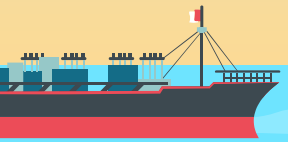
Egypt Imports Analysis

Across all Sectors from 2005 : 2023
(23/10/2024)

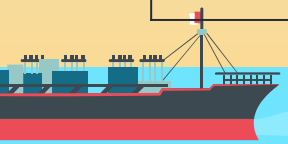
Team Members

Amani Mustafa Mahmoud	Data cleaning and preprocessing
Mohamed Eid	Creating physical database
Mahmoud Fawzy	EDA (Exploratory Data Analysis) Using SQL querying
Mohamed Yehia	Data Visualization
Mahmoud Al-Sayed	Recommendations and solutions study
Maher Mahmoud Maher	project facilitator, predictive analysis, presentation



Tools Used

Asana	Project Management Tool
Excel (power query)	Data cleaning and preprocessing
Mermaid.js	ER diagram
SQL Server	As a Database Engine
Python	Using Keras for Predictive Analysis
PowerBI	Developing Star schema | Dashboards and Visualization
PowerPoint	Story Telling | Presenting



Objectives

Using the data that Central Bank of Egypt Provided for Egypt Trades from 2005 to 2022:

- Assess economic performance
- Forecast future trends
- Support informed decision-making
- Track subsequent changes

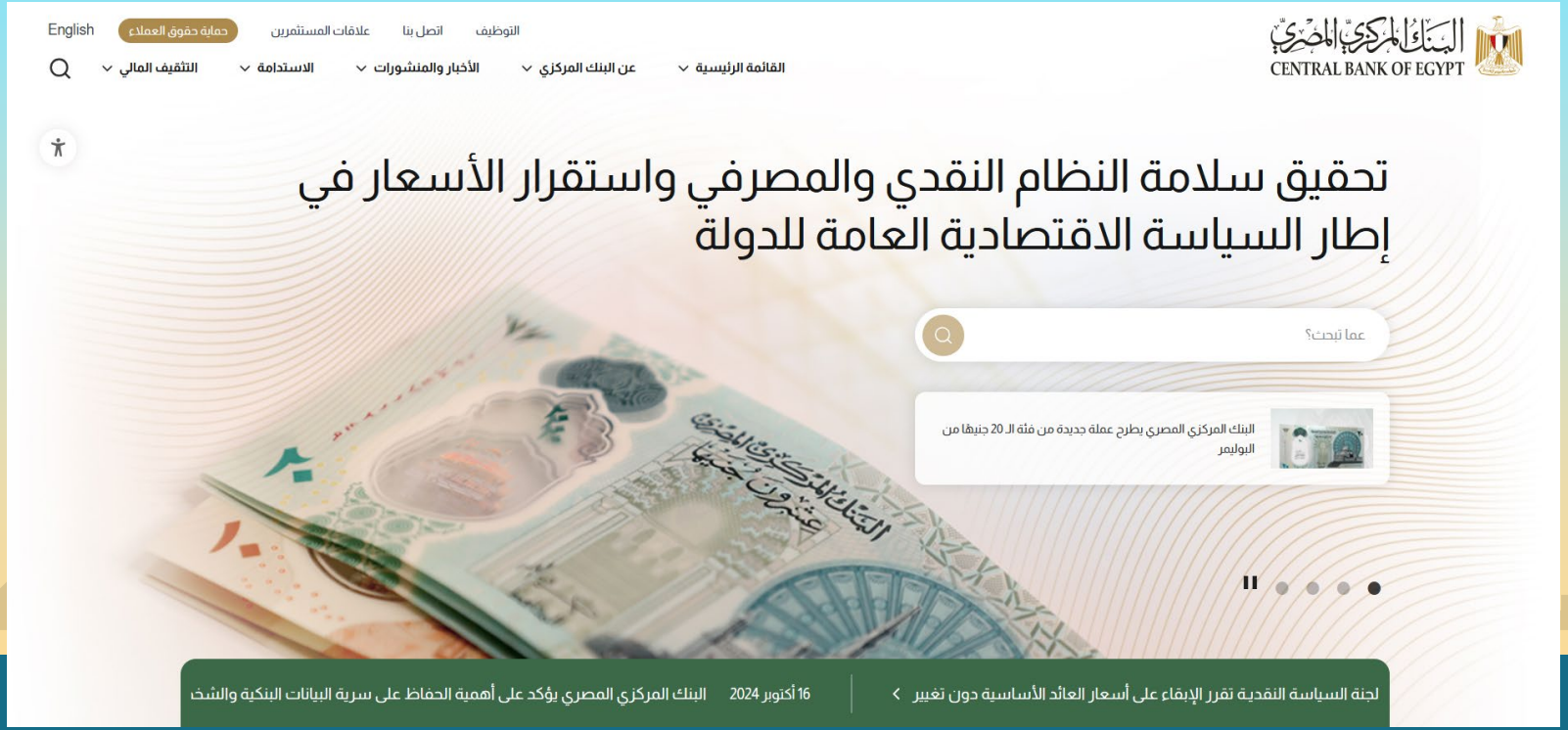
Targets:

Policymakers - Business stakeholders

Data Source

Central Bank of Egypt

(Economic Studies > Time-series > International-Trades)



Analysis Stages

01

Data cleaning

02

Physical DB

03

EDA

04

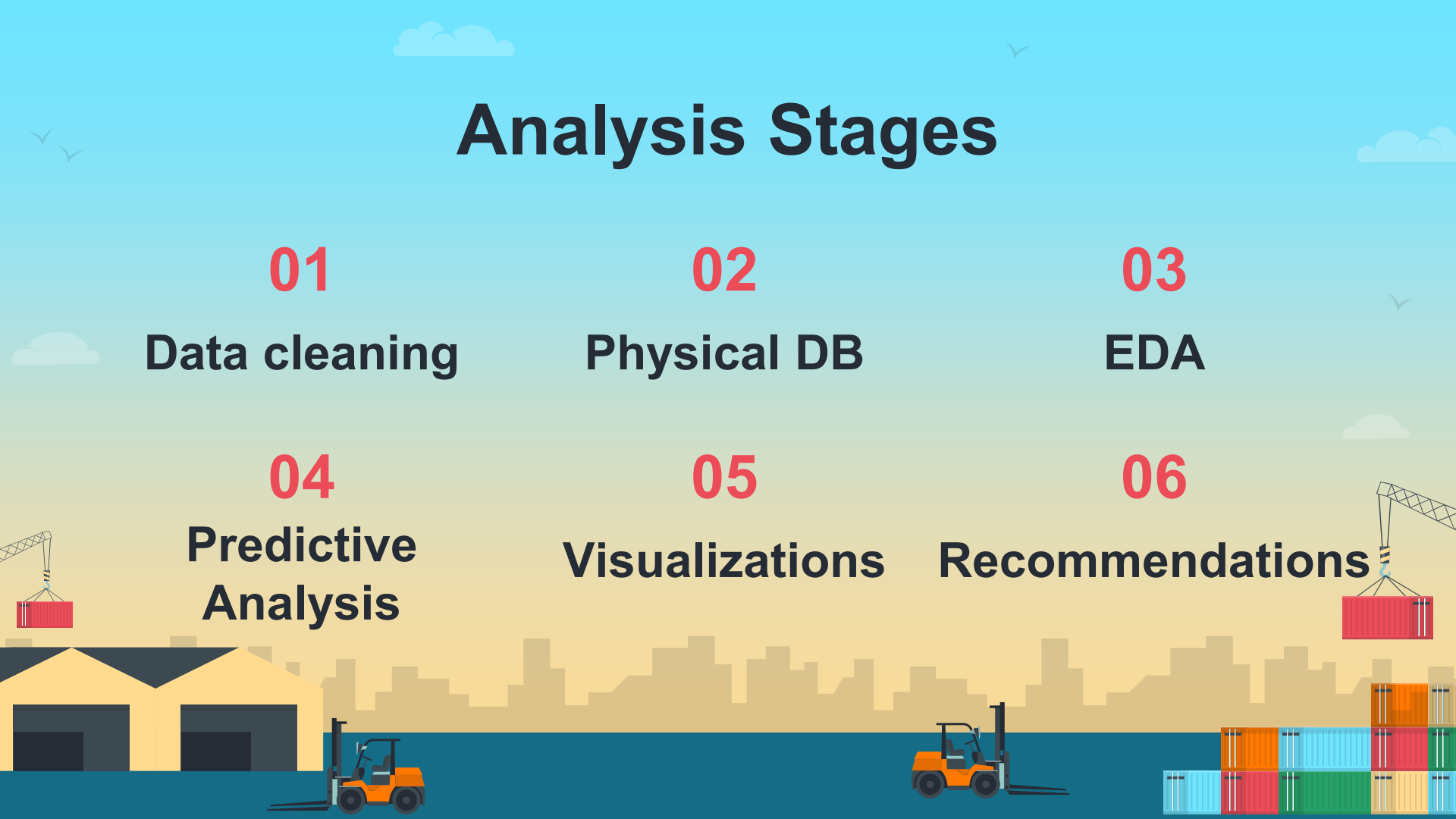
Predictive Analysis

05

Visualizations

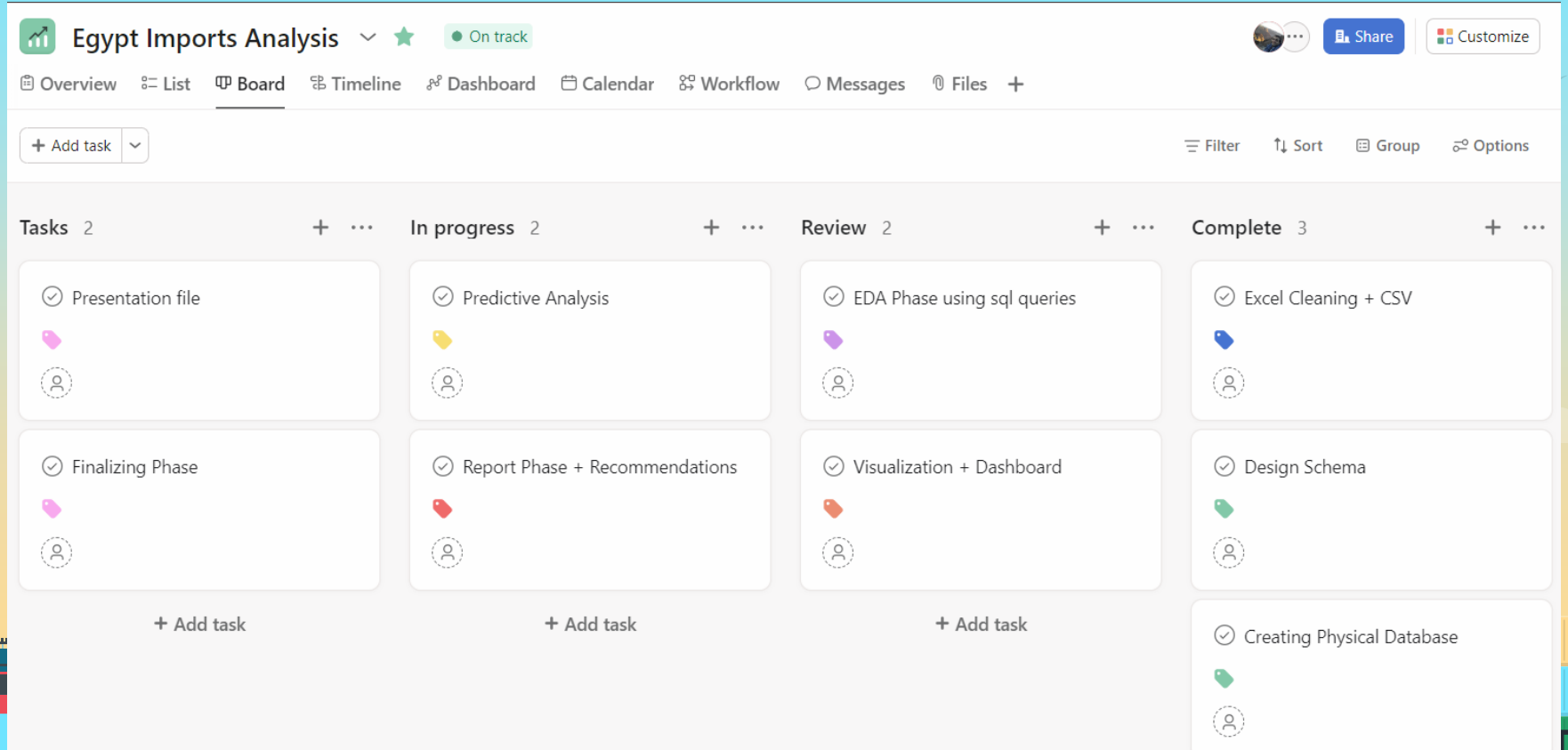
06

Recommendations



Kanban Board

Using Asana as Project Management Tool



01

Data cleaning and preprocessing

Raw Data

Data were split into **2 files** in Excel
one for data of 2005 to 2016 ,The second for data of 2017 to 2022
AND both are in **pivot** form

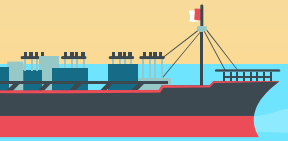
Main Merchandise Balances

During	2016/2017			2017/2018			2018/2019		
	الصادرات Exports	الواردات Imports	الفائض / العجز Surplus / Deficit	الصادرات Exports	الواردات Imports	الفائض / العجز Surplus / Deficit	الصادرات Exports	الواردات Imports	العجز Surplu
Oil merchandise balance	6589.5	12015.5	(5426.0)	8773.0	12489.8	(3716.8)	11557.0	11548.9	
Crude oil	3876.0	1898.9	1977.1	4600.8	2534.4	2066.4	4851.3	2567.8	2
Oil products	2202.3	7391.0	(5188.7)	3490.4	7951.6	(4461.2)	4824.0	8122.7	(3
Bunker and jet fuel	278.7	243.6	35.1	519.4	261.8	257.6	760.4	318.4	4
Natural gas	232.5	2482.0	(2249.5)	162.4	1742.0	(1579.6)	1121.3	540.0	5
Foodstuff Merchandise Balance (without cereals), of which:	2999.0	5869.1	(2870.1)	3118.3	6487.2	(3368.9)	3367.2	6287.5	(2
Meat and edible offals	14.0	938.5	(924.5)	16.0	1142.3	(1126.3)	11.5	886.9	(
Milk and dairy products, eggs, poultry, honey and edible products	302.6	578.2	(275.6)	230.3	614.1	(383.8)	256.1	659.7	(
Edible vegetables, plants, roots and tubers	720.1	343.6	376.5	833.0	343.9	489.1	904.6	467.3	4
Animal or vegetable fats, greases and oils and products thereof	144.0	1140.8	(996.8)	106.6	1039.3	(932.7)	121.0	1058.4	(
Miscellaneous food preparations	226.3	374.9	(148.6)	166.7	282.6	(115.9)	177.0	240.0	(
Sugar and sugar confectionery	317.0	428.9	(111.9)	237.0	710.7	(473.7)	277.2	343.9	(
Edible fruits and nuts	608.6	130.4	478.2	770.6	167.9	602.7	786.3	221.2	5
Preparations of vegetables, fruits or nuts	192.8	92.8	100.0	144.3	57.0	87.3	141.7	95.3	
Merchandise Balance of Cereals and Milling Products, of which:	224.0	4746.5	(4522.5)	295.6	4512.5	(4216.9)	318.0	4960.9	(4
Maize	11.7	1437.4	(1425.7)	2.7	1573.1	(1570.4)	0.9	1403.6	(1
Wheat	7.3	2177.1	(2169.8)	0.0	1570.9	(1570.9)	0.0	2126.6	(2
Soya beans for non-sowing	6.7	659.3	(652.6)	8.5	939.1	(930.6)	5.9	813.9	(
	5.3	44.2	(38.9)	23.4	64.1	(40.7)	39.3	170.6	(

Data preprocessing

1. **Merging** the 2 files into one
2. **REMOVING** the addition columns and blank row
3. **Checking** for Errors or missing values
4. **Standarize** the year format
5. Using **PowerQuery** for **Un-pivotting** and transforming it into **Tapular form**
6. Export the Outcome into **CSV file**

Data Unpivoted



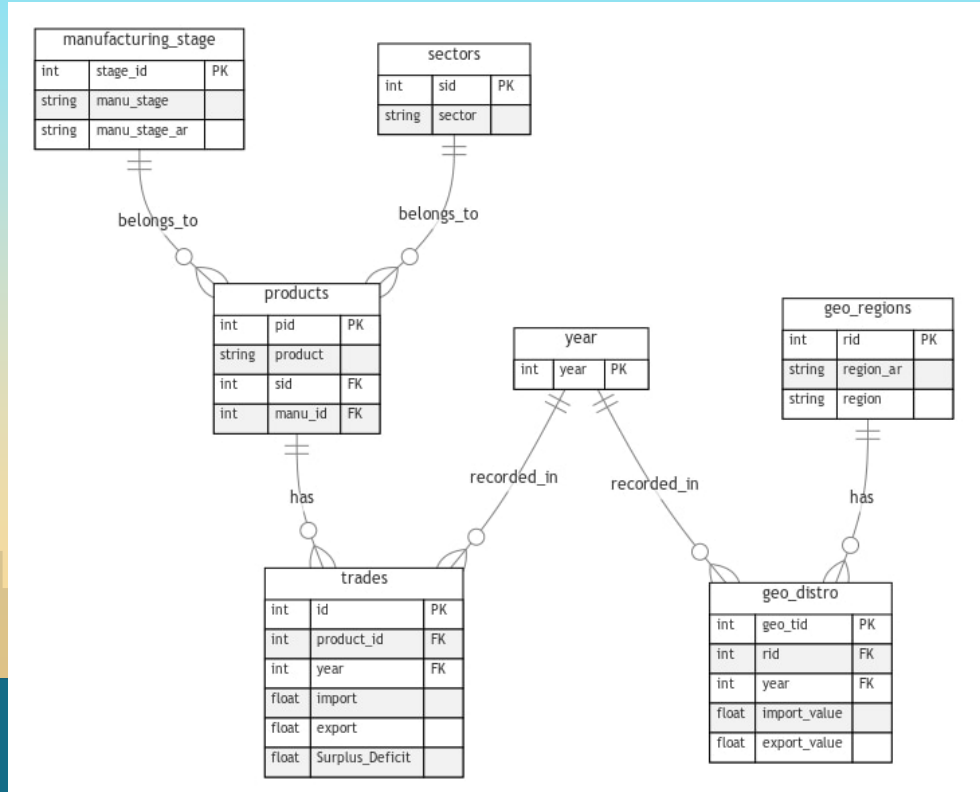
	A	B	C	D	E	F
1	product	sector	year	import	export	Surplus / Deficit
2	Crude oil	Oil merchandise	2005	2844.2	3213.8	369.6
3	Crude oil	Oil merchandise	2006	1560.2	3128.3	1568.1
4	Crude oil	Oil merchandise	2007	5086	4910.5	-175.5
5	Crude oil	Oil merchandise	2008	2613	4004.3	1391.3
6	Crude oil	Oil merchandise	2009	1876.7	4475	2598.3
7	Crude oil	Oil merchandise	2010	2334	5662	3328
8	Crude oil	Oil merchandise	2011	2050.9	5211	3160.1
9	Crude oil	Oil merchandise	2012	2665	7303.2	4638.2
10	Crude oil	Oil merchandise	2013	2093	7715	5622
11	Crude oil	Oil merchandise	2014	2492.4	6158.2	3665.8
12	Crude oil	Oil merchandise	2015	910.7	3557.9	2647.2
13	Crude oil	Oil merchandise	2016	1898.9	3876	1977.1
14	Crude oil	Oil merchandise	2017	2534.4	4600.8	2066.4
15	Crude oil	Oil merchandise	2018	2567.8	4851.3	2283.5
16	Crude oil	Oil merchandise	2019	4286.3	3245	-1041.3
17	Crude oil	Oil merchandise	2020	3439	2677.8	-761.2
18	Crude oil	Oil merchandise	2021	4525	3845.3	679.7

02
Creating physical database

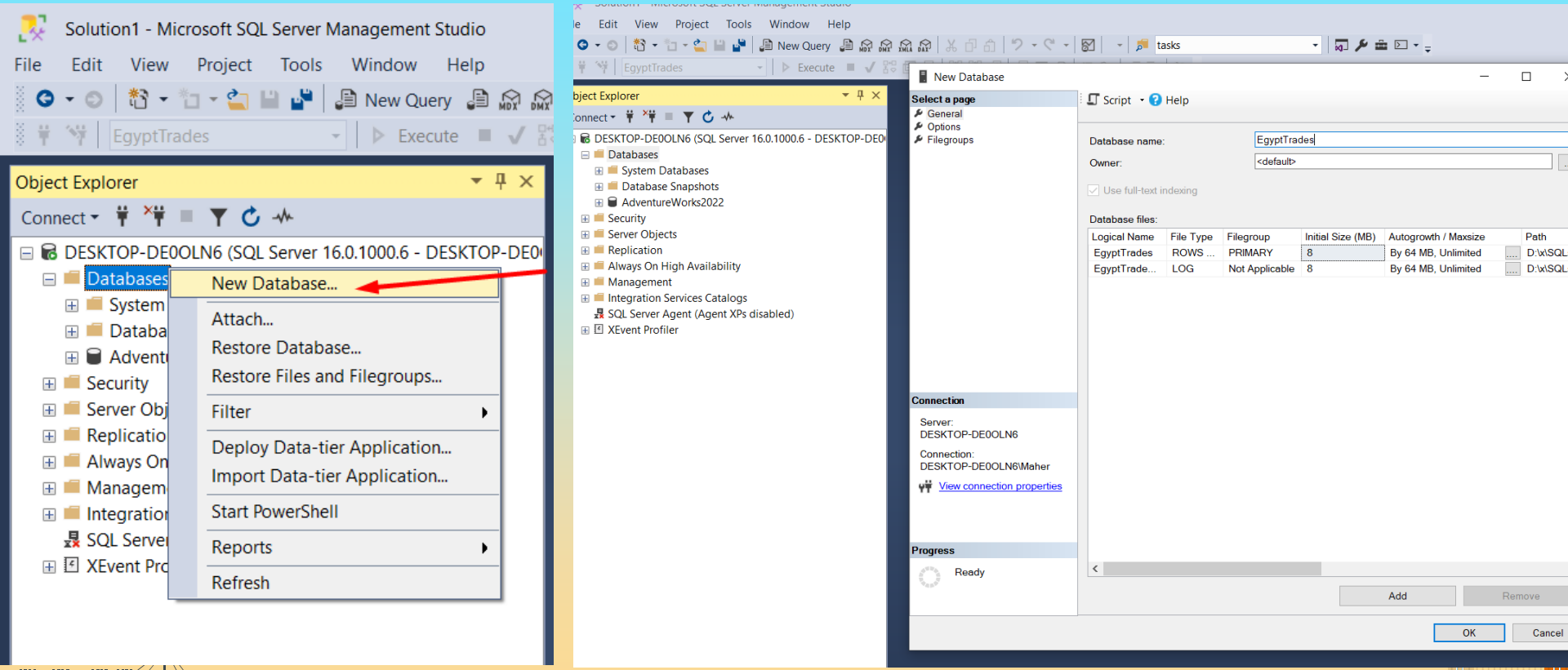
ER Diagram & Normalizing Data

1. Adding new 2 perceptive to the analysis ((Geographical Distribution – Manufacturing Stage))
2. Plan for the **ER Diagram** and present planned schema using Mermaid.js
3. **Normalizing** the data tables into planned one
4. Export it into csv files to import it into sql server

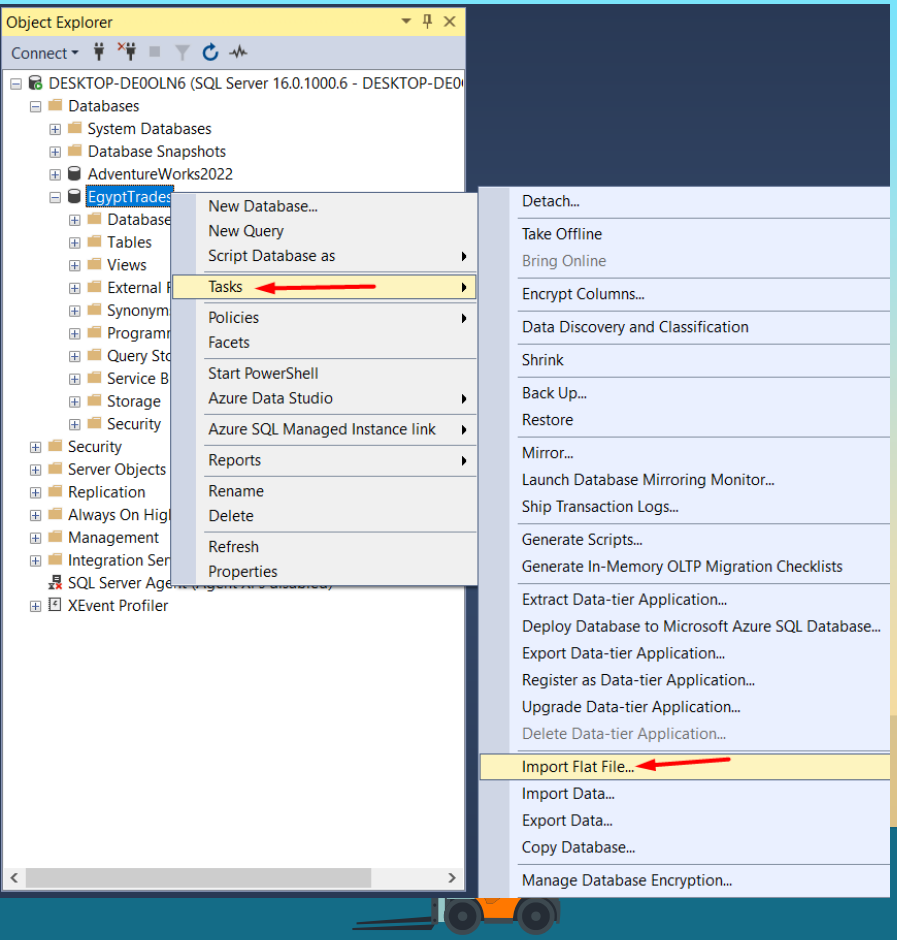
Planned Schema

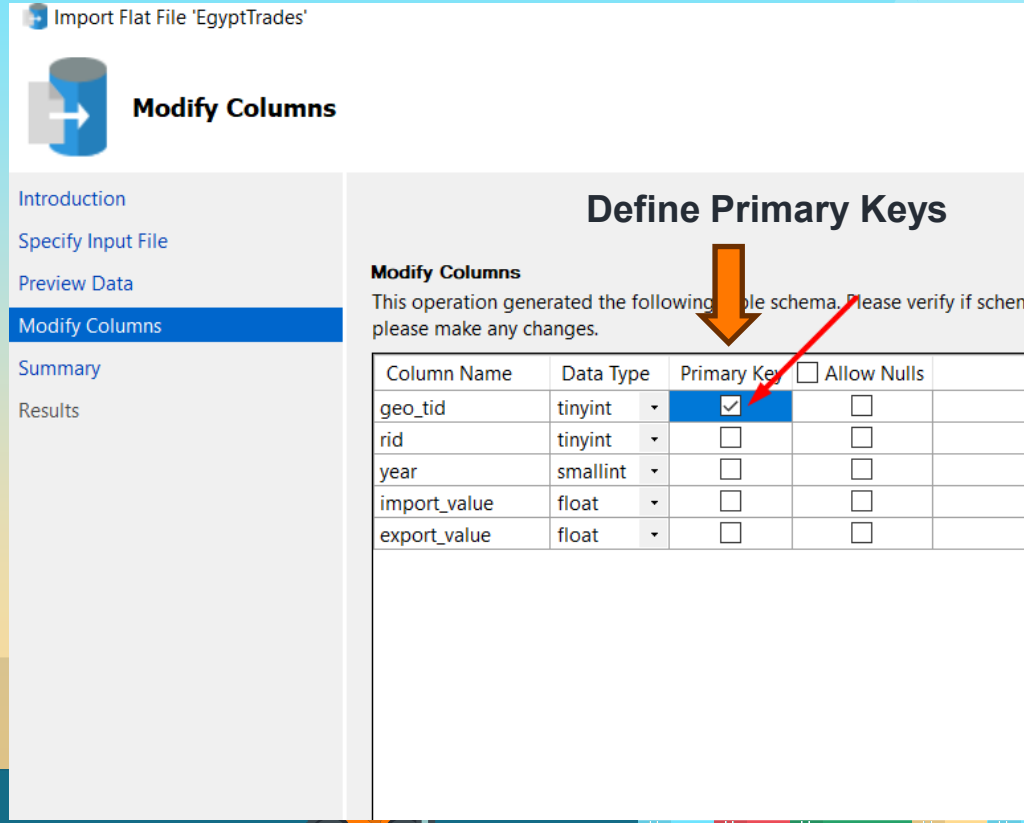


Creating physical Database

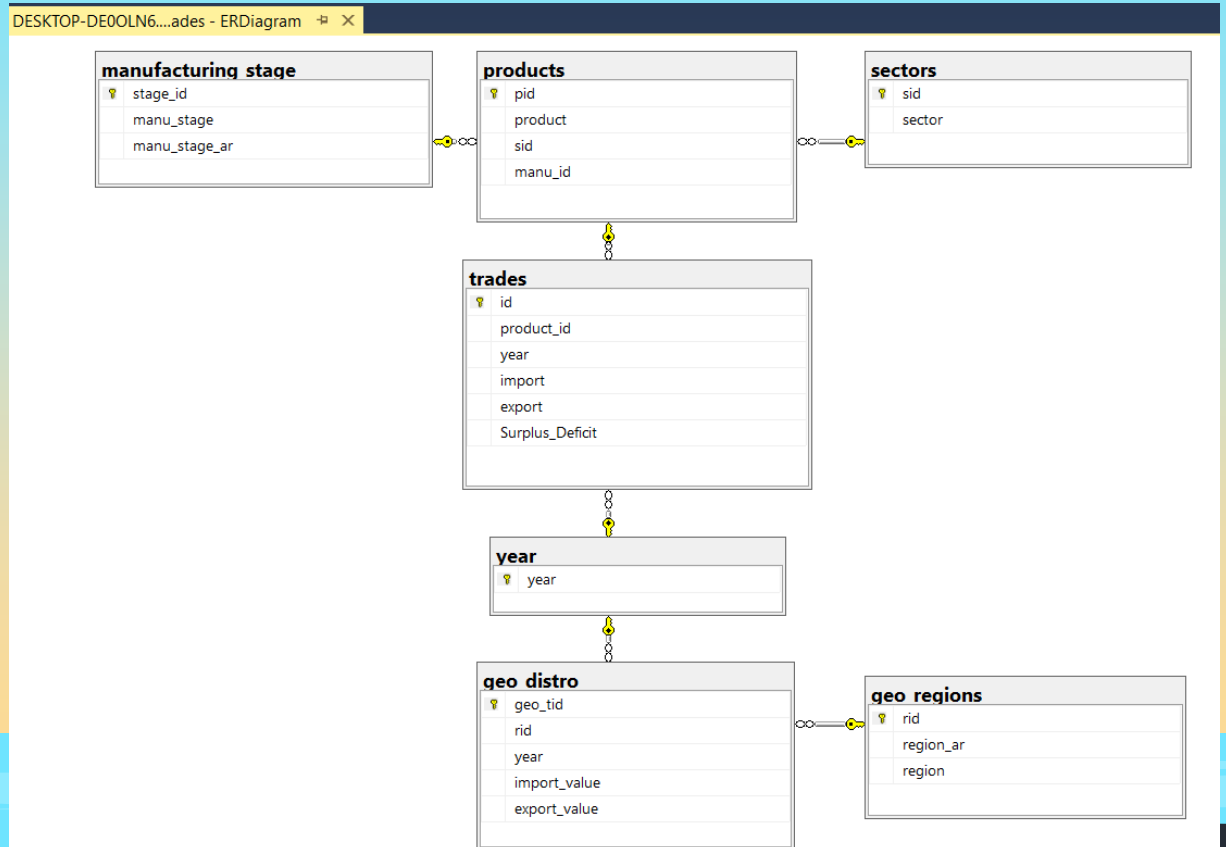


Importing the CSV files

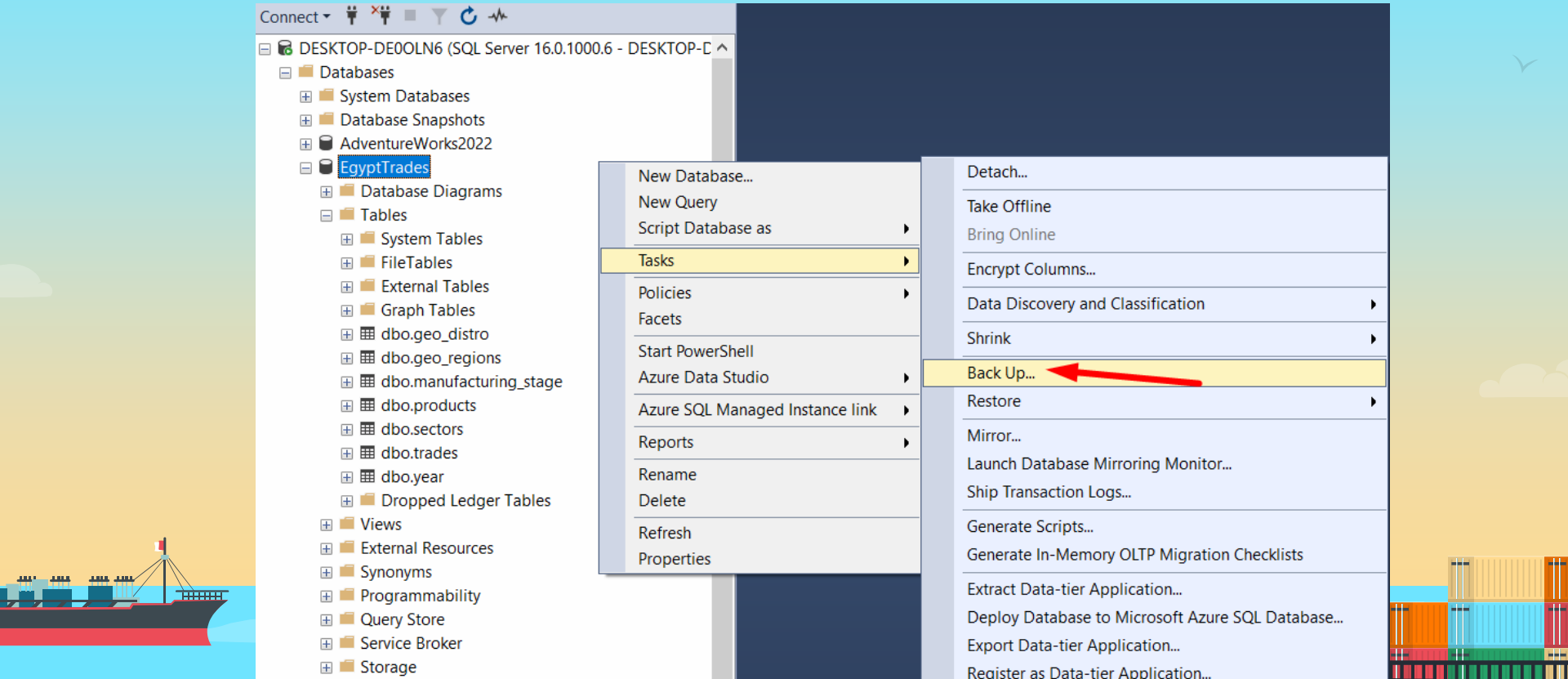




Creating Relations between tables and Final Logical Schema

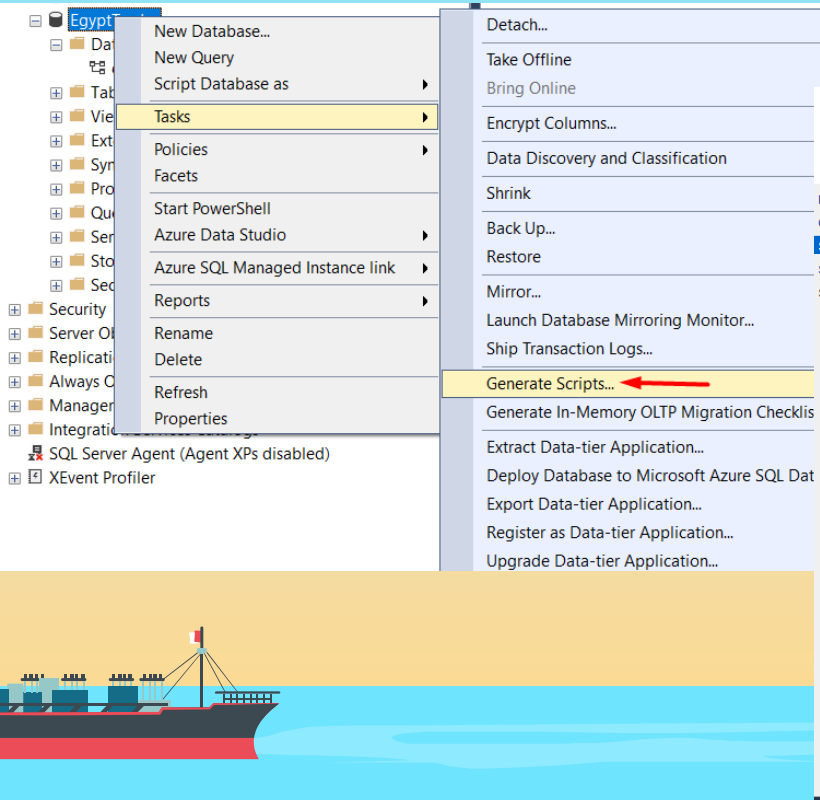


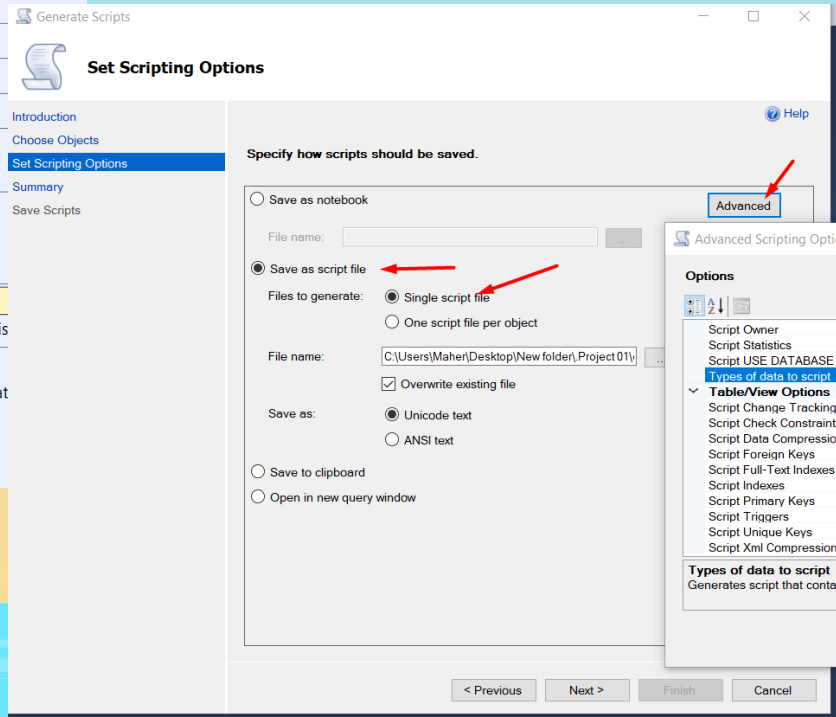
Export the Database into .bak file



Export DB into SQL Script for Members with outdated ver.

Fully export of Database (Schema and Data)





03
EDA
Exploratory Data Analysis

EDA
Key Metrics & Questions

KPIs

1- Total Annual Import Values
(product - economic sector - manufacturing stage – region)

2- Percentage Distributions
(total imports - Regional - Manufacturing stage – Sector)

3- Growth & Change Metrics
(Year-over-year change rates - Crisis period impact – Sector growth rates)

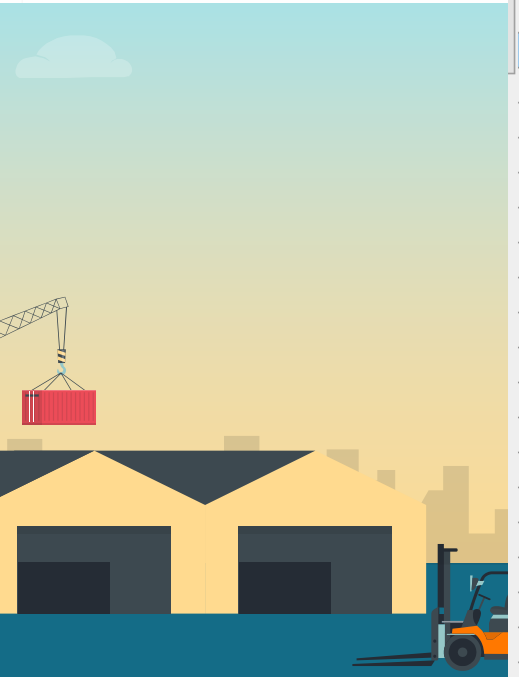
Questions

1- Top Import Products (2005-2023) ?
2- Major Import Source Regions
3- Manufacturing Stage Distribution
4- Leading Import Sectors
5- Crisis Impact
6- Declining Import Sectors
7- Commodity Import Ratios
8- High-Growth Import Sectors

SQL queries

Applying multiple SQL queries to extract **key findings**

```sql
--8. What are the differences in imports by year?
--KPIs:
--Yearly growth rate of imports: To see the annual increase or decrease in imports.
--Years of significant changes: Identify years that have seen significant changes in imports.
WITH yearly_imports AS (
    SELECT year,SUM(import) AS total_import_value
    FROM      Trades
    GROUP BY  year)
SELECT     year, total_import_value,
           LAG (total_import_value) OVER (ORDER BY year) AS previous_year_import_value,
               (total_import_value - LAG(total_import_value) OVER (ORDER BY year)) AS difference_in_imports,
              ((total_import_value - LAG(total_import_value) OVER (ORDER BY year))
              / LAG(total_import_value) OVER (ORDER BY year) * 100) AS percentage_change
FROM     yearly_imports
ORDER BY year;
```



	year	total_import_value	previous_year_import_value	difference_in_imports	percentage_change
1	2,005	30,441	[NULL]	[NULL]	[NULL]
2	2,006	38,308.1	30,441	7,867.1	25.844
3	2,007	52,771.201	38,308.1	14,463.1	37.755
4	2,008	50,342.199	52,771.201	-2,429.001	-4.603
5	2,009	48,993.1	50,342.199	-1,349.099	-2.68
6	2,010	54,095.5	48,993.1	5,102.399	10.415
7	2,011	59,210.899	54,095.5	5,115.399	9.456
8	2,012	57,682.8	59,210.899	-1,528.099	-2.581
9	2,013	60,181.9	57,682.8	2,499.101	4.332
10	2,014	61,305.501	60,181.9	1,123.601	1.867
11	2,015	57,387.701	61,305.501	-3,917.801	-6.391
12	2,016	59,003.001	57,387.701	1,615.3	2.815
13	2,017	63,102.999	59,003.001	4,099.998	6.949
14	2,018	66,529.4	63,102.999	3,426.4	5.43
15	2,019	62,841.1	66,529.4	-3,688.3	-5.544
16	2,020	70,736.101	62,841.1	7,895.002	12.563
17	2,021	87,302.4	70,736.101	16,566.299	23.42
18	2,022	70,783.6	87,302.4	-16,518.8	-18.921

SQL queries

Applying multiple SQL queries to extract **key findings**

```sql
--2. What are the top geographic regions from which Egypt imports between 2005 and 2023?
--KPIs:
--Total value of imports per geographic region annually: To know the regions on which Egypt depends for imports.
--Percentage of each region of total imports: To determine the share of each geographic region.

SELECT   gr.region,gd.year, SUM(gd.import_value) AS Total_Import_Value,
         (SUM(gd.import_value) / (SELECT SUM(import_value) FROM geo_distro WHERE year = gd.year) * 100) AS Percentage_of_total_imports
FROM     geo_distro gd
JOIN     geo_regions gr ON gd.rid = gr.rid
GROUP BY gr.region, gd.year
ORDER BY gd.year, total_import_value DESC;
```

	region	year	Total_Import_Value	Percentage_of_total_imports
152	African countries (excluding Arab countries)	2,021	587.2	0.673
153	Australia	2,021	536.9	0.615
154	Asian countries (excluding Arab countries)	2,022	17,165.6	24.251
155	EU	2,022	14,880.9	21.023
156	Arab countries	2,022	14,476	20.451
157	Other countries and regions	2,022	9,503.1	13.426
158	Other European countries	2,022	6,685.6	9.445
159	USA	2,022	4,205.8	5.942
160	Russian Federation & C.I.S.	2,022	3,036.6	4.29
161	African countries (excluding Arab countries)	2,022	468.9	0.662
162	Australia	2,022	361.1	0.51

Key Findings

1. **Overall Imports**: Egypt's total imports rose from $28.66 billion in 2005 to $77.52 billion in 2023, indicating a substantial increase of 170%.

2. **Top Trading Partners**: The USA, China, and Germany were Egypt’s main suppliers in 2023, accounting for 42% of total imports.

3. **Major Import Categories**: Oil merchandise (17%), chemicals (8%), and base metals (7.5%).

4. **Growth Trends**: Significant growth in imports from China and the USA, with China’s share increasing from 6.8% in 2005 to 13.8% in 2023.

6. **Raw Materials**: Remained significant, peaking at $17.84 billion in 2017.

7. **Intermediate Goods**: Fluctuated, with a rise to $6.64 billion in 2021.Final Goods: Steady growth, especially in consumer non-durable goods, reaching $12.15 billion in 2021.

Key Findings

8. **Raw materials** averaged 20-24%, **intermediate goods** around 6-10%, and final goods grew over time.

9. **Key Year**: 2021 marked a peak in consumer non-durable goods due to changing demand.

10. Key Findings on Imports by Economic Sector (2005-2023)
    Top Sector: **Oil merchandise** consistently had the highest import value, peaking at approximately $12.49 billion in 2017.
    Other Significant Sectors: **Base metals** & products and **chemicals merchandise** were major contributors. Vehicles, cars, and transportation also recorded substantial imports.

11. **Impact of Global Economic Crises** on Egypt's Imports
    2008 Financial Crisis: Total Imports (2008): $50.34 billion.
    Decline in 2009: Imports fell to $48.99 billion, a decrease of 2.68%.
    COVID-19 Pandemic: Total Imports (2020): $70.74 billion.
    Significant Growth in 2021: Imports surged to $87.30 billion, reflecting a 23.42% increase from 2020.

Key Findings

12. Total imports Yearly **Growth Rates**:
    2021: Peak increase of 23.42%.
    2022: Notable decline of 18.92% after a peak in 2021.

13. **Most Significant Declines in Imports (2022):**
    Vehicles & Transportation: Decline: $2.68 billion
    Base Metals & Products: Decline: $1.89 billion
    Chemicals Merchandise: Decline: $1.81 billion

14. **Least Significant Declines in Imports (2022):**
    Oil Merchandise: Decline: $138.10 million
    Machinery & Equipment: Decline: $1.27 billion
    Cotton & Textiles: Decline: $1.29 billion

04

Predictive Analysis

Data preprocessing

1- Targeting **Sectors Imports** only for analysis

2. **Remove** unwanted columns using power query

3- Transform the data to have a **chronological time order** by pivoting.

	A	B	C	D	E	F
1	product	sector	year	import	export	Surplus / Deficit
2	Crude oil	Oil merchandise	2005	2844.2	3213.8	369.6
3	Crude oil	Oil merchandise	2006	1560.2	3128.3	1568.1
4	Crude oil	Oil merchandise	2007	5086	4910.5	-175.5
5	Crude oil	Oil merchandise	2008	2613	4004.3	1391.3
6	Crude oil	Oil merchandise	2009	1876.7	4475	2598.3
7	Crude oil	Oil merchandise	2010	2334	5662	3328
8	Crude oil	Oil merchandise	2011	2050.9	5211	3160.1
9	Crude oil	Oil merchandise	2012	2665	7303.2	4638.2
10	Crude oil	Oil merchandise	2013	2093	7715	5622
11	Crude oil	Oil merchandise	2014	2492.4	6158.2	3665.8
12	Crude oil	Oil merchandise	2015	910.7	3557.9	2647.2
13	Crude oil	Oil merchandise	2016	1898.9	3876	1977.1
14	Crude oil	Oil merchandise	2017	2534.4	4600.8	2066.4
15	Crude oil	Oil merchandise	2018	2567.8	4851.3	2283.5
16	Crude oil	Oil merchandise	2019	4286.3	3245	-1041.3
17	Crude oil	Oil merchandise	2020	3439	2677.8	-761.2
18	Crude oil	Oil merchandise	2021	4525	3845.3	-679.7
19	Crude oil	Oil merchandise	2022	3277.8	2332.6	-945.2
20	Oil products	Oil merchandise	2005	2361.8	3218.6	856.8
21	Oil products	Oil merchandise	2006	2421.6	3319.1	897.5
22	Oil products	Oil merchandise	2007	4475	4756.1	281.1

	A	B	C	D	E	F	G
1	year	base metals	cereals mer	chemicals n	cotton & its	foodstuff me	machinery,
2	2005	1891	1342.7	1509.2001	769.6	1426.6	887.5
3	2006	2942.0001	1687.5999	2319.3	1042.8	2195.4	1297.3
4	2007	5345.3998	2607.2	3653.7	1511.8	3149.4	2211.3
5	2008	5276.5001	2029.6	3985.5999	1668	3384.1	2158.2
6	2009	4292.6001	2347.1	4011.4	2182.2	3761.8	3172.9
	2010	4187.8	3740.0999	3856.5	2274.6	4561.7	3408.9999
	2011	4451.4999	4375.7999	4616.7	2714.4	5405.2	3481.3
	2012	3859.2999	4051.8999	4357.9999	2690.5	4836.9	3184.5
	2013	4461	4501.0001	4280.1001	3041.7	4796.6999	2833.3
11	2014	4107.5999	4610.0001	4713.4001	2858.8	4166.7	3760.7
12	2015	3469.3999	4057.5	4774.9	2274.4999	4014.5999	3484.4001
13	2016	3277.1001	4318.0001	4496.1	2133.2	4028.1001	3643.5
14	2017	5059.5999	4147.2	4169.3001	2537.4	4357.8001	3603.9999
15	2018	5000.8001	4514.7001	4889.8999	2796.2001	3972.7	4716.9
16	2019	4120.2	4854.3	4996.1	3034.8	4619.0999	4931.6
17	2020	4583.2001	5628.9001	5680.0001	3096.1999	4823.3	5256.2
18	2021	7007.0002	7398.4	7973.8002	3713.5	6292.2999	5517
19	2022	5115.6	5923.7999	6162.9001	2420.5	4121.3001	4247.5999

Data preprocessing using Python

1- **Import the csv** with Pandas Library

2- Change **year column datatype** to Datetime

3- **Indexing** the Dataframe with year column

tsa.ipynb > # Check the size of training data

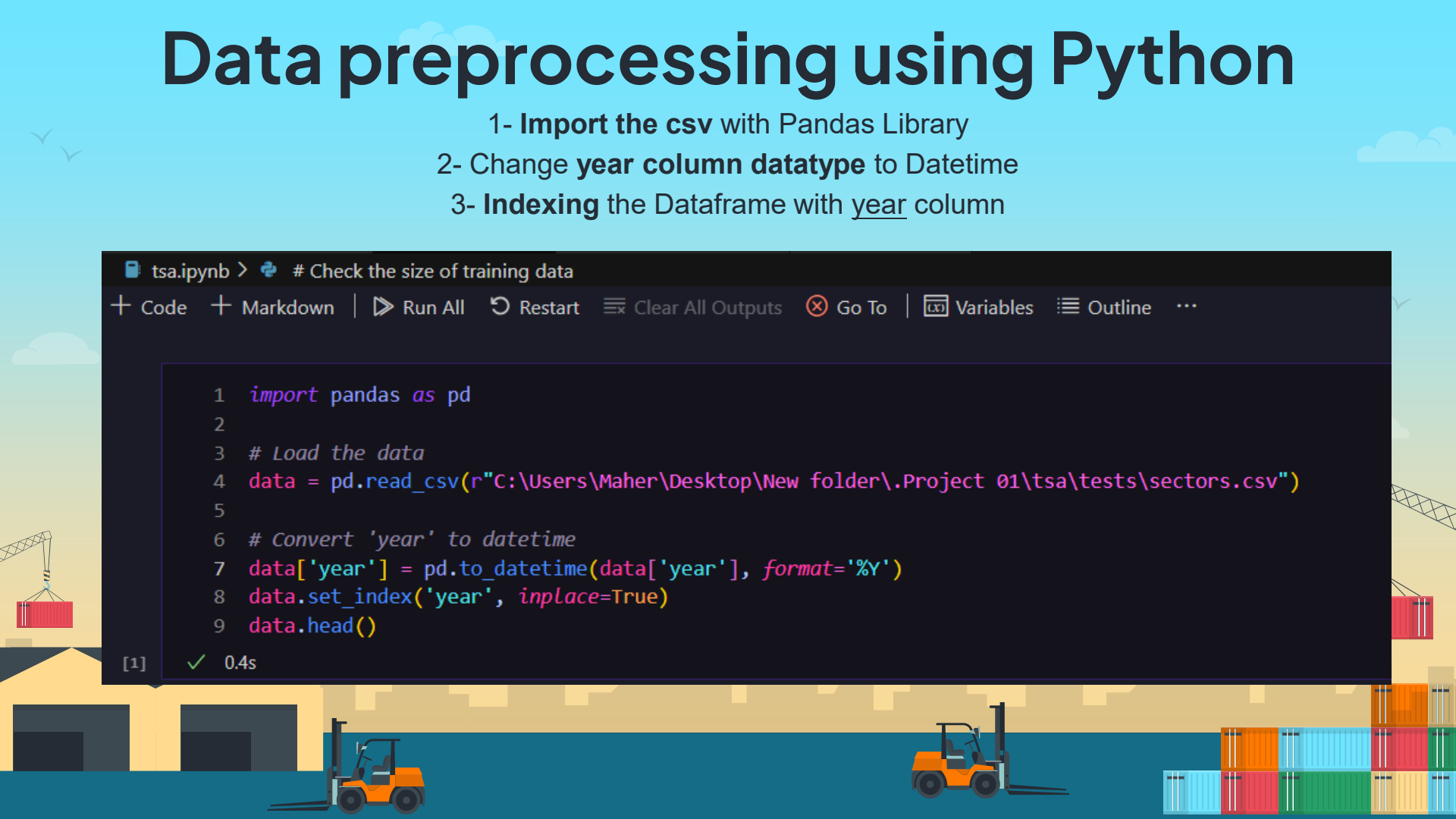
+ Code + Markdown | Run All Restart Clear All Outputs Go To | Variables Outline ···

```python
import pandas as pd

# Load the data
data = pd.read_csv(r"C:\Users\Maher\Desktop\New folder\.Project 01\tsa\tests\sectors.csv")

# Convert 'year' to datetime
data['year'] = pd.to_datetime(data['year'], format='%Y')
data.set_index('year', inplace=True)
data.head()
```

[1] ✓ 0.4s



Checking for stationary

1- Appling the ADfuller Test on columns to check for stationary

2- **Target:** Predicting the values of imports for **oil sector** for **next 3 years**

- **P-Value** < 0.05
- **T-stat** < 5% crit value

Which indicate that **Oil sector** is **stationary**

Column	Test Statistic	p-value	Critical Values	Is Stationary
Base Metals & Products	-3.5772	0.0062	1%: -4.3316 5%: -3.2329 10%: -2.7487	True 1
Cereals Merchandise	0.7484	0.9908	1%: -4.2232 5%: -3.1894 10%: -2.7298	False
Chemicals Merchandise	-2.1550	0.2230	1%: -3.8893 5%: -3.0544 10%: -2.6670	False
Cotton & Its Products & Other Textiles	-2.6256	0.0878	1%: -4.3316 5%: -3.2329 10%: -2.7487	False
Foodstuff Merchandise	-1.4309	0.5674	1%: -4.3316 5%: -3.2329 10%: -2.7487	False
Machinery, Appliances, Electric Equipment & Parts Thereof	-2.1411	0.2283	1%: -3.8893 5%: -3.0544 10%: -2.6670	False
Oil Merchandise	-3.3268	0.0137	1%: -4.3316 5%: -3.2329	True 2

***Picking a TSA model**

- **non-integrated models**
  Used for stationary data
- **integrated models**
  Used for Non-stationary

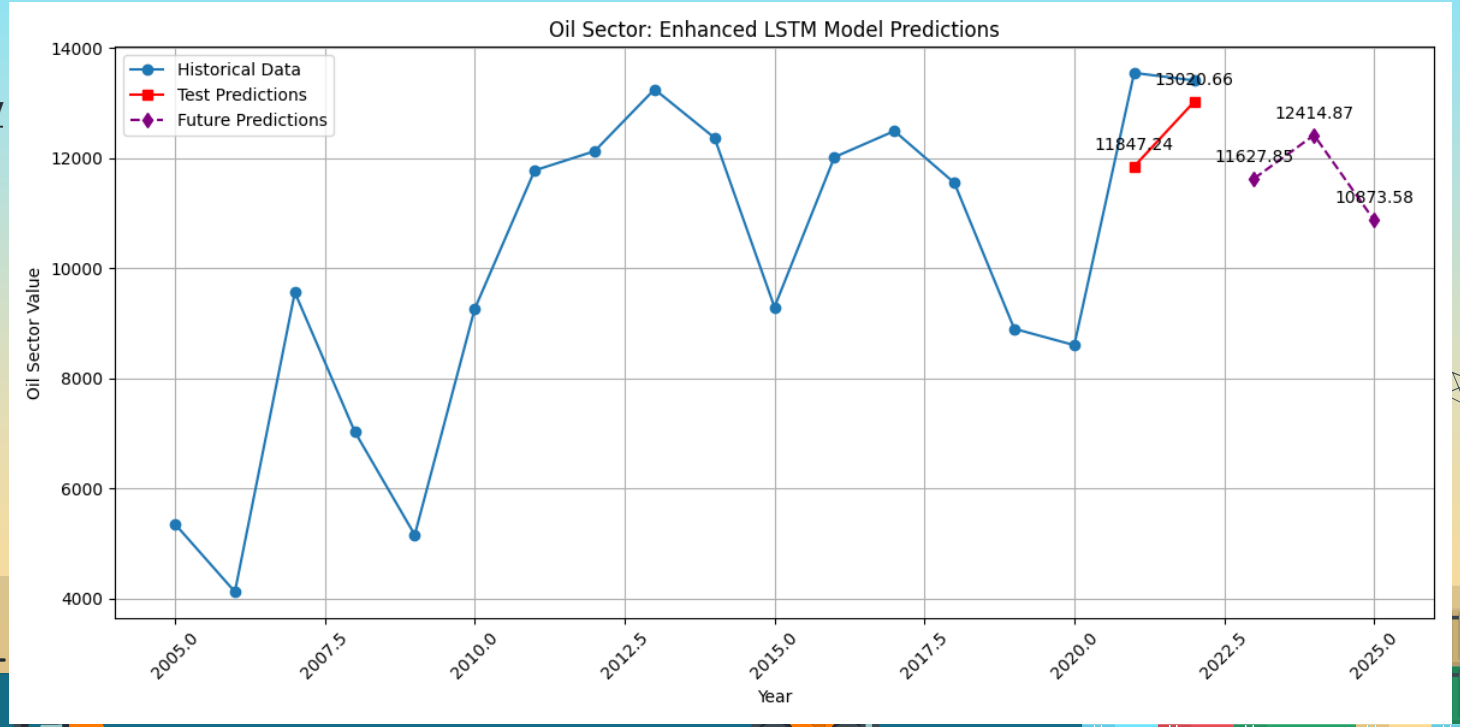
Predictions

1- Due to the **short length** of the provided data there was **no Accurate TSA model** could **reliably predict** the testing set

2- We ended Using **Keras** library specifically **LSTM model**

*** Predicted Values**
For Oil Imports next 3y

- 2023 : **$11.62 billion** will decrease ▼
- 2024 : **$12.41 bn** slightly increase ▲
- 2025 : **$10.87 bn** further decrease ▼▼

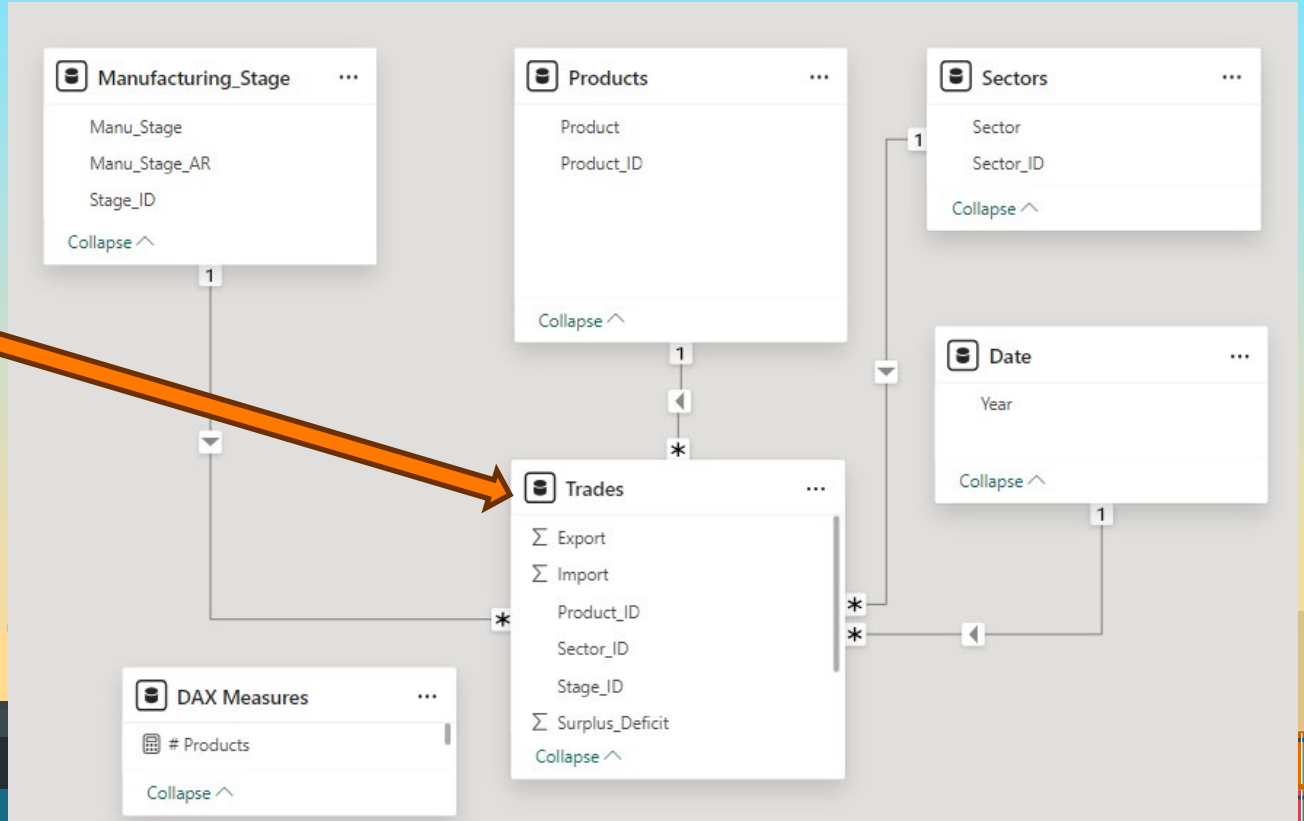


05

Data Visualization

Star Schema Using PowerBI

Trades as Fact Table



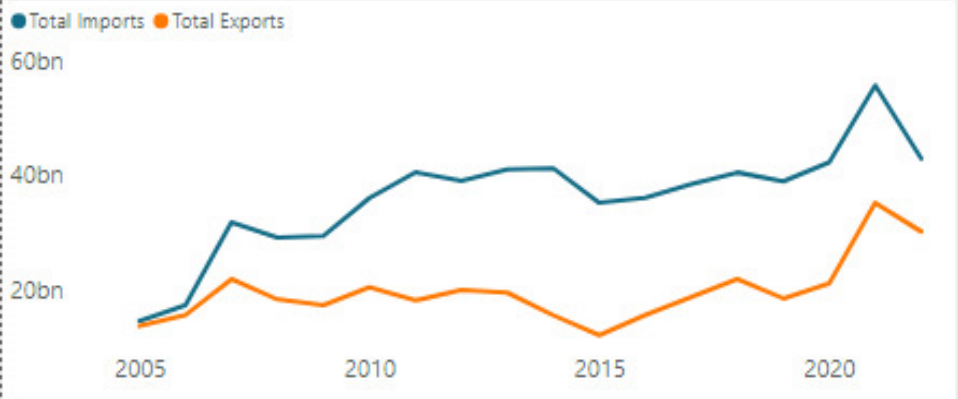
Egypt Trades

(2005 : 2023)

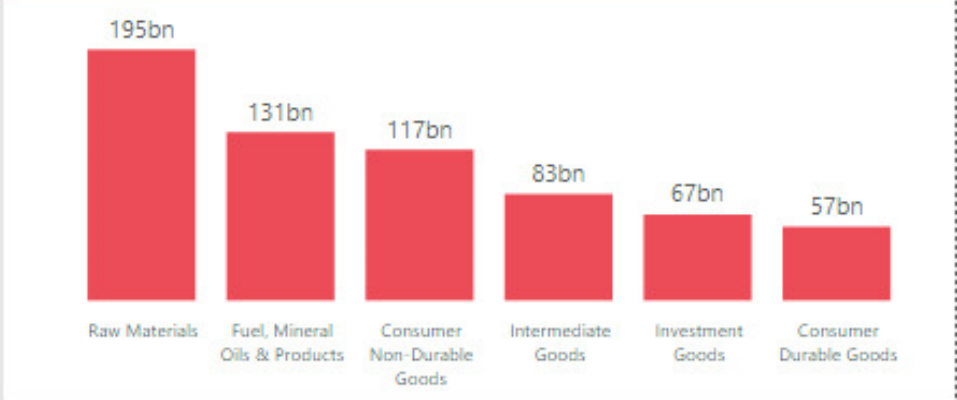
Total Imports	Total Exports	Total Surplus / Deficit
650bn	354bn	295bn

Year: All

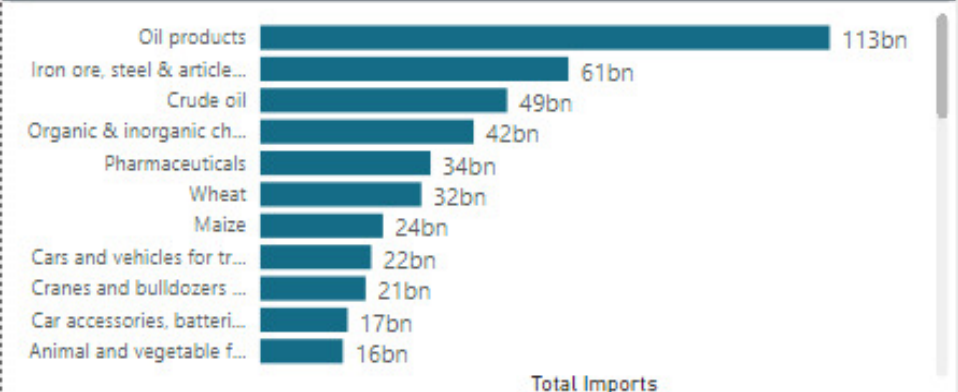
Total Imports and Total Exports by Year



Total Imports by Manu_Stage



Total Imports by Product



Total Imports by Sector

Products

37

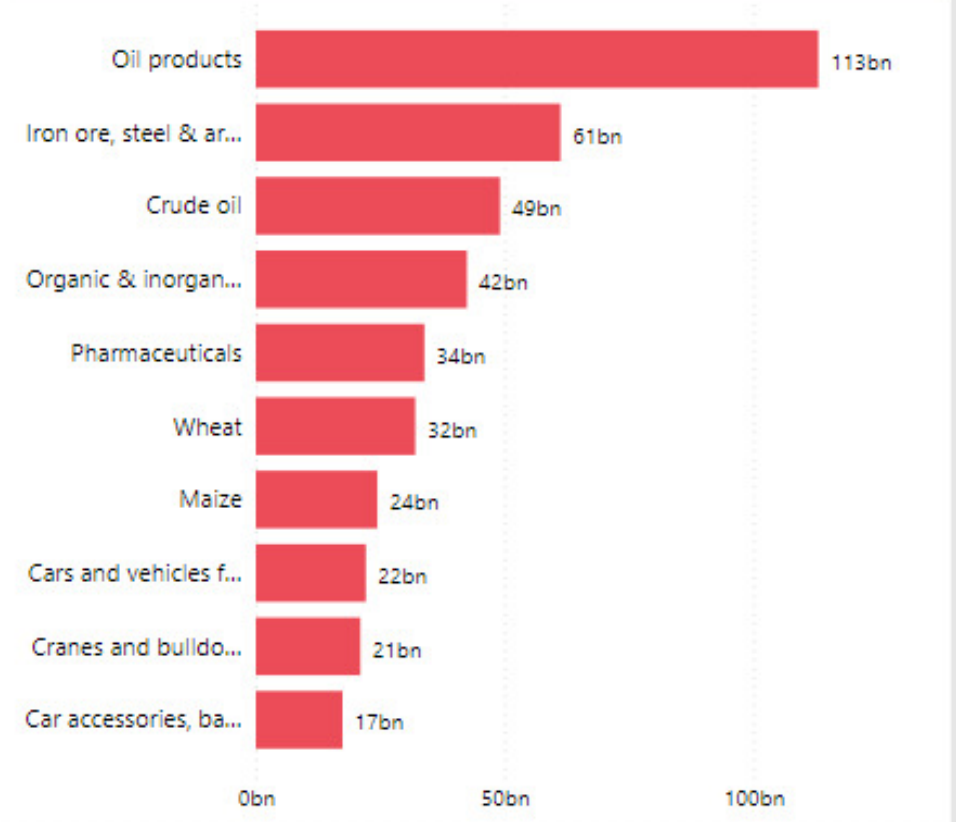
Most Imported Product

Oil products **113.0bn**

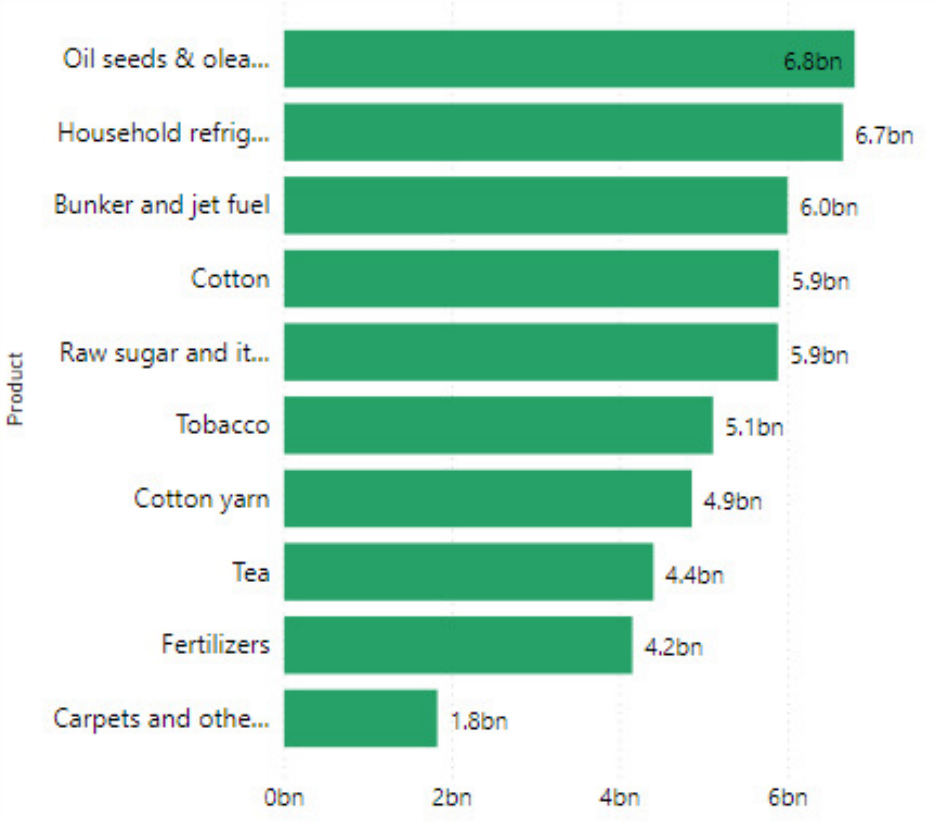
Year

All

Top 10 Importing Products



Bottom 10 Importing Products



Sectors

No of All Sectors

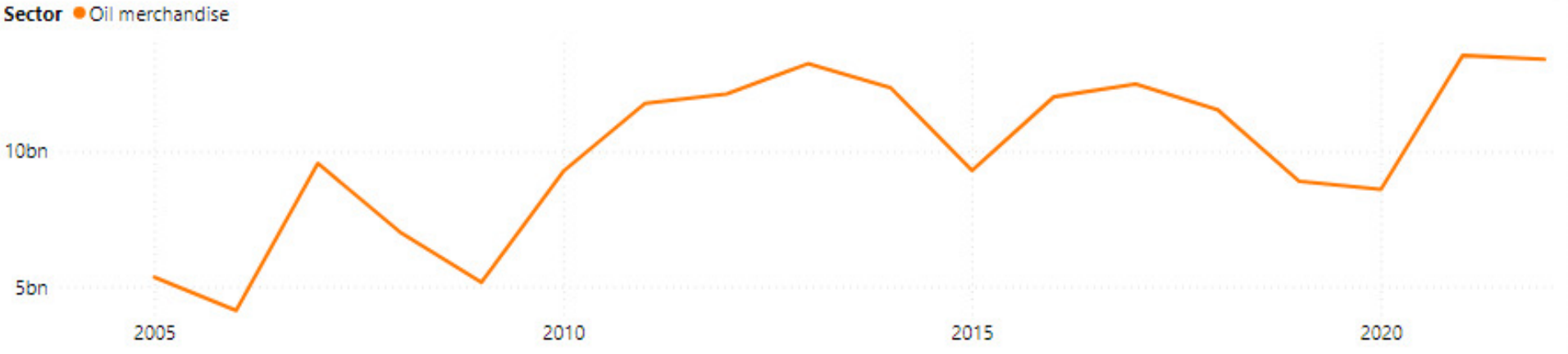
8

No of All Products

37

Sector	Total Imports
Oil merchandise	**179,818,800,338.75**
Bunker and jet fuel	6,003,599,960.33
Crude oil	49,055,299,499.51
Natural gas	11,742,899,902.34
Oil products	113,017,000,976.56
Total	**179,818,800,338.75**

Total Imports by Year and Sector



Manufacturing Stages

No of All Manufacturing Stages

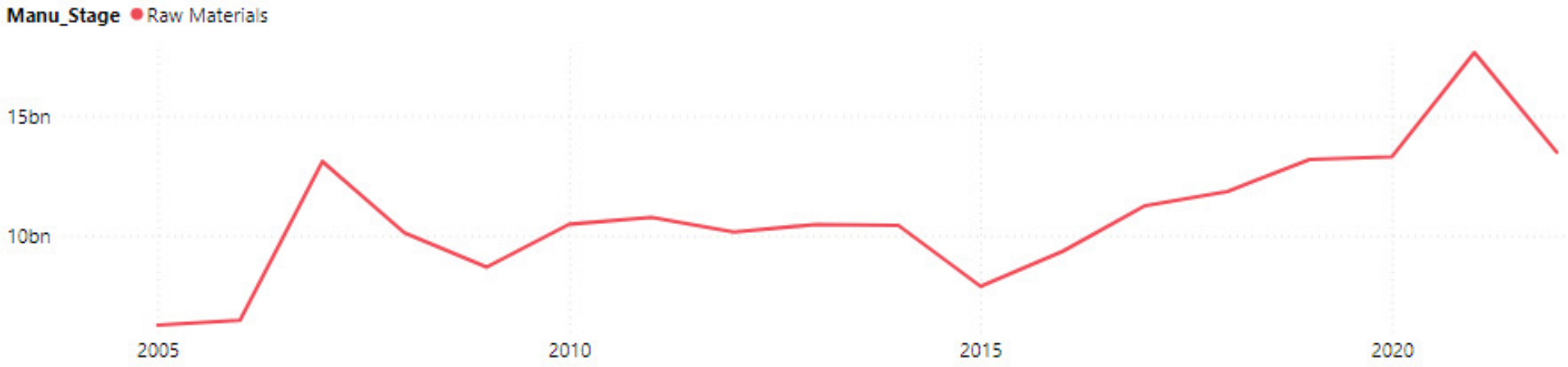
7

No of All Products

37

Manu_Stage	Total Imports
Raw Materials	**194,982,199,508.67**
Aluminum ore and its articles	7,925,600,036.62
Copper ore and its articles	9,314,300,003.05
Cotton	5,902,199,905.40
Crude oil	49,055,299,499.51
Iron ore, steel & articles thereof	61,207,699,951.17
Maize	24,424,000,244.14
Total	**194,982,199,508.67**

Total Imports by Year and Manu_Stage



06
Recommendations and solutions study

Recommendations for Policymakers

- Promoting Domestic Production:

1- Provide Targeted Incentives: Offer tax breaks, subsidies, and other incentives to encourage domestic production of key imported goods, such as food, pharmaceuticals, and manufacturing inputs.

2- Improve Business Environment: Simplify regulatory procedures, reduce bureaucratic hurdles, and provide access to affordable financing to facilitate domestic investment and entrepreneurship.

3- Invest in Research and Development: Support research and development activities to enhance domestic innovation and competitiveness, enabling local industries to produce high-quality products that can compete with imports.

Recommendations for Policymakers

- Power Sector Development:

4- Diversify Energy Sources: Invest in renewable energy projects such as solar and wind to reduce dependency on oil.

5- Expand Natural Gas Utilization: Increase the use of domestic natural gas in power generation as a cleaner alternative to oil.

6- Promote Electric Mobility: Encourage the adoption of electric vehicles (EVs) by building charging infrastructure and transitioning public transport to electric power, reducing oil consumption in transportation.

Recommendations for Policymakers

- Agricultural Development:

7- Modernize Farming Practices: Promote the adoption of modern farming techniques, such as precision agriculture and sustainable farming methods, to increase yields and reduce reliance on imported inputs.

8- Invest in Irrigation Systems: Improve irrigation infrastructure to ensure adequate water supply for agriculture, especially in arid regions.

9- Support Value-Added Agriculture: Encourage the development of value-added agricultural industries, such as food processing and packaging, to increase domestic value-capture and reduce reliance on raw material exports.

Recommendations for Policymakers

- Industrial Development:

10- Attract Foreign Investment: Create a favorable investment climate to attract foreign direct investment (FDI) in manufacturing and other sectors. This can involve providing tax incentives, infrastructure support, and a skilled workforce.

11- Promote Industrial Clusters: Develop industrial clusters to foster collaboration, knowledge sharing, and economies of scale among domestic firms.

12- Enhance Technical Skills: Invest in vocational training and education to equip the workforce with the skills needed to meet the demands of modern industries.

Thanks!

Do you have any questions?

Feel free to ask!

Google Drive Link for the project

GitHub repo link for the project