



Time Series Forecasting

ICICI Bank: Daily Stock Price & Returns

Introduction

About Company

ICICI Bank is a leading private sector bank in India. The Bank's consolidated total assets stood at Rs. 14.76 trillion on September 30, 2020. ICICI Bank currently has a network of 5,288 branches and 15,158 ATMs across India



Financial Performance

FINANCIAL HIGHLIGHTS

The financial performance for fiscal 2020 is summarised in the following table:

| ₹ in billion, except percentages | Fiscal 2019 | Fiscal 2020 | % change |
|--|-------------|-------------|----------|
| Net interest income and other income | 415.27 | 497.16 | 19.7% |
| Operating expenses | 180.89 | 216.14 | 19.5% |
| Core operating profit | 220.72 | 268.08 | 21.5% |
| Treasury income | 13.66 | 12.93 | (5.3)% |
| Operating profit | 234.38 | 281.01 | 19.9% |
| Provisions & contingencies (excluding tax) | 196.61 | 140.53 | (28.5)% |
| Profit before tax | 37.77 | 140.48 | 271.9% |
| Profit after tax | 33.63 | 79.31 | 135.8% |
| ₹ in billion, except percentages | Fiscal 2019 | Fiscal 2020 | % change |
| Consolidated profit before tax and minority interest | 74.08 | 185.89 | 150.9% |
| Consolidated profit after tax and minority interest | 42.54 | 95.66 | 124.9% |

Shareholders of ICICI Bank with more than one percent holding at March 31, 2020

| Name of the Shareholder | No. of Shares | % holding |
|---------------------------------------|---------------|-----------|
| Deutsche Bank Trust Company Americas* | 1,239,237,331 | 19.15 |
| Life Insurance Corporation of India | 521,902,188 | 8.06 |
| SBI Mutual Fund | 237,754,343 | 3.67 |
| HDFC Mutual Fund | 224,605,465 | 3.47 |
| Dodge & Cox International Stock Fund | 196,131,976 | 3.03 |
| ICICI Prudential Mutual Fund | 163,148,918 | 2.52 |
| Europacific Growth Fund | 135,615,372 | 2.10 |
| Reliance Mutual Fund | 112,506,655 | 1.74 |
| Government of Singapore | 108,965,533 | 1.68 |
| Aditya Birla Sun Life Mutual Fund | 107,202,608 | 1.66 |
| Kotak Mahindra Mutual Fund | 94,184,312 | 1.46 |
| NPS Trust | 88,627,973 | 1.37 |
| UTI Mutual Fund | 83,008,110 | 1.28 |
| Axis Mutual Fund | 73,705,550 | 1.14 |
| Abu Dhabi Investment Authority | 71,243,514 | 1.10 |

* Deutsche Bank Trust Company Americas holds equity shares of ICICI Bank as depositary for ADS holders.

Assets

The following table sets forth, at the dates indicated, the principal components of assets.

| ₹ in billion, except percentages | | | |
|--|----------------------|----------------------|--------------|
| Assets | At March 31, 2019 | At March 31, 2020 | % change |
| Cash and bank balances | ₹ 802.96 | ₹ 1,191.56 | 48.4% |
| Investments | 2,077.33 | 2,495.31 | 20.1 |
| - Government and other approved investments ¹ | 1,479.09 | 1,883.20 | 27.3 |
| - Equity investment in subsidiaries | 98.03 | 98.03 | 0.0 |
| - Other investments | 500.21 | 514.08 | 2.8 |
| Advances | 5,866.47 | 6,452.90 | 10.0 |
| - Domestic | 5,236.15 | 5,913.23 | 12.9 |
| - Overseas branches | 630.32 | 539.67 | (14.4) |
| Fixed assets (including leased assets) | 79.31 | 84.10 | 6.0 |
| Other assets | 818.52 | 759.78 | (7.2) |
| - RIDF and other related deposits ² | 292.55 | 287.57 | (1.7) |
| Total assets | ₹ 9,644.59 | ₹ 10,983.65 | 13.9% |

1. Banks in India are required to maintain a specified percentage, currently 18.00% (at March 31, 2020), of their net demand and time liabilities by way of liquid assets like cash, gold or approved unencumbered securities.
2. Deposits made in Rural Infrastructure Development Fund and other related deposits pursuant to shortfall in the amount required to be lent to certain specified sectors called priority sector as per RBI guidelines.
3. All amounts have been rounded off to the nearest ₹ 10.0 million.

Total assets of the Bank increased by 13.9% from ₹ 9,644.59 billion at March 31, 2019 to ₹ 10,983.65 billion at March 31, 2020, primarily due to a 10.0% increase in advances and a 20.1% increase in investments, offset, in part, by a 7.2% decrease in other assets.

LIABILITIES

The following table sets forth, at the dates indicated, the principal components of liabilities (including capital and reserves).

| ₹ in billion, except percentages | | | |
|---|----------------------|----------------------|--------------|
| Liabilities | At March 31, 2019 | At March 31, 2020 | % change |
| Equity share capital | ₹ 12.94 | ₹ 12.98 | 0.3% |
| Reserves | 1,070.74 | 1,152.06 | 7.6 |
| Deposits | 6,529.20 | 7,709.69 | 18.1 |
| - Savings deposits | 2,276.71 | 2,455.91 | 7.9 |
| - Current deposits | 962.69 | 1,022.28 | 6.2 |
| - Term deposits | 3,289.80 | 4,231.51 | 28.6 |
| Borrowings (excluding subordinated debt) | 1,382.85 | 1,410.79 | 2.0 |
| - Domestic | 635.07 | 811.26 | 27.7 |
| - Overseas branches | 747.78 | 599.53 | (19.8) |
| Subordinated debt (included in Tier-1 and Tier-2 capital) | 270.35 | 218.17 | (19.3) |
| - Domestic | 270.35 | 218.17 | (19.3) |
| Other liabilities | 378.51 | 479.95 | 26.8 |
| Total liabilities | ₹ 9,644.59 | ₹ 10,983.65 | 13.9% |

1. All amounts have been rounded off to the nearest ₹ 10.0 million.

Total liabilities (including capital and reserves) increased by 13.9% from ₹ 9,644.59 billion at March 31, 2019 to ₹ 10,983.65 billion at March 31, 2020 primarily due to a 18.1% increase in deposits.

Time Series Analysis

Price Trends

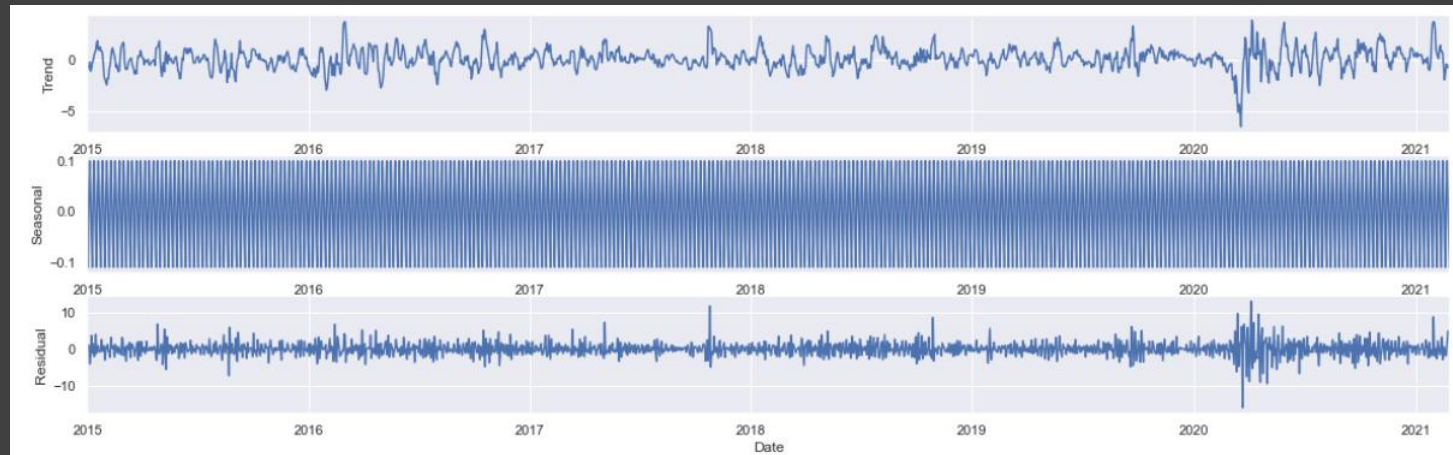


Time Series Analysis

Time series analysis is a statistical method to analyse the past data within a given duration of time to forecast the future. It comprises of ordered sequence of data at equally spaced interval.

$$\textit{Time Series} = \textit{Trend} + \textit{Seasonality} + \textit{Residual}$$

Seasonality



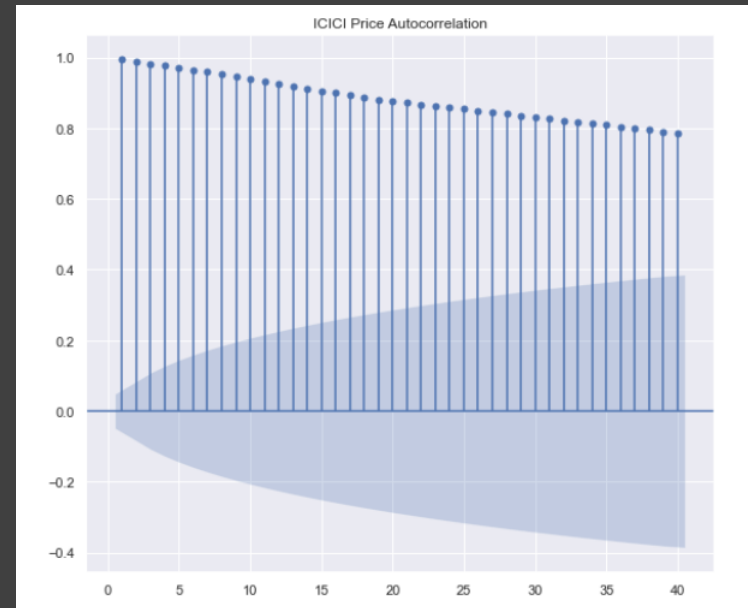
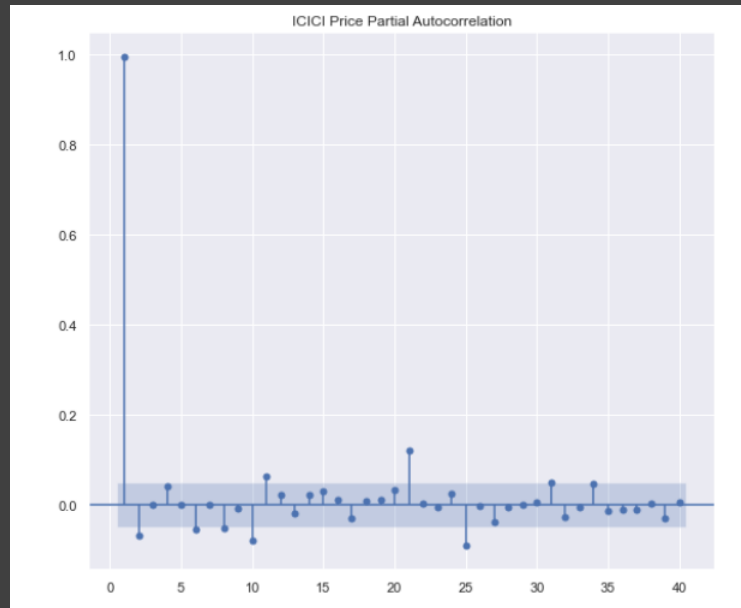
Stationarity

$$\mu = \text{Constant}$$

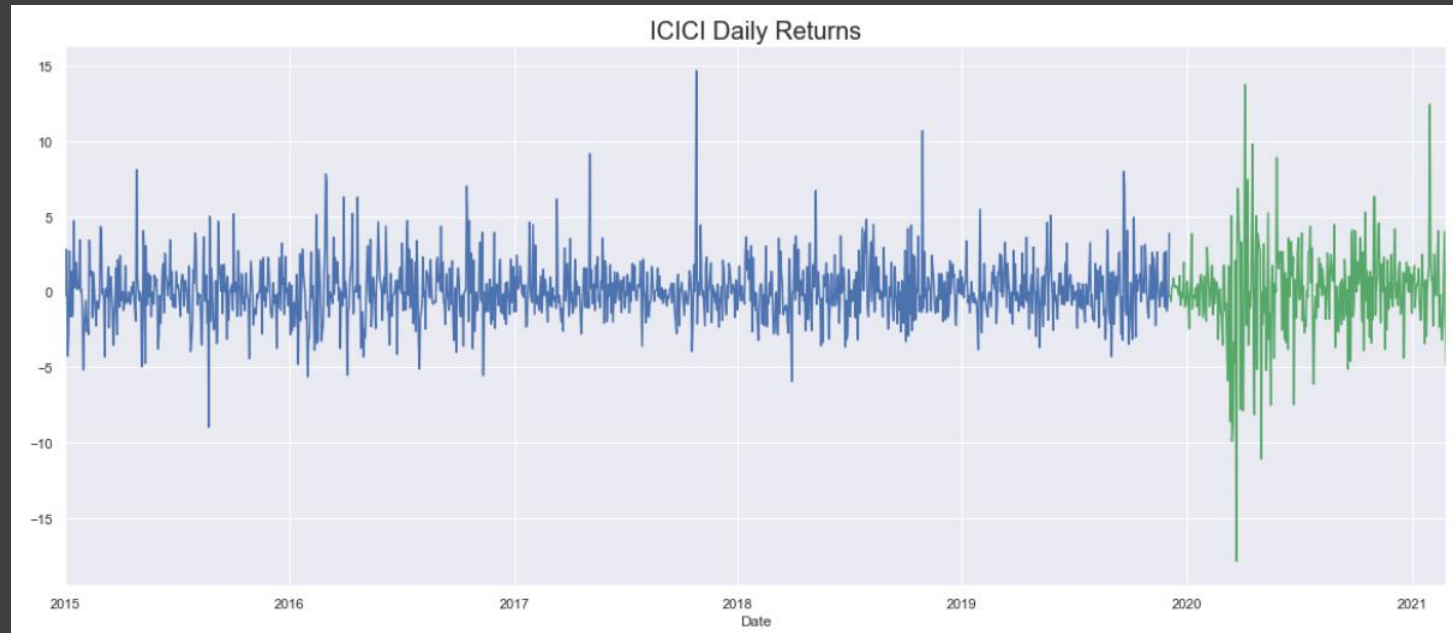
$$\sigma^2 = \text{Constant}$$

$$\text{Cov}(X_n, X_{n+k}) = \text{Cov}(X_m, X_{m+k})$$

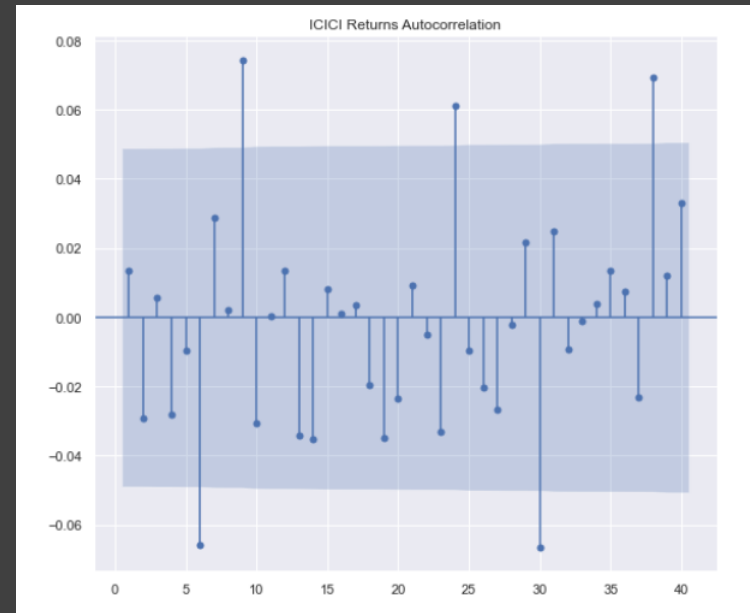
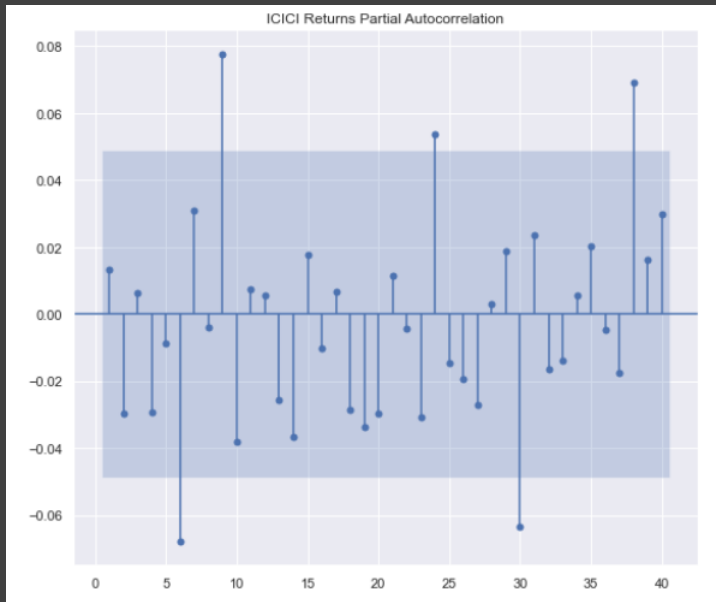
PACF & ACF for Prices



Returns



PACF & ACF for Returns



ARIMA

NON-STATIONARY TIME SERIES

ARIMA

$$y_t = c + \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q}$$

Prediction



Price Forecast



ARMA

STATIONARY TIME SERIES

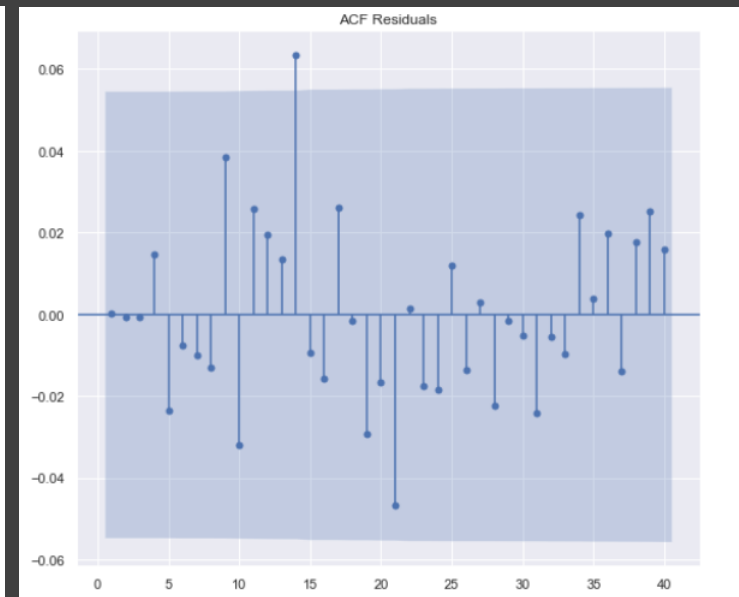
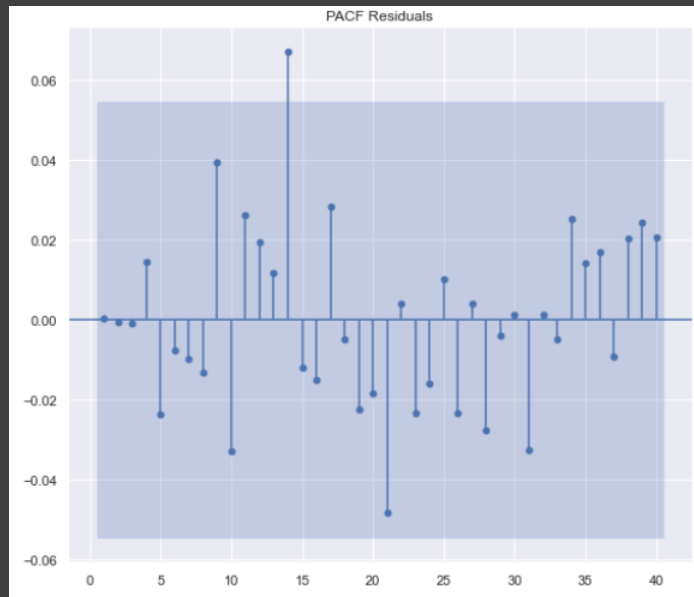
ARMA

$$y_t = c + \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q}$$

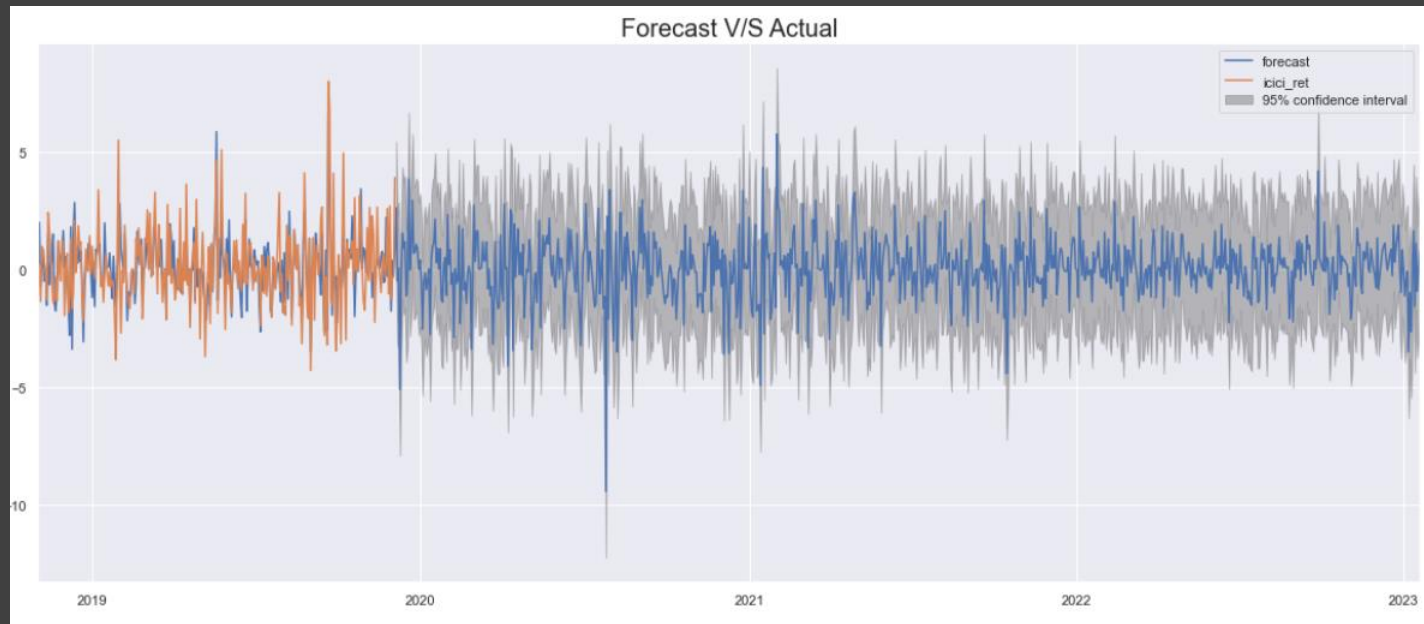
Prediction



Test for Overfitting



Returns Forecast

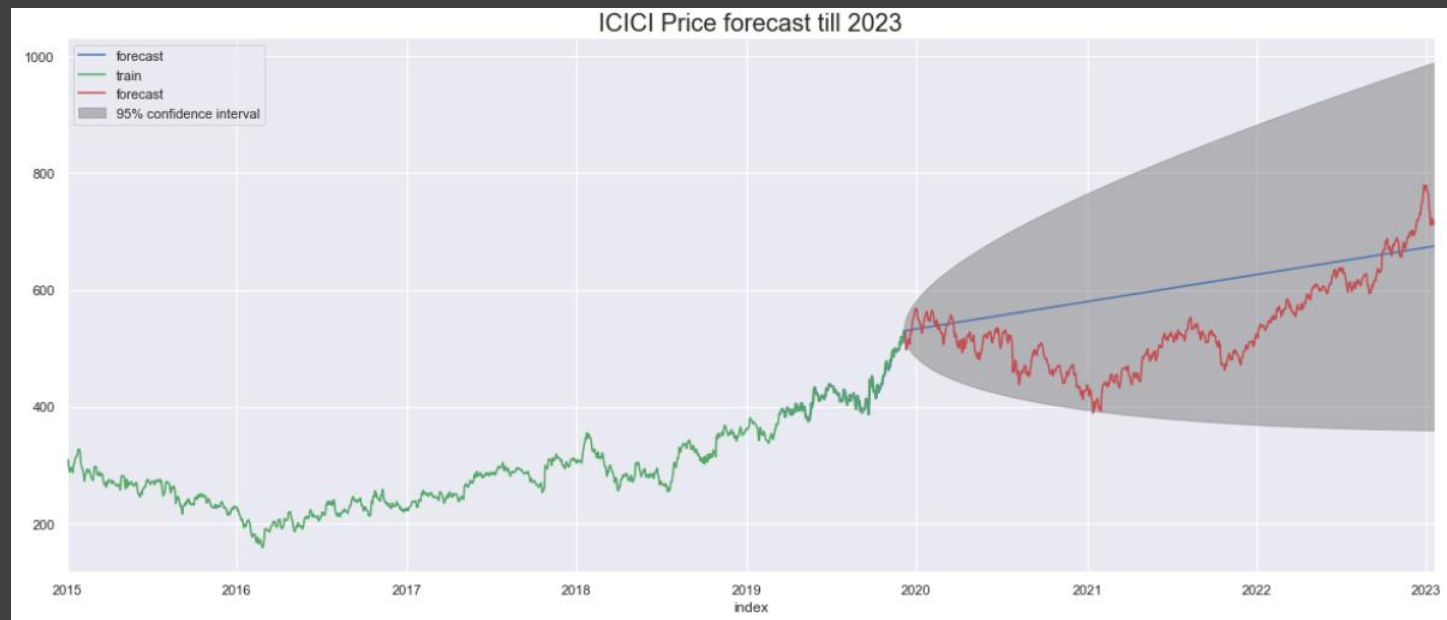


Price Forecast



Comparison

Price Forecast



Real Market Scenario



Thank You
