PROFESSIONAL STATISTICIANS SOCIETY OF NIGERIA

THE BOOK OF ABSTRACT

7TH INTERNATIONAL CONFERENCE OF PSSN

THEME: THE PATHWAY TOWARDS SUSTAINING CREDIBLE ELECTORAL PROCESSES IN NIGERIA

VENUE: NASARAWA STATE UNIVERSITY, KEFFI, NIGERIA

JULY, 2023

A STUDY ON AN EOQ MODEL FOR NON-INSTANTANEOUS DETERIORATING ITEMS WITH THREE-PHASE DEMAND RATES, LINEAR TIME-DEPENDENT HOLDING COST AND TIME-DEPENDENT PARTIAL BACKLOGGING RATE

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In this study, an EOQ model for non-instantaneous deteriorating items with three-phase demand rates, time-dependent linear holding cost and time-dependent partial backlogging rate has been considered. The average demand rates before deterioration sets in, after deterioration sets in and during shortages are not the same and both considered as constant. Shortages are allowed and partially backlogged, and the backlogging rate is variable and depends on the waiting time for the next replenishment. The model determined the optimal time with positive inventory, cycle length and order quantity that minimise total variable cost. The necessary and sufficient conditions for the existence and uniqueness of the optimal solutions have been established. Some numerical examples have been given to illustrate the theoretical results of the model. Sensitivity analysis of some model parameters on optimal solutions has been carried out and suggestions toward minimising the total variable cost of the inventory system were also given.

Keywords: "Non-instantaneous deterioration, three-phase demand rates, time-dependent linear holding cost, time-dependent partial backlogging rate"

A COMPARATIVE ANALYSIS OF ORDINARY LEAST SQUARES AND QUANTILE REGRESSION ESTIMATION TECHNIQUE

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This study explores quantile regression estimation technique and its practicality in regression analysis; hence we provide a comparative study in view of quantile regression as an alternative to the traditional ordinary least squares regression. Although the ordinary least squares (OLS) model examines the relationship between the independent variable and the conditional mean of the dependent variable, whereas the quantile regression model examines the relationship between the independent variable and the conditional quantiles of the dependent variable. Quantile regression overcomes various problems associated with OLS. First, quantile regression is defined and its advantages over ordinary least squares regression are illustrated. Also, specific comparisons are made between ordinary least squares and quantile regression estimation methods. Lastly, both estimation techniques were applied on a real life data and the results obtained from the analysis of two types of datasets in this study suggests that quantile regression provides a richer characterization of the data giving rise to the impact of a covariate on the entire distribution of the response variables as the effect can be very different for different quantiles. Quantile regression therefore gives an efficient and more complete view of the relationship amongst variables, hence, suitable in examining predictors effects at various locations of the outcome distribution.

Keywords: Regression, Ordinary Least Squares Regression, Quantile Regression, Mean Square Error, Variance

STOCHASTIC MODEL OF TUMOR-IMMUNE INTERACTION WITHIN TUMOR MICRO-ENVIRONMENT

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The stochastic model of non-immunogenic tumor micro-environmental factors on tumor growth in the presence of immune surveillance is investigated. The Novikov theorem, Fox approach and the Ansatz of Hanggi is used to obtain an approximate Fokker Planck equation for the underlying transition probability deriving the system forward in time, and for which the steady state distribution for the tumor growth system is derived. We find that the correlation time strength ? and the immune strength ? have opposite effect on both the steady state distribution P_st (t) and the stationary mean ?x?_st of the tumor population, with increase in correlation time strength ? promoting growth and increase in the immune response strength ? inhibiting growth. The result also indicated that the stronger the immune response ?, the weaker the effect of correlation time strength ? on the tumor growth system

Keywords: Langevin equation, Fokker-planck equation, Gaussian colored noise, Tumor-immune interaction potential

A NAÏVE CHOICE OF WEIGHT FOR EFFICIENT SUPPORT VECTOR MACHINE GROUP RESPONSE CLASSIFICATION

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This paper proposes a new choice of weight for efficient Support Vector Machine (SVM) method class prediction and group response classification. The proposed method introduced a naïve method of determining weight for the features using the the proportion of the classes in the response variable. The weights obtained are incorporated with the respective features before passing into the standard SVM algorithm to maximize the classification accuracy. Monte-Carlo Cross Validation method was implemented to determine the predictive power of the proposed method by partitioning the data into train and test samples using 80:20 splitting ratios for both simulated and real life data sets. The proposed method yielded high prediction accuracy on the test sample data set. Results from other performance indices further gave credence to the efficiency of the proposed method. The performance of the proposed method was compared with other methods and the result showed the excellence of this method.

Keywords: "Naïve weight", "Support Vector Machine", "Group classification", "Performance indices"

BASIC CONTROL CHART FOR MONITORING ENVIRONMENTAL DATA: A KUMARASWAMY-G FAMILY OF DISTRIBUTIONS APPROACH

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Different probability distributions have been used for modelling over time in many study fields. The Kumaraswamy (Kw) distribution is one member of this type of distribution family. In this study, new control limits based on the Kumaraswamy-Normal distribution generated from the Kumaraswamy-Generalized (Kw-G) family of distributions, are presented. This technique was used to assess and compare the performance of some basic control charts in the Kw-Normal environment through Monte Carlo simulation analysis which affirmed the performance of the proposed chart. The numerical results showed that the new control chart outperforms the Kumaraswamy control chart in terms of run length analysis. Finally, the practical application of the Kw-N control chart in modelling environmental data is demonstrated.

Keywords: Kumaraswamy distribution, Kumaraswamy-Normal distribution, Statistical process control, Environmental Data

HEAVY-TAILED MIXTURE CURE RATE MODELS BASED ON TWO VARIANTS OF T-X FAMILY OF DISTRIBUTIONS AS BASELINES

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In many research areas such as engineering, financial and bio-medical sciences, data are usually positive, and their distribution are mostly unimodal hump shaped and extreme values yielding heavier tails. Research literature have shown that the standard classical distribution and simple variable transformation are sometimes insufficient to provide an adequate fit. This inadequacy causes the loss of some very vital characteristics of the data in the final analytical results. In this research work, two new heavy-tailed mixture cure rate models; Type 1 Heavy-Tailed Gamma (T1HT-G) mixture cure rate model was developed using two new heavy-tailed distributions family of distribution and Gamma distributions as baselines. The maximum likelihood parameters estimation approach was adopted for estimating the model parameters. The maximum likelihood performance was assessed based on biases and mean squared errors via the Monte Carlo simulation framework. Deviance information criteria such as AIC, BIC and CAIC were adopted to measure the models' performance. The simulation studies were conducted using three different sample sizes and 50 replications. Results from the simulation studies showed that the TI-HTG is a heavy-tailed distributions. The applicability of these model was illustrated using real life biological and biomedical data. Comparative measures from the models TI-HTG mixture cure rate (AIC=51.60, BIC=61.55, CAIC=52.08) was smaller which showed the adequacy of the models to provide better fit for heavy-tailed data than the well-known standard distributions. These results have supported the fact that heavy tailed models provide better fits than the usual standard distributions when analysis heavy-tailed data.

Keywords: Heavy-tailed mixture cure rate

COMPARISON OF SETAR AND ARIMA MODELS - AN APPLICATION TO OIL PRICES IN NIGERIA

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The Self-exciting Threshold Autoregressive (SETAR) model is an autoregressive model applicable to time series data sets, it permits greater flexibility in model parameters that involve regime switching behaviour. This study therefore compared the SETAR and ARIMA models to see which was more accurate in predicting Nigeria's yearly oil prices between 1987 and 2017. The methodology applied are: Exploratory Data Analysis (EDA), Stationarity Test, Model specification tools (ACF and PACF), Akaike Information Criterion (AIC), SETAR Model, ARMA Model, Normality Test, Serial Correlation Test, Heteroscedasticity and Forecast evaluation in order to demonstrate the relationship and pattern between oil prices over the years. The analysis established that oil prices in Nigeria fluctuated significantly with positive skeweness of 1.023, kurtosis flat tailed of 2.771 and normally distributed errors through Jarque-Bera statistic with ($p < 0.05$). After the data undergone stationary test, the specified models of SETAR(2,2,1) and ARIMA(1,1,8) were derived. It was later affirmed that the SETAR model outperformed the ARIMA model through the least values of AIC, SC and Sum of Square Residual (SSR) of 2.2937, 2.3679 and 378.8779 respectively. Hence, the best model for the oil prices using SETAR(2,2,1) yielded equation: Yt = ?0.309779 + 0.609045Yt?1 + ?t with establishment at 5% level of significance. This led to the forecast evaluation of ten years; 2018 to 2027. Conclusively, this work has confirmed non-linearity of oil prices in Nigeria, but later turned to linearity after going through differencing by means of ADF unit root test with better performance from SETAR compared to ARIMA. Hence, when comparing the two models, the SETAR Model is advised.

Keywords: Self-exciting Threshold Autoregressive (SETAR) Model, Autoregressive Integrated Moving Average (ARIMA) Model, Non-linearity, Stationary, Oil Prices.

STATISTICAL ANALYSIS ON THE ROLES OF NATIONAL DEPOSIT INSURANCE CORPORATION TO BANK DEPOSITORS IN NIGERIA

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RAHAMAN, Aliyu1; AJIBOYE, L. O.2; ADEJUMO, W. A.3 & TIJANI, R. O. 4 1Department of Mathematics & Statistics, School of Science, The Oke-Ogun Polytechnic, Saki. P.M.B. 21, Saki Oyo State. Nigeria. e-mail: rahamanaliyutops@gmail.com .2,3&4Department of Insurance, School of Financial Management Studies, The Oke-Ogun Polytechnic, Saki. P.M.B. 21, Saki Oyo State. Nigeria. The main aim of this paper is to evaluate the roles of National Deposit Insurance Corporation to bank depositors in Nigeria. The purpose of this research work is to look at the causes of bank failure in developing economy which Nigeria is one and to critically study the impact of the Nigeria Deposit Insurance Corporation (NDIC) in the Nigeria financial institution. The data set used for this study was secondary data which was collated from the Nigeria Deposit Insurance Corporation (NDIC) Annual Report and Statement of Accounts between 2014 and 2019. At the end of the analysis, this work be able to formulate three different Multiple Linear Regression Models. The Predictive Power (PP) for all the three fitted Multiple Linear Regression Models were above 90%. Test for the Significance of Joint Parameters-Using F-test (ANOVA) was carried out and the result revealed that the joint parameters of DICDMB (TNAFC, TNAPC, TDFC & TDPC) were significant to model 4.4 at 5% level of significance. Finally, with the reference to the R-Studio output 2 (the impacts of (DICDMB, MPRP and INSF) on TNADMB) revealed that joint contribution of DICDMB, MPRP and INSF were really significant to the fitted model 4.8 at 5% level of significance. Finally, this study concludes that the presence of a Deposit Insurance Scheme in Nigeria is a major boost to financial institutions in Nigeria and should be supported by government through the enhanced powers of the regulatory authorities.

Keywords: NDIC, Multiple Regression, R-Studio Software, F & t-test, Correlation

A HIDDEN MARKOV MODEL APPROACH TO SURVEILLING THE TRANSMISSION OF LASSA FEVER VIRUS IN NIGERIA

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Lassa fever is a highly infectious viral disease that is endemic in Nigeria and other West African countries. Early detection and response to outbreaks of the disease are critical to prevent its spread and reduce morbidity and mortality. Finding mathematical patterns that explain the mechanisms of Lassa fever transmission, as well as a thorough understanding of the biological factors affecting the disease, are necessary in putting in place a surveillance system and preventing further disease spread. In this study, we applied a Hidden Markov Model (HMM) approach to surveil the transmission of Lassa fever virus in Nigeria. The HMM model was developed using the SIR model to formulate the transition matrix and data from past outbreaks of the disease to compute the observations. Our results showed the dry season as the peak period for Lassa fever and it records it lowest numbers during the rainy season. The transition matrix showed a 98% chance of transitioning to the infected state from being susceptible and a 96% chance of remaining infected. The stable probability resulted in a 97.9% probability of transitioning to the infected state and a 1.7% chance of transitioning to the susceptible state. The Empirical analysis using the proposed HMM approach does not only provide a valuable tool for public health officials to track and respond to outbreaks of Lassa fever, leading to more effective disease control strategies but also, establishes an efficient structure for other infectious diseases modeling to aid in early detection and response to outbreaks.

Keywords: Lassa fever, Hidden Markov model, infectious diseases, transition probability matrix, emission prbability matrix,

MODIFIED WEIBULL DISTRIBUTION FOR MODELING OF WIND SPEED DATA

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In this work, we present a flexible Weibull distribution called a Modified Weibull (MW) distribution which is more adaptable to use in modeling lifetime data. Structural properties of the distribution were studied which include moments and incomplete, quantile function, entropy, order statistics, and weighted moments. The application was based on modeling wind speed data obtained from three locations in Nigeria and compared its modeling performance with other probability distributions, for example, Lomax, Weibull, and Frechet distribution. Findings indicate that MW distribution gives better fits using some model evaluation criteria.

Keywords: Wind speed, moments, entropy, modified Weibull.

FITTING AUTOREGRESSIVE INTEGRATED MOVING AVERAGE WITH EXOGENOUS VARIABLES MODEL WITH LOGNORMAL ERROR TERM. BY ANDREW OJUTOMORI BELLO AND OLANREWAJU I. SHITTU

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The conventional Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX(p, d, q)) model with Normal Error term requires stringent assumptions of normality of error term and stationarity of the series. These models have found widespread application in multidimensional relationships among economic variables; these assumptions are often violated in practice leading to spurious regression model with poor forecast performance. Thus, this paper is designed to develop an ARIMAX(p, d, q) model with Lognormal Error term capable of analysing time series data even when the assumptions were violated with reasonable forecast performance. The choice of lognormal error term was based on the asymmetric property which overcomes non normality, the long tail and positive limit values properties overcome non stationarity. The dataset used were monthly External Reserves (Million USD), Official Exchange Rate (Naira to USD), Crude Oil Export (Million Barrel per Day) and Crude Oil Price (USD per Barrel). One hundred and twenty (120) observations were considered. Proposed ARIMAX (1, 0, 1) with lognormal error term ameliorate the non-normal and non-stationary assumptions. Proposed model performance was compared with conventional ARIMAX (1, 1, 1) with normal error. Box-Jenkins Time Series procedure was used to model ARIMAX (1, 1, 1). Model performance test used Akaike Information Criteria (AIC), Mean Square Forecast Error (MSFE) and Loglikelihood (Loglik) values. The Loglik values of conventional ARIMAX (1, 1, 1) with normal error and proposed ARIMAX (1, 0, 1) with lognormal error term were -240.23 and 1344.47; AIC values were 490.45 and -0.41 while MSFE values were 12.48 and 1.77. The proposed model has the highest Loglik value, smallest AIC and smallest MSFE values when compared with conventional ARIMAX (1, 1, 1) with normal error, hence, the proposed model is considered better. The fitted model improved better forecast performance when normality and stationarity assumptions were violated.

Keywords: ARIMAX, Log-normal error, Exogenous variables, Stationarity, Forecast

ON DISTRACTORS ANALYSIS OF MULTIPLE CHOICE QUESTIONS: ITEM RESPONSE THEORY APPROACH

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In recent times, there have been increased in the used of multiple choice options by institutions of learning, examination bodies, and industries to elicit information on learners and applicants' latent abilities for several purposes, but little attentions had been paid to the efficacy of the distractors in multiple choice items' options leading to low integrity of assessment, selection, certification, and placement. This study demonstrated the use of multinomial probability distribution incorporating latent traits to the item response function options thereby identified flaws, poor, weak, and good item distractors' response options as a function of respondents' abilities using maximum likelihood estimation technique with the aids of Stata 16SE. The study met to benefit test developers such as higher institutions of learning, examinations bodies, industries, and other item response users.

Keywords: difficulty; discrimination; distractors; multinomial; test;

ASSESSING COMMUNITY DIRECTED SCREENING TO IDENTIFY ASYMPTOMATIC MALARIA RESERVOIR OF PLASMODIUM FALCIPARUM IN NASARAWA STATE, NIGERIA

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Asymptomatic malaria is prevalent in highly endemic areas of Africa, with only a small percentage of individuals exhibiting clinical symptoms. The clinical consequence of asymptomatic malaria is not fully understood. Some researchers are of the view that asymptomatic parasitaemia is involved in the development of partial immunity and may protect against clinical disease from new infections. This study therefore determined the prevalence of asymptomatic reservoir of plasmodium falciparum and the level of knowledge of malaria among the populace in Nasarawa state. A community-based cross sectional study was conducted among selected local government areas of the state. The local government areas were observed to have reported the highest positivity rate of malaria between 2017 to 2022. The study was conducted from November 2022 to April 2023. A semi-structured questionnaire was employed to collect socio-demographic data and other associated risk factors by trained health professionals. Body temperature and other clinical manifestations were examined to identify the asymptomatic individuals. This examination were carried out after selection of individuals from households before mRDT is conducted. Data entry and analysis will be carried out using SPSS version 20 software. The results obtained is very desirable.

Keywords: "Plasmodium falciparum, asymptomatic, screening, mRDT"

ASYMMETRIC MODEL FOR MODELING SKEWED DATA

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Badmus, N. I1., Ogundeji, R. K2 and Olufolabo, O. O3 1&2Department of Statistics, University of Lagos, Akoka, Nigeria 3Department of Statistics, Yaba College of Technology, Yaba, Lagos, Nigeria Corresponding Author's Email: nibadmus@unilag.edu.ng Abstract In this article, we present a new asymmetric distribution called Topp-Leone modified Weighted Rayleigh (TLMWR) distribution from Topp-Leone distribution. We study and examine several properties of the propose distribution such as density, distribution, reliability, hazard rate function, moment, generating function, quantile function and order statistics. The estimation of model parameters is obtain using method of maximum likelihood estimates. Exploratory data analysis, diagnostic test, normality test and goodness of fit statistics are carry out on the data used for the direction of skewness and level of kurtosis. The fitness and effectiveness of the proposed distribution is tested using both simulation and real data set to compare with other existing and new distributions. Therefore, we conclude based on the results from the analysis and supported the validity of the proposed model than other distributions considered.

Keywords: Diagnostic test, Exploratory data, Hazard Rate, Moment, Normality test

AN OVERVIEW OF NON-PARAMETRIC SPATIO-TEMPORAL MODELS AND IDENTIFICATION OF HOTSPOT AREAS OF MORTALITY DUE TO FEMALE BREAST CANCER DISEASE IN NIGERIA

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Breast cancer is currently the most common type of cancer worldwide, with 2.26 million cases recorded in 2020. It is also the most common cancer among women both in developed and developing countries, and a major cause for public health concern. Hence, reliable information about the spatio-temporal trends of mortality due to female breast cancer disease is necessary. In this study, different non-parametric spatio-temporal models were reviewed and compared. The first type of models has a single-level spatial structure, while the second type has two-level spatial structure models. For the temporal effects, both followed different models of first and second order of random walk. The objectives were to provide an overview of these non-parametric spatio-temporal models in terms of their assumptions and applied to female breast cancer mortality data from 16 hospital-based cancer registries (HBCRs) in Nigeria for comparison and detection of hotspot areas of mortality due to female breast cancer disease fitted within the Bayesian hierarchical framework with integrated nested Laplace approximation. The result showed that a two-level spatial structured model with a Leroux conditional autoregressive (LCAR) prior, and a structured temporal random effect with a random walk of order two (RW2) prior and a Type IV space-time interaction effect fitted best. The study also identified a number of health areas in the north-west region, far south-west part and far south-south region of the country as having a tendency of contributing to the final cancer risk.

Keywords: Non-parametric, mortality, space-time interactions, deviance information criteria, female breast cancer.

IMPROVED ESTIMATORS FOR FINITE POPULATION MEAN USING AUXILIARY ATTRIBUTE IN TWO-PHASE SAMPLING

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In this paper, a family of exponential-type estimator in two-phase sampling when the population proportion of the auxiliary character is available is proposed. Theoretically, the bias and minimum mean square error (MSE) for the proposed estimator are obtained. The expression for MSE of the proposed exponential-type of estimator is compared with the existing estimators in the literature. Comparison analysis of proposed estimators with some of the existing estimators reviewed in the literature was carried out based on mean square error (MSE) and relative efficiency using both simulated and real life datasets. The result of the comparisons showed that the proposed exponential-type estimators gave more efficient results than the existing estimators. Furthermore, the realistic conditions under which the proposed class of exponential-type estimators is more efficient were also presented. Hence, the proposed estimators can be considered as significant alternatives to estimating population characteristics of real life datasets.

Keywords: Auxiliary variable, two-phase sampling, bias, mean square error, efficiency.

ROBUST MODIFIED JACKKNIFE RIDGE ESTIMATOR FOR ADDRESSING MULTICOLLINEARITY AND OUTLIERS IN A POISSON REGRESSION MODEL

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The parameters of the Poisson regression model (PRM) are usually estimated using the maximum likelihood estimator (MLE). MLE suffers a breakdown when there is either multicollinearity or outliers in a PRM. The shrinkage estimators are usually preferred in handling multicollinearity and robust estimators handle problem of outliers in the dataset. However, both methods suffer breakdown when both problems jointly exist in a PRM. Thus, we developed a new estimator called robust modified jackknife ridge estimator to address both problems in a PRM. The new estimator is formed by combining the modified jackknife ridge estimator with the transformed M-estimator (MT). Simulation study and real life application was carried out to examine its performance using mean squares error as performance evaluation criterion. The simulation and real life application results show that the new estimator outperformed the existing ones compared with in this study by having the smallest mean squares error.

Keywords: Multicollinearity, Outliers, Ridge estimator, Transformed M-estimator, Jackknife Ridge estimator.

THE GENERALIZED FAMILY OF NORMALIZATION FOR TRANSFERABLE UTILITY (TU) GAME

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The concept of normalization in cooperative game theory so far, does not have a generalized family. In this work, we have been able to establish a generalized form of normalization that presents itself as a family to the existing forms. The procedure for the generalized form of normalization involves specifying the boundary parameters and estimating the transformation parameters through them such that the coalition worth of the generated game lie within the pre-specified boundary. This family of game normalization is flexible and applicable in all class of cooperative game. In addition, it observes transferable utility invariant property and retains inessential game property of the original game. Its application on a game data shows how it shrinks (expands) the worth of coalitions to lie within pre-specified boundary.

Keywords: cooperative game, game normalization, weighted Shapley value

AN ASSESSMENT OF THE RELATIONSHIP BETWEEN KNOWLEDGE LEVEL AND AWARENESS LEVEL OF RISK FACTORS CONTRIBUTING TO VVF IN JAHUN GENERAL HOSPITAL OF JIGAWA STATE NIGERIA.

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Women are frequently considered a vulnerable gender group in most third-world nations; yet, the catastrophic and humiliating repercussions of ill health, such as VVF, make them even more vulnerable in these societies, revealing their emotional fragility. The vesico vaginal fistula (VVF) problems in Jahun General Hospital occur in the presence of lack of knowledge and early marriage of teenage girls and some disease, and the most common system of vesicovaginal fistula VVF is urinary incontinence urine leakage from the vagina, which is often exacerbated by physical activities. Additionally, the patient may develop vulva discomfort, itching, and recurring urinary tract infections. Information about VVF community awareness will alert health professionals and support groups to the need for primary prevention by raising awareness of the condition in rural communities. VVF prevention necessitates strategies to educate the community on cultural, social, and psychological factors that raise the incidence of fistula. Lack of knowledge, the awareness level of contributing factors, and Early age of the mother's obstetric complication are the most common cause of VVF, which include not only early pregnancy but also delayed and obstructed labor. In this study, the cross-sectional study design was used because the purpose of the study was to determine the relationship between the level of knowledge on VVF and the level of awareness of the risk factors contributing to VVF at the Jahun General Hospital. The findings of this study revealed that there is a lack of knowledge of VVF in the Jahun and the communities around it. This could be due to a lack of awareness efforts aimed at raising women's understanding of contributing factors, and prevention of VVF.

Keywords: Keywords: Vesico-vaginal fistula, Awareness, pregnancy, cross-sectional research, Data.

ON COMPARING THE PERFORMANCE OF THE PREDICTION VARIANCE OF SOME CENTRAL COMPOSITE SECOND-ORDER DESIGNS IN THE CUBOIDAL REGION USING QUANTILE PLOTS

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The single-value optimality criteria such as A-, D-, G-, and I- optimality criteria are often used in evaluating the response surface designs. These single-value optimality criteria do not explain how the prediction variance of the response surface is distributed throughout the region of interest. For prediction-based assessment, alternative to single number criteria, the variance dispersion graph (VDG) and fraction of design space (FDS) are used to evaluate and compare the prediction variances (PV) of some competing response surface designs. VDG display the maximum and minimum of the PV function on concentric spheres inside the region of interest R against their radii r. also the FDS plot the prediction variance against the fraction of design space that is less than or equal to the given PV value. However, due to inefficiency of the VDG and FDS to show the full description of distribution of the prediction we take another look at the stability and prediction capability of the three second-order response surface designs under study using the quantile plots to monitor the behaviour of the design's PV throughout the regions. The combined quantile plots of Central composite design (CCD), Small composite design (SCD), and Minimum run resolution (MinRes) V designs are compared. The aim is to examine the behaviour of the quantile of the PV and also describe the distribution of the PV on the cuboidal region to enable us recommend based on their performance characteristics.

Keywords: "Prediction variance, Optimality criteria, Quantile plot, Response surface design"

SELECTION OF A NEW BIASING PARAMETER FOR THE NEGATIVE BINOMIAL REGRESSION MODEL

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The negative binomial regression (NBR) model is a generalized linear model which relaxes the restrictive assumption by the Poisson regression model when the variance is equal to the mean. Estimation of the parameters of the NBR model is estimated by Maximum likelihood (ML) method. When the explanatory variables are highly correlated which indicate multicollinearity, when used with ML will result to unstable regression estimates. Here, we develop a modified jackknifed Negative binomial Kibria-Lukman (MJNBKL) estimator. The MJNBKL coefficient (shrinkages) was estimated in different ways. Theoretically, we compared MJNBKL with other existing estimators to confirm its superiority over others. The performance evaluation of MJNBKL was established using the simulation study and the real-life application. Simulation results demonstrate that shrinkage parameter selection based on the work of Kibria (2003) i.e., k3 is more efficient that other methods considered.

Keywords: Negative Binomial regression, Multicollinearity, Kibria-Lukman estimator, Maximum Likelihood, Jackknife

DYNAMIC PROGRAMMING TO PORTFOLIO RETURN OPTIMIZATION OF BELLMAN'S MODEL: THE BEST CLUSTER PATTERN FOR THE MODEL

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A suitable decision plan is followed by effective financial management to achieve optimality while investing in a competing stock portfolio. This study altered a Dynamic Programming (DP) model of Bellman. The modified model was used to solve a business problem. The problems of choosing a stock portfolio for optimal return among investors in financial markets have resulted in a financial crisis. Most financial analysts provide investors with incorrect and non-validated investment information. The consequences were minimal optimum, no return, and an investment problem. The goals are to ensure optimality in investor returns, validate the results using two validity tests, and select the test that best validated the model. The silhouette and Dunn tests were used to validate the outcome result. The results of using Silhouette reduced computational complexity and produced a more robust and validated return. The k-means clustering (an aspect of unsupervised machine learning) provided better statistical evaluation, the best fit, and investment patterns. In comparison to previous work, the introduction of variables allowed for the best return at stage one. Finally, a validated investment report can help to avoid mistakes made by market analysts and investors when making investment decisions.

Keywords: Gap Statistic, Clustering, Decision making, Dynamic programing, Dynamic programing, Stocks portfolio

CATEGORICAL ANALYSIS OF VARIANCE ON KNOWLEDGE, COMPLIANCE AND IMPACT OF HAND HYGIENE AMONG HEALTHCARE PROFESSIONALS DURING COVID-19 OUTBREAK IN SOUTH-EAST, NIGERIA

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Abstract This paper examined the knowledge, compliance and impact of hand hygiene among healthcare professionals during COVID-19 outbreak in South-East, Nigeria. The data used in this study were collected from twenty (20) hospitals in South-East, Nigeria using questionnaire with closed-type question forms. A total number of 600 questionnaires were used in this study. Two-way CATANOVA was used to examine the gender and health profession that have well knowledge, compliance and impact experience of hand hygiene during COVID-19 outbreak. The result showed no statistically significant difference in the knowledge, compliance and impact experience of hand hygiene among four major health professions (medical doctors, nurses, pharmacists, laboratory scientists) and also between the genders at a 5% significance level. The findings showed that the changing of healthcare professional from one health profession to another does not affect the knowledge, compliance and impact experience of hand hygiene. It was noticed that 599(99.8%) healthcare professionals have good knowledge of hand hygiene, 395(65.8%) practice hand hygiene every time, and 507(84.5%) have high impact experience of hand hygiene. There is enhancement in the knowledge, compliance and impact experience of hand hygiene of healthcare professionals as their years of service increase.

Keywords: CATANOVA, Hand hygiene, Healthcare associated infection, Healthcare profession, Compliance, Knowledge, Impact

A STUDY OF SAMPLING PLANS WITH INSPECTION ERRORS USING COST MINIMIZATION MODEL

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Acceptance sampling can be performed during inspection of incoming raw materials, during final product or service inspection or between manufacturers and their customers to determine conformance to standards. It is erroneously assumed however that the inspection of the units during acceptance sampling is error-free. In this paper, this assumption is relaxed. An Adjusted Kumar's Cost Model is used to obtain the optimal sampling plans for RSS and RDS plans with inspection errors that minimize the total cost and satisfy both the producer's and consumer's risk requirements using the parameters: sample size(n)?250, fraction defective unit (p) =0.03, Acceptable Quality Limit(AQL)=0.02, Lot Tolerant Percent Defective(LTPD)=0.07, Producer's risk (?) =0.05, Consumer's risk (?) =0.1. The optimal values of Rectifying Single Sampling (RSS) plan and Rectifying Double Sampling (RDS) plan with inspection errors are then compared. Results from the optimal sampling plans of RSS, and RDS plans shows that though the number of defective units not detected (D_ne) in optimal RSS plan is higher, the Average Total Inspection (ATI) and Total Cost (TC) is lower than that of the optimal RDS plan. Sensitivity analysis carried out also shows lower total cost in the optimal RSS plan than in optimal RDS plan. The probability of rejection given Acceptable Quality Level (AQL) and the probability of acceptance given poor lots quality or Lots Tolerant Percent Defective (LTPD) in optimal RSS plan are also lower than in the optimal RDS plan. It can therefore be concluded that the optimal RSS plan with inspection errors is more economical and provides more protection to both the producer and the consumer risk than the optimal RDS plan with inspection errors.

Keywords: Average Outgoing Quality (AOQ), Acceptable Quality Level (AQL) Average Total Inspection (ATI), Lot Tolerant Percent Defectives (LTPD),Producer's risk, Consumer's risk

AN INTEGRATED APPROACH TO STOCK SELECTION IN NIGERIAN STOCK EXCHANGE

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We employed data envelopment analysis and free disposal hull to measure efficiency of listed companies in Nigerian stock exchange in terms of the financial performance. From principles, it is assumed that every good financial performer will give a good return to the investors in the long run. This study combines all the critical criteria for evaluating the performance of the companies in term of financial performance. There are 2 parts: the first shows the absolute amount and it represents the financial status of the companies were used as variables. It includes total assets, current assets, current liabilities, total expenses, net income after taxes and revenue. The second part was the financial ratios which were treated as the inputs and outputs. The financial ratios include current ratio, debt ratio, debt-to-equity ratio, return on investment, return on equity and earning per share. From the result, the companies that showed 100% efficiency were recommended to the investors. Whereas, for each and every inefficient company, there is a set of optimum company to be their reference company. To improve the efficiency, those companies need to either increase their output (maximize-output model) or reduce their inputs (minimize-input model).

Keywords: Free disposal hull, Data Envelopment Analysis, stock market, financial performance, efficiency analysis

AN EVALUATION OF THE IMPACT OF FOURIER AND SEASONAL DECOMPOSITION ON ARMA MODELING OF RAINFALL TIME SERIES

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Rainfall is a crucial environmental variable that influences numerous aspects of human life, including agriculture, hydrology, and water resources management. Understanding and modeling rainfall patterns can be beneficial for predicting droughts, floods, and other extreme weather events. Two widely used time series models for analyzing rainfall data are Fourier Transformed ARMA (FTARMA) and Seasonal Transformed ARMA (STARMA). This study aims to compare the performance of FTARMA and STARMA models in forecasting monthly rainfall data in the city of Katsina, Nigeria. The study utilizes monthly rainfall data spanning from January 1941 to December 2019. The data was pre-processed by removing any seasonal trend, and the autocorrelation function (ACF) and partial autocorrelation function (PACF) were used to determine the appropriate order of the models. The results of the study indicate that FTARMA models outperform STARMA models in forecasting monthly rainfall data. The FTARMA models were found to have a higher accuracy, as measured by mean absolute error (MAE) and mean squared error (MSE), than the STARMA models. Furthermore, FTARMA models showed a better fit to the data, as evidenced by the lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values. The study concludes that FTARMA models provide a more accurate and efficient method for forecasting monthly rainfall data than STARMA models. Therefore, the use of FTARMA models can be beneficial for water resource management and planning in areas where accurate rainfall predictions are crucial.

Keywords: ARIMA, STARMA, FTARMA, Rainfall, Time Series

IDENTIFYING THE PRINCIPAL FACTORS INFUENCING BANDTRIRY IN NORTHERN NIGERIA

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Banditry apposition is a serious and increasing security Challenging situation especially in the Northwestern states and the entire nation Nigeria with many lives and properties been wasted. This paper examined the principal factor influencing banditry in eleven(11) states from the Northwest of Nigeria and state from the North central as safe and unsafe on data collected from National Population Commission (NPC), National Bureau of Statistics (NBS) and Central Bank of Nigeria (CBN). The data set has thirteen entries and each entry represents the information of a particular state under the study. The variables are the factors leading to the spread of banditry, such as population rate(POP), poverty rate(PVR), high cost of living(HCL), drug abuse(DA), unemployment illiteracy(UR), corruption rate (CR), police strength(PS), Illiteracy Rate(ILLR), High Cost of Living(HCL), Average Bribe Size(ABS), number of people who paid bribe(NPB), Other Social problems(OSP), Number of people who had contact with corruption (NBS). Principal Component Analysis(PC) was applied on the data by extracting four PCs out of the 13 original variables, these PCs account for almost 75.30% variance of the original data set. The results showed that retained Unemployment, Corruption Rate, Poverty Rate and densely populated states collectively made contribution to PC1. PC2, PC3, and PC4; represent population factor, which positively classify area as ‘safe’ or ‘unsafe. This implies that State with high illiteracy rate, unemployment rates, poverty rates and densely populated states influenced banditry.

Keywords: Banditry, Principal Component Analysis, safe, unsafe, Northern Nigeria.

IMPACT OF COVID-19 ON THE ACADEMIC PERFORMANCE OF SCIENCE STUDENTS USING BAYESIAN STATISTICAL MODEL

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Considering the emergence of the global COVID-19 pandemic, teaching and learning activities were disrupted for almost a year across the Senior Secondary Schools in Nigeria. This research work seeks to investigate and evaluate the degree of impact of COVID-19 on the academic performance of Science students from four (4) Science subjects; Mathematics, Physics, Chemistry and Biology using a Bayesian Hierarchical Linear Mixed Effects model fitted to cross-sectional data. The Bayesian Hierarchical Linear Mixed Effects Model is designed for this application which allows student-specific error variances to vary across the selected Science subjects. Three hypotheses were actually formulated and the data collected was analyzed using Residual Maximum Likelihood in R package. It was clearly evident that COVID-19 had a huge impact on the academic performance of Science students in Secondary schools. Some recommendations were suggested to the educators that it is a necessity that educators should blend and permeate into the innovative paradigm shift of the 21st century known as digital and pedagogical mode of teaching, and they should train and guide the learners until they acclimatize to the environment of online teaching.

Keywords: Bayesian, Impact, COVID-19, Academic performance, Science students

STATISTICAL ANALYSIS OF THE IMPACT OF LIBRARY USAGE ON STUDENT ACADEMIC PERFORMANCE OF STUDENTS IN TERTIARY INSTITUTION

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ABSTRACT This study examined the impact of use and availability of library resources on students' academic performance. The study was carried out to verify if the usage and availability of library resources significantly contributed to students' academic performance. The data used for the study were obtained from the administered questionnaires among Yaba College of technology Students that visited library. In this present study, non-probability sampling technique was used based on the nature of target population. And the research used statistical package for social science (SPSS) version 25.0, excel version 2010 and STATA version 13.0 and the statistical tools employed are path analysis and Kruskal-Wallis statistical tools. Path model revealed the nature of impact of usage and availability of library resources on student CGPA. The appropriate model formulated is GPA=0.001+0.023 Resources Availability+0.055 Resources Use. The result of the analysis shows that among all the variables considered, usage of library resources has significant positive impact on students' academic performance ($z=3.07$, $p<0.05$). The combined test of usage and availability of resources have significant impact on students' academic performance ($z=6.59$, $p<0.05$). This means that the availability have indirect positive significant impact on CGPA. We therefore conclude that usage of library resources is a means to enhance students' academic performance. Finally, we recommend that the students should always use library resources to perform well academically.

Keywords: Path analysis, Grade Point Average, Academic performance, Library usage, Kruskal-Wallis

BAYESIAN METHOD OF ESTIMATION FOR THE AWARENESS LEVEL OF HIV/AIDS AMONG FISRT YEAR STUDENTS AT THE MAKARFI CAMPUS OF KADUNA STATE UNIVERSITY (KASU).

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This study present Bayesian method of Estimation for the awareness levels of HIV/AIDS among first year students. The Bayesian estimates of the awareness levels is derieved by assuming that the prior distributions of awareness level is an informative Bernouli distribution prior. The Posterior distribution of the awareness levels were obtained and the estimates were obtained using quadratic loss function.Further more we carried out an assessment performance of the estimated awareness levels by the use of means and variances of the estimates under Bayesian approach. Our result shows that the awareness level of spread and strategies for preventing the spread of HIV/AIDS do not differ significantly, but the awareness level of the spread produced the best best estimate of awareness level of HIV/AIDS.

Keywords: "Bayesian Estimate", " HIV/AIDS", "Prior Distribution", '"Posterior Distribution",

DESIGN AND ANALYSIS ON EFFECT OF VARYING PREPARATIONS OF TERMINALIA CATAPPA FRUIT ON THE TREATMENT OF TRANSGENIC DROSOPHILA MELANOGASTER.

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The research is aimed at investigating the effect of aqueous preparation and dose levels of Terminalia Catappa ripe and unripe fruit and their interaction on the treatment of Transgenic Drosophila Melanogaster. General two (2) factor Randomized compelete block design was employed and it was discovered that there is significant difference in the treatment of Transgenic Drosophila Melanogaster due to variation in the preparations and dose levels. It is also discovered that there is effect of interaction between preparations and dose level. Since the effect of varying preparations is influenced by the presence of varying dose levels, hence it is recommended to adopt preparation of Terminalia catappa ripe fruit and dose level 100mg/kg for optimum treatment of Transgenic Drosophila Melanogaster.

Keywords: "Terminalia catappa", "Ripe and unripe fruit", Transgenic Drosophila Melanogaster", "General two factor experiment"

A HARTLEY-ROSE AND RATIO ESTIMATION FOR THE ITEM SUM TECHNIQUES IN SENSITIVE SURVEYS: AN APPLICATION TO BESTIALITY AMONG TERTIARY STUDENTS IN LAGOS, NIGERIA.

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Bestiality is a condition where individuals experience sexual and emotional attraction to animals, which is widely considered deviant in Nigeria today. Hence, it is regarded as a sensitive topic in the survey. Respondents find it difficult to give accurate responses to sensitive topics which flaws the outcome and validity of results in sensitive surveys. Researchers have developed several methods and approaches to improve respondents' answers in sensitive surveys. The Item Sum Technique (IST) is a very recent indirect questioning approach used by researchers to get answers to sensitive questions using a quantitative questioning method. The study aims to estimate the sensitive characteristic when using the IST by comparing the Hartley-Rose and ratio type estimators in order to ascertain the most efficient method of estimation. The study also determines the population prevalence of students who are engaged in the act of bestiality among tertiary students in Nigeria. The result of the findings revealed that Hartley-Rose family of estimators outperformed the simple mean estimator and the ratio estimator because they have smaller MSE, thus are unbiased and more efficient. The results further showed that about 14.7% of the respondents had engaged in bestiality in one form or the other.

Keywords: Bestiality; Item Sum Technique; Hartley-Rose Estimator; Ratio Estimator; Sensitive Surveys

A ROBUST TECHNIQUE FOR FITTING RIDGE REGRESSION MODELS

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In this paper, a robust technique for fitting the ridge regression (RR) model in the presence of multicollinearity is proposed. The new technique completely relaxes the two basic requirements in the standard ridge regression estimation i.) that the predictor variables be scaled to unit lengths or have zero means and unit standard deviations and ii.) that the value of the shrinkage parameter, k of the ridge estimator be strictly non-negative. Results from Monte Carlo studies showed that the proposed estimation technique yielded ridge regression models that are relatively more efficient than those provided by the standard ridge regression estimators. Finally, the newly proposed method yielded results that are easily interpretable for meaningful inferences.

Keywords: Ridge regression, Orthogonality, Non-negative shrinkage parameter, Scaling, Mean square error.

THE TWO TITLE OF MY ABSTRACT IS BJKBJBKMBVH JHBVHGH

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Keywords: Keyword, Keyword, Keyword, Keyword, Keyword, Keyword, Keyword

A STATISTICAL STUDY OF WIND SPEED AND ITS CONECTIVITY WITH RELATIVE HUMIDITY AND TEMPERATURE IN UGHELLI, DELTA STATE, NIGERIA.

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One of the vital meteorological variables that plays a significant role in various natural phenomena is wind. The importance of wind can not be overemphasized in that recently the study of wind has gained serious attention due to its role as a source of renewable energy. The understanding of wind as a meteorological variable is of great importance particularly for the purpose of prediction and management of severe weather events. However; wind as a meteorological variable depends greatly on temperature and relative humidity and several statistical approaches such as time series analysis, extreme value analysis and spatial analysis have been used to analyze wind data. This study uses the kernel density method in the analysis of wind data in Ughelli, Delta State and the interconnection with temperature and relative humidity using the Gaussian kernel function for a period of five consecutive years from 2018 to 2022. The results of the investigated period with statistical tools concludes that wind speed data and the two meteorological parameters are highly connected with temperature being positively correlated with wind speed while relative humidity is highly negatively correlated with wind speed. The results have also established that of the two meteorological parameters investigated, temperature contributes most to the wind speed in Ughelli because increase in temperature leads to corresponding increase in wind speed and vice versa. Similarly, the negative correlation of wind speed and relative humidity implies that as relative humidity increases, there is decrease in wind speed and vice versa.

Keywords: Climate, Kernel, Relative Humidity, Temperature, Wind Speed

THE RAYLEIGH-EXPONENTIATED ODD GENERALIZED LOMAX DISTRIBUTION; PROPERTIES AND APPLICATIONS.

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The Rayleigh distribution has wide range of applications in Applied Sciences and Engineering; some of which are related to sea waves, harbor, coastal-engineering and studies on wind-wave heights and lots more. In this paper, we propose a new distribution titled Rayleigh-Exponentiated Odd Generalized Lomax Distribution and present some of its statistical properties comprising moments, moment generating function, entropy, quantile function and order statistics. The parameters of the new distribution were estimated using the method of maximum likelihood. A real data set was used to illustrate the flexibility of the distribution and the performance of the new distribution was compared with other distributions in literature.

Keywords: Lomax distribution, Exponentiated Odd Generalized family, quantile function, entropy, order statistics

DYNAMICS OF COVID-19 DATA WITH VARYING DEGREES OF NON-PHARMACEUTICAL INTERVENTIONS USING MODELS WITH HYPERBOLIC SINE RESTRICTIONS

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COVID-19 mortality measures based on the daily reported data were modelled and compared using Exponential and Hyperbolic Exponential growth equations. Nigeria data was used to compute case fatality rate, infection fatality rate and crude death rate which were equalled modelled using Weibull, Lognormal, Exponential and Gamma probability distributions. Exponential and Hyperbolic Exponential Growth models were used to forecast the likelihood of emerging cases and death as a result of Covid-19 using the Nigeria Data.

Keywords: Coronavirus Disease-2019, Distribution, Probability, Mortality, Hyperbolic growth Models

MULTIPLE LOGISTICS REGRESSION ANALYSIS FOR PREDICTING ACADEMIC PERFORMANCE OF STUDENTS IN SSCE

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In this paper we investigated academic performance of students at senior secondary school. A primary data was collected from the students using multi stage sampling. The study used polychotomous dependent variable such as good performance, average performance and poor performance and independent variables such as age, gender, school location, teachers experience, learning materials, parents income. A multiple logistic regression was employed to predict the students performance based on the influence of the independent variables. The study findings revealed that the variables age, teachers experience, parents income and learning materials have contributed largely to the students academic performance with p-value (<0.05) level of significance, while the variables gender, school location and residence have contributed lightly to the students academic performance based on multiple R-square of determination. Therefore the policy makers should give more priority in adopting the significant variables.

Keywords: academic performance, multi stage sampling, multiple logistic regression, predictors

EFFECT OF GLOBALIZATION ON SOME SUB-SAHARAN AFRICAN COUNTRIES ECONOMICS

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This project measures the position of some Sub-Saharan African countries' economies in the global economy using the simple GDP (1990-2019). These countries have their Purchasing power parity (PPP = $1.90) or less and were reported as the poorest in Africa and the world. Investigating their growth over globalization using five existing panel models; Pooling estimator, Within estimator, Random estimator, First Difference estimator, and Between estimator, and regressing annual percentage economic growth over the overall globalization and annual percentage economic growth over the economic, social, and Political globalization indices. A comparative analysis of the Sub-Sahara African Countries Panel data using these five-panel data models. Panel dataset and a panel dataset with a transformed independent variable(s) (log transformation); Testing for the individual effects shows that the Within estimator is preferred to the Pooling estimator; also, F-test indicates that the Within estimator is selected to the Pooling estimator and Hausman Test shows that Random estimator is preferable to Within estimator; for all the various analysis performed, Random estimator is most appropriate. In addition, there is an improved estimation on Within estimation in Social Globalization for transformed panel data over untransformed panel data; the Random estimator for transformed data has an improved coefficient on the intercept, Social Globalization. It was also observed that Economic Globalization and Social Globalization increase economic growth. In the Pooling estimator, economic growth via Economic Globalization is 2%; in the Within estimator, Social Globalization increases growth by 1%; and in the Random estimator, Economic Globalization increases growth by approximately 10%, and Social Globalization increases growth by 4%. Pesaran CD test shows that there is no cross-section dependence, and Bruesch-Godfrey/Wooldridge test shows there is autocorrelation. In the plot for heterogeneity, there is heterogeneity in the individuals across countries and years.

Keywords: Keywords: Panel data, log transformation, globalization, economic growth, LMadj

META-ANALYSIS ON THE RISK OF MATERNAL MORTALITY IN NIGERIA

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The meta-analysis was based on ten studies consisting of a total of 7999 observations to investigate the risk of maternal mortality. The effect size index was the odds ratio obtained via google search from 20th February 2023 till 6th May 2023. The random-effects model was employed for the analysis. The studies in the analysis were assumed to be a random sample from a universe of maternal mortality studies in Nigeria. The mean effect size was 3.163 with a 95% confidence interval of 1.730 to 5.782. The Z-value tested the null hypothesis that the mean effect size is 1, we found Z=3.741 with p < 0.001 for ?=0.05, hence we rejected the null hypothesis and concluded that the mean effect size was not precisely 1 for the risk of maternal mortality, the result therefore favoured mortality. The Q-statistic provided a test of the null hypothesis that all studies in the analysis share a common effect size, the Q-value is 383.589 with 9 degrees of freedom (k-1) and p < 0.001, for ?=0.1, we rejected the null hypothesis that the true effect size was the same in all ten studies, since Q?k-1, k being the number of studies. The I-squared statistic was 98%, which tells us that some 98% of the variance in observed effects reflected variance in true effects rather than sampling error. Tau-squared, the variance of true effect sizes, was 0.738 in log units. Tau, the standard deviation of true effect sizes, was 0.859 in log units. Since we assumed that the true effects were normally distributed (in log units), we estimated the prediction interval to lie between 0.386 to 25.933. The true effect size in 95% of all the studies fell in this interval. Computations were carried out using Comprehensive Meta-Analysis Version 4 (Borenstein et. al., 2022)

Keywords: Maternal Mortality, Meta-Analysis, Odds Ratio, Nigeria

COMPARATIVE ANALYSIS OF SOME ESTIMATORS OF SIMULTANEOUS EQUATION MODEL UNDER VIOLATION OF COLLINEARITY ASSUMPTIONS

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Assumptions of independence between explanatory variables and lack of multicollinearity are usually violated in single equation modelling. This has resulted into the development and the use of simultaneous equations in econometric modelling. However, in simultaneous equations model (SEM), multicollinearity of the equations have been observed to influence estimation of the model parameters. This study therefore examined the effect of multicollinearity on three methods of parameter estimation in a SEM using Monte Carlo approach. The levels of multicollinearity among the exogenous variables were specified as ? = 0, 0.2, 0.6 and 0.9. A Monte Carlo experiment was carried out at three sample sizes (n=20, 50 and 100). The estimation methods; Ordinary Least Squares (OLS), Two Stage Least Squares (2SLS) and Three Stage Least Squares (3SLS); were ranked according to their performances. Finite properties of estimators' criteria namely Root Square (R2), Root Mean Square Error (RMSE) and Mean Square Error (MSE) were used for comparing the methods. An estimator is best at a specified level of multicollinearity and sample size if it has minimum total rank over the model parameters and the criteria. It is observed that the best method for estimating the SEM model when there is no multicollinearity is 2SLS at small and moderate sample sizes OLS is the best when sample size is large. Furthermore, when there is multicollinearity, 3SLS estimator followed by 2SLS is preferred than OLS at every sample size.

Keywords: Collinearity, Multicollinearity, OLS, 2SLS, 3SLS, RMSE

MODIFIED SEQUENTIAL PROBABILITY RATIO TEST BASED ON TRUNCATED LIFE TESTS USING MAXWELL – BOLTZMANN DISTRIBUTION

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The sequential probability ratio test is put together as a sequential test of one simple hypothesis against another. In many occurrences, a parametric form is considered for the density or (discrete) probability function, and the two simple hypotheses are specified by two values of the parameter. The sequential probability ratio test has an optimum property for these two hypotheses, given such a test there is no other test with at least as low probabilities of Type I and Type II errors and with smaller expected sample sizes under either or both of the two hypotheses. However, one is interested in the performance of the procedure for more values of the parameter than these two. A limitation of the sequential probability ratio test is that in general the expected sample size is relatively large for values of the parameter between the two specified ones; that is, in cases in which one does not care greatly which decision is taken, a large number of observations is expected. The question is how to reduce the expected sample size for values of the parameter when this tends to be large. we consider a special case of the problem, we considered the performance of acceptance sampling plans using modified sequential probability ratio test (MSPRT) based on truncated life tests on Maxwell – Boltzman distribution function in terms of obtaining the minimum number of sample sizes necessary to obtain specified average life time under a given consumer's and producer's risk. When the distribution is normal with known variance and the parameter of interest is the mean. For this procedure we calculate exactly the operating characteristic, the distribution of observation time, the expected observation time, and related probabilities.

Keywords: Keywords: modified sequential probability ratio test, Maxwell-Boltzman Distribution, Average sample number, operating characteristics curve

ON EXPONENTIALLY WEIGHTED MOVING AVERAGE CONTROL CHART FOR TIME TRUNCATED LIFE TEST USING INVERSE WEIBULL DISTRIBUTION

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Control charts are widely used in industry for process and measurement control to monitor production processes in order to discover any problems or issues that may arise during the production process and to help in finding solutions for these issues. In this research, we consider a situation in which the product's quality, as measured by its lifetime, is monitored, the monitoring requires life tests to be performed and this may take relatively long time, the test time is truncated at some pre-specified time, chosen to be related to the product's target mean life. This results in a truncated life test. The number of failures during the life test is use as an indicator of the quality of the product. Consider the situation which the lifetimes follow the Inverse Weibull distribution to monitor the reliability of the production process. An EWMA control chart is proposed for this specific situation, thus extending the moving average (MA) control charts methodology to situations involving truncated life tests for Inverse Weibull distribution one real data sets was analyzed, in order to obtain the quantities needed for constructing the control chart with the aim that the average run length (ARL) is close to its target value. The control chart is evaluated by obtaining the ARL values when the process is out-of-control for various values of the shift coefficient. We obtained the coefficients of the control limit and the truncation coefficient for different sample sizes and average run length target values. It is shown that the MA control chart out performs the EWMA control chart for all shift parameters after evaluating with the ARL at the given sample sizes.

Keywords: Control Charts, EWMA, Inverse weibull distribution, Moving average, average rerun

ALPHA POWER EXTENDED INVERSE LOMAX POISSON DISTRIBUTION: PROPERTIES, INFERENCE, AND APPLICATIONS TO LIFETIME DATA

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ABSTRACT In this work, a new four-parameter extended inverse Lomax distribution named Alpha power Extended Inverse Lomax Poisson distribution is introduced using the alpha power Poisson generator. This method adds two shape parameters to a baseline distribution thereby increasing its flexibility in modelling lifetime data. We study some structural properties of the new distribution such as the mean, variance, quantile function, median, ordinary and incomplete moments, reliability analysis, Lorenz and Bonferroni curves, Renyi entropy,and order statistics. We use the method of maximum likelihood technique for estimating the model parameters of Alpha power extended inverse Lomax distribution and the corresponding confidence intervals are obtained. Two lifetime data sets are presented to demonstrate the applicability of the new model and it is found that the new model has superior modeling power when compare to other competitive models.

Keywords: Reliability analysis, Lorenz and Bonferroni and curves, order statistics, moments, maximum likelihood estimation

ON ORDER SELECTION AND FORECASTING OF GARCH MODEL FOR NON-STATIONARY AND NON NORMAL DATA STRUCTURE

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The paper is aimed at identifying the orders of GARCH Models in Non-Stationarity and Non-normal data structure. Data were simulated that satisfied the non-stationary and non-normal requirement. Several GARCH models of orders (1,1), (1,2),(2,1) and (2,2) were fitted on the simulated data at sample sizes 20, 40, 60, 80, 100, 120, 140, 160, 180 and 200 respectively. The penalty functions of Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), Schwarz Information Criteria (SIC) and Hannan-Quin (HQIC) used in assessing the best fit modesl. It was observed that parsimonious models were selected as the best fit in most of the scenario. GARCH model order selection is insensitive to the underlying distribution of the series. The models fitted and selected under the different conditions of non-Stationarity and non-normal data structure were tested on real life data with similar conditions and the selection proved to be appropriate in identifying the orders in relation to the conditions of the series. The study recommends that for every time series model order selection tests for normality and otherwise should be of priority just as that of Stationarity.

Keywords: Conditions, Data, Didtribution, order, simulated, structure

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Hhh

Keywords: Hh

APPLICATION OF TRANSPORTATION MODEL WITH LEAST COST METHOD FOR OPTIMAL SYSTEM OF PRODUCT DISTRIBUTION CHAIN.

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The study was carried out to investigate the Application of Transportation Model with Least-cost Method for Optimal System of Product Distribution Chain. The study sought to achieve the following objectives; to assess the effect of transportation networks on customers response in business operation; to determine the effect of using transportation model in business operations; to ascertain the importance of this model. The study adopted the transportation model of Anand and Raghunayagan (2018) for this study. The population consists of fifty (50) respondents from four organization in Enugu and Ebonyi State that deal on chippings, cement and related products. The population was used as sample size because it is manageable and consists of 50 respondents from four firms located in Enugu and Ebonyi States that deal on chippings, cement and related products. Quantitative research approach was used for the study. This was ensured by the application of transportation model. Findings revealed that transportation networks affect customers response in business operation distribution route on hiking the cost of chipping; also, that there are effects of using transportation model in business operations; that there is importance of this model in business operation. The study then recommended that Organizations should facilitate actual products and materials planning, scheduling and distribution by availing of the systematic programming which the transportation technique affords also that effective application of the transportation algorithm will significantly minimize total cost/maximize total benefits as the case may be, thus outweighing system costs incurred trailblazing the programming. Authors Name: Odoh Nnamdi Paschal & Anene-Nwankwo Ifunanya. Affiliation: Esut State University of Science and Technology. Email. nnamdipaschalodoh@gmail.com

Keywords: "least cost", "Transportation Cost", "optimal system".

OPTIMUM THIRD ORDER BOX-BEHNKEN DESIGNS

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Optimal response surface designs are experimental designs generated based on a specific optimality criterion such as D-, E-, and G-optimality criteria etc. In this work, three third-order Box-Behnken designs in the spherical region: Augmented Box-Behnken designs (ABBDs), Augmented fractional Box-Behnken designs (AFBBDs) and New Augmented Box-Behnken designs (NABBDs) were evaluated and compared for 4 ? k ? 6 factors using 0 ? nc ? 5 center points based on D-, A-, G- and I- optimality criteria. The results showed that AFBBDs are optimum for D-, G- and I- optimality criteria while ABBDs are optimum for A-optimality criterion. Furthermore, at k = 4 and 5, the AFBBDs, ABBDs and NABBDs are optimum at nc = 0 and 5 respectively for D- and A-optimality criteria while that of G- and I- optimality criteria fluctuate.

Keywords: Response surface designs, Optimality criteria, Prediction variance, Spherical region, Center point.

ANALYSIS OF THE IMPACT OF SOCIO-ECONOMIC AND HEALTH OF ELECTORATES ON 2023 ELECTIONS CREDIBILITY

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ABSTRACT The Nigeria 2023 elections may have come and gone but its impacts of credibility or otherwise still lingers in the hearts of many Nigerians. Nigerians have had their fair share of what is best known as ''Do-or-die'' politics among political desperados seeking to hold public offices. After the failure of successive administrations to conduct free, fair and credible elections in Nigeria, the Nigerian people lost confidence in the ability of the government to make their votes count in a democratic contest. This research seeks to examine the impacts of socioeconomic and health of electorates on the credibility of 2023 elections in Nigeria. A quantitative research method was carried out using a structured questionnaire to collect primary data from the target population. The target population consists of all people of voting age within Gomge metropolis, i.e 18 years and above. The results showed that most of the people who voted in the 2023 elections are the lower-class (or poor) citizens. It revealed a correlation between receipt of gifts/money from politicians and voting. Majority of those who sold their votes are healthy and educated Nigerians who completed tertiary education but are poor and earn betweenN20,000-N49,999 monthly salary. The research concludes that socioeconomic status of electorates impacts on the credibility of the 2023 elections. However, there is no evidence to show that health of electorates impacts on the Nigeria 2023 elections credibility.

Keywords: Keywords: "socioeconomic", "credible elections", "lower-clas citizens", "health", "vote-buying"

STOCHASTIC MODELING OF NIGERIA COVID-19 TRANSMISSION DYNAMICS WITH VACCINATION AND RANDOM PERTURBATIONS

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A number of non-medical solutions through mathematical modeling have been proffered at making contributions to find solution to the ravaging challenges of Covid-19 pandemic before the advent of vaccination. Application of stochastic in modelling is one of the few known scientific approaches at studying the spread, predicting possible outcomes, evaluating the effectiveness of disease control strategies and accommodating the random perturbation involved in the disease spread. This work provides mathematical solution of the vaccination introduction among the various combating efforts at curtailing the menace caused by the disease. A disease infection flow transmission diagram was constructed, and it identified nine (9) population compartments by their different health status, which gave a model SVEIIQISRR. Set of non-linear differential stochastic equations were derived from the infection flow transmission diagram, which were tested for stability, like the non-endemic equilibrium point, locally asymptomatically stability, stability of non-endemic equilibrium point and existence of unique global solution. The analytical study of the model consists of parameter estimation, basic reproduction number estimation and parameters' sensitivity index estimation were performed. Simulation operations were conducted on the model using Maple software (version 18) to estimate the various parameters. The model shows a potential reduction in the Covid-19 susceptible population as the rate of Covid-19 vaccination increases in Nigeria before the end 2022.

Keywords: "Stochastic", "Modeling", "Covid-19", "Vaccination", "Transmission"

ON THE PERFORMANCE OF SARIMA AND SARIMAX MODEL IN FORECASTING MONTHLY AVERAGE RAINFALL IN KOGI STATE, NIGERIA

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Forecasting monthly rainfall is very important for better approach to flood management in kogi state and also plays a pivotal role in agriculture which remains a significant factor in Nigeria's economy. Advanced time series univariate models such as Seasonal Autoregressive Integrated Moving Average (SARIMA) models are usually employed in modelling and forecasting rainfall in Nigeria due to their non-linear pattern and spatiotemporal variation. Few studies have attempted to investigate the influence of other climatic factors in modelling and prediction of rainfall pattern. This study examines the performance of a univariate SARIMA model and SARIMAX model which uses monthly temperature and relative humidity as exogenous factors in forecasting monthly average rainfall in Lokoja, the capital of Kogi state. The study uses monthly data on rainfall, temperature and relative humidity spanning from 2010 to 2022 obtained from Nigeria Meteorological Agency NIMET, Lokoja station. The series were appropriately differenced to attain stationarity. The plots of the autocorrelation function (ACF) and partial autocorrelation function (PACF) were used to select some tentative models whose parameters would be estimated. The most suitable SARIMA model [SARIMA ?(1,1,0) ×(0,0,1)?_12] was chosen based on maximum Coefficient of Determination (R^2), the minimum Akaike information criterion (AIC), minimum Bayesian Information Criterion (BIC) and Durbin Watson statistics. However, SARIMAX model outperformed SARIMA model based on the selection criteria highlighted. SARIMAX model was therefore recommended for modelling and forecasting monthly average rainfall in Kogi state.

Keywords: SARIMA, SARIMAX, exogenous, ACF, PACF, Rainfall.

DYNAMIC PROGRAMMING TO PORTFOLIO RETURN OPTIMIZATION OF BELLMAN'S MODEL: THE BEST CLUSTER PATTERN FOR THE MODEL

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A suitable decision plan is followed by an effective financial management to achieve optimality while investing in a competing stock portfolio. This study altered a Dynamic Programming (DP) model of Bellman. The modified model was used to solve a business problem. The problems of choosing a stock portfolio for optimal return among investors in financial markets have resulted in a financial crisis. Most financial analysts provide investors with incorrect and non-validated investment information. The consequences were minimal optimum, no return, and an investment problem. The goals are to ensure optimality in investor returns, validate the results using two validity tests, and select the test that best validated the model. The silhouette and Dunn tests were used to validate the outcome result. The results of using Silhouette reduced computational complexity and produced a more robust and validated return. The k-means clustering (an aspect of unsupervised machine learning) provided better statistical evaluation, the best fit, and investment pattern. In comparison to previous work, the introduction of variables allowed for the best return at stage one. Finally, a validated investment report can help to avoid mistakes made by market analysts and investors when making investment decisions.

Keywords: Gap Statistic, Clustering, Decision making, Dynamic programing, Dynamic programing, Stocks portfolio

EFFICIENCY OF SOME MODIFIED RATIO ESTIMATORS IN TWO-STAGE SAMPLING

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In this research work some modified ratio estimators of population mean in two-stage sampling were proposed utilizing simple random sampling without replacement scheme (SRSWOR). The estimators were formed by modifying some existing ratio estimators in two-stage sampling using information on a single supplementary variable . The bias and mean square errors (MSEs) of the proposed estimators were obtained up to the first order of approximation using Taylor`s series expansion. Empirical study was performed to assess the efficiency of the modified estimators over some related existing estimator considered in the study and the result reveals that proposed estimators were more efficient with minimum mean squares (MSEs).

Keywords: Two-Stage Sampling, Ratio Estimators, Bias, Mean Square Error, Efficiency

USING SARIMA TO FORECAST MONTHLY MEAN SURFACE AIR TEMPERATURE IN JOS NORTH REGION OF PLATEAU STATE, NIGERIA

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Abstract: Weather forecasting is a significant topic in meteorology and science analysis. In this study, the forecasting model was built using the Seasonal Auto Regressive Integrated Moving Average (SARIMA) model, which is based on the Box-Jenkins system. The mean monthly temperature data for Jos city from the Department of Meteorology and Climatology University of Jos within the period of January 1986 to December 2018 was used, The SARIMA models' most appropriate orders were determined using the autocorrelation and partial autocorrelation functions for time series results. The monthly mean Temperature was used to verify the validity of these models. Statistical criteria such as MAE, RMSE, MAPE, and R2 were used to measure the model's accuracy and compare them. The model SARIMA(4,1,6)(2,1,2)12 was chosen as the most reliable result and was used to forecast the monthly mean temperature for the study area for the period (2019 to 2021). Author's: Dayyab Abdulkarim Shitu, Ahmed Abdulkadir, Rashida Idris. Affiliation: Abubakar Tafawa Balewa University Bauchi, Bauchi state Email address: dayyababdulkarim@gmail.com

Keywords: Keywords: Monthly mean temperature, Time series forecasting, SARIMA model, Auto-Regressive, Moving Average.

A STUDY OF BORDERLINE APPLICATION ON MATHEMATICAL MODELLING OF LEPROSY TRANSMISSION IN NIGERIA

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By Funmilayo Joyce Damilare-Joshua and Adebowale Olusola Adejumo Department of Statistics, University of Ilorin, Ilorin, Nigeria E-mail: fdjoshua14@gmail.com, aodejumo@unilorin.edu.ng Abstract Leprosy, one of the neglected tropical illnesses, is a chronic, painful, crippling, and disfiguring disorder that is most prevalent in the context of extreme poverty, particularly among the rural poor and certain disadvantaged urban groups. Peripheral nerves, often known as skin and skin-related nerves, are largely impacted by leprosy. Therefore, this study's main goal is to use a deterministic mathematical model based on ordinary differential equations and numerical simulations to model the leprosy transmission in Nigeria. The model divided the population concerned into six compartments namely susceptible (S(t)), exposed (E(t)), multibacillary leprosy (MB), paucibacillary leprosy (PB), recovered rate (R(t)) due to treatment and borderline infection (BI) which was newly introduced and were formulated and analyzed with numerical simulations. The outcome of the numerical simulations indicates that while the addition of an exposed population, or the E(t) compartment, appears to slow the outbreak but does not appear to reduce the number of people ultimately infected by the disease. Also, the borderline, PB and MB slowly increase before flattening out. The vulnerability level off after reaching a peak and then level off. The recovered rate increases over 100 years before levelling off, which is consistent with real-world circumstances. In conclusion, we can show that the simulation roughly matches the real-life situation of the symptoms. Consequently, the susceptible and exposed population should receive vaccination intervention that is properly administered in the meantime and to stop the disease from spreading further in Nigeria, the resurgence of the disease needs to be addressed.

Keywords: Keywords: Leprosy, Mathematical Model, Multibacillary leprosy, Paucibacillary leprosy, Borderline

ASSOCIATION STUDIES OF SEQUENCED COVID-19 DATA FOR INFERENCE IN HAPLOTYPING

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Combination of alleles across multiple loci on the same chromosome is termed Hyplotyping while alleles is one possible form of a gene at a given locus. Standard genotyping, which is based on PCR/sequencing or on chips, does not, however, allow for the direct determination of haplotypes. Hence the aim of this study was to ascertain if there was an improved power to detect association between complex traits and densely spaced genetic markers using EM Algorithms and Linkage disequilibrium approaches. Published dataset on Severe acute respiratory syndrome coronavirus 2 2019-nCoV_PH_nCOV_20_022 N gene for nucleocapsid phosphoprotein was used for the study. Our findings revealed that the genetic variability of genomic data can only be determined if more than one genomic data is compared to each other. Also, results varied across sampled data which showed variability with the tendencies of maintaining consistency of the genetic drift within the domain of statistical inference. Our results also showed that the data was not at Linkage disequilibrium and that genetic variability of the data was insignificant with the complete dataset while more useful bootstrap properties and significant genetic variability were recorded when bootstrap samples were used. This study showed that hydrogen bond can affect stability and structure of the DNA sequence mutation by certain genomic features while resampling approaches were recommended for genetic variation in data of this magnitude.

Keywords: Covid-19, Genetic drift, SNPs, Statistical Genetics, Sequence

ASSOCIATION STUDIES OF SEQUENCED COVID-19 DATA FOR INFERENCE IN HAPLOTYPING

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Combination of alleles across multiple loci on the same chromosome is termed Hyplotyping while alleles is one possible form of a gene at a given locus. Standard genotyping, which is based on PCR/sequencing or on chips, does not, however, allow for the direct determination of haplotypes. Hence the aim of this study was to ascertain if there was an improved power to detect association between complex traits and densely spaced genetic markers using EM Algorithms and Linkage disequilibrium approaches. Published dataset on Severe acute respiratory syndrome coronavirus 2 2019-nCoV_PH_nCOV_20_022 N gene for nucleocapsid phosphoprotein was used for the study. Our findings revealed that the genetic variability of genomic data can only be determined if more than one genomic data is compared to each other. Also, results varied across sampled data which showed variability with the tendencies of maintaining consistency of the genetic drift within the domain of statistical inference. Our results also showed that the data was not at Linkage disequilibrium and that genetic variability of the data was insignificant with the complete dataset while more useful bootstrap properties and significant genetic variability were recorded when bootstrap samples were used. This study showed that hydrogen bond can affect stability and structure of the DNA sequence mutation by certain genomic features while resampling approaches were recommended for genetic variation in data of this magnitude.

Keywords: Covid-19, Genetic drift, SNPs, Statistical Genetics, Sequence

ON THE IMPACT OF FINANCIAL INCLUSION ON ECONOMIC GROWTH IN NIGERIA USING AUTOREGRESSIVE DISTRIBUTED LAG FRAMEWORK

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Adenomon, M. O.; John, M. A.; Idris, M. U.; Audi, N. I. & Saidu, R. Y. Department of Statistics, Nasarawa State University, Keffi, Nigeria & NSUK-LISA Stat Lab, Nasarawa State University, Keffi, Nigeria. Corresponding author: adenomonmo@nsuk.edu.ng; +2347036990145 Abstract Financial Inclusion involves steps taken by financial institution(s) to make every day financial services available to more of the world's population at a reasonable cost. This study sets out to investigate the impact of financial Inclusion on economic growth in Nigeria. Annual data covering the period of 2005 to 2020 was sourced from CBN statistical bulletin and World Bank Indicator (WDI) for Gross of Domestic Product (GDP) at basic price, Savings and time deposits of other depository cooperation banks, Loans from Commercial Banks to rural branches, Loans to small scale enterprises and Automated Teller Machine (ATM) per 100,000 adults. The study employed the Auto-Regressive Distributive Lag (ARDL) framework in determining the existence of long run and short-run Impacts of financial inclusion on economic growth in Nigeria. the optimal ARDL (1,1,0,1,1) was obtained and the bound test revealed the existence of long run relationship but the impact of the variables of financial inclusion were not significant ($p>0.05$). In the short run relationship, Deposit and ATM were negatively related to economic growth ($p<0.05$) while loans to rural branches and small-scale enterprises were positively related to economic growth in Nigeria ($p<0.05$). The speed of adjustment stood at 12.9% ($p<0.05$). The estimated short run model is stable, free from heteroscedasticity and serial correlation while error is normally distributed. Evidence from Granger causality test revealed that Loan to small scale enterprise granger causes GDP in Nigeria. The study thus concludes that Financial Inclusion has Impact on economic growth in Nigeria and recommends reforms and campaign on the importance of Loans and financial literacy at large.

Keywords: Financial Inclusion, Economic Growth, ARDL, GDP, ATM.

STREAMFLOW VARIABILITY AND FLOODING EFFECTS OF SHIRORO DAM RESERVOIR, NIGER STATE. NIGERIA

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Flooding menace in Nigeria is linked to natural causes, urbanization and management practices and has now become a recurrent natural disaster. In 1999 and 2003, when Shiroro dam spilled, some villages and communities were completely submerged under water. Deaths occur, valuables lost, farm lands devastated, while hundreds of thousands of persons were displaced. The main objective of this study is to investigate the annual and monthly streamflow variation and flooding effects of Shiroro dam reservoir. In view of this, the paper aims at examining the annual and monthly trends of the reservoir inflow. Records for a period of twenty five (25) years (1996 – 2020) was obtained from the Meteorological Station at Shiroro. Two methods were used for the analysis, namely; The Extreme Value Theorem (EVT), using the Gumbel's equation and the Autoregressive Integrated Moving Average (ARIMA) models for the seasonarity effect of the monthly data. The initial model identification was done by using the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF). Equation XT ??3468.5 ??1341 ??0.81yT ??0.405) was developed for the annual inflow to forecaste for 5, 10, 50, 100, and 150 years and ARIMA (1, 0, 1), having the highest R2, was also used for the monthly inflow to forecaste for 5, 10, 50, 100 and 150 years. The results show an upward trend in both cases. It is therefore recommended that Shiroro reservoir should be dredged and well channeled so as to reduce depth of runoff during the full wet seasons and predictions to utilize the potential usage of the reservoir effectively for farming activities and generation of power for both industrial and domestic use was made.

Keywords: Streamflow, Reservoir, Variation, Dam, and Flooding

STATISTICAL APPRAISAL TO PRESIDENTIAL ELECTION RESTRUCTURING: A PATHWAY TO ALL REGION'S PRESIDENCY

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The research, statistical appraisal to presidential election restructuring as a path to all zone's presidency pattern was seen to be zoning from the NW and SW. Except in 2010 for the first time that President Goodluck Ebele Jonathan was coincidentally in power owing to the death of his boss, President Umaru Musa Yar'adua. From 1992 to 2023, the Independent National Electoral Commission (INEC) served as the data's primary source. The fundamental conversion of the data and the graph presentation were done using the Excel application package, and the analysis was done using Minitab. The graph plot's visualization reveals that, on average, the South-East has made the least percentage contributions to obtaining the president, while the North-West has made the largest contributions of any zone. The aggregate proportional values for each zone in terms of obtaining the presidency are NW (23%) and SS (11%), NE (15%), NC (16%), SW (17%), and SS (18%). In this democratic era, no President has ever been elected from the three zones with the lowest contributions. The NW that is overthrown has reigned twice, the SW has reigned twice, and the SS has reigned once. According to the information gathered, SW has been elected president three times: Chief MKO Abiola in 1992, President Olusegun Obasanjo in 1999 and again in 2003, and the current President Bola Ahmed Tinubu.

Keywords: "Electoral Process", "Presidency", "Percentage", "Multiple Regression", "Constitution".

APPLICATION OF SARIMA MODEL IN MODELLING AND FORECASTING WIND IN KEBBI STATE EMIRATES

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Researchers had proven in the past that the weather is not constant throughout the universe. Weather plays vital role in Agriculture, Trade, Gas and Electricity companies as well as day today human activities. The research aimed at applying SARIMA model in modeling and forecasting wind in Kebbi State Emirates which comprises of Yauri, Zuru, Gwandu and Argungu Emirates. Wind monthly data were collected from World Historical Weather in each of the Emirates from 2009 to 2021. The SARIMA model was employed as the statistical tool for the analysis. This research analysis employed R software programming. The initial analysis carried out suggested that all the series representing the Emirates were all stationary except Aliero (Gwandu) and Argungu winds but all were stationary after transformation. Augmented Dickey Fuller tests were employed to investigate the unit-roots from the data and all test results proved that there were no unit roots from the dataset. HEGY test also revealed the absence of seasonal unit roots for all the Emirates. All the tests were carried out at 5% significant level. KPSS test revealed that all the data were stationary except for the cases of Aliero and Argungu winds. Thus, the necessary transformations were carried out to stabilize the two. Akaike Information Criterion (AIC) was used to obtain the wind model identification for each of the Emirates. The wind optimum models that were identified are ARIMA(4,0,1), ARIMA(5,0,1), SARIMA(0,0,0)x(0,0,2)^12 and SARIMA(0,0,1)x(0,0,1)^12 for Aliero, Argungu, Yauri and Zuru Emirates respectively.

Keywords: SARIMA, Wind, Stationary, Unit root, Optimum model

PATTERN OF CONTRACEPTIVE USAGE IN NIGERIA USING BAYESIAN NETWORK AND STRUCTURAL EQUATION MODELLING

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Turman Henry1 Sunday Charity1 Makoshi B. Joshua1 1 Federal School of Statistics, Manchok Corresponding Author's email: turman112h@gmail.com Abstract Contraceptive is a means of controlling fertility through prevention of unintended and unwanted pregnancies. Contraceptives usage help in improving infant and maternal wellbeing and also both economic and social factors.This work seeks to show the pattern of the usage of some family planning methods in relation to some factors informing their choices. The usage of Bayesian (BN) and structural equation modelling (SEM) is employed on (Nigeria Demographic Household Surveys) NDHS data. Bayesian networks are good for prediction and diagnosis they establish a joint probability distribution of a set of random variables with a possible mutual causal relationship. SEM is one of the most widely used techniques due to its ability to provide a quantitative assessment of relationships among variables under study base on combines cause–effect information of a statistical data. A predictive patterns of the usage of the family planning methods (condoms, IUD, Injectable, pills) was established in relation to some factors (i.e. educational level, Wealth index, mass media, religion, place of residence and husband consent) that influence their usage. Model diagnostics is performed and results from rural and urban ever married were compared using the above mention techniques. The SEM result also showed significant relationship between family planning methods and some factors considered in this study. The odds of contraceptive usage increased with greater exposure to the factors considered eg educated women indicate to have more knowledge of contraceptive methods. This result will seriously help health workers, social workers and biostatisticians make good decision based on the establish relationships and probabilities values using Bayesian network on contraceptive usage.

Keywords: Bayesian network, Structural Equation Modelling, contraceptive usage, Nigeria.

EFFECT OF SOME SELECTED MACROECONOMIC VARIABLES ON NIGERIA'S ECONOMIC PERFORMANCE

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ABSTRACT: The relationship between the exchange rate (EXCHR), the consumer price index (CPI), a proxy for inflation, capital expenditure (CAP), and recurrent expenditure (RCE), all of which are crucial tools for determining the appropriate economic policy on gross domestic product in Nigeria between (2000 - 2021), was examined in this study using data from the CBN and Nigerian economic indicators. The Autoregressive Distributed Lag (ARDL) model, bounds co-integration tests, and unit root test were all used to analyze this work. The goal was to ascertain how these macroeconomic factors will affect GDP (Gross Domestic Product). The unit root test results revealed that the variables are mixed integrated, with Capital Expenditure being stationary at levels and the other variables in the model being stationary at first difference. According to the results of the bounds co-integration test, there is a long-term relationship between GDP and the underlying explanatory factors. Consumer price index and capital expenditure were positive and statistically significant in relation to gross domestic product, suggesting that an increase in either of these variables will result in an increase in GDP. Conversely, exchange rate was negatively correlated with GDP and statistically significant, suggesting that a unit increase in the exchange rate will result in a decrease in GDP. Although it was not statistically significant, the recurrent spending was also found to have a favorable impact on the gross domestic product. A further finding of the model is that the independent variables account for 97.0% of the variation in GDP. The findings support the

Keywords: "Gross Domestic Product; Exchange rate", "Consumer Price Index", "Capital Expenditure", "Recurrent Expenditure", "Autoregressive distributed lag "

EFFECT OF SOME SELECTED MACROECONOMIC VARIABLES ON NIGERIA'S ECONOMIC PERFORMANCE

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ABSTRACT: The relationship between the exchange rate (EXCHR), the consumer price index (CPI), a proxy for inflation, capital expenditure (CAP), and recurrent expenditure (RCE), all of which are crucial tools for determining the appropriate economic policy on gross domestic product in Nigeria between (2000 - 2021), was examined in this study using data from the CBN and Nigerian economic indicators. The Autoregressive Distributed Lag (ARDL) model, bounds co-integration tests, and unit root test were all used to analyze this work. The goal was to ascertain how these macroeconomic factors will affect GDP (Gross Domestic Product). The unit root test results revealed that the variables are mixed integrated, with Capital Expenditure being stationary at levels and the other variables in the model being stationary at first difference. According to the results of the bounds co-integration test, there is a long-term relationship between GDP and the underlying explanatory factors. Consumer price index and capital expenditure were positive and statistically significant in relation to gross domestic product, suggesting that an increase in either of these variables will result in an increase in GDP. Conversely, exchange rate was negatively correlated with GDP and statistically significant, suggesting that a unit increase in the exchange rate will result in a decrease in GDP. Although it was not statistically significant, the recurrent spending was also found to have a favorable impact on the gross domestic product. A further finding of the model is that the independent variables account for 97.0% of the variation in GDP. The findings support the idea that macroeconomic policies targeted at promoting sustainable economic development cannot be overstated. The study makes two recommendations: the federal government, through the CBN, should make sure that exchange rate policy should be consistent to give opportunity for a realistic and stable exchange rate capable of driving economic

Keywords: "Gross Domestic Product", "Exchange rate", "Consumer Price Index", "Capital Expenditure", "Recurrent Expenditure", "Autoregressive distributed lag"

MODELING VOLATILITY MEAN REVERSION AND HALF-LIFE OF CRUDE OIL PRICES IN NIGERIA

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ABSTRACT Volatility mean reversion entails retracing a phenomenon such as crude oil price back to its long-run average level. The concept assumes that a level that strays far from the long-term trend will again return, reverting to its understood state or secular trend. The aim of this study is to model volatility mean reversion and half-life of crude oil prices in Nigeria using symmetric and asymmetric GARCH models. The study utilizes both daily and monthly crude oil prices from 23rd October, 2009 to 5th April, 2023 and January, 2006 to February, 2023 respectively. The study employs summary statistics and normality measures, time plots; Ng-Perron modified unit root test and heteroskedasticity test to examine the properties of crude oil prices and returns in Nigeria. The study also employs symmetric and asymmetric mean reversion GARCH models and volatility half-lives as principal methods of analysis. Results showed that the crude oil returns were non-Gaussian, leptokurtic, heavy-tailed, stationary and mean reverting. The symmetric GARCH (2,2) and asymmetric EGARCH (2,2) were optimally selected by Schwartz information criterion (SIC) in conjunction with log likelihood (LogL) as the best fitting models for daily crude oil returns while GARCH (1,1) and EGARCH (2,3) models were selected for modeling the volatility of monthly crude oil returns. The symmetric GARCH (2,2) and GARCH (1,1) models showed evidence of volatility clustering and shock persistence for both daily and monthly crude oil returns, whereas, the asymmetric EGARCH (2,2) and EGARCH (2,3) models showed evidence for the existing of asymmetry and leverage effects for both crude oil returns. Overall, the crude oil returns were found to be mean reverting, stable, non-explosive, predictable and stationary with volatility half-lives of 101 to 125 days and 7 months for daily and monthly crude oil returns respectively. Mean reversion phenomenon implies that crude oil prices revert to a long-run mean price level over time. Specifically high crude oil prices will, in time, fall back to a long term mean, and particularly low prices will rise over time. The study provides some policy recommendations.

Keywords: Asymmetry, Half-Life, Leverage Effects, Mean Reversion, Oil Price, GARCH Models, Nigeria.

ESTIMATION OF A SCALE PARAMETER OF THE NEW WEIGHTED WEIBULL DISTRIBUTION USING BAYESIAN AND MAXIMUM LIKELIHOOD METHODS.

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K. Samson*, K .E. Lasisi*, A. Abdulkadir*, A. U. Farouk**, L. I. Mangbon*** * Department of Mathematical Science, Abubakar Tafawa Balewa University, Bauchi, Nigeria **Department of Mathematics and Statistics, School of Science and Technology, Federal Polytechnic, Bauchi, P.M.B.0231, Bauchi State, Nigeria. ***Department of Statistics, Federal School of Statistics, Manchock, Kaduna State, Nigeria *Corresponding author: Kujesamson@gmail.com. Tel: +2348133152446. Abstract: The new weighted Weibull distribution is a three-parameter lifetime model with high flexibility for analyzing real life data. It has a scale parameter and two shape parameters responsible for the flexibility in the distribution. With all the importance and necessity of parameter estimation theory in model fitting and application, it has not been established that a particular estimation method is better for any of these three parameters of the new weighted Weibull distribution. Therefore, this paper focuses on the development of Bayesian estimators for the scale parameter of the new weighted Weibull distribution using two non-informative prior distributions (Uniform and Jeffery) and an informative prior (gamma) under squared error loss function (SELF), quadratic loss function (QLF) and precautionary loss function (PLF). These results are compared with the maximum likelihood estimation method using Monte Carlo simulations. To compare the efficiency of these estimation methods, the mean square error (MSE) has been used as a criterion for choosing the best estimator.

Keywords: Keywords: New Weighted Weibull distribution; Bayesian analysis; Jeffrey Prior distribution; Quadratic Loss function; Maximum Likelihood Estimation and Mean square error.

ESTIMATION OF A SCALE PARAMETER OF THE NEW WEIGHTED WEIBULL DISTRIBUTION USING BAYESIAN AND MAXIMUM LIKELIHOOD METHODS.

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K. Samson*, K .E. Lasisi*, A. Abdulkadir*, A. U. Farouk**, L. I. Mangbon*** * Department of Mathematical Science, Abubakar Tafawa Balewa University, Bauchi, Nigeria **Department of Mathematics and Statistics, School of Science and Technology, Federal Polytechnic, Bauchi, P.M.B.0231, Bauchi State, Nigeria. ***Department of Statistics, Federal School of Statistics, Manchock, Kaduna State, Nigeria *Corresponding author: Kujesamson@gmail.com. Tel: +2348133152446. Abstract: The new weighted Weibull distribution is a three-parameter lifetime model with high flexibility for analyzing real life data. It has a scale parameter and two shape parameters responsible for the flexibility in the distribution. With all the importance and necessity of parameter estimation theory in model fitting and application, it has not been established that a particular estimation method is better for any of these three parameters of the new weighted Weibull distribution. Therefore, this paper focuses on the development of Bayesian estimators for the scale parameter of the new weighted Weibull distribution using two non-informative prior distributions (Uniform and Jeffery) and an informative prior (gamma) under squared error loss function (SELF), quadratic loss function (QLF) and precautionary loss function (PLF). These results are compared with the maximum likelihood estimation method using Monte Carlo simulations. To compare the efficiency of these estimation methods, the mean square error (MSE) has been used as a criterion for choosing the best estimator.

Keywords: Keywords: New Weighted Weibull distribution; Bayesian analysis; Jeffrey Prior distribution; Quadratic Loss function; Maximum Likelihood Estimation and Mean square error.

COMPARATIVE STUDY OF MACHINE LEARNING PROCEDURES FOR PREDICTION OF DIABETES

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Discriminant analysis is one of the powerful statistical learning techniques used to analyze data in which the response variable is dichotomous while other features are quantitative. However, its usage in prediction or classification problems is extremely low when compared with some of the most widely used techniques such as Logistic Regression (LR), Support Vector Machine (SVM), and Random Forest (RF) among others. Hence, this study focuses on comparing the performances of Quadratic Discriminant Analysis (QDA), Linear Discriminant Analysis (LDA), Logistic Regression (LR), and Random Forest (RF). Pima Indian Diabetes dataset was used for the study and the performances of the aforementioned techniques were measured by the score of accuracy, sensitivity, specificity, positive predicted value, negative predicted value, prevalence, detection prevalence balanced accuracy, confusion matrix, and receiver operating characteristic (ROC) curve. The study revealed that QDA outperformed the LDA, LR and RF with about 80.8% and 77% accuracy and balanced accuracy scores, respectively, if the less important variables pressure and triceps are removed.

Keywords: Discriminant Analysis, Logistic Regression, Random Forest, Diabetes Prediction and Support Vector Machine

EFFECT OF SOME SELECTED MACROECONOMIC VARIABLES ON NIGERIA'S ECONOMIC PERFORMANCE

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The relationship between the exchange rate (EXCHR), consumer price index (CPI), capital expenditure (CAP), and recurrent expenditure (RCE), all of which are crucial tools for determining the appropriate economic policy on Gross domestic product (GDP) in Nigeria between (2000 - 2021), was examined in this study using data from the CBN and Nigerian economic indicators. The study employed Autoregressive Distributed Lag (ARDL) model, bounds co-integration test, and unit root test. The goal was to ascertain how these macroeconomic variables affect GDP. The unit root test results revealed that the variables are mixed integrated, with Capital Expenditure being stationary at levels and the other variables in the model being stationary at first difference. According to the results of the bounds co-integration test, there is a long-run relationship between GDP and the underlying explanatory variables. Consumer price index and capital expenditure were positive and statistically significant in relation to gross domestic product. Conversely, Exchange rate was negatively and statistically significant. Although not statistically significant, the recurrent expenditure was also found to have a favorable impact on the gross domestic product. Also, the model revealed that the independent variables account for 97.0% of the variation in GDP. The study concluded that an increase in exchange rates hinders the expansion of the Nigerian economy. Furthermore, the study recommended that the Federal Government, through the CBN, should make sure that exchange rate policy is consistent in order to create the possibility for a reasonable and stable exchange rate, also the share of Capital allocations should be prioritized based on projects and areas that have substantial advantages for the citizens.

Keywords: Gross Domestic Product, Exchange rate, Consumer Price Index, Capital Expenditure , Autoregressive distributed lag

HIERARCHICAL REGRESSION ANALYSIS ON THE IMPACT OF EMPLOYEE EMPOWERMENT ON ORGANIZATIONAL PERFORMANCE OF QUOTED MANUFACTURING COMPANIES IN NIGERIA

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Turman Henry1 Ndan Ruya 1 Christiana J. Bakut1 Charity Sunday1 1 Federal School of Statistics, Manchok Corresponding Author’s email: turman112h@gmail.com Employee empowerment is one of the tools that are used by human resource managers to attain organizational objectives. Employee empowerment provides the needed power and motivation to the employees thus, facilitating his optimum productivity, employee empowerment is highly significant in that it leads to an employee’s physical and psychological attachment to the organization, resulting in commitment towards the job and increase accountability. The objective of this study is to determine the impact of employee empowerment on organizational performance. The data used for this work is from a structured questionnaire. Hierarchical multiple regression analysis was performed. Hierarchical linear models are useful for understanding relationships in hierarchical data structures, such as employee within an organization. Hierarchical linear models, sometimes called multi-level linear models, nested models handles these hierarchical data structures. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. Among the predictors’ variables, Competence, Information sharing, Decision making and Training all were statistically significant and contributed positively to the overall organizational performance. Customer service, Internal business process, Learning and growth where then used as a second set of factors. These factors too, made a significant unique contribution to the model. The variance between the 1st and 2nd model is significant as indicated by Sig. F Change value (.000), the is 10%. It is obvious that an empowered employee is a key asset to an organisation, because this study shows relationship between training and organisational performance.

Keywords: Employee empowerment, organizational performance, Hierarchical linear model.

A STUDY ON BAYESIAN MIXED LOGISTIC REGRESSION

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The study examined a study on Bayesian Mixed Logistic Regression with a view to estimating the parameters of the model using the maximum likelihood method and to compare the performance of the model with that of other models using a real life data set. The study also investigated the choice of Seven different priors such as Uniform, Jeffrey's, Gamma, Exponential, Beta, Cauchy and Normal distribution that include both informative and non-informative priors were used to model Bayesian Mixed Logistic Regression using COVID-19 dataset and simulated data. We plotted Kernel density plots to check for good convergence and it resembled the shape of an expected inverse-gamma distribution. The main finding is that the Jeffrey's prior outperforms the other alternative priors for the real life data while Beta distribution outperforms the other alternatives for the simulated data. The estimated log-marginal likelihood of the model for Jeffrey's prior is, -191.41681, is higher than that of the model with normal priors, -202.06434, Uniform (-201.8982), Gamma (-202.78049), Exponential (-200.99817) and Cauchy priors (201.40335) which indicates that the model with Jeffreys priors fits the data better. Furthermore, Jeffrey's prior is more efficient than the other alternatives and it seems to be preferable to normal priors, Uniform, Gamma, Exponential and Cauchy priors for the real life data while for the simulated data Beta distribution is preferable. The study therefore recommended that it is imperative for one to choose a prior that, at least, reflects the relative importance of the attribute of the data and then could increase the reliability of the choice data and consequently the estimated values for the preference parameters. Nigeria Centre for Disease Control (NCDC) hast to pay attention and put in place appropriate measures to the critical and active cases since they are the major factors that affect COVID-19 deaths in Nigeria.

Keywords: Bayesian, Mixed Logistic

TESTING THE RANDOM WALK HYPOTHESIS IN THE NIGERIAN CRUDE OIL PRICES: EVIDENCE FROM RESCALED RANGE HURST EXPONENT ANALYSIS

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The aim of this study is to examine the Random Walk Hypothesis (RWH) in the Nigerian crude oil market using the daily and monthly crude oil prices in Nigeria from 23rd October, 2009 to 5th April, 2023 and January, 2006 to February, 2023 respectively. The study employs Ng-Perron modified unit root test, the random walk model, Hurst Exponent Rescaled Range (R/S) analysis, and symmetric AR(1)-GARCH(1,1) models as methods of analysis. The results of the study rejected the null hypotheses of a unit root and random walk in the crude oil returns. The results of the Hurst exponents as well as the filtered R/S Hurst Exponents analysis for both daily and monthly crude oil returns showed the Hurst exponent variances in the range of $0.5<H<1$ indicating that the Nigerian crude oil returns are persistent and non-random. The results from symmetric AR(1)-GARCH (1,1) models indicate that the volatility shocks in the Nigerian crude oil market are quite persistent for both daily and monthly returns. The results of Ng-Perron modified unit root test, Hurst exponents, AR(1,)-GARCH (1,1) models and the filtered R/S Hurst Exponents are consistent indicating that the Nigerian crude oil returns series are quite persistent, non-random, and predictable. Therefore, the null hypothesis of random walk is rejected in the Nigerian crude oil market during the period of the study. The rejection of Random Walk Hypothesis (RWH) implies that the Nigerian crude oil market is weak-form inefficient. This result further implies that crude oil prices in the Nigerian crude oil market are predictable, dependable, consistently mispriced, inflated, and liable to arbitraging and left unprotected to speculations and market manipulations. The study recommends among others short-term trading strategy for investors, prompt dissemination of available market information on the performance of crude oil to investors by market operators and addressing trading frictions, developing and implementing policies that will ensure active trading and vibrancy in the Nigerian crude oil market.

Keywords: Crude Oil Price, GARCH Model, Hurst Exponent, Random Walk, Unit Root, Nigeria.

MODELLING OF INTERNALLY GENERATED REVENUE IN NIGERIA

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Abstract The purpose of this study is to investigate if there was a natural grouping or clusters among the 36 states in Nigeria. This clusters or natural groupings are based on the internally generated revenue of the all the states in Nigeria. Data for the research was collected from the Federal Internal Revenue Services (FIRS) for the first quarter of 2022. The data consist of 5 variables and 36 observation. However, Lagos state was treated as an outlier and therefore removed from the data set. Hence all the analysis done in this study was based on the 35 states in Nigeria excluding Lagos state. The K-Means clustering algorithm was adopted in this research and the result presented two distinct (non-overlapping) clusters which cluster one having 25 observations and cluster two having 10 observation. These clusters were labeled low and high respectively based on the cluster properties. Furthermore, the study also attempted to compare the predictive power of three (3) different classification models; artificial neural network (ANN), k-nearest neighbor (k-NN) classifier, and the naïve Bayes classifier. For each of this classification model, the accuracy in predicting the class of the test set was examined. The k-NN model gave an accuracy of 100% in predicting the items in the test set, the ANN model had an accuracy of 90% in predicted the items in the test set, while the naïve Bayes model gave an accuracy of 80% in predicting the items in the test set.

Keywords: Internally Generated Revenue, Classification Models, Clusters, K-Means Clustering Algorithm

STATISTICAL MODELLING OF HUMAN DEATHS PER ROAD ACCIDENT: A POISSON REGRESSION MODEL

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Abstract The purpose of this study is to identify the potential factors causing road accidents and their effect on the number of human deaths. Certain factors were considered as having effect of the number of human deaths per road accident. These factors include; age of driver, sex of driver, years of driving experience of driver and the educational level of driver. Data for this work was collected from the Federal Road Safety Commission Bauchi State. Since the dependent variable is a count data, the Poisson regression model was used to model the effect or impact of these independent variables on the number of human death per road accident. The result indicated that age of driver, years of driving experience of driver and educational level of driver have significant effect on the number of human death per road accident.

Keywords: Statistical Modelling, Human Death per Road Accident, Risk Factor, Poisson Regression,

ON OPTIMUM NUMBER OF STATES OF A HIDDEN MARKOV MANPOWER MODEL

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Hidden Markov models have wide application in many dynamic systems where a part of the systems' dynamics is hidden or not observable, and as such has no direct data representation. They have been applied in manpower systems to model unobserved heterogeneity in personnel transitions across membership states, which involves the choice of the number of states of the hidden Markov chain within each observable states of the systems. The choice has, however, been subjectively made, due to the lack of observable data on the hidden states, leading to the possibility of different persons using different number of hidden states for the same system. This work addresses this problem for a multi-level manpower system through construction of ordered pairwise model comparison tests. In this way, the optimum number of states is identified. The illustration shows the usefulness of the method in choosing the best among many competing hidden Markov manpower models.

Keywords: Statistical manpower planning, hidden Markov model, comparison test, optimum number of states

MULTI-LEVEL MODELLING OF SOME FACTORS AFFECTING POVERTY RATE AT DIFFERENT POLITICAL REGIME IN NIGERIA FROM 1999-2022

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ABSTRACT The Problem of poverty is one of the fundamental problems that should draw the attention of government both National, state and Local government. This study examined the effect of food price, education price, health price, transport price on poverty rate at different political regime in Nigeria from 1999 to 2022, where the indicator of poverty rate is considered as final consumption expenditure of household. The independent variables (Xi's) used are; food price, education price, health price, and transport price. While the dependent variable(Y) is; final consumption expenditure of household. The study uses a secondary data obtained from national bureau of statistics (NBS) from 1999 to 2022. Multilevel regression model was used for data analysis. The result obtained at level 1 shows that, on average, the final consumption expenditure of household in Nigeria is 1406751 which is found to be significant with p-value 0.0364 less than 0.05 level of significant, in the same vein, the adequacy of the model is 82.2% . At level 2, when the intercept was allow to vary across the regimes, it was found that Buhari,s regime yield on average the highest poverty rate compare to Obsanjo and Goodluck/Yar'adua regime. In conclusion, poverty rate in Nigeria increases from regime to regime as it is seen in this study.

Keywords: Political Regime, Poverty Rate, Multi-Level Modelling

ASSESSING THE ADEQUACY OF CENSORING AND SUBSAMPLING FOR SELECTING OPTIMAL DISTRIBUTIONS IN HYDROLOGICAL EXTREMES.

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For accurate and reliable flood control measures, it is necessary to quantify and estimate the design flood through at-site or regional Flood Frequency Analysis (FFA). Graphical and statistical testing such as hypothesis and information-based tests are methods used for selecting suitable distribution in FFA. The subjective nature and ineffectiveness to differentiate probability distributions by these methods are often being criticized. Hence, other methods are needed to discriminate further among distributions. This study investigates the potential utility of censoring and subsampling with the aid of a goodness of fit (GoF) test to select the optimal distribution for hydrological extremes when the sample size is small and the parent distribution is highly asymmetric. The capability of the GoF test to recognize the parent distribution in the presence of subsampling and censoring varies from case to case. The ADC test performs better in identifying the parent distribution. Subsampling performs better for the uncensored data and censoring improves the percentage acceptance of the true parent distribution.

Keywords: "Flood frequency analysis", "Probability distributions", "Censoring", "Subsampling", "Parent distribution".

BLOCKCHAIN INNOVATION FOR RELIABLE ELECTION RESULT TRANSMISSION IN NIGERIA

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The significance of elections in contemporary democratic societies cannot be exaggerated. However, a notable challenge to democracy arises from the prevailing mistrust in the electoral systems of numerous countries. Even in renowned democracies such as India, the United States, and Japan, imperfections persist within their electoral frameworks. This paper focuses on using blockchain technology to achieve reliable election result transmission in Nigeria. It highlights the challenges the current electoral system faces and emphasizes the potential benefits of blockchain, such as transparency and trustworthiness. The paper examines blockchain's key features and analyses its possible challenges, including technological infrastructure and regulatory frameworks. It introduces a design framework that focuses on the transmission of results from polling units. It also explores successful case studies from other countries and proposes recommendations for adopting blockchain in Nigeria's electoral processes. By leveraging blockchain innovation, Nigeria can enhance electoral integrity, transparency, and public trust in its democratic system.

Keywords: Blockchain technology, Reliable election result transmission, Current electoral system, Transparency, Trustworthiness

STATISTICAL ANALYSIS ON STUDENTS ADAPTIVITY TO LEARNING; MULTINOMIAL LOGISTIC REGRESSION APPROACH.

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Student adaptivity deals with the different levels at which students can adapt to their learning so as to aid success in their studies. Lack of class concentration, insufficient teachers, incomplete syllabus for students, and many other problems students face in their various studies. Therefore, this work aims to determine the effect of demographic factors and the internet on student adaptivity in class which influence the students learning and ameliorates the problems of students not adapting to learning in class. In this study, Multinomial Logistics regression analysis was adopted, the variable was analyzed using descriptive statistics, the goodness of fit test was carried out to know if the model is of good fit, Cox & Snell and Nagalkerke pseudo - R-square provides the amount of variation in the dependent variable explained by the model. The data on students in schools, colleges and universities were gotten from the website Kaggle.com for the period of December 10, 2020 to Jan 5, 2022. It was observed that four factors: gender, educational level, internet type, and network type has significantly influenced students' low levels of adaptivity. College students were more likely than university students to have low adaptivity levels, also Wi-Fi users were less likely to have low adaptivity levels than mobile data users. The model was of good fit and the variation in adaptivity level was between 5.9% and 10.5% while the Internet type was the only significant predictor for moderate adaptivity levels. Based on this study, it was observed that out of five factors considered, only four factors contributed significantly to low-level adaptivity of students while one factor contributed significantly to moderate adaptivity level.

Keywords: Students, Internet, Multinomial Logistics Regression, Descriptive statistics, Cox & Snell

COMPARATIVE STUDY ON TWO METHOD FOR ESTIMATING THREE PARAMETER EXPONENTIATED ODD GENERALIZED EXPONENTIAL EXPONENTIAL DISTRIBUTION

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Turman Henry1, S. E Chaku2, Sunday Charity1, Makoshi B. Joshua1 1 Department of statistics, Federal School of Statistics, Manchok. 2 Department of statistics, Nasarawa state university Keffi. Corresponding Author's email: turman112h@gmail.com Maximum likelihood is a relatively simple method of constructing an estimator for an un-known parameter μ. Maximum likelihood estimator (MLE) is obtained by taking the partial differentiation of likelihood function of a distribution. While the penalized MLE is obtained by adding a penalty to the regular MLE. The aim of this work is to make comparison between the regular MLE and penalized MLE of a three (3) parameter (Exponentiated Odd Generalized Exponential Exponential Distribution (EOGEED), this distribution has two shape and one scale parameters. Sample size 50, 100, 250 of simulated data were generated to check the performance of regular MLE and PMLE. The results show that the PMLE performs better than regular MLE especial for small sample size.

Keywords: Maximum likelihood estimator, penalized Maximum likelihood estimation, Exponentiated Odd Generalized Exponential Exponential Distribution

COMPARATIVE STUDY OF MACHINE LEARNING PROCEDURES FOR PREDICTION OF DIABETES

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Discriminant analysis is one of the powerful statistical learning techniques used to analyze data in which the response variable is dichotomous while other features are quantitative. However, its usage in prediction or classification problems is extremely low when compared with some of the most widely used techniques such as Logistic Regression (LR), Support Vector Machine (SVM), and Random Forest (RF) among others. Hence, this study focuses on comparing the performances of Quadratic Discriminant Analysis (QDA), Linear Discriminant Analysis (LDA), Logistic Regression (LR), and Random Forest (RF). Pima Indian Diabetes dataset was used for the study and the performances of the aforementioned techniques were measured by the score of accuracy, sensitivity, specificity, positive predicted value, negative predicted value, prevalence, detection prevalence balanced accuracy, confusion matrix, and receiver operating characteristic (ROC) curve. The study revealed that QDA outperformed the LDA, LR and RF with about 80.8% and 77% accuracy and balanced accuracy scores, respectively, if the less important variables pressure and triceps are removed.

Keywords: Discriminant Analysis, Logistic Regression, Random Forest, Diabetes Prediction and Support Vector Machine

NEW WEIGHTED EXPONENTIAL DISTRIBUTION: ITS DISTRIBUTIONAL PROPERTIES AND SIMULATION STUDIES

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This research paper a new distribution known as the Modified Weighted Exponential Distribution (MWED) was developed. The probability density function (pdf) and cumulative distribution function (cdf) of the developed distribution were derived. This is an extension of the well-known exponential distribution. The new distribution's properties have been thoroughly studied. The estimation of the distribution parameters was done using the methods of maximum likelihood and maximum product spacing estimations. The performance of the MWED has been evaluated using simulation studies and the results show that our proposed distribution fits the datasets more better compared to the fits of the other two distributions (New Weighted Exponential distribution and Exponential distribution) considered in this study.

Keywords: Modified Weighted Exponential Distribution, Likelihood estimation, Order Statistics, Simulation

EXPLORING THE PERFORMANCE OF INAR MODEL IN FITTING AND FORECASTING COUNT TIME SERIES DATA WITH EXCESS ZERO

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Excess zeros shows that the count data set has numbers of zeros. Most time series data that involve counts usually contains zeros counts which exceed the levels allowed under a standard model family in the time series analyses. The excess zeros refer to the data with large number of zeros counts which may cause the violation of stationarity assumption of time series data. Mostly, discrete time series data contains excess zeros which cannot be statistically explained by simple model. The effect of excess zeros on time series count data cannot be disregarded. Thus there is a need for a model that would cater for excess zeros in the time series data.This study therefore aimed at determining the best Integer-Valued Autoregressive (INAR) model to fit and forecast heavy tailed count time series data at different levels of excess zeros. Data set were simulated in R statistical software with sample sizes of 30, 60, 90,…,300, from poison and geometric distributions to produce count data with excess zero. The model under study will then be fitted to the simulated data so as to examine the effect of the proportion excess zeros on the selected orders of the INAR model of 10%, 20% and 30% of excess zeros were created on sample sizes of data simulated. Each constructed data set entails a specific effect of the excess zeros observed in the display of models outputs. The best fit model is INAR (4)and INAR (3) for low and high levels of excess zeros respectively at different sample sizes. The performance of INAR models increased as sample sizes was increase.

Keywords: : INAR(p), Excess zeros, Count data, Poisson, Geometric Distribution, Forecasting

STATISTICAL ANALYSIS OF THE KNOWLEDGE AND USAGE OF MODERN CONTRACEPTIVES AMONG ADOLESCENT AND YOUNG FEMALE ADULTS IN YABATECH.

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Contraceptive knowledge and services are fundamental to everyone's health and human rights. This study examined the statistical analysis of the knowledge and usage of modern contraceptives among the adolescent female using contraceptives in Yaba College of Technology, Yaba, Lagos. The objectives are to identify the level of knowledge and usage about contraceptive methods among adolescent and young female adult. A well-structured questionnaire was used to collect the data from the adolescent females from the different schools (faculties) in Yabatech. Stratified and simple random sampling techniques were used to administer the questionnaires. The statistical tools used are Chi square, correlation coefficient and Friedman test and the statistical package used is Statistical Package for Social Sciences (SPSS) version 20. It was concluded after the research that Christians and single respondents with 64.3% and 82.6% respectively have knowledge about modern contraceptives, also most of the respondents have knowledge of about the common contraceptives (82.3%) and not the modern contraceptives like intrauterine devices and tubal ligation and most of the respondents got the knowledge from healthcare workers, finally early usage of contraceptive has significant influence on the reproductive health of adolescent and young female adult with the p value less than 0.05. Before young adults start engaging in sexual activities, they should be given basic information on contraceptive methods and sex education, mostly through healthcare workers, guardians, parents, and media.

Keywords: “Contraceptives”, “sex education”, “knowledge”, “reproductive health”, “young female adults”

MULTIVARIATE TIME SERIES MODELLING OF THE INFLUENCE OF SELECTED ECONOMIC VARIABLES ON THE GDP IN NIGERIA (1981 -2021)

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Multivariate Time Series Modelling of the Influence of Selected Economic Variables on the GDP in Nigeria (1981 -2021) Abstract The study investigates the influence of selected macro-economic variables on GDP in Nigeria. This study utilizes secondary data obtained from the Central Bank of Nigeria, Statistical Bulletin, and World Data Bank of all variables investigated in the model. The study covers yearly data from 1981 to 2020. The study employed the multivariate time series estimation technique via Vector Error Correction modelling to model the economic variables in Nigeria. The stationarity test was done via augmented dickey fuller test for the six variables (Gross Domestic Product, Government consumption Expenditure, Foreign Direct Investment, Export rate, Import rate and Inflation rate). Our findings indicated that all the six macro-economic variables were found to be non-stationary at levels, but became stationary at first difference (i.e. integrated of order one). Also, Johansen cointegration test was performed and the result revealed that the six variables are cointegrated with at most one cointegrating equation and a VECM was applied according to its result. Our model results point on the association between variables on both long and short runs. Then, Granger test under VECM was equally applied in order to establish the causality between variables. Test for adequacy performed on the residuals of the VECM indicates that they are homoskedastic, have no serial correlation and are normally distributed indicating that the model is good. The empirical result yields a stable and suggest a long-run relationship among the variables in the study.

Keywords: Key words: "Vector Autoregression (VAR)", "Vector Error Correction Model (VECM)", "Cointegration (CI)", "Integrated of order one I(I)", "Gross Domestics Products (GDP)".

MULTIVARIATE TIME SERIES MODELLING OF THE INFLUENCE OF SELECTED ECONOMIC VARIABLES ON THE GDP IN NIGERIA (1981 -2021)

[1]Ajiboye Yemisi Olamide ; [2]Idowu Eunice Olushola ; [3]Ganiyu Yinusa Adekunle ; [4]Hassan Idris O.

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The study investigates the influence of selected macro-economic variables on GDP in Nigeria. This study utilizes secondary data obtained from the Central Bank of Nigeria, Statistical Bulletin, and World Data Bank of all variables investigated in the model. The study covers yearly data from 1981 to 2020. The study employed the multivariate time series estimation technique via Vector Error Correction modelling to model the economic variables in Nigeria. The stationarity test was done via augmented dickey fuller test for the six variables (Gross Domestic Product, Government consumption Expenditure, Foreign Direct Investment, Export rate, Import rate and Inflation rate). Our findings indicated that all the six macro-economic variables were found to be non-stationary at levels, but became stationary at first difference (i.e. integrated of order one). Also, Johansen cointegration test was performed and the result revealed that the six variables are cointegrated with at most one cointegrating equation and a VECM was applied according to its result. Our model results point on the association between variables on both long and short runs. Then, Granger test under VECM was equally applied in order to establish the causality between variables. Test for adequacy performed on the residuals of the VECM indicates that they are homoskedastic, have no serial correlation and are normally distributed indicating that the model is good. The empirical result yields a stable and suggest a long-run relationship among the variables in the study.

Keywords: “vector autoregression (VAR)”, “vector error correction model (VECM)”, “cointegration (CI)”, “Integrated of order one I(I)”, “Gross Domestics Products (GDP)”

SPATIAL DEPENDENCE OF POVERTY RATE ON SOME SOCIO-ECONOMIC INDICATORS IN NIGERIA

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SPATIAL DEPENDENCE OF POVERTY RATE ON SOME SOCIO-ECONOMIC INDICATORS IN NIGERIA 1Isaac Oluwaseyi Ajao, 2Vincent Jemilohun and 3Clement Adeyeye Awogbemi 1Department of Mathematics and Statistics, The Federal Polytechnic, Ado-Ekiti 2Department of Business Management, Afe Babalola University, Ado-Ekiti, Nigeria 2Statistics Programme, National Mathematical Centre, Abuja, Nigeria Corresponding author: ajao_io@fedpolyado.edu.org Abstract: This paper investigates the spatial dependence between the poverty rate (PR) and other economic variables in Nigeria. The study employs the spatial error model (SEM) and utilizes the Akaike Information Criterion to determine the best-fitting model. The analysis reveals a global relationship among the variables, as indicated by the spatial autocorrelations using Moran's I. The results indicate that Dollar per day (DD) has a significant impact on the poverty rate in Nigeria. The findings suggest that increasing DD could potentially reduce the poverty rate in the country. This research provides insights for policymakers to develop appropriate plans and strategies for poverty reduction based on the identified socio-economic indicators.

Keywords: Poverty rate, spatial dependence, socio-economic indicators, spatial error model, Nigeria

SPATIAL DEPENDENCE OF POVERTY RATE ON SOME SOCIO-ECONOMIC INDICATORS IN NIGERIA

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Abstract This paper investigates the spatial dependence between the poverty rate (PR) and other economic variables in Nigeria. The study employs the spatial error model (SEM) and utilizes the Akaike Information Criterion to determine the best-fitting model. The analysis reveals a global relationship among the variables, as indicated by the spatial autocorrelations using Moran's I. The results indicate that Dollar per day (DD) has a significant impact on the poverty rate in Nigeria. The findings suggest that increasing DD could potentially reduce the poverty rate in the country. This research provides insights for policymakers to develop appropriate plans and strategies for poverty reduction based on the identified socio-economic indicators

Keywords: Poverty rate, spatial dependence, socio-economic indicators, spatial error model, Nigeria

EFFICIENCY OF SOME DISTANCE MEASURES FOR CLUSTERING HIGH DIMENSIONAL DATASETS

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Clustering is a useful technique that organizes a large quantity of unordered datasets into a small number of meaningful and logical clusters. The quality of clustering results relies on the similarity measure used by the technique and its ability to discover some or all of the hidden patterns. Different types of distance measures have been used for data clustering. This paper, analyze and evaluate the performance of Euclidean, Manhattan and Minkowski distance measures. The technique utilizes the basic K-Means algorithm with application of z-score normalization to high dimensional datasets. The experiments are conducted with simulated datasets and the result shows a good and promising performance using squared Euclidean distance. It is also observed that, the sum of the total clustering errors reduced significantly whereas inter-distances between clusters are preserved to be as large as possible for better clusters identification.

Keywords: basic K-Means, data clustering, euclidean distance, manhattan distance, minkowski distance, similarity measures,.

CHARACTERISTICS DYNAMICS OF ZERO INFLATED SURVIVAL EVENT DATA (ZISED)

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Zero-inflated Survival Event Data are faced at times, in appraising the properties of covariates and risk factors on outcomes. Events, connotes terminal outcome experienced at the end of a designated time or study, such as death, dropout or wellness collected for every subject. In the study described herein, a class of parametric and semi parametric-models for survival data were examined to accommodate zero-inflated event by using Weibull, Lognormal and Loglogistic Accelerated Failure Time (AFT) models. The Bayesian framework via Markov chain Monte Carlo simulations implemented in R programming language was used to examine the behavior of these models for coefficients; 0.5, 1.0 & 1.5 sample sizes; 250, 500 & 1000 and when events are inflated with at least 70% of zeros. Via the simulation study, it was discovered that the Partitioned Accelerated Failure Time (PAFT) models outperformed those not partitioned; ie. Non-Partitioned Accelerated Failure Time (NPAFT) models. The Lognormal Partitioned Accelerated Failure Time (LPAFT) model was applied and estimates obtained were frequently accurate at low and intermediate impact parameters of 0.5 & 1.0 respectively, than those of the corresponding Weibull and Loglogistic models using the Watanabe Akaike Information Criterion (WAIC). The best modelling method was applied to Liver Cirrhosis dataset.

Keywords: "Zero Inflated Event", "Parametric models", "Semi-parametric model", "Accelerated Failure Time", "Liver Cirrhosis data".

CHARACTERISTICS DYNAMICS IN ZERO INFLATED SURVIVAL EVENT DATA (ZISED)

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Zero-inflated Survival Event Data are faced at times, in appraising the properties of covariates and risk factors on outcomes. Events, connotes terminal outcome experienced at the end of a designated time or study, such as death, dropout or wellness collected for every subject. In the study described herein, a class of parametric and semi parametric-models for survival data were examined to accommodate zero-inflated event by using Weibull, Lognormal and Loglogistic Accelerated Failure Time (AFT) models. The Bayesian framework via Markov chain Monte Carlo simulations implemented in R programming language was used to examine the behavior of these models for coefficients; 0.5, 1.0 & 1.5 sample sizes; 250, 500 & 1000 and when events are inflated with at least 70% of zeros. Via the simulation study, it was discovered that the Partitioned Accelerated Failure Time (PAFT) models outperformed those not partitioned; ie. Non-Partitioned Accelerated Failure Time (NPAFT) models. The Lognormal Partitioned Accelerated Failure Time (LPAFT) model was applied and estimates obtained were frequently accurate at low and intermediate impact parameters of 0.5 & 1.0 respectively, than those of the corresponding Weibull and Loglogistic models using the Watanabe Akaike Information Criterion (WAIC). The best modelling method was applied to Liver Cirrhosis dataset.

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STATISTICAL STUDY ON THE IMPACT OF DIGITAL ECONOMY ON NIGERIA'S BANKING SECTOR

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Digital economy is one of the important contributions to the development and growth of a country, reason why Nigeria sought to include digital technology in their national development plan and it has existed for over a decade.The introduction of digital technologies in the country has given commercial bank an opportunity to embrace digital technology. They also invest in technology because is inclined the views that advancement in technology improves quality service delivery, brings about competitive advantage as well as profitability. Among the innovative products introduced include electronic banking services such as mobile banking, Automated Teller machine (ATM), internet banking etc. The study gathered from 10 commercial banks in Nigeria, in order to access how digital technology has impacted the banking sector, customer satisfaction and bank's financial performance were measured. A structured Questionnaire Model (SQM) was used to examine customer satisfaction on e-banking service quality. The spearman's correlation coefficient was used to find out the relationship between the variables, the results indicated that there exists a negative relationship between e-banking service quality and customer satisfaction and it was significant. The regression analysis model is used to measure the financial performance of the banks. The results of the analysis revealed that there is significant relationship between e-banking services and financial performance.

Keywords: Digital economy, E-banking, Customer satisfaction, Financial performance

DEVELOPMENT OF A NEW ERROR INNOVATION DISTRIBUTION IN MODELLING VOLATILITY OF NIGERIA STOCK EXCHANGE (NSE)

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Error distributions have been found to be very useful in volatility modelling. To this end, several error innovation distributions have been developed in order to estimate volatility models. Some distributions have gained attention from literature such as normal, student -t, generalized error innovation distribution, skewed normal, skewed student-t and skew generalized distribution. This research proposes a novel error innovation distribution to model volatility in a financial investment using symmetric and asymmetric volatility models. The main objective of this work is to develop and evaluate the efficacy of several GARCH models in terms of fitness and forecasting performance by comparing it to the six existing error distributions with the newly developed error distribution. The proposed distributions' general log-likelihood functions distribution, and partial derivative with respect to volatility were all derived. Moreover, the results of the parameter estimation using both the existing and the newly derived distributions are also presented. The results indicated that the Standardized Exponentiated Gumbel Error Innovation Distribution (SEGEID) outperform other error innovation distributions.

Keywords: “Error Innovation”, “Volatility”, “GARCH”, “forecasting”, “Distribution”.

DEVELOPMENT OF A NEW ERROR INNOVATION DISTRIBUTION IN MODELLING VOLATILITY OF NIGERIA STOCK EXCHANGE (NSE)

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Abstract Error distributions have been found to be very useful in volatility modelling. To this end, several error innovation distributions have been developed in order to estimate volatility models. Some distributions have gained attention from literature such as normal, student -t, generalized error innovation distribution, skewed normal, skewed student-t and skew generalized distribution. This research proposes a novel error innovation distribution to model volatility in a financial investment using symmetric and asymmetric volatility models. The main objective of this work is to develop and evaluate the efficacy of several GARCH models in terms of fitness and forecasting performance by comparing it to the six existing error distributions with the newly developed error distribution. The proposed distributions' general log-likelihood functions distribution, and partial derivative with respect to volatility were all derived. Moreover, the results of the parameter estimation using both the existing and the newly derived distributions are also presented. The results indicated that the Standardized Exponentiated Gumbel Error Innovation Distribution (SEGEID) outperform other error innovation distributions.

Keywords: “Error Innovation”, “Volatility”, “GARCH”, “forecasting”, “Distribution”.

PREDICTING MORTALITY, HOSPITAL LENGTH OF STAY AND NEED FOR SURGERY IN PEDIATRIC TRAUMA PATIENTS

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Pediatric trauma is one of the major health problems around the world which threats the life of children. The survival of injured children depends upon appropriate care, accurate triage and effective emergent surgery. The objective of this study was to determine the predictive values of injury severity score (ISS), new injury severity score (NISS) and revised trauma score (RTS) on children's mortality, hospitalization and need for surgery. The records of trauma patients under 15 years old transported to emergency department of University of Maiduguri Teaching Hospital from 2015 to 2022 will be used. Statistical analysis will be applied to determine the ISS, NISS and RTS ability in predicting the outcomes of interest.

Keywords: Trauma, Child Mortality, Length of Stay, Injury Severity Score, New Injury Severity Score, Revised Trauma Score

ON THE ASSESSMENT OF FACTORS AFFECTING SECONDARY SCHOOL STUDENTS' PERFORMANCE IN SCIENCE SUBJECTS USING MODELS WITH AND WITHOUT RANDOM EFFECTS

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On the Assessment of Factors Affecting Secondary School Students' Performance in Science Subjects using Models with and without Random Effects by aWaheed B. Yahya, bYusuf Bello and cImrana Mohammad Alhasan aDepartment of Statistics, University of Ilorin, Ilorin, Nigeria b,cDepartment of Statistics, Federal University, Dutsin-Ma, Katsina State, Nigeria Clustered data are a commonly occurring phenomenon. The presence of clustering brought a dependency of the observations within clusters, such that if we ignore the dependency of the observations within clusters the estimated standard errors of the regression coefficients will be biased downward, leading to too narrow estimated confidence intervals and smaller p-values. Linear mixed models are often used to account for the clustering effects. A dual linear mixed model restructures initial clusters to surface some new latent clusters that maximize the dependency of the observations within clusters, model fitness and predictive accuracy. In this paper we compared models with and without random effects to determine the most fitted and efficient model. Results of the analysis show that dual linear mixed model is the most fitted model with the highest predictive accuracy. Furthermore, students' knowledge in Mathematics has strong influence in their performance in Physics. Keywords: Models with and without random effects, predictive accuracy, Students' Performance, Science Subjects

Keywords: : Models with and without random effects, predictive accuracy, Students' Performance, Science Subjects

THE PATHWAY TOWARDS SUSTAINING CREDIBLE ELECTORAL PROCESSES IN NIGERIA; A COMPREHENSIVE OVERVIEW.

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The pathway towards sustaining credible electoral processes in Nigeria requires several key steps which this paper examined. First and foremost, it is crucial to establish a robust legal framework that upholds the principles of fairness, transparency, and accountability in elections. This includes enacting comprehensive electoral laws that clearly define the rights and responsibilities of all stakeholders involved, such as voters, candidates, political parties, and electoral management bodies. Additionally, building strong and independent electoral management bodies is essential. These bodies should be composed of impartial and competent individuals who can oversee the entire electoral process, from voter registration to the announcement of results. Adequate resources, training, and technical support should be provided to ensure their effectiveness and autonomy. Ensuring a transparent and inclusive voter registration process is another crucial aspect. Implementing modern technologies, such as biometric systems or online registration portals, can enhance accuracy, efficiency, and accessibility while minimizing opportunities for fraud or manipulation. Promoting civic education and awareness campaigns plays a vital role in sustaining credible electoral processes. Citizens should be educated about their voting rights, the importance of participating in elections, and how to identify and report irregularities. This empowers voters to make informed decisions and strengthens their trust in the electoral system. Furthermore, ensuring a level playing field for all political contestants is crucial. Implementing campaign finance regulations, monitoring political advertising, and combating misinformation or propaganda is essential to prevent undue influence and manipulation. Lastly, fostering international cooperation and inviting observation missions from reputable organizations can enhance the credibility of electoral processes. External scrutiny and recommendations from experienced observers can provide valuable insights and help identify areas for improvement. Sustaining credible electoral processes requires a comprehensive approach encompassing legal frameworks, independent institutions, transparency, voter education, dispute resolution, and international cooperation.

Keywords: "Pathway", "Sustaining", "Credible", "Electoral Process"

CONFIDENCE BANDS FOR THE MEAN FUNCTIONS OF PRE-WEANING WEIGHT IN BUNAJI CATTLE GROWTH PROFILES

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Accurate estimation of pre-weaning weight in calves is an important problem in cattle production management and is currently an active area of research interest. In this paper, we investigate the uncertainty in estimating pre-weaning weight in Bunaji bulls when an optimal mean model was used. We developed simultaneous confidence bands for the functional mean model, establishing bounds with a standard margin of error (? = 0.05) to account for uncertainty in weight estimates, providing additional flexibility in model application. Our findings revealed that pre-weaning weight can be accurately estimated for a preferred margin of error.

Keywords: Bunaji bulls, Confidence bands, Estimation uncertainty, Mean function.

FLEXIBLE PREDICTION OF THE MEAN FUNCTION OF PRE-WEANING WEIGHT IN CATTLE GROWTH PROFILES

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Modeling growth profiles provide an important tool for prediction and inference in animal science by measuring time-dependent future weights and other growth parameters of interest. In this paper, we quantify prediction accuracy in forecasting pre-weaning weight in Bunaji bulls based on an optimal mean function model. By constructing simultaneous prediction bands for the mean function model, we establish prediction limits (? = 0.05) for the Bunaji cattle, subsuming growth profiles of several other cattle breeds and providing a basis for inference.

Keywords: Bunaji bulls, Inference, Prediction accuracy, Prediction band

SEMIPARAMETRIC NON-LINEAR MODELLING OF PANEL DATA WITH NON-NORMAL RESPONSES BY K. JIMOH AND W. B. YAHYA

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The violation of normality assumption of the error term has been an issue of concern to Econometricians and Statisticians. Despite this, some researchers discovered that ignoring dependency and spatial heterogeneity when both are actually present in a model would lead to bias in parameter estimation. The objectives of this study were to: (i) incorporates unobservable heterogeneous variable to non-linear panel data model; (ii) investigate the behaviour of four non-linear panel data model estimators with respect to their robustness to multicollinearity; (iii) compare the efficiencies of the existing non-linear models with the new model; and (iv) validate the results obtained from Monte-Carlo study using real life dataset. A non-linear panel data model of the exponential form: y_it=?_0 e^(?_1 ?_1it X_1it+?_2 ?_2it X_2it+?_i+U_it); i=1,…,n; t=1,…,T was fitted. Hence, log?(y?_it)=log?_0+?_1 ?_1it X_1it+ ?_2 ?_2it X_2it+?_i+U_it where y_it is the response variable, X_1it and X_2it are the predictors, ?_0 is the intercept, U_it is the idiosyncratic error term and ?_i is the unobserved heterogeneity variable on U_it. Data for different sample sizes, n = 20, 50, 100, 200, 300 and time points, T = 5 and 15 years with collinearity level 0.8 were simulated using 1000 iterations. The semi-parametric estimators were employed over some smoothing parameter values and they were all compared with the Least Square (LS) and Generalised Method of Moments (GMM) estimators using the Mean Square Error (MSE), Mean Absolute Error (MAE) and Median Absolute Error (MedAE) criteria. Finally, we discovered that a non-linear model with latent variable and non-normal error structure was suitable for fitting panel data with collinear predictors and among the estimators considered, at ?=0.8, ET was the best when n =20, T=5 while GMM and CU were good at n = 300, T=5.

Keywords: Semiparamertic Model, Non-Normal Response, Panel Data, Non-Linear Model, Multicollinearity

A NEW LIFETIME DISTRIBUTION: ITS PROPERTIES AND APPLICATION, CANCER DATA

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Making appropriate decisions in health and biomedical science fields require appropriate modelling of data such as lifetime data. The use of flexible distributions is a key step in the right direction. Nevertheless, no single distribution can be flexible enough to model all kinds of data. Therefore, the development of distributions of different shapes and scales is essential for modelling purposes. In this paper, a new lifetime distribution, known as New Two-Parameter Generalized Lindley (NTPGL) distribution which is a compound of exponential and gamma distributions. The objective of this study is to develop a new lifetime distribution that can serve as an alternative distribution to modeling lifetime data. The Plots of the density function of the new distribution show that the distribution can exhibit decreasing, increasing, right-skewed, left-skewed and symmetric shapes. Mathematical properties, such as the moments, order statistics and entropy measures, are derived. The maximum likelihood estimation (MLE) method was used to estimate the parameters of the distribution. The goodness-of-fit was tested with two cancer data sets and its performance was compared with some existing distributions. The results show that the model can provide a good fit to lifetime data and good alternative to the existing models.

Keywords: "Exponential", "Gamma", "Renyi entropy", "Moments", "MLE"

IMPACT OF MACROECONOMIC FACTORS IN SELECTED AFRICAN COUNTRIES A PANEL DATA ANALYSIS

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This panel study intends to examine the relationship between GDP, inflation and unemployment rate in three selected African countries (Nigeria, Morocco and Cote d'Ivoire). The data used in this study are annual covering 1992 to 2020. The Hausman test showed that the p-value <0.5%, hence we use the fixed effects to estimate our model. The Pedroni cointegration test revealed that the p-values of 9 out of 11 outcomes are <0.5; we reject the null hypothesis of no cointegration, hence the variables have long run association while Granger causality test showed non -directional association between the three variables under study.

Keywords: Inflation, unemployment, Hausman test. Pedroni Cointegration, Granger causality test

NON-PROPORTIONAL HAZARD MODEL WITH FRAILTY AND WITHOUT FRAILTY DISTRIBUTION UNDER DIFFERENT MIXTURES OF BASELINE DISTRIBUTION

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Proportional hazards (PH) model is one of the most commonly used models in the analysis of time-to-event data. The assumption of (PH) model which states that the ratio of the hazards for any two individuals is constant over time may not hold if the hazard ratio varies with time. It is therefore necessary to use methods that do not assume proportionality to investigate the effects of covariates on survival time, leading to non-proportional hazards. The PH model under frailty setting is a natural extension of the standard PH model to address the erroneous assumption that the baseline survival times are independently and identically distributed. This study compared non-proportional hazard (NPH) model with frailty and without frailty using Integrated Nested Laplace Approximation (INLA) and Markov Chain Monte Carlo (MCMC) methods under the mixture of different baseline distributions. Data were simulated from mixtures of Weibull-Weibull, Lognormal-Lognormal and Weibull-Lognormal baseline hazard distributions using sample sizes 50, 100, 200, 500,100 and censoring percentages 0%, 20%, 50%, 80% for no, low, moderate, high censoring respectively. The non-proportional models with and without frailty were then fitted to the data using Deviance Information Criterion (DIC) as the comparing metric. It was observed that models with frailty performed better than the model without frailty across all the mixtures of baseline hazard distributions, for all sample sizes and all censoring percentages.

Keywords: Proportional Hazards, Non-Proportional Hazards, Frailty, Baseline Distribution, DIC

SATISTICAL ANALYSIS OF THE KNOWLEDGE AND USAGE OF MODERN CONTRACEPTIVES AMONG ADOLESCENT AND YOUNG FEMALE ADULTS IN YABATECH.

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Abstract Contraceptive knowledge and services are fundamental to everyone's health and human rights. This study examined the statistical analysis of the knowledge and usage of modern contraceptives among the adolescent female using contraceptives in Yaba College of Technology, Yaba, Lagos. The objectives are to identify the level of knowledge and usage about contraceptive methods among adolescent and young female adult. A well-structured questionnaire was used to collect the data from the adolescent females from the different schools (faculties) in Yabatech. Stratified and simple random sampling techniques were used to administer the questionnaires. The statistical tools used are Chi square, correlation coefficient and Friedman test and the statistical package used is Statistical Package for Social Sciences (SPSS) version 20. It was concluded after the research that Christians and single respondents with 64.3% and 82.6% respectively have knowledge about modern contraceptives, also most of the respondents have knowledge of about the common contraceptives (82.3%) and not the modern contraceptives like intrauterine devices and tubal ligation and most of the respondents got the knowledge from healthcare workers, finally early usage of contraceptive has significant influence on the reproductive health of adolescent and young female adult with the p value less than 0.05. Before young adults start engaging in sexual activities, they should be given basic information on contraceptive methods and sex education, mostly through healthcare workers, guardians, parents, and media.

Keywords: Key words: “Contraceptives”, “sex education”, “knowledge”, “reproductive health”, “young female adults”

ON GENERALIZED LINEAR MODEL APPLICATION OF CONWAY-MAXWELL POISSON DISTRIBUTIONS FOR MODELING UNDERDISPERSED COUNT DATA

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This study considered the generalized linear model application of Conway-Maxwell-Poisson based distributions. The distributions were fitted to the 2018 Nigeria demographic and health survey data set consisting of 13160 observations of pregnant women in the south-west geopolitical zone. The method of maximum likelihood estimation was used for parameter estimation. The method was implemented in R software package using Newton Ralphson procedure. The result shows that the traditional Poisson distribution fitted the data poorly since it is only restrictive under equidispersion assumption. The negative binomial distribution does not converge for the data considered. It was also observed that the two-parameter Conway-Maxwell-Poisson distribution produces the best fitted model among other competing models. The convergence problems was overcame with the choice of appropriate initial values.

Keywords: Conway-Maxwell-Poisson, over-dispersiond, empirical variance, empirical mean

SPATIAL ANALYSIS OF BANDITRY ASSAULT IN KATSINA STATE AND ITS CONNECTION WITH LOCATIONS.

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Security has historically been the fundamental element that ensures a minimum level of life in any community as well as the continuity of services and growth in investment. But without security, Rape, Kidnapping, Banditry, Unemployment, Poverty, and Illiteracy will prevail in the society. The aim of this research is to build a system of finding a crime future pattern that will at least help the enforcers to solve the crime and to reduce its Rate in the Study Area. To compare the crime rates between some Villages in order to ensure the factors contributing to the Crime Rate in the Study area. The research adopt the used of spatial techniques in aiming the objectives such as Co-Kriging (CK), Universal Kriging (UK) and Inverse Distance Weighting (IDW) in order to examine the Spatial variability contributing to banditry. From the result of the findings, it has been confirmed that, high level of Illiteracy, unemployment and poverty rate in the study areas has a positive influence on the crimes rates. The study suggests Government should provide a campaign awareness that will encourage the youth in such localities to know the further implication of committing crimes, Drug abuse and providing them with Good Educational system, Palliatives to those who shows interest in joining education, employ those with certificates within the villages, Good Road networking, Nearby Security Outpost etc.

Keywords: "Co-Kriging", "Universal Krigging", "Inverse Distance Weighting" and "Crime rate Data".

MACHINE LEARNING BASED APPROACH ON FOODS AND NUTRIENTS, HEALTH OUTCOMES AND DIETARY PATTERNS

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People with sufficient nutrition are extra productive and dynamic in creating opportunities to progressively break the progressions of hunger and poverty. In this paper, we seek to explore the relationship between foods, nutrients, health outcomes, and dietary patterns. We present a machine learning technique to monitor nutrient intake based on user reported food consumption. Traditional statistical principles have greatly impacted descriptive and inferential decision on nutritional data. Nevertheless, these principles are not sufficiently good to interpret large integrated nutritional datasets. Machine learning (ML) systems/approaches can play many roles in the interpretation, prediction and producing algorithms for dietary intake. Our model system explores the potential effect of different dietary components intake. The developed ML algorithm/system has the potential to contribute to the field of nutrition science by providing valuable tool for individuals to optimize their dietary choices and enhance their overall health and well-being.

Keywords: Machine learning, Nutrition, Dietary patterns, Health outcomes

FACTORS THAT INFLUENCED VOTERS TURNOUT IN NIGERIA'S 2023 GENERAL ELECTIONS: A STATISTICAL REVIEW

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This study examines the factors that influenced voter turnout in the Nigerian 2023 general election. Voter turnout is a crucial indicator of democratic participation and legitimacy, and understanding the factors that contribute to high or low turnout is essential for improving the electoral process. By conducting a case study of the Nigerian 2023 election, this research aims to identify the key determinants that influenced voter participation. The study utilizes a mixed-methods approach, combining quantitative analysis of voter data with qualitative interviews and surveys. The quantitative analysis examines demographic variables such as age, gender, education, and socioeconomic status to determine their impact on voter turnout. Additionally, the study investigates the influence of political factors such as party affiliation, campaign strategies, and voter mobilization efforts on turnout. The qualitative component of the research involves interviews with voters and key stakeholders involved in the election process. These interviews provide valuable insights into voters' perceptions, motivations, and barriers to participation. Furthermore, surveys are conducted to gather additional data on voters' attitudes towards the electoral system, trust in political institutions, and awareness of the election process. Preliminary findings suggest that multiple factors play a significant role in influencing voter turnout in the Nigerian 2023 election. Socioeconomic status and educational attainment emerge as important predictors of participation, with higher levels of education and income positively associated with voter turnout. Political factors, including party affiliation and campaign strategies, also appear to influence voter mobilization and engagement. The findings of this study have implications for policymakers, political parties, and civil society organizations seeking to enhance democratic participation in Nigeria. By understanding the factors that impact voter turnout, stakeholders can develop targeted interventions to increase engagement, address barriers to participation, and promote inclusivity in the electoral process.

Keywords: Mixed-methods approach, Electoral process, Voters participation, Nigeria