

BAYESIAN LEARNING AND AUTOREGRESSIVE PERSISTENCE: ADAPTIVE FORECASTING OF THE DOW JONES INDUSTRIAL AVERAGE (2022–2025)

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Abstract

Financial markets operate as dynamic systems in which information and volatility interact continuously, challenging traditional forecasting models based on fixed historical patterns. This study compares Bayesian and Autoregressive (AR (1)) models for forecasting daily returns of the Dow Jones Industrial Average (DJIA) between October 2022 and October 2025, using daily open-close data (approx. 750 trading days). Using the EViews 12 Student Version, the analysis constructs daily percentage returns and evaluates each model through key econometric indicators: Mean Absolute Error (MAE), Forecast Bias and a newly introduced Adaptability metric.

Empirical results show that the AR (1) model achieves lower error and negligible bias, confirming its stability and persistence, whereas the Bayesian model exhibits higher MAE and modest positive bias but significantly greater adaptability. The Bayesian approach updates prior beliefs (0.55) into posterior probabilities (0.92) in response to market evidence, illustrating how information assimilation enhances real-time responsiveness. Although less smooth, the Bayesian forecasts better capture short-term uncertainty and regime shift typical of modern equity markets. The findings demonstrate that Bayesian learning provides a flexible alternative to autoregressive persistence, offering a richer representation of how market expectations evolve under uncertainty. This research contributes to the econometric literature by operationalizing Bayesian inference within a standard forecasting environment and proposing adaptability as a quantitative measure of model responsiveness. The results have implications for both academic forecasting and practical investment decision-making in volatile market conditions.

Keywords

Bayes' theorem; Bayesian inference; capital markets; financial forecasting; market uncertainty; adaptive decision-making; probabilistic modelling.

JEL Classification

C11, C58, G11, G17

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