



# ARIMA-MCMC

A novel approach to  
predicting financial time series

# Problem Statement

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- Prediction of stock prices
  - Explosion of new retail traders
  - Trading signal generation
- Financial time series
  - Autocorrelation
    - Current price correlated with last timestep
  - Stationarity
    - Variance, or other statistics, change over the course of the time series

# Background

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- Many techniques have been used in solving stock price predictions
  - Logistic Regression
  - ANN-ARIMA Technique
  - MCMC Simulation
  - LSTM Models

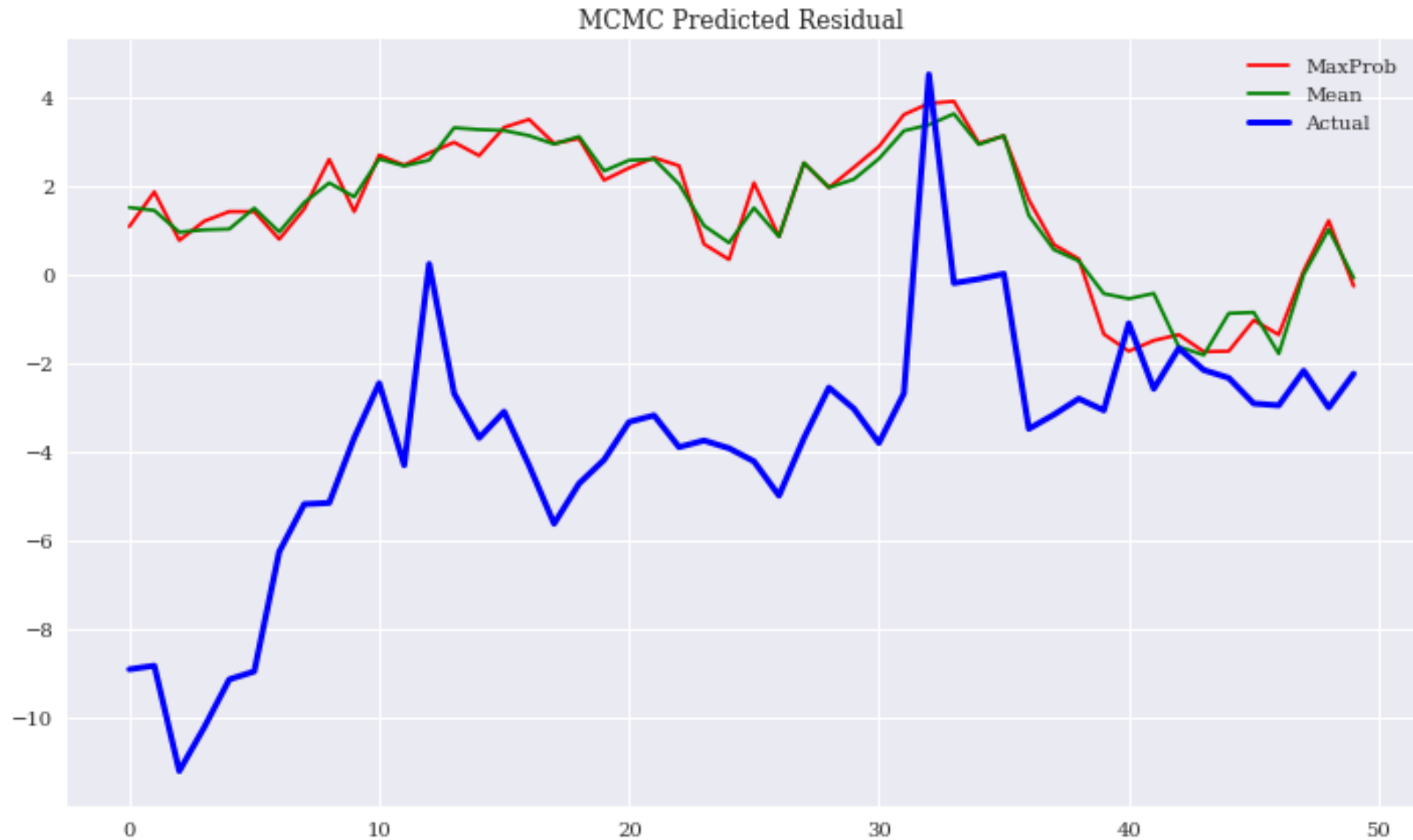
# Methodology

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- Hybrid approach: ARIMA-MCMC
  - Auto-Regressive Integrated Moving Average: ARIMA
    - Removes autocorrelation and creates a stationary time series
  - MCMC
    - Creates many simulations of probability distributions using Bayesian methods
- Technique
  - ARIMA is fit to the previous 100 minutes to predict the next 30
  - Residuals are fed to MCMC to predict future residuals
  - Price prediction is the ARIMA prediction plus MCMC predicted residual

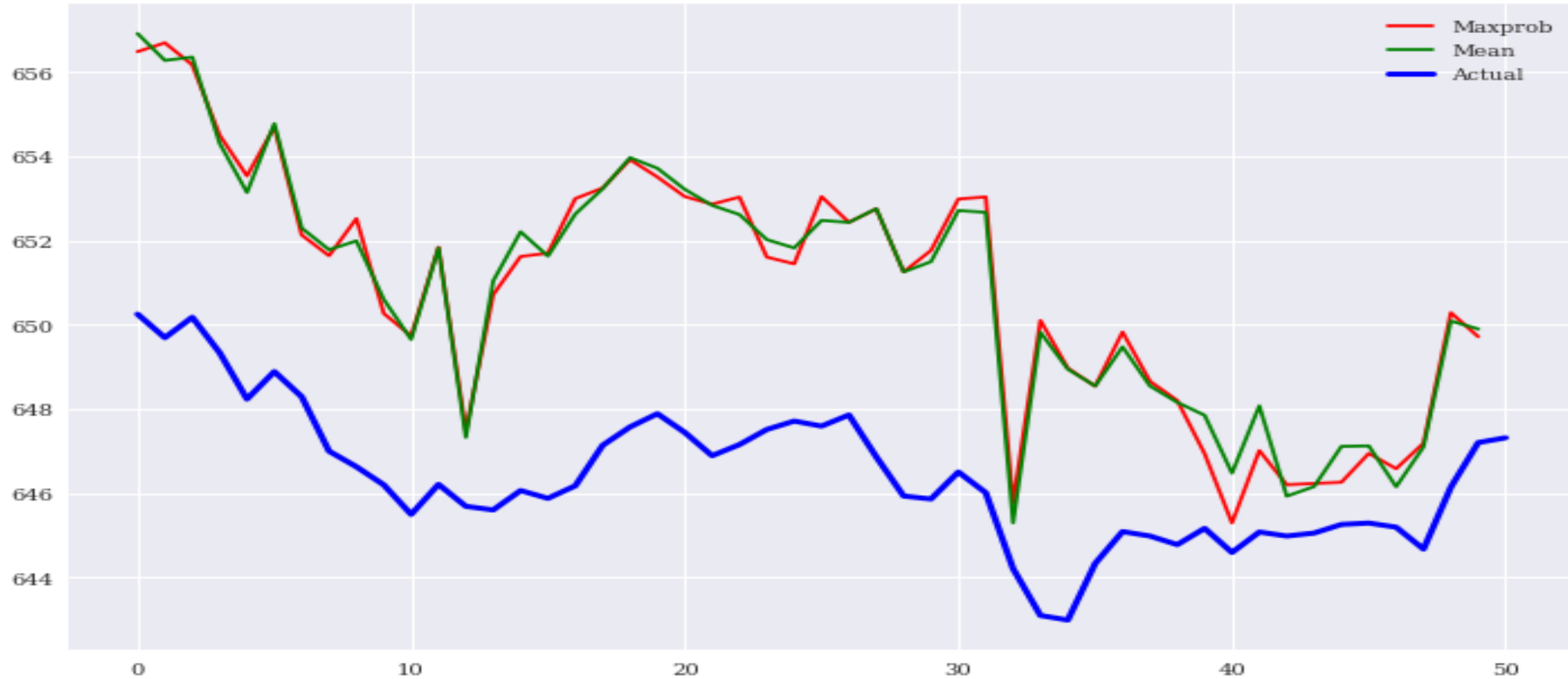
# Results - Residual MCMC

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# Results - Price ARIMA-MCMC

ARIMA & MCMC Predicted Price at t+30 minutes



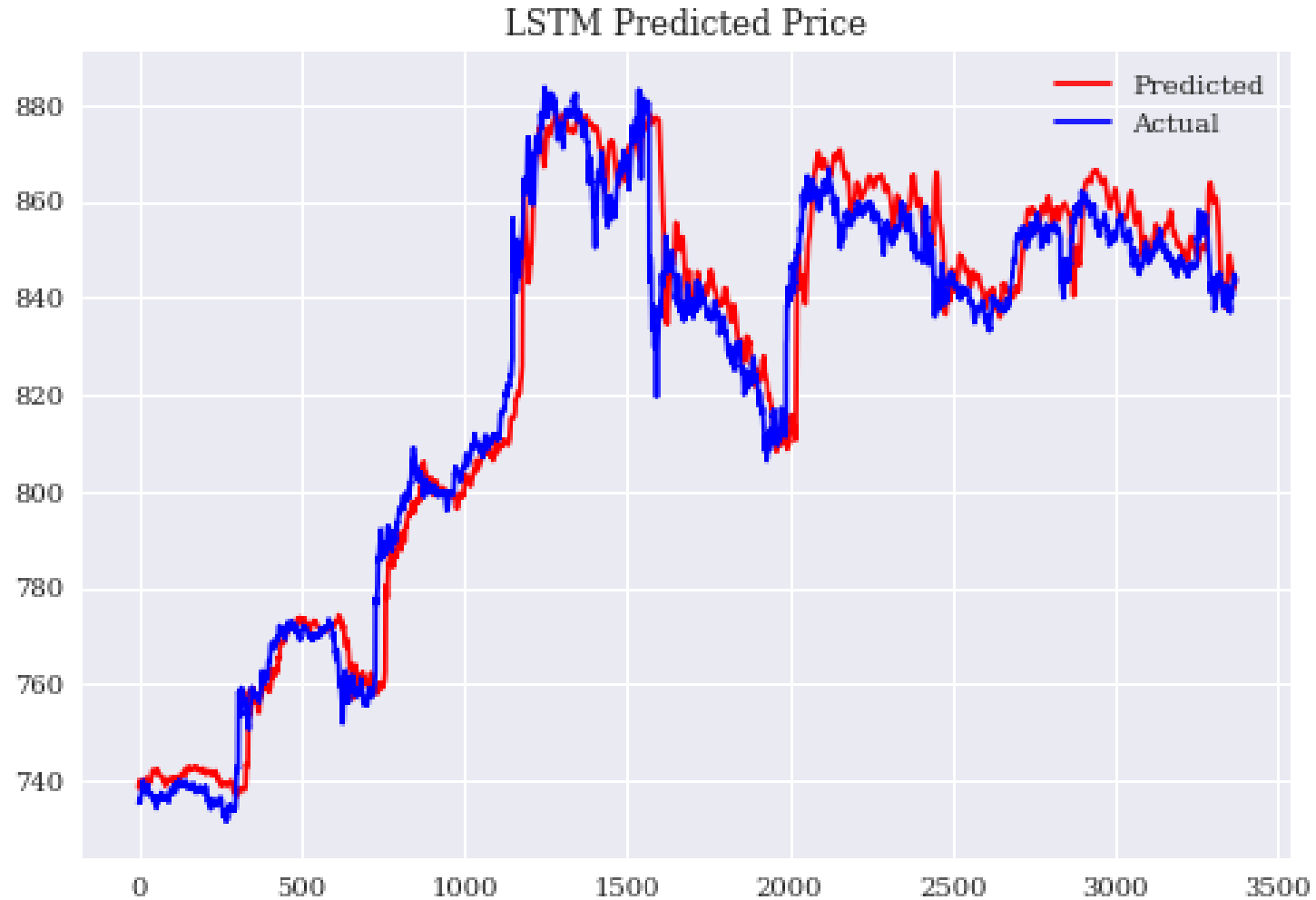
# Benchmark

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- Deep Long Short-term Memory (LSTM)
  - Current state of the art
  - Pros:
    - Robust to stationarity and autocorrelation
    - No assumptions about models or their distributions are necessary
  - Cons:
    - Black-box – model is not transparent
    - Computationally and time expensive

# Benchmark Results - LSTM

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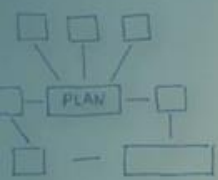




# Conclusion & Future Work

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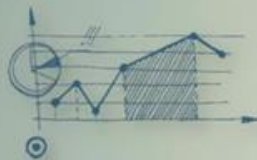
- Conclusion
  - MCMC has richer output than LSTM
  - ARIMA-MCMC outperformed LSTM in RMSE
  - ARIMA-MCMC took longer than LSTM when forecasting
- Future Work
  - Streamline the training process to speed up ARIMA-MCMC
  - Train and evaluate on more securities
  - Mine output for buy/sell signals + risk values



3.



IDEA



MAX

MANAGEMENT

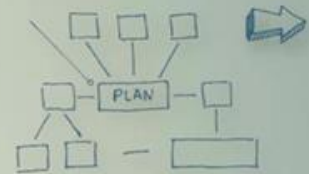


MAX



OPTIONS

OPTIONS



NEXT



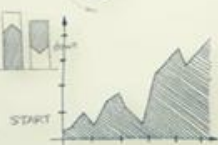
SUCCESS

PROGRESS

MANAGEMENT

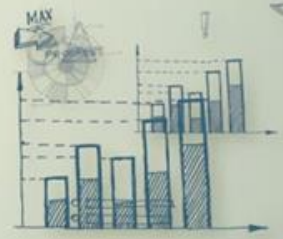


PROGRESS



START

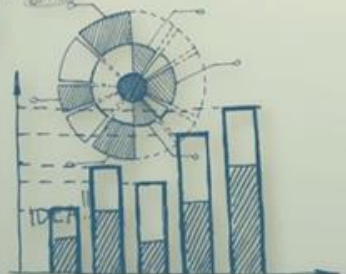
OPTIONS



NEXT



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IDEA

IDEA

