TITLE PAGE

FORECASTING - A TOOL FOR EFFECTIVE

MANAGEMENT DECISION - MAKING

(Case study of Foreign Exchange Market)

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DECICATION

This Research work is dedicated to the Almighty on whom belong my soul and on whom I depend on.

APPROVAL PAGE

I agree in every capacity to certify that this project work, FORECASTING - A TOOL FOR EFFECTIVE MANAGEMENT DECISION - MAKING was produced by the bearer, MR TAJUDEEN ALANI WILLIAMS in partial fulilment of Post Graduate Diploma course in Computer Science

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DR. K.R. ADEBOYE   DR.K.R ADEBOYE

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21/4/94

EXTERNAL EXAMINER.

APPRECIATION

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TAJUDEEN A. WILLIAMS PGD/MCS/010

TOPIC: FORECASTING - A tool for effective   management
decision - making.

(A case study of Foresgn Exchange Market)

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ABSTRACT

Forcasting is an act of predicting what will happen in the future, Similarly, economic forecasting is the predication of any of the elements of economic activity which may be on the short, medium or long term basis.

The researcher looks at Foreign Exchange Market as an instrument of budgeting for organisations that require transfer of funds, importation and exportation of goods and services, etc for the purpose of effective running of this business organisations. With a good Foreign Exchange Market forecast, the budget will be very useful throughout the year. Whereas, if there is a great deviation from the proposals, then the budget will be thrown aside for other management decisions which may not be favourable to the organisation.

The researcher however collected necessary data from the central Bank of Nigeria and other organisations. He used it to demonstrate some related forecasting tools which may include Time - series, regression Analysis, Purchasing power parity and International Fisher effect to determine the foreign exchange rate which could help in the effective and efficient management of our organisations.

1.0 INTRODUCTION

In the modern times, business organisations are becoming more and more complex with different levels of activities which necessitate the need for real planning, Planning is a process of determining goals or objectives and setting causes of action that will help in achieving them. Planning is necessary because the organisations environment is constantly changing due to new laws been made by the governments, changing in the economy every minute and competitions from other organisations. All of these however will have an impact on the success or failure of the organisations.

However, forecasting is an essential tool for good planning because the bigger the organisation, the greater the need to know what the situation would be in some months or years ahead. Therefore, to make a faster and effective decisions for greater efficiency in our organisation, some decision-making tools must be made use of . The researcher will look at forecasting as a decision-making tool for effective management of our organisations.

Forecasting is an act of predicting what will happen in the future and similarly, economic focecasting is the prediction of any of the elements of economic activity which may be on the short, medium or long term basis. These definitions can however be generalized to cover all human activities since our daily life requires planning and

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predic tions for easiness and conveniences. A young man who leaves his home 30 minutes behind his usual time in Lagos may prefer to join a taxi instead of a bus due to some factors or date avilable to him. This involves prediction because for him to get to his place of work on time, he must have predicted possible time to get there by taxi and by bus and make the "best" choice.

Foreign Exchange system in Nigeria before 1986 was through import licensing which has been protecting our organisations. Some of these organisation relied on this protection to the extent that they do not use their forsight and initiative to expand and make their organistion more effective and efficient. But with the expansion of the finance industry in the past years, which is one of the major impact of deregulation of the Nigerian economy through the structural Adjustment Programme - SAP), brought another system of Forign Exchange Market.

This however is a challenge to our organisations to either improve their rate of efficiency or be swept out of the economy because without proper planning, they will continue to have problems in getting foreign exchange, raw-materials, spare parts e.t.c. to help their organisations moving. This is why for the past few year, we have been experiencing retrenchments, reduction in production, half - salaried workers and sometimes most workers are advised to sit at home for sometimes until situation improves etc.

Therefore, they will at the long-run either need to fold up or run to the financial market to sometimes borrow at an exhorbitant rate which could claim what could have been their profits or make them run at a loss. This is why it is important for our organisations to have a clearer aims and objectives and use effective management tools to achieve these objectives rather than reliance on the government for protection everytime.

A business organisation which was established with some stated aims and objectives must make predictions to achieve them since there are many factors which may constitute a stumbling block to their achievements. Efforts however must be made at predicting how these barriers will look like at any given point in time and its effects on the organisational objectives. It is due to this fact that the researcher picks Foreign Exchange market as a good planning instrument which must be well taken care of by predicting what the trend may look like before the budget is prepared.

Therefore, the researcher will collect some necessary data using some forecasting tools to predict what the market will look like in a period of time with the precision level given.

1.1 HISTORY OF SAP AND FEM.

Structural Adjustment programme has always been the instrument used by both the World Bank and the International Monetary Fund (IMF) for the disbursement of structural

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Adjustment Loans (SAL). The purpose of SAL has beeen to support the implementation of polices and institutional changes necessary to modify the structure of an economy so that a good growth rate can be maintained and a viable balance of payment feasible in the medium term. However, in various World Bank documents, the objectives of structural Adjustment Programme include the followings.

(i)   Correcting balance of payments inbalances.

(ii)   Elimination of distortions and promotion of micro-economic efficiency.

(iii)   Reduction of high inflation rate

(iv)   Protection or resumption of output growth.

(v)   Minimization of the cost of adjustment.

The central Bank of Nigeria was established under the ordinance of 1958 and it commenced its operations on the 1st July, 1959. Section 4 of the 1958 ordinance spelt out the principal objectives as follows:

(1)   to issue legal tender currency in Nigeria,

(2)   to maintain external reserves in order to safeguard the international value of the currency;

(3)   to promote monitory stability and a sound financial structure in Nigeria and.

(4)   to act as banker and financial adviser to the Federal Government.

Under sections 28 and 29 of the act, the management of the bank is to, among others, determine the rate of exchange at which the bank shall buy and sell foreign currencies. Therefore the central Bank of Nigeria, as an agent of the Federal Government, administers the foreign exchange control regulations and negotiates with international finacial institutions on behalf of the Federal Government of Nigeria.

Decree 24 of the banking act also gave more power to the central Bank of Nigeria. For example, section 8(1) of the decree make the Governor of the Bank directly responsible to the president of the Federation and no longer through the minister of finance and section 39(1) also states that CBN shall be soley responsible for the articulation and implementation of the monetary polices and was also given power to regulate the entire banking system.

1.1.1 INTRODUCTION TO SAP IN NIGERIA

Structural Adjustment Programme was introduced in the Nigerian economy due to the illing nature of the economy. Domestic inflation kept rising from 7.76% in 1982 to 39.9% in 1984 and in the external sector, the continous pressure on the balance of payment led to reduction of our external reserves 2.4 billion naira in 1981 to 798.5 million naira in 1983. Also, as a result of decline in the price of oil in the world market, the situation become critical and in one of the speech of the then president - General Ibrahim B.

Babagida on the 27th June, 1986, he announced the decision of the Federal Government to establish the Structural Adjustment Programme (SAP) to implement, among others, the following objectives:

(i)   to introduce the second - tier Foriegn Exchange Market.

(ii) to deregulate the economy through the abolition of import licencing, commodity boards etc.

(ii) Diversification of the production sectors of the economy especially Agriculture and industries so as to reduce the present heavy dependent on oil.

(iv) Privatisation, the promotion of non-oil exports. However the introduction Foreign Exchange Market which was backed up by decree 23 of 1986 commenced operations in Sept.29, 1986 for buying and selling of foreign exchange at a determined market rate.

According to the Central Bank report, Foreign Exchange Market was to be managed in such a manner that the forces of supply and demand for the foreign currencies determines it rates but however, the current govern-ment has placed a ceiling to which it can reach. The logic employed assumes a systematic depreciation of the naira and ultimaely, the merging of the offical and socond tier market which was achieved in July 1987. All these ideas was to allow the naira find its "realistic value" so as to eliminate the

operations of the parallel market and the various distortions in resources allocation. Recent development has even made the "black market" illegal. Therefore Foreign Exchange Market after the merging has the following objectives:

   (i)   to determine a realistic exchange rate for the naira through the operations of market forces of demand and supply.

   (ii) to provide forum for rational allocation of the scarce foreign exchange resources.

   (ii) deregulation of cumbersome controls in the economy

FEM was however intended to provide the following advantages among others

   -    To considerably increase government revenue in terms of the volume of naira availabe to the government. This will in turn increase employment, development of rural areas and domestic self-sufficiency in food production within some few years.

   -    It is also to replace the former import licencing system with appropriate pricing system which will eliminate foreign exchange malpracticed like over-invoicing, importation of sub-standard goods, selling of import lincence at exhorbitant prices etc. This will allow manufacturers to freely

purchase foreign exchange for use which in turn will increase productivity.

- It is also to pave way for diversification of the economy into non-oil sectors and reduce the pospensity of Nigerians for imported goods.

- Freedom of transaction in foreign exchange. Both Nigerians and foreigners can buy, sell and keep domicliary account for foreign currencies.

- It allows competition among users which influences the prices of goods and services. Therefore users, especially manufacturers with efficient management should be able to fix reasonable prices for their goods such that it could be within the reach of the customers and at the sametime does not flunctuate with the constant changing of naira exhange rate.

1.2 OBJECTIVES OF THE RESEARCH WORK

Since forecasting has been the basis of most planning and decision - making activities on the long-run, individuals, governments and organisations all believes it is an essential tool that must be taken seriously. It is in line with this that the researcher intends to use foreign exhange rate to demonstrate the use of some forecasting instructments so that it could help in the effective and efficient management of our organisation.

1.3 LIMITATIONS.

Due to the fact that forecasting instruments or tools are many coupled with the little available time, the researcher will discuss on time- eries Analysis, the regression Analysis, Purchaing Power Parity (PPP) and International fisher effect and the demonstration of how it can be used using computer programs.

CHAPTER TWO

2.0   <u>INTRODUCTION</u>

The foreign exchange market started developing after the world war 11 in which Western Europe was in need of rebuilding their war - turn nations. Under the Marshall plan, United State of America is to help them build their economies which further strengthen their relationship and along the line, European Common Market was formed to promote better relations among these nations.

With the development of this trade coupled with the development in trams-portation and communication, U.S.A and their European Allies become more and more stronger that other nations started using US dollars and European currencies as their reserve currency because they are widely accepted and stronger. Today the whole world is dependent on one another; the developed world are dependent on the under developed for some agricultural raw-materials, crude oil, etc while the under-developed depends on the developed for equipment, processed raw-materials, etc. As S. B. Block

and G.A. Hirt put it (1987,p.672) "Today, the world economy is more integrated than ever, and nations are dependent on one another for many valuable and scarce recources."

2.1   THE NEED FOR PLANNING AND FORCASTING

Since most governments, organisations and individuals can not do without foreign exchange either directly or indirectly, it will be necessary for them to do proper planning since this foreign exchange flunctuate due to some factors which shall be discussed later.

Planning is the process of determining goals or objectives and setting cources of action that will help in achieving them. The planners are involved in decision - making to project what the future will look like. Similarly, forecasting is an essential instrument for planning and can not be easily seperated from each other because it is in the process of good planning that forecasting is made use of. This part of view is further buttressed by Makridakis and others (1983,p.708).

"Because both forecasting and planning concern themselves with the future, it is impotant to integrate these two functions within the organization. A knowledge of forecasting techniques is of little value unless they can be effectively applied in the organizations planning process. It requires an examination of the planning activities within an organisation so that the types of forecasting required and the techniques available for providing them

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can be tailored to the organizations needs."

The planning here will however be much related to budgeting in our organizations with the present system being operated in the country. Therefore appropriate forecasting instrument is needed to make nearly accurate forecast of what the foreign exchange will look like during a fiscal year. flunctuation in foreign exchange rate is caused by many factors which can be categorized under one of the following headings according to Allen Eeston (1976, p9).

1.   Demographic changes

2.   Economic trends

3.   Bussiness phylosophy

4.   Legal and legislative enactment

5.   Social attitudes and practices

6.   Educational trends

7.   Religious attitude and change in public morality

8.   War and peaceful developments

9.   Scientific and technical developments

10. Political developments.

11. Foreign developments

12. Health and medical developments.

From the above listed points, the followings are the most common ones.

(i)   -   Inflation

(ii)   -   Interest rate

(iii)   -   Balance of payments

(iv)   -   Government policies

(v)   -   Drop in export

(vi)   -   Political turmoil

(vii) -   Wide spread labour strike.

(i)   INFLATION:-   This is mostly applied to developed countries where inflationary rate is used as a measure of exchange rate, when inflation rate diffentials between two countries changes, the exchange rate is also adjusted. This is a tool for purchasing power parity theory.

(ii)   INTEREST RATE:- When a country is having low interest rate, the investors in that country may prefer to move their capital to where the interest rate is higher. This however makes their former basis foriegn exhange to reduce in value while their new basis foriegn exchange will appreciate in value.

(iii) BALANCE OF PAYMENT:- This shows the export and import transaction of a country

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and the rest of the world. When there is surplus in the balance of trade, it mean**s** people will be demanding more of the country's currency than the country is demanding for other currencies which makes it stronger. If on the other hand, the balance of payment is deficit in nature, there will be pressure on that country's currency which will make it to depreciate in value

(iv) GOVERNMENT POLICIES:- Some governments may decide to fix the values of the currenices below the actual value to promote investment and some using some monetary and fiscal polices that will affect the value of the foreign exhange market. For example, exessive government spending will cause inflation and this will eventually effect the foreign exchangs value.

(v) DROP IN EXPORT:-This is also a major factor in Nigeria expecially the country's OPEC quota which can be reduced

sometimes to bring the price up or for other reasons. Nigerian export earnings, however, come mostly from the sector thereby reducing the export earnings and this means reduction in the supply of foreign exchange.

(vi) POLITICAL TURMOIL:- This is another factor which has been contributing to the rapid upward movement of the foreign exchange value. Since the polictial problems of June 12, 1993 when most people have decided to leave the country or leave for their villages, most investors tend to distance themselves from Nigeria and economic activties were also affected.

(vii) WIDE SPREAD LABOUR STRIKE:- This tends to paralyse the economy and when this happens, investors are scared; there will be transfer of investments to other countries, reduction in exports etc. All these, however, will effect country's foreign exchange value.

Furthermore, decisions are made under three environmental conditions

(i)   -   Certainty

(ii)   -   Risk

(iii)   -   Uncertainty

(i)   CERTAINTY:- To make such decision-making environment, the decision - maker is sure of what he is to operate on and could be said that the probability of the event happening is one the event is deterministic. This is hardly seen in our modern world which is full of many unpredictable events.

(ii)   RISK:-   The decision - maker has many alternative at hand with different probabilities assigned to them. Therefore, he will need to choose the one he feels is the "best". There are times when the decision - maker will need to make some sort of subjective distribution so as to arrive at a fairly reasonable decision.

(iii) UNCERTAINTY:- These are situations when the environment is not certain and no simple probabilities can be

assigned. Probabilities may be unknown in a stable environment if there is no past records or experienced mostly in new industries. They may also be unknown because the environment itself is not steady.

2.2. FEM AND OUR ORGANIZATIONS

Before the era of SAP, the country was seriously in problem. The minister of finance, Dr. Chu Okogwu, in his 1988 budget speech said.

"The country was on the edge of social - economic precipice just before the advent of SAP, and economic collapse would surely have occurred if, after missing one opportunity after another, we had failed to embark on rational economic reform."

This is because international credit lines has been blocked such that those with import licence were unable to use them and companies started cutting back the number of staff which in turn worsen our unemployment rate and salary areas was the order of the day. This was why president I.B.Babangida, in Euromoney of february 1988, said "life was already tough and it was going to get tougher. Nigeria could no longer afford to drift without a clear economic plan". This however brought what is known as SAP into Nigeria and

with regards to our organizations, the aim of SAP can be broken down into the following steps:

(1) Adoptation of a realistic exchange rate policy.

(2) Rationalization and restructuring of tariffs.

(3) Strengthening of demand management policies.

(4) Adoptation of measures to stimulate domestic production and broaden the supply base of the economy.

(5) Adoptation of appropriate pricing polices.

(6) Encouragement to rationalization and privatization of public sector enterprises.

(7) Reduction of complex administrative controls, simultaneaously with a greater reliance on the market forces.

(8) Move towards improved trade and payment liberalizations.

And according to one of the SAP's documents from CBN.

"the programme aims at altering and realigning aggregate patterns so as to minimize dependence on imports, enhance the no-oil export base and bring the economy back to the path of steady and balance growth".

Due to the high distortions in the Nigeria economy, SAP envisages a greater role from our organizations for effectives restructuring of the economy. According to Mr Oladele Olashore in his paper delivered at the Branch Anual General Meeting of the Manufacturers Association of Nigeria, Ibadan on March 6th, 1987, he said "The challenge of SAP for

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the private sector, is a challenge of strategy, a challenge of efficiency, innovation and productivity. " This is really true because our organizations have been relying too much on the government for protection; they have been over exploiting governments weakness and mismanagement which makes them to lack forsight and direction.

Most of the organizations are facing problems of lack of raw materials and cash flow squeeze because FEM has formalised the foreign exchange shortages. With the advent of SAP, ther is need for proper specifications of their aims and objectives which can mostly be achieved by good techniques and enterprising managerial activities. This is very important because it determines their sense of direction and ability to plan effectively. As in the words of Mr. Olashore.

> "The SAp is in a clarion call for a change in the basic operational format of the business organization in Niergia. No longer can political patronage be the basis for the organizations existence. Importation can no longer be predicted on easy accessibility of unlimited and cheap foreign currency. Cash flow analysis, market potential, market segmentation, efficiency, business strategy, management initiative, and host of other operational criteria are now the name of the game."

This is why the researcher believes a very good budget planning which takes care of the foreign exchange rate is a

good management initiative and strategy for achieving the organizational goals since foreign exchange itself flunctuates. This can be supported in the words of Block and Hirt (1987,p.678) which says

"Since flunctuations in currency values results in foreign exchange risk, the financial executive must understand the factors causing these changes in currency values. Although the value of a currency is determined by the aggregate demand and supply for that currency, this alone does not help our financial manager to understand or predict the changes in exchange rates."

2.3 TYPES OF FORECASTING TOOLS

If an event is to take place within a very short period of time, there may be no need for planning but the very minute it will take a longer period, then the need for planning arises. In such cases however, there is also need for forecasting to determine when and how an event could occur for affective and efficient planning due to some controllable and uncontrollable situations. ie.

$$P = F (C_1 \ C_2 \ \_ \ \_ \ \_ \ C_n, \ U_1 \ U_2 \ \_ \ \_ \ \_ \ U_m)$$

where

P = objectives or aims of the organization

C_1 = controllable situations

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U_1 = uncontrollable situations

It should be noted that uncontrollable situations required forecasting white controllable situations required decision - making for proper planning. According to madrikakis and others (1983, P4).

" forecasting is an integral part of decisions - making activities of management. An organization establishes goals and objectives, seeks to predict environmental factors, this selects actions that it hopes will result in the attainment of the goals and objectives.

An organization could develope a forecasting system for uncertain events by building multiple approaches to the problem. Therefore to use forecasting effectively, the following areas should be covered.

- Identification and definition of forecasting problems.

- Application of a rage of forecasting methods .

- Procedures for selecting the appropriate methods for specific situation.

- Organizational support for applying and using formalized forecasting methods.

The usage of forecasting has a wide range of acceptance and the method employed depends on the time horizon, types of data patterns, cost understand-ability. The methods of forecasting can be categorised into two broad divisions:

(i) Quantitative methods.

(ii) Qualitative methods.

It is very important, however, to discuss this characteristics of forecasting before dwelling into the methods itself.

TIME HORIZON:- The horizon deals with the length of forecast. Short - term forecasting uses qualitative methods, medium or intermidiate forecasting uses either quantitative or qualitative while long-term forecasting mostly uses qualitative techniques.

THE PATTERN OF DATA:- It is better to first plot the past data to visualize the trend. It is with this that the best quantitative method could be choosen.

COST:- This is the cost of developing the techniqe, the cost of running the model and other cost associated with it.

UNDERSTANDABILITY:- Managers prefer to use techniques that are familiar with than others even if it will be more accurate the ability to convince them could also allow for more efficient techniques.

2.3.1   QUANTITATIVE TECHNIQUES.

Quantitative techniques rely on the availability of quantified information to be able to forecast what the future will look like and it has the following assumptions.

- Information about the past is available
- Information is inform of numeric data.
- Assumption of continuity ie past pattern will continue into the future.

TIME SERIE ANALYSIS:-

Quantitative techniques generally rely on past figues or what could be termed the history of that activty. Time - series is however considered when the data or observed values is a function of time. that is, the data is collected for some specified ordered period of time. Therefore in time series it is necessary to know the past data to be able to project into the future. It is also important to know the pattern of the data collected so that appropriate time series method could be used. The patterns include.

(1)   SEASONAL PATTERN:-When data is influenced by some periodic factors. For example, most Nigerians going on holiday in Europe prefer to go in summer which could make the demand for foreign exchange to be higher during that period.

(ii)   CYCLICAL PATTERN:-This pattern exist when there is long - term economic flunctuation or oscillation about the trend line.

(iii)   TREND PATTERN:- This pattern exist when there is secular increase or decrease in data over a long-term period.

(iv)   RANDOM OR IRREGULAR PATTERN:- It is a shape upward and downward movement which is usually brief and can be caused by factors such as strikes, floods, droughts, etc.

SIMPLE MOVING AVERAGE

This is simple smoothing method of influencing past data, through the mean as a means of forecasting. The number of periods is specified as dimmed fit by the user. the steps involved inculde.

(1)   Pick the number of periods, N to be used for the moving averages.

(2)   Add the first N series and divide it by N.

(3)   Drop the upper most in the calculation and add the mext period before the next division by N

(4)   Continue with (3) until the lost period is reached.

(5)   Calculate the error by substrating real data from forecast data.

Smoothing method only consisders the elimination of randomnesss so that the feasible pattern can be used to project in to the future while decomposition method identifies different patterns involoved which is usually common to economic and business series. There are many alternative approaches to decomposition methods all aiming at eliminating the patterns in series to the best accuracy level. Time series analysis in this form is based on the assumption that, for any period of time, the value is influenced by some of the patterns described above.

$$\text{i.e} \quad Y = T * C * S * I \quad - - - - (1)$$

when using multiplicative model.

$$Y = T + C + S + 1$$

when using Additive model.

RATIO - TO - MOVING AVAERAGE.

The method of ratio - to - moving average involves the following steps:

(1) calculate the moving average to elimnate the seasonality and randomness.

$$\text{ie moving Average} = MA = T \times C \quad - - - (2)$$

(2) Find the ratio of data to moving average by dividing equation (1) by (2)

$$\text{i.e } Y/MA = \left(T * C * S * I \right) / \left(T * C \right) = S * I$$

That is T & C effect is removed.

(3) Calculate the seasonal indices by adding the corresponding weeks or quarters or months and divide by the number of figures added.

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(4)   Use the appropriate seasonal indices to multiply
        the given data.

NB   There are many methods of calculating (1) and (3)
        above but the research intends to use the one found in
        weiss and gershon (1989,p154) and Groebner and
        Shannon

TREND ANALYSIS:-

This analysis is mostly referred to as least squares
method and it is used to compute the trend values. However,
it   should   be   noted   that   the   population figures   are
caonsidered   here   which is supported by   Kaznier   and   pohl
(1987,p.435).

"The   time series value Y are not random - sample data
   but rather are complete historical values". the linear
   equation is given as below

      Y = a + bx

      where

      Y = trend value for a given time period

      a = the intercept

      b = the slope of the line

      x = any time period.

$$b = \sum_{i=1}^{N} (Y_i - \bar{Y})(X_i - \bar{X}) / \sum_{i=1}^{N} (X_i - \bar{X})^2 \quad or \quad \frac{\sum_{i=1}^{N} X_i Y_i - \bar{X}\bar{Y}}{\sum_{i=1}^{N} X_i^2 - N\bar{X}^2}$$

$$\text{and } a = \bar{Y} - b\,\bar{x}$$

$$\text{where} \quad - \quad \bar{Y} = \sum_{i=1}^{N} Xi \ /N \text{ and } \bar{X} = \sum_{i=1}^{N} Y_i \ / N$$

EXPONEENTIAL METHOD OF TREND ANALY

This method is usually useful when there is a constant growth rate of data and any linear estimate would clearly be a poor estimate, therefore the data can then be transformed by calculating the natural logarithm of each values so that linearity would exist and least squares method can then be applied successfully.

i.e. log Y = log a + x log b

OR

$$Y = ab^{x}$$

It should however be noted that after the least squares method has been successfully used, the value should be coverted back to its original form by getting the antilog or using the formaular.

$$\log_{e} Y = K$$

$$Y = e^{k}$$

where

Y = time series value

K = constant derived from using least squares method. For a good forecast however, after the least

squares method has been used, the derived equation can be used to make projections. The above methods however have there short - comings but due to their brilliant performance, it shall be over-looked to some extent. However, the error margin shall be calculated or measured. Other computational methods include.

PURCHASING POWER PARITY METHODS

It compares purchasing power of a country to the order to determine the upward or downward movement of a country's currency. For example, if a tin of 450 grammes of a brand of beverage is sold at 80 naira in Nigeria and the same is sold at 20 dollars in U.S.A, then the exchange rate is required to be in ratio of 4 naria to 1 dollar. Assuming the exchange rate started at this point, if there is an inflation rate of 30% in Nigeria and 5% in U.S.A, then this inflation rate will be used to adjust the rate of exchange too. The formular usually employed is

$$(1 + 1 \text{ infla})/(1 + \text{infla}) = ER_T + 1/ ER_T$$

where

InflA = inflation in country A

InflB = inflation in country B

ER = Exchange Rate

T = time period

In the above given example, we have

$$(1 + 0.30)/(1 + 0.05) = ERT + 1/ ERt$$

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ie. ERT + 1 = (1 + 0.30)/(1 + 0.05) * (ERT)

INTERNATIONAL FISHER EFFECT

According to Grosse and Kujawa (1988,p148)

"The international fisher effects translates irving fisher's reasoning about domestic interest rates to the transactional level." International fisher Effect hold the view that foreign exchange rates are determined by interest rate differentials among countries. A 20% higher interest rate in Nigeria compared to U.S.A means a 20% depreciation in the value of naira and the formaula is

$$(1 + iA)/(1 + iB) = (ERT + 1)/ ERT$$

Or

$$ERT + 1 = (1 + iA)/(1 + iB) (ERT)$$

where

iA = interest rate in country A

iB = interest rate in country B.

2.3.2. QUANTITATIVE TECHNIQUES

This is a method of forecasting that does not require data in the same manner as quantitative method, the input here depends on the method to be used and it requires intuitive thinking, judgement and accumulated knowledge. It utilizes human mind effectively to process diversed pieces of in formation and structure results of forecasting in such a way that it can be easily integrated in planning and

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decision - making process. The methods used here, among others, include

(i) JURY OF EXECUTIVE OPINION.

This is a simple system of forecasting in which top - level executives give their opinion on what they thougth could be the best forecast on an issue and these are weighed and a decision is taken on this. It is a subjective method of forecasting because it only involves experiences and good judgement and it is sometimes used when there is no adequate supply of data.

(ii) THE DELPHI ECHNIQUES.

This techniques was developed by Rand coporation but has its root in ancient Greece. It is another method of aggregation the opinion of experts with two more characteristic - anonymity and feed back. Each expert is given a questionaire to fill and the responses are tabulated and the experts that have their responses above or below the average are asked to justify that forecast or revise it. This continue until the opinions converge to an appreciable level.

(iii)   SALES FORCE COMPOSITE METHODS.

It is commonly used in sales forecast and there are three ways or approaches to it - grass root approach, sales executive approach and the distributors approach.

In the grass root approach, it is believed that the sale people are in contact with the people, they will be

able to estimate the next periods' sale which is passed on to the sales manager, then to the regional heads before it is finally passed on to the headquaters.

The sales execute staff approach believes that the sale people method will be show therfore the sales executive staff should be used if they are well trained for that purposed. The distributors' approach rely on projections from the distributors for planning.

It is widely believed that different experts using the same method normally produce different results, sometimes with a wide divergence in opinion that people tend to loose confidence in it but it has its advantages too especially when there are no past records for planning.

2.4 MEASURING FORECAST ERROR

Since there is nothing like perfect technique of forecasting, due to the introduction of one bias or the other during the projection process, therefore it is better to measure this error. According to All Easton (1976,p.37) he said.

"Bias is the limitation of one's own point of view that can make decision less (or more) acceptable to various effected interests other than the decision - maker. It is impossible to rid one's self of bias completely, but it is possible to take careful steps to minimize its effects. Of course, there is a limit to how for

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the effects of bias can be limited".

The most common measuring instruments of forecast error is the means or average error which is demoted by.

$$ME = \sum_{i=1}^{N} \left(Y_i - F_i \right) / N$$

where

Y$_i$ = Actual data in period i

F$_i$ = Forecast " _ " _ " "

N = Number of past data used.

The mistake in this method is that sometimes the under forecasting causing a lot of error in the forecast. To avoid this problem, standard error or mean absolute deviation can be used to keep all error terms in non-negative form.

Mean squared Error = MSE = $\sum_{i=1}^{N} (Y_i - F_i)^2 / N$

_____

Stardard Error = SE = SQRT (MSE)

Mean Absolute Deviation = MAD = $\sum_{i=1}^{N} / Y_i - F_i / /N$

However, it is important to note that an error of 50 units in a data of 100 units is different from an error of 50 units in a data of 100,000 units. In the formers, the error is 50% while in the later, the error is 0.05% which is negligible. This is why it is important to consider percentage error i.e

percentage Error = PE = $\left(Y_i - F_i \right) * 100 / Y_i$

Mean Percentage Error = MPE = PE/N

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CHAPTER THREE

METHOD OF DATA COLLECTION

Quantitative techniques of data analysis can not be useful without some available data. These data could be internal or external

- Internal data are those collected within the organisation in question while external data involves the collection of data from primary source or secondary source. It is from primary source when it is collected directly from the original publication and it is a secondary source of data if it involves reproduction from primary source.

The data to be used in the analysis were collected mainly from the primary source. That is, from the Central Bank of Nigreia who publish the foreign exchange rate at intervals of time for the consumption of the public. Documents were also observed from their library to have a first class information for the analysis.

Secondary data were also collected from other publications from Ministry of Economic planning, Ministry of Information, Federal office of Statistics and some newspaper publications.

YEAR:	1	:	2	:	3	:	4	:
1983 :	1.4530	:	1.4043	:	1.3382	:	1.3359	:
1984 :	1.3325	:	1.3028	:	1.3028	:	1.2627	:
1985 :	1.1807	:	1.1239	:	1.1081	:	1.0697	:
1986 :	0.9977	:	0.9459	:	0.7445	:	0.4566	:
1987 :	0.2662	:	0.2476	:	0.2480	:	0.2356	:
1988 :	0.2358	:	0.2398	:	0.2157	:	0.1964	:
1989 :	0.1351	:	0.1337	:	0.1380	:	0.1332	:
1990 :	0.1266	:	0.1259	:	0.1256	:	0.1198	:

TABLE 1 (US $ PER ₦)

SOURCE CENTRAL BANK OF NIGERIA

S/N: EX. RATE (₦ PER US $)

1 :	7.8621
2 :	7.9009
3 :	7.9388
4 :	7.9400
5 :	7.9400
6 :	7.9424
7 :	7.9523
8 :	7.9623
9 :	7.9743
10 :	8.0089
11 :	8.3200
12 :	8.7071

TABLE 2

SOURCE CBN (1990)

S/N : EX. RATE (₦ PER US $)

1 :	3.9500
2 :	3.5000
3 :	3.8601
4 :	4.0001
5 :	4.0800
6 :	4.1499
7 :	4.1805
8 :	4.2108
9 :	4.2559
10 :	4.2998
11 :	4.1925
12 :	4.1497

TABLE 3

SOURCE CBN (1987)
COPIED FROM FEM
FED. MIN. OF INFORMATION & CULTURE.

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DATA ANALYSIS

USING TIME - SERIES ANALYSIS (from Table 1)

S/N:	EX. RATE	:	MOVING AV:	RATIO
1 :	1.4530	:	0.0000	: 0.0000
2 :	1.4043	:	0.0000	: 0.0000
3 :	1.3382	:	1.3678	: 97.8368
4 :	1.3359	:	1.3400	: 99.6912
5 :	1.3325	:	1.3229	: 100.7238
6 :	1.3028	:	1.3094	: 99.4998
7 :	1.3028	:	1.2812	: 101.6839
8 :	1.2627	:	1.2399	: 101.8399
9 :	1.1807	:	1.1932	: 98.9534
10 :	1.1239	:	1.1447	: 98.1808
11 :	1.1081	:	1.0977	: 100.9451
12 :	1.0697	:	1.0526	: 101.6245
13 :	0.9977	:	0.9849	: 101.2996
14 :	0.9459	:	0.8628	: 109.6299
15 :	0.7445	:	0.0000	: 0.0000
16 :	0.4566	:	0.0000	: 0.0000

YEAR:	1	:	2	:	3	:	4	:
1983 :	0.0000	:	0.0000	:	97.8368	:	99.6912	:
1984 :	100.7238	:	99.4998	:	101.6839	:	101.8399	:
1985 :	98.9534	:	98.1808	:	100.9451	:	101.6245	:
1986 :	101.2996	:	109.6299	:	0.0000	:	0.0000	:
AV. INDEX :	100.3256	:	102.4368	:	100.1553	:	101.0519	:
NORMALIZED :		:		:		:		:
INDEX :	99.3398	:	101.4302	:	99.1711	:	100.0589	:

S/N:	EX. RATE	:	PREDICTED: RATE	:	INDEX RATIO	:	NORMALIZED RATE
1:	1.4530	:	1.5259	:	99.3398	:	1.5158
2:	1.4043	:	1.4755	:	101.4302	:	1.4966
3:	1.3382	:	1.4250	:	99.1711	:	1.4132
4:	1.3359	:	1.3745	:	100.0589	:	1.3753
5:	1.3325	:	1.3241	:	99.3398	:	1.3153
6:	1.3028	:	1.2736	:	101.4302	:	1.2918
7:	1.3028	:	1.2231	:	99.1711	:	1.2130
8:	1.2627	:	1.1727	:	100.0589	:	1.1734
9:	1.1807	:	1.1222	:	99.3398	:	1.1148
10:	1.1239	:	1.0718	:	101.4302	:	1.0871
11:	1.1081	:	1.0213	:	99.1711	:	1.0128
12:	1.0697	:	0.9708	:	100.0589	:	0.9714
13:	0.9977	:	0.9204	:	99.3398	:	0.9143
14:	0.9459	:	0.8699	:	101.4302	:	0.8824
15:	0.7445	:	0.8195	:	99.1711	:	0.8127
16:	0.4566	:	0.7690	:	100.0589	:	0.7694

From Table 1

S/N	EX. RATE	MOVING AV	RATIO
1	0.2662	0.0000	0.0000
2	0.2476	0.0000	0.0000
3	0.2480	0.2456	100.9978
4	0.2356	0.2408	97.8507
5	0.2358	0.2358	100.0159
6	0.2398	0.2268	105.7203
7	0.2157	0.2093	103.0394
8	0.1964	0.1835	107.0373
9	0.1351	0.1605	84.1679
10	0.1337	0.1429	93.5619
11	0.1380	0.1339	103.0331
12	0.1332	0.1319	100.9856
13	0.1266	0.1294	97.8551
14	0.1259	0.1261	99.8018
15	0.1256	0.0000	0.0000
16	0.1198	0.0000	0.0000

YEAR	1	2	3	4
1987	0.0000	0.0000	100.9978	97.8507
1988	100.0159	105.7203	103.0394	107.0373
1989	84.1679	93.5619	103.0331	100.9856
1990	97.8551	99.8018	0.0000	0.0000
AV. INDEX	94.0130	99.6947	102.3567	101.9578
NORMALIZED				
INDEX	94.4801	100.1901	102.8654	102.4645

S/N	EX. RATE	PREDICTED RATE	INDEX RATIO	NORMALIZED RATE
1	0.2662	0.2670	94.4801	0.2522
2	0.2476	0.2557	100.1901	0.2562
3	0.2480	0.2445	102.8654	0.2515
4	0.2356	0.2333	102.4645	0.2390
5	0.2358	0.2220	94.4801	0.2098
6	0.2398	0.2108	100.1901	0.2112
7	0.2157	0.1995	102.8654	0.2053
8	0.1964	0.1883	102.4645	0.1929
9	0.1351	0.1771	94.4801	0.1673
10	0.1337	0.1658	100.1901	0.1661
11	0.1380	0.1546	102.8654	0.1590
12	0.1332	0.1434	102.4645	0.1469
13	0.1266	0.1321	94.4801	0.1248
14	0.1259	0.1209	100.1901	0.1211
15	0.1256	0.1097	102.8654	0.1128
16	0.1198	0.0984	102.4645	0.1008

```
            MEAN ERROR = -0.0000
            MEAN SQUARES ERROR =  0.0003
            MEAN ABSOLUTE DEVIATION =  0.0144
            MEAN PERCENTAGE ERROR = -1.0113
            STANDARD ERROR =  0.0183


THE PREDICTED VALUE OF QUARTER 4   IS 0.2390
```

From Table 2

S/N:	EX. RATE	:	MOVING AV:		RATIO
1 :	7.8621	:	0.0000	:	0.0000
2 :	7.9009	:	0.0000	:	0.0000
3 :	7.9388	:	7.9202	:	100.2350
4 :	7.9400	:	7.9351	:	100.0616
5 :	7.9400	:	7.9420	:	99.9750
6 :	7.9424	:	7.9465	:	99.9489
7 :	7.9523	:	7.9535	:	99.9844
8 :	7.9623	:	7.9661	:	99.9518
9 :	7.9743	:	8.0204	:	99.4251
10 :	8.0089	:	8.1595	:	98.1546
11 :	8.3200	:	0.0000	:	0.0000
12 :	8.7071	:	0.0000	:	0.0000

YEAR:	1	:	2	:	3	:	4	:
1987 :	0.0000	:	0.0000	:100.2350	:100.0616	:
1988 :	99.9750	:	99.9489	:	99.9844	:	99.9518	:
1989 :	99.4251	:	98.1546	:	0.0000	:	0.0000	:
AV.INDEX :	99.7000	:	99.0517	:100.1097	:100.0067	:
NORMALIZED :		:		:		:
INDEX :	99.9829	:	99.3328	:	100.3938	:100.2905	:

S/N	:PREDICTED: EX. RATE	:	RATE	:	INDEX RATIO	:	NORMALIZED RATE
1:	7.8621	:	7.7719	:	99.9829	:	7.7706
2:	7.9009	:	7.8202	:	99.3328	:	7.7680
3:	7.9388	:	7.8685	:	100.3938	:	7.8995
4:	7.9400	:	7.9167	:	100.2905	:	7.9397
5:	7.9400	:	7.9650	:	99.9829	:	7.9637
6:	7.9424	:	8.0133	:	99.3328	:	7.9598
7:	7.9523	:	8.0616	:	100.3938	:	8.0933
8:	7.9623	:	8.1098	:	100.2905	:	8.1334
9:	7.9743	:	8.1581	:	99.9829	:	8.1567
10:	8.0089	:	8.2064	:	99.3328	:	8.1516
11:	8.3200	:	8.2547	:	100.3938	:	8.2872
12:	8.7071	:	8.3029	:	100.2905	:	8.3270

MEAN ERROR = -0.0000
MEAN SQUARES ERROR = 0.0250
MEAN ABSOLUTE DEVIATION = 0.1223
MEAN PERCENTAGE ERROR = -0.0359
STANDARD ERROR = 0.1581

THE PREDICTED VALUE OF WEEK 4 IS 7.9397

S/N	EX. RATE	:	MOVING AV:		RATIO
1 :	3.9500	:	0.0000	:	0.0000
2 :	3.5000	:	0.0000	:	0.0000
3 :	3.8601	:	3.8438	:	100.4241
4 :	4.0001	:	3.9413	:	101.4922
5 :	4.0800	:	4.0626	:	100.4289
6 :	4.1499	:	4.1290	:	100.5071
7 :	4.1805	:	4.1773	:	100.0769
8 :	4.2108	:	4.2180	:	99.8290
9 :	4.2559	:	4.2382	:	100.4165
10 :	4.2998	:	4.2321	:	101.5994
11 :	4.1925	:	0.0000	:	0.0000
12 :	4.1497	:	0.0000	:	0.0000

YEAR:	1	:	2	:	3	:	4	:
1987 :	0.0000	:	0.0000	:	100.4241	:	101.4922	:
1988 :	100.4289	:	100.5071	:	100.0769	:	99.8290	:
1989 :	100.4165	:	101.5994	:	0.0000	:	0.0000	:
AV.INDEX :	100.4227	:	101.0532	:	100.2505	:	100.6606	:
NORMALIZED :		:		:		:		:
INDEX :	99.8270	:	100.4538	:	99.6558	:	100.0635	:

```
                    :PREDICTED:    INDEX    :NORMALIZED
S/N:EX. RATE :  RATE    :   RATIO   :    RATE
----------------------------------------------------------
    1:     3.9500 : 3.8151  :   99.8270 : 3.8085
    2:     3.5000 : 3.8613  :  100.4538 : 3.8788
    3:     3.8601 : 3.9075  :   99.6558 : 3.8940
    4:     4.0001 : 3.9536  :  100.0635 : 3.9562
    5:     4.0800 : 3.9998  :   99.8270 : 3.9929
    6:     4.1499 : 4.0460  :  100.4538 : 4.0644
    7:     4.1805 : 4.0922  :   99.6558 : 4.0781
    8:     4.2108 : 4.1384  :  100.0635 : 4.1410
    9:     4.2559 : 4.1846  :   99.8270 : 4.1773
   10:     4.2998 : 4.2308  : •100.4538 : 4.2500
   11:     4.1925 : 4.2769  :   99.6558 : 4.2622
   12:     4.1497 : 4.3231  :  100.0635 : 4.3259

          MEAN ERROR = -0.0000
          MEAN SQUARES ERROR =  0.0192
          MEAN ABSOLUTE DEVIATION =  0.1111
          MEAN PERCENTAGE ERROR = -0.1320
          STANDARD ERROR =  0.1386
```

THE PREDICTED VALUE OF WEEK 4   IS 3.9562

THE PREDICTED VALUE OF WEEK 13   IS 4.3618

```
370 END10 REM A PROGRAM TO USE TIME SERIES ANALYSIS
15 REM IN PREDICTING SOME EXCHANGE RATE.
20 REM R = EXCHANGE RATE,CAV = CENTERED AVERAGE,
25 REM SIC = TOTAL FOR EACH QUOTA
30 REM RORCAV = RATIO OF R TO CAV,SINDEXR = SEASONAL INDEX RATIO
40 REM NORMP = NORMALIZED PREDICTION,SICAV = AV. FOR EACH QUOTA
45 REM TO CALCULATE THE TOTALS,CENTERED AVERAGE AND THE RATIO
50 N = 16 : K = 4 : CLS
60 DIM R(40),TOTAL(40),AV(40),CAV(40),SIC(40),RORCAV(40)
65 DIM SINDEXR(40),NORMP(40),SICAV(40)
70 FOR I = 1 TO N :R(I) = 0
75 READ R(I)
76 NEXT I
79 FOR I = 1 TO N : TOTAL(I) = 0 :AV(I)= 0: NEXT I
80 FOR I = 1 TO N-K+1
90 FOR J = I TO I+K-1
100 TOTAL(I+2) = TOTAL(I+2) + R(J)
110 NEXT J
120 AV(I+2) = TOTAL(I+2) / K
130 NEXT I
133 FOR I = 1 TO N : CAV(I) = 0 :RORCAV(I) = 0 : NEXT I
140 FOR I = k-1 TO N-K +2
150 CAV(I) = (AV(I) + AV(I+1)) / 2
160 RORCAV(I) = (R(I) / CAV(I))*100
170 NEXT I

'TO PRINT EX. RATE, CENTERED MOVING AVERAGE AND THE RATIO
PRINT : PRINT
PRINT TAB(10);"S/N: EX. RATE  :   MOVING AV:      RATIO"
PRINT TAB(10);"----------------------------------------------"
FOR I = 1 TO N
PRINT TAB(10);USING "## :   #.####    :   #.####   :   ###.####";I;R(I);CAV
NEXT I

'TO CAL. THE TOTAL & AVERAGE FOR EACH QUOTA AND THE SEASONAL INDEX
180 SICAVT = 0
FOR I = 1 TO K : SIC(I) = 0 :NORMP(I) =0
184 SINDEXR(I) = 0:SICAV(I) = 0: NEXT I
186 SI = 0
190 FOR I = 1 TO K
200 FOR J = I TO N STEP K
210 SIC(I) = SIC(I) + RORCAV(J)
NEXT J
SICAV(I) = SIC(I) /(N/K-1)
SICAVT = SICAVT + SICAV(I)
NEXT I
SI = (K * 100)/SICAVT
FOR I = 1 TO K : SINDEXR(I) = SI * SICAV(I) : NEXT I
PRINT : PRINT
YEAR = 1983
PRINT TAB(10);"  YEAR:      1    :    2    :    3    :    4    :"
```

```
FOR I = 1 TO N STEP K : PRINT TAB(10);YEAR;":";
FOR J = I TO I + 3
PRINT USING "###.####   :";RORCAV(J);
NEXT J
PRINT : YEAR = YEAR + 1
NEXT I
PRINT TAB(7);"AV.INDEX :";
PRINT USING "###.####   :###.####   :###.####   :###.####   :";SICAV(1);SIC
PRINT TAB(5);"NORMALIZED :                 :             :           :"
PRINT TAB(10);"INDEX :";
PRINT USING "###.####   : ###.#### : ###.#### :###.####   :";SINDEXR(1);S
PRINT:PRINT :PRINT
INPUT PR

'TO CALCULATE THE PREDICTED RATE
DIM X(40), Y(40)
FOR I = 1 TO N : X(I) =  0: NEXT I
FOR I = 1 TO N : X(I) = I : NEXT I
FOR I = 1 TO N : TX = TX + X(I) :TR = TR + R(I)
TX2 = TX2 +X(I)^2 : TXY = TXY + X(I) * R(I)
NEXT I
XMEAN = TX / N : YMEAN =TR / N
B = (TXY - N * XMEAN * YMEAN)/(TX2 - N * XMEAN^2 )
A = YMEAN - B * XMEAN
FOR I = 1 TO N: Y(I) = 0 :Y(I) = A + B * X(I) : NEXT I
FOR I = 1 TO K
FOR J = I TO N STEP K
NORMP(J) = SINOEXR(I) / 100 * Y(J)
NEXT J
NEXT I
INPUT PR
PRINT TAB(10);"                :PREDICTED:    INDEX   :NORMALIZED"
PRINT TAB(10);"S/N:EX. RATE :   RATE    :     RATIO   :   RATE        "
PRINT TAB(10);"------------------------------------------------------"
G = 1
FOR I = 1 TO N : PRINT TAB(10);USING "###:   #.#### : #.####   : ###.####
G = G +1 : IF G > K THEN G = 1
NEXT I
TME = 0 :TMSE = 0 : TMAD = 0 : TMPE = 0
FOR I = 1 TO N : DIFF = R(I) - Y(I)
TME = TME + DIFF : TMSE = TMSE + DIFF^2
TMAD = TMAD + ABS(DIFF) : TMPE = TMPE + (DIFF / R(I) * 100)
NEXT I
ME = 0 : MSE = 0 : MAD = 0 : MPE = 0 : SE = 0
ME = TME /N : MSE = TMSE /N : MAD = TMAD / N
MPE = TMPE /N : SE = SQR(MSE)
INPUT PR
PRINT :PRINT TAB(20); "MEAN ERROR = ";USING "##.#####";ME
PRINT TAB(20); "MEAN SQUARES ERROR = ";USING "##.####"; MSE
```

40

```
PRINT TAB(20); "MEAN ABSOLUTE DEVIATION = ";USING "##.####";MAD
PRINT TAB(20); "MEAN PERCENTAGE ERROR = "; USING "##.####";MPE
PRINT TAB(20); "STANDARD ERROR = ";USING "##.####";SE
PRINT : PRINT
PRINT "ENTER W FOR WEEK ,M FOR MONTH,Q FOR QUARTER OR Y FOR YEAR OF PRE
INPUT A$
IF A$ = "W" THEN A$ = "WEEK"
IF A$ = "Q" THEN A$ = "QUARTER"
IF A$ = "Y" THEN A$ = "YEAR"
IF A$ = "M" THEN A$ = "MONTH"
PRINT "ENTER THE PREDICTION PERIOD. "
INPUT P
EX = A + B * P   : PRED = 0
FOR I = 1 TO K
FOR J = I TO P STEP K
PRED = SINDEXR(I)/ 100 * EX
IF J = P THEN 265
NEXT J
NEXT I
265 PRINT "THE PREDICTED VALUE OF ";A$;P;" IS ";USING "#.####";PRED
270 DATA 1.4530,1.4043,1.3382,1.3359,1.3325,1.3028,1.3028
280 DATA 1.2627,1.1807,1.1239,1.1081,1.0697,0.9977,0.9459
290 DATA 0.7445,0.4566
295  DATA 0.2662,0.2476,0.2480,0.2356,0.2358
300  DATA 0.2398,0.2157,0.1964,0.1351,0.1337,0.1380,0.1332
310  DATA 0.1266,0.1259,0.1256,0.1198
320  DATA 7.8621,7.9009,7.9388,7.9400,7.9400,7.9424
330  DATA 7.9523,7.9623,7.9743,8.0089,8.3200,8.7071
340  DATA 3.9500,3.5000,3.8601,4.0001,4.0800,4.1499
350  DATA 4.1805,4.2108,4.2559,4.2998,4.1925,4.1497
360 STOP
```

```
   END '***********LEAST SQUIRES METHOD*****************
O DIM X(40), Y(40),PY(40)
O N = 12: ANS$ = "N"
O TX = 0 : TX2 = 0 : TY = 0 : L = 1 : K = 1 : M = 12
  IF ANS$ = "Y" THEN L = K +30 : M = N + 30
  FOR I = L TO M :X(I) = 0 : Y(I) = 0
  X(I) = I
   100   READ Y(I)
  NEXT I
  'TO CAL. SUM OF X , X^2 , Y , XY
  FOR I = L TO M
  TX = TX + X(I) : TY = TY + Y(I)
  TX2 = TX2 + X(I)^2 : TXY = TXY + X(I) * Y(I)
  NEXT I
  LPRINT "USING LEAST SQUARES METHOD."
  XMEAN = TX / N : YMEAN = TY / N
  B = (TXY - N * XMEAN * YMEAN)/(TX2 - N * XMEAN ^2)
  A = YMEAN - B * XMEAN : 'LPRINT A,B
  ' TO CAL . ERRORS
  TME = 0 : TMSE = 0 : TMAD = 0 : TMPE = 0:CLS
  FOR I = L TO M
  PY(I) = A - B * I :'LPRINT I,Y(I),PY(I)
  NEXT I

  FOR I = L TO M : DIFF = Y(I) - PY(I)
  TME = TME + DIFF : TMSE = TMSE + DIFF^2
  TMAD = TMAD + ABS(DIFF) : TMPE = TMPE + (DIFF / Y(I) * 100)
  NEXT I
  ME = 0 : MSE = 0 : MAD = 0 : MPE = 0 : SE = 0:CLS
  ME = TME /N : MSE = TMSE / N : MAD = TMAD /N
  MPE = TMPE /N : SE = SQR(MSE)
  ' LPRINT TAB(15);"THE LEAST SQUARES EQUATION IS Y = ";;
  ' LPRINT TAB(35);USING "£.££££";A;" +";
  ' LPRINT TAB(43);USING "£.££££";B;"X"
  LPRINT TAB(10);"S/N:   EX. RATE :PRED. RATE"
  LPRINT TAB(10);"----------------------------------"
  FOR I = 1 TO N
  LPRINT TAB(10); USING "££ :   £.££££   :   £.££££   ";I;Y(I);PY(I) : NEXT I
  LPRINT : LPRINT: LPRINT TAB(15); "MEAN ERROR = ";USING "£.££££";ME
  LPRINT TAB(15); "MEAN SQUARE ERROR = ";USING "£.££££";MSE
  LPRINT TAB(15); "MEAN ABSOLUTE DEVIATION = "; USING "£.££££";MAD
  LPRINT TAB(15); "MEAN PERCENTAGE ERROR = "; USING "£.££££";MPE
  LPRINT TAB(15); "STANDARD ERROR = "; USING "£.££££";SE
O DATA 3.9500,3.5000,3.8601,4.0001,4.0800,4.1499
O DATA 4.1805,4.2108,4.2559,4.2998,4.1925,4.1497
O DATA 7.8621,7.9009,7.9388,7.9400,7.9400,7.9424
O DATA 7.9523,7.9623,7.9743,8.0081,8.3200,8.7071
```

```
USING LEAST SQUARES METHOD.
     S/N:   EX. RATE :PRED. RATE
     ------------------------------
      1 :    3.9500   :   3.7227
      2 :    3.5000   :   3.6765
      3 :    3.8601   :   3.6303
      4 :    4.0001   :   3.5842
      5 :    4.0800   :   3.5380
      6 :    4.1499   :   3.4918
      7 :    4.1805   :   3.4456
      8 :    4.2108   :   3.3994
      9 :    4.2559   :   3.3532
     10 :    4.2998   :   3.3070
     11 :    4.1925   :   3.2609
     12 :    4.1497   :   3.2147


          MEAN ERROR = 0.6004
          MEAN SQUARE ERROR = 0.4814
          MEAN ABSOLUTE DEVIATION = 0.6298
          MEAN PERCENTAGE ERROR = %14.34201145172119
          STANDARD ERROR = 0.6938




USING LEAST SQUARES METHOD.
     S/N:   EX. RATE :PRED. RATE
     ------------------------------
      1 :    7.8621   :   7.6755
      2 :    7.9009   :   7.6272
      3 :    7.9388   :   7.5790
      4 :    7.9400   :   7.5307
      5 :    7.9400   :   7.4825
      6 :    7.9424   :   7.4342
      7 :    7.9523   :   7.3859
      8 :    7.9623   :   7.3377
      9 :    7.9743   :   7.2894
     10 :    8.0081   :   7.2412
     11 :    8.3200   :   7.1929
     12 :    8.7071   :   7.1447


          MEAN ERROR = 0.6273
          MEAN SQUARE ERROR = 0.5295
          MEAN ABSOLUTE DEVIATION = 0.6273
          MEAN PERCENTAGE ERROR = 7.6924
          STANDARD ERROR = 0.7277
```

CHAPTER FOUR

4.1   SUMMARY

Since the country's export is mainly from crude oil and the crude oil is quoted in US dollar, the analysis was based mostly on US dollar. Time - series Analysis was used to analyse the exchange rate of US dollar per Naira for 1983 to 1986 as in table 1. When the code number one was picked, the predicted rate was 1.5158 and when the code number 5 was picked, the predicted rate was 1.3153.

Similarly when the exchange rate of US dollar per Naira for 1987 to 1990 was used, the time series analysis was also observed to produce a prediction rate of 0.2562 when code number 2 was used and code number 4 was used, the predicted exchange rate was 0.2390.

The data was splitted into two because there was a drastic depreciation in the value of Naira since the inception of SAP in july 1986 which affected mostly the last quarter of 1986 downward. This is why 1983 to 1986 was picked as a set of Data and 1987 to 1990 was also picked as another set of data.

However, the average monthly exchange rate of Naira per US dollar for January to December 1990 was also availble in table 2. The exchange rate for April was predicted as 7.9397 as against 7.9400 and also 7.9623 as against the predicted value of 8.1334

Similary Bid number 31 to 43 between 2-7-87 to 17-12-87 was also available and the first 12 of the data was used to

predicted the 13th one. This gives a predicted value of 4.3618 as against 4.0999 with a Standard Error (SE) of 0.1386 which brought the value very close to the actual value.

The least squares methods was also used on some of the data which shows a wider deviations compared to time - series Analysis. This shows that time - series Analysis is a better forecasting instrument.

The inflation rate in Nigeria moved from 13% in 1991 to 44.5% in 1992 as contained in statistical Bulletin of the CBN and it was also reported in vangard's "money world", page 12 of monday October, 18, 1993 that the then secretary of finance during the Interim National Government gave the figure of 56% as inflation rate for 1993. The inflation in most industrilized world, especially Britain, was put at an average of 3.5% (from CBN Economic Report for the first help of 1993, P.12).

These data was used in computing the 1993 exchange rate per one pound sterling which was 49.6565 Naira. This however justifies the exchange rate if we are to go by the inflation rate in Nigeria compared to Britain which makes a good prediction.

4.2   CONCULUSION

From the data analysis, it can be said that the use of Time - Series Analysis, the Least Squares Methods and others are good and effective instruments of forecasting that can

help in the administration of our organisations. These forecasting instruments that was used on the Foreign Exchange Rate can also be used on various economic activities for greater efficiency and effectiveness of our organisations. This however will in turn increase employment, production and the Gross Domestic Product (GDP) of the country.

It is a known fact that the foreign exchange management and exchange rate level selected are bound to have a wide - spread impact in terms of price movements, either upward or downward, on the entire economy. It is therefore suggested that

-   there should be reduction in debt servicing burden so that there will be additional foreign exchange for use to boost the country's economy.

-   there should be proper monitoring of our exports especially the exportation of crude oil which is our major export product so that there will be reduction in the sabotage of our scarce foreign exchange. This will increase the volume of foreign exchange, reduce the pressure from demand for foreign exchange and consquently increases our exchange rate.

- Non oil export should be further encouraged to reduce our dependent on only crude oil. This is however an avenue for foreign exchange generation which has not been properly exploited to a greater extent.
- The level of inflation should be reduced. Though the level of interest rate has been pegged at 21%, other measures including Open Market Operations (OMO) should be effectively utilized.

   Our organisations should therefore rise up to the challenges of Structural Adjustment Programme and stop seeing themselves as government baby that should continue to be protected. The researcher is however not saying that our organisations should not be protected at all when and where necessary but these protections should not be their only surviving instrument.

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