Report

- ## Objective:

The aim is to understand trends in APMC (Agricultural produce market committee)/mandi price & quantity arrival data for different commodities in Maharashtra.

- ## Methodology:

Trend Analysis in Agriculture sector using:

- Time Series Analysis
- Statistics
- Decomposition of Time-Series data
- Data Visualization.

Libraries Used:

- Python
- Statsmodels
- Matplotlib, Seaborn
- Pandas, Numpy

(I) For finding the outliers: IQR (Inter Quartile Range method is used to find the outliers in particular type of crops. Lower thresholds and Upper thresholds are defined and the data in filtered on the range of lower and upper threshold.

1. For removing outliers present in the msprice within the particular crop type.
2. For removing the outliers present in the modal prices within the commodities.

(II) For accounting seasonality and de-seasonalizing the prices:

1. Combining the APMC and commodities to find unique clusters.
2. Removing the clusters which are having Count less than 12 i.e. having the datapoints at least a year.

Detect seasonality type (multiplicative or additive) for each cluster of APMC and commodities:

Additive Model -> An additive model suggests that the components are added together as follows: y(t) = Level + Trend + Seasonality + Noise

-> An additive model is linear where changes are made constantly by the same amount
Multiplicative Model -> An multiplicative model suggests that the components are multiplied together as follows: y(t) = Level * Trend * Seasonality * Noise
-> An multiplicative model is nonlinear such as quadratic or exponential where changes are increases or decreases overtime.
In additive model, the amplitude and frequency of the cycles are same where in multiplicative model, the amplitude and frequency vary.
Using seasonal decompose for decomposing the data and Auto Correlation function for determining the seasonal type of the cluster

<u>De-seasonalise prices for each commodity and APMC according to the detected seasonality type:</u>

For de-seasonalise the modal_prices:
-> *if additive* - subtract the seasonal value from the modal_price
-> *if multiplicative* - divide the seasonal value from the modal_price

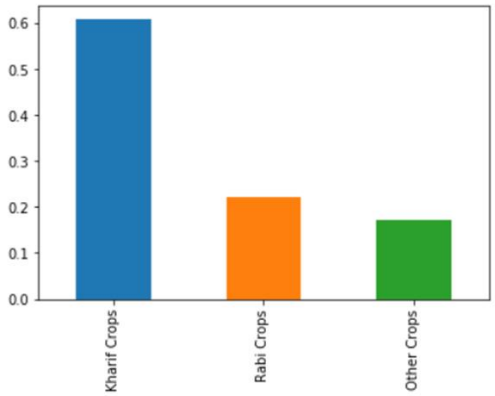
(III) <u>Compare prices in APMC/Mandi with MSP(Minimum Support Price)- raw and de-seasonalised:</u>

Comparing the modal prices (raw and de-seasonalised) in APMC Commodity cluster with MSP (Minimum Support Price) of the commodities through graphs.

(IV) The top 20 APMC and Commodities cluster with highest fluctuations.

- # Analysis

(V) The amount of Kharif crops are more as compared to Rabi or Other crops.



From the above bar graph, we can conclude than Kharif crops are more than Rabi Crops

(VI) There are total **588** commodities which are multiplicative and **364** commodities which are additive.

	Commodity	Seasonality Type
0	Akole:bajri	Multiplicative
1	Akole:paddy-unhusked	Additive
2	Akole:wheat(husked)	Multiplicative
3	Akole:gram	Additive
4	Akole:soybean	Multiplicative

(VII) After deseasonalising the modal prices, following was the output:

	APMC	Commodity	combination_label	date	modal_price	quarter	deseasonalise_price
0	Akole	bajri	Akole:bajri	2014-09-01	1650.0	3	1664.590398
1	Akole	bajri	Akole:bajri	2014-10-01	1560.0	4	1588.085197
2	Akole	bajri	Akole:bajri	2014-11-01	1550.0	4	1572.191403
3	Akole	bajri	Akole:bajri	2014-12-01	1563.0	4	1536.385799
4	Akole	bajri	Akole:bajri	2015-01-01	1580.0	1	1607.065791

(VIII) Comparing the modal and deseasonalise prices with msp.

```
Enter APMC: Akole
Enter commodity within the APMC bajri
```

(IX) Top 20 APMC and Commodities cluster with highest fluctuations.

Top 20 APMC and Commodities cluster with highest fluctuations

```
fluctuation = highest_price_fluctuations(df)
```

```
fluctuation
```

```
['Barshi:brinjal',
 'Barshi:tomato',
 'Barshi:cabbage',
 'Barshi:green chilli',
 'Barshi:flower',
 'Barshi:lemon',
 'Barshi:cluster bean',
 'Barshi:cucumber',
 'Barshi:ladies finger',
 'Barshi:capsicum',
 'Barshi:bitter gourd',
 'Pune:squash gourd',
 'Vadgaon Peth:tomato',
 'Mumbai:squash gourd',
 'Aurangabad:tomato',
 'Kalvan:onion',
 'Yeola:onion',
 'Shahada:maize',
 'Pune-Pimpri:onion',
 'Solapur:papai']
```

- # Conclusion

APMC/mandis and commodities clusters with highest price fluctuation across different commodities in each relevant season, and year are as follows:

['Barshi:brinjal', 'Barshi:tomato', 'Barshi:cabbage', 'Barshi:green chilli', 'Barshi:flower', 'Barshi:lemon', 'Barshi:cluster bean', 'Barshi:cucumber', 'Barshi:ladies finger', 'Barshi:capsicum', 'Barshi:bitter gourd', 'Pune:squash gourd', 'Vadgaon Peth:tomato', 'Mumbai:squash gourd', 'Aurangabad:tomato', 'Kalvan:onion', 'Yeola:onion', 'Shahada:maize', 'Pune-Pimpri:onion', 'Solapur:papai']

	APMC	Commodity	Month	Year	max_price
0	Barshi	brinjal	October	2016	4163
1	Barshi	tomato	July	2016	2445
2	Barshi	cabbage	July	2016	1486
3	Barshi	green chilli	July	2016	5190
4	Barshi	flower	July	2016	1641
5	Barshi	flower	October	2016	1447
6	Barshi	lemon	September	2016	4647
7	Barshi	cluster bean	October	2016	4821
8	Barshi	cucumber	October	2016	1590
9	Barshi	ladies finger	July	2016	2105
10	Barshi	ladies finger	October	2016	2106