

Analysis and Future Prediction of Financial Ratios in the Cement Sector

DACHEPALLI PURUSHOTHAM¹, Dr. NARESH OGIRALA²

Student's (24761E0011), Master of Business Administration,

Lakireddy Bali Reddy College of Engineering, Mylavaram, India¹

Associate Professor, Lakireddy Bali Reddy College of Engineering, Mylavaram, India²

Abstract: This report analyzes and forecasts six important financial ratios—Net Profit Margin (NPM), Return on Net Worth (RONW), Fixed Asset Turnover Ratio (FATR), Current Ratio (CR), Quick Ratio (QR), and Inventory Turnover Ratio (ITR)—for the period from 16 to 25 using data available up to period 15. The study uses time series methods, along with residual analysis through ACF and PACF, to check how well the models fit the data. The results show that profitability measures like NPM and RONW are expected to increase gradually and reach stable levels over time, although the wide confidence ranges indicate some uncertainty in these predictions. Efficiency and activity ratios such as FATR and ITR show slight declines before stabilizing, while liquidity ratios like CR and QR remain mostly steady after small initial changes. The graphical trends also support the idea that most ratios are moving towards stability, and the residual analysis suggests that the models used are reasonably reliable. Overall, the findings provide a clear view of expected future financial performance, which can be helpful for planning, while also pointing out areas where predictions may be less certain.

Keywords: Time series forecasting, analysis of financial ratios such as Net Profit Margin, Return on Net Worth, Fixed Asset Turnover, Current Ratio, Quick Ratio, and Inventory Turnover, along with tools like autocorrelation and partial autocorrelation functions and residual analysis for checking model accuracy.

1. INTRODUCTION

Financial ratio analysis plays an important role in understanding a company's profitability, efficiency, and liquidity, but relying only on past data does not fully support future decisions. To overcome this, time series forecasting is used to estimate future values based on historical trends. In this report, six major financial ratios—Net Profit Margin (NPM), Return on Net Worth (RONW), Fixed Asset Turnover Ratio (FATR), Current Ratio (CR), Quick Ratio (QR), and Inventory Turnover Ratio (ITR)—are analyzed using data up to period 15, and forecasts are developed for periods 16 to 25. The study also includes residual analysis using autocorrelation (ACF) and partial autocorrelation (PACF) to check how well the models perform, along with forecast values, standard errors, and 95% confidence intervals. Graphs are used to clearly show both past trends and expected future movements. The main aim is to provide dependable estimates of future financial performance, understand the level of uncertainty in predictions, and assist in better planning and decision-making.

2. REVIEW OF LITERATURE

Time series forecasting is commonly used in financial research as an effective way to predict future values by studying past trends and patterns. In the area of financial ratio analysis, this method allows researchers to go beyond simple comparisons of historical data and develop a better understanding of future performance. Among the various techniques available, ARIMA models are widely preferred because they use past values and error terms to generate forecasts. To check whether these models are suitable, researchers often rely on residual analysis using tools like autocorrelation (ACF) and partial autocorrelation (PACF), which help identify any remaining patterns in the data. A well-fitted model is expected to produce residuals that do not show significant correlation, indicating that the model has captured most of the relevant information. The accuracy of forecasts is usually supported by measures such as standard errors and confidence intervals, often set at a 95% level to indicate the range within which future values may fall. Different financial ratios are used for specific purposes in forecasting, where profitability ratios like Net Profit Margin and Return on Net Worth assess earning potential, liquidity ratios such as Current Ratio and Quick Ratio reflect short-term financial stability, and efficiency ratios like Fixed Asset Turnover and Inventory Turnover show how effectively resources are utilized. When forecasted values begin to level off, it generally suggests stable long-term behavior, whereas wider confidence intervals indicate greater uncertainty. Visual tools like graphs and time series plots also play an important role in presenting trends and patterns clearly. Overall, earlier studies highlight that time series forecasting provides meaningful insights that support financial planning, decision-making, and risk assessment.

3. STATEMENT OF THE PROBLEM

Making effective financial decisions depends on having a clear idea about future performance, but relying only on past financial ratios does not provide enough insight for planning ahead. This creates a challenge for managers, investors, and analysts who need reliable estimates to support decision-making, risk evaluation, and proper use of resources. Although time series forecasting can help predict future values, its usefulness depends on how accurate and reliable the models are. In this study, the main problem is to generate dependable forecasts for six important financial ratios—Net Profit Margin (NPM), Return on Net Worth (RONW), Fixed Asset Turnover Ratio (FATR), Current Ratio (CR), Quick Ratio (QR), and Inventory Turnover Ratio (ITR)—using data up to period 15 and extending predictions up to period 25. It is also important to check whether the models used are appropriate by analyzing residuals through ACF and PACF, ensuring that no significant patterns are left unexplained. Another issue is to measure the level of uncertainty in the forecasts using standard errors and 95% confidence limits. The study also aims to identify which ratios show stable and consistent future trends and which ones have wider ranges, indicating less certainty. Without addressing these aspects, it becomes difficult to make informed financial decisions. Therefore, this study focuses on producing reliable forecasts, testing model accuracy, and clearly presenting the expected future performance of these financial ratios.

4. RESEARCH GAP

Although the document presents forecast results for six key financial ratios—Net Profit Margin (NPM), Return on Net Worth (RONW), Fixed Asset Turnover Ratio (FATR), Current Ratio (CR), Quick Ratio (QR), and Inventory Turnover Ratio (ITR)—there are several important areas that have not been fully addressed. Firstly, the specific time series model used for forecasting is not clearly mentioned, and there is no explanation of how the model was selected using criteria like AIC or BIC. Secondly, even though ACF and PACF plots of residuals are included, no formal statistical tests such as the Ljung-Box test are used to confirm whether the residuals are truly independent. Thirdly, the study does not compare the performance of different forecasting models, so it is unclear whether the chosen approach provides the best results. In addition, there is no evidence that the data was tested for stationarity or whether any transformations were applied before forecasting. The analysis also focuses only on individual ratios without considering possible relationships between them, such as the link between profitability and liquidity. Furthermore, the study does not include validation methods or error measures like MAE or RMSE to evaluate the accuracy of the forecasts. Lastly, there is no comparison with industry standards or alternative forecasting techniques. Addressing these limitations would improve the reliability, clarity, and usefulness of the overall analysis.

5. OBJECTIVES OF THE STUDY

1. To forecast future values of six important financial ratios for periods 16 to 25 using past data up to period 15.
2. To evaluate the suitability of the forecasting models by analyzing residual patterns through ACF and PACF.
3. To measure the level of uncertainty in the forecasts using standard errors and 95% confidence intervals.
4. To study the trend and stability of different financial ratios over the forecast period.
5. To identify which financial ratios provide more reliable predictions based on the consistency of their forecast ranges.

6. RESEARCH DESIGN

The study follows a quantitative and time-based research design, using past financial data to estimate future values of selected ratios. It is non-experimental in nature, as it depends entirely on existing data without making any changes to variables. The approach is mainly focused on univariate time series forecasting, where each financial ratio is analyzed separately based on its historical values.

1. Type of Study

This study is both descriptive and predictive. It describes past trends of financial ratios using charts and statistical tools, and also predicts future values for upcoming periods.

2. Data Source

The data used in this study is secondary in nature and consists of time series values for six financial ratios from period 1 to 15. Although the exact source is not specified, it is likely taken from financial statements or similar records.

3. Variables Studied

The study focuses on six financial ratios as the main variables: Net Profit Margin (NPM) and Return on Net Worth (RONW) representing profitability, Current Ratio (CR) and Quick Ratio (QR) representing liquidity, and Fixed Asset Turnover Ratio (FATR) and Inventory Turnover Ratio (ITR) representing efficiency. No external or independent variables are included, as each ratio is forecasted using its own past data.

4. Forecasting Horizon

The historical data from periods 1 to 15 is used to build the models, and forecasts are generated for periods 16 to 25, covering a total of 10 future time periods.

5. Model Diagnostics

To check whether the models are appropriate, residual analysis is carried out using ACF and PACF. These tools help identify if any patterns are left unexplained. Ideally, the residuals should not show significant autocorrelation, which indicates a good model fit.

6. Forecast Outputs

For each ratio and each future period, the study provides forecasted values, standard errors, and upper and lower limits of a 95% confidence interval. These outputs help in understanding both the expected values and the level of uncertainty in predictions.

7. Visual Presentation

Time series graphs are used to clearly show both past data and forecasted values. These visuals help in understanding trends, patterns, and how the ratios are expected to behave in the future.

8. Analytical Approach

The analysis involves selecting suitable time series models, checking their accuracy through residual analysis, generating forecasts, and calculating confidence intervals. Graphs are also used to support interpretation of the results.

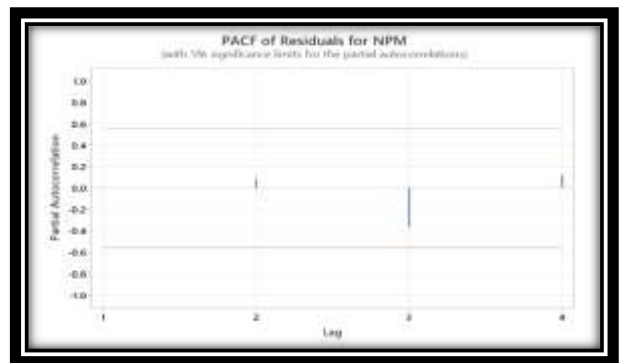
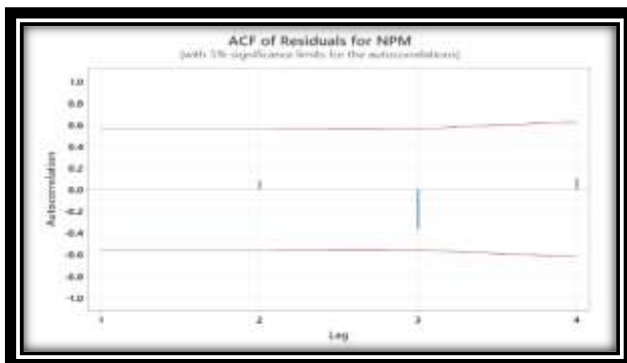
9. Limitations of the Design

There are some limitations in this approach. The study does not include external factors, so it cannot explain cause-and-effect relationships. It also does not compare different forecasting models or use advanced statistical tests for validation. In addition, no separate testing is done to check how accurate the forecasts are outside the sample data.

Table 1: Net Profit Margin Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	1.5144	6.808	-11.832	14.861
17	2.6201	7.3288	-11.747	16.988
18	3.0609	7.4082	-11.462	17.584
19	3.2365	7.4207	-11.311	17.784
20	3.3065	7.4227	-11.245	17.858
21	3.3344	7.423	-11.218	17.886
22	3.3455	7.4231	-11.207	17.898
23	3.35	7.4231	-11.202	17.902
24	3.3517	7.4231	-11.2	17.904
25	3.3524	7.4231	-11.2	17.905

Source: Authors calculation



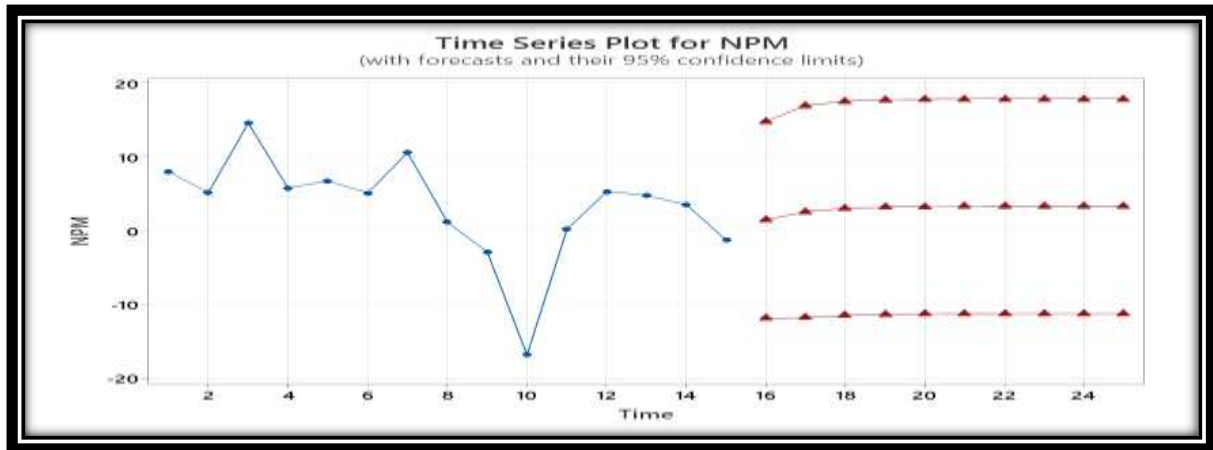
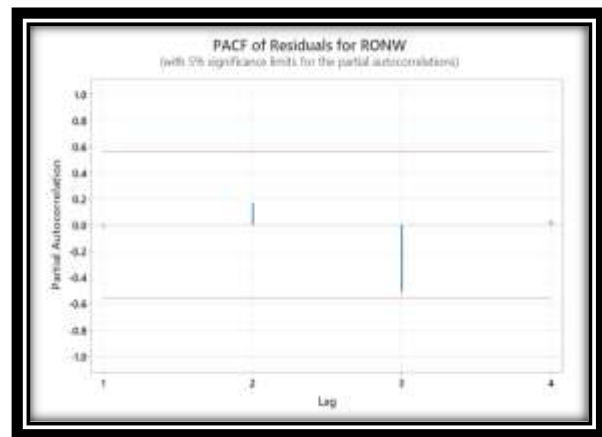
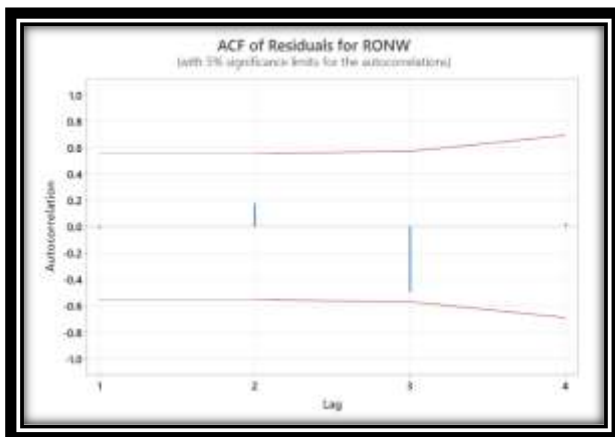


Table 2: Return On Net Worth Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	1.11051	6.32326	-11.2856	13.5066
17	2.96991	6.72879	-10.2212	16.1610
18	3.64644	6.78066	-9.6463	16.9392
19	3.89259	6.78749	-9.4136	17.1988
20	3.98214	6.78840	-9.3258	17.2901
21	4.01473	6.78852	-9.2934	17.3229
22	4.02658	6.78853	-9.2816	17.3348
23	4.03090	6.78853	-9.2773	17.3391
24	4.03247	6.78854	-9.2757	17.3407
25	4.03304	6.78854	-9.2752	17.3412

Source: Authors calculation



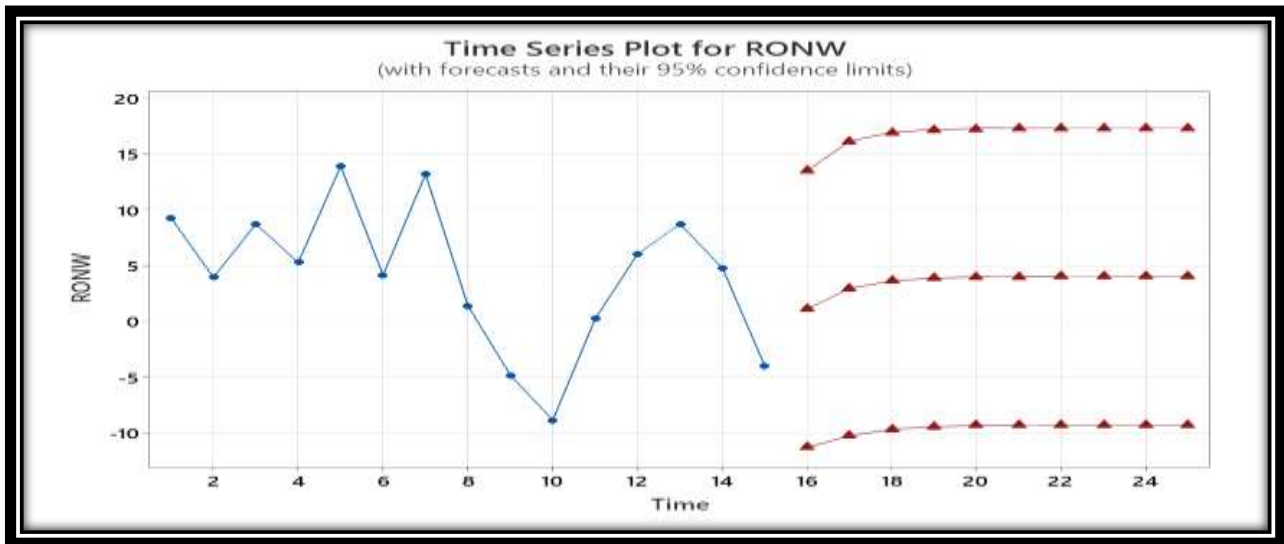
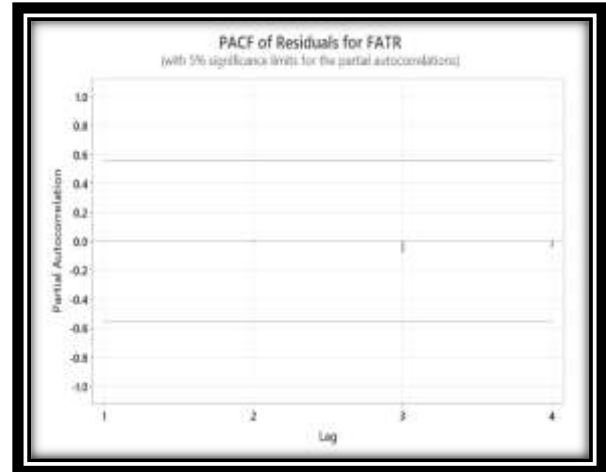
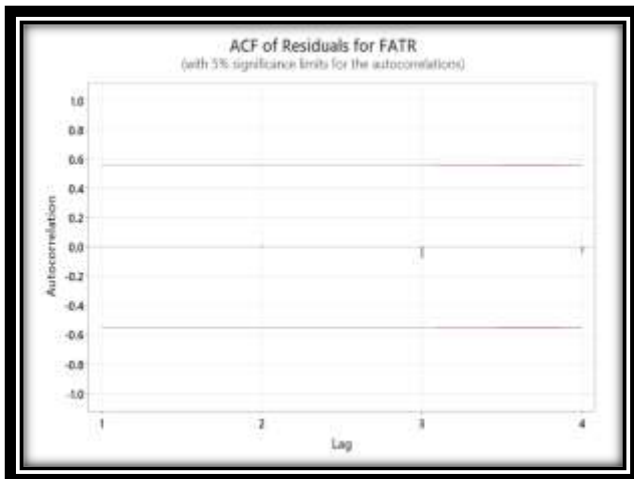


Table 3: Fixed Asset Turnover Ratio Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	0.675024	0.204015	0.275073	1.07498
17	0.636802	0.205264	0.234404	1.03920
18	0.632567	0.205279	0.230139	1.03500
19	0.632098	0.205279	0.229669	1.03453
20	0.632046	0.205279	0.229617	1.03447
21	0.632040	0.205279	0.229612	1.03447
22	0.632040	0.205279	0.229611	1.03447
23	0.632039	0.205279	0.229611	1.03447
24	0.632039	0.205279	0.229611	1.03447
25	0.632039	0.205279	0.229611	1.03447

Source: Authors calculation



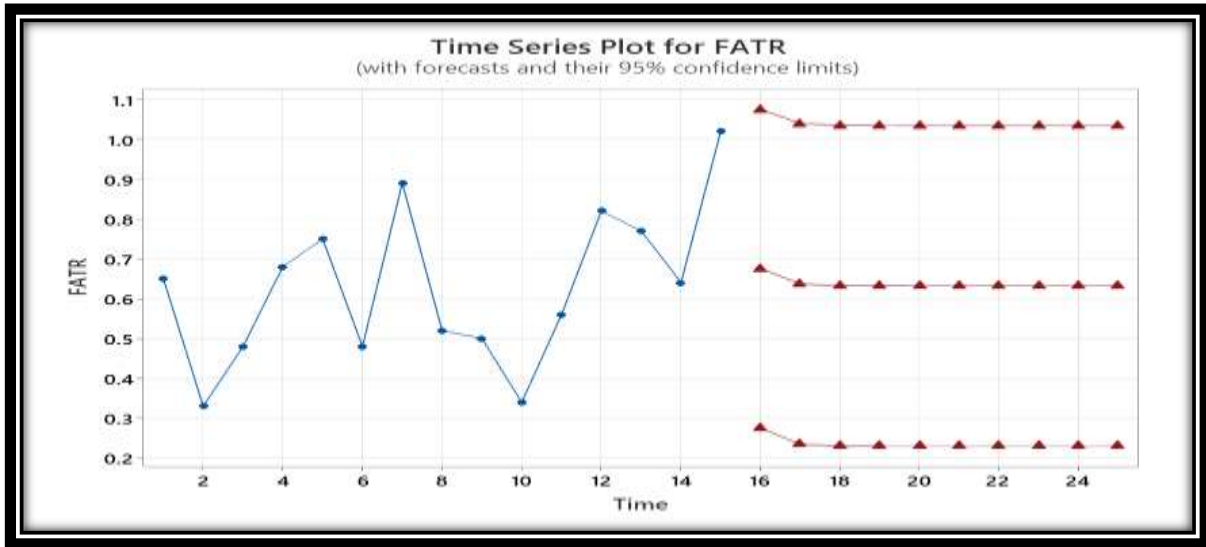
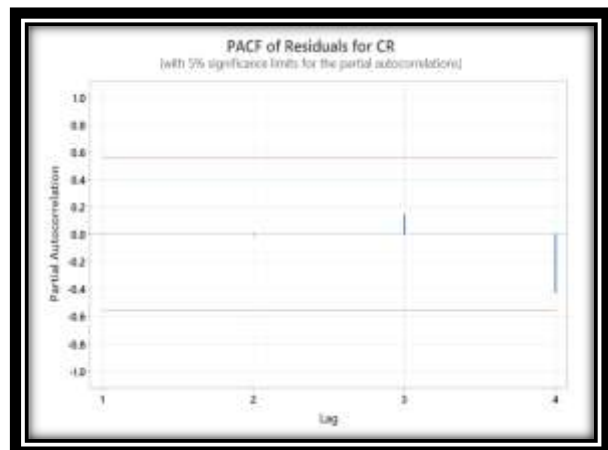
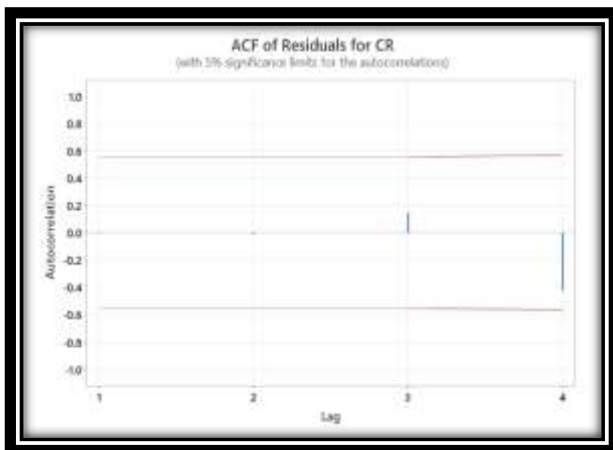


Table 4: Current Ratio Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	1.11446	0.513352	0.108085	2.12083
17	1.13879	0.514922	0.129341	2.14824
18	1.13879	0.514922	0.129341	2.14824
19	1.13879	0.514922	0.129341	2.14824
20	1.13879	0.514922	0.129341	2.14824
21	1.13879	0.514922	0.129341	2.14824
22	1.13879	0.514922	0.129341	2.14824
23	1.13879	0.514922	0.129341	2.14824
24	1.13879	0.514922	0.129341	2.14824
25	1.13879	0.514922	0.129341	2.14824

SOURCE: AUTHORS CALCULATION



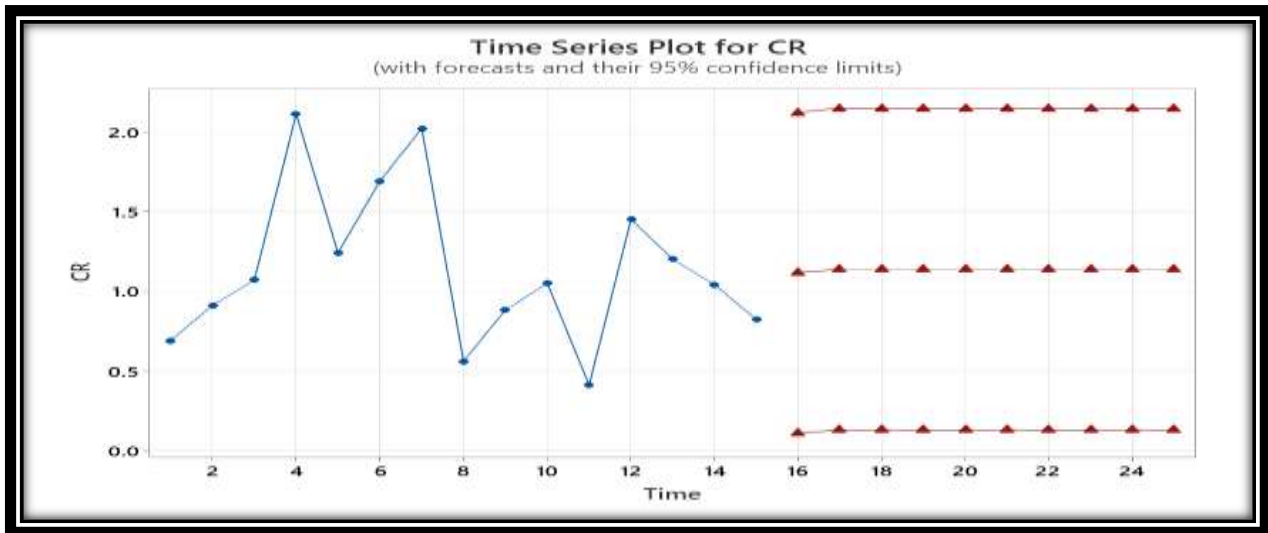
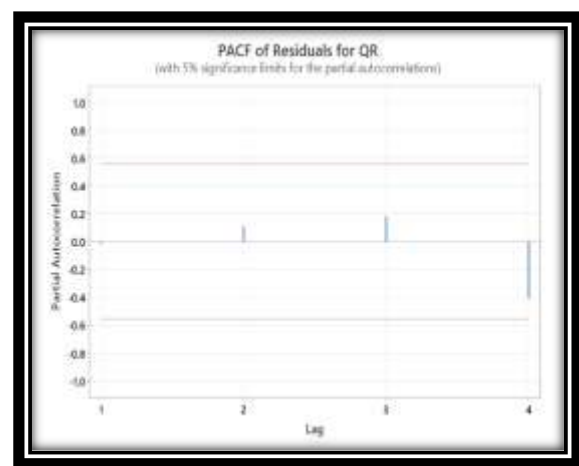
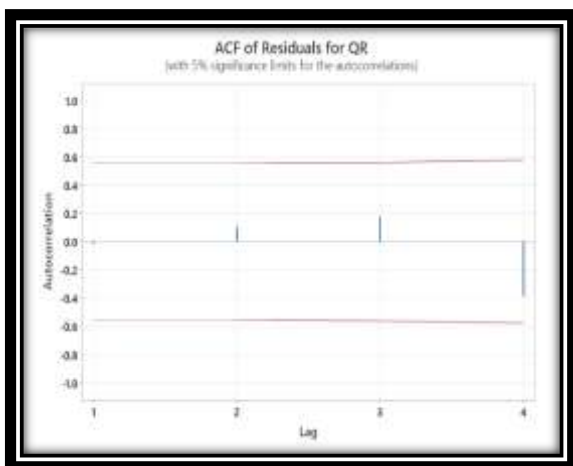


Table 5: Quick Ratio Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	0.795576	0.457847	-0.101985	1.69314
17	0.816270	0.459610	-0.084748	1.71729
18	0.818088	0.459624	-0.082957	1.71913
19	0.818247	0.459624	-0.082797	1.71929
20	0.818262	0.459624	-0.082783	1.71931
21	0.818263	0.459624	-0.082782	1.71931
22	0.818263	0.459624	-0.082782	1.71931
23	0.818263	0.459624	-0.082782	1.71931
24	0.818263	0.459624	-0.082782	1.71931
25	0.818263	0.459624	-0.082782	1.71931

SOURCE: AUTHORS CALCULATION



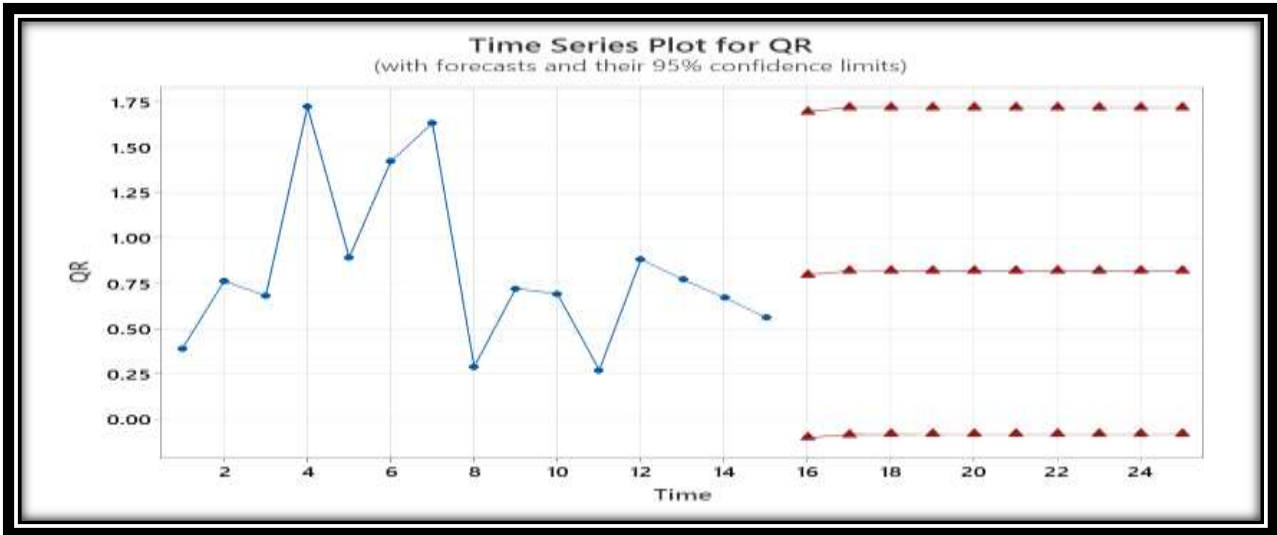
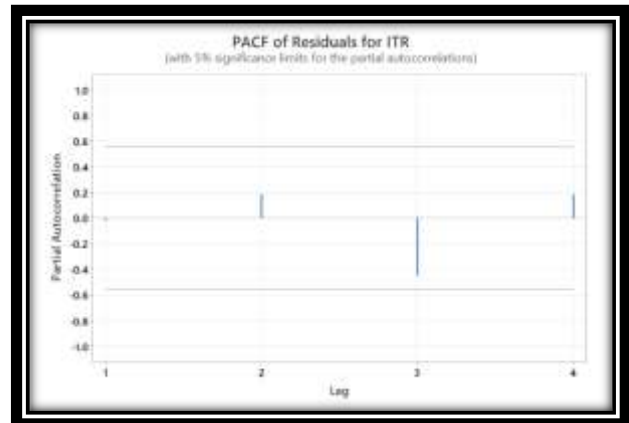
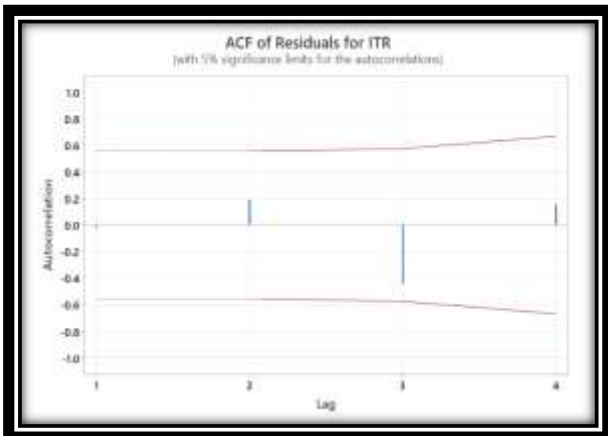
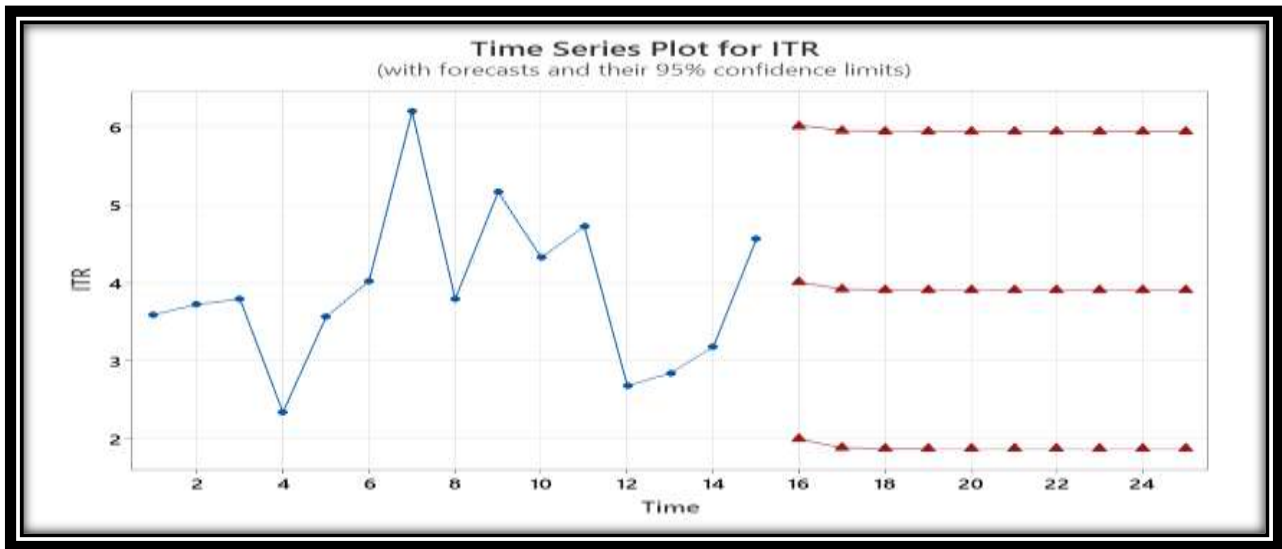


Table 6: Inventory Turnover Ratio Forecasts from Time Period 15

Time Period	Forecast	SE Forecast	95% Limits	
			Lower	Upper
16	4.00333	1.02431	1.99528	6.01139
17	3.91730	1.03647	1.88540	5.94919
18	3.90400	1.03676	1.87153	5.93646
19	3.90194	1.03677	1.86946	5.93442
20	3.90162	1.03677	1.86914	5.93410
21	3.90157	1.03677	1.86909	5.93405
22	3.90157	1.03677	1.86909	5.93405
23	3.90157	1.03677	1.86909	5.93405
24	3.90157	1.03677	1.86909	5.93404
25	3.90157	1.03677	1.86909	5.93404

SOURCE: AUTHORS CALCULATION





7. INTERPRETATION

Table 1 The forecast results for Net Profit Margin show a steady upward movement from period 16 to period 25, increasing from 1.51 to around 3.35, which suggests a gradual improvement in profitability over time. By the end of the forecast period, the values appear to stabilize near 3.35. However, the standard errors are quite high throughout, indicating a significant level of uncertainty in these predictions. This is further reflected in the very wide 95% confidence intervals; for example, in period 16 the range extends from a large negative value to a high positive value, and a similar pattern continues up to period 25. The presence of negative lower limits, even though Net Profit Margin is generally expected to be positive, points to high variability in the data or possible limitations in the model. Therefore, even though the forecasts suggest improvement, the large range of possible values means the results should be interpreted carefully and not relied upon without caution.

Table 2 The forecast values for Return on Net Worth show a consistent upward trend from period 16 to period 25, rising from about 1.11 to nearly 4.03, which indicates a gradual improvement in returns generated from shareholders' equity. Over time, the forecasts seem to settle around a stable level close to 4.03. However, the standard errors remain quite high throughout the forecast period, even exceeding the forecast values in some cases, especially in the earlier periods. This high level of uncertainty is also reflected in the wide 95% confidence intervals. For example, the range in period 16 stretches from a large negative value to a high positive value, and a similar wide spread continues up to period 25. The fact that all lower limits are negative, even though Return on Net Worth is generally expected to be positive, suggests considerable variation in the data or possible limitations in the forecasting model. Therefore, although the forecasts indicate improving performance, the large uncertainty means that actual outcomes may vary significantly, and the results should be used with caution.

Table 3 The forecast values for the Fixed Asset Turnover Ratio show a small drop from period 16 to period 17, decreasing from about 0.675 to 0.637, after which the values become stable and remain close to 0.632 from around period 22 to period 25. Compared to profitability ratios, the standard errors for FATR are quite low and remain almost constant, indicating that the forecasts are more precise and reliable. This is also supported by the relatively narrow 95% confidence intervals, which stay within a limited range throughout the forecast period. Unlike earlier ratios, all the lower limits are positive, which makes sense for an efficiency ratio like FATR. The way the values settle into a stable level suggests consistent long-term behavior, meaning the model has captured the pattern effectively. Overall, the forecasts for FATR appear more dependable, and their smaller range of uncertainty makes them more useful for planning and evaluating operational efficiency.

Table 4 The forecast results for the Current Ratio show a small increase from period 16 to period 17, rising from about 1.11 to 1.14, after which the values remain unchanged at 1.14 for the rest of the forecast period up to period 25. This indicates that the ratio is expected to reach a stable level and maintain it over time. The standard errors are moderate and remain almost the same across all periods, suggesting a consistent level of uncertainty in the predictions. The 95% confidence intervals are not very wide, with values staying within a reasonable range throughout the forecast horizon. Importantly, the lower limits are positive in all periods, which is appropriate for a liquidity measure like the Current Ratio. The stability of the forecast suggests that the company's short-term financial position is expected to remain steady. However, the range of possible values still shows that the actual ratio could vary, sometimes falling below or rising above

the expected level. Overall, compared to profitability ratios, the Current Ratio forecasts appear more stable and reliable for understanding future liquidity position.

Table 5 The forecast values for the Quick Ratio show a small increase from period 16 to period 17, moving from around 0.80 to 0.82, followed by very minor changes in the next few periods before becoming stable at approximately 0.818 from period 21 to period 25. This indicates that the ratio quickly reaches a steady level and is expected to remain constant over time. The standard errors are moderate and remain almost the same across all periods, showing a consistent level of uncertainty in the forecasts. The 95% confidence intervals are fairly narrow, although the lower limits are slightly negative in all periods, which is not practically possible for this ratio. This suggests a small level of uncertainty in the model, even though the negative values are very close to zero. The stable forecast value below 1 indicates that the firm's quick assets may not be sufficient to fully cover its current liabilities, reflecting a tighter liquidity position. However, since the upper limits of the confidence intervals go above 1, there is still a possibility that the actual ratio could be higher. Compared to the Current Ratio, the Quick Ratio remains lower, which is expected because inventory is not included. Overall, the forecasts appear stable and reasonably reliable despite some minor uncertainty.

Table 6 The forecast results for the Inventory Turnover Ratio show a small decrease from period 16 to period 17, dropping from about 4.00 to 3.92, followed by very slight declines in the next few periods. After period 20, the values become stable and remain close to 3.90 up to period 25. This indicates that the ratio is expected to settle at a consistent level over time. The standard errors are moderate and stay nearly the same throughout the forecast period, suggesting a steady level of uncertainty in the predictions. The 95% confidence intervals are reasonably narrow and remain within a practical range, with all lower limits being positive, which is appropriate for this type of ratio. The stable forecast around 3.90 suggests that the company is expected to maintain a consistent rate of inventory movement, meaning inventory will be sold and replaced at a steady pace. Compared to profitability ratios, these forecasts are more precise and show less variation. Overall, the results indicate a slight initial decline followed by stability, suggesting no major changes in inventory management efficiency, and the forecasts can be considered fairly reliable for planning purposes.

CONCLUSION

The time series analysis of six key financial ratios—Net Profit Margin (NPM), Return on Net Worth (RONW), Fixed Asset Turnover Ratio (FATR), Current Ratio (CR), Quick Ratio (QR), and Inventory Turnover Ratio (ITR)—for periods 16 to 25 shows clear differences in trends, stability, and reliability of forecasts. The profitability ratios, NPM and RONW, display a gradual upward trend, indicating a possible improvement in earnings and returns. However, these forecasts come with a high level of uncertainty, as shown by large standard errors and very wide confidence intervals, including negative lower limits, which reduces their reliability. On the other hand, efficiency and liquidity ratios such as FATR, CR, QR, and ITR show more stable behavior with smaller error ranges and mostly positive confidence limits. These ratios also settle at consistent long-term values, suggesting steady operational and financial performance. The use of ACF and PACF helps in checking the suitability of the models, while graphical representations make it easier to understand trends and future movements. Overall, the results indicate that while profitability forecasts should be treated carefully due to uncertainty, the other ratios provide more dependable insights for planning and decision-making. Further improvement in forecasting can be achieved by using better models, including additional variables, and testing accuracy with new data.

ACKNOWLEDGMENT

I would like to express my heartfelt thanks to everyone who supported and motivated me throughout this research. Their encouragement and guidance played a key role in helping me successfully complete this project.

I am thankful to the sources that provided the financial data used in this study. The availability of organized time series data for Net Profit Margin, Return on Net Worth, Fixed Asset Turnover Ratio, Current Ratio, Quick Ratio, and Inventory Turnover Ratio made it possible to carry out a detailed forecasting analysis, including the use of ACF and PACF for checking model performance.

I also extend my gratitude to the developers of the statistical software used in this work. These tools were very helpful in performing time series analysis, generating forecasts, creating graphs, and calculating confidence intervals for future periods.

I sincerely appreciate the contributions of researchers whose work in time series forecasting, ARIMA models, and financial ratio analysis helped shape the foundation of this study. Their ideas guided the overall approach and helped in understanding and interpreting the results.

I am deeply grateful to my mentors, friends, and colleagues for their valuable suggestions and continuous support during every stage of this project, from analysis to final reporting. Their input helped in dealing with challenges and improving the overall quality of the study.

Finally, I would like to acknowledge the broader research community for developing standard methods used in forecasting and data analysis. This study would not have been possible without the support of all these individuals, and any errors or limitations remain my own responsibility.

With gratitude,

DACHEPALLI PURUSHOTHAM.

REFERENCES

- [1]. In 1978, Ljung, G. M. and Box, G. E. P. explained a method for checking the accuracy of time series models in their research article published in *Biometrika*.
- [2]. In 1983, Pandit, S. M. and Wu, S. M. discussed time series and system analysis with practical applications in their book published by John Wiley & Sons.
- [3]. In 2003, Zhang, G. P. introduced a method of forecasting time series data by combining ARIMA and neural network models in the journal *Neurocomputing*.
- [4]. In 2007, Wild, J. J., Subramanyam, K. R., and Halsey, R. F. presented concepts of financial statement analysis in their book published by McGraw-Hill Education.
- [5]. In 2008, Makridakis, S., Wheelwright, S. C., and Hyndman, R. J. explained various forecasting methods and their applications in their book by John Wiley & Sons.
- [6]. In 2013, Penman, S. H. discussed financial statement analysis and security valuation techniques in his book published by McGraw-Hill Education.
- [7]. In 2015, Box, G. E. P., Jenkins, G. M., Reinsel, G. C., and Ljung, G. M. provided a detailed explanation of time series forecasting and control methods in their book published by John Wiley & Sons.
- [8]. In 2015, Robinson, T. R., Henry, E., Pirie, W. L., and Broihahn, M. A. explained international financial statement analysis in their book published by CFA Institute and John Wiley & Sons.
- [9]. In 2017, Shumway, R. H. and Stoffer, D. S. presented time series analysis with practical examples using R in their book published by Springer.
- [10]. In 2021, Hyndman, R. J. and Athanasopoulos, G. explained forecasting principles and practices in their book published by OTexts.