StockGro Final Project Report

# **Methodology and Models Used**

This project is a time series forecasting and risk-aware portfolio construction with historical stock data (2020–2024). We use the following models:

* **ARIMA:** Linear model to account for the autocorrelations and tuned with default (5,1,0) order.
* **Prophet:** Additive model is appropriate for trend and seasonality and is based on 2-day ahead forecast.
* **LSTM:** DLM using sequences of 60 days – to predict 2 next days. DL-model for non-linear temporal patterns.

Some of the evaluation metrics are MAPE, RMSE, and directional accuracy. Portfolio allocation incorporates forecast-driven allocation and volatility sensitive sizing.

**Stock Selection Rationale**

We selected 10 diversified NSE-listed stocks based on:

* Sector coverage (IT, banking, FMCG, energy, pharma, auto, infra)
* Volatility and trend decomposition
* Popularity and liquidity

Selected Stocks by Sector:

**Stocks Sector**

[RELIANCE.NS](http://reliance.ns) Energy

[INFY.NS](http://infy.ns) IT

[HDFCBANK.NS](http://hdfcbank.ns) Banking

TCS.NSIT IT

[ITC.NS](http://itc.ns) FMGC

[LT.NS](http://lt.ns) Infra

[SUNPHARMA.NS](http://sunpharma.ns) Pharma

[MARUTI.NS](http://maruti.ns) Auto

[ADANIGREEN.NS](http://adanigreen.ns) Renewable Energy

[HINDUNILVR.NS](http://hindunilvr.ns) FMCG

# **Forecast Results and Confidence Intervals**

We forecasted 2 trading days ahead using ARIMA, Prophet, and LSTM. Here’s a sample comparison for INFY:  
  
 **| Model | MAPE | RMSE | Direction Accuracy** |  
 |---------------- |----------------- |----------------- |----------------------------------- |  
 | ARIMA | 0.0083 | 12.56 | Yes |  
 | Prophet | 0.0921 | 29.03 | No |  
 | LSTM | 0.0045 | 10.14 | Yes |  
  
Prophet tends to underperform due to trend extrapolation. LSTM generally had the lowest errors.

# **Portfolio Composition and Rationale**

Weights were assigned using a combination of forecasted mean returns and 10-day rolling volatility.  
  
 **| Stock | Weight (%) |** |-------------------------|------------------|  
 | INFY.NS | 14.7 |  
 | [SUNPHARMA.NS](http://sunpharma.ns) | 13.4 |  
 | TCS.NS | 12.2 |  
 | MARUTI.NS | 11.8 |  
 | ITC.NS | 10.6 |  
 | RELIANCE.NS | 10.1 |  
 | ADANIGREEN.NS| 9.4 |  
 | LT.NS | 8.3 |  
 | HDFCBANK.NS | 5.4 |  
 | HINDUNILVR.NS | 4.1 |

**Performance on StockGro**

Total Turnover: ₹79,99,385.15

Transaction Charges: ₹7,614.85

Net Portfolio Value: ₹79,76,297.61

Top profitable trades:

* SUNPHARMA: ₹7,300.44
* ADANIGREEN: ₹727.99
* INFY: ₹735.24
* MARUTI: ₹128.30
* ITC: ₹117.80

Major losses were small (e.g., HINDUNILVR: -₹105.80).

# **Model Accuracy and Prediction vs Reality**

ARIMA and LSTM were reliable. Prophet underperformed on short horizons.  
  
Example (INFY last 2 days):

* Actual: ₹1556.68 → ₹1569.45
* LSTM: ₹1554.01 → ₹1568.99
* Prophet: over-smoothed trend

LSTM outperformed due to better handling of short-term volatility.

# **Reflections: What Worked, What Didn’t, What You’d Improve**

What Worked:

* LSTM forecasts were closest to actual
* Volatility-aware allocation reduced losses
* Sectoral diversification mitigated risk

What Didn’t:

* Prophet was weak for 2-day horizons
* Some trades (e.g. HINDUNILVR) gave unexpected outcomes

Improvements:

* Use log returns as features
* Add ensemble models for better stability
* Consider using GARCH for volatility modeling

# **Some visual comparisons**

