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DEMAND FORECASTING AS A VERITABLE TOOL FOR HIGHER MANAGERIAL EFFICIENCY IN INDUSTRIES IN NIGERIA

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Abstract

This study aimed at exploring the benefits of demand forecasting and portrayed it as a veritable tool for increasing managerial efficiency in industries in Nigeria. The study is an effort to show that the utilisation of demand forecasting could become a veritable way of minimizing wastages, thereby maximizing profits, recovering and reviving of Nigeria's ailing and moribund industries. In Specific terms, limestone production and sales in Nigeria was used for a practical illustration. In doing this, the least squares approach and t-test statistics were used to analyse limestone production and sales in Nigeria from 2001-2010. Projections were also made for limestone production and sales from 2011-2014. 2011 was used as a base year to compare projections with actual realizations for limestone production and sales data. It was found that there was no significant difference between the projected and real values for the limestone production and sales in the base year, thus, re-affirming the efficacy of demand forecasting. It was therefore recommended among other things that managers rely strongly on demand forecasting throughout their operations.

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JEL Classification: G30, G31

Introduction

Evidently, the role of managers in any organization is very important. Jobber and Lancaster (2009) posited that no organization can rise above its management. This is because the manager of any organization is charged with all responsibilities of administration and decision-making (George, 2002). Banjoko (2002) added that the manager sets up the strategy of the organization, regulates the inputs of workers and ensures that the overall goals of the organisation are achieved. In order to achieve organisational objectives, Schuler (1983) observed that the managers must utilise available resources wisely. These resources according to Schuler include natural, human, financial and technological resources, which serve as unavoidable for organisational effectiveness. Stevenson (2012) noted that efficient management is a product of informed decisions, and informed decisions is a product of accurate data processing. Accurate data processing results in accurate information, which assists a manager to take the right, which is profitable to the organisation (Kress, 2007). According to Kress many organizations have failed due to poor managerial decisions stemming from wrong information.

Stevenson (2012) averred that the most important information needed by managers for decision making, particularly within an industrial setting include demand and supply trend, production rate, accurate predictions of consumer behaviour, currency exchange rate and the general trend in market variables. Stevenson (2012) therefore recommended that to increase proficiency, a manager should apply techniques such as demand forecasting. Picinkene (2008) reaffirmed that severe competition and rapid changes in the market have underscored the relevance of accurate information from forecasts. Jobber and Lancaster (2009) noted that the manager needs to comprehend the state of demand so as to develop proper business plans, as well as make strategic decision on the vision of the organisation, the technology to be used as well as infrastructural needs of the organization. Jobber and Lancaster (2009) defined demand forecasting as the prediction of the quantity of goods or services to be purchase by consumers. Wisner and Stanley (2008) added that efficient production planning for a product or service cannot be accomplished unless the volume of demand is known. Calvin (2007) observed that as organizations become more proficient in forecasting their demand, greater efficiency in running the business is achieved. According to

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Nagarajan (2010) demand forecasting improves safety stock requirements and customer services which give rise to increased profitability and viability.

In his view, Stapleton (1974), posited that as demand forecasting puts forth future business scenario, it helps in reducing the risks involved in decision-making and drives the business planning tasks. Banjoko (2002) stated that the harsh business scenario of today has great implications for managers because of the increasing need to match demand with supply, which reduces wastage and maximizes profit. Today, with industrialization came an expansion in the number of items that need to be forecasted. Chukwu (2007) added that in today's unstable and troubled economic times, both private and public organizations as well as individuals are faced with the common challenge of making decisions under an atmosphere of uncertainty. Donaldson (1998) averred that when properly modelled, forecasting help to ameliorate the impact of uncertainties. It provides managers with the basic information required to make informed decisions.

Jobber and Lancaster (2009) stated that one great feature or benefit of forecasting is that it helps to control, minimize or even eradicating wastages in the industry. Forecasting is indeed a veritable tool to balance demand and supply in the industry. Kress (2007) stated that when demand is properly forecasted, wastages are eliminated thereby leading to profit is maximization. When there is maximum profit, growth and expansion becomes necessary. Growth and expansion industries come with employment opportunities which help to reduce or eradicate poverty in the nation (Ugbam, 2012). According to Donaldson (1998), forecasting is vital towards enhancing management's ability to drive the business and sustain long-term growth. Banjoko (2007) highlighted the importance of demand forecasts in making decisions regarding the feasibility and viability of a businesss.

George (2002) maintained that forecasting is also important in providing some useful insight into the development of new product lines. In other words, organizations will not put their scarce resources on projects that may likely fail. Industry studies, according to Flyvberg, Holm and Buhl (2005) study indicated that on average, organisations with more precise forecasting and planning competencies have lesser inventory lying dormant in the warehouse, proper-ordering ratings and faster cash-to-cash cycle periods than others. Furthermore, accurate forecasting supports higher earnings per share, higher return on investments as well as enhanced profit margins (Kress, 2007). Hence, forecasting is the safest means of ensuring greater managerial efficiency, as well as sustainable growth and expansion of commerce and industry.

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Problem statement, research questions and objectives

Evidently, the numbers of ailing and moribund industries in Nigeria are on the rise. There have been rising cases of dismissal, disengagement and laying off of employees at various sectors of the Nigerian economy. This is partly because only a few organizations in Nigeria make effort to monitor the quality of information used in building demand models. It is indeed worrisome that managers who are the main drivers of the economy shy away from demand forecasting, despite its potentials in aiding their choices of decision-making. The major problem is that experts seem to be having conflicting opinions about the efficacy of demand forecasting. While some experts discredited demand forecasting other others applauded its potency. This inconclusive state of affairs created room for further investigations.

Aim of the study

This study aimed to explore the benefits of demand forecasting as a veritable tool for increasing managerial efficiency in industries in Nigeria. The study is an effort to show how the utilisation of demand forecasting could become a veritable way of minimizing wastages, in other to maximise profits and reviving ailing and moribund industries in Nigeria.

Literature Review

Conceptualising Demand Forecasting

Jobber and Lancaster (2009) defined demand forecasting as the prediction of the quantity of goods or service to be purchased by consumers. Lapide (2009) explained that the 1950s saw the development of the exponential smoothing forecasting methods by the industrialist, Robert G. Brown. According to Ugbam (2012), most of the forecasting software packages that are available today are based on Brown's method. Olalekan et al. (2012) narrated that theories such as game theory came into use towards the latter part of the century, as people realized its potential to influence the future. Olalekan et al. (2012) posited that the Delphi method, which is part of the subjective-intuitive methods, was propounded in the 1950's by the Rand Corporation in Santa Monica, California. Subsequently a wide variety of statistical time-series analysis evolved as people made effort comprehend seasonal and trend variations (Ugbam, 2012). Ugbam (2012) added that forecasting methods and systems became even larger in scale to accommodate the industrial growth and expansion of that generation. Technology also kept pace with this dramatic growth. Computer systems which are based on moving-average and exponential smoothing methods, which do not require so much historical data

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were, developed (Kress, 2007). Lapide (2009) maintained that the biggest change over the past few decades has been a movement from 'historical-based forecasting to demand-driven forecasting', which is a trend from forecasting models that are mainly based on analysing historical data to those that also incorporate the impact of demand-shaping activities, such as sales and marketing promotions.

Flyvberg, Holm and Buhl (2005) posited that no economy thrives where demand forecasting is not used by the managers of the economy. Ugbam (2012) added that the very objective of demand forecasting is to be as accurate and reliable as possible, so as enhance optimum utilization of resources. Unfortunately, Olalekan, Oyewole and Olawande (2012) alleged that most Nigerian managers seem to doubt the accuracy of demand forecasting. Hence, they avoid its utilisation. Accuracy is paramount in forecasting exercises and managers need to base their planning and decision-making on accurate information (George, 2009). In spite of this, some literature argue that most forecasts are inaccurate. However, Flyvberg et al (2005) noted that forecasts have most often remained remarkably imprecise for many years. Kress (2007) asserted that only a minority of firms produce forecasts that are within five percent of the actual result. Donaldson (1998) held that, "all forecasts are wrong but differ according to the extent of their wrongness'. Schuler (1983) was of the view that no one can accurately predict demand.

On the contrary, Lysons and Farrington (2006) adduced several reasons for the inaccuracy of some forecasts and maintained that demand forecasting remains a veritable tool for managerial decision making. Mendenhall, Reinmuth, Beaver and Duhan (1986) attributed inaccuracy to the uncertainty of the future and posited that projections into the future are prone to error and become even more conjectural as one extends further into the future. Calvin (2007) augured that forecasts are often based on assumptions, which could possibly be incorrect or altered by some unexpected circumstances such as war, economic, social or climatic factors. Hence, Calvin maintained that the inaccuracy of forecasts should not nullify the merits of forecasting. Schuler (1983) blames forecast inaccuracy on incompetency on the part of businessmen and managers who refuse to employ experts in forecasting. Waters (1997) posits that skilled people are more in a better position to forecast with great precision to the benefit of their organization. Banjoko (2002) believed that leaving the forecasting job in the hands of skilled professionals will help in addressing the inaccuracy problem. Freund (1983) noted that the reliability of the data is equally important because unreliable data will most likely yield unreliable forecast.

Kress (2007) is of the view that the development and administration of quality demand prototypes as well as the generation of precise forecasts is a professional

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domain that requires skills and technical knowhow of various disciplines such as modelling, statistics, mathematics, management sciences, information technology, data-mining as well as deep knowledge of business. In spite of these merits, Chukwu (2012) notes that only few organizations in Nigeria indulge in proper planning process when it comes to using appropriate skills, resources, tools and methods to ensure the initiation of precise and germane forecasts.

Forecast Assumptions

According to Waters (1997) forecasting techniques are based on following assumptions.

i. The approaches are dependent on historical data, which assumes that the conditions that prevailed in past observations will be obtainable in the future,
ii. As the forecast horizon reduces, forecast precision increases, and
iii. Aggregate forecasts are usually more accurate in comparison to disaggregate ones.

In an attempt to explain the first assumption Kress (2007) asserted that the past and current activity of a process is a good indicator of future outcomes. Lapide (2009) noted that the implication of the second assumption is that short-term forecasts are more accurate than the long-term ones. Unquestionably, the more we delve into the future, the more speculative things will become (Ugbam, 2012). Olalekan et al (2012) explained that the understanding of the third assumption is that forecasting mistakes within items in a group have tendency to cancel out each other. For example, industry forecasting is likely to be more accurate than a forecast for individual firms.

Demand Forecasting Techniques

Numerous techniques are used in forecasting demands. These techniques vary in their degree of sophistication from the simple judgmental approaches to the complex statistical methods (Banjoko, 2002). There is a wide range of things to be forecasted and there are different situations in which demand forecasts are needed. The implication, according to Waters (1997), is that there is no single best method. Ugbam (2012) posited that the choice of a method depends on a number of factors such as time horizon, availability of data, the level of precision needed, forecasting budget size, and availability of experts, organizational flexibility and repercussions of a poor forecast. Several perspectives have been brought to bear on the classification of demand forecasting techniques. However, Olalekan et al (2012) observe that the

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most commonly used approach in research literature categorized them into two broad groups, namely qualitative and quantitative forecasting techniques. This categorization is based on the type of information needed for the forecast.

Qualitative Techniques

According to Wisner and Stanley (2008) qualitative techniques are based on management judgment and opinions and are commonly used when relevant historical sample database is not available. Mendenhall, Reinmuth, Beaver and Duhan(1986) noted that, the methods are generally fast and cheap but are particularly burdened by the problem of accuracy since human judgment is often prone to biases (Banjoko, 2002). Banjoko (2002) listed qualitative Technique to include, such as Panels of Executive Opinions, Consumer surveys and Delphi Technique. Banjoko (2002) explained that Panels of Executive Opinions make use of experts or specialists, who have special knowledge of the industry in question. They form panels, which are normally comprised of a mixture of internal and external personnel. Jobber and Lancaster (2009) explained that opinions could be taken individually or there could be group brain-storming sessions aimed at arriving at a consensus. While this approach is more reliable than a one-person's insight, Waters (1997) noted that sometimes dominant personality amongst the experts can lead mistakes, and as such, poor outcome.

Donaldson (1998) stated that Consumer surveys normally use telephone contacts and personal interviews as a data collection avenue. According to George (2002) the consumers are probe regarding their buying plans as well their projected purchasing behaviours. A large number of respondents are required for effective generalizations. Calvin (2007) concluded that this approach is suitable for industrial goods where there are just a few bulk purchasing customers. This is not the case with consumer goods. Schuler (1983) explained that Delphi Technique employs the help a panel of specialists to produce a more precise forecast. Each expert produces a forecast, which combines the opinion and judgment the given specialist. Mendenhall et al (1986) added that the respective forecasts are collated and concise by an external party and returned to the organisation for comments and reviews by the internal experts. Based on this, the experts make new forecasts. Stapleton (1974) remarked that this process lingers up until an ultimate forecast materialises. The advantage of this technique is that experts work individually and not in contact with each other. This removes the risk of dominant personality factor in the forecasting process.

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Quantitative Techniques

These are statistical techniques and involve the analysis of objective data (Stevenson, 2012). It includes time series analysis, which involve the projection of historical data; associative methods, which utilizes casual or explanatory variables to make estimates; and the simulation methods, which mimic consumer's preferences that result in demand, (Wisner et al, 2008). According to Pilinkene (2008) time series or projective methods use historical data of actual demand to predict future demand. This is based on the supposition that the future could easily be predicted from the past events. Freund (1983) identified the four basic components of a time series, namely secular trend, seasonal variations, cyclical variations and irregular variations. However, Lysons and Farrington (2006) insisted on five components, which they listed as average, trend, seasonal, cyclical and random error. The average represents the mean of the observations over time. The trend is a steady increase or decrease in the average over a given period of time. Seasonal influences are predictable short-run cyclical behaviour owing to the time of day, week, month or season. Cyclical movement is the random long-run cyclical behaviour owing to the lifecycle of business or product, while Random error is the left over variation that cannot be explained by the four other components (Steveson, 2012).

There are several variations of the time series method but Lysons et al (2006) maintain that the most frequently used are the moving averages and the exponential smoothing methods. According to Wisner et al (2008) moving average smoothen out fluctuations that occurred in demand within the period. The average of two or more previous periods of actual demand is used as the next period's forecast. The longer the average period, the greater will be the smoothing. Jobber et al (2009) identify the shortfall of moving averages as the inability to predict a 'downturn or upturn in demand'. Exponential smoothing, according to Lysons et al (2006) overcomes the shortfalls of the moving average. It makes a new forecast by adjusting the previous forecast by a fraction of the difference between the previous forecast and the actual demand for that period. A new forecast is obtained by taking a proportion(An) of the latest observation and a proportion(1-a) of the previous forecast (Waters, 1997).

Donaldson (1998) explained that associative (causal) forecasts attempt to predict a dependent or criterion variable from one or more independent or predictor variables, whose values are either known or can be accurately predicted. Schuler (1983) hinted that if the independent variable(s) cannot be estimated, this method cannot be used. Mendenhall et al (1986) associative methods include ***correlation and***

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regression analysis. Correlation measures the direction of the relationship between two variables (Ugbam, 2012). There are many diverse correlation methods. The most commonly known, which is the Pearson or product-moment correlation, measures the direction for the linear association between variables (Kress, 2007). The Pearson or product-moment correlation does not work well with curvilinear relationships. The main outcome of a correlation is called the **correlation coefficient** ("r"). Its numerical value ranges from -1.0 to +1.0. Lapide (2009) explains that when r is close to 0, it implies that a relationship does not exist between the variables under investigation. A positive 'r' implies that when one variable gets bigger the other becomes higher, while a negative 'r' implies that when a variable gets bigger, the other becomes smaller, which is known as 'inverse correlation' in most cases.

According to Flyvberg et al (2005) simple linear regression models explain the nexus between one dependent variable and another independent variable by utilising a straight line. Lysonsand Farrington (2006) stated that multiple regressions generally explains the nexus between one dependent variable and two or more independent variables. Wisner et al (2008) explain that simulation forecasting is based on the use of historical data. It mimics consumer preferences that result in demand for specific products and is leveraged on its ability to create and explore a wide range of scenarios. Being one of the most complicated approaches, it is less frequently used. However, with the widespread use of computers, Jobber et al (2009) pointed out that this techniquehas become possible. **Figure 1** below shows the demands forecasting techniques in a flowchart format.

Table 1 above, shows limestone production in metric tons in Nigeria from 2001-2010 from the month of January to December. The Table revealed a fluctuating production trends between years and months. In certain years, the production seems to be rising but declines after some years, and rise again. For instance, in January 2001 production stood at 2477 metric tons and fell to 2439 metric tons in 2003 and increases again in 2004 and 2005 to 2642 and 5882 respectively. It fell again in 2006 and 2007 and rose in 2008 and fell once more in 2009 before rising again in 2010 to 12663 metric tons. This fluctuating production trend seems to reflect in different years from the month of February to December, which shows that there is inconsistency or fluctuation in the production of limestone.

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FOR CAST TECHNIQUES

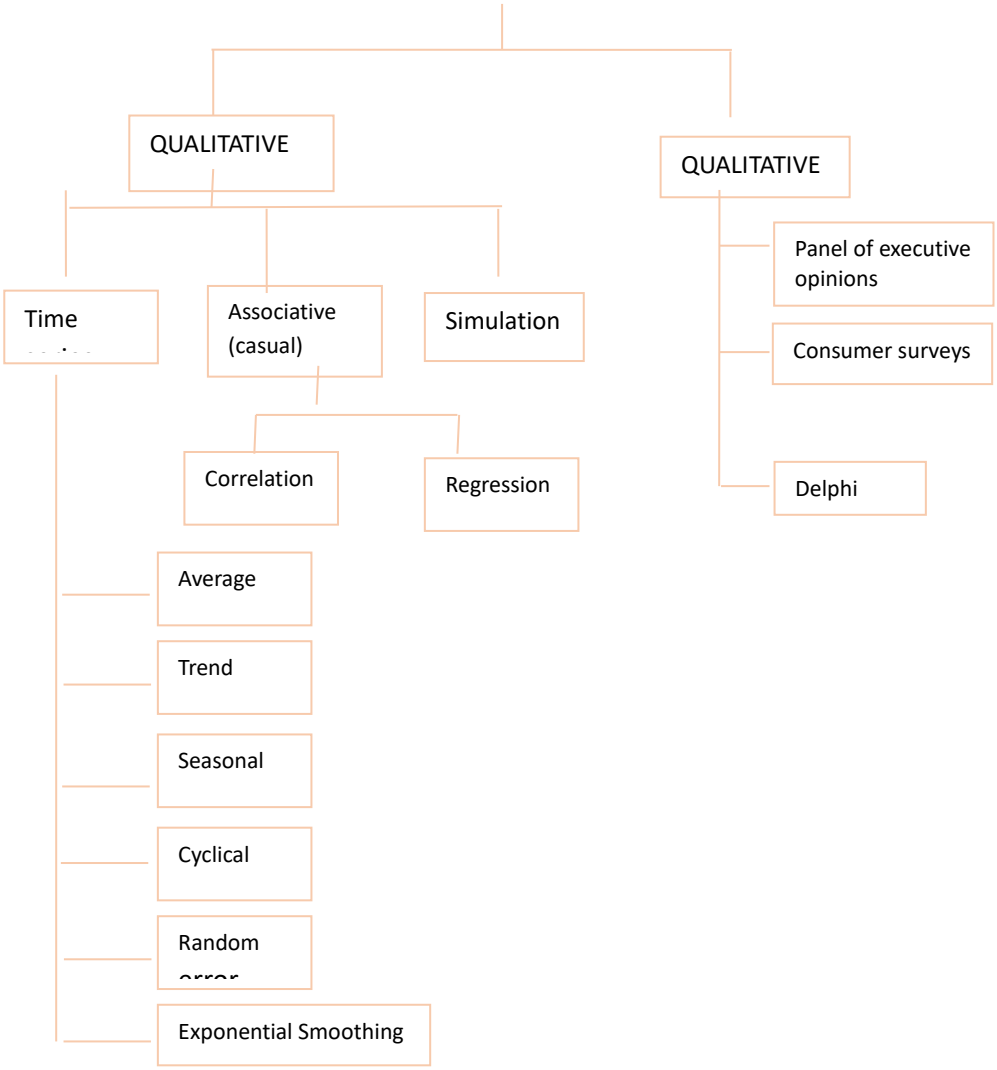

Fig. 1. Flowchart of demand forecasting techniques.

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Practical Application

Table 1. Limestone Production (in Metric Tons) in Nigeria, 2001-2010.

MONTH	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January	2477	2439	2315	2642	5882	4006	2632	8794	7659	12663
February	1733	3684	2027	2144	45188	1868	4610	6691	5532	6252
March	1840	2727	2200	4751	2261	3366	6154	7924	8399	7814
April	3229	2605	3304	2969	3673	4578	4900	4676	5900	9235
May	2787	2628	2402	4807	4352	2372	7402	8700	9897	10477
June	2287	1326	1650	2219	2090	5094	7682	12075	4560	10426
July	3952	3581	4715	5524	2158	3967	6797	8049	5296	9790
August	3370	1750	2916	7265	4978	6636	6427	8151	9113	5963
September	2430	3712	3366	3202	2965	4289	3619	6012	6558	11415
October	1974	3466	2647	2549	4654	7310	5569	9632	8680	9784
November	2642	2825	4800	5162	5958	5716	7363	202	10180	9921
December	3271	3747	4126	4474	6513	8865	8523	871	10897	13269

Source: Kamal (2011)

Table 2. Limestone Sales (in Metric Tons) in Nigeria, 2001-2010

MONTH	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January	2233	2911	2227	2784	2120	3206	12385	4705	6831	10634
February	767	1355	4092	3073	5733	7622	7707	8330	9550	12722
March	1156	2987	4455	4621	5672	2531	3066	4386	5926	9827
April	2160	3452	2653	2353	2200	3278	7233	2256	7670	4494
May	1286	2502	1700	2191	1455	6956	7272	9922	9808	6653
June	1340	1611	3227	2400	2358	3040	5369	6270	6718	4027
July	1839	1851	3101	1940	6107	4148	7891	6038	4397	10027
August	2475	1865	2849	3527	3583	3539	6429	8566	10038	8420
September	1374	2764	2011	2353	5223	4706	8746	6968	9646	10328
October	1600	2360	2941	2213	5528	5394	8038	8460	8964	9990
November	1929	2962	4484	5635	4095	6013	6151	8327	5343	10645
December	3799	3861	3933	4313	6317	7286	8123	9505	9010	13846

Sources: Kamal (2011)

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Similar to production, Table 2 above revealed to certain extent a fluctuating trends in the sale of limestone in metric tons in Nigeria from 2001-2010. However, the trend revealed different movements in the sales of limestone between years and months. For instance unlike other months which has a rising and to certain extent a falling trends in the sale of limestone, December maintained an upward momentum in the sales of limestone. The sales rose consistently from 3799 metric tons in December 2001 to 13846 metric tons in 2010.

Table 3. Calculation of trends by Least Square Approach of times series analysis for production and sales of Limestone in Nigeria

Variable	Production	Sales
N	120	120
$\sum Y_t$	635,528	613370
$\bar{Y}$	5296.1	5111.4
$\sum^t$	7260	7260
$\bar{t}$	00.5	60.5
$\sum t^2$	583220	583220
$\sum Y_t\, t$	48297158	47134424
B	68.39	69.63
Equation	$a = \bar{Y} - b\bar{t}$	$a = \bar{Y} - b\bar{t}$
A	1158.5	898.78
Trend equation	$Y_t = a + b_t$	$Y_t = a + b_t$
Y_t	$1158.5 + 68.39_t$	$898.78 + 69.63_t$

Source: Author's Fieldwork

Table 3 above is the time series analysis by least square approach for production and sales of limestone in Nigeria. The table shows that for production Y_t is equal to $1158.5 + 68.39_t$, while for sale, $Y_{t\,is}$ equal to $898.78 + 69.63_t$. These trends will be used for further analysis in the proceeding section.

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Projections of Limestone production and sales from 2011 to 2014

2011 data would be used to compare projected production and sales data with actual (real) production and sales data owing to the fact that the 2012-2014 actual (real) production and sales data could not be realised.

Table 4. Limestone Production and Sales in metric tons Forecast For 2011.

MONTH	ESTIMATED TREND (T_t)		SEASONAL INDEX (S_t)		FORECAST (T_t x S_t)	
	Production	Sales	Production	Sales	Production	Sales
January	9433.69	9324.01	0.9900	1.0159	9339.35	9472.26
February	9502.08	9393.64	0.8160	1.2773	7753.70	11998.50
March	9570.47	9463.27	0.9309	1.0511	8909.15	9946.84
April	9638.86	9532.9	0.8873	0.8088	8552.56	7710.21
May	9707.25	9602.53	1.0457	0.9644	10150.87	9260.68
June	9775.64	9672.16	0.8548	0.9644	8356.22	9260.68
July	9844.03	9741.79	1.0808	0.7373	10639.43	7131.28
August	9912.42	9811.42	1.1361	0.9949	11261.50	9761.38
September	9980.81	9881.05	0.8581	0.9949	8564.53	9761.38
October	10049.2	9950.68	1.0018	0.9916	10067.29	9867.09
November	10117.6	10020.31	1.1035	1.0903	11164.77	10925.14
December	10186	10089.94	1.2975	1.3131	13216.34	13249.10
					117975.71	**116540.78**

Source: Kamal (2011)

Table 4 above, shows that the estimated trend of limestone production in January 2011 was 9433.69 metric tons and that of December 2011 were 10186 metric tons. In other word, there is an estimated increase in production between January and December 2011 with 752.31 metric tons. Almost similar estimation applies in terms of sales from January 2011 to December 2011. In January 2011 the estimated sales were 9324.01 metric tons, which rose to 10089.94 in December 2011. In other words there was an increase in the sale of limestone from January 2011 to December 2011 with 765.93 metric tons. The same rising trend seems to reflect in the forecasted production and sales of limestone. For instance in January 2011, the forecasted production and sales were 9339.35 and 9472.26 metric tons

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respectively. These figures increased to 13216.34 and 13249.10 metric tons in December 2011 respectively. The total production of limestone in 2011 stood at 117975.71 metric tons while the total sale stood at 116540.78 metric tons.

Table 5. Limestone Production and Sales Forecast in metric tons for 2012

MONTH	ESTIMATED TREND (T_t)		SEASONAL INDEX (S_t)		FORECAST (T_t x S_t)	
	Production	Sales	Production	Sales	Production	Sales
January	10255	10159.57	0.9900	1.0159	10151.83	10321.11
February	10322.96	10229.2	0.8160	1.2773	8423.37	13065.76
March	10391.15	10298.83	0.9309	1.0511	9673.12	10825.10
April	10459.54	10368.46	0.8873	0.8088	9280.75	8386.01
May	10527.93	10438.09	1.0457	0.9644	11009.06	10066.49
June	10596.32	10507.72	0.8548	0.7373	9057.73	7747.34
July	10664.71	10577.35	1.0808	0.9112	11526.42	9638.08
August	10733.1	10646.98	1.1361	0.9949	12193.87	10592.68
September	10801.49	10716.61	0.8581	0.8442	9268.76	9046.96
October	10869.88	10786.24	1.0018	0.9916	10889.45	10695.64
November	10938.27	10855.87	1.1035	1.0903	12070.38	11836.16
December	11006.66	10925.5	1.2975	1.3131	14281.14	14346.27
					127825.88	**126567.60**

Source: Kamal (2011)

Table 5 above, shows that the estimated trend of limestone production in January 2012 was 10255 metric tons and that of December 2012 were 11006.66 metric tons. In other word, there is an estimated increase in production from January to December 2012 with 751.66 metric tons, which was slightly higher than 2011. Almost similar estimation applies in terms of sales from January 2012 to December 2012. For instance, in January 2012 the estimated sales were 10159.57 metric tons, which rose to 10925.5 in December 2012. In other words, similar to 2011 there was an increase in the sales of limestone from January 2012 to December 2012 with 765.93 metric tons. The same rising trend seems to reflect in the forecasted production and sales of limestone. For instance in January 2012, the forecasted production and sales were 10151.83 and 10321.11 metric tons

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respectively. These figures increased to 14281.14 and 14346.27 metric tons in December 2012 for production and sales respectively. The total production of limestone in 2012 stood at 127825.88 metric tons while the total sales stood at 126567.60 metric tons.

Table 6. Limestone Production and Sales Forecast in metric tons for 2013

MONTH	ESTIMATED TREND (T_t)		SEASONAL INDEX (S_t)		FORECAST (T_t x S_t)	
	Production	Sales	Production	Sales	Production	Sales
January	11075.05	10995.13	0.990	1.0159	10964.30	11169.95
February	11143.44	11064.76	0.81600	1.2773	9093.05	14133.02
March	11211.83	11134.39	0.9309	1.0511	10437.09	11703.36
April	11280.22	11204.02	0.8873	0.8088	10008.94	9061.81
May	11348.61	11273.02	1.0457	0.9644	11867.24	10872.31
June	11417	11273.65	0.8548	0.7373	9759.25	8363.40
July	11485.39	11482.54	1.0808	0.9112	12413.41	10399.44
August	11553.78	11482.54	1.1361	0.9949	13126.25	11423.98
September	11622.17	11552.17	0.8581	0.8442	9972.98	9752.34
October	11690.56	11621.8	1.0018	0.9916	11711.60	11524.18
November	11758.95	11691.43	1.1035	1.0903	12976.00	12747.17
December	11827.34	11761.06	1.2975	1.3131	15345.97	15443.45
Source: Kamal (2011)					**137676.09**	**136594.40**

Table 6 above, shows that the estimated trend of limestone production in January 2013 was 11075.05 metric tons and that of December 2013 were 11827.34 metric tons. In other word, there is an estimated increase in production from January to December 2013 with 752.29 metric tons, which was slightly higher than 2012. Almost similar estimation applies in terms of sales from January 2013 to December 2013. For instance, in January 2013 the estimated sales were 10995.13 metric tons, which rose to11761.06 in December 2013. In other words, similar to 2012 there was an increase in the sales of limestone from January 2013 to December 2013 with 765.93 metric tons. The same rising trend seems to reflect in the forecasted production and sales of limestone. For instance in January 2013, the forecasted production and sales were 10964.30 and 111169.95 metric tons respectively. These figures increased to 15345.97 and 15443.45 metric tons in

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December 2013 for production and sales respectively. The total production of limestone in 2013 stood at 137676.09 metric tons while the total sales stood at 136594.40 metric tons.

Table 7. Limestone Production and Sales Forecast in metric tons for 2014

MONTH	ESTIMATED TREND (T_t)		SEASONAL INDEX (S_t)		FORECAST (T_t x S_t)	
	Production	Sales	Production	Sales	Production	Sales
January	11895.73	11088.91	0.9900	1.0159	11776.77	11265.32
February	11964	11900.32	0.8160	1.2773	9762.72	15200.28
March	1203251	11969.95	0.9309	1.0511	120106	12581.61
April	12100.9	12039.58	0.8873	0.8088	12725.43	9737.61
May	-	12109.21	-	0.9644	-	11678.12
June	12237.68	12178.84	0.8548	0.,7373	10460.77	8979.46
July	12306.07	12258.47	1.0808	0.9112	13300.40	11160.81
August	12374.46	12318.1	1.1361	0.9949	14058.62	12255.28
September	12442.85	12387.73	0.8581	0.8442	10677.21	10457.72
October	12511.24	121457.36	1.0018	0.9916	12533.76	12352.72
November	12579.63	12526.99	1.1035	1.0903	13881.62	13658.18
December	12648.02	12596.62	1.2975	1.3131	16410.81	16540.62
Source: Kamal (2011)					**1475263**	**145867.63**

Table 7 above, shows that the estimated trend of limestone production in January 2014 was 11895.73 metric tons and that of December 2014 were 12648.02 metric tons. In other word, there is an estimated increase in production from January to December 2014 with 752.29 metric tons, which was similar to 2013. Almost similar estimation applies in terms of sales from January 2014 to December 2014. For instance, in January 2014 the estimated sales were 11088.91 metric tons, which rose to 12596.62 in December 2014. In other words, in 2014 there was a rapid increase in the sales of limestone from January 2013 to December 2013 with 1507.71 metric tons. The same rising trend seems to reflect in the forecasted production and sales of limestone. For instance in January 2014, the forecasted production and sales were 11776.77 and 11265.32 metric tons respectively. These figures increased to 16410.81 and 16540.62 metric tons in December 2014 for

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production and sales respectively. However, there were no records for production in May 2014. The total production of limestone in 2014 stood at 1475263 metric tons while the total sales stood at 145867.63 metric tons.

The fitted trend equation for production is:
$Y_t = 1158.5 + 68.39t$
Where t = 1, 2. … …… …… …… ….. 120
Such that t = 1; represents January 2001
t = 2; represents February 2001
: :
: :
t = 120; represents December 2010
Hence t +1 = 120 +1; represents January 2011
: :
: :
$Y_{121} = 1158.5 + 8275.19 = 9433.69$
$Y_{122} = 1158.5 + 8343.58 = 95402.08$
: :
: :
t + 48 = 120 + 48 = 168 represents December, 2014
$Y_{168} = 1158.5 + 11489.52 = 12648.02$
Thus, the predicted value = Trend (T_t) x seasonal index (S_t)
$Y_{121} = 9433.33 \times 0.9900 = 9339.35$
$Y_{122} = 9502.08 \times 0.8150 = 7753.70$
: :
: :
$Y_{168} = 12648.02 \times 1.2975 = 16410.81$
The fitted trend equation for sales is
$Y_t = 898.78 + 69.65t$ is as defined above
$Y_{121} = 898.78 + 8425.23 = 9324.01$
$Y_{122} = 898.78 + 8494.86 = 9393.64$
: :
: :
$Y_{168} = 898.78 + 16697.84 = 12596.62$
The predicted value: Trend (Tt) x seasonal index (St)

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Y_{121} = 9324.01 x 1.0159 = 9472.26
Y_{122} = 9393.64 x 1.2773 = 11998.50
: :
: :
Y_{168} = 12596.62 x 1.3131 = 16540.62

Owing to the fact that the real data for 2012-2014 could not be realised as at the time of executing the research, we utilised only 2011 base year for our analysis.

Comparison of 2011 Projections with Real Data

Table 8. Limestone Production/Sales Projection and Real Data in metric tons for 2011

Month	Projected (production)	Projected (sales)	Real data (production)	Real data (sales)
January	9339.35	9472.26	10024	9942
February	7753.70	11998.50	8151	10002
March	8909.15	9946.84	8808	9765
April	8552.56	7710.21	8202	7994
May	10150.87	9260.68	9890	9670
June	8356.22	7131.28	8450	8250
July	10639.43	8876.72	10.740	8530
August	11261.50	9761.38	11150	9841
September	8564.53	8341.58	8945	8950
October	10067.29	8341.58	10550	8950
November	11164.77	10925.14	11279	10740
December	13216.34	13249.10	13483	12995

Source: Author's Fieldwork

Table 8 above shows limestone production/sales projection and real data for 2011. The above table is a reflection that there is a slim variance between the projected production/sales and the real data for production/sales. For instance, in the month of March, while the projected production was 8909.15 metric tons, the actual production was 8808 metric tons, which is a shortfall of 101 metric tons from the projected production. In the same month the projected sales were 9946.84

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metric tons, while the real sales were 9765 metric tons, which amounts 181.84 shortfall from the projected sale, etc.

Test of Equality of Means

To confirm if there is a significant difference between the means of the predicted figures (projections) and real data for the year 2011, t-test statistics was used at .05 level of significance. Below are the results:

For Production:

$$t = \frac{\dot{X}_1 - \dot{X}_2}{\sqrt{(S_1^2/n_1 + S_2^2/n_2)}}$$

$$= \frac{9962 - 9831.31}{\sqrt{(2470600.727/12 + 2447049.182/12)}}$$

$$= 130.69/640$$

$$= 0.204$$

t = t-test statistics, hence, t-calculated.

For Sales:

$$t = \frac{\dot{X}_1 - \dot{X}_2}{\sqrt{(S_1^2/n_1 + S_2^2/n_2)}}$$

$$= \frac{9711.73 - 96379.08}{\sqrt{(2981517.704/12 + 1736853.182/12)}}$$

$$= 32.65/627.05$$

$$= 0.052$$

t = t-test statistics, hence, t-calculated.

Interpretation of Results

For production, since the calculated t-value (0.204) is less than the t-critical value (1.32), we therefore conclude that there is no significant difference between the mean of the forecasted figures and the real data. This implies equality of means. For sales, since the calculated t-value (0.052) is less than the t-critical value (1.32), we therefore conclude that there is no significant difference between the mean of the forecasted figures and real data. This also implies equality of means. Since the

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differences in means is found to be non-statistically significant, which implies equality of means, it is therefore found in this study that the projections made based on the least square model are fairly accurate and could be relied upon for planning and decision making purposes.

Limitations of the study

The analysis could have be more robust if the researchers were able to obtain the real data for 2012-2014. However, due to the fact that the real data for 2012-2014 could not be realised as at the time of conducting the research, the researchers therefore relied on only 2011 base year for the analysis, which is hereby acknowledged as the limitation of the study.

Conclusion and recommendations

When properly modelled, demand forecasts could help to ameliorate the impact of uncertainty in the business environment. It provides managers with the basic information required to make informed decisions. Forecasting can become a critical instrument for the enhancement of management ability to drive and sustain the long-term growth of business. The importance of demand forecasts in making decisions regarding the feasibility and viability of a business plan cannot be overemphasised. Forecasting is indeed important in providing some useful insight into the development of new products and product lines. It assists organizations to avoid putting their scarce resources on projects that may not be successful in future. Studies have shown that, on average, companies with more accurate demand forecasting and planning capabilities have less inventory, better perfect-order ratings and shorter cash-to-cash cycle times than others. More than that, accurate demand forecasts lead directly to higher earnings per share, higher return on assets and improved profit margins (Kress, 2007). Based on the above analysis, the current study submits and reiterates that forecasting is at the heart of business performance and potentially a significant driver of value in any economy. Therefore, it is proposed that managers of industries in Nigeria should always consider forecasting as a veritable tool for organisational efficiency. However, to maximize the benefit of demand forecasting, the following recommendations are noteworthy:

1. Given that the data used in demand forecasting is derived from multiple sources with possibilities of inaccuracy, there will be a need for strong control to enhance the liability of data used for demand forecasting.

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2. Managers should see demand forecasting as an interdisciplinary activity that requires a combination of the technical skills of statisticians, economists and behavioural scientist and as such, should employ the services of experts in demand forecasting to minimize or even eradicate inaccuracies.

3. A combination of methods should be used by analysts in forecasting the demand for their products and services.

4. Ministries of commerce and industry as well as labour and productivity, at both the federal and state levels should embark on aggressive sensitization of managers on the importance demand forecasting.

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