International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 06 | June - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Prediction of Stock Prices Based on Nifty 50 Companies Using Regression Analysis

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Abstract

This study applies linear regression to forecast stock prices of ten Nifty 50 companies using historical data from 2024 to early 2025. Utilizing Microsoft Excel and VBA, a scalable, accessible framework was developed, with time and trading volume as key variables. Models were evaluated using R-squared and Mean Absolute Error (MAE). Results showed that linear regression effectively captured long-term trends, especially in stable stocks, but struggled with high volatility. The approach is valuable for educational and preliminary financial analysis, and future research should explore hybrid models for improved accuracy in dynamic markets.

Introduction

Stock price prediction plays a key role in investment and risk management. This study applies linear regression analysis to forecast stock prices of selected Nifty 50 companies, using historical data with time and volume as predictors.

Implemented through Excel and VBA, the approach offers a practical, accessible tool for students and novice investors. While linear models have limitations in capturing market volatility, they serve as a strong foundation for basic forecasting. The study also highlights potential for future research using advanced models and macroeconomic variables, especially in the context of emerging markets like India.

Literature Review

Stock price forecasting has evolved from basic methods like moving averages and ARIMA to advanced tools such as AI and machine learning. While these models vary in complexity and accuracy, linear regression remains widely used for its simplicity and transparency.

Fama's (1970) Efficient Market Hypothesis (EMH) suggests that prices reflect all available information, making prediction theoretically impossible. However, emerging markets like India often show inefficiencies, allowing room for pattern recognition in historical data.

Studies by Gupta & Basu (2012) and Nageswari et al. (2019) demonstrated the effectiveness of regression models in Indian markets, noting their value in educational settings. Others, like Patel et al. (2015) and Choudhry & Wu (2014), promoted hybrid models that integrate technical and macroeconomic indicators for better accuracy.

Despite the popularity of complex algorithms, regression models continue to be practical, interpretable, and cost-effective, especially for students and small-scale analysts. This study builds on past work by applying regression to ten Nifty 50 companies using Excel and VBA, offering an accessible method for forecasting in a post-COVID context.

Research Objectives

This study aims to assess the effectiveness of linear regression in forecasting stock prices of selected Nifty 50 companies using historical data. The specific objectives are:

- To analyse and preprocess historical price and volume data for trend identification and model preparation.
- To build regression models using time and trading volume as predictors of daily closing prices, implemented in Excel with VBA automation.

- To forecast stock prices for May 2025 and compare them with 2024 trends to assess short-term predictive accuracy.
- To evaluate model performance using R^2 and MAE, assessing fit and forecasting precision.
- To examine sector-specific forecasting accuracy across high- and low-volatility stocks.
- To demonstrate Excel and VBA as cost-effective tools for academic and beginner-level financial modelling.

These objectives support the development of transparent, accessible forecasting tools for researchers and retail investors, particularly in emerging markets.

Methodology

This study uses Excel and VBA to forecast Nifty 50 stock prices with linear regression. Data from 10 companies in 2024 was sourced from Yahoo Finance, NSE, and Moneycontrol. The model predicts closing prices using time and trading volume. VBA automates forecasting and visualization. Model performance was evaluated using R^2 and MAE.

Data Analysis

The analysis followed a structured, automated approach to forecast stock prices for ten Nifty 50 companies using 2024 historical data (closing prices, volumes, and dates) processed in Microsoft Excel.

Custom VBA scripts automated linear regression modelling across all company datasets, ensuring consistency, saving time, and reducing manual errors. For each company, the analysis produced:

- **Regression Equation** showing the relationship between closing price, date, and volume.
- **Forecasted Price for May 2025** based on the regression model.
- **Performance Metrics:**
  - R^2 to evaluate model fit
  - MAE to measure average prediction error (₹)
- **Visual Charts:**
  - 2024 actual vs. fitted prices
  - 2025 predicted trend projections

This approach enabled efficient, consistent forecasting and visualization across all companies.

Example Results:

Company	R^2	MAE	Forecasted Price (May 2025)
Bharti Airtel Ltd.	0.87	₹74.2	₹1,675
Bajaj Auto Ltd.	0.92	₹115	₹10,650
Adani Ports Ltd.	0.88	₹64.5	₹1,420

Findings

- Strong Trends: Most models showed high R^2 (≥ 0.85), accurately capturing stable trends (e.g., Bajaj Auto, Bharti Airtel).
- Volatility Sensitivity: Higher MAE in volatile stocks (Adani Green, Britannia) revealed limits in handling sharp price swings.
- Best for Stable Stocks: Linear regression suited low-volatility stocks with gradual price changes.
- Limited for Sudden Changes: Models struggled with nonlinear events like price spikes or drops.
- Forecast Alignment: May 2025 predictions generally followed 2024 trends.
- Efficient & Accessible: Excel with VBA enabled scalable, transparent, and cost-effective multi-stock analysis.

Discussion

This study confirms the practicality of using linear regression for short-term stock price forecasting, particularly through accessible tools like Microsoft Excel with VBA. The approach delivered consistent and interpretable results, especially for companies with stable price trends, making it ideal for students, researchers, and novice investors.

Despite its strengths, the model is limited by its assumption of linearity and exclusion of external variables like interest rates, earnings, or geopolitical events. As seen in cases like Adani Green and Britannia, the model could not capture sharp market fluctuations, reducing its effectiveness in highly volatile scenarios.

Nonetheless, the simplicity, scalability, and transparency of Excel-based regression make it valuable for academic learning and preliminary forecasting. High R^2 values suggest that time and volume alone can explain much of the price movement in low-volatility stocks.

In conclusion, while linear regression is not as powerful as advanced models like ARIMA or LSTM, it remains a strong foundational tool. Future research should explore hybrid models that combine traditional regression with machine learning and macroeconomic inputs for greater accuracy.

Conclusion

Linear regression remains a practical and accessible tool for stock price forecasting, particularly in academic and beginner investment settings. This study demonstrated its effectiveness in analyzing and predicting trends for selected Nifty 50 companies using Excel and VBA, offering a user-friendly and efficient solution.

While the model lacks the complexity to capture market volatility or external shocks, its strengths lie in its simplicity, speed, and interpretability. It serves as a solid starting point for learners and a baseline for more advanced models like ARIMA or machine learning.

In essence, linear regression provides a cost-effective, educational framework that supports data-driven insights and helps build foundational skills in financial analytics.

Recommendations

Based on the study's findings and limitations, the following suggestions can enhance future stock price forecasting research:

1. **Include Macroeconomic Indicators**
Incorporate factors like interest rates, inflation, GDP, and crude oil prices to improve model accuracy by capturing broader economic influences.

2. **Compare with Advanced Models**
Benchmark linear regression against models like ARIMA, Random Forests, and LSTM to evaluate performance across varying conditions.

3. **Use Full Nifty 50 Dataset**
Expanding the sample to all Nifty 50 companies can enhance generalizability and enable sector-wise comparisons.

4. **Adopt Python or R**
Transitioning from Excel to Python or R allows real-time data integration, advanced analytics, and scalable modelling.

5. **Build Hybrid Models**
Combining regression with techniques like moving averages, decision trees, or sentiment analysis can improve forecasting in volatile markets.

6. **Factor in Qualitative Data**
Incorporate insights from earnings reports, management commentary, and geopolitical events to provide richer model context.

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