

GVA Prediction India

A woman in traditional Indian attire is captured from behind, dancing in a colonnade. She wears a blue and gold blouse, a white sari with gold polka dots and a gold border, and a large, round, light purple floral headpiece. Her arms are raised, and her sari is flowing around her. The setting is a series of stone arches, with sunlight filtering through, creating a warm, golden glow. The background shows greenery and a paved walkway.

Acknowledgement

The study was sponsored with financial support of NITI Aayog , Government of India and conducted by Quantta Analytics Pvt. Ltd, Kolkata.



SCOPE OF PROJECT

Quantta was given a project to identify leading indicators that provided an early warning system of the direction and change of the GVA and GDP.

We identified ~ 100 potential indicators which was finally reduced to ~ 24 that showed high confidence in predicting the direction of economy growth



DISCLAIMER

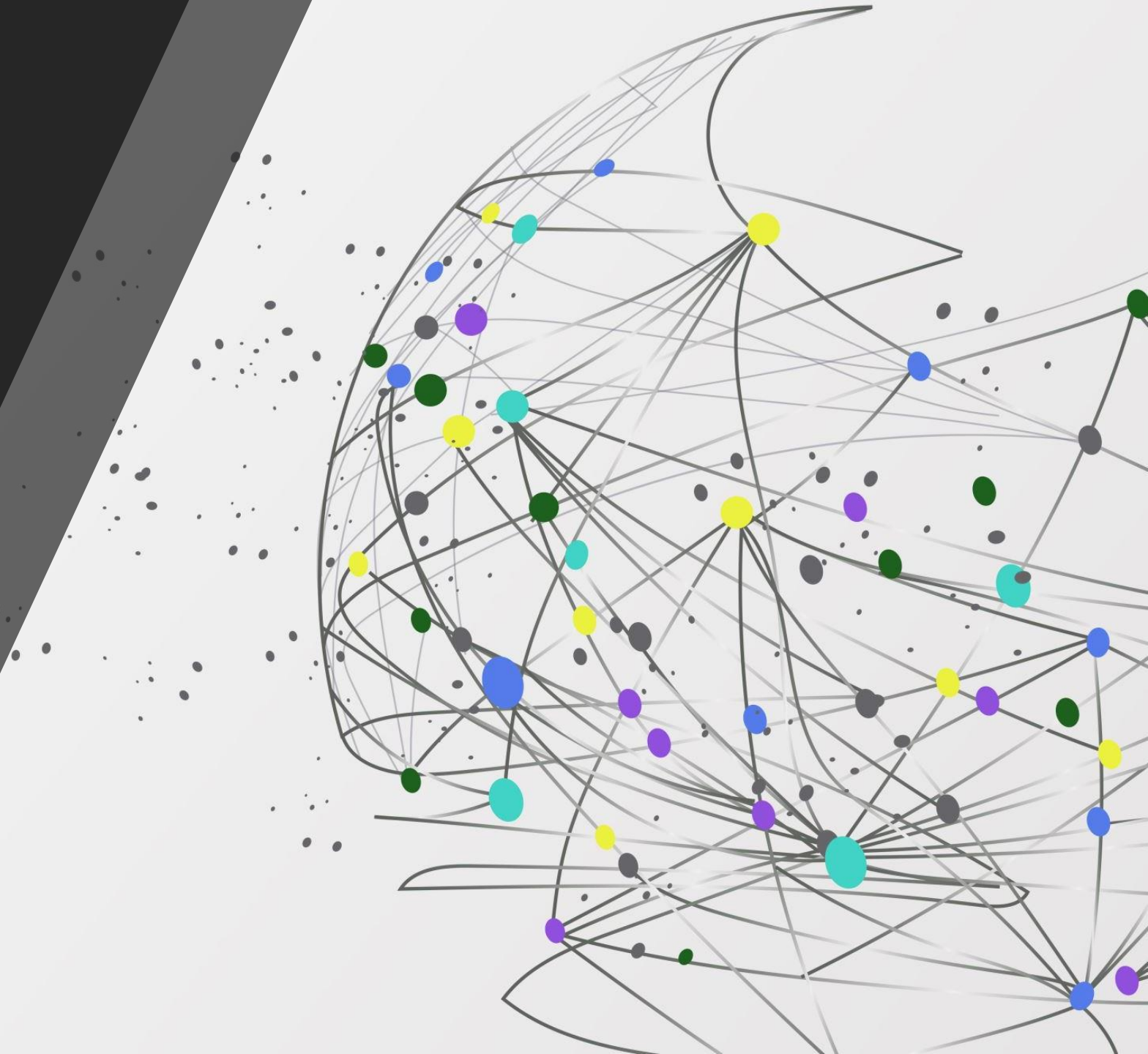
Quantta Analytics Pvt. Ltd, has received the grant under the Research Scheme of NITI Aayog, 2018 to produce the document. However, NITI Aayog shall not be held responsible for findings or opinions expressed in the document prepared. This responsibility rests with Quantta Analytics Pvt. Ltd.

SUMMARY

WE PREDICT

- **Positive 9.93% Growth** in GVA for Q3 FY 2021-22
- **Positive 8.80% Growth** in GVA for Q4 FY 2021-22

Quick Summary



Key Findings

With the normalization of livelihood, we are seeing improvement and positive signs in all sectors.

Passenger traffic of airways and railways are increasing everyday as more people are now travelling for work as well as leisure.

The export and import sector is showing a strong recovery.

The eight core sector is also showing a good recovery, the steel, cement, crude all sectors are showing an upward trending graph.

Overall the Indian economy is doing good.

Variables Identified For Further Testing

We looked at the following seven variables for predicting the GVA accurately:

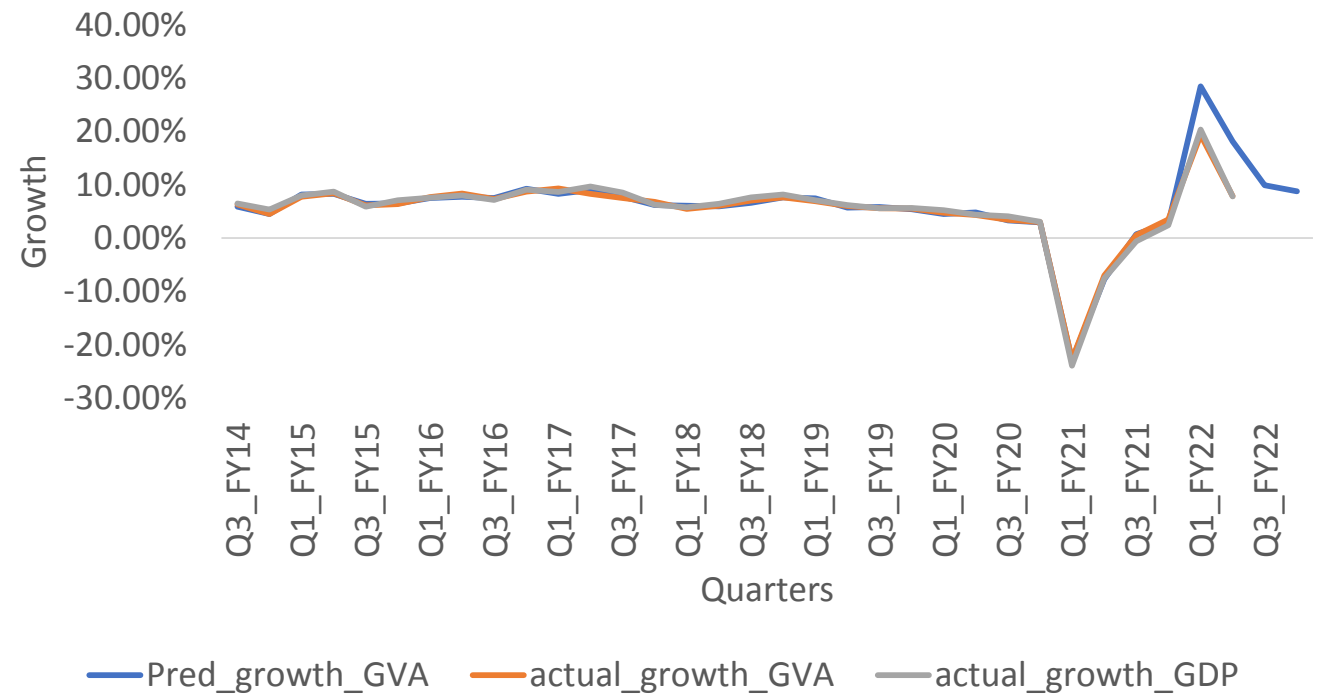
- Monthly turnover at NSE
- Market capitalization of BSE
- Monthly turnover at BSE
- Market capitalization of NSE
- Monthly average price of gold
- Monthly average price of silver
- USD INR exchange rate

• Out of the above eight variables, the following four variables gave us good prediction power and we incorporated the same:

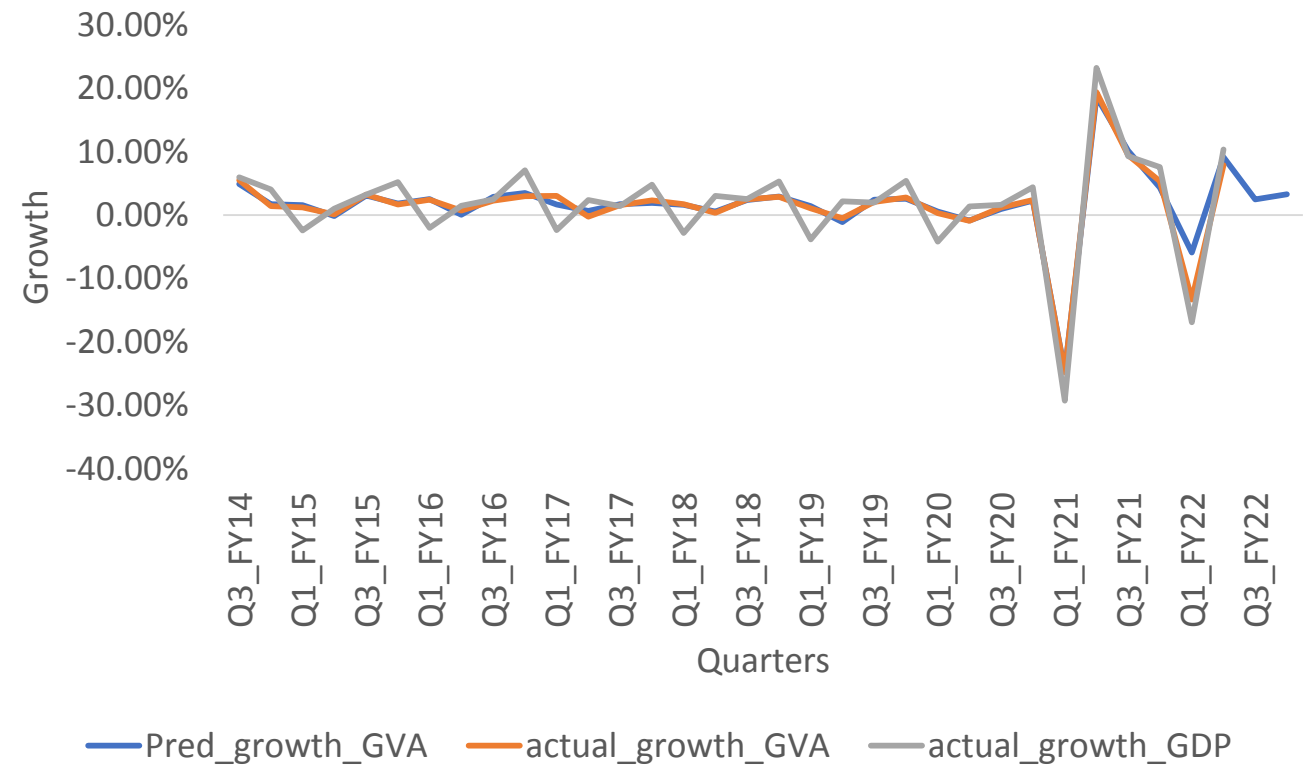
- Monthly turnover at NSE
- Market capitalization of NSE
- Monthly average price of gold
- USD INR exchange rate

For NSE, we are using total turnover as of now. Instead of turnover, we can use its components: price and volume. To get price, we can choose either one popular index or stock that can be representative of whole Indian market.

Y-O-Y Growth Actual Versus Predicted



Q-O-Q Growth Actual Versus Predicted



Y-O-Y Growth Actual Versus Predicted

Our predicted growth in GVA has closely mirrored the actual outcome. We have stress tested this over the past eight years. We believe that this provides a good early warning system for the likely change in GVA in a quarter. Some of the deviations are also because of structural changes such as Demonetization or VAT.

Quarters	Predicted Growth in GVA	Actual Growth in GVA
Q1_FY15	8.19%	7.75%
Q2_FY15	8.30%	8.45%
Q3_FY15	6.43%	6.14%
Q4_FY15	6.53%	6.39%
Q1_FY16	7.55%	7.70%
Q2_FY16	7.75%	8.36%
Q3_FY16	7.51%	7.33%
Q4_FY16	9.25%	8.72%
Q1_FY17	8.34%	9.32%
Q2_FY17	9.02%	8.29%
Q3_FY17	7.80%	7.53%
Q4_FY17	6.18%	6.83%
Q1_FY18	6.09%	5.48%
Q2_FY18	5.94%	6.11%
Q3_FY18	6.60%	7.07%
Q4_FY18	7.66%	7.63%
Q1_FY19	7.49%	6.95%
Q2_FY19	5.75%	6.06%
Q3_FY19	5.82%	5.62%
Q4_FY19	5.46%	5.55%
Q1_FY20	4.55%	4.76%
Q2_FY20	4.81%	4.33%
Q3_FY20	3.31%	3.47%
Q4_FY20	2.98%	3.04%
Q1_FY21	-22.89%	-22.81%
Q2_FY21	-7.70%	-7.00%
Q3_FY21	0.73%	0.58%
Q4_FY21	2.80%	3.50%
Q1_FY22	28.49%	19.36%
Q2_FY22	18.15%	7.88%
Q3_FY22	9.93%	
Q4_FY22	8.80%	

Q-O-Q Growth Actual Versus Predicted

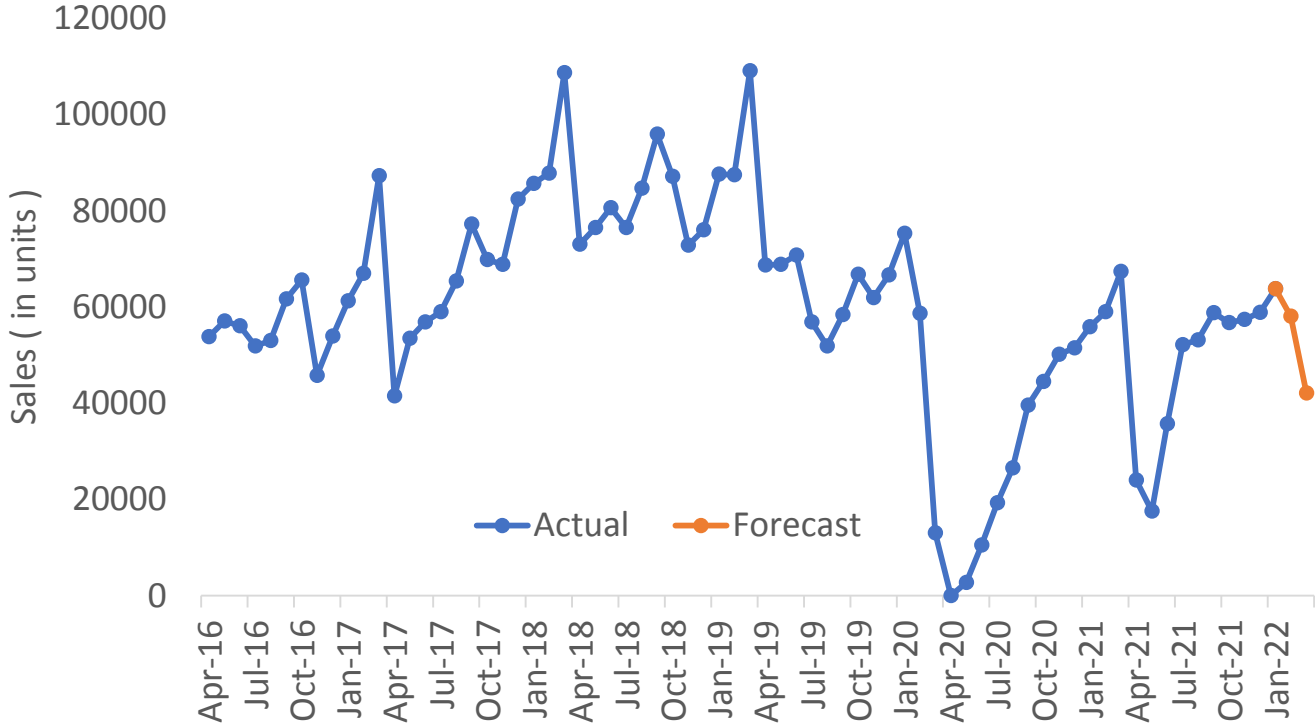
Our predicted **growth in GVA has closely mirrored the actual outcome.** We have stress tested this over the past thirty two quarters. We believe that this provides a good early warning system for the likely change in GVA in a quarter. Some of the deviations are also because of structural changes such as Demonetization or VAT.

Quarters	Predicted Growth in GVA	Actual Growth in GVA
Q1_FY15	1.57%	1.22%
Q2_FY15	-0.12%	0.09%
Q3_FY15	3.12%	3.26%
Q4_FY15	1.83%	1.69%
Q1_FY16	2.55%	2.46%
Q2_FY16	0.07%	0.70%
Q3_FY16	2.88%	2.28%
Q4_FY16	3.48%	3.01%
Q1_FY17	1.69%	3.03%
Q2_FY17	0.69%	-0.24%
Q3_FY17	1.73%	1.56%
Q4_FY17	1.93%	2.34%
Q1_FY18	1.61%	1.73%
Q2_FY18	0.55%	0.35%
Q3_FY18	2.37%	2.48%
Q4_FY18	2.94%	2.87%
Q1_FY19	1.45%	1.09%
Q2_FY19	-1.08%	-0.49%
Q3_FY19	2.43%	2.07%
Q4_FY19	2.59%	2.80%
Q1_FY20	0.57%	0.33%
Q2_FY20	-0.83%	-0.89%
Q3_FY20	0.96%	1.22%
Q4_FY20	2.27%	2.38%
Q1_FY21	-24.69%	-24.84%
Q2_FY21	18.71%	19.40%
Q3_FY21	10.18%	9.48%
Q4_FY21	4.37%	5.34%
Q1_FY22	-5.88%	-13.32%
Q2_FY22	9.16%	7.92%
Q3_FY22	2.51%	
Q4_FY22	3.30%	

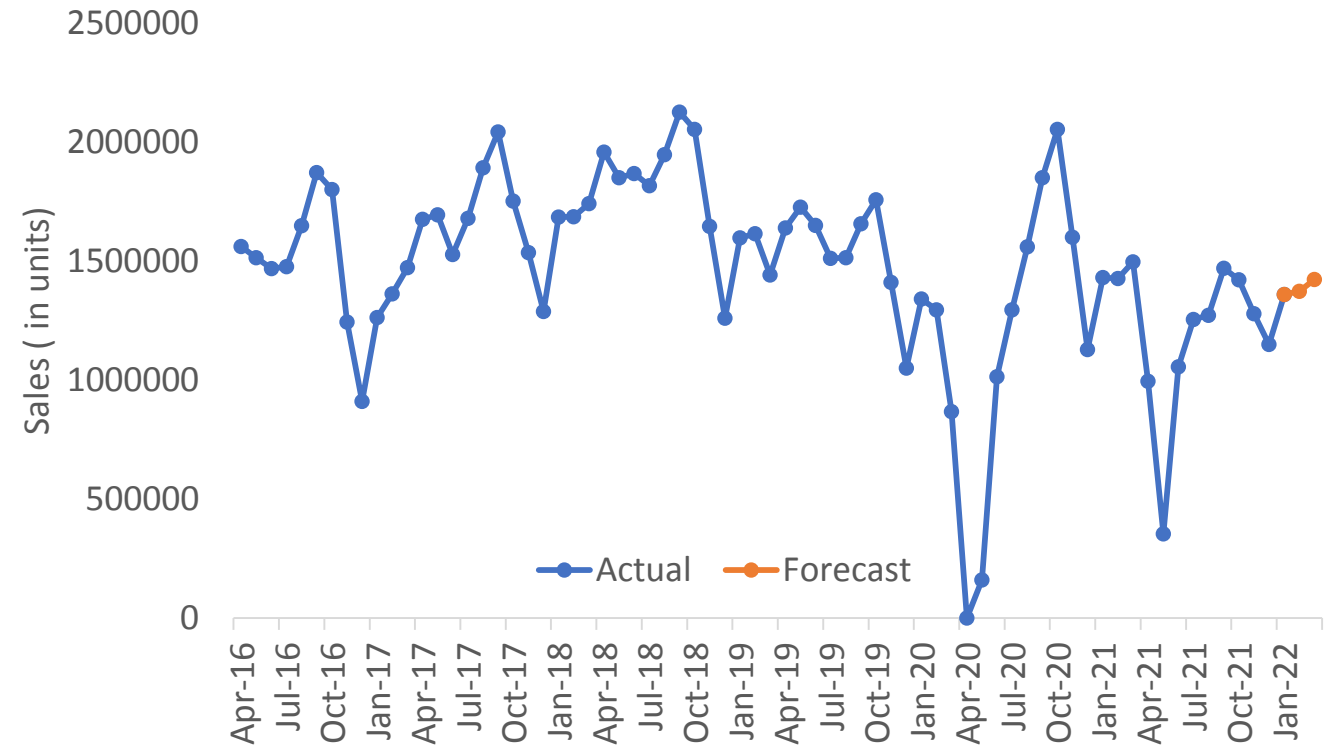


**AUTOMOBILE –
COMMERCIAL & TWO WHEELER**

Commercial Vehicle Sale Volume with Prediction



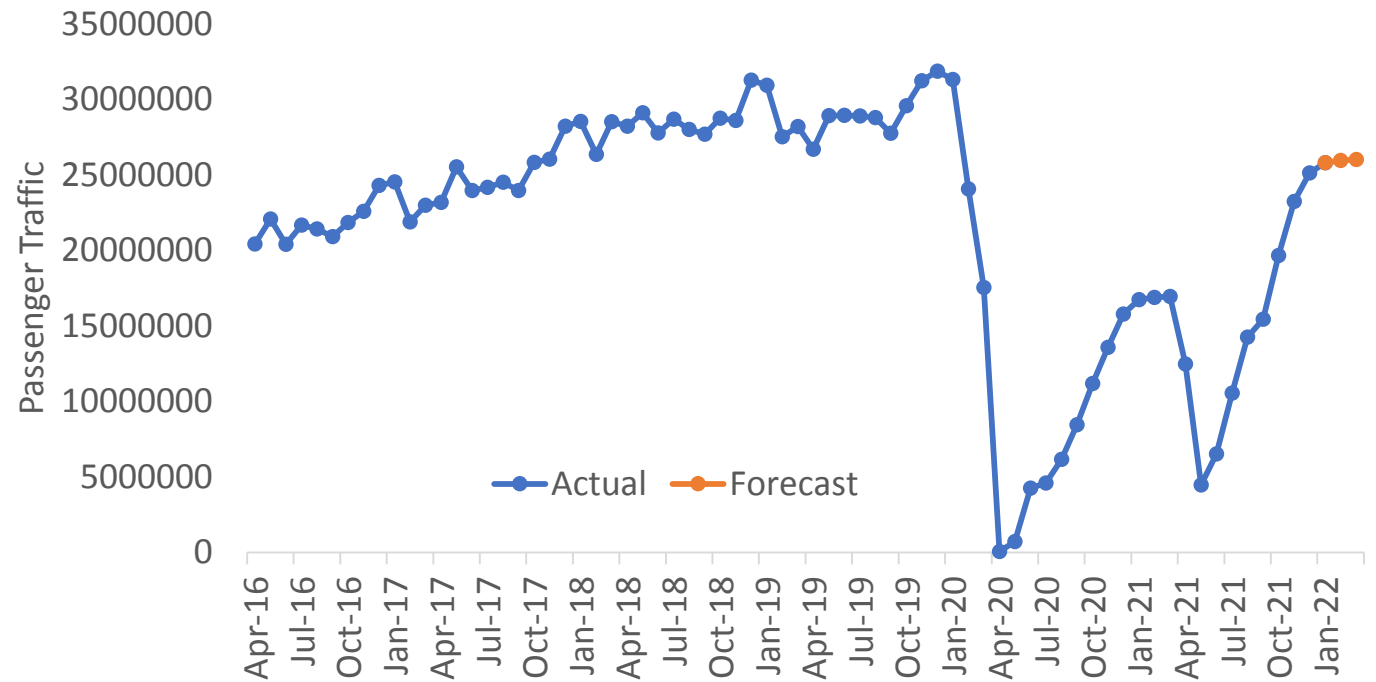
Two Wheeler Vehicle Sale Volume with Prediction



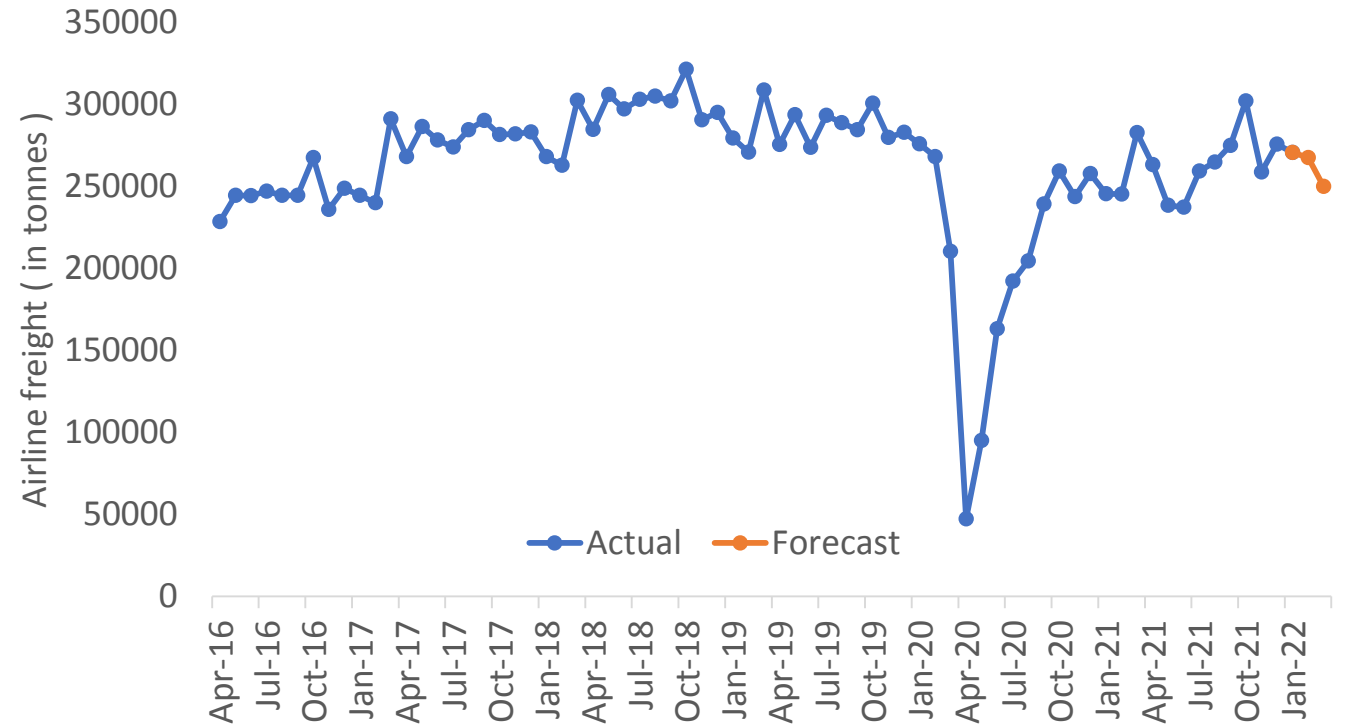


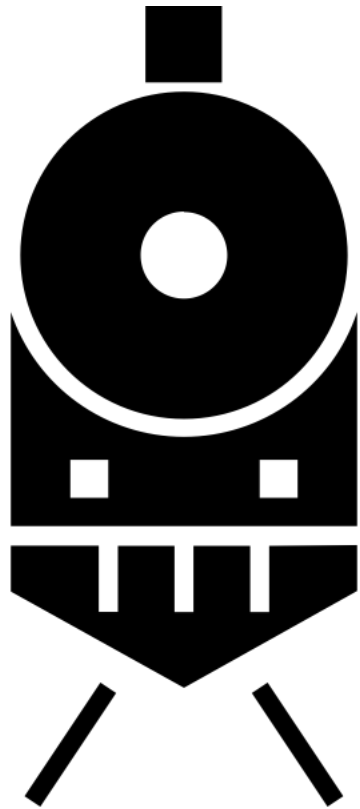
**AIRLINE TRAFFIC –
PASSENGER & FREIGHT**

Airline Passenger Traffic with Prediction



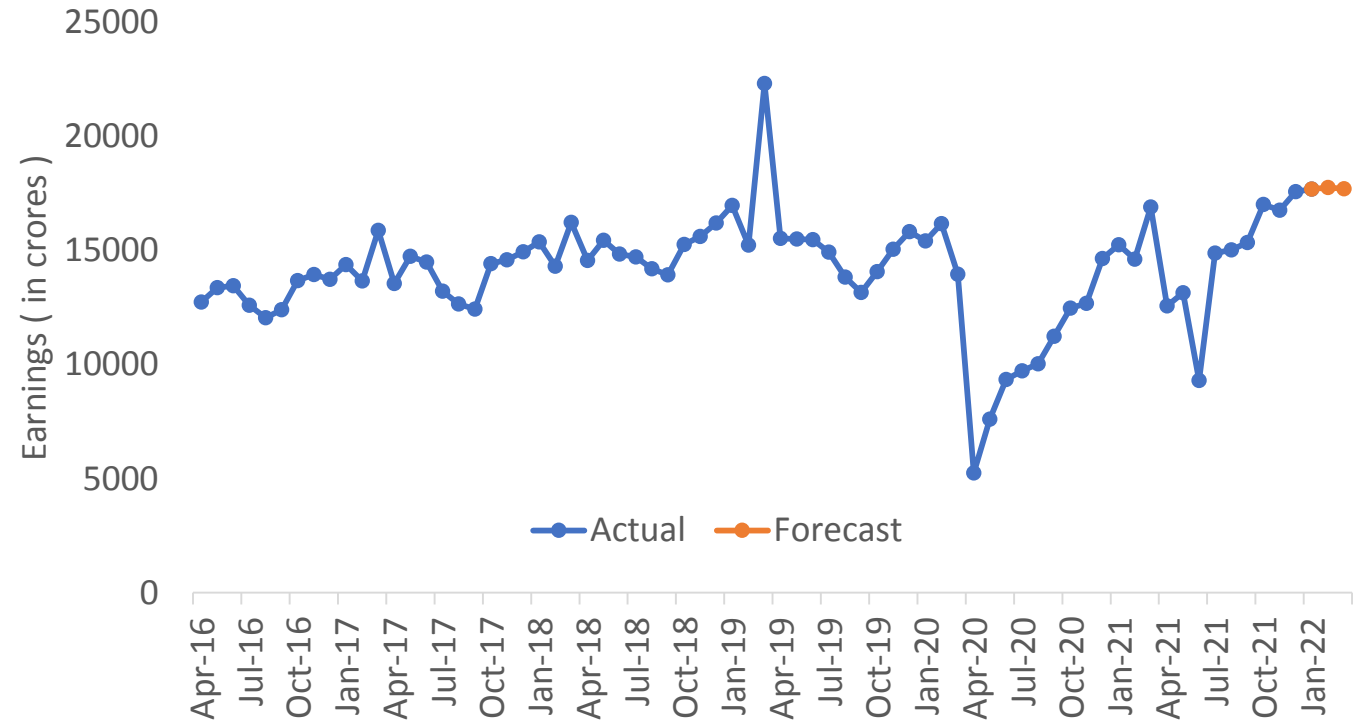
Airline Freight Volume with Prediction



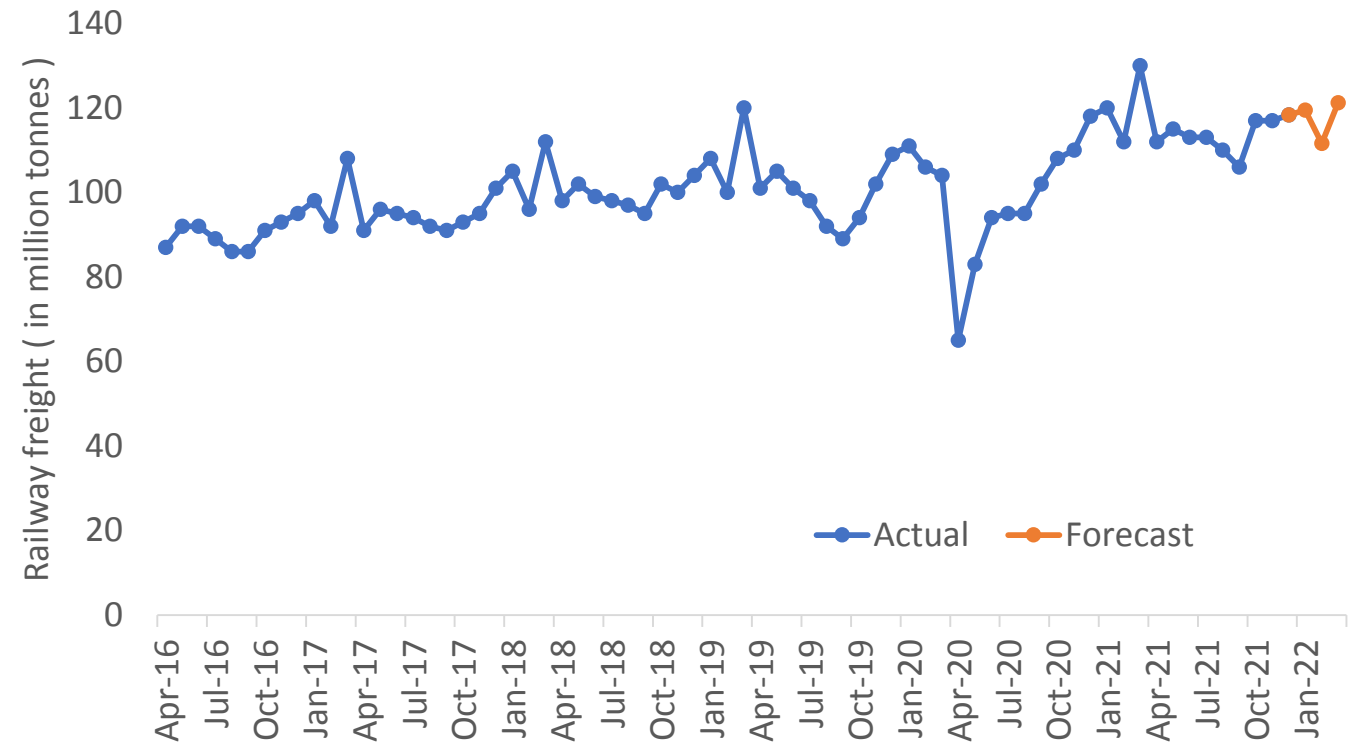


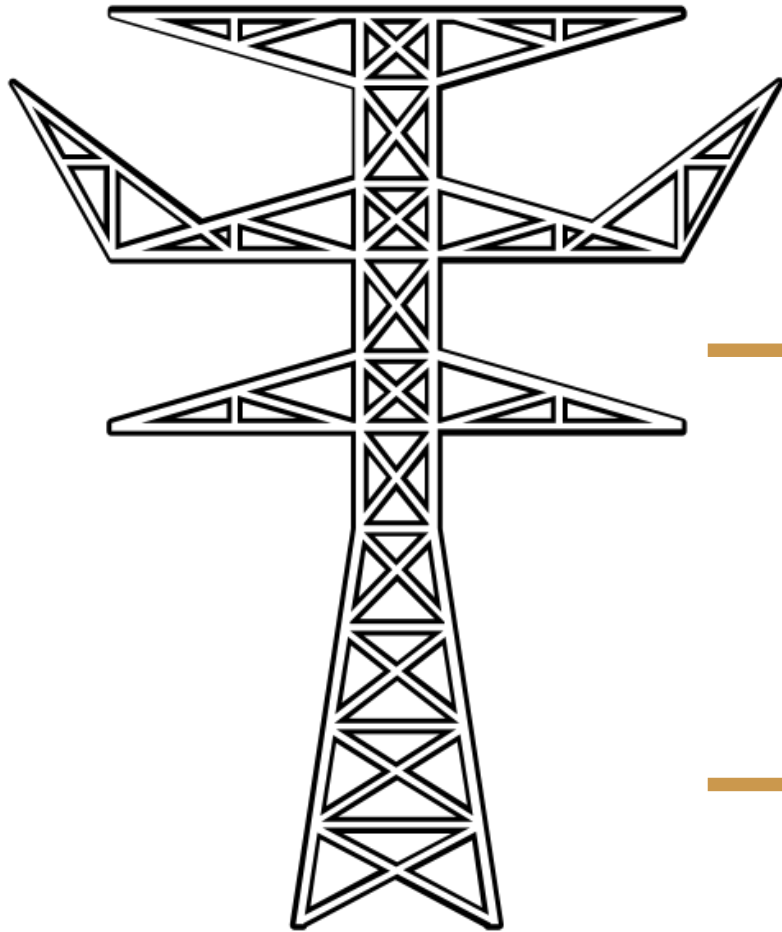
**RAILWAY –
FREIGHT & EARNINGS**

Railway Earning with Prediction



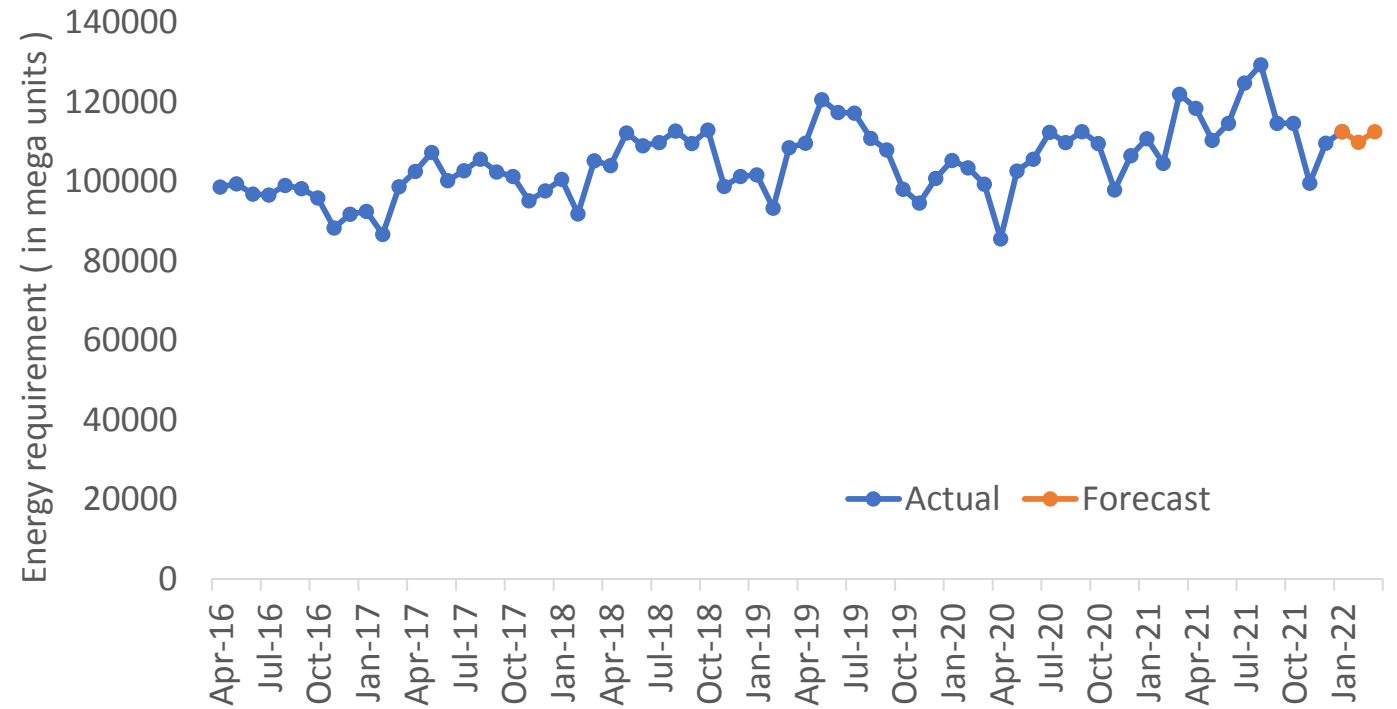
Railway Freight Traffic with Prediction



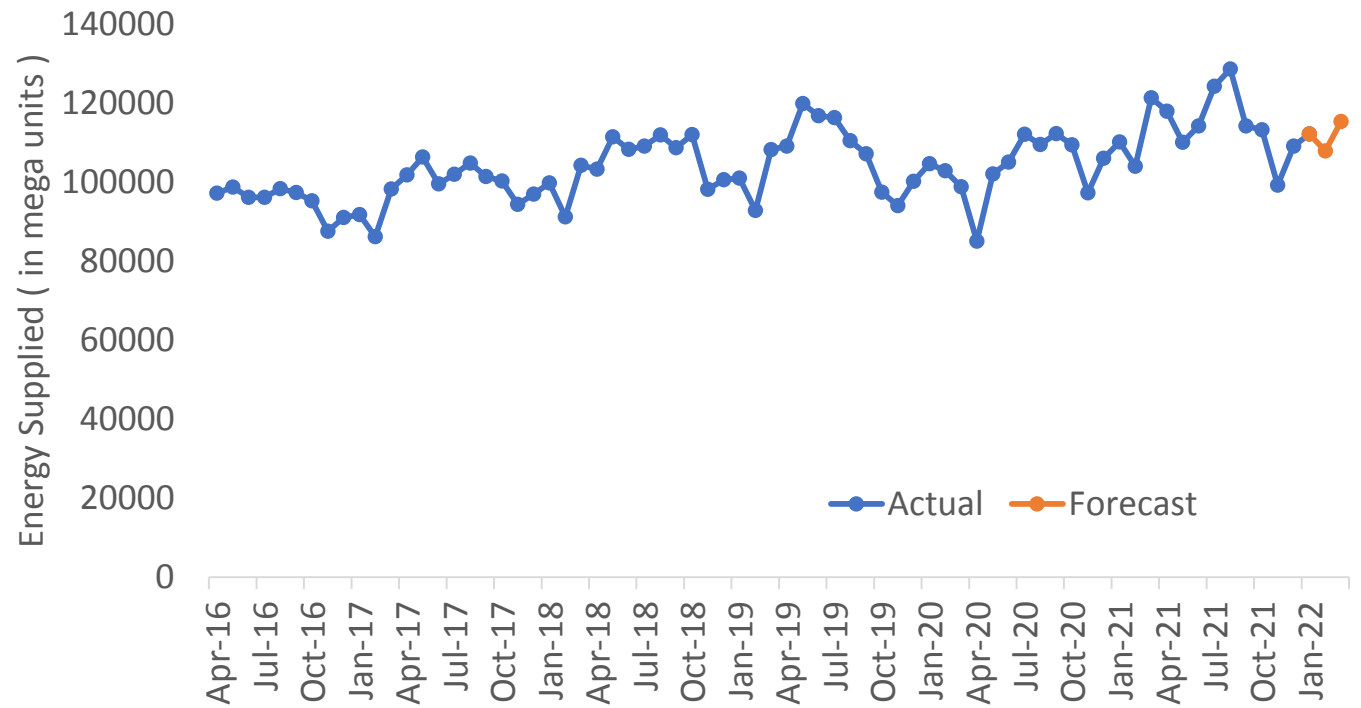


**POWER
DEMAND & SUPPLY**

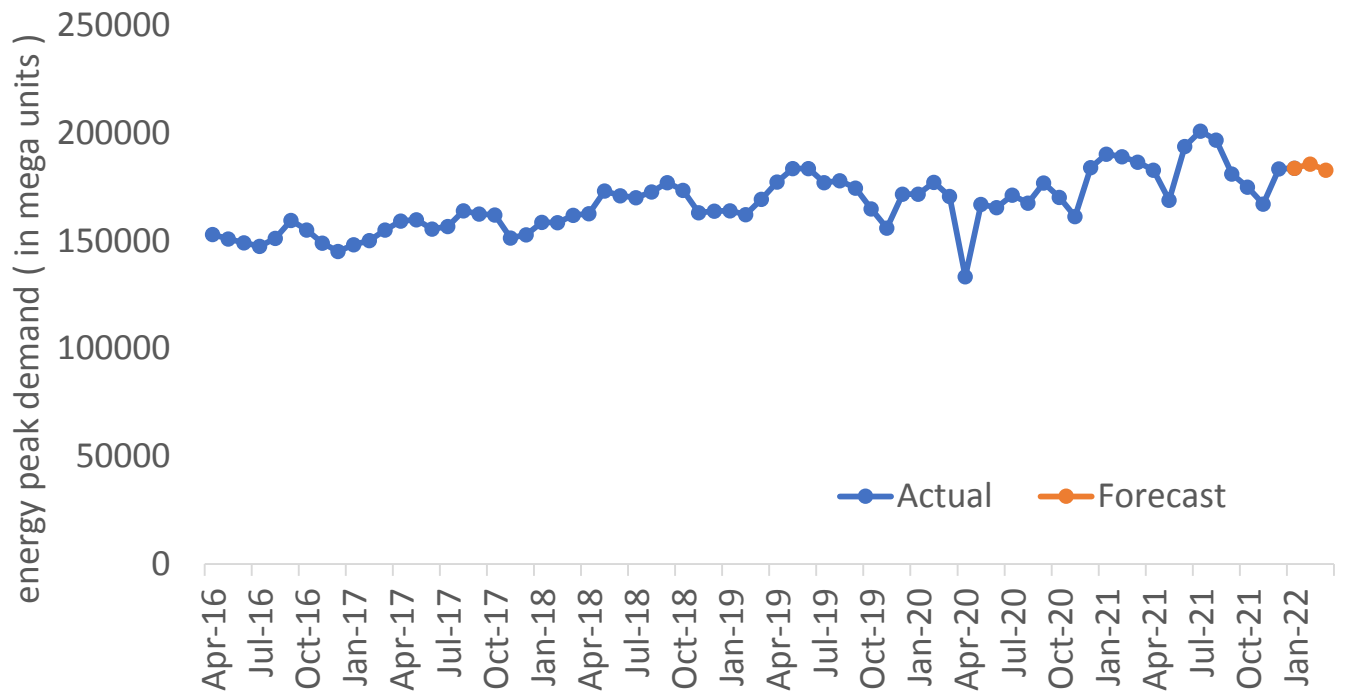
Energy Requirement in Mega Units



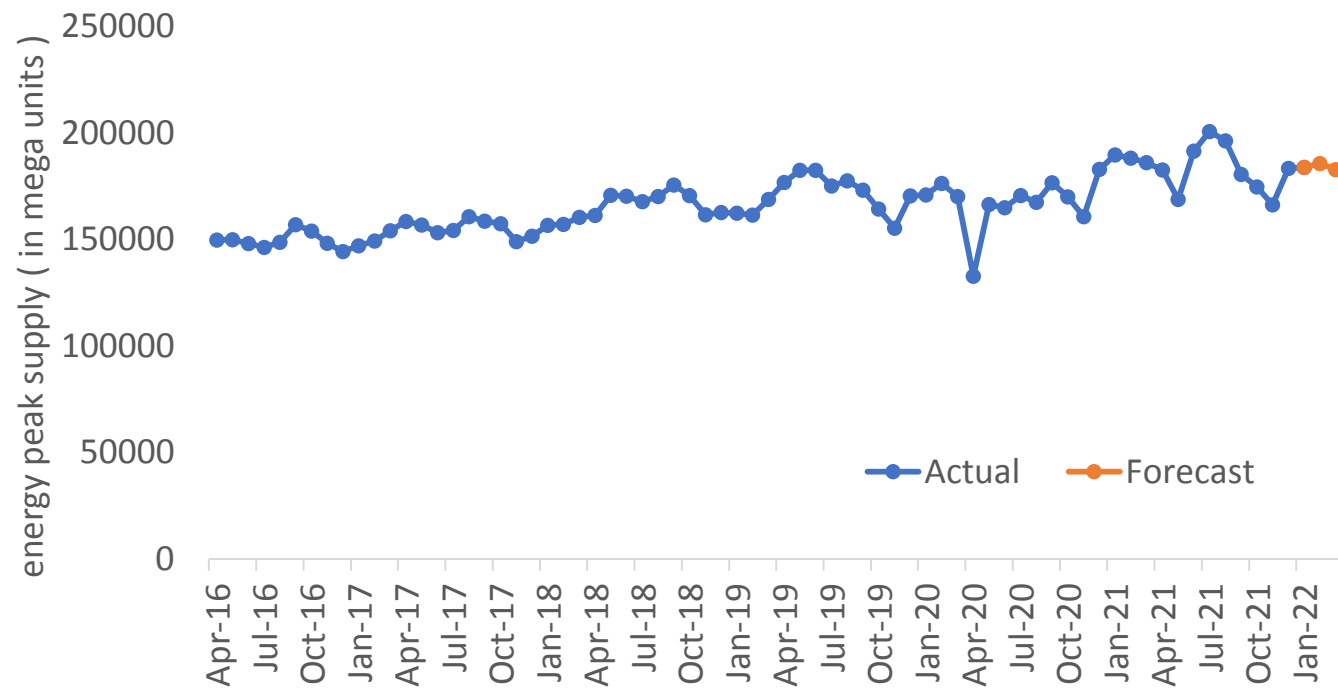
Energy Supplied in Mega Units

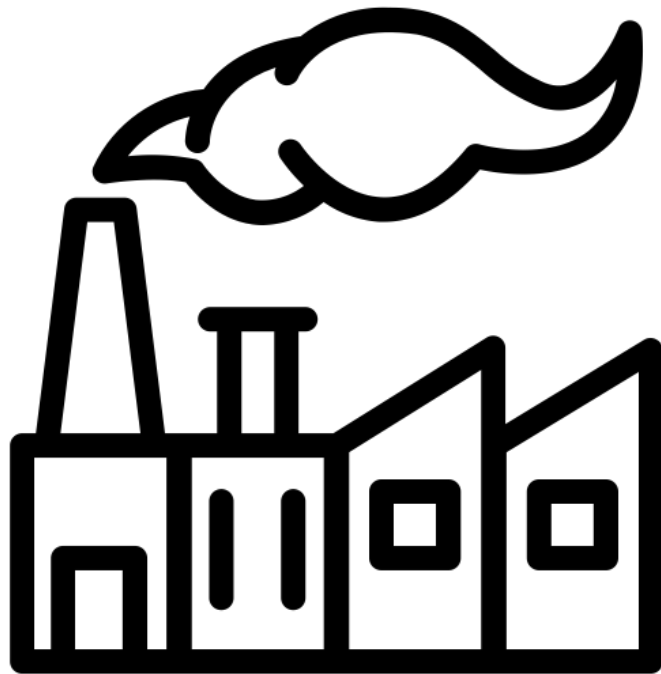


Energy Peak Demand



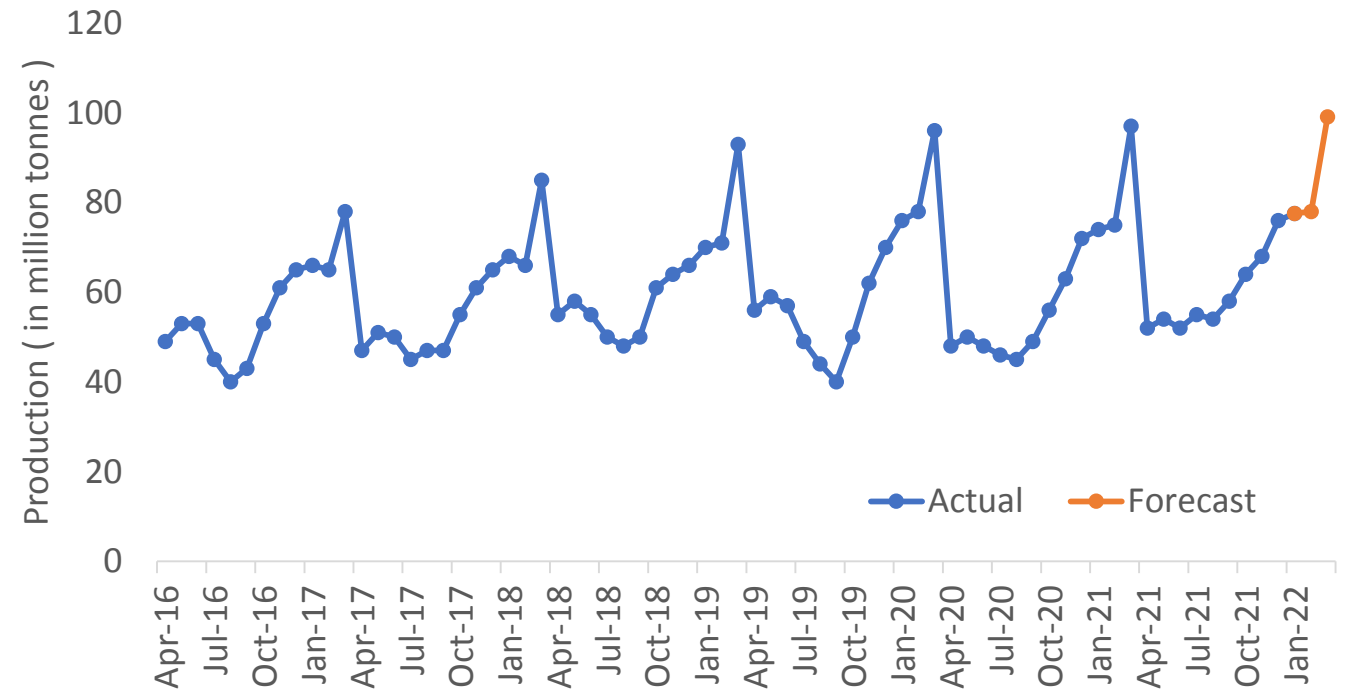
Energy Peak Supply



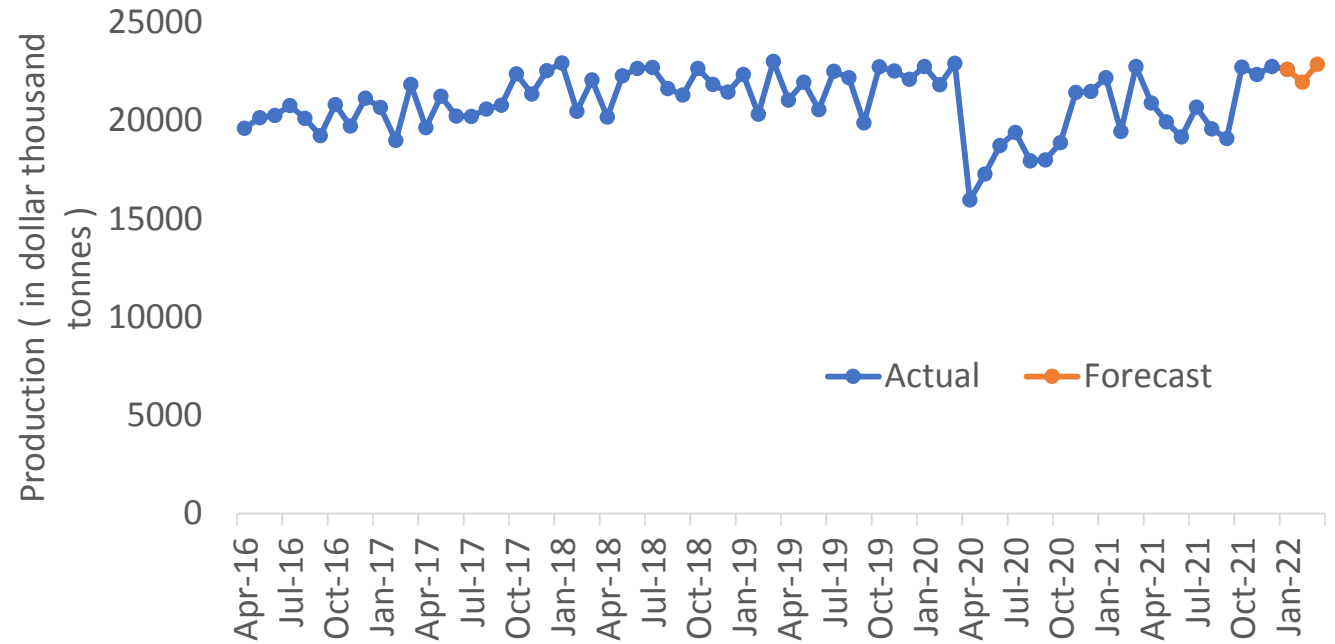


MANUFACTURING

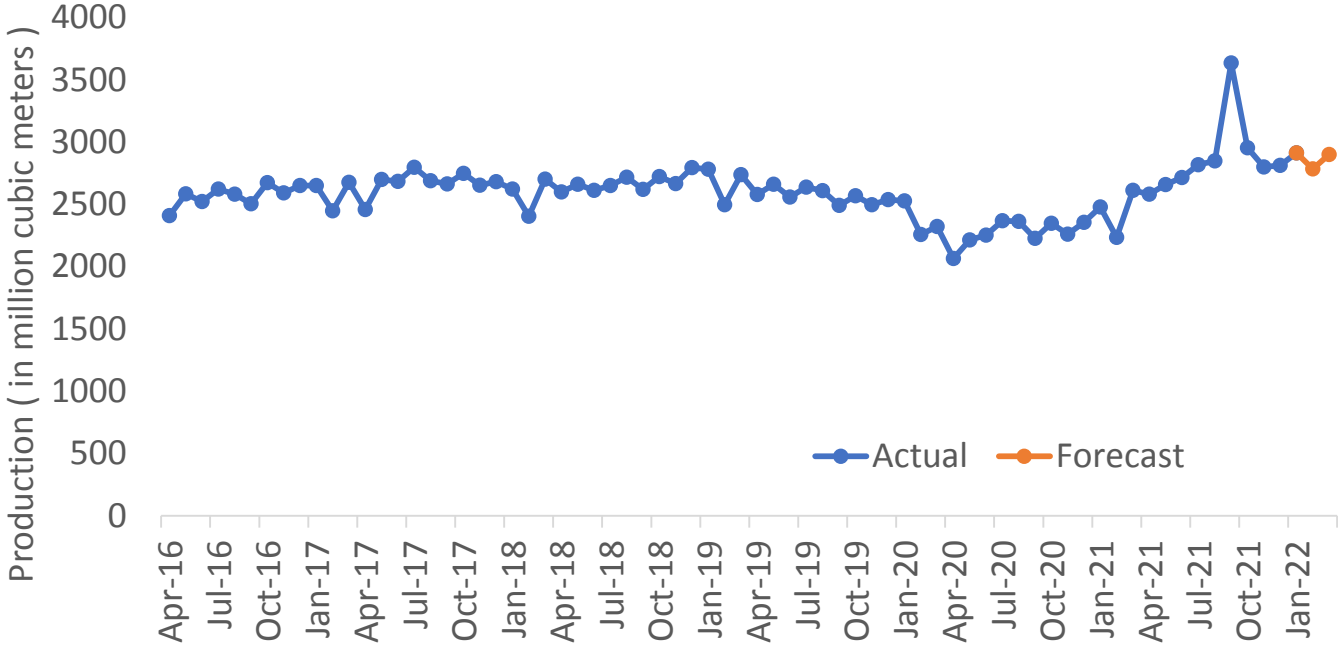
Coal Production in Million Tonnes with Prediction



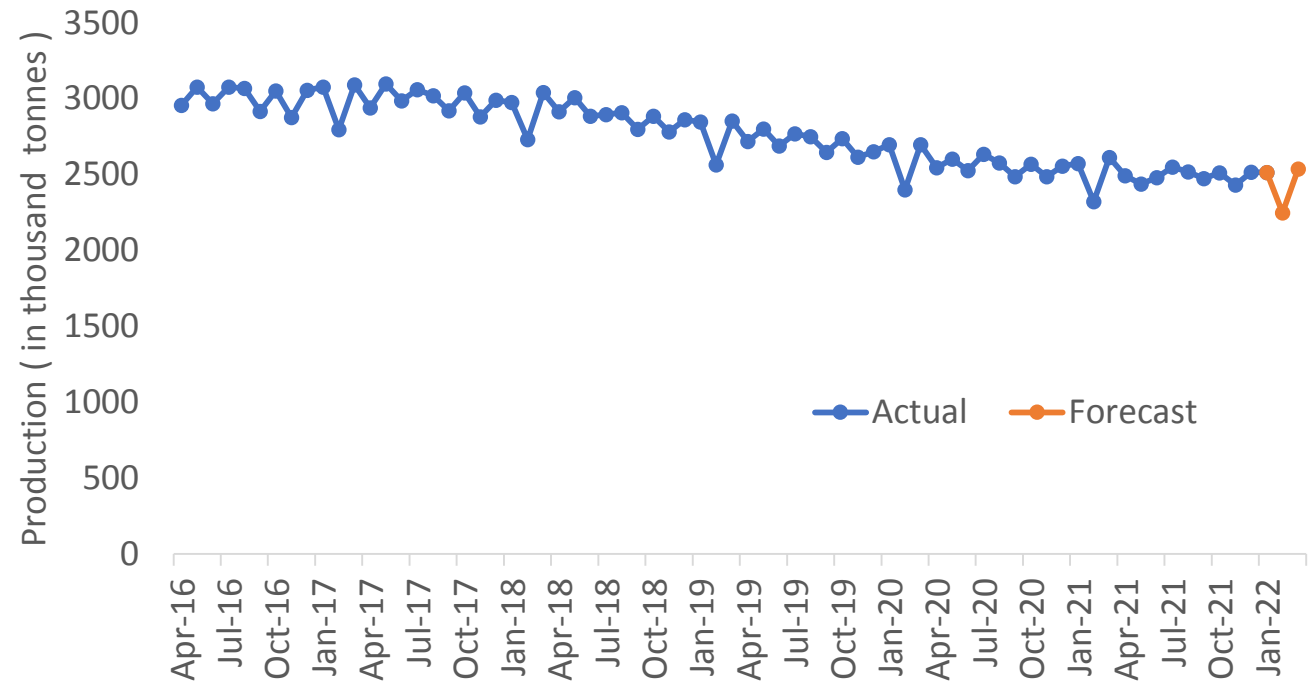
Petroleum Production in Tonnes with Prediction



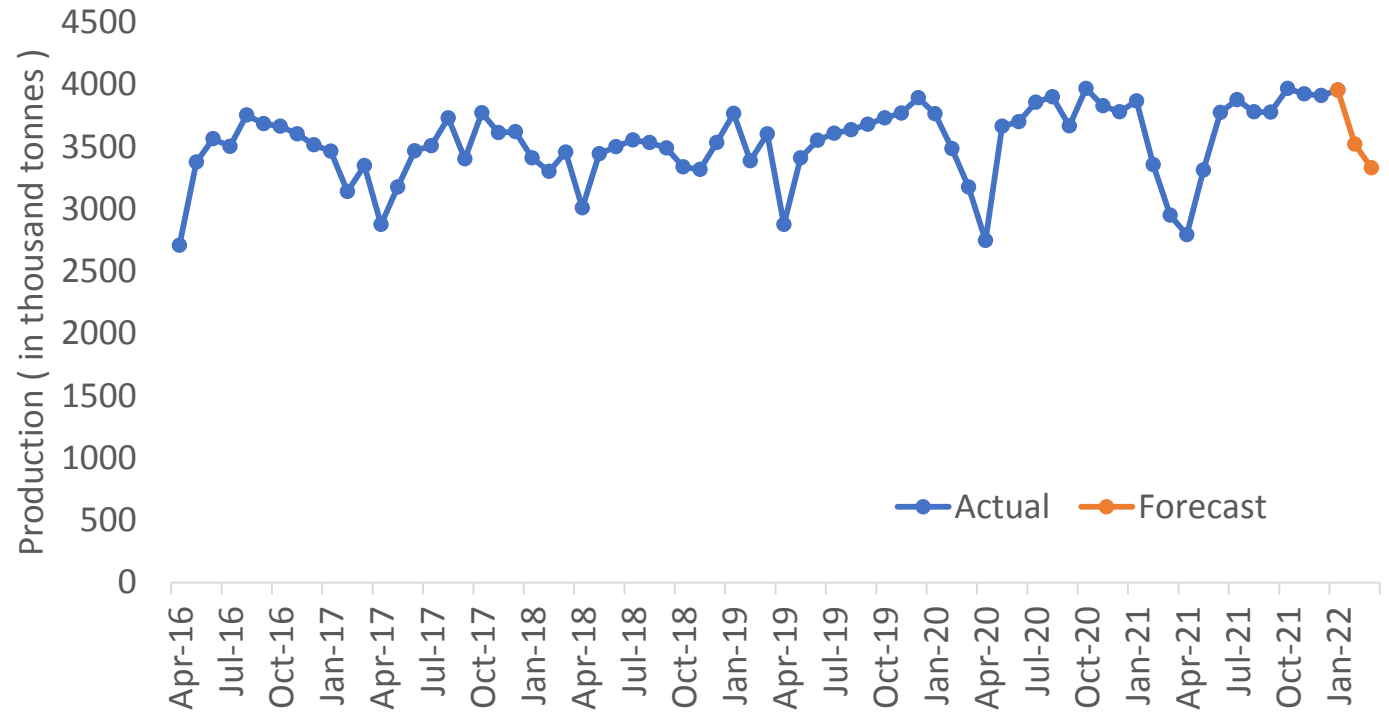
Natural Gas Production with Prediction



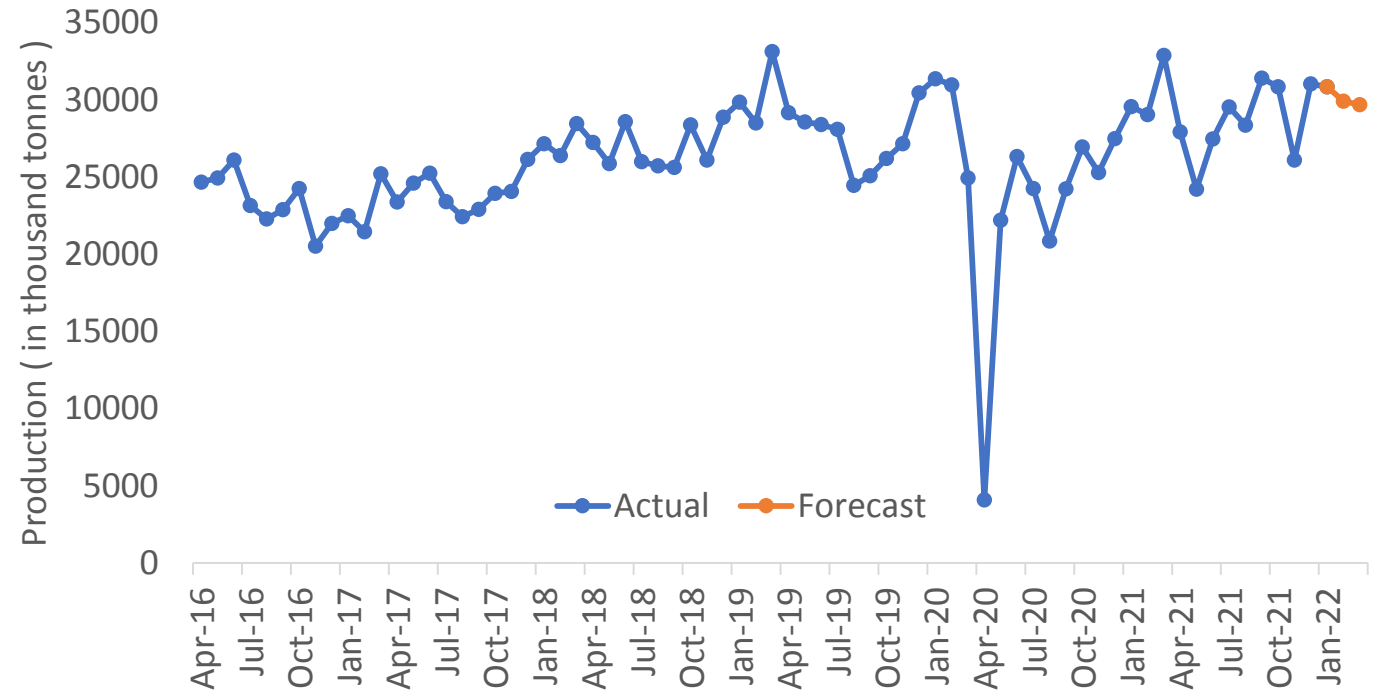
Crude Oil Production with Prediction



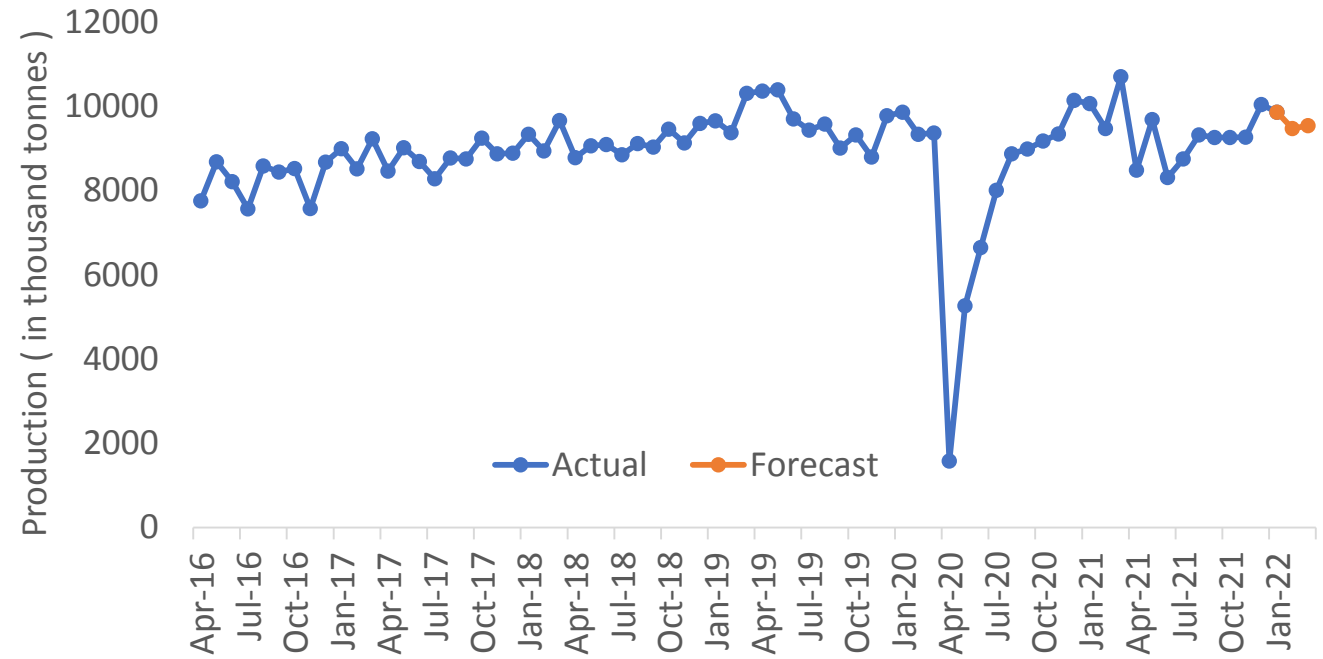
Fertilizer Production with Prediction

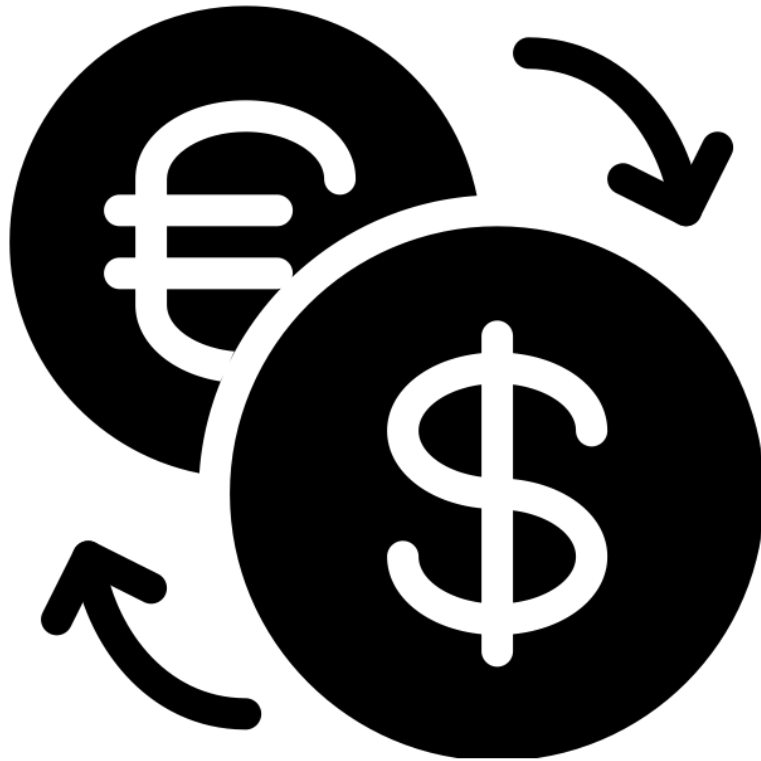


Cement Production with Prediction



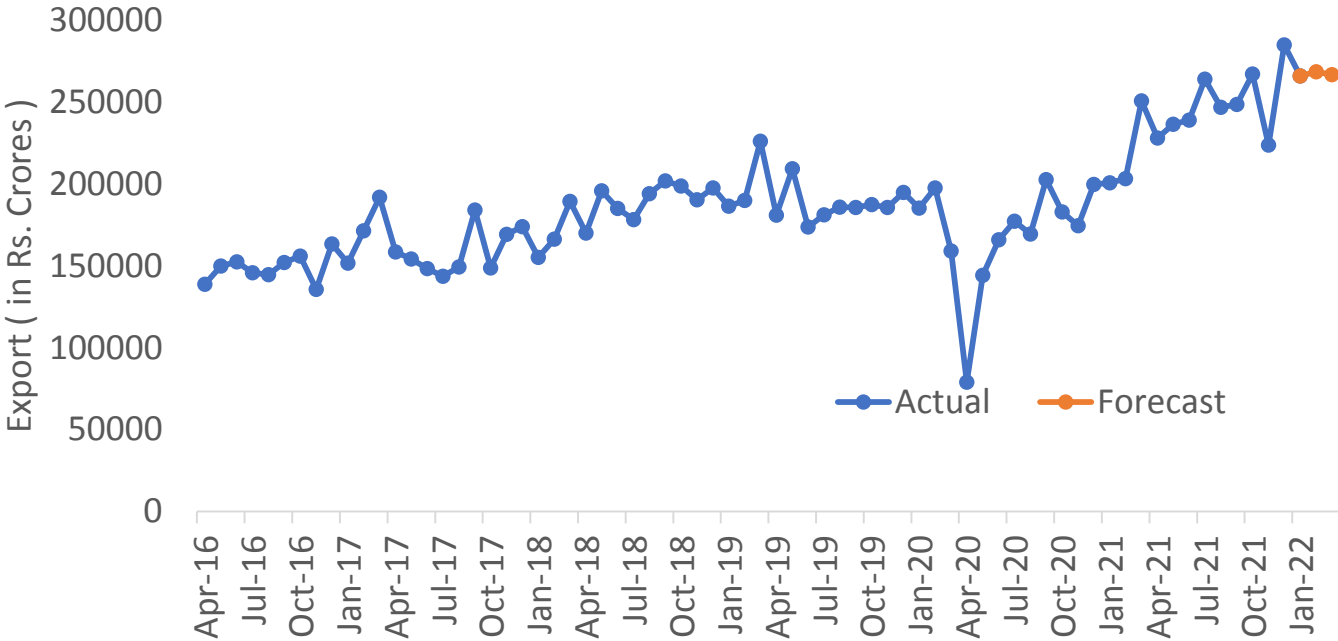
Steel Production with Prediction



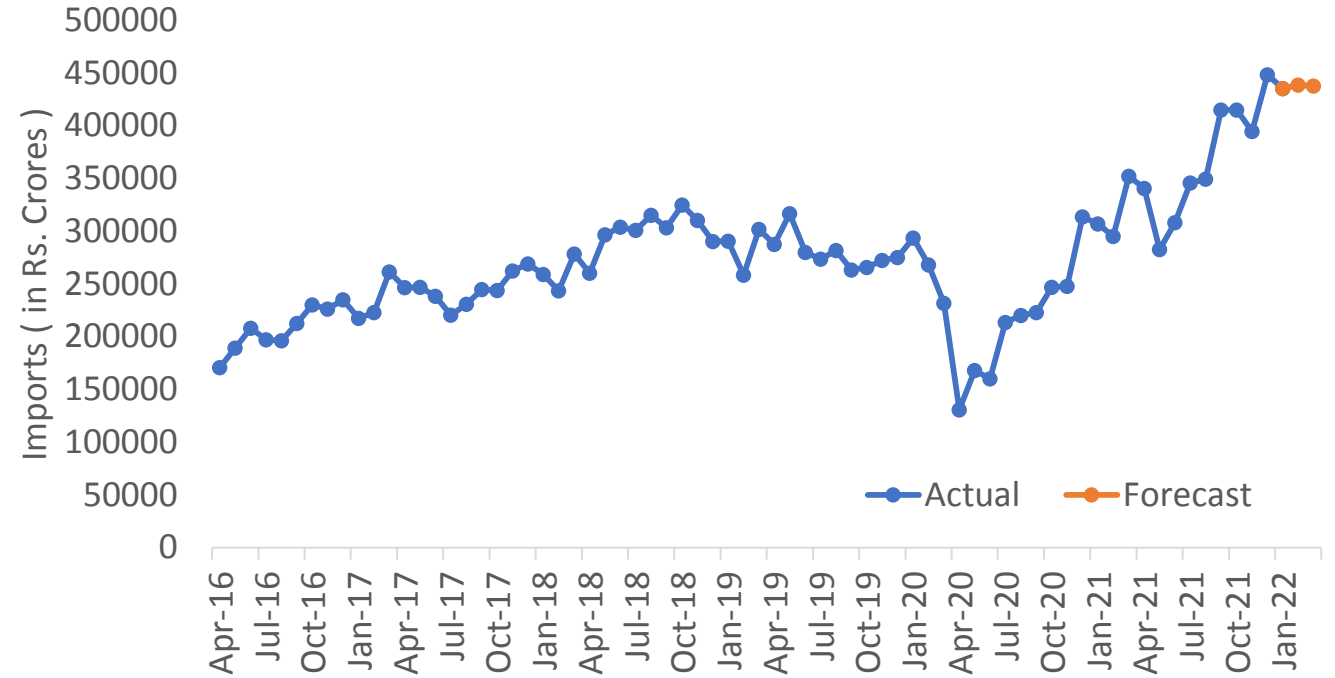


**IMPORT & EXPORT –
GOODS & SERVICES**

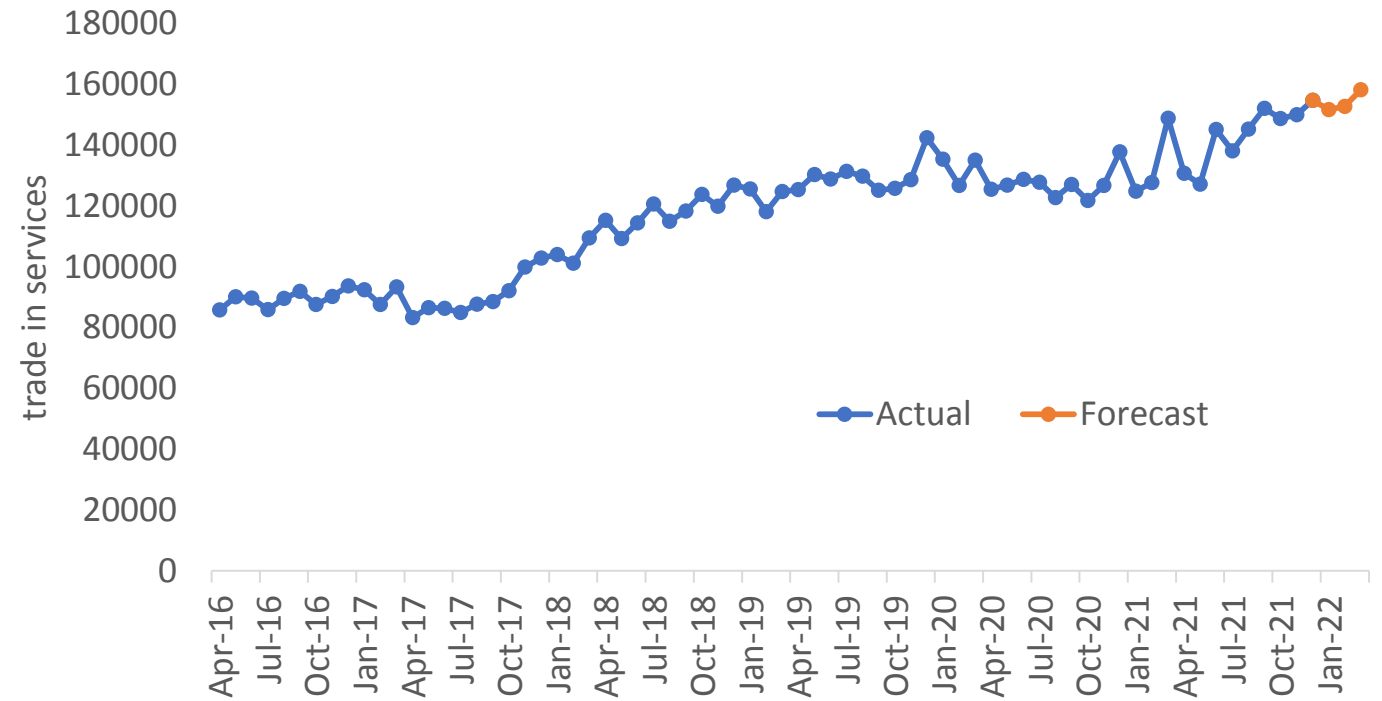
Export with Prediction



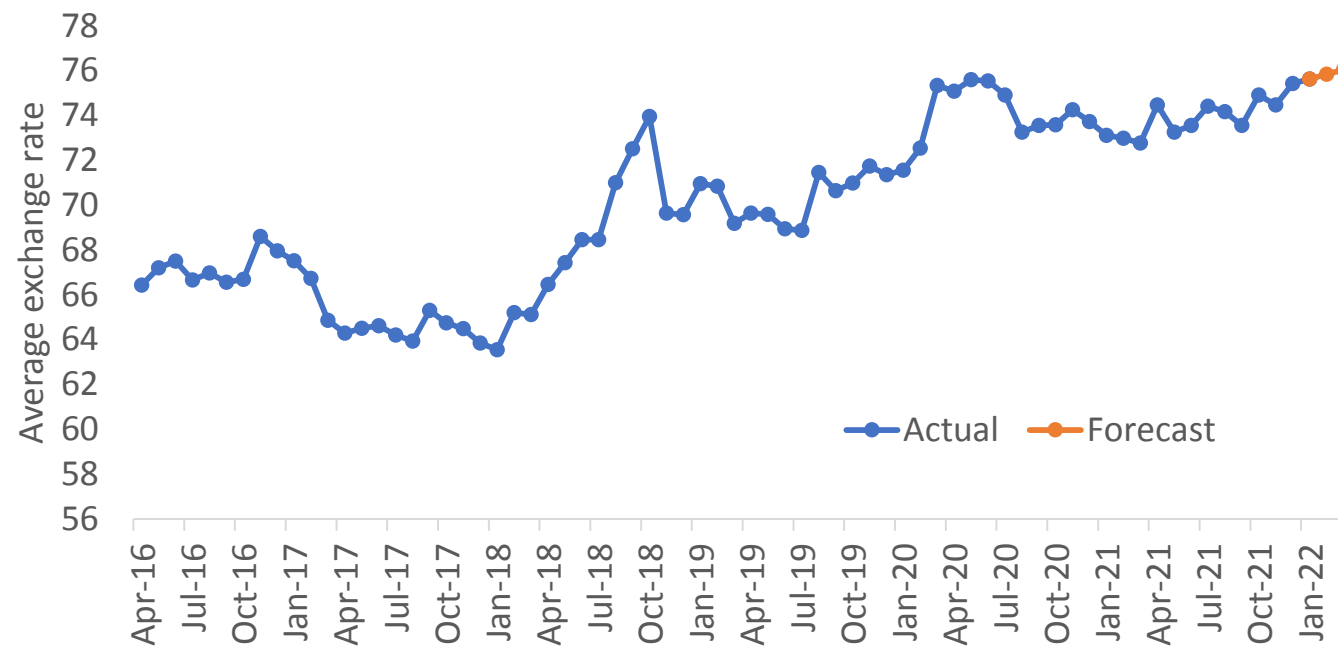
Import with Prediction

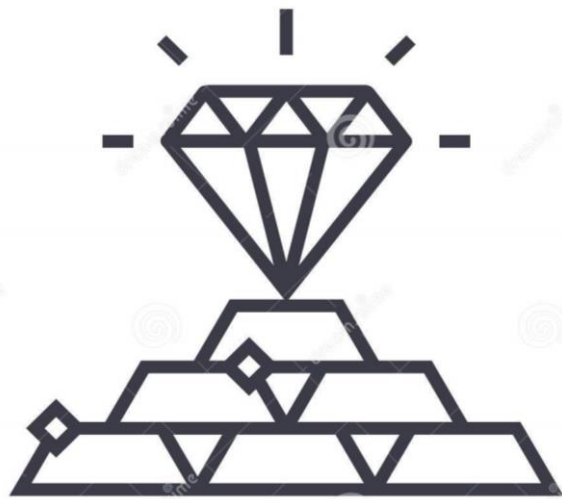


Trade in Service with Prediction



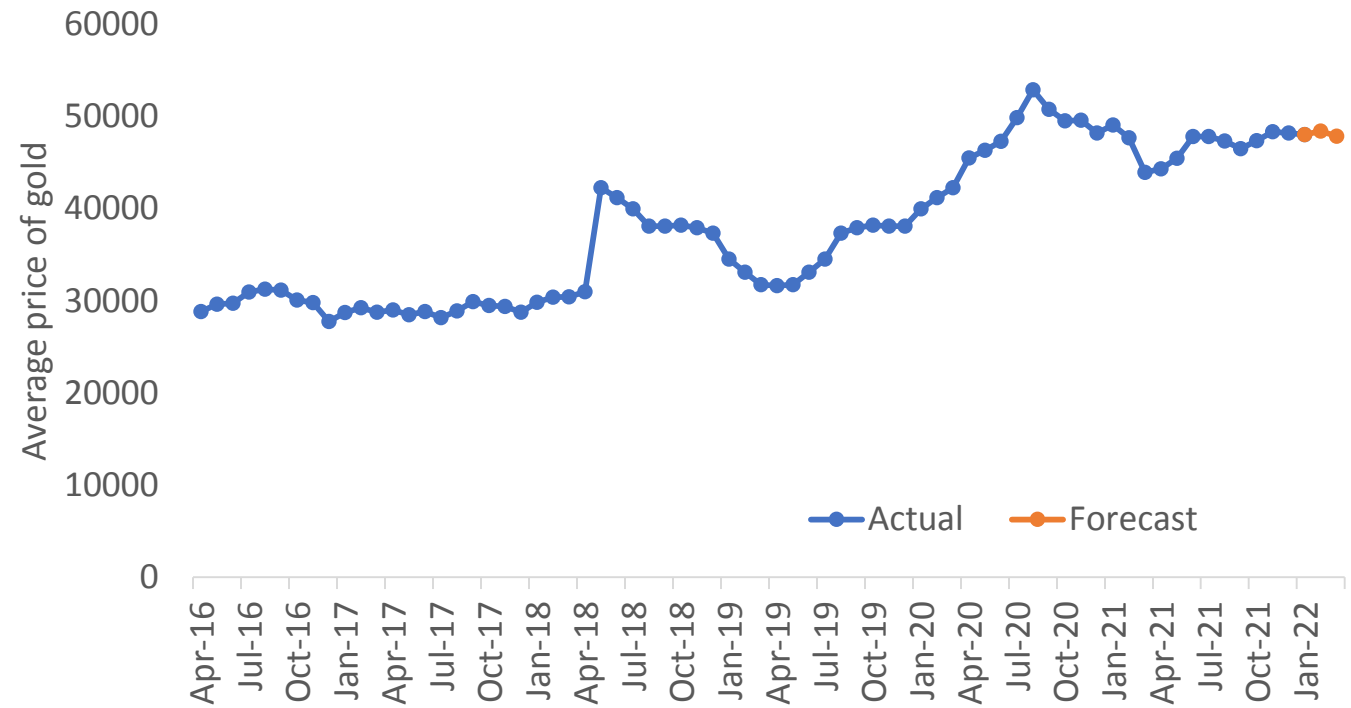
USD INR exchange rate

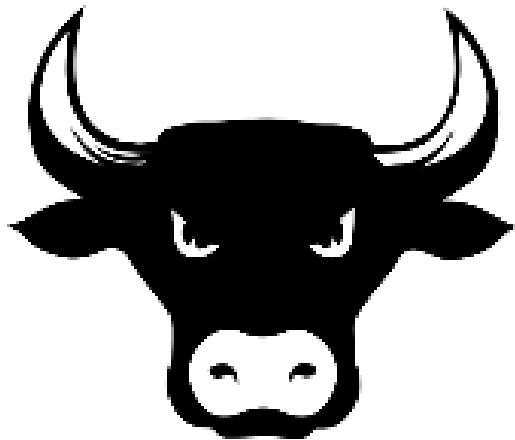




COMMODITY – GOLD

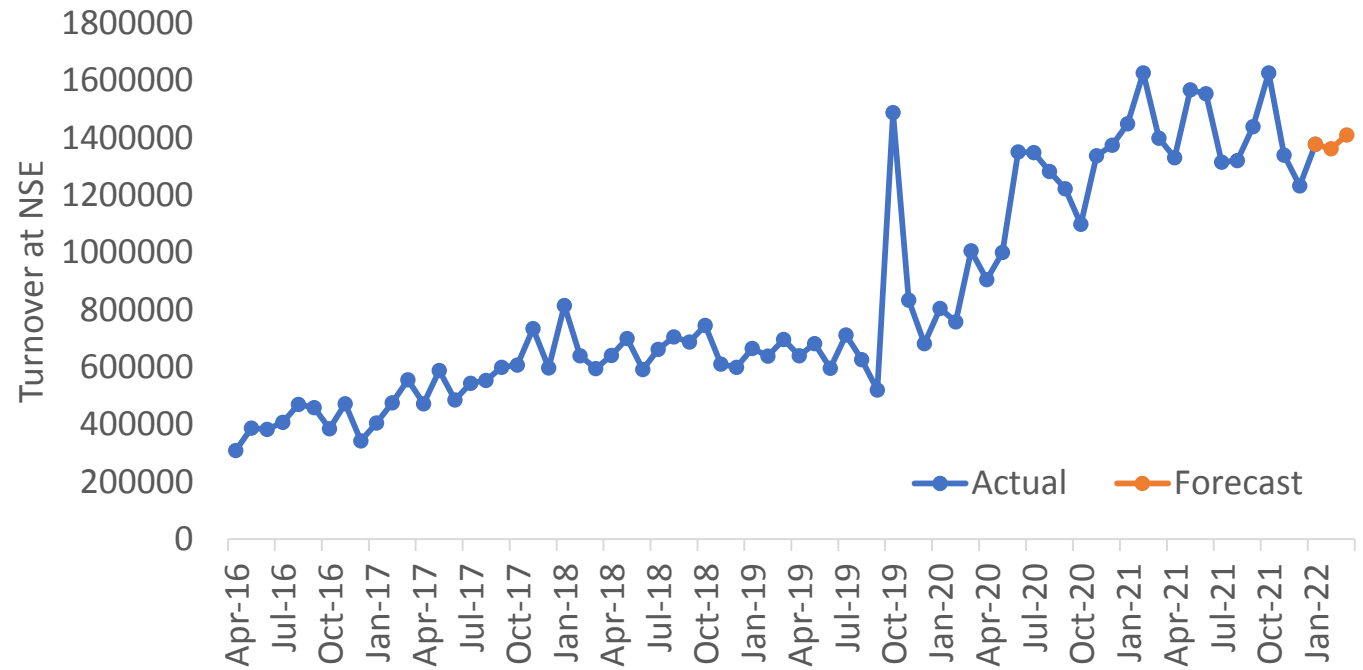
Average price of gold with Prediction



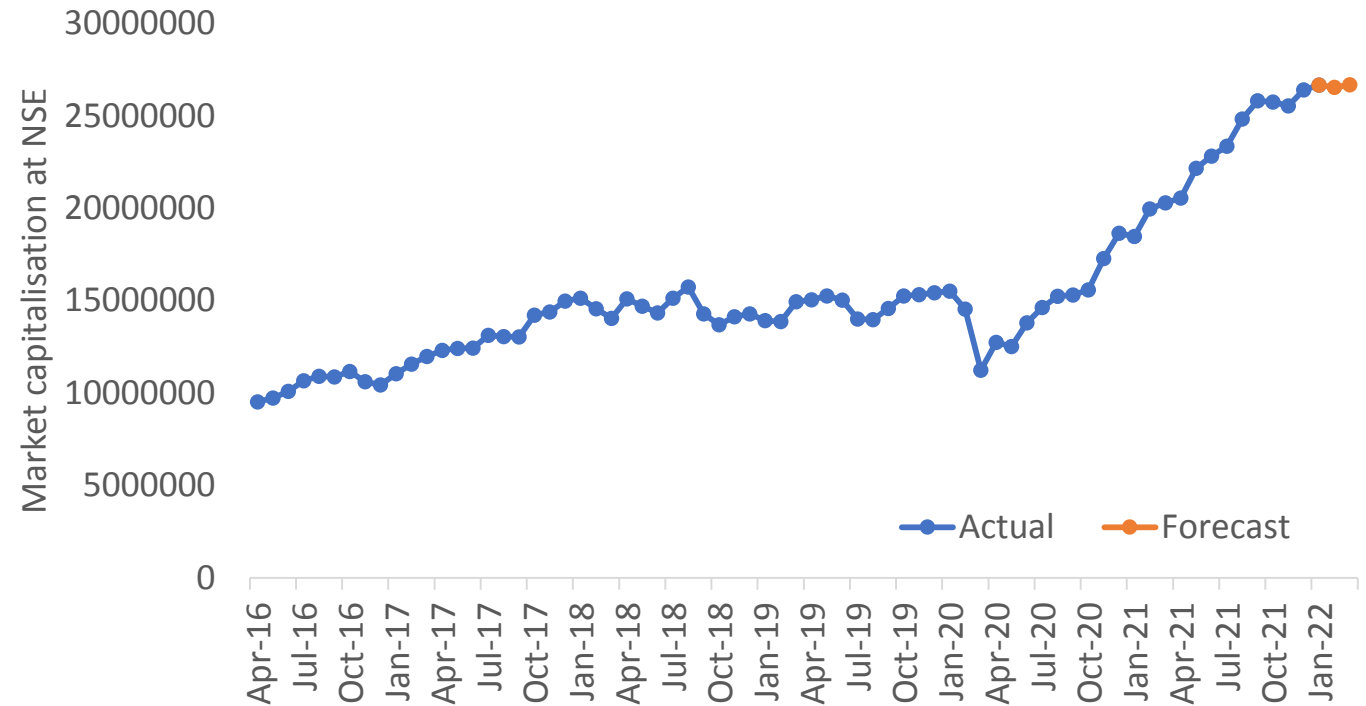


**STOCK MARKET – TURNOVER
AND MARKET CAPITALISATION**

Turnover at NSE with prediction



Market Capitalization of NSE with Prediction





QUANTTA MODEL

Sectors Selected for Analysis



AUTOMOBILE



AVIATION



COMMODITY



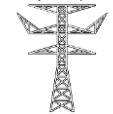
STOCK MARKETS



BANKING SECTOR



RAILWAYS



POWER



MANUFACTURING SECTOR



EXPORT & IMPORT OF GOODS & SERVICES

Indicators Used for Analysis with Time Lag



Indicators	Lag 1	Lag 2	Lag 3	Lag 4
Commercial Vehicles Sales	0.085	0.100	0.004	0.239
Two Wheelers Sales	0.193	0.534	0.932	0.430
Production of Coal in Million Tonnes	0.812	0.078	0.091	0.490
Production of Crude Oil in Thousand Tonnes	0.407	0.033	0.001	0.006
Production of Natural Gas in Million cubic meters	0.005	0.004	0.003	0.113
Production of Petroleum Refinery Products Dollar in Thousand Tonnes	0.046	0.040	0.271	0.484
Production of Fertilizers in Thousand Tonnes	0.000	0.060	0.152	0.582
Production of Steel in Thousand Tonnes	0.130	0.838	0.542	0.825
Production of Cement in Thousand Tonnes	0.001	0.044	0.171	0.055
Energy Requirement MU	0.302	0.554	0.391	0.059
Energy Supplied MU	0.146	0.648	0.361	0.068
Energy Peak Demand MU	0.531	0.596	0.707	0.310
Energy Peak Supply MU	0.233	0.891	0.778	0.407
Railway Freight Tonnage in million tonnes	0.044	0.001	0.021	0.133

Indicators Used for Analysis with Time Lag



Indicators	Lag 1	Lag 2	Lag 3	Lag 4
Railways Passengers (millions)	0.959	0.121	0.290	0.535
Railways Earnings (Crores)	0.024	0.002	0.029	0.405
Airline Passengers	0.329	0.000	0.000	0.002
Airline Freight	0.232	0.279	0.575	0.350
Exports of Goods (Crores)	0.733	0.260	0.140	0.725
Import of Goods (Crores)	0.511	0.556	0.675	0.338
Export of Services	0.328	0.084	0.387	0.147
Import of Services	0.491	0.967	0.245	0.385
Statutory Liquidity Ratio	0.075	0.192	0.637	0.185
Cash Deposit Ratio	0.004	0.006	0.361	0.121
Credit Deposit Ratio	0.019	0.053	0.681	0.600
Policy Repo Rate	0.176	0.006	0.182	0.782
Reverse Repo Rate	0.625	0.129	0.432	0.721
Marginal_Standing_Facility_Rate	0.458	0.005	0.013	0.040
Bank_Rate	0.458	0.005	0.013	0.040
NSE Turnover	0.460	0.308	0.555	0.360
NSE Index (Moving Average)	0.691	0.476	0.866	0.922

Final Lead Indicators Selected



Indicators	Quarterly Time Lag
Commercial Vehicles Sales	T-3
Two Wheelers Sales	T-0
Airline Passengers Domestic	T-3
Airline Freight	T-0
Railways Freight	T-2
Railways Earnings (Crores)	T-2
Energy Requirement MU	T-3
Energy Supplied MU	T-3
Energy Peak Demand MU	T-0
Energy Peak Supply MU	T-0
Production of Coal in Million Tonnes	T-2
Production of Petroleum Refinery Products Dollar in Thousand Tonnes	T-2
Production of Natural Gas in Million cubic meters	T-3
Production of Crude Oil in Thousand Tonnes	T-3
Production of Fertilizers in Thousand Tonnes	T-1
Production of Cement in Thousand Tonnes	T-1
Production of Steel in Thousand Tonnes	T-0
Exports of Goods (Crores)	T-0
Import of Goods (Crores)	T-0
Export of Services	T-2
USD INR exchange rate	T-0
Market capitalization and turnover of NSE	T-0
Monthly average price of gold	T-1

Methodology

Since we are studying L.I. and its impact on GVA, we de-trend the series and obtain the cyclical component of the 20 selected lead indicators using the Hodrick–Prescott (H.P.) filter. A business cycle describes changes in economic growth as measured by GVA. Each data series of the all L.I. is converted into logarithm form. We take the Standard Deviation (SD) of the cyclical component. The log form of the data series is divided by the SD. Average the standardized series across all components for each quarter to obtain the Quantta Index. Forecast the trend of L.I. based on the past values. Overlay trend and impact of GST/demonetization on Quantta Index and calculate Quantta Score y-o-y growth in Quantta score is predicted y-o-y growth in GVA

Block Granger Test

A time series of L.I. is said to Granger Cause GVA if the lagged values of L.I. provide significant information about future values of GVA. Obtain Probability (p) values for each of the sub indicators. It is used to weigh the strength of the Indicators on GVA. The p-value is a number between 0 and 1. A small p-value (typically ≤ 0.1) indicates strong evidence of L.I. impact on GVA. A large p-value (> 0.3) indicates weak evidence/ impact of L.I. on GVA. A marginal p-value (0.1- 0.3) indicates medium impact of L.I. on GVA. P values is calculated for each time period. Lowest p value shows highest correlation between L.I. and GVA

Products and Services are used in the process of value addition in the Economy. Depending on the nature of the sector, different sectors the process of creating the product or output.

In order to measure the impact of a sector on the economy, we lag, measured as T Minus from the period under study. For example, a sector that indicates the sentiment of the farmer to grow crops. The consumption of fertilizers show a narrow time lag between consumption impact on the economy making it a lead indicator about the state of economy. The domestic passenger traffic on the other hand shows a lag indicating that people postpone travel when uncertainty increases increase their travel when they have a positive outlook on the historic performance of their business and the economy. These signals are vital understand the underlying trends in the economy.