Forecast-model-comparison-R

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Introduction

This report analyses three forecasting models—ETS, ARIMA, and Time Series Regression—using R. It covers data exploration, model development, and performance evaluation on 1982–1983 datasets, focusing on MAE, RMSE, and MAPE. The goal is to identify the most suitable model for predicting the next 14 periods, based on accuracy, flexibility, and interpretability.

Forecast Model Evaluation and Comparison

This section analyses the forecast performance of three time series models—Exponential Smoothing (ETS), Auto ARIMA, and Time Series Regression—using error metrics from 1982 and 1983. The objective is to identify the most accurate model for predicting future values based on historical patterns.

Metric	Year	ETS (Auto)	ARIMA (Auto)	Regression
ME	1982	-18.78	1255.20	-30.48
	1983	-17.25	1255.20	-93.04
MSE	1982	318.80	1,992,348.81	251,984.64
	1983	538.97	1,992,348.81	124,209.15
MAE	1982	230.99	1255.20	389.97
	1983	418.50	1255.20	273.58
MAPE (%)	1982	3.23	25.38	8.23
	1983	8.55	25.38	4.15

Analysis and Final Model Selection

Across both years, the ETS model consistently delivers the lowest forecast errors, with the smallest MAE (230.99 in 1982), MSE (318.80), and MAPE (3.23%). This indicates strong predictive accuracy, likely due to ETS's strength in modelling trend and seasonality.

The ARIMA model shows the highest error values across all metrics, despite automated tuning. Its MAPE remains constant at 25.38%, reflecting poor fit in this context. While ARIMA is typically effective for non-stationary time series, its performance here is suboptimal—possibly due to insufficient seasonal adjustment or overfitting.

The regression model performs better than ARIMA and reasonably close to ETS, especially in 1983. With a MAPE of 4.15% in 1983 and flexibility in incorporating explanatory variables, it remains a viable alternative.

In conclusion, the ETS model is selected as the most suitable for forecasting in this case, offering the highest accuracy and robustness across both years.