Forecasting the National Passing Rate of the Certified Public Accountant Licensure Examination (CPALE)

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Abstract

In this research, Autoregressive Integrated Moving Average (ARIMA) was used in forecasting the national passing rate of the Certified Public Accountant Licensure Examination (CPALE) for 2024 to 2027 and selecting the best fitted model are the main objectives of this study. The data were gathered from the Professional Regulation Commission (PRC) which employs semi-annual data passing rates from 2010 through 2023. This work shows how the historical passing rate data can be used to forecast future rates and how these forecasts may be used in the Accounting Industry. Using the Box-Jenkins time series process, historical demand data was utilized to create various ARIMA models, and the best models were chosen based on four performance criteria: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC)/ Schwartz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQC) and Coefficient of Determination (R squared). Based on the criteria the best ARIMA models were ARIMA (2,1,2), (2,1,1) for May and October first-timer examinees and ARIMA (2,1,3), (1,2,1) for May and October repeater examinees. The results obtained prove that the models could be utilized to forecast the passing rate. The results will assist reviewers/ instructors and PRC in forecasting or setting the passing rate. The researcher recommends that the Commission on Higher Education (CHED), the Board of Accountancy (BOA), the Philippine Institute of Certified Public Accountants (PICPA), and the Professional Regulation Commission (PRC) should look into the matter, revisit and improve the course/review program, teaching techniques, and board examination questions.

Keywords: *Passing rate, First-timer Examinees, Repeater Examinees, CPALE, CPA*

INTRODUCTION

The Certified Public Accountant Licensure Examination (CPALE) is part of the Professional Regulation Commission's (PRC) mandate to oversee the implementation of Republic Act 9298. This Act, also known as the Philippine Accountancy Act of 2004, was enacted to highlight the importance of accountants in nation building and development. The objectives of this act are to standardize and govern accounting education, examination, supervision, control and regulation of the accounting profession in the Philippines (Republic Act No. 9298, 2004). The said Act requires all applicants for registration for the practice of accountancy to undergo a licensure examination to be administered by the Board in such places and dates as the Commission may designate, subject to compliance with the requirements prescribed by the Commission in accordance with Republic Act No. 8981.

The first board examination for CPA was given in May 1932. Since then up to 2023 the total number of those who took the examination was 798,126 of which 200,923 have passed, representing a passing rate of 25.17%. From 1932 to 1948 the number of examinees was less than a thousand. However, the number increased to four digits in 1949 until 1976, when the figures increased to more than 10,000 and reached a record high of 23,775 in 1984, but gradually tapered down to 7,654 in 1995. It climbed up to more than 11,000 in 1998, and steadily increased to 19,273 in 2015 (Valcarcel, 2018). Finally, it went up to more than 20,000 in 2016 until it reached a record high of 24,811 in 2019.

The highest passing rate was 61% in 1942, when 20 out of 33 candidates passed the examination, followed by 55% in 1943, when 16 out of 29 candidates passed, and 50% out of 24 in 1945. However, this was when the number of examinees was less than 50. Meanwhile, when the number of examinees exceeded thousands, the highest ever recorded result was 48.36% from 3,973 out of 8,216 passed at the October 2010 examination.

The lowest passing rate ever recorded in the history of CPA Licensure exam in the Philippines way back in 1954 with 6.48% (152/2,345). Almost after 40 years, the lowest passing rate based on the historical data is 17.12% in 1993 while after a decade, 19.57% (1,454 out of 7,428) was recorded during the October 2003 examination and 19.34% (1,075 out of 5,557) during May 2003. However, the May 2019 examination has 16.47% and the lowest ever recorded rating after 1954 to 2019 almost 65 years ago was the result of the September 2019 exam with 14.32% (2,075/14,492) which gives an alarming signal for the Higher Education Institutions (HEIs) and the BOA on how to improve this result (Laguador & Refozar, 2020).

CPALE is notorious for its difficulty, as proven by its low passing rates in comparison to other professions. It seeks to assess the competence of aspiring CPAs in order to determine whether their knowledge and abilities meet the standards to be in the profession. Passing the CPALE is required for anyone who wants to practice public accountancy as a profession, and passing it will give the examinee the Certified Public Accountant License.

The results of this study will influence the development of innovations in the form of improvements in teaching methods and procedures, student activities, and feasible drills to improve the performance of BSA graduates in the CPALE. In addition, this study could be a basis for the Professional Regulation Commission in setting the passing rates based on the prior years' performance and make necessary improvements based on the findings.

Objective of the Study

This study aims to determine the most fitted models in forecasting the national passing rate of the CPALE. Furthermore, the study intent to forecast the May and October passing rates from the year 2024 to 2027.

Conceptual Framework

The researcher uses a conceptual framework as a guide in forecasting the May and October passing rates for the first-timer and repeater CPALE examinees. It follows a four-step process which includes the identification, estimation, diagnostic and forecasting. The figure below shows the stages in the Box-Jenkins approach for this research.

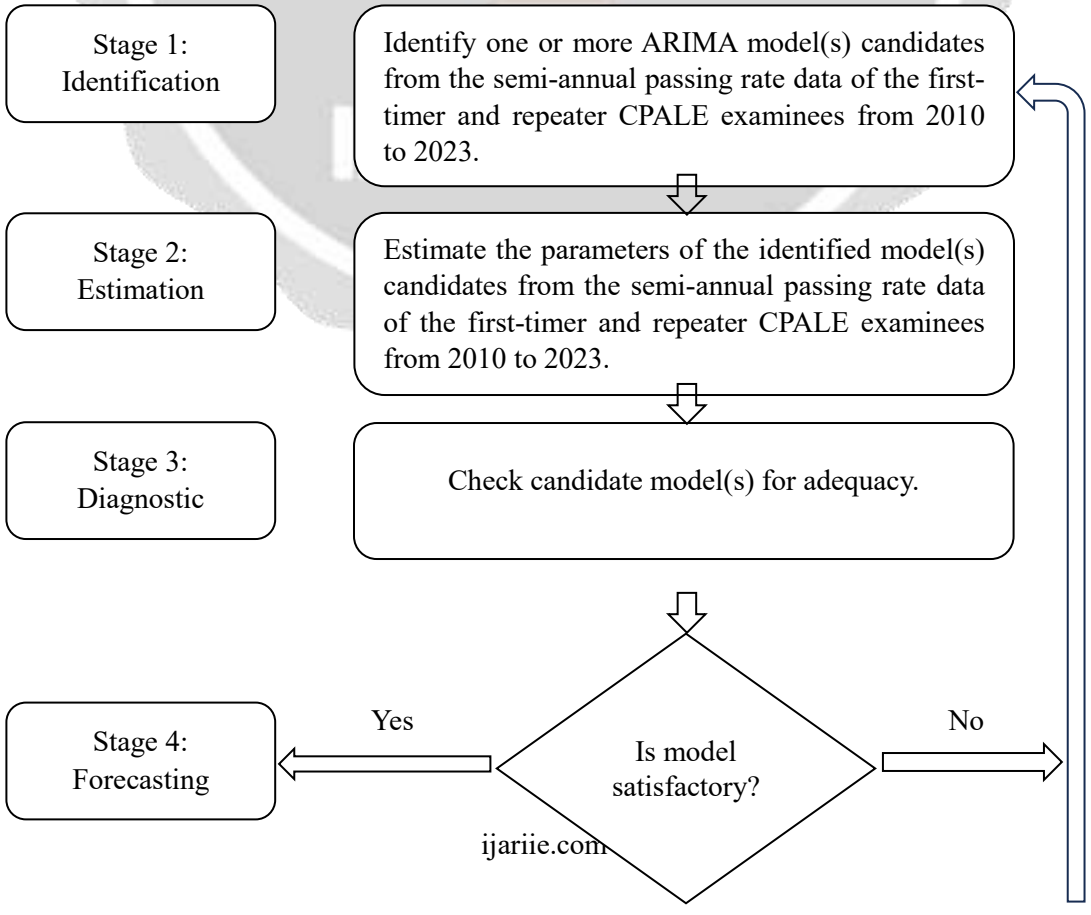


FIGURE 1. Research Paradigm

Statement of the Problem

The following inquiries must be addressed by the researcher in order to meet the objective of the study:

1. What is the trend of the graph of the first-timer and repeater CPALE examinees?
2. What will be the statistical model of the first-timer and repeater CPALE examinees that can be formulated using ARIMA?
3. What are the forecasted passing rates of the first-timer and repeater CPALE examinees from the year 2024 to 2027 using the most suited model?

Scope and Limitation

This study was conducted to forecast the passing rates of the first-timer and repeater CPALE examinees. The study employs semi-annual data passing rates from 2010 through 2023. The data were gathered from the National Accounts of the Philippines retrieved from the Professional Regulation Commission (PRC, https://www.prc.gov.ph). This research will forecast the May and October passing rates of first-timer and repeater CPALE examinees for the year 2024-2027.

Significance of the Study

This study intends to forecast the passing rates of the first-timer and repeater CPALE examinees based on the trend between 2010 to 2023. The conduct of this study will be beneficial to the accountancy students as basis on their journey towards the accounting profession. It can also be beneficial to the schools, colleges, review centers and reviewers as foundation for the programs, subjects and strategies, or as an outline to achieve the objectives, vision, plans and techniques and to establish strategies for teaching that are efficient and successful in molding future CPAs. In addition, this can also be used by reviewees and students to design their learning techniques given the limited time available in preparation for the examination and to construct their study strategies and prepare themselves mentally, emotionally, physically, and spiritually for the CPALE. Further,
the results and findings of this study could be concrete evidence to support other related studies.

REVIEW OF RELATED LITERATURE AND STUDIES

In the study entitled Influence of selected factors on CPA Licensure Examination Results by Herrero investigated the elements that influenced the performance of Rizal Technological University CPA board examinees in the 2012 licensure examinations in order to evaluate the intervention required to improve the university's review programs. The researcher employed a descriptive study approach with 24 survey participants. Results of the study revealed that: student factors (interest in the accounting program, time spent for studying lessons and availing of library/internet resources in research activities) and home/family factors (family financial support, parental involvement in studies, motivation and encouragement) highly influence performance; school factors (adequacy of relevant library books and materials, adequacy of technology hardware and software, good accounting program and good accounting faculty) were perceived to have average influence; and scholarships, grade weighted averages and attendance to review courses handled by prestigious review schools were found to be positive factors in passing the board examinations. Based on the findings, the researcher recommended that the regular assessment through qualifying examinations be conducted and that the pre-board/mock examinations in the review classes be strengthened (Herrero, 2015).

The paper of Castillo gives a trend analysis on the Certified Public Accountant (CPA) license examination performance of a selected accountancy school in the Philippines and compare it to that of other institutions. The

quantitative research method was applied. The results reveal that the selected school's performance in the CPA license examination has been steadily declining over the last five years. Although it still had significantly better annual performance, as shown by a greater passing % compared to the national passing percentage, the difference in passing rates was shrinking yearly. The report recommended that remedial steps be implemented in order to do better in future examinations, retake the lead in the locality and region, and compete with the best performing accounting schools in the country (Castillo, 2017).

In the paper of Jackie D. Urrutia, Alsafat M. Abdul and Jacky Boy E. Atienza, attempts to build a statistical model to forecast the Imports and Exports from the year 2018 to 2022. The data were gathered from Philippines Statistical Authority with a total of 100 observations from the first quarter of 1993 to fourth quarter of 2017. The researchers conducted a Statistical test in order to formulate and compare the statistical models of Autoregressive Integrated Moving Average (ARIMA) and Bayesian Artificial Neural Network (BANN) for imports and exports then applied the forecasting accuracy such as MSE, NMSE, MAE, RMSE, and MAPE to compare the performance of the two models. The study shows that Bayesian Artificial Neural Network is the most fitted model in forecasting the imports and export of the Philippines. Furthermore, the actual values and predicted values of both imports and exports using ANN have no significant difference based on the results of Paired T-test, indicating that the actual data and forecasted data are most likely near enough with a 95% level of significance (Urrutia, Abdul, & Atienza, Forecasting Philippines imports and exports using Bayesian artificial neural network and autoregressive integrated moving average , 2019).

The application of the ARIMA model on the COVID-2019 epidemic dataset conducted by Domenico Benvenuto, Marta Giovanetti, Lazzaro Vassallo, Silvia Angeletti and Massimo Ciccozzi proposed a simple econometric model that could be useful to predict the spread of COVID-2019. Auto Regressive Integrated Moving Average (ARIMA) model prediction on the Johns Hopkins epidemiological data was performed to predict the epidemiological trend of the prevalence and incidence of COVID-2019. The study concluded that although more data are needed to have a more detailed prevision, the spread of the virus seems to be slightly decreasing. Moreover, although the number of confirmed cases is still increasing, the incidence is slightly decreasing. If the virus does not develop new mutations, the number of cases should reach a plateau. The forecast and the estimate obtained are influenced by the “case” definition and the modality of data collection. For further comparison or for future perspective, case definition and data collection must be maintained in real time (Benvenuto, Giovanetti, Vassallo, Angeletti, & Ciccozzi, 2020).

Rangsan Nochai and Titida Nochai conducted a research study to establish an appropriate ARIMA Model for forecasting oil palm price of Thailand in three types: farm price, wholesale price and pure oil price for the period of five years, 2000 – 2004. The study considered the minimum of mean absolute percentage error (MAPE). The researchers developed model for three types of oil palm price, were found to be ARIMA (2,1,0) for the farm price model, ARIMA (1,0,1) for whole sale price, and ARIMA (3,0,0) for pure oil price (Nochai & Nochai, 2006).

In 2015, Jackie D. Urrutia, Merrill Lynch T. Olfindo, Razzcelle Tampis conducted a research study entitled Modelling and Forecasting the Exchange Rate of the Philippines: A Time Series Analysis. The researchers formulated a mathematical model to forecast Exchange Rate of the Philippines from the 1st Quarter of 2015 up to the 4th Quarter of 2020 using Autoregressive integrated Moving Average (ARIMA). Upon forecasting the Exchange Rate, the formulated ARIMA model was (0, 1, 0). The researchers concluded that all of the independent variables have a significant linear relationship to the dependent variable. Interest Rate (x1) and Labor Force Participation Rate (x3) was concluded as significant factors of Exchange Rate. The researchers recommended forecasting Exchange Rate for the years beyond 2020. It is also suggested to add more factors that can really influence Exchange Rate to be able to formulate a more accurate model such as money supply, gross domestic product, domestic currency, cost of credit, oil prices and central bank intervention (Urrutia, Olfindo, & Tampis, 2015).

In the study of Jackie D. Urrutia, Francis Leo T. Mingo, Ciandreu Noah M. Balmaceda entitled Forecasting Income Tax Revenue of the Philippines using Autoregressive Integrated Moving Average (ARIMA) Modeling: A Time Series Analysis developed a mathematical model to estimate and to forecast the Income Tax Revenue of the Philippines for the year 2014-2020. The researchers looked at five (5) explanatory variables: the Real GDP Growth Rate, the Employment Population, the Unemployment Rate, the Annual Domestic Crude Oil Prices, and the Inflation Rate. The best fitted model produced was ARIMA (0,1,0) or a random walk model, which is a special case of ARIMA model and demonstrates that there is no statistically significant difference between the actual values of

Income Tax Revenue analyzed using Paired T-Test. As a result, they employed Multiple Linear Regression to discover the key components capable of predicting the Dependent Variable Income Tax Revenue. The study's significance in assessing potential changes in Income Tax Revenue to aid the government in preparing for the country's future necessities (Urrutia, Mingo, & Balmaceda, 2015).

The work of Jackie D. Urrutia, John Lean B. Diaz and Francis Leo T. Mingo entitled Forecasting the Quarterly Production of Rice and Corn in the Philippines: A Time Series Analysis used the quarterly volume of total production of the mentioned crops gathered from the Philippine Statistics Authority (PSA). The quarterly volume of total production was predicted using Seasonal Autoregressive Integrated Moving Average (SARIMA) Modelling through a Box-Jerkins method of forecasting. The models obtained were for SARIMA (2 1 8) (1 1 0)4 for rice production and SARIMA (3 1 8) (0 1 1)4 for Corn production. The dynamically forecasted values of both series were following the trend pattern of the past values of their allotted observed values which were going on an upward direction indicating favourable outcome for the study. This may help people for better understanding the possible changes in values of the data series gathered and may even help the government for any reforms they can make for the upward mobility of production of crops, in agriculture and especially, economy of the country (Urrutia, Diaz, & Mingo, 2017).

According to the study entitled Forecasting the Gross Domestic Product of the Philippines using Bayesian artificial neural network and autoregressive integrated moving average which aimed to forecast the Gross Domestic Product (GDP) of the Philippines from the 1st Quarter of 2018 to 4th Quarter of 2022. It is concluded in this study that the ARIMA (1,1,1) and Bayesian ANN can forecast the GDP of the Philippines. The researcher used Forecasting accuracy such as MSE, NMSE, MAE, RMSE, and MAPE to compare the performance of two models. In this paper, the best fitted model obtained is Bayesian ANN. This study helps economics specifically in economic forecasting and economic analysis (Urrutia, Longhas, & Mingo, 2019).

Fershie D. Yap conducted a study entitled Accountancy Students' Performance in the CPALE. The study aimed to find out the factors affecting the performance of the students in President Ramon Magsaysay State University in the CPA Licensure Examination. Since the success of an individual on the CPA exam can be influenced by many factors, the study trims down all the possible factors that will have a great effect on the performance such as the attitudes of students; study habits, percentage rate in the monitoring exam of the 5th year students; a general weighted average of the students; and the teaching methods of board subject professors. This is descriptive research using a quantitative method with the questionnaire as the main instrument in data gathering from fifteen CPALE passers as the respondents. It is recommended that regular assessment will be conducted, students' grades especially on board subjects should be monitored, professors teaching board subjects should explain concepts clearly and easily understood, and mock exam should be conducted (Yap, 2023).

The paper entitled Predictive Validity of CPA Mock Examinations to CPA Licensure Examinations of USL Accountancy Graduates ascertained the correlation between Certified Public Accountant (CPA) Mock Examinations and CPA Licensure Examination (CPALE) among Accountancy graduates in the University of Saint Louis for the years 2018 and 2019. The data on the CPA mock examinations scores and CPALE scores were analyzed using frequency while the correlation between CPA mock examinations and CPALE scores was analyzed using Pearson-R. The study revealed that even when a graduate passed the mock examination with high remarks, it does not give a reasonable assurance in passing the CPALE and vice versa (Abella, Soriano, & Tarrosa, 2020).

Evaluation of Romblon State University's Adopt-a-Reviewee Project for Certified Public Accountant Licensure Examination is a research study aimed to assessed the said project. A mixed method research was employed in gathering information from 16 beneficiaries and their respective families using two parallel forms of validated evaluation questionnaire complemented with interviews. Results reveal that ADOPT is an effective intervention in improving RSU's performance in CPALE as well as the socio-economic condition and well-being of the beneficiaries and their families. Workable measures are advanced in order to sustain the project despite challenges in fund sourcing and generation (Fetalvero, Faminial, Montoya, Foja, & Fetalvero, 2018).

Predictors of Qualifying in the Accountancy Program in a Public University in the Philippines was conducted by Eva U. Cammayo and Jeanette I. Gonzales to determine the reasons for not succeeding in the BS Accountancy program among the students. This study traced the retention and attrition of the 491 BS Accountancy freshmen enrolled in the university from School Year 2013 to 2015. The primary reasons for not succeeding in the

BSA program were their failure to pass the battery examination, not meeting the minimum grade requirement of accounting courses, and their failure to maintain a GWA of 2.0 and above in all the courses in the BSA program. This finding could be used by the program management as the basis for enhancing the BS Accountancy curriculum to possibly increase the number of students who will stay and finish
the program (Cammayo & Gonzales, 2022).

The declining passing percentages of the CPA Licensure Exam for the past years prompted this study entitled Academic Performance, Motivations, Attitudes and Study Habits on the Preparedness for Accountancy Licensure Examination. The researchers used statistical methods such as frequency counts, percentages, weighted averages, and the Pearson Correlation Coefficient. The results show that the students' motivations, attitudes, and study habits are satisfactory. While academic performance-wise, they were at 43.7% described as very good, 38% superior, 15.5% good, and 2.8% excellent. The researchers recommend innovating the teaching strategy and creating more motivational learning experiences (Gatela, Oras, Paguidopon, & Pale).

Furthermore, the work of Jamal Fattah, Latifa Ezzine, Zineb Aman, Haj El Moussami, and Abdeslam Lachhab constituted a contribution to modeling and forecasting the demand in a food company by using time series approach. The historical demand information was used to develop several autoregressive integrated moving average (ARIMA) models by using Box–Jenkins time series procedure and the adequate model was selected according to four performance criteria: Akaike criterion, Schwarz Bayesian criterion, maximum likelihood, and standard error. The results obtained proved that the model could be utilized to model and forecast the future demand in food manufacturing (Fattah, Ezzine, Aman, Moussami, & Lachhab, 2018).

METHODOLOGY

Research Process

In this research, EVIEWS is the statistical tool used by the researcher to forecast the May and October passing rates of the first-timer and repeater CPALE examinees from the year 2024 to 2027.

Statistical Treatment

Autoregressive Integrated Moving Average

A statistical analysis model that uses time series data to either better understand the data set or to predict future trends. It is a statistical model which predicts future values based on past values. It is a form of regression analysis that gauges the strength of one dependent variable relative to other changing variables (Hayes, 2023).

An ARIMA model is labeled as an ARIMA model (p, d, q), wherein:

- p is the number of autoregressive terms;
- d is the number of differences; and
- q is the number of moving averages

Autoregressive models assume that Y_t is a linear function of the preceding values and is given by equation: $Y_t = \alpha_1 Y_{t-1} + \varepsilon_t$ (Fattah, Ezzine, Aman, Moussami, & Lachhab, 2018).

The possible models for the ARIMA will be compared using the Akaike Information Criterion (AIC) - an information criteria-based relative fit index that was developed as an approximation of out-of-sample predictive accuracy of a model given the available data (Akaike, 1974), Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC) - is a measure of the goodness of fit of a statistical model (Mohamad, 2016), Hannan-Quinn Information Criterion (HQC) – an alternative to AIC, BIC/SIC and Coefficient of Determination (R squared) - used to explain the relationship between an independent and dependent variable (Nevil, 2023).

Box-Jenkins Model

A forecasting methodology using regression studies on time series data. The methodology is predicated on the assumption that past occurrences influence future ones. This is best suited for forecasting within time frames of 18 months or less. Autoregressive integrated moving average (ARIMA) models are a form of Box-Jenkins model (Scott, 2022).

RESULTS AND DISCUSSIONS

Tables 1 & 2 and Figures 2 & 3 shows the trend of the passing rate of first-timer CPALE examinees from the year 2010 to 2023. Whereas Tables 3 & 4 and Figures 4 & 5 shows the trend of the passing rate of repeater CPALE examinees from the year 2010 to 2023.

Trend of the Graphs

FIRST-TIMERS

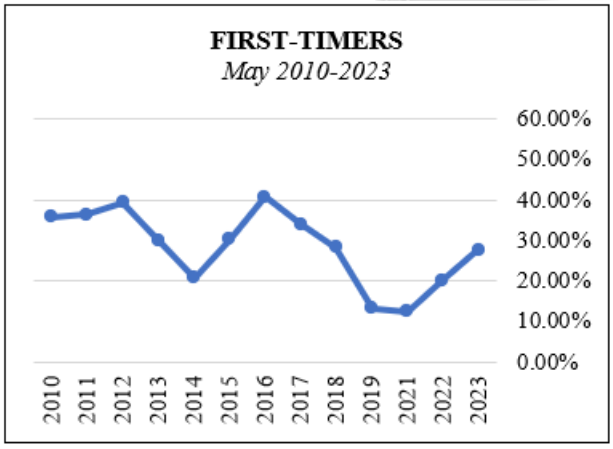
MAY			
Date of Examination	**Total no. of Passed**	**Total no. of First-timer Examinees**	**Passing rate**
MAY 2010	739	2,065	35.79%
MAY 2011	820	2,245	36.53%
MAY 2012	988	2,512	39.33%
MAY 2013	765	2,534	30.19%
*MAY 2014[1]	591	2,827	20.91%
MAY 2015	793	2,611	30.37%
MAY 2016	1,191	2,926	40.70%
MAY 2017	1,279	3,756	34.05%
MAY 2018	1,067	3,768	28.32%
MAY 2019	546	4,114	13.27%
*MAY 2021[2]	188	1,498	12.55%
MAY 2022	510	2,519	20.25%
MAY 2023	1,404	5,077	27.65%

Table 1. The passing rate of the first-timer CPALE examinees based on the trend from 2010 to 2023.

OCTOBER			
Date of Examination	**Total no. of Passed**	**Total no. of First-timer Examinees**	**Passing rate**
OCT 2010	3,006	5,811	51.73%
OCT 2011	3,226	6,046	53.36%
OCT 2012	3,883	7,320	53.05%
OCT 2013	3,605	7,839	45.99%
OCT 2014	3,363	8,389	40.09%
OCT 2015	4,397	9,734	45.17%
OCT 2016	4,476	10,645	42.05%
OCT 2017	3,869	10,968	35.28%
OCT 2018	3,115	10,682	29.16%
OCT 2019	1,662	10,532	15.78%
*OCT 2021[3]	128	782	16.37%
OCT 2022	981	4,160	23.58%
OCT 2023	1,551	5,052	30.70%

Table 2. The passing rate of the repeater CPALE examinees based on the trend from 2010 to 2023.

**Note: Actual date of examination is July 2014[1], October 2021[2] and December 2021[3] respectively. The months indicated were changed for forecasting purposes.*



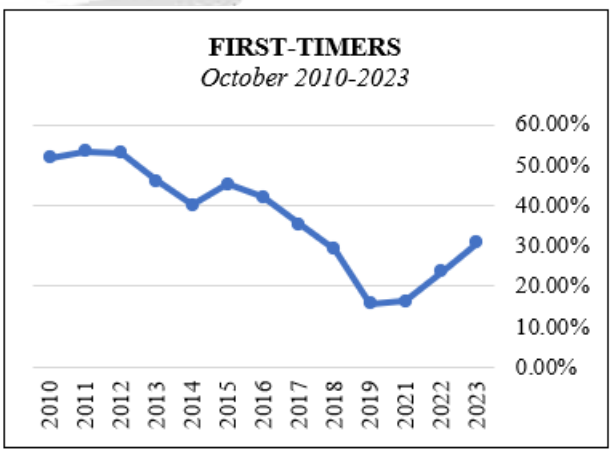


FIGURE 2. Trend of the graph of first-timer examinees for the month of May from 2010 to 2023.

The graph shows that in May 2021 (actual examination date is October 2021) is the lowest passing rate and in May 2016 is the highest passing rate of first-timer examinees for the month of May from 2010 to 2023.

FIGURE 3. Trend of the graph of first-timer examinees for the month of October from 2010 to 2023.

The graph shows that in October 2019 is the lowest passing rate and in October 2011 is the highest passing rate of first-timer examinees for the month of October from 2010 to 2023.

REPEATERS

MAY				OCTOBER			
Date of Examination	**Total no. of Passed**	**Total no. of Repeater Examinees**	**Passing rate**	**Date of Examination**	**Total no. of Passed**	**Total no. of Repeater Examinees**	**Passing rate**
MAY 2010	1,147	2,707	42.37%	OCT 2010	967	2,405	40.21%
MAY 2011	1,310	3,013	43.48%	OCT 2011	840	2,479	33.88%
MAY 2012	1,007	2,803	35.93%	OCT 2012	889	2,667	33.33%
MAY 2013	788	3,131	25.17%	OCT 2013	641	2,557	25.07%
*MAY 2014[1]	516	2,708	19.05%	OCT 2014	760	2,701	28.14%
MAY 2015	1,339	3,343	40.05%	OCT 2015	1,071	3,583	29.89%
MAY 2016	1,776	3,984	44.58%	OCT 2016	773	3,740	20.67%
MAY 2017	2,110	5,881	35.88%	OCT 2017	642	3,765	17.05%
MAY 2018	1,776	6,006	29.57%	OCT 2018	501	3,666	13.67%
MAY 2019	1,153	6,204	18.58%	OCT 2019	413	3,960	10.43%
*MAY 2021[2]	173	864	20.02%	*OCT 2021[3]	190	672	28.27%
MAY 2022	480	1,923	24.96%	OCT 2022	741	2,503	29.60%
MAY 2023	835	2,295	36.38%	OCT 2023	1,189	3,682	32.29%

**Note: Actual date of examination is July 2014[1], October 2021[2] and December 2021[3] respectively. The months indicated were changed for forecasting purposes.*

Table 3. The passing rate of the first-timer CPALE examinees based on the trend from 2010 to 2023.

Table 4. The passing rate of the repeater CPALE examinees based on the trend from 2010 to 2023.

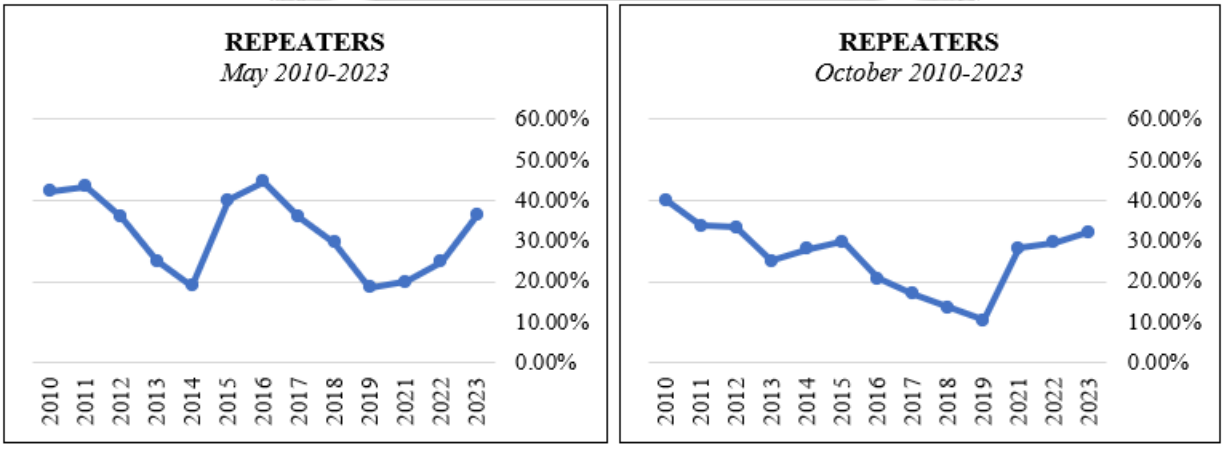


FIGURE 4. Trend of the graph of repeater examinees for the month of May from 2010 to 2023.

The graph shows that in May 2019 is the lowest passing rate and in May 2016 is the highest passing

rate of repeater examinees for the month of May from 2010 to 2023.

FIGURE 5. Trend of the graph of repeater examinees for the month of October from 2010 to 2023.

The graph shows that in October 2019 is the lowest passing rate and in October 2010 is the highest passing rate of repeater examinees for the month of October from 2010 to 2023.

Model Identification

The possible models for the ARIMA p and q components were determined by generating the correlogram from all the collected data and displaying the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQC) and Coefficient of Determination (R squared) results.

FIRST-TIMERS

MAY				
ARIMA Model/s	**Akaike Information Criterion (AIC)**	**Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC)**	**Hannan-Quinn Information Criterion (HQC)**	**Coefficient of Determination (R squared)**
ARIMA (2,1,2)	-1.921769	-1.760134	-1.981613	0.386913
ARIMA (2,1,3)	-2.010131	-1.848495	-2.069974	0.443505

Table 5. The statistical model/s of the first-timer May CPALE examinees formulated using ARIMA.

OCTOBER				
ARIMA Model/s	**Akaike Information Criterion (AIC)**	**Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC)**	**Hannan-Quinn Information Criterion (HQC)**	**Coefficient of Determination (R squared)**
ARIMA (2,1,1)	-2.295426	-2.133790	-2.355269	0.219264
ARIMA (2,1,3)	-2.347245	-2.185610	-2.407089	0.303885

Table 6. The statistical model/s of the first-timer October CPALE examinees formulated using ARIMA.

REPEATERS

MAY				
ARIMA Model/s	**Akaike Information Criterion (AIC)**	**Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC)**	**Hannan-Quinn Information Criterion (HQC)**	**Coefficient of Determination (R squared)**
ARIMA (2,1,3)	-1.627302	-1.465666	-1.687145	0.395445

Table 7. The statistical model/s of the repeater May CPALE examinees formulated using ARIMA.

OCTOBER				
ARIMA Model/s	**Akaike Information Criterion (AIC)**	**Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC)**	**Hannan-Quinn Information Criterion (HQC)**	**Coefficient of Determination (R squared)**
ARIMA (1,2,1)	-1.857027	-1.695391	-1.916870	0.000282
ARIMA (2,2,1)	-1.858413	-1.696777	-1.918256	0.001888
ARIMA (5,2,1)	-1.892680	-1.731044	-1.952523	0.062016

Table 8. The statistical model/s of the repeater October CPALE examinees formulated using ARIMA.

Most Suited Model

By comparing the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQC) and Coefficient of Determination (R squared) results, the researcher deduced that the most fitted model that can be used in forecasting the May and October passing rates of the first-timer and repeater CPALE examinees from the year 2024 to 2027 are the following:

Examinees	**Month**	**ARIMA Model/s**	**Akaike Information Criterion (AIC)**	**Bayesian Information Criterion (BIC)/ Schwarz Information Criterion (SIC)**	**Hannan-Quinn Information Criterion (HQC)**	**Coefficient of Determination (R squared)**
First-timers	May	ARIMA (2,1,2)	-1.921769	-1.760134	-1.981613	0.386913
	Oct	ARIMA (2,1,1)	-2.295426	-2.133790	-2.355269	0.219264
Repeaters	May	ARIMA (2,1,3)	-1.627302	-1.465666	-1.687145	0.395445
	Oct	ARIMA (1,2,1)	-1.857027	-1.695391	-1.916870	0.000282

Table 9. The most fitted model to be use in forecasting the May and October passing rates of the first-timer and repeater CPALE examinees from the year 2024 to 2027.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013269	0.023016	-0.576495	0.5801
AR(2)	-0.243310	1.980109	-0.122877	0.9052
MA(2)	-0.476827	2.610625	-0.182649	0.8596
SIGMASQ	0.004022	0.003038	1.323681	0.2222

R-squared	0.386913	Mean dependent var	-0.006777
Adjusted R-squared	0.157006	S.D. dependent var	0.084594
S.E. of regression	0.077669	Akaike info criterion	-1.921769
Sum squared resid	0.048260	Schwarz criterion	-1.760134
Log likelihood	15.53062	Hannan-Quinn criter.	-1.981613
F-statistic	1.682909	Durbin-Watson stat	1.892722
Prob(F-statistic)	0.247068		

Inverted AR Roots	.00+.49i	.00-.49i
Inverted MA Roots	.69	-.69

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.017003	0.022106	-0.769154	0.4639
AR(2)	-0.159087	0.374305	-0.425021	0.6820
MA(1)	0.465485	0.347301	1.340292	0.2170
SIGMASQ	0.002937	0.001833	1.602257	0.1478

R-squared	0.219264	Mean dependent var	-0.017524
Adjusted R-squared	-0.073512	S.D. dependent var	0.064065
S.E. of regression	0.066378	Akaike info criterion	-2.295426
Sum squared resid	0.035248	Schwarz criterion	-2.133790
Log likelihood	17.77255	Hannan-Quinn criter.	-2.355269
F-statistic	0.748915	Durbin-Watson stat	1.806453
Prob(F-statistic)	0.552861		

Inverted AR Roots	.00+.40i	.00-.40i
Inverted MA Roots	-.47	

FIGURE 6. AIC, BIC/ SIC, HQC and R squared results for first-timer examinees for the month of May 2010-2023.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009502	0.022483	-0.422613	0.6837
AR(2)	-0.422961	0.512998	-0.824487	0.4336
MA(3)	-0.470222	0.483972	-0.971589	0.3597
SIGMASQ	0.005355	0.002413	2.219508	0.0572

R-squared	0.395445	Mean dependent var	-0.004990
Adjusted R-squared	0.168737	S.D. dependent var	0.098299
S.E. of regression	0.089623	Akaike info criterion	-1.627302
Sum squared resid	0.064259	Schwarz criterion	-1.465666
Log likelihood	13.76381	Hannan-Quinn criter.	-1.687145
F-statistic	1.744293	Durbin-Watson stat	2.099206
Prob(F-statistic)	0.235214		

Inverted AR Roots	.00+.65i	.00-.65i	
Inverted MA Roots	.78	.39+.67i	.39-.67i

FIGURE 7. AIC, BIC/ SIC, HQC and R squared results for first-timer examinees for the month of October 2010-2023.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006573	0.027474	-0.239244	0.8169
AR(1)	-0.244731	31.36782	-0.007802	0.9940
MA(1)	0.229080	31.60861	0.007247	0.9944
SIGMASQ	0.004693	0.002671	1.757175	0.1169

R-squared	0.000282	Mean dependent var	-0.006596
Adjusted R-squared	-0.374612	S.D. dependent var	0.071565
S.E. of regression	0.083905	Akaike info criterion	-1.857027
Sum squared resid	0.056321	Schwarz criterion	-1.695391
Log likelihood	15.14216	Hannan-Quinn criter.	-1.916870
F-statistic	0.000753	Durbin-Watson stat	1.910655
Prob(F-statistic)	0.999969		

Inverted AR Roots	-.24
Inverted MA Roots	-.23

FIGURE 8. AIC, BIC/ SIC, HQC and R squared results for repeater examinees for the month of May 2010-2023.

FIGURE 9. AIC, BIC/ SIC, HQC and R squared results for repeater examinees for the month of October 2010-2023.

Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.033	-0.033	0.0163	
		2	-0.138	-0.139	0.3367	
		3	-0.560	-0.582	6.1914	0.013
		4	-0.098	-0.317	6.3945	0.041
		5	0.154	-0.155	6.9650	0.073
		6	0.324	-0.127	9.9083	0.042
		7	0.027	-0.229	9.9320	0.077
		8	-0.130	-0.211	10.636	0.100
		9	-0.131	-0.086	11.590	0.115
		10	0.055	0.005	11.845	0.158
		11	0.029	-0.132	11.988	0.214

FIGURE 10. Ljung-Box Q-statistic result for first-timer examinees for the month of May 2010-2023.

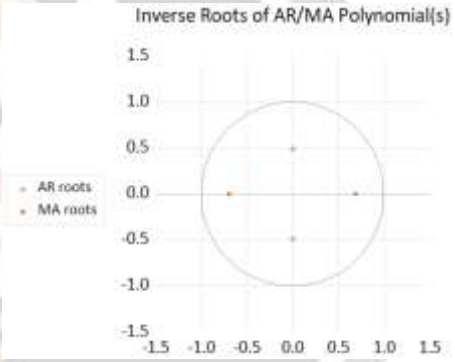


FIGURE 11. ARMA Structure result for first-timer examinees for the month of May 2010-2023.

Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.008	0.008	0.0010	
		2	-0.094	-0.094	0.1492	
		3	-0.141	-0.140	0.5183	0.472
		4	-0.306	-0.324	2.4899	0.288
		5	0.094	0.058	2.7018	0.440
		6	0.068	-0.016	2.8314	0.586
		7	-0.013	-0.094	2.8371	0.725
		8	-0.176	-0.291	4.1360	0.658
		9	-0.043	-0.024	4.2378	0.752
		10	0.040	-0.018	4.3754	0.822
		11	0.062	-0.056	5.0234	0.832

FIGURE 12. Ljung-Box Q-statistic result for first-timer examinees for the month of October 2010-2023.

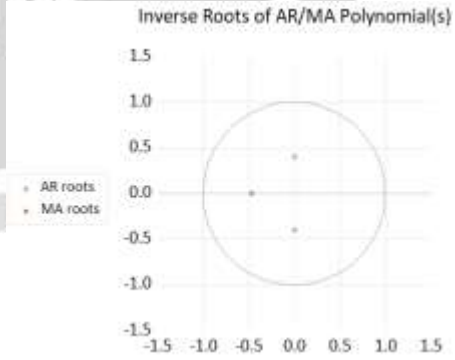


FIGURE 13. ARMA Structure result for first-timer examinees for the month of October 2010-2023.

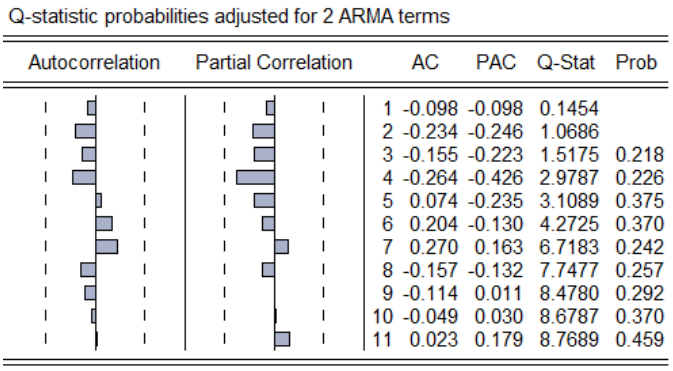


FIGURE 14. Ljung-Box Q-statistic result for repeater examinees for the month of May 2010-2023.

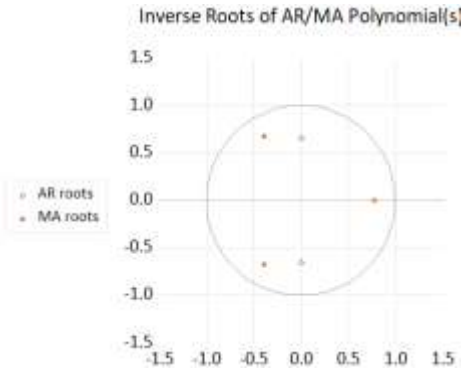


FIGURE 15. ARMA Structure result for repeater examinees for the month of May 2010-2023.

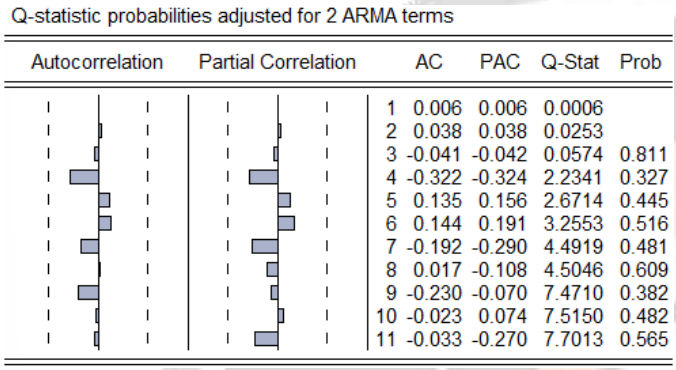


FIGURE 16. Ljung-Box Q-statistic result for repeater examinees for the month of October 2010-2023.

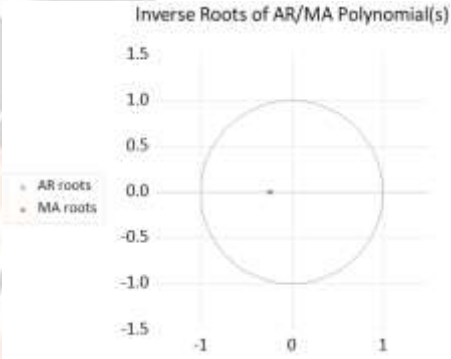


FIGURE 17. ARMA Structure result for repeater examinees for the month of October 2010-2023.

The results of Q-Statistics as seen in Figures 10, 12, 14 and 16, indicates that P-values are higher than 0.05. Hence, it implies that it could not reject the null hypothesis and the residuals are white noise.

Whereas, in Figures 11, 13, 15 and 17 shows the ARMA Structures which indicate that AR and MA roots lie inside the unit circle and implies that the ARMA process is stationary and invertible.

The Forecasted Value

Tables 10 and 11 shows the forecasted passing rate of first-timer and repeater CPALE examinees from the year 2024 to 2027.

FIRST-TIMERS			
MAY		OCTOBER	
Date of Examination	Passing rate	Date of Examination	Passing rate
MAY 2024	21.28%	OCT 2024	30.99%
MAY 2025	14.29%	OCT 2025	27.89%
MAY 2026	14.19%	OCT 2026	25.87%
MAY 2027	14.24%	OCT 2027	24.39%

Table 10. The forecasted passing rate of first-timer examinees.

REPEATERS			
MAY		OCTOBER	
Date of Examination	Passing rate	Date of Examination	Passing rate
MAY 2024	33.21%	OCT 2024	31.57%
MAY 2025	25.46%	OCT 2025	30.93%
MAY 2026	22.10%	OCT 2026	30.27%
MAY 2027	24.02%	OCT 2027	29.61%

Table 11. The forecasted passing rate of repeater examinees.

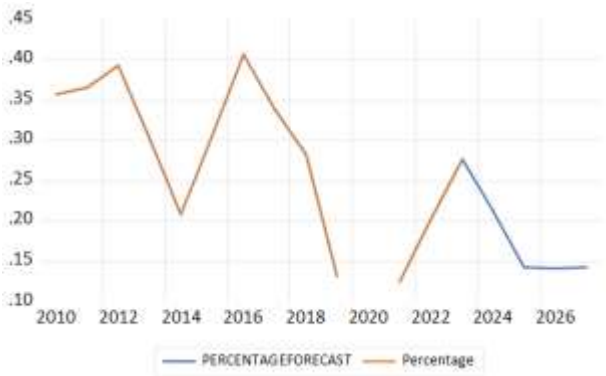


FIGURE 18. Graph of the forecasted passing rate of first-timer examinees for the month of May 2024-2027.

The graph illustrates that the passing rate of first-timer examinees for the month of May will decline marginally in 2024, substantially by 6.99% in 2025, and will most likely stable until 2027.

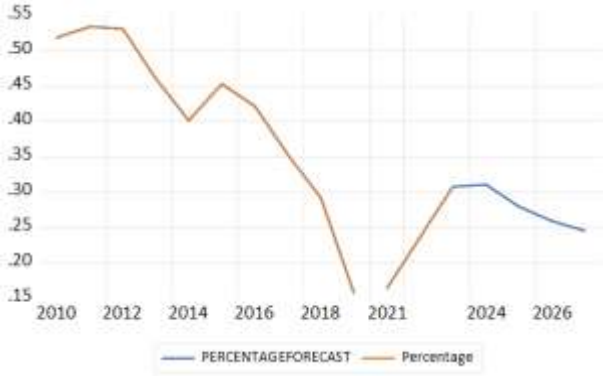


FIGURE 19. Graph of the forecasted passing rate of first-timer examinees for the month of October 2024-2027.

The graph shows that the passing rate of first-timer examinees for the month of October will slightly increase in 2024 to 30.99% and continually drop for the years 2025 to 2027.

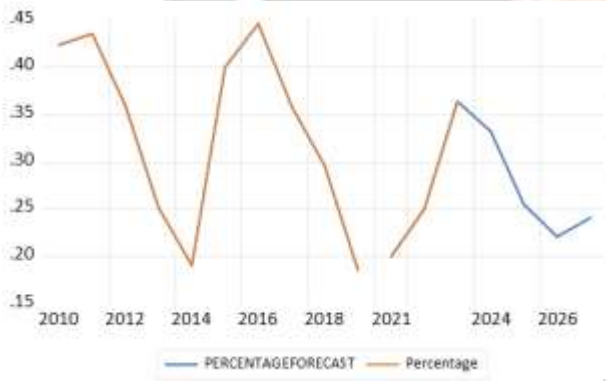


FIGURE 20. Graph of the forecasted passing rate of repeater examinees for the month of May 2024-2027.

The graph shows that the passing rate of repeater examinees for the month of May will reduce by 3.18% in 2024, 7.75% in 2025, and marginally increase in 2027.

FIGURE 21. Graph of the forecasted passing rate of repeater examinees for the month of October 2024-2027.

The graph shows that the passing rate of repeater examinees for the month of October will continue to fall in 2024 to 2027.

CONCLUSION

As a conclusion, the researcher developed ARIMA models to anticipate the passing rates of first-timer and repeater examinees for the months of May and October 2024-2027. The results obtained demonstrate that the models can be used to forecast CPALE passing rates. These findings will assist reviewers/ instructors and PRC in forecasting or setting the passing rate. The researcher recommends that the Commission on Higher Education (CHED), the Board of Accountancy (BOA), the Philippine Institute of Certified Public Accountants (PICPA), and the Professional Regulation Commission (PRC) should look into the matter, revisit and improve the course/review program, teaching techniques, and board examination questions.

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