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PREREQUISITE KNOWLEDGE AND ACADEMIC SUCCESS IN ECONOMETRICS: A LOGISTIC REGRESSION STUDY OF ECONOMICS UNDERGRADUATES IN NIGERIA

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Abstract
This paper has discussed the factors that affect the academic performance of students in Econometrics at Prince Abubakar Audu University, Nigeria. Logistic regression modelling method was used to estimate quantitative demographic and academic data of a sample size of 897 Economics students. There were thirteen academic and demographic characteristics that were taken into account, bearing a particular interest in the performance in Econometrics. The results came up with six notable predictor variables that affect the academic performance of students in Econometrics. These consist of performance in Mathematics to Economists II (ECO 104), Economics Statistics (ECO 106), Macroeconomics Analysis II (ECO 204), Mathematics to Economists III (ECO 205) and Statistics to Economists III and IV (ECO 207 and ECO 208). This is because the courses are both introductory and analytical levels, with the critical role played in student achievement in Econometrics. The research suggests that these courses are of the utmost attention to educators and curriculum planners in the lecturing and learning framework to improve the quality of Econometrics learning in Nigeria.

Keywords: Education, Students' Academic Performance, Econometrics, Tertiary Institutions, Logistic Regression Model
Jel Codes: A22, C01, C53, C59

1. Introduction

Education is fundamental in the human and economic development of nations, a beacon of future success, a gateway to abundant life opportunities, and a bestowal of numerous advantages. Education does not merely impart information; it illuminates minds, aids in career planning, fosters personal growth, contributes to the broader societal well-being, and its transformative power extends far beyond the individual, shaping communities and entire nations. These are reasons why countries of the world prioritise education in their developmental plans and policies (Genelza, 2022).

Nations across the globe prioritise education as a cornerstone of both economic growth and human development. The emphasis lies in the fact that education plays a pivotal role in providing a skilled and proficient workforce, thereby bolstering a country's productivity. This notion was underscored in a recent study by Abdullahi (2021), which highlighted that leaders in developing nations, such as Nigeria, have a profound understanding of the significance of education. These leaders were acutely aware that education catalyses nurturing the human resources

required across various sectors of their countries, including the civil service, industries, and all branches of government.

Therefore, the profound impact of education on human development and economic growth is indisputable. The neoclassical theory of economic growth has long recognised education as a pivotal determinant of human capital development, leading to sustainable economic progress (Mankiw, 2020). It forms the foundation upon which nations build their future, measured by various indicators such as education funding, the learning system, and student academic performance (Olalekan et al., 2020; Wijaya & Saputri, 2019).

Student academic performance among educational measuring indicators stands as a tangible yardstick for evaluating the quality of education students receive in learning engagements. Academic successes can be assessed either at the course-based level or at the general students' performance in terms of cumulative grade point averages (CGPA). According to Yağcı (2022), such outcomes are a reflection of the educational system and the degree to which students have absorbed the knowledge and skills presented to them in the formal educational system. Measuring students' academic performance at the course-based level has proven to be effective in reducing the overall failure rate among students, as exemplified in medical education. In the realm of medicine, courses such as "Human Anatomy and Physiology", among other factors, are considered core components of the curriculum which are fundamental for medical practice (Hull et al., 2016). Success in these courses is closely tied to a strong foundation in basic subjects like Biology, Chemistry, Physics, Biochemistry, and Mathematics. Therefore, students' performance in these foundational courses is directly related to their overall success in medical school. Predicting students' performance in Human Anatomy and Physiology using the mentioned prerequisite courses can significantly contribute to improving their final year grades and cumulative grade point averages (CGPA) in Medicine.

Similarly, in fields like law and engineering, students' final year graduating performance is contingent on their success in prerequisite courses. Law students must excel in legal theory, contract law, criminal law, and constitutional law to be eligible for a Bachelor of Laws (LLB) degree (NOUN, 2023). In the case of civil engineering, performance in various mathematical, physical, and science courses, along with specific civil engineering electives, determines success in the final year (CGPA) of the engineering graduate. Predicting student performance in these prerequisite disciplines can greatly reduce the overall failure rate in these fields of study, fostering a more successful and proficient graduate body.

In a nutshell, Economics as a discipline in the social sciences delves into the quantitative and qualitative study of human behaviours in relation to scarce resources and their efficient utilisation for societal benefits (Jhingan, 2017). Within Economics courses, Econometrics plays a vital role by providing the tools and techniques for the quantitative and qualitative measurement of economic variables, facilitating the validation of economic theories and principles. Econometricians employ mathematics, statistical inference, and economic theories to construct predictive models essential for evaluating real-world scenarios crucial to economic decision-making (Gujarati & Porter, 2009). The performance of students in econometrics greatly depends on their skills in prerequisite courses, such as economic mathematics, statistics, and macroeconomic theories, ranging

from foundational concepts to practical applications. Being able to predict students' success in econometrics using historical data from these prerequisite Economics courses is crucial for enhancing overall academic achievement in the field of Economics. Thus, the study explored students' academic performance in Econometrics through logistic regression model analytics, drawn from past student performance records in prerequisite courses, evidence from the Economics Department, Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria. This study endeavour provided valuable information and facts to enhance the educational experience and outcomes for Economics students and contribute to the broader discourse on the role of educational assessment and planning for qualitative education in Nigeria.

2. Literature Review

2.1. Conceptual Review

Education provides tools for acquiring knowledge in either a formal or informal system in society. It is a driving force behind societal and economic advancement, a beacon guiding nations towards a brighter and more prosperous future. According to Genelza (2022), education is a structured process that facilitates the transmission of knowledge from one generation to another within a society, and this knowledge transfer can take place through formal or informal means. Formal education encompasses a systematically organised approach to knowledge transmission. It involves a structured learning system that occurs within educational institutions, spanning from elementary schools to higher education institutions, while, in contrast, informal education involves the transmission of knowledge through less structured or unorganised processes that occur within society (Moulton, 1997; Johnson & Majewska, 2022). Informal type of education can include family-based knowledge sharing and interactions within the broader social context, which often take place outside the formal educational framework and are characterised by their flexibility and adaptability to different learning environments and are measurable through students' outcomes in contents learnt either on courses base or final graduating grades.

In today's data-driven world, educational institutions are increasingly relying on data mining techniques to gain insights into student performance, enhance instructional strategies, and improve overall academic outcomes. One critical application of education data mining is the analysis of student performance in specific courses, known as course-based student academic performance. Course-based student academic performance analysis involves data gathering and analysis to evaluate how students perform in a specific course (Nabil et al., 2021). This analysis typically includes various data sources, such as demographic and students' academic features, such as student performance in the course in terms of semester or session grade. The study objective was to gain a comprehensive understanding of student performance within an economics-specific course (Econometrics), discover areas of success, and develop approaches to enhance student learning and outcomes in Econometrics and the Economics discipline in general.

2.2. Review of Related Studies

Baiduri et al. (2024) conducted a study on the impact of cognitive load on learning achievement and academic progression among mathematics education students in tertiary institutions. The objective of the study was to examine how

different types of cognitive load, intrinsic, extrinsic, and germane, interact with students' academic performance and semester level. The study employed a survey-based quantitative approach, collecting data from 158 students of mathematics education. Descriptive statistics, correlation analysis, and one-way ANOVA were utilised to analyse the relationships between cognitive load and students' learning outcomes. The findings revealed significant descriptive differences in the mean levels across the three types of cognitive load. However, correlation analysis showed a statistically insignificant positive relationship between cognitive load and students' achievement in mathematics courses, suggesting that variations in cognitive load did not have a significant impact on academic performance. Furthermore, ANOVA results indicated that the semester level had no significant effect on students' cognitive load. These findings contribute to the broader discussion on cognitive load theory, underscoring the need for instructional strategies that effectively balance and optimise cognitive load in mathematics education.

Tadese et al. (2022) study utilised conventional analytical tools to identify the determinants of academic performance among university students in Southern Ethiopia through an institution-based cross-sectional study spanning 29 days. With a total of 659 enrolled students, data collection used a self-administered questionnaire. Employing a multistage sampling technique, the study revealed associations between smoking, age, field of study, and academic performance. Notably, it underscored the importance of reducing smoking for improved academic achievement and suggested the inclusion of older students' perspectives to enhance the academic environment in higher institution studies.

Mappadang et al. (2022) conducted a study investigating the determinants of academic performance among undergraduate accounting students in Indonesia. The primary objective was to examine how academic interest, learning attitude, and learning quality influence students' academic success. The study also included control variables to assess their impact on students' performance. The research employed a cross-country survey design, with a sample of 872 students selected using disproportionate random sampling. The study tested the validity and reliability of research instruments before analysis. A multinomial logit regression model was used to evaluate the relationship between academic performance and the studied factors. The findings indicated that academic interest significantly determines students' academic performance. Students with higher academic interest were more likely to achieve better academic results. The study concluded that learning attitude and learning quality did not contribute positively to academic performance; instead, they showed a negative correlation. The study's results highlight the importance of fostering students' academic interest as a key driver of performance.

A similar study was conducted by Alani and Hawas (2021) to ascertain the determinants affecting students' academic performance at Sohar University, Oman. Utilising a quantitative survey methodology involving structured questionnaires administered across various faculties, the study identified environmental factors and teaching techniques as significant determinants of academic performance at the university. In the same vein, Ahmed et al. (2021) carried out a study at Kogi State University, Anyigba, to examine factors influencing students' academic performance using a binary logistic regression approach. The research aimed to uncover and address strategic solutions for

improving academic outcomes among students. The authors selected several key variables for analysis, including students' Joint Admission Matriculation Board (JAMB) examination scores (representing prior academic achievement), the number of friends on social networking sites, and the alignment of classroom knowledge with real-world applications (indicating students' motivation). Other factors considered were lecture attendance frequency, weekly study hours, discussion of lecture ideas (academic habits), and the time spent on additional jobs alongside academic responsibilities. The study identified that these variables negatively impacted students' academic performance with a high level of significance.

Fadzillah et al. (2020) study was conducted to investigate the factors affecting student performance in accounting subjects, a quantitative course in management science, focusing on pre-diploma students at Universiti Teknologi Mara, Cawangan Pahang, Kampus Jengka. The study aimed to identify key determinants that influence students' achievement in accounting, emphasising the role of early exposure to accounting at the secondary school level. Other factors examined included gender, students' interests, and parental influence. The study used questionnaires to collect data from students enrolled in the post-secondary schools' Commerce Program. Students' academic performance was measured using their total marks in the Introduction to Accounting course. The collected data were analysed using SPSS software, where hypothesis testing was conducted to determine the effects of the identified factors and student outcomes. The findings revealed that early exposure to accounting and students' interest significantly influenced their performance in accounting subjects. However, the study did not establish a strong correlation between gender, parental influence, and academic achievement.

Hassan et al. (2020) examined the determinants of academic performance among accounting students in Malaysian universities. The study aimed to investigate how gender, ethnic groups, type of secondary school, sponsorship, and family income influence students' success in their academic programs, measured by their cumulative grade point average (CGPA) at graduation. The study employed a quantitative research design using secondary data from 367 undergraduate accounting students who graduated in 2016 from Universiti Utara Malaysia (UUM). The data were analysed to identify significant relationships between the selected attributes and students' academic performance. The findings revealed that ethnic background, type of secondary school, and family income significantly influenced students' academic performance. Specifically, Chinese students outperformed Malay, Indian, and other ethnic groups. Additionally, students from certain secondary school backgrounds and those with higher family incomes achieved better academic results. However, gender and sponsorship were discovered to have no significant effect on students' CGPA. The study's findings provide valuable insights for higher education institutions, parents, and policymakers in designing effective intervention mechanisms to improve student performance.

Maina and Ojobo (2020) extended the application of logistic regression analysis to architecture education at Kaduna State University, a relatively underexplored field compared to other disciplines. The study aimed to predict students' probability of graduating with at least a second-class degree, which is a prerequisite for enrolment in postgraduate architecture programs and professional

examinations. Analysis of 175 students revealed three significant predictors of success: students' academic level/class, lecturers' competence and experience, and cost of assignment materials. These findings highlight the critical importance of monitoring student progression at the 100-level, ensuring quality teaching staff, and addressing financial barriers to learning. The study demonstrates that, beyond cognitive ability, institutional quality and economic constraints are essential predictors of academic success.

Yousef (2019) extended the scope of his initial study to examine the determinants of academic performance among university students majoring in statistics at United Arab Emirates University (UAEU). The primary objective was to assess how demographic and academic factors such as gender, age, nationality, high school major, and high school score influence students' academic success, measured by overall grade point average (GPA) in a quantitative course (Statistics). The study used a sample of 188 undergraduate statistics students (142 female and 46 male) spanning the 2012-2013 to 2015-2016 academic years. The research employed the conventional analytical methods of descriptive and inferential statistical methods to analyse the collected data. The findings revealed that gender, age, and nationality had no significant impact on students' academic performance.

However, students' high school major courses offered and performance significantly influenced undergraduate students' GPA, indicating that students from a science background and those with higher high school scores performed better in the statistics program. Despite its contributions, the study had several limitations, including the restricted sample size (only students from one university) and the limited scope of factors considered, which included limited cognitive factors. Nevertheless, the study provided valuable insights for students, educators, and university policymakers, highlighting the importance of academic background in predicting student success in statistics programs. This study is notable for being the first to explore the determinants of academic performance among undergraduate statistics students, offering a foundation for further research on factors influencing academic success in quantitative disciplines.

Salami et al. (2024) difference approach of employing a machine learning analytical method to predict students' outcomes in the Economics quantitative course, which was a paradigm shift from conventional analytics. The study made use of machine learning classifiers of k-nearest neighbour (K-NN), support vector machine (SVM), naïve baye and random forest to analyse student demographic and academic features to predict their success in the Economics quantitative-based course in Nigeria University. The support vector machine classifier outperformed other selected algorithms for the study of 87.50% performance accuracy. This study and the findings emphasised the importance of machine learning analytics in education data mining studies for valuable insights necessary for an efficient and quality learning system.

Similarly, O'Connell et al. (2018) utilised a machine learning analytical approach on historical student data to investigate the factors influencing student performance in mathematics courses, which gave a paradigm shift like others in the field of education data mining. The machine learning multiple regression and principal component analyses were used to analyse a substantial dataset of 20,000 students enrolled in an introductory college algebra course at an urban American

research university. The findings underscored the importance of students' past performance and experiences, such as grade-point average and the number of accumulated credit hours, in predicting student success in the course. The findings further revealed that student's general outcome in algebraic mathematics was below average compared to their performance in mathematical courses. The study recommended interventions that could enhance future student success rates in college-level mathematics courses.

The reviewed studies in students' academic performance across disciplines of higher institutions of learning exception and not limited to O'Connell et al. (2018) revealed that most authors in the field of pedagogical researches affirmed strongly on the significant roles of qualitative elements in determining students' academic outcomes in higher institution of learning systems while the importance of quantitative factors inherently explaining students' academic successes were limitedly showcase among the stated previous studies. A gap is filled by this study through inclusively considering the quantitative aspect of learning attributes, such as students' past knowledge in prerequisite courses, which are quantitatively measured to determine students' performance in Econometrics, a fundamental course in Economics as a discipline.

2.3 Theoretical Framework

The adopted theoretical framework for this study revolves around the field of learning analytics. Learning analytics is a multidisciplinary approach that combines learning, information science, and innovation technology to analyse and interpret data related to the learning process. Siemens and Baker (2012) revealed that learning analytics comprises a learning engagement data hub and learning analytics knowledge. The formal is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational settings, and using those methods to better understand students, and the settings which they learn in while the latter is defined as the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which learning occurs (Romero & Ventura, 2010; Gasevic et al., 2017). Nonetheless, the theoretical framework of this study was based on the EDM framework aspect of learning analytics as demonstrated in Nabil et al. (2021).

The adoption of EDM as a component of the learning analytics theoretical framework of this study helps to provide a holistic link and explanations for every component of the study.

3.0 Methodology

3.1 Methodological Framework

The research design, focused on education data mining using the traditional method of the logit regression model, adopts a qualitative and classification approach to analyse the performance of Economics students in Econometrics at PAAU. The population comprised Economics students at PAAU, spanning 19 graduating sets over 24 academic years. The sample consists of 897 students who graduated from entering academic admission sessions between 2016 and 2020. Data collection involved acquiring demographic and academic records from the Student Academic Records Unit of the University and organising them confidentially into an E-View 12 version implementable Excel spreadsheets.

3.2 Model Specification

Among the conventional techniques of analysing qualitative data is the logistic regression model. It is an efficiency analytical model of categorical variables. The logistic regression model, often referred to as the logit model, is the natural logarithm of odds ratios. It is a statistical method used for binary classification tasks, where the outcome variable (dependent variable) is categorical and has only two possible outcomes, such as (yes/no, true/false, passed/failed, 0/1). It's called "logistic" because it uses the logistic function, also known as the sigmoid function, to model the probability that a given input belongs to a particular category. Below is the logistic regression model:

Model Representation

In logistic regression, we want to model the chances that an input *x* belongs to a certain category, like class 1. We denote this probability as:

Eqn. [1]..... $P(y = \frac{1}{x})$

Where *y* is the binary outcome variable.

Logistic Function

The denote *σ (z)* is defined as:

Eqn. [2]..... $\sigma(z) = \frac{1}{1+e^{-z}}$

Z is a linear explanation of the input features:

Eqn. [3]..... $z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots\ldots\ldots + \beta_n x_n$

Here are the $\beta_0, \beta_1, \beta_2, \ldots\ldots\ldots\ldots, \beta_n$ Coefficients (parameters) of the model and $x_1, x_2 \ldots\ldots\ldots\ldots, x_n$ are the input features.

Model Interpretation

The logistic regression model estimates the probability that the outcome variable *y* equals 1 given the input features *x*. In other words, it estimates the probability of the positive class. The expected probability is then converted to a binary outcome using a threshold of 0.5. If the predicted probability is greater than the threshold, the model predicts class 1; otherwise, it predicts class 0. The parameters estimated from logit models can be interpreted in terms of odds ratios or the maximum likelihood of an event occurring, either in general or in a specific order.

Evaluation Metrics

Parameter coefficients and p-values play a vital role in the evaluation metrics of the logit estimated model. The threshold of z-statistics ($p<0.05$) indicates rejection of the null hypothesis (H_0) of non-significance of the parameter estimate and acceptance of the alternative hypothesis (H_1) indicating significance of the individual parameter estimate. Cox and Snell R^2 referred to as pseudo R^2 is an important evaluation metric. It measures the degree of goodness-of-fit of a logit model. Unlike the multiple regression model of the ordinary least squares technique, where it is expressed in terms of the total explained variable by the explanatory variables of the model, known as the coefficient of determination, pseudo R^2 in the logit regression model is a dichotomous dependent variable model, and little reservation should be exercised in its explanation (Gujarati & Porter, 2009). Count R^2 is another vital logit regression model evaluation metric.

It calculates the logit regression model accuracy in terms of the ratio of correctly classified instances over all instances of the data set for the analysis. It's a critical evaluation indicator in categorical data analysis. To test the null hypothesis that all the slope coefficients are simultaneously equal to zero, the equivalent of the F test in the linear regression model is the likelihood ratio (LR) statistic. Given the null hypothesis, the LR statistic follows the χ^2 distribution with degrees of freedom (df) equal to the number of explanatory variables.

Variables and Measurement

The study focuses on the demographic and academic outcome predictors of selected Economics students at PAAU. Predictor variables include students' ID, gender, and prerequisite courses such as Principles and Theories of Economics, Mathematics for Economists, and Introduction to Statistics. These courses span mathematics, statistics, and macroeconomics theories. Econometrics I and II serve as target class variables. These prerequisites are offered in the first and second years, preceding the study of Econometrics in the third year. The study utilised 13 attributes with 897 observations, aiming to analyse student successes in Econometrics based on their performance in related courses. The academic features of students' engagement grading are described in Table 1 below.

Table 1. Academic Features Measurement Description

S/N	Grading (Percentage %)	Remark	Grade Classified to Categorical Variable
I	100-70 (A)	Excellency	PASS
II	69-60 (B)	Very Good	
III	59-50 (C)	Good	
IV	49-40 (D or E)	Poor	
V	39-0 (F)	Fail	FAIL

Source: Researcher Computation, 2025

The study categorises demographic features by gender (male or female) and academic performance by conventional university grading scale (100-0 percent) detailed in Table 1. Grades range from A (Excellence) for 100-70 per cent, B (Very Good) for 69-60 percent, to F (Fail) for 39-0 percent. Predictor variables Pass and Fail are binary-coded as 1 or 0 for the logit regression model analysis. These adjustments were essential for accurate binary classification analysis.

4.0 Analysis and Discussion of Findings

4.1. Analysis

Table 2 provides descriptive statistics on student gender distribution and academic performance features. The Table revealed that 61% of the student's population sampled for the study were male while 39% were female out of 897 students. Academic features were presented in variable class, with missing values less than 50% filled with minority instances. Students' performance in each course was detailed in terms of passed and failed percentages class. For example, Macroeconomic Analysis (ECO203) had the highest passed rate (94%) and lowest failure rate (6%). Econometrics (ECONOMETRICS) had the lowest success rate (77%) and the highest failure rate (23%).

Table 2. Descriptive Statistics

Attribute	**Variable Class**	**Missing Value (%)**	**No. of Male (%)**	**No. of Female (%)**	**Sample Size**
Gender	Categorical	Null	545	352	897
Attribute	**Variable Class**	**Missing Value (%)**	**No. of Passed (%)**	**No. of Failed (%)**	**Sample Size**
ECO 102	Categorical	26 (3%)	718(80%)	179 (20%)	897
ECO 103	Categorical	23 (3%)	775(86%)	122 (14%)	897
ECO 104	Categorical	31 (3%)	781(87%)	116 (13%)	897
ECO 105	Categorical	32 (4%)	793(88%)	104 (12%)	897
ECO 106	Categorical	249 (27%)	749(84%)	148 (16%)	897
ECO 203	Categorical	30 (3%)	842(94%)	55 (6%)	897
ECO 204	Categorical	37 (4%)	824(92%)	73(8%)	897
ECO 205	Categorical	37 (4%)	710(79%)	187 (21%)	897
ECO 206	Categorical	48 (5%)	683(76%)	214 (24%)	897
ECO 207	Categorical	19 (2%)	762(85%)	135(15%)	897
ECO 208	Categorical	274 (3%)	755(84%)	142 (16%)	897
Econometrics	Nominal	84 (9%)	688(77%)	209 (23%)	897

Source: Research computation, 2025

Gender distribution and academic performance metrics are vital indicators for a quantitative study of this nature. Table 3 below presents the logistic regression model results.

Table 3. Logistic Regression Model Estimates

Variable	**Coefficient**	**Std-Error**	**Z-Statistics**	**Probability**
C	-4.369678	0.537356	-8.131806	0.0000
ECO 207	0.31114	0.246695	1.261232	0.2072
ECO 208	1.341571	0.222867	6.019612	0.0000
ECO 102	0.348156	0.226864	1.534645	0.1249
ECO 103	0.307088	0.258415	1.188351	0.2347
ECO 104	1.059775	0.248938	4.257189	0.0000
ECO 105	0.414784	0.275415	1.506031	0.1321
ECO_106	0.708188	0.233854	3.02834	0.0025
ECO 203	0.325616	0.356937	0.91225	0.3616
ECO 204	0.909954	0.318648	2.85567	0.0043
ECO 205	0.827031	0.215253	3.842142	0.0001
ECO 206	0.354121	0.213889	1.655629	0.0978
GENDER	-0.073295	0.195225	-0.37544	0.7073

Regression Statistics:

Pseudo R^2 = 0.229515

Count R^2 = 0.1884 (19%)

Chi-Square (**χ^2** *cal.*) = 231.91, *Chi-Square* (**χ^2** *statistics at 12 df with 0.05 significant level*) =21.0261

Source: Computed with E-View 12 version (2025)

Table 3 presents a model intercept parameter estimate of -4.369678, which represents the likelihood ratio of the null model of the logistic regression with 5% significant level ($p < 0.05$). It is an indicator that the model is unlikely to observe such a value if the true coefficient were zero. The logistic regression model results in Table 3 show that the following predictor variables (ECO 207, ECO 208, ECO 104, ECO 106, ECO 204, ECO 205) have statistically significant coefficients ($p < 0.05$). The likelihood of a student passing econometrics in the intermediate level of studies increases as he or she passes the above prerequisite courses with 5% level of significance. The results in Table 3 also revealed that the following explanatory variables such as ECO 102, ECO 103, ECO 105, ECO 206, GENDER have coefficients that are not statistically significant ($p > 0.05$) suggests that there is insufficient evidence to conclude that these variables have a significant effect on the likelihood chances of a student passing Econometrics in 300 Level if he or she passes the above listed courses. The logistic regression model statistics of Pseudo R^2 of 0.229515 (23%) and *Count* R^2 of 0.1884 (19%) indicate a poor fit of the model. The calculated chi-square value (231.91) obtained is compared to the table chi-square value (21.03) at the specified degrees of freedom and significance level (12 df, 0.05). In this case, the calculated chi-square value exceeds the critical value, an indication of statistical significance of the model in general.

4.2. Discussion of Findings

Descriptive statistics were utilised to explain the distribution of variables across gender and students' academic performance in the selected courses for the study. To address missing values, the related class's minority instance was used to fill in the gaps, a basic data analytical approach for handling missing data of this peculiarity. The descriptive statistics revealed significant findings: 94% of students passed Macroeconomics Analysis 1 (ECO 203), with a 6% failure rate. In contrast, Econometrics, the target variable, exhibited the highest failure rate at 23%, with a 77% passed rate, consistent with the notion supported by O'Connell et al. (2018) that students tend to perform better in theoretical courses compared to quantitative ones in any discipline of study.

The logistic regression model estimates of the study identified several academic performance features significant in determining students' performance in the predicted variable, which is in accordance with the studies of Tadese et al. (2022) and Ahmed et al. (2021). While their studies were qualitative in nature, this study is quantitative, re-emphasising the importance of quantitative empirical research in educational learning engagements. The study findings further showed that despite the poor model performance of the conventional logistic regression, as indicated by *Pseudo* R^2 and *Count* R^2 (model accuracy), its overall significance through square-chi (χ^2) showed worthwhile deterministic studies in this area, similar to studies of Baiduri et al. (2024), Mappadang et al. (2022) and Yousef (2019), opposed the predictive machine learning studies of Salami et al. (2024) and O'Connell et al. (2018).

5. Conclusion and Recommendations

This study was carried out to explore the determinants of students' academic performance in a fundamental Economics-based course of Econometrics through a logistic regression model approach at Prince Abubakar Audu University, Nigeria. Using a sample size of 897 students' demographic and academic data that are quantitative in nature, the study explored 13 features, focusing on Econometrics. Logit regression model analysis results revealed six predictor variables significantly affecting the Economics students' performance in Econometrics. These identified indicators are quantitative in nature compared to the predominant findings of previous studies in this area, particularly when traditional analytical tools are employed. Given the evolving complexity of educational processes, the study advocates for widespread consideration of quantitative elements of student's engagements in learning systems to enhance the understanding of what constitute students' academic performance holistically in Economics quantitative courses. This provides reliable insights and informed decision-making for qualitative learning systems in Nigerian higher institutions. Policies should target additional support for students in quantitative courses and a suggest for further studies in longitudinal studies to explore how academic performance predictors evolve over time and their long-term impact on students' academic performance with more advance methods.

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