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UTILITY OF PARAMETRIC TECHNIQUES AS A TOOL FOR STATISTICAL ANALYSIS IN NIGERIA PUBLIC ADMINISTRATION

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ABSTRACT
This paper examines parametric techniques in statistical analysis and their application in public administration. These statistical methods rely on specific assumptions like normal distribution and equal variances to analyze numerical data, test hypotheses, and make predictions. The research explores five core areas: mean comparison, relationship analysis, hypothesis testing, probability distribution analysis, and time series analysis. Each area provides valuable tools for evidence-based policymaking, allowing government officials to evaluate programs, understand relationships between variables, test assumptions, model data behavior, and forecast trends. Through mean comparison tests like t-tests and ANOVA, administrators can determine which public programs deliver better results. Relationship analysis using correlation and regression helps identify connections between factors like education spending and student performance. Hypothesis testing provides scientific verification of policy assumptions before implementation. Probability distributions help model risk and uncertainty in public projects. Time series analysis enables forecasting future needs in areas such as healthcare, transportation, and social services. These techniques support transparent, efficient governance when properly applied. However, these methods face significant limitations when real-world governance data doesn't meet underlying assumptions. Complex social phenomena often produce data with outliers, non-normal distributions, or incomplete information that challenges parametric analysis. Additionally, misinterpretation of results can lead to flawed policy decisions. The paper concludes with practical recommendations for improving the effectiveness of parametric techniques in public administration settings, including enhanced data collection methods, statistical training for officials, integration with non-parametric approaches, and adoption of advanced analysis tools.

Keywords: Parametric Techniques, Public Administration, Statistical Analysis, Utility,

Introduction
Parametric techniques are statistical methods that rely on specific assumptions about the data, such as normal distribution, equal variances, and large sample sizes. These techniques play a crucial role in statistical analysis by helping researchers analyze numerical data, test hypotheses, and make predictions. In public administration, parametric techniques assist policymakers, administrators, and researchers in making informed decisions based on reliable data (Tashakkori & Teddlie, 2010). They allow for the accurate evaluation of government policies, public service performance, and economic trends, ensuring that policies and programs are backed by empirical evidence. These statistical tools are widely used in areas such as resource allocation, policy effectiveness assessment, and forecasting future public service needs.

One of the major uses of parametric techniques in statistical analysis is mean comparison, which involves determining whether there is a significant difference between two or more groups. This is useful in public administration when evaluating government programs, such as comparing the

effectiveness of different welfare policies across multiple regions. Statistical tests like the t-test and ANOVA are commonly used to analyze whether government interventions lead to meaningful improvements in public services (Ogunleye, 2020). By comparing means, policymakers can determine which initiatives are more successful and allocate resources accordingly, ensuring efficiency in public administration. This technique helps identify disparities in service delivery and provides insights into areas needing improvement.

Another important aspect of parametric techniques is their role in analyzing the relationship between variables. Policymakers often need to understand how different factors interact to develop better policies. Pearson correlation and regression analysis are commonly used to determine the strength and direction of relationships between variables such as public spending and economic growth, education level and employment rate, or infrastructure development and poverty reduction (Afolabi & Babatunde, 2021). These techniques help governments predict the effects of policy changes, enabling them to make data-driven decisions. For example, regression models can assess how tax reforms impact government revenue, providing a basis for adjusting fiscal policies to maximize economic benefits.

Hypothesis testing is another essential application of parametric techniques in public administration. This method helps policymakers test assumptions about public policies and governance issues before making significant decisions. Using tests such as the t-test and z-test, administrators can determine whether changes in governance strategies lead to real improvements. For example, if a government wants to know whether increasing public sector wages leads to higher productivity, hypothesis testing can provide statistical evidence to support or reject this assumption. This ensures that policy decisions are based on scientific reasoning rather than assumptions or political biases, making governance more transparent and effective (Schutt, 2020).

Parametric techniques also play a crucial role in probability distribution analysis, which is used to model and predict data behavior in public administration. Many government activities, such as budgeting, population growth estimates, and risk assessment in public projects, rely on probability distributions to make informed predictions. Normal distribution models are commonly used in performance evaluations and quality assessments of public services. Governments use probability analysis to estimate unemployment rates, tax revenue projections, and resource needs for future development (Schutt, 2020). Understanding the probability of different outcomes, policymakers can develop strategies to mitigate risks and ensure optimal resource allocation.

Time series analysis is another critical area where parametric techniques contribute significantly to public administration. This method is used to analyze historical data and predict future trends. Governments rely on time series models to anticipate economic fluctuations, inflation rates, population growth, and trends in public service demand. For example, time series analysis helps forecast the need for healthcare facilities by analyzing hospital admission trends over time. Similarly, it is used to study voter behavior, allowing governments to design better civic engagement strategies (Bryman, 2022). Through time series analysis, policymakers can make proactive decisions that enhance the effectiveness of public programs and governance strategies.

Despite their numerous benefits, parametric techniques have certain limitations that can impact their effectiveness in public administration. These methods require data to meet specific assumptions, such as normal distribution and equal variances, which may not always be applicable in real-world governance scenarios. Additionally, parametric techniques are sensitive

to outliers, which can distort results and lead to inaccurate conclusions. Public administration often deals with complex and unpredictable data, making it challenging to apply parametric methods in all cases (Ajayi & Okonkwo, 2023). Furthermore, some government data sets are incomplete or biased, affecting the reliability of statistical analyses. Policymakers must be cautious when interpreting parametric results to avoid misleading conclusions that could negatively impact governance and policy implementation. To improve the effectiveness of parametric techniques in public administration, several steps can be taken. Governments should invest in high-quality data collection methods to ensure accurate and reliable statistical analysis. Training public administrators in statistical techniques will help them make better use of parametric methods in decision-making (Okonkwo & Ibrahim, 2022). Additionally, integrating parametric techniques with non-parametric methods can provide a more comprehensive approach to policy analysis. Policymakers should also use advanced software tools to enhance the accuracy and efficiency of statistical calculations. Addressing these challenges, parametric techniques can continue to serve as valuable tools for evidence-based policymaking and governance improvement.

Objectives of the Study

The main aim of this paper is to discuss the utility of parametric techniques as a tool for statistical analysis in public administration. The specific objectives of this paper are:

i. To discuss the concept of parametric techniques
ii. To highlight the core area of parametric techniques as a tool for statistical analysis
iii. To highlight the utility of parametric techniques in public administration
iv. To highlight utilities of utility of parametric techniques in Nigeria public administration
v. To highlight the limitations of parametric techniques in public administration

Concept of Parametric techniques

Parametric techniques have been defined by various scholars to emphasize their significance in statistical analysis and research. Creswell (2021) defined parametric techniques as statistical methods that assume underlying probability distributions and specific parameters within a dataset to conduct hypothesis testing and make reliable inferences. These techniques are widely used in research to analyze structured numerical data and draw conclusions based on established mathematical principles. According to Neuman (2014), parametric techniques involve statistical tests that rely on key assumptions such as normality, homogeneity of variance, and independence of observations, making them effective for comparing groups, analyzing trends, and predicting outcomes in public administration and social sciences. DeVaus (2017) defined parametric techniques as quantitative research tools that allow researchers to test relationships between variables and assess the strength of associations using statistical models such as regression, t-tests, and ANOVA. These techniques help in decision-making processes by providing empirical evidence that guides policy formulation and evaluation. O'Leary (2020) described parametric techniques as a category of statistical methods that provide precise results when the underlying assumptions about data distribution are met, making them highly reliable for analyzing large datasets in public policy research.

Tashakkori and Teddlie (2010) explained parametric techniques as essential statistical tools that enable researchers to measure effects, assess policy interventions, and predict future trends based on well-defined data patterns. These methods are instrumental in evidence-based policymaking, particularly when evaluating the success of governance strategies. Similarly, Salkind (2019) defined parametric techniques as mathematical approaches used to assess quantitative data by applying probability theories and inferential statistics, making them suitable

for analyzing economic and administrative policies. Taylor (2021) described parametric techniques as critical statistical methodologies that rely on data normality and sample representativeness to ensure valid and accurate findings. These techniques support structured policy analysis and enhance government decision-making by offering objective insights into public administration performance. Babbie (2013) defined parametric techniques as statistical frameworks designed to test hypotheses and establish causality between variables, making them essential for analyzing policy impacts and forecasting public sector trends.

Parametric Techniques in Statistical Analysis

Parametric techniques are statistical methods that require certain assumptions about the population data, such as normal distribution, equal variances, and known parameters. These techniques are widely used in research and analysis to make predictions, test hypotheses, and compare data. Understanding the different areas of parametric techniques helps researchers and policymakers use them effectively in decision-making processes. The core areas of parametric techniques include:

Mean Comparison

Mean comparison techniques are fundamental statistical methods that allow researchers to determine if significant differences exist between the averages of different groups or samples. These techniques form the backbone of experimental research where treatments, interventions, or different conditions need to be evaluated for their effectiveness. In public administration and policy evaluation, mean comparison methods help determine whether new programs or initiatives have created measurable impacts on target populations (Field, 2021). These techniques rely on the assumption that the underlying data follows a normal distribution, which makes them powerful but also requires careful consideration of data characteristics before application. When properly applied, mean comparison tests provide clear numerical evidence of differences that might otherwise be obscured by natural variation in the data. Government agencies, educational institutions, and healthcare systems routinely employ these tests when evaluating program outcomes, student performance metrics, or patient treatment responses. The statistical significance determined through these tests helps decision-makers allocate resources effectively and implement evidence-based policies that address real differences rather than random fluctuations in data (Field, 2021).

T-test: One of the most common methods of mean comparison is the **t-test**, which compares the means of two groups. This is particularly useful when analyzing the performance of public sector workers in different departments. If two different administrative strategies are tested, the t-test can determine if there is a significant difference in productivity levels between the two groups. This helps in identifying the most effective administrative practices.

Paired t-test: Another method, the **paired t-test**, is used to compare the means of the same group before and after an intervention. For example, if the government implements a new salary structure for civil servants, a paired t-test can analyze if there is a significant improvement in employee motivation and efficiency after the change. This helps policymakers assess the impact of policy adjustments before making permanent decisions.

Analysis of variance (ANOVA): The **analysis of variance (ANOVA)** is another key method in mean comparison, used when comparing three or more groups. ANOVA helps in determining whether differences in policies or interventions produce varying effects across multiple locations. For instance, it can be applied in analyzing healthcare spending across different states

to see if certain regions require more funding than others. This ensures that resources are distributed effectively.

Overall, mean comparison techniques provide policymakers and researchers with valuable insights by determining whether policy changes or interventions have statistically significant effects. They help in making informed decisions based on empirical data, ensuring that public administration efforts are optimized for maximum efficiency.

Relationship between Variables

Understanding relationships between variables is essential for making informed policy decisions. In public administration and social sciences, researchers often seek to determine how one factor influences another. For instance, policymakers may want to know whether an increase in government spending leads to economic growth or whether educational investment reduces unemployment rates (Schutt, 2020).

Pearson correlation: One widely used method in relationship analysis is **Pearson correlation**, which measures the strength and direction of the relationship between two numerical variables. For example, it can be used to determine the relationship between healthcare expenditure and life expectancy. If there is a strong positive correlation, it suggests that higher healthcare spending leads to better health outcomes, which can guide future budget allocations.

Regression analysis: Another important technique is **regression analysis**, which examines how one or more independent variables affect a dependent variable. Governments use regression analysis to study the impact of various policies, such as how tax incentives influence business investments. Analyzing past trends, policymakers can predict the effects of new policies before implementation, reducing the risks of poor decision-making. Multiple regression models allow researchers to assess how several factors influence a particular outcome. For instance, when studying the factors affecting voter turnout in elections, researchers can analyze the impact of education level, income, and political awareness simultaneously. This provides a more comprehensive understanding of voter behavior. Applying relationship analysis techniques, public administrators can identify key factors that influence social and economic development. These methods help ensure that policies are backed by data, leading to more effective governance and decision-making processes.

Hypothesis Testing

Hypothesis testing is a fundamental part of parametric techniques, allowing researchers to test assumptions and validate policy decisions. In public administration, hypothesis testing helps policymakers determine whether observed changes in governance strategies are statistically significant or if they occurred by chance (Bryman, 2022).

Z-test: A common method in hypothesis testing is the **z-test**, which is used when comparing means of large samples. This technique is useful in analyzing national-level policy changes, such as studying whether an increase in minimum wage leads to a reduction in poverty levels. By testing hypotheses, governments can assess the effectiveness of different strategies before implementing them nationwide.

F-test: The **F-test** is another important technique, often used to compare variances between two or more groups. It is particularly useful in resource allocation, where policymakers may need to determine whether budget distribution across different sectors leads to significant differences in

outcomes. For example, an F-test can analyze whether increased funding for security leads to lower crime rates compared to other sectors. Hypothesis testing helps in making informed decisions by eliminating uncertainty and ensuring that policies are supported by empirical data. It reduces the chances of implementing ineffective policies, saving governments time and resources.

Probability Distribution Analysis

Probability distribution analysis is essential in predicting policy outcomes and managing risks in public administration. Many governmental decisions, such as budgeting and economic forecasting, rely on probability models to estimate future trends (Weisberg, 2022).

Normal distribution: The **normal distribution** is widely used in performance evaluation and resource allocation. For instance, governments use normal distribution models to assess the average performance of students in national exams. This helps in setting realistic education standards and identifying areas needing improvement.

Binomial distribution: The **binomial distribution** is used for binary outcomes, such as success or failure in policy implementation. For example, when assessing a new digital governance initiative, researchers can use binomial distribution to estimate the probability of its success based on past implementations in other regions. Applying probability distribution analysis, public administrators can make well-informed predictions, minimize risks, and ensure that resources are utilized efficiently.

Time Series Analysis

Time series analysis is crucial for studying trends and making long-term predictions in governance and economics. Governments use time series models to track inflation rates, population growth, and economic performance over time (Tabachnick & Fidell, 2021).

ARIMA (Auto-Regressive Integrated Moving Average): One widely used technique is **ARIMA (Auto-Regressive Integrated Moving Average)**, which helps in forecasting trends such as stock market fluctuations and employment rates. Policymakers use ARIMA to anticipate economic downturns and implement measures to stabilize the economy.

Linear regression for time series: Linear regression for time series examines long-term patterns and helps in making strategic policy decisions. For example, it can be used to predict future demand for public transportation based on historical usage data, ensuring proper infrastructure planning. Using time series analysis, governments can proactively respond to future challenges, ensuring that policies are designed to meet the evolving needs of society.

Differences between Parametric and Non-Parametric Techniques in Statistical Analysis

Statistical analysis is an essential tool in research for making data-driven conclusions. It is broadly classified into **parametric** and **non-parametric techniques**, depending on the nature of the data and the assumptions made about the population distribution. While **parametric methods** rely on specific assumptions about the data distribution, **non-parametric methods** are more flexible and make fewer assumptions (Gibbons & Chakraborti, 2020). The choice between these two techniques depends on the data type, sample size, and whether the assumptions of parametric tests are met. Below are some major differences between parametric and non-parametric techniques

Assumptions about Data Distribution: The primary difference between parametric and non-parametric techniques is their reliance on data distribution. Parametric tests assume that the data follows a specific probability distribution, such as the normal distribution (Cochran, 2021). This assumption allows for precise estimations and hypothesis testing using means and variances. Common parametric tests, such as the t-test and ANOVA, require data to be normally distributed to provide valid results. On the other hand, non-parametric tests do not require the data to follow any specific distribution (Conover, 2019). These methods are useful when the data is skewed, ordinal, or has outliers that may violate normality assumptions. Examples of non-parametric techniques include the Mann-Whitney U test, Kruskal-Wallis test, and Wilcoxon signed-rank test. These methods are preferred when the data does not meet parametric assumptions or when sample sizes are small (Siegel & Castellan, 2020).

Measurement Level of Data: Parametric techniques are designed for continuous and interval data, where numerical values have meaningful differences and ratios. These methods rely on arithmetic operations, such as means, variances, and standard deviations, to summarize data (Montgomery & Runger, 2021). For instance, a t-test compares the means of two groups, assuming that the differences are measurable and follow a normal distribution. In contrast, non-parametric techniques are suitable for ordinal and categorical data, where values represent ranks or categories rather than numerical measurements (Field, 2020). For example, the Kruskal-Wallis test compares the median ranks of multiple groups rather than their means, making it useful for analyzing survey responses, rankings, or subjective ratings. Non-parametric tests provide meaningful insights when the exact numerical differences between values are not well defined or when data is recorded as ranks rather than precise numbers.

Sensitivity to Outliers and Small Sample Sizes: Parametric methods are sensitive to outliers and small sample sizes, as extreme values can distort the mean and variance, leading to misleading results (Moore, McCabe, & Craig, 2022). When the dataset is small, normality assumptions may not hold, making parametric tests unreliable. For instance, in clinical trials or social science research with small participant samples, using a t-test may lead to biased conclusions due to the influence of a few extreme values. Conversely, non-parametric methods are robust to outliers and work well with small sample sizes (Hollander, Wolfe, & Chicken, 2019). Since these techniques rely on median or rank-based statistics, they are less affected by extreme values. The Mann-Whitney U test, for example, can compare two independent groups without being influenced by unusually high or low scores. This makes non-parametric techniques particularly valuable in research settings where data variability is high or when working with limited observations.

Efficiency and Statistical Power: Parametric tests are generally more statistically powerful than non-parametric tests when their assumptions are met (Wasserman, 2021). Statistical power refers to a test's ability to detect a true effect when it exists. Since parametric tests use specific probability distributions, they can efficiently estimate parameters such as means and variances, leading to precise and generalizable conclusions. For example, ANOVA can efficiently compare multiple group means, making it a preferred choice for experimental studies. In contrast, non-parametric tests are less powerful, meaning they may require a larger sample size to detect the same effect as a parametric test (Lehmann, 2020). Since these tests use rank-based statistics rather than precise numerical values, they sacrifice some efficiency in favor of flexibility. However, when the assumptions of parametric tests are violated, non-parametric methods become the better choice, as they avoid errors associated with incorrect assumptions about the data distribution.

Application in Real-World Research Scenarios: In practical research, parametric techniques are widely used in scientific, medical, and economic studies, where data collection follows standardized methods, and normality assumptions can be reasonably met (Fisher & Marshall, 2021). For example, in medical research, linear regression analysis is commonly used to predict patient outcomes based on blood pressure or cholesterol levels. Similarly, economic models often rely on parametric techniques such as regression analysis to predict financial trends. Non-parametric methods, however, are preferred in fields like psychology, sociology, and market research, where data is often ordinal, categorical, or non-normally distributed (Sheskin, 2020). For example, when studying customer satisfaction, businesses may use the Wilcoxon signed-rank test to compare customer ratings before and after implementing a new policy. In social science research, the Chi-square test is frequently used to assess relationships between categorical variables, such as gender and voting behavior. These real-world applications highlight the versatility of non-parametric methods in handling diverse data types.

Examples of Parametric and Non-Parametric Techniques
To illustrate the differences further, this table give brief common examples of parametric and non-parametric statistical tests:

Parametric Tests	**Non-Parametric Tests**
t-test (Compares means of two groups)	**Mann-Whitney U test** (Compares ranks of two groups)
ANOVA (Compares means of multiple groups)	**Kruskal-Wallis test** (Compares median ranks of multiple groups)
Pearson correlation (Measures linear association between variables)	**Spearman's rank correlation** (Measures non-linear association)
Linear regression (Predicts outcome based on independent variables)	**Logistic regression** (Predicts categorical outcomes)
Paired t-test (Compares means of the same group before and after treatment)	**Wilcoxon signed-rank test** (Compares ranked differences in repeated measures)

Utility of Parametric Techniques in Nigeria Public Administration
Parametric techniques are widely used in Nigeria's public administration to analyze data, assess government programs, and make informed policy decisions. These statistical methods help Nigerian policymakers understand trends, allocate resources efficiently, and improve governance. By assuming specific data distributions, parametric techniques provide reliable and accurate results that aid in decision-making.

Policy Evaluation and Public Program Assessment: One of the most significant uses of parametric techniques in Nigeria is in evaluating the effectiveness of government policies and public programs. Using statistical methods such as regression analysis, t-tests, and ANOVA, policymakers can assess whether implemented policies have achieved their intended goals. For example, a paired t-test can be used to analyze the impact of the Universal Basic Education (UBE) program on literacy rates before and after its implementation (Afolabi & Babatunde, 2021). By using parametric techniques, Nigerian public administrators can identify whether policies should be expanded, modified, or discontinued to improve governance and service delivery.

Budget Planning and Resource Allocation: Parametric techniques play a crucial role in budget planning and resource allocation in Nigeria. Regression analysis and time series forecasting are used to estimate future government expenditures and revenues. For example, the Nigerian Ministry of Finance can use these statistical methods to predict oil revenue fluctuations based on global market trends (Ogunleye, 2020). By applying parametric techniques, financial planners can ensure that budgets are designed based on statistical evidence rather than assumptions, leading to efficient resource distribution across key sectors such as education, healthcare, and infrastructure.

Performance Measurement and Accountability: To ensure transparency and efficiency, Nigerian public administration requires effective performance measurement techniques. Parametric techniques such as ANOVA and t-tests are used to compare the productivity of different government agencies, assess service delivery efficiency, and evaluate employee performance. For instance, ANOVA can be applied to analyze the effectiveness of state-level healthcare programs by comparing performance metrics across multiple states (Eze, 2022). These techniques help identify areas that require improvement and promote accountability within government institutions.

Crime Rate Analysis and Security Policy Planning: Parametric techniques are also used to analyze crime rates and improve security policies in Nigeria. Regression models and time series analysis help law enforcement agencies predict crime trends and allocate resources effectively. For example, a study may use multiple regression analysis to examine the relationship between unemployment rates and crime levels in urban areas in a place such as Lagos, Ibadan, Abuja, Delta and Kano (Olawale, 2021). By understanding crime patterns through statistical analysis, Nigerian security agencies can develop proactive policies, deploy resources strategically, and improve overall public safety.

Economic Development and Employment Analysis: Economic growth and employment generation are central to Nigeria's development agenda. Parametric techniques help policymakers analyze economic trends, assess job market conditions, and develop effective employment policies. For instance, regression analysis can be used to determine how government investment in small and medium enterprises (SMEs) affects job creation (Adeyemi & Yusuf, 2021). These insights enable the Nigerian government to design policies that support economic diversification, improve labor market conditions, and reduce unemployment rates.

Challenges and Limitations of Parametric Techniques as a Tool for Statistical Analysis

Parametric techniques have proven to be valuable in statistical analysis, aiding Nigerian public administrators in decision-making, policy evaluation, and resource management. However, despite their numerous benefits, these techniques face significant challenges and limitations that can affect their effectiveness. This include:

Strict Assumptions and Data Requirements: Parametric techniques require that data meet specific assumptions such as normal distribution, homogeneity of variance, and independence of observations. In many cases, data collected in Nigeria's public administration sector do not meet these assumptions due to inconsistencies, missing values, and errors in reporting (Okonkwo & Ibrahim, 2022). For example, when conducting policy evaluations using regression analysis, deviations from normality can lead to biased and unreliable results. The strict requirements of parametric techniques limit their applicability in real-world governance settings where data may not always meet these assumptions.

Limited Availability and Reliability of Data: The effectiveness of parametric techniques depends on high-quality, accurate, and comprehensive data. However, in Nigeria, data collection processes in public administration often suffer from inefficiencies, corruption, and lack of standardized reporting systems (Adegbite, 2021). For instance, government agencies may provide incomplete or outdated records when analyzing public expenditures, leading to incorrect budget forecasts. Without reliable data, parametric statistical models can produce misleading results, undermining the credibility of policy recommendations and public sector decisions.

Computational Complexity and Resource Constraints: Many parametric techniques, such as regression analysis and ANOVA, require advanced statistical software and computational power for accurate execution. However, many Nigerian public institutions lack access to modern technology and trained personnel capable of effectively applying these techniques (Adebayo & Yusuf, 2020). The limited availability of data analysts and statisticians in government agencies further restricts the use of parametric techniques. As a result, policymakers may rely on less accurate or outdated methods for decision-making, reducing the effectiveness of statistical analysis in governance.

Sensitivity to Outliers and Data Anomalies: Another major limitation of parametric techniques is their sensitivity to outliers, extreme values, and anomalies in data. Since Nigerian public administration deals with complex datasets involving social, economic, and demographic variables, unexpected data irregularities can significantly impact statistical analysis (Ogunyemi, 2022). For example, when analyzing economic growth trends, the presence of extreme fluctuations in oil revenue due to global price changes can distort regression models, leading to inaccurate policy recommendations. Proper data cleaning and robust statistical adjustments are necessary to minimize the impact of outliers, yet many government agencies lack the expertise to handle such complexities.

Difficulty in Adapting to Dynamic Governance Challenges: Public administration is a dynamic field where governance issues evolve over time, requiring flexible and adaptive statistical methods. However, parametric techniques are often rigid and may not effectively capture the complexities of rapidly changing public sector environments (Nwosu & Adewale, 2021). For example, sudden economic shocks, political instability, or health crises like the COVID-19 pandemic introduce uncertainties that traditional parametric models may fail to predict accurately. This limitation calls for the integration of non-parametric techniques and advanced machine learning models to enhance adaptability in policy analysis and decision-making.

Conclusion

Parametric techniques represent powerful statistical tools that significantly enhance decision-making in public administration by providing quantitative evidence for policy development and program evaluation. By employing methods such as t-tests, ANOVA, regression analysis, and time series forecasting, government officials can objectively compare program outcomes, understand relationships between policy variables, test assumptions about governance strategies, and anticipate future public service needs. This evidence-based approach leads to more efficient resource allocation, targeted interventions, and improved public service delivery that benefits citizens and strengthens democratic governance.

Nevertheless, the application of parametric techniques in public administration faces notable challenges, including strict data assumptions that may not align with complex governance

realities. The sensitivity to outliers, requirement for normal distribution, and need for complete datasets can limit the effectiveness of these methods in certain public administration contexts. Moving forward, governments must address these limitations by investing in statistical capacity building, enhancing data collection systems, and adopting integrated analytical approaches that combine parametric and non-parametric methods. By acknowledging both the strengths and limitations of parametric techniques, public administrators can leverage these statistical tools more effectively to develop robust policies and improve governance outcomes.

Recommendations

i. There is need to invest in quality data collection systems that provide accurate, complete, and representative information for statistical analysis, ensuring that parametric techniques can be applied effectively in public administration.
ii. There is need to implement comprehensive statistical training programs for public administrators and policymakers to enhance their understanding of parametric techniques and appropriate application conditions.
iii. It is important to adopt integrated analytical approaches that combine parametric and non-parametric methods to provide more robust analysis when dealing with complex or non-standard public administration data.
iv. It is recommended to utilize advanced statistical software tools that can handle large datasets, automate calculations, and provide clear visualizations to make parametric analysis more accessible and useful for governance decisions.
v. There is need to establish statistical quality control processes to verify that data meets the necessary assumptions for parametric analysis before drawing conclusions that inform policy decisions.

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