

MARKET ANALYSIS AND FORECASTING OF OIL AND GAS (LUBRICANT) MANAGEMENT IN NIGERIA

A CASE STUDY OF GRAND PETROLEUM

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Abstract

This paper has two main objectives; the first objective is the market analysis of lubricant product, and the second objective is to use actual data to forecast and estimate the error of the forecast. Also included is the competitive advantage, involving strategy in management, and products market applications. The market analysis is done using the data from Grand Petroleum Nigeria Limited, there has being an increase in production and products demand. Forecasting is the science of projecting into the future was used to project the production of these five products for 2014. A reliable result was obtained when the error was evaluated. The error calculated for the five products were all within the limit of the upper confidence limit and the lower confidence limit. Other factors used to evaluate the error also give a reasonable level of accuracy for all the products. The choice of seasonal method used for the forecasting was influence by the shape of the graph for the different products and also by the outcome of the expert modeler when the data was computed into SPSS Statistics software.

Keywords: *Forecasting, Seasonality, Production, Lubricant, Marketing, Production, Demand*

INTRODUCTION

Grand Petroleum Limited is the sole manufacturer of Hi-Speed range of lubricants. These serve automotive, industrial, marine, machinery, and specialty uses. The Hi-Speed range has being approved by the Nigeria Standards Organization as part of the Mandatory Conformity Assessment (MANCAP). The Company is aggressively engaged in the manufacturing and Sale of Lubricating Oils, sole manufacturing and marketing of the Hi-Speed range of lubricants, toll blending arrangements, engine oils, hydraulic oils, automobile fuels and lubrication, industrial fuel and lubrication and other specialty oils. The Company is involved in different energy trading and it is audaciously registering its influence on the downstream sector of the economy of Nigeria and West Africa as well. It has strong international alliances with some of the world's recognized names in the business of petroleum and state of the art facilities like a 30,000 metric tons (MT) tank farm in the Calabar. Export Processing Zone and a 25,000 metric tons (MT) lubricant plant in Lagos Nigeria and among others.

The future market of lubricants in Nigeria look promising especially for the five products considered in this paper. There will be increase in demand for these products as long as the standard and necessary evolving changes in technologies are kept and adhered too.

The very first objective of this research is the market analysis of lubricant product. The second objective of this research is forecasting of future demands. Forecasting demand which is the process of obtaining correct picture of how the future demand will look like. Survey method can also be used for products that have no historical records but products with historical records, statistical method are used to project the future. Forecasting methods are determined by the nature of product data, if the data to be forecasted is used to plot graph, the nature of the graph will determines the method to be used. Another determining factor of forecasting method is the used of expert modeler. The accuracy of the forecasted values can be evaluated by using different forecasting error evaluation. The one with the lowest values of error are more appropriate. Forecasting can also be use to evaluate the market analysis of products by using autocorrelation functions and partial autocorrelation functions which gives details of the product production rate, whether it is increasing or decreasing. Because production is directly proportional to demand, an increase in production will signify an increase in demand and decrease in production will also indicates a decrease in demand.

This paper will focus on the literature review of different aspect of forecasting techniques. The third part is market analysis. The forth part will focus on the competitive advantage through product differentiation, cost and response. The fifth part will focus on forecasting to analyze the rate of production of the selected products and market demand and conclusion.

LITERATURE REVIEW

The major cause of variation in economic and business time series in terms of growth rate measure either monthly or quarterly is mainly due to seasonal changes (Fildes, R., Armstrong, S.J., 2006). Seasonal adjusted methods can cause serious data distortion, to the extent that the cycles of business and nonlinearities are also affected. Series of time seasonality is made up of two models which are root unit seasonality and periodic models (Fildes, R., Armstrong, S.J., 2006).

Short term demand estimation uses survey method while statistical methods are more appropriate for forecasting in the long term. Any of the two methods can be used to forecast for an existing products; but for a new products that lack historical data, only survey methods will be appropriate. Survey methods involve proper investigation about the intentions of the consumers, experts' opinions, managerial plans survey, and the markets. Forecast for demands are made by the data collected for analysis. Survey of consumers 'is done by collecting information from the potentials consumers through direct interview to know their willingness to buy a particular product at different prices rate. Consumers' survey can either be end use method or complete enumeration sample survey. It is complete enumeration survey when the product consumers of a product are contacted to know their plans of buying the production concern for the period of forecast. The sales forecast is gotten by adding the likely demand of all the consumers. This method is free from bias because its uses direct information. This method is only applied to product that its consumers are located within certain region. It cannot be applied when the consumer of the product are scattered dispersedly. The estimation obtained through this method is not very reliable as consumers may not think out in advance what they may likely do during the survey situations. The question may not be answer correctly by the consumer as they may not be fully aware of their exact demand. The market conditions may also affect their answers and make it biased, and future unforeseen circumstances may also affect their answer to the questionnaire (Singh S.P. 2014). Appropriate accuracy of survey cannot always forecast consumer demand even when it is properly designed. Inadequate information by the consumer can affect their decision if the product will be purchase by them (Singh S.P. 2014).

One of the advantages of forecasting is that it enables us to improve the inventory management. Decreasing inventory is an important component of cost control in management of supply chain. There are many ways to minimize inventory, and one of the major ones is forecasting demand which is the process of obtaining correct picture of how the future demand will look like (Skylergreene Hubpages, 2012). Planning demand is one of the foremost ways of reducing safety stock by supply chain managers. The primary goal in the supply chain is

increasing accuracy in forecasting. Correct forecast can be obtained by using Mean Absolute Percent Error (MAPE) formula. Correct forecast is a method that is indirectly proportional to MAPE, that is, as correct forecast increases, MAPE decreases. The aim of forecasting demand is to monitor inventory, hence forecasting demand are clearly seen in daily management inventory (Skylergreene Hubpages, 2012).

The accuracy of forecasting can be remarkably improved through the use of different and combination of multiple individual forecasts (Clemen 1989). This conclusion has being maintained in many survey and papers that followed after. It has been found in different competitions of forecasting that single forecasting method cannot consistently perform well across forecasting horizons and all time series (Fildes, Hibon, Makridakis & Meade, 1998). Misspecification bias in the individual models can be reduced and accuracy prediction can be increase through forecasts combination. The strengths and limitations of the different forecasting methods are always the source of the increase in accuracy. Values are added to forecast combinations when the different forecasting methods are misspecified differently (Diebold and Lopez 1996). The worst forecasting method should be avoided by practitioner when combining different forecasting method for that specific point in time, and therefore makes the evaluations across all forecasting horizons (Hyndman 2006). Individual models respond differently to changes in structural data, and due to this reason, forecasts combinations from different models with different degrees of adaptability to changes in structure will perform better than forecasts from individual models (Timmermann, 2006).

Also in forecasting system that uses history of sales data to create the statistical forecast for the future purposes. The sales history to run this statistical forecast will either be demand history or shipment history. For instance, if a customer placed an order for 20,000 units, in June, but you were unable to ship the product not until October. If the Company system post the history as October, then the forecasting system use 0 units in June and 20,000 units in October to get the forecast statistically. The right procedure is to post the 20,000 units as June history for sales forecasting reasons. Demand data can still be altered by non-recurring or one-time orders that can result to inaccurate sales statistical forecasts. Demand data that get into the demand history record include promotions sales that will not be repeated in the same season in the coming year, increase in demand as a result of special order, customer one-time orders, using specific –customer demand that are too small to be significant statistically. Demand history values that are outside of a statistical confidence interval are automatically filtered by some systems. Data scrubbing when included in the process of regular demand planning can help to eliminate bad data. In order to make adjustments to the sales forecast, the sales forecast have to travels from the forecast planner to the sales team to and the product management team.

Most often, planner's base forecast adjustment on a feeling instead of exact knowledge of the activity of customer. Danger should be signified if you surpass more than 10 to 20 percent of the forecasts statistical system's (Fred Tolbert, 2012)

MARKET ANALYSIS

The market analysis for this paper was done based on the data made available by the Company of our case study. According to their sales and demand record, demand is directly proportional to production. This was further analyze using autocorrelation functions to analyze the market demand whether it is increasing or decreasing in relation to production rate. The market analysis done revealed the rate of demand of the selected products produced by the company and also the rate of production as the Company often produced according to the proportionality of customer demand. This analysis was also responsible for the choice of five products selected for analysis and discussion because they have the highest demand when compare with other products.

The following findings were discovered by the market analysis when the Company data was used. Product 1 was having 5.2% demand and production, product 2 was having 9.4% demand and production, product 3 was having 8.3% of demand and production, product 4 was having 35% of demand and production, and product 5 was having 28.2% of demand and production. The rest products result are as follows: HI-Therm 32 was 0.06%, Turbine Oil T46 was 2.08% , Extreme Pressure 2 and 3 Grease was 1.02%, Heavy Duty Grease was 0.01%, Transformer Oil was 2.04%, Transol DX 11D was 0.9%, Moto 2T was 0.162%, Gamma XP 100, 150, 220,320,460, and 680 was 3.5%, Compol S46 was 0.012%, Compol 68 was 0.034%, Compressor ISO VG150 was 0.022%, Bearing and Circulating Oil was 1.736% and other Specialty Oil was 2.324%.Based on this analysis a five product is selected and past production data was collected starting from 2009 to 2013. The data is summarized in the table A.1 in appendix.

COMPETITIVE ADVANTAGE

The creation of a system that gives a special advantage over competitors is called competitive advantage. This is done in order to create value in sustainable and an efficient way. Grand Petroleum Limited have being able to achieve its missions and competitive advantage over its competitors through differentiation, cost leadership and response.

Grand Petroleum Limited products are sold at a moderately low price which has attracted many customers to them across West Africa and the past years. They have being able to deployed a term of market specialist to attend to their customers complain and pass the

messages across to the various organs of production involved in their production activities. The company have being able to different their products in terms of packaging, quality, physical appearance and the durability of its lubricants by their users. They have also provided free transportations to deliver the products to all part of Nigeria and West Africa for their customers to increase their gain margin.

FORECASTING

The scientific art of foretelling future events is called forecasting. Forecasting was used to project the production of these five products for 2014 (see table A.2 in appendix).

A reliable result was obtained when the error was evaluated. The error calculated for the five products were all within the limit of the upper confidence limit and the lower confidence limit. Other factors used to evaluate the error also give a good level of range for all the products. The choice of seasonal method used for the forecasting was influence by the shape of the graph for the different products and also by the outcome of the expert modeler when the data was computed into SPSS Statistics software.

The following methods will be used to evaluate the data collected, which are as follows; Moving Average, Seasonal Exponential Smoothing, Adaptive Filtering, Box-Jenkins, and Classical Decomposition. The graphs below shows the autocorrelations functions for the five products.

Figure 1: Autocorrelation Function for Product 1 and 2

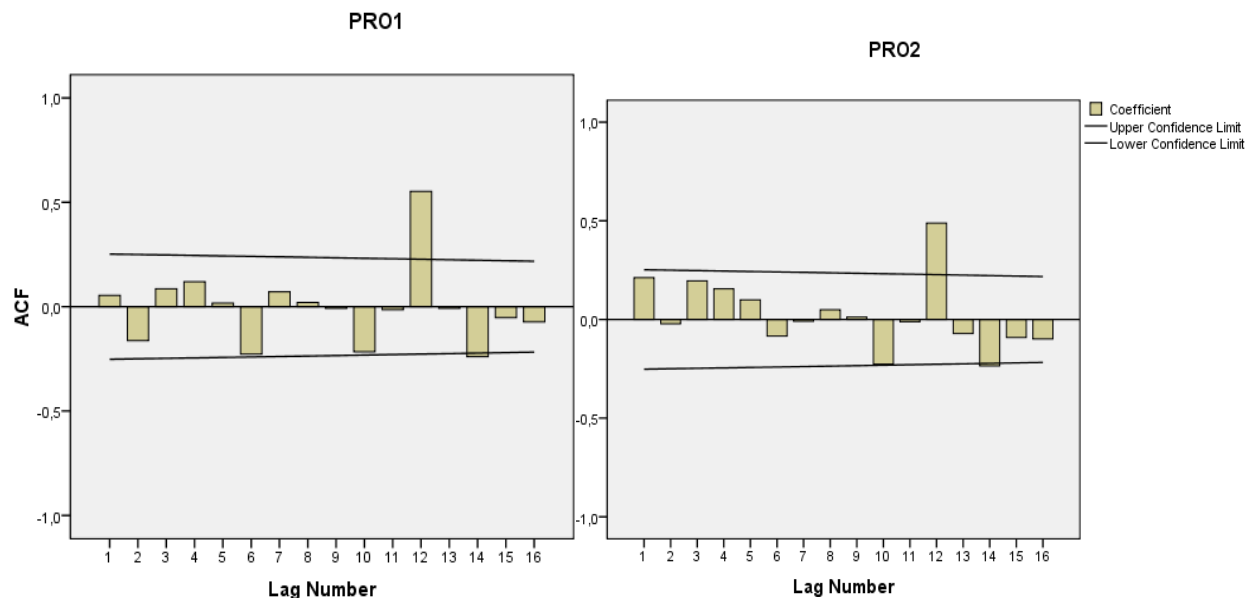
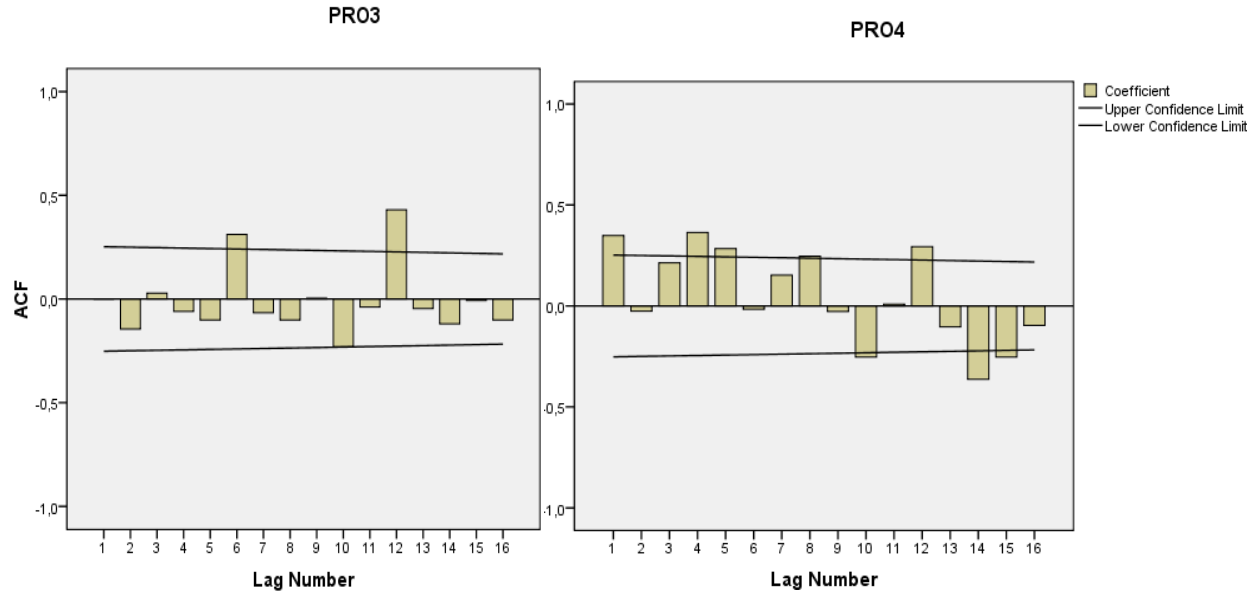
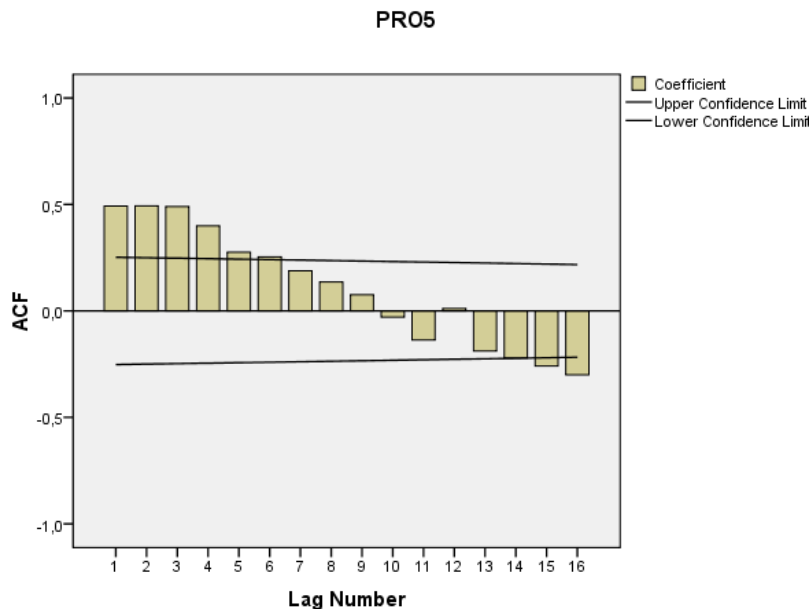


Figure 2: Autocorrelation Functions for Product 3 and 4



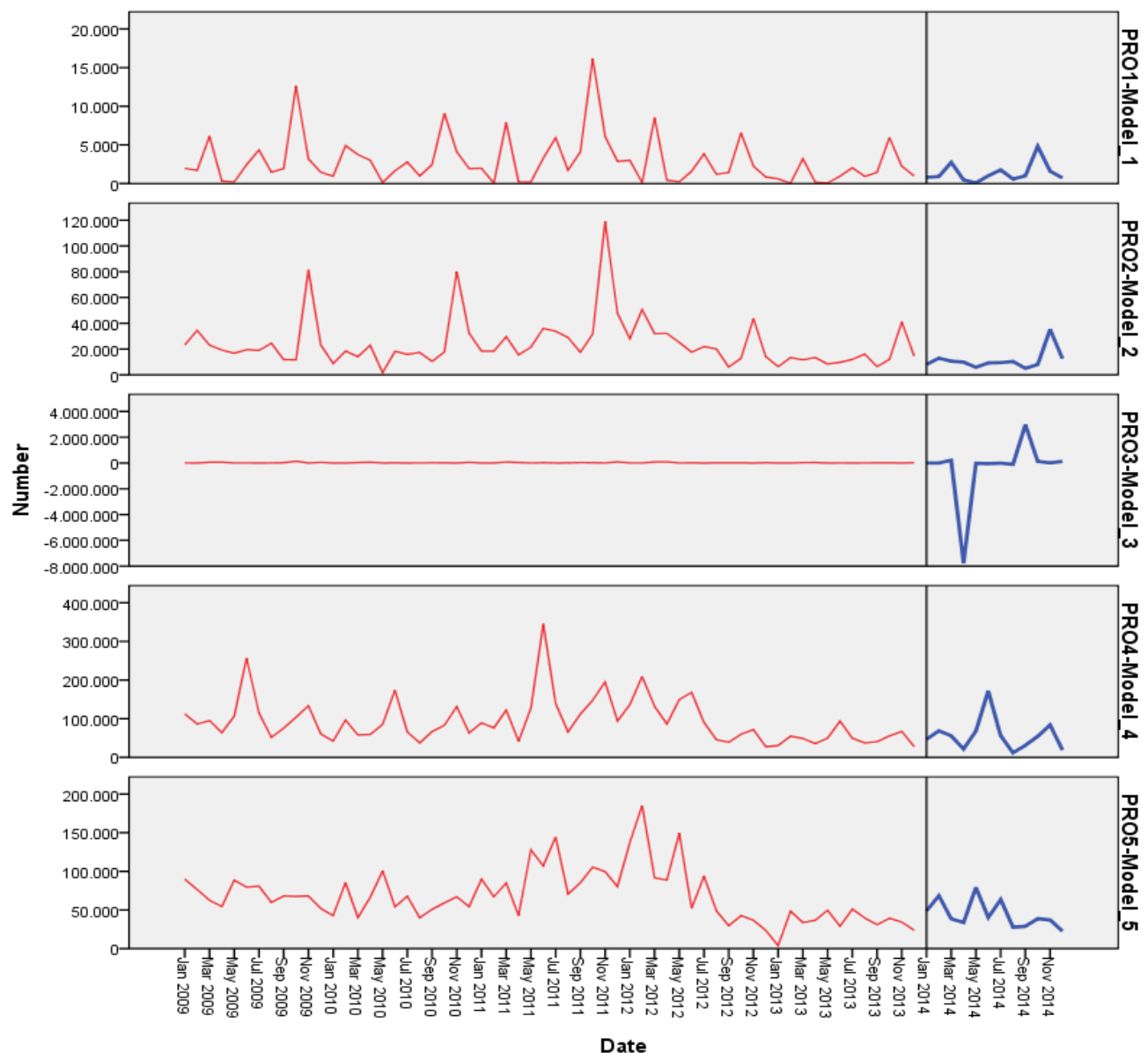
Using the figures above, that is figures 1 and 2 using their correlation at 12, there appear to be a remarkable increase in their autocorrelation functions. This means that there was great high demand for these four products as the market is the greatest allocation of resources. With this verification, I conclude that there was remarkable increase in production and also demand for products 1, 2, 3 and 4.

Figure 3: Autocorrelation Functions for Product 5



From the figure 3 above, this product is almost at the control limit that is there is little or no increase in production of this product. If more circumspective is not apply in managing this product, it might go below the control limit that means it might tend toward negative value which is the lower confidence limit (LCL). From this analysis, there may be purchase returned of finished product or adulteration of the product without noticing it, which may affect the market demand for this product. I conclude that there is need to get feel back from the end users of this product and see how to improve either on the quality or the awareness of the existence of this product.

Figure 4: Actual Data Graph and Forecasting Graph for the Five Products.



The forecasted values when compare with the actual values using their upper confidence limit and lower confidence limit, to compare the forecasted value for the two tables for the five products, they all falls within the limit, that means the forecasted values are with little or no error in it for the five products. There is only remarkable deviation from the trend only in product 3 which is somehow stable compare to the forecasted values which is partly seasonal and partly periodical.

CONCLUSION

This study discussed the need for professional management of lubricant in order to produce more standard products, minimized cost, optimized profit, reduced waste, effective line of communication, risk management. For any lubricants to break even there must be a professional lubricant management which oversee and coordinate the rest department for effective and prompt production management. Beside the market analysis, a competitive advantage technique is discussed. The companies compete with other competitors by reducing cost of their products without reducing qualities. This can be done by engaging in mass production of lubricants which can reduce the cost of production. Another method to compete with other competitors is through response, that is by responding to consumers complain on time and also by rendering some free services to the final consumers.

The study utilizes market analysis to find most demandable products and utilize the production rate to forecast future demand. The market analysis of lubricants products in Nigeria shows a great remarkable increase for the demand for most of the products except for some of the products. The reasons for such steady demand may be due to some reasons like lack of proper awareness of such products, inadequate distribution channels, inability to act on customer feel back and high cost of products. The problems listed above has hindered wide spread of lubricant products in Nigeria as some customers have formed the habit of using cheaper, easily accessible and popular product as substitute when face with the problem of cost and availability without considering the consequences of such products on their engines or machines. From the analysis done with the selected products in mist of other products, the peak period for lubricants in Nigeria seems to be in the Months of October and June, these may be due to the weather conditions in the coastal area which may affect the viscosity of the oil and eventually leads to often replacement of such lubricants.

The rate of products purchases return or damage is extremely very low according to the autocorrelation analysis done by SPSS Statistics 17 Software using the products data. Comparing the forecasted values for the different products with the original values and using the upper confidence limit and the lower confidence limit, the forecasted values have a great degree

of accuracy. The different methods used to check the errors of the forecasting, also shows that the forecasting done was with little or no error in it. In conclusion, there will be a remarkable increase in the demand for lubricant products in the future some seldom decrease from time to time in Nigeria.

LIMITATIONS AND FURTHER RESEARCH

The major problem encountered in this study is the difficulty of getting data as most companies sees their data as the secret of the company. Many companies were approached for data, but the offers were turned down. A better result would have being obtained if data from different lubricant companies were analyzed and compared.

Further research or future study should be done on lubricants distribution, awareness and market applications of some products that are not generally used by the consumers. Research should be done on how to create data collection center for all lubricants companies in Nigeria for comparative studies on different aspects of the industry. Finally, comparative research studies should be done on how to reduce production cost by associating between blended base oil from crude oil and synthetic base oil from plants and animals.

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APPENDICES

Table A - 1: Products Data

Date	Pro1	Pro2	Pro3	Pro4	Pro5
Jan 2009	1970,00	23220,00	4976,00	112782,00	89977,00
Feb 2009	1695,00	34516,00	2198,00	86275,00	76383,00
Mar-09	6135,00	23008,00	60383,00	95099,00	62565,00
Apr 2009	313,00	19200,00	63247,00	63874,00	54558,00
May-09	212,00	16767,00	6364,00	106946,00	88702,00
Jun 2009	2438,00	19534,00	8741,00	256742,00	79623,00
Jul 2009	4348,00	18905,00	3485,00	114975,00	80817,00
Aug 2009	1472,00	24518,00	8359,00	51660,00	59824,00
Sep 2009	1929,00	11813,00	22444,00	75600,00	68069,00
Oct 2009	12632,00	11635,00	141958,00	103808,00	67597,00
Nov 2009	3177,00	81397,00	2647,00	133574,00	68178,00
Dec 2009	1462,00	23142,00	55011,00	60574,00	51921,00
Jan 2010	934,00	8720,00	1869,00	42357,00	42668,00
Feb 2010	4922,00	18456,00	2461,00	96586,00	85512,00
Mar-10	3746,00	14046,00	38860,00	58056,00	40265,00
Apr 2010	3013,00	22901,00	60265,00	59059,00	66291,00
May-10	142,00	1567,00	4273,00	85464,00	100658,00
Jun 2010	1655,00	18204,00	11585,00	174320,00	54061,00
Jul 2010	2778,00	15876,00	1984,00	65487,00	67868,00
Aug 2010	982,00	17372,00	7531,00	37329,00	39948,00
Sep 2010	2436,00	10442,00	19840,00	66829,00	50818,00
Oct 2010	9081,00	17767,00	15003,00	82912,00	59223,00
Nov 2010	4108,00	80100,00	3423,00	131446,00	67092,00
Dec 2010	1936,00	32271,00	57443,00	63251,00	54215,00
Jan 2011	1969,00	18381,00	3939,00	89280,00	89937,00
Feb 2011	43,00	18386,00	1935,00	75963,00	67254,00
Mar-11	7894,00	29604,00	81905,00	122364,00	84865,00
Apr 2011	204,00	15498,00	41193,00	41601,00	42825,00

May-11	195,00	21508,00	5866,00	127746,00	127748,00
Jun 2011	3278,00	36053,00	22943,00	345238,00	107067,00
Jul 2011	5917,00	33812,00	4227,00	139474,00	144546,00
Aug 2011	1737,00	28944,00	13314,00	65992,00	70623,00
Sep 2011	4091,00	17532,00	33310,00	112202,00	85320,00
Oct 2011	16183,00	31662,00	26736,00	147754,00	105538,00
Nov 2011	6103,00	119009,00	5086,00	195296,00	99682,00
Dec 2011	2868,00	47798,00	85080,00	93684,00	80300,00
Jan 2012	3006,00	28058,00	6013,00	136284,00	137286,00
Feb 2012	120,00	50575,00	5324,00	208956,00	184999,00
Mar-12	8525,00	31970,00	88450,00	132142,00	91647,00
Apr 2012	422,00	32093,00	85301,00	86146,00	88680,00
May-12	229,00	25158,00	6861,00	149422,00	149421,00
Jun 2012	1597,00	17570,00	11181,00	168246,00	52178,00
Jul 2012	3838,00	21933,00	2742,00	90475,00	93765,00
Aug 2012	1206,00	20092,00	9242,00	45810,00	49025,00
Sep 2012	1422,00	6094,00	11578,00	38999,00	29656,00
Oct 2012	6556,00	12827,00	10832,00	59862,00	42758,00
Nov 2012	2245,00	43784,00	1871,00	71851,00	36674,00
Dec 2012	841,00	14012,00	24942,00	27464,00	23541,00
Jan 2013	608,00	6325,00	1425,00	30800,00	3884,00
Feb 2013	32,00	13375,00	1300,00	54792,00	48452,00
Mar-13	3216,00	11675,00	32525,00	48872,00	33749,00
Apr 2013	160,00	13425,00	35400,00	35568,00	36688,00
May-13	72,00	8375,00	2175,00	49664,00	49656,00
Jun 2013	952,00	9700,00	6300,00	93728,00	29013,00
Jul 2013	2044,00	11950,00	1600,00	49408,00	51100,00
Aug 2013	924,00	16100,00	7475,00	37244,00	39865,00
Sep 2013	1436,00	6400,00	12150,00	40656,00	30870,00
Oct 2013	5956,00	11925,00	10075,00	55496,00	39342,00
Nov 2013	2240,00	41050,00	1800,00	67296,00	34412,00
Dec 2013	988,00	14550,00	25025,00	27824,00	23750,00

Table A - 2: Forecasting Table

Model		Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014
PRO1- Model_1	Forecast	794,27	903,75	2739,74	455,98	84,75	1003,39
	UCL	3476,77	3709,95	7044,31	3201,54	2772,93	10246,04
	LCL	-1888,22	-1902,46	-1564,83	-2289,58	-2603,42	-8239,27
PRO2- Model_2	Forecast	8077,58	12909,27	10543,11	9897,68	5810,12	9264,28
	UCL	23872,93	31768,52	29279,14	29378,10	23433,36	32014,78
	LCL	-7717,77	-5949,99	-8192,93	-9582,73	-11813,13	-13486,22
PRO3- Model_3	Forecast	2253,18	3641,11	221154,59	-7784539,69	-21073,39	-45005,22
	UCL	35191,23	36930,78	633339,47	9146281,43	39530,85	76778,06
	LCL	-30684,88	-29648,56	-191030,28	-24715360,80	-81677,62	-166788,50
PRO4- Model_4	Forecast	46588,20	68802,05	55594,28	21537,31	68136,12	171942,53
	UCL	109981,64	137080,08	128430,06	98661,95	149323,38	256998,58
	LCL	-16805,24	524,02	-17241,49	-55587,34	-13051,14	86886,48
PRO5- Model_5	Forecast	48686,11	68455,74	38553,95	33744,16	79172,76	40324,17
	UCL	89475,55	114059,46	88510,13	87702,85	136856,91	101507,34
	LCL	7896,66	22852,02	-11402,23	-20214,53	21488,62	-20859,01

Note: For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.