once an accurate formula is established, the analyst inputs the necessary information into the formula to derive the forecast (Russell & Taylor, 2000; Pride & Ferrell, 2008).

Econometric Model

The econometric model is one of the tools economists use to forecast future developments in the economy. Econometricians measure past relationships among such variables as consumer spending, household income, tax rates, interest rates, unemployment, population shifts, price level, etc and then try to forecast how changes in some variables will affect the future course of other variables (Hymans, 2008). It is a system of equations which describes the operation of an economic system and it deals with empirical estimation of economic relationships. The economic system may be the economy of a country or the market within a particular industry. The technique can be used to estimate the parameters of the model using the data on the variables which are in the model (Ojameruaye & Oaikhenan, 2001).

On the basis of the results, the estimated model can be used to forecast and make policies. At the economy level, it can be used to predict future values of economic variables such as Gross Domestic Product (GDP), inflation rate and, level of exports, while at the business level it can be used to forecast sales, profits and prices of shares.

Input-Output Analysis

This has to do with models which are concerned with the flows of goods among industries in an economy or among branches of a large organisation. Wassily Leontief developed this type of analysis to explain and predict the behaviour of economic systems. The analysis attempts to predict how the industry or company would be affected if one or more

sectors are subjected to changes in demand (Agbadudu, 1998). This implies that it indicates the changes in sales that a producer industry might expect because of changes in purchasing by another industry. It requires a lot of historical data for their development.

Simulation Models

These are dynamic models, usually computer-based, that allow the forecaster to make assumptions about the internal variables and external environment in the model (Stevenson, 2009). Depending on the variables in the model, the forecaster can ask 'what if questions' such as what would happen to the forecast if price increased by 10% or what effect a recession would have on the forecast? The advantages of associative methods are that they include other variables in forecasting the phenomenon of interest and they are more detailed than trend analysis. Associative methods force the company to consider the causal factors that determine sales and the relative importance of the independent factors can be evaluated. However, they are complex and are applicable only if the trend is linear. They cannot be used if there is no past data, for example, they cannot be used to forecast sales for new products.

As can be seen from the discussions, there are several quantitative techniques for forecasting sales. Therefore, to be able to choose the appropriate technique, the analyst should consider the cost involved, the type of product and market characteristics, time span of the forecast, the purpose(s) of the forecast, stability of the historical data and availability of required information as well as managerial preferences. In addition, a properly prepared forecast should be accurate as this will enable users to plan for possible errors and will also provide a basis for comparing alternative forecasts.

Measures and Impact of Forecast Errors

According to Stevenson (2009), forecasting techniques generally assume that the same underlying factors that existed in the past will continue to exist in the future but that because of instability and the quality as well as quantity of data (Adebayo, Ojo, & Obamiro, 2006*)* forecasts are rarely perfect and so actual results usually differ from predicted values (Shapiro, 2007). However, forecasts for groups of items tend to be more accurate than forecasts for individual items because forecasting errors among items in a group usually have a cancelling effect. Forecast error is determined by examining the difference between actual results and forecast values (Baumgartner, 2004, Hillier, Hillier, Schmedders, & Stephen, 2008). Generally, it is computed as:

$$E_t = Y_t - F_t$$

Where E_t is the forecast error at period t, Y_t is the actual value at period t, and F_t is the forecast for period t. More simply, it is given as:

$$\frac{\text{Actual - Forecast}}{\text{Forecast}}$$

Forecast error = _____

Although forecast error is inevitable, the objective of good forecasting is that the errors should be minimised as much as possible (Russell & Taylor, 2000). Jarrett (1990), states that accuracy of forecasts is enhanced when the source of error is identified and corrected. He further to observed that errors associated with forecasts have costs implication which exert direct impact on budgeting, planning, production, and perhaps even pricing. Therefore, an estimate of the inaccuracy of the forecast can be just as helpful as the forecast of the expected sales. A good forecast thus needs to include a mean and an estimate of how the forecast will vary around the mean. To ascertain how well a forecast model is working, actual past data are compared to the forecast for that period (Gilmore, 2006). According to (Wikipedia, 2013), the measures of aggregate error include: Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), Percent Mean Absolute Deviation (PMAD), Mean Squared Error (MSE), Root Mean squared error (RMSE), Forecast skill (SS), and Average of Errors (E).

The traditional error measures such as mean absolute deviation and mean square error do not provide a reliable basis for comparison of methods (Armstrong & Collopy, 1992). The Mean Absolute Percentage Error (MAPE) is more appropriate because it is invariant to scale and is not overly influenced by outliers (Kahn, 2003). Using any of the error measures, a large degree of error may indicate that either the forecasting technique is wrong or it needs to be adjusted by changing its parameters. According to Karabulut (2011), the possible reasons for errors in forecasting include flaws in data used in forecasting, insufficient data, non-realistic and accurate assumptions, changes in business and operating environment and the market in which the company operates as well as the actions of competitors, suppliers, distributors and government. Forecast errors not only tell a firm how well their forecast system is working but they also provide information about how much risk there is in the forecast by helping a manager understand the inherent variation in the forecasts.

Methodology

The purpose of the paper is to determine the forecasting technique that best predicts sales in the brewery industry using Guinness Nigeria Plc as a case study. Secondary sources of data, including the financial statements of the company for a period of ten (10) years, were used. The period covered is from 2003 to 2012. The selected period of 10 years is considered adequate in order to guard against error occasioned when the period covered is too remote.

The data for the analysis include turnover and operating expenses such as advertising and promotion, as well as distribution and

administrative expenses from 2003 to 2012. The focus is to predict sales (dependent variable) based on years as well as advertising and promotion, distribution and administrative expenses (independent variables). This would indicate if trend analysis or associative techniques are the best forecasting technique in the brewery industry and this kind of forecast can play a crucial role in the company's strategic plan.

Analysis and Discussion of Results

Table 1: Sales and Operating Expenses of Guinness Nigeria from 2003 to 2012 in N'mn

Year	**Sales**	**Advertising and Promotion Expenses**	**Distribution Expenses**	**General/Administrative Expenses**
2003	38,103,096	2,177,752	3,016,954	7,639,433
2004	47,508,486	2,957,668	4,306,003	9,501,172
2005	47,030,812	3,468,792	3,755,097	10,168,383
2006	53,651,781	4,072,091	4,379,760	5,131,486
2007	62,265,413	5,349,226	4,406,694	4,138,170
2008	69,172,852	6,163,742	5,066,087	5,448,662
2009	89,148,207	7,795,558	5,966,268	8,034,198
2010	109,366,975	8,567,584	8,591,894	10,204,146
2011	123,663,125	9,790,639	11,327,533	8,196,926
2012	126,288,184	11,182,679	13,424,380	9,522,147

Source: Annual Report and Financial Statements of Guinness Nigeria (2003-2012)

Method of Least Squares Result

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.969[a]	.939	.931	8.69793E6

a. Predictors: (Constant), Year

Table 3: Coefficients

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.662E7	2750527.816		27.856	.000
	Year	1.062E7	957610.870	.969	11.087	.000

a. Dependent Variable: Sales

b. Predictors: (Constant), Year

Tables 2 and 3 show the results of ordinary least squares using years as the independent variable. The results indicate that trend analysis

which is based on years alone is a significant predictor of sales and that year explains 93.9% variation in sales. Based on the results, the equation for the trend line is:

$Y = 7.662 + 0.969X$

Using the trend line, the forecast for 2013 can be estimated to be:

Y = N141,310,000

Regression Results

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.991[a]	.983	.975	5.29012E6	1.859

a. Predictors: (Constant), General and Administrative Expenses, Advertising and Promotion Expenses, Distribution Expenses

b. Dependent Variable: Sales

Table 5: Coefficients

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5081017.931	7509465.205		.677	.524
	Advertising and Promotion Expenses	8.558	1.709	.794	5.007	.002
	Distribution Expenses	1.794	1.570	.190	1.143	.297
	General and Administrative Expenses	.944	.927	.063	1.019	.348

a. Dependent Variable: Sales

b. Independent variables: Advertising and Promotion expenses, Distribution expenses and General/ administrative expenses

Table 4 shows the model summary of the regression analysis. The R Square value, which is the coefficient of determination (0.983), suggests that the independent variables (advertising and promotion expenses, distribution expenses and general/administrative expenses) explain 98.3% of the amount of variation in the dependent variable (sales). Table 5 shows the coefficients of the independent variables. These coefficients indicate the contribution of each of the independent variables to sales in Guinness Nigeria Plc. The result shows that advertising and promotion expenses (x_1) contribute 8.558, distribution expenses (x_2) contribute (1.794) while general and administrative expenses (x_3) contribute 0.944. This implies that every million spent on advertising and promotion will increase sales by 8.6% while for distribution and general/administration, it is 1.7% and 0.9% respectively. This seems to

suggest that advertising and promotion has a more significant impact on sales in Guinness Nigeria than distribution and administration and so it is able to predict sales better than any other expenses.

The regression equation can be written as:

$$Y = 5081017.931 + 8.558\ x_1 + 1.794\ x_2 + 0.944\ x_3$$

This equation can then be used to forecast sales based on advertising and promotion, as well as distribution and administrative expenses. For example, if Guinness Nigeria intends to increase its operating expenses from the N34,129,206 it spent in 2012 to N36,000,000 in 2013 and decides to allocate the amount equally by spending N12,000,000 each on advertising and promotion, distribution and administration, the sales forecast in million will be:

Y = 5081017.931 + 8.558 (12,000,000) + 1.794 (12,000,000) + 0.944 (12,000,000)

Y = N140, 633,017.9---------- Equal Allocation (N12,000,000 each)

However, if it decides to allocate more to advertising and promotion by spending N16,000,000 on advertising and promotion and N10, 000 each on distribution and administration, then the sales forecast will be:

Y = 5081017.931 + 8.558 (16,000,000) + 1.794 (10,000,000) + 0.944 (10,000,000)

Y=N169, 389,017.9----------Higher allocation to advertising and promotion

If the higher allocation of N16, 000,000 is shifted to distribution and administration respectively, the sales forecast will be:

Y = 5081017.931 + 8.558 (10,000,000) + 1.794 (16,000,000) + 0.944 (10,000,000)

Y = N128, 805,017.9 ---------- Higher allocation to distribution

Y = 5081017.931 + 8.558 (10,000,000) + 1.794 (10,000,000) + 0.944 (16,000,000)

Y= N123, 705,017.9----------Higher allocation to administration

From the calculation above, when the budget of N36million was allocated to the three expenditures, predicted sales value was higher when more funds were allocated to advertising and promotion. The analysis indicates that if Guinness Nigeria Plc forecast a high sales value, more funds have to be allocated to advertising and promotion. This suggests that advertising and promotion is a better predictor of sales than other operating expenses. Figure 3 and Figure 4 below show the trend of sales as well as advertising and promotion, distribution and general/administrative expenses for the period under consideration.

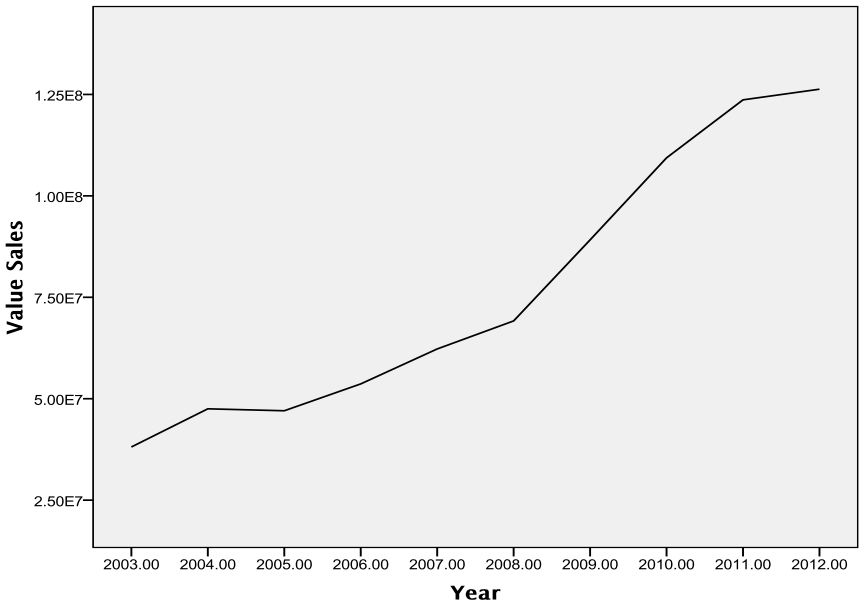


Figure 3: Sales Trend of Guinness Nigeria from 2003 to 2012

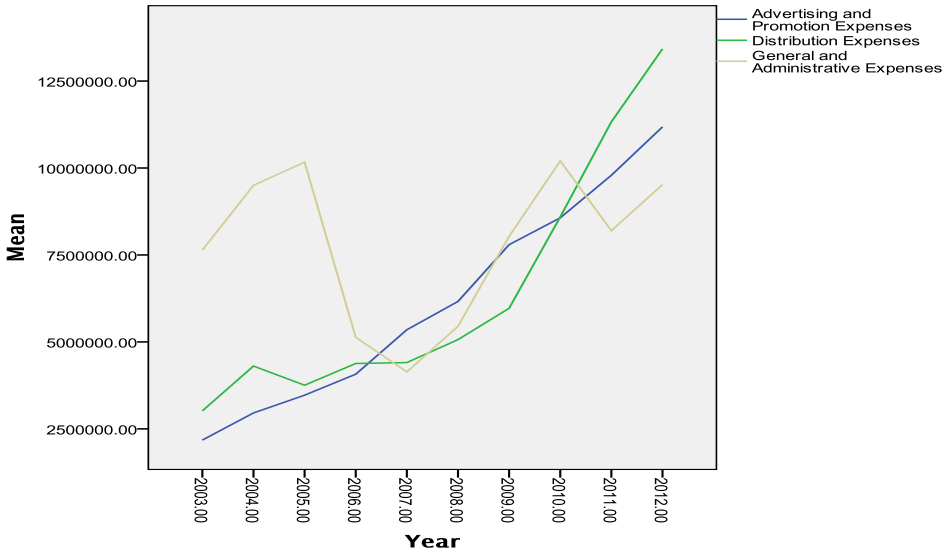


Figure 4: Trend of Advertising/Promotion, Distribution and General Expenses of Guinness Nigeria from 2003 to 2012

An examination of the line graph in figures 3 and 4 shows that trend analysis based on years as well as advertising and promotion are good predictors of sales over the period under consideration. This shows that both trend and associative analysis can be used to forecast sales in the company and if the factors that contributed to the attainment of the level of sales in the past will continue to exist in the same manner in the future, then the company can concentrate on what actual sales will be at a certain

level of marketing efforts. The advantages of the regression technique over the method of least squares are that it is more robust and that can be used to choose the level of marketing effort that will produce an expected level of sales and this can be vital in developing a marketing plan.

Summary and Conclusion

Sales forecasting is one of the most tedious tasks and areas of management which requires a lot of experience and knowledge to be able to make a good prediction. It involves detailed analysis of all the available information regarding the different aspects of sales. The ability to effectively forecast sales can have a significant and positive impact on sales and operations as well as the overall financial health of a company (Gilmore, 2006). A thorough analysis of several aspects of sales forecasting enables management to get a clear picture of what sales forecasting is, its purposes and uses, methods of sales forecasting, what indicators affect the forecast and, perhaps most importantly, the impacts of errors on forecasting (Kahn, 2003). Sales forecasting is so important that most proactive companies include this topic in their sales manager training programmes, since inaccurate demand predictions can have disastrous effects on the profitability and competitiveness of a firm (Armstrong, 2006).

The theoretical argument for why companies should use sales forecasting is to give an accurate prediction of what the future will be and how the company can use these forecasts to revise and implement plans to achieve the desirable outcomes. Within sales forecasting, there are two main perspectives: the producer and the user of a forecast. The producer is the one looking at indicators and then uses one or more methods to make a prediction of future sales. From the user's perspective, the forecast is a management tool upon which decisions are based.

Forecasting involves methods that are derived primarily from judgmental sources versus those from statistical sources. Judgmental and statistical procedures are often used together, and since 1985, much research has examined the integration of statistical and judgmental forecasts (Armstrong & Collopy, 1992). Quantitative forecasting techniques are best employed when companies have access to historical data (Mentzer, 1999). Quantitative techniques have distinct advantages in situations where managers must make frequent forecasts for several products. Because of the large number of calculation involved in quantitative forecasting procedures, analysts make use of computers and appropriate forecasting software (Dalrymmpple & DeCarlo, 2004). Qualitative forecasting techniques, on the other hand, are often referred to as judgmental or subjective techniques because they rely more on opinion and less figures in their formulations and computations. The absence of past sales data necessitates the need on the part of organisations employing

qualitative forecasting techniques to be more creative in coming up with sales predictions (Mentzer & Kahn, 1995). Extant literature have shown that combining mathematical calculations with management/sale force knowledge of the demand pattern of a company's product can lead to logical and justified sales estimates. Forecasting is of special importance in industries where important strategic decisions need to be taken to optimise the efficiency of resources and hence maximise profits. Therefore, managers cannot afford to base their decisions merely on guesswork; hence, with the aid of forecasting, the uncertainties that are likely to be met in future as regards decision-making are reduced to a minimum.

This paper has discussed and analysed several quantitative sales forecasting techniques that managers may consider when forecasting sales. It was found that organisations can use any of the techniques; however, when some internal factors or marketing activities significantly predict sales, regression analysis would be the best option. The paper found that year and advertising/promotion predict sales better than distribution and administrative expenses. However, it is also important for managers to consider other issues associated with forecasting such as the forecast environment. The forecaster must understand the system for which the forecast is being made, how sensitive it is to changes in the environment, how much its future direction depends on its past movement and which factors in the environment seem to affect it most. This is necessary because the underlying assumptions for making decisions with a forecast is the belief that the future follows the past with some degree of regularity such that what happened in the past will likely continue in the future.

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