Institute of Technical Education and Research [ITER] , Bhubaneswar

AFFILIATED BY

SOA | SIKSHA 'O' ANUSANDHAN

TRAINING REPORT ON COAL PRICE ANLYSIS AND COAL CONSUMPTION

FOR BCCL

BHARAT COKING COAL LIMITED

(A SUBSIDIARY OF COAL INDIA LIMITED)

DHANBAD,JHARKHAND

B.TECH IN COMPUTER SCIENCE AND ENGINEERING (2022 – 2026)

UNDERTAKEN AT :

SYSTEM DEPARTMENT BCCL , DHANBAD

CERTIFICATE

This is to certify that I am a student of 2nd year B.TECH at **SIKSHA 'O' ANUSANDHAN ,Bhubaneswar** have successfully completed my project report entitled **" COAL PRICES ANALYSIS AND COAL CONSUMPTION " .** It's Industrial training starts from **1st of July to 28th of July (4 weeks) at System Department BCCL , Headquarter ,Dhanbad .**

The matter embodied in this project is entirely genuine and authentic work done by the students . This project has not been submitted to any other institute for fulfilment of the requirements of any course of studying to the best of my knowledge .

HOD (SYSTEM)

SYSTEM DEPARTMENT

B.C.C.L ,DHANBAD

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MR. AVINASH KUMAR NANDAN

DEPUTY MANAGER SYSTEM

SYSTEM DEPARTMENT

B.C.C.L ,DHANBAD

ACKNOWLEDGEMENT

I would like to extend our sincere thanks to our project manager **MR. AVINASH KUMAR NANDAN, Deputy Manager System .**

His consistent support helped me in accomplishing this project successfully . His experience and Technical skills always provide me guidance to work .

I also thank to **H.R.D Department of B.C.C.L** for this help .

I am grateful to HOD(System) for granting me the permission to do this Training and project in their estimate organisation .

I also thank all the staff members of the organisation for their co – operation throughout the working of this project

I am also thankful to my parents ,seniors and batchmates for showing their support , co-operation and continuous motivation .

PRAKSHI PRIYA

SIKSHA 'O' ANUSANDHAN ,BHUBANESWAR

REG NO. – 2241016464

BRANCH – CSE [DATA SCIENCE]

CONTENTS

ABSTRACT

Government have been striving since the late 1990's to find better ways to connect with their constituents via the Web . By putting government information online ,making it easily accessible , findable, readably, understandable , people can now interact with their government in ways never imagined . Current web technology allows government to share with public a variety of information is unlimited quantities on demand . Technology is always available to allow citizens to bring issues of concern to the attention of local regional governments .

However, exploiting these capabilities within government system is a challenge that encompasses environmental policy , legal and cultural issues . Establishing effective eGovernment requires openness transparency , collaboration , and skills in taking advantage of the capabilities of the World Wide Web . The goal of this project is to ensure that the government services are made available to the common people electronically by improved online infrastructure .

COAL INDIA LIMITED

➢ *INTRODUCTION TO COAL INDIA LIMITED*

Coal India Limited (CIL) is an Indian state-controlled coal mining company headquartered in Kolkata ,West Bengal . India and the largest coal producer company in the world and a Maharatna company .

The company contributes to around 82% of the coal production in India . It produced 554.14 million tons of raw coal in 2016-17 ,an increase from its earlier production of 494.24 million tons of coal during FY 2014-15 and earned a revenue of 05,435 crore (USS 14 billion) from sale of coal in the same financial year .

As on 14 October 2015 , Union Government of India owns CIL and controls the operations of CIL through Ministry of Coal .

In April 2011 , CIL was conferred the Maharatna statue by the union govt. of India , making it one of the seven Maharatnas .

As on 14 October 2015, its market capitalization was 2.11 Lakh crore .

(USS 14 Bullion) making it India's 8th most Valuable company by market value .

Coal India limited is one of the largest coal producing companies in the world with the total production of 431.32 million metric tons in 2010-2012 . CIL has 8 holly subsidiaries.

As of March 31st 2011 , it operated 470 mines in 21 major coal fields across 8 states in India including 164 opencast mines 275 underground mines and 31 mixed mines .

BBCL | BHARAT COKING COAL LIMITED

- ***INTRODUCTION TO BCCL***

BHARAT COKING COAL LIMITED [BCCL] is a subsidiary of Coal India Limited with its Headquarter in Dhanbad , India . It was incorporated in January 1972 to operate coking coal mines (214 in number) operating in Jharia and Raniganj Coalfields and was taken over by the government of India on 16 October 1971 .

The company operates 81 coal mines which include 40 underground , 18 opencast and 23 mixed mines as of April 2010 . The company also runs 6 Coking coal washeries ,two non-coking coal washeries , one captive power plant (20 MW) and five by -product coke plants . The mines are grouped into 12 areas for administration purposes .

BCCL is the major producer of prime coking coal (raw and washed) in India . Medium Coking Coal is produced in its mines in MOHUDA and BARAKAR areas . In addition to production of hard coke , BCCL operates washeries , sand gathering plants , a network of aerial ropeways for transport of sand , and coal bed methane – based power plant in Moonidih .

- ***CURRENT SITUATION***

BHARAT COKING COAL LIMITED gave an annual coal production of around 37.04 million tons in 2016-17 with a turnover of 11,505 crore (USS 1.7 billion) . It has a manpower of about 49,901 as cm 01.10 – 2017 .

ADMINISTRATIVE AREAS

There are 12 areas in the BCCL :

ADMINISTRATIVE AREA	*NAME*
1. Area No 1	Barora Area
2. Area No 2	Block II Area
3. Area No 3	Govindpur Area
4. Area No 4	Katras Area
5. Area No 5	Sijua Area
6. Area No 6	Kusunda Area
7. Area No 7	Putki Balihari Area
8. Area No 8	Bastacola Area
9. Area No 9	Lodna Area
10. Area No 10	Eastern Jharia Area
11. Area No 11	Chanch Victoria Area
12. Area No 12	Western Jharia Area

INTRODUCTION

Traditional methods of Web services by BCCL , ever since known , have relied on pen and paper with several layers of substantiation which not only slows down the process but also gives power in not so worthy hands to flout the rules laid by the government to successfully execute this searching procedure . This portal has been developed to tackle these two major issues along with other minor problems which one may be able to see on a deeper analysis .

Understanding coal price dynamics can help BCCL optimize its production, marketing strategies, and financial performance. It is responsible for producing prime coking coal for the steel sector and is a major player in the Indian coal industry.

Data visualization is a powerful tool for enhancing the analysis and understanding of coal consumption at BCCL. By transforming raw data into meaningful visual insights, BCCL can improve operational efficiency, make informed decisions, and effectively communicate findings.

Data visualization transforms raw data into meaningful insights, aiding BCCL in making data-driven decisions, optimizing operations, ensuring compliance, and effectively communicating with stakeholders. By leveraging advanced visualization tools, BCCL can enhance its overall efficiency, reduce costs, and improve its environmental and safety standards.

MOTIVATION

As mentioned earlier , traditional methods to physically return items that are found or find an item that is just too difficult . This is a real issue faced by all of us in our day – to – day life . In today's world almost everyone is occupied with a smartphone and internet connectivity . So , this gave us an idea to develop this Online portal for the convenience of people at large . Currently it is being developed for BCCL as an intra organizational portal but later it can be scaled up to serve a larger set of people .

AIM AND SCOPE OF THE PROJECT

The major aim of this project to provide a fast ,easy , secure and optimized platform to the common people Who are in need of our company's facilities and services . The traditional methods are time consuming as well as physically tiring . This project aims to solve basic problems faced by people in their daily lives .

Currently this portal is being developed by keeping in mind Employees of BCCL exclusively as and when deployed . Later on , it can be scaled up for larger public .

TOOLS AND TECHNOLOGIES USED

➢ DATA VISUALIZATION

Data visualization is the art and science of transforming raw data into meaningful and easily understandable visual representations. It involves using charts, graphs, maps, and other visual elements to reveal patterns, trends, and insights that might be hidden within the data.

Why is Data Visualization Important?

- **Enhanced Understanding:** Visuals process information faster than text, making complex data accessible to everyone.
- **Effective Communication:** Visuals tell a story, making it easier to convey insights and persuade audiences.
- **Improved Decision Making:** By identifying trends and patterns, data visualization aids in informed decision-making.
- **Data Exploration:** Visualizations help uncover hidden relationships and correlations within the data.

Key Principles of Effective Data Visualization

- **Clarity:** The visualization should be easy to understand.
- **Relevance:** The visual should convey the intended message.
- **Simplicity:** Avoid clutter and unnecessary elements.
- **Consistency:** Use consistent colors, fonts, and scales.
- **Interactivity:** Allow users to explore the data further.

➢ *Tools for Data Visualization*

There are numerous tools available for creating data visualizations, ranging from basic spreadsheet software to specialized data visualization platforms. Some popular options include:

- **Microsoft Excel:** Offers basic charting capabilities.
- **Python libraries:** Matplotlib, Seaborn, Plotly, and more.

➢ Microsoft Excel

Microsoft Excel is a powerful spreadsheet software that's become an indispensable tool for businesses, students, and individuals alike. Think of it as a digital version of a paper spreadsheet, but with immense capabilities.

ADVANTAGES :

- **Organize data:** Create tables with rows and columns to structure your information.
- **Perform calculations:** Use formulas and functions to perform mathematical operations, from simple addition to complex financial analysis.
- **Analyse data:** Discover trends, patterns, and insights using tools like pivot tables and charts.
- **Create visualizations:** Transform data into visual representations (charts, graphs) for better understanding.
- **Manage databases:** Store and manage large datasets efficiently.
- **Automate tasks:** Use macros (recorded sequences of actions) to streamline repetitive tasks.

➢ *PYTHON*

Python is a high-level, general-purpose programming language renowned for its readability and simplicity. Its emphasis on code clarity makes it an excellent choice for beginners and experienced programmers alike .

ADVANTAGES :

 Object-Oriented Programming: Supports OOP concepts for structured code.

 Embedding Capabilities: Can be embedded in other applications.

 High-Level Language: Abstracts low-level details, making it easier to focus on problem-solving.

- ***PYTHON IN EXCEL***

Python in Excel integrates the power of Python directly into Microsoft Excel, allowing users to leverage Python's robust data analysis and visualization libraries within the familiar Excel environment. This feature is available in Microsoft 365 and is particularly useful for those who want to enhance their Excel spreadsheets with Python's capabilities.

Advantages of Python in Excel

The integration of Python into Excel brings a powerful combination of capabilities. Here are some key advantages:

1. Enhanced Data Analysis
2. Advanced Data Visualization
3. Automation of Tasks
4. Improved Data Handling
5. Integration with Jupyter Notebooks
6. Machine Learning and Predictive Analytics.

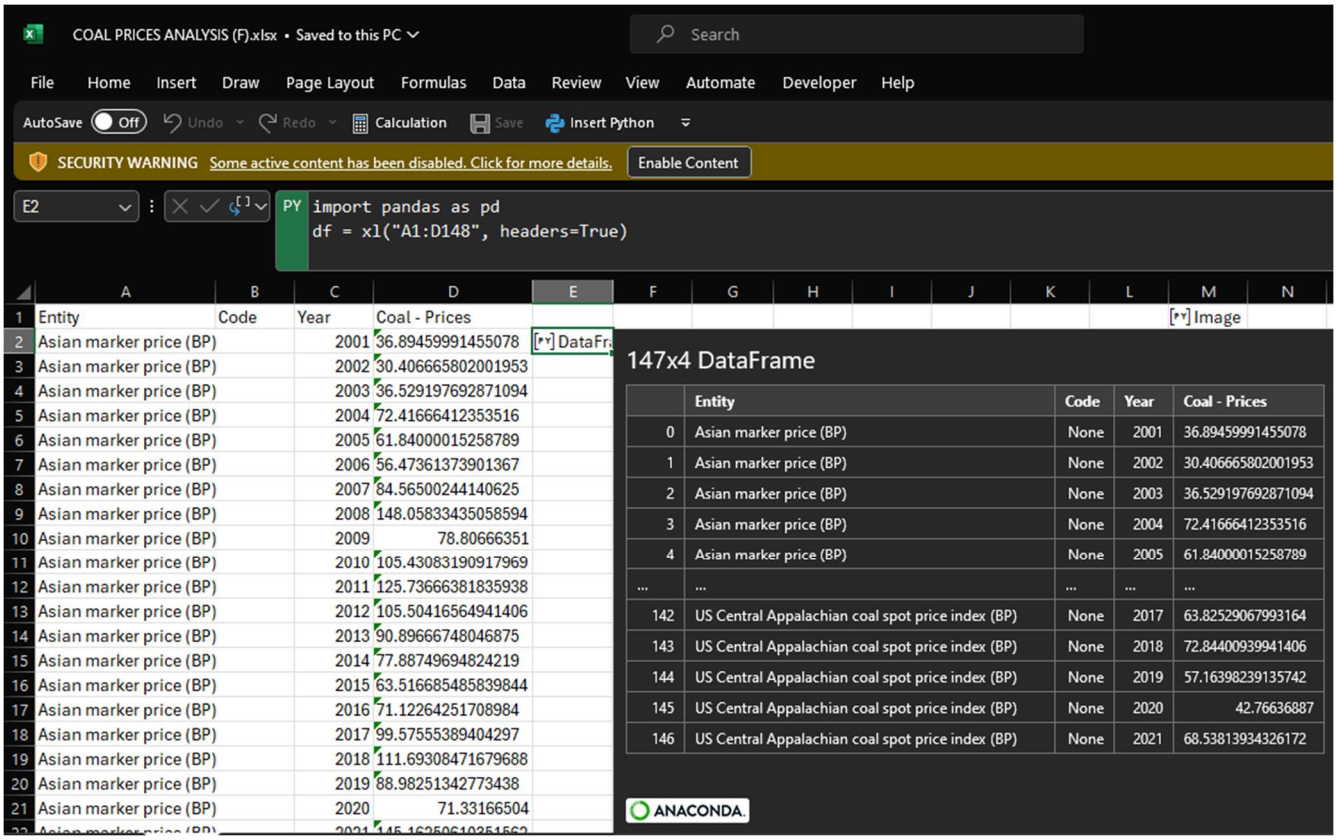
DESIGN AND IMPLEMENTATION

In this project , the portal has been focusing on two divisions that is coal prices and coal consumption . In this project , we use data visualization to create effective and visually appealing charts in Excel to analyse and present various aspects such as production statistics, financial performance, safety records, environmental impact . We created a line chart for the purpose of monthly production volumes or financial performance. We create bar graph for comparing different categories, like production by mine or safety incidents by type. We also created pie charts for showing the composition of a whole, like revenue sources in both divisions . We also plot scatter graph for showing relationships between variables, like production volume vs. revenue. We also

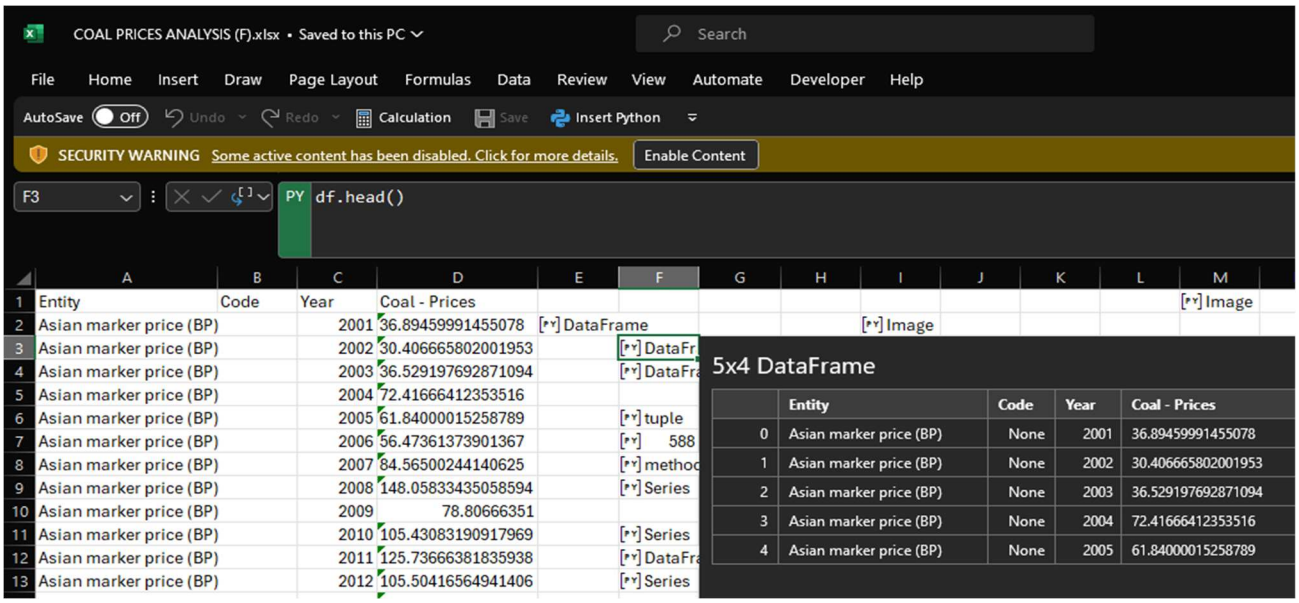
customize the graphs in different forms such as titles and labels , legends , colour and styles and data labels by using matplotlib in python . We have applied library like numpy , pandas , matplotlib and seaborn to design different forms of graphs with dataset installed . In Coal Price Analysis project , there are some benefits for BCCL are revenue optimization , risk management , operational efficiency , strategic planning , price analysis , competitive analysis . Hence , BCCL can enhance its decision-making, improve profitability, and strengthen its market position. from coal prices analysis project what is beneficial for bccl . A comprehensive coal consumption analysis can provide invaluable insights for Bharat Coking Coal Limited (BCCL) to optimize its operations, enhance market position, and contribute to strategic decision-making . The focus of this implementation is on efficiency and providing transparency to the users as well as the system .

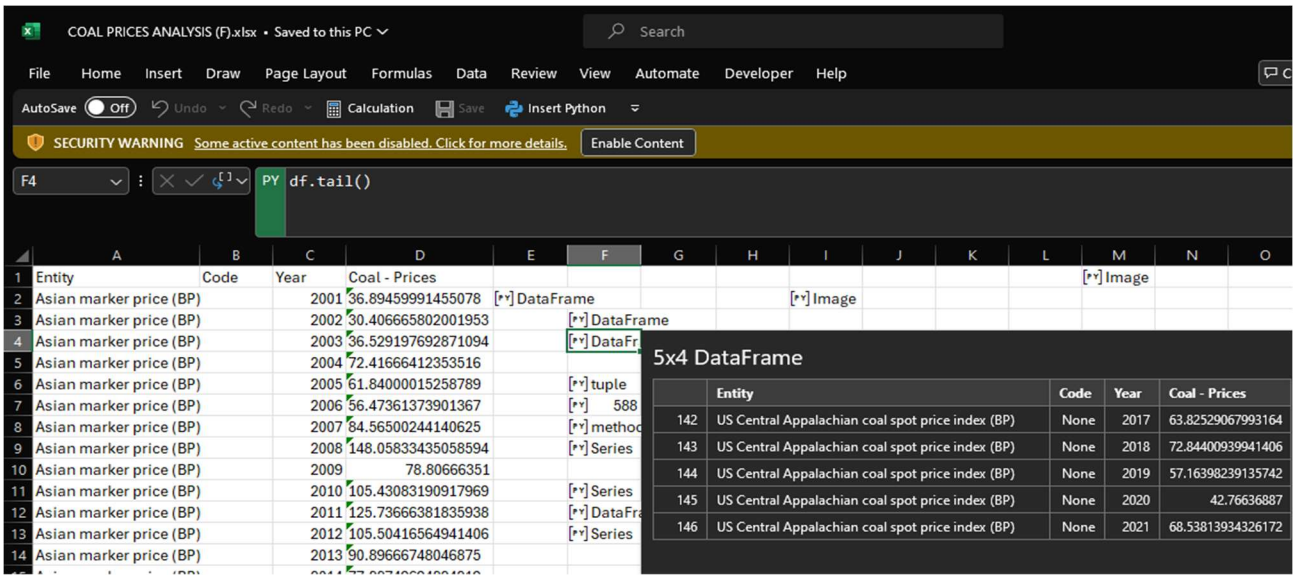
SCREENSHOTS

> COAL PRICES ANALYSIS



	Entity	Code	Year	Coal - Prices
0	Asian marker price (BP)	None	2001	36.89459991455078
1	Asian marker price (BP)	None	2002	30.406665802001953
2	Asian marker price (BP)	None	2003	36.529197692871094
3	Asian marker price (BP)	None	2004	72.41666412353516
4	Asian marker price (BP)	None	2005	61.84000015258789
...	...	...	...	...
142	US Central Appalachian coal spot price index (BP)	None	2017	63.82529067993164
143	US Central Appalachian coal spot price index (BP)	None	2018	72.84400939941406
144	US Central Appalachian coal spot price index (BP)	None	2019	57.16398239135742
145	US Central Appalachian coal spot price index (BP)	None	2020	42.76636887
146	US Central Appalachian coal spot price index (BP)	None	2021	68.53813934326172


COAL PRICES ANALYSIS (F).xlsx • Saved to this PC
Search
File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details. Enable Content
F3
PY df.head()
5x4 DataFrame
Entity Code Year Coal - Prices
0 Asian marker price (BP) None 2001 36.89459991455078
1 Asian marker price (BP) None 2002 30.406665802001953
2 Asian marker price (BP) None 2003 36.529197692871094
3 Asian marker price (BP) None 2004 72.41666412353516
4 Asian marker price (BP) None 2005 61.84000015258789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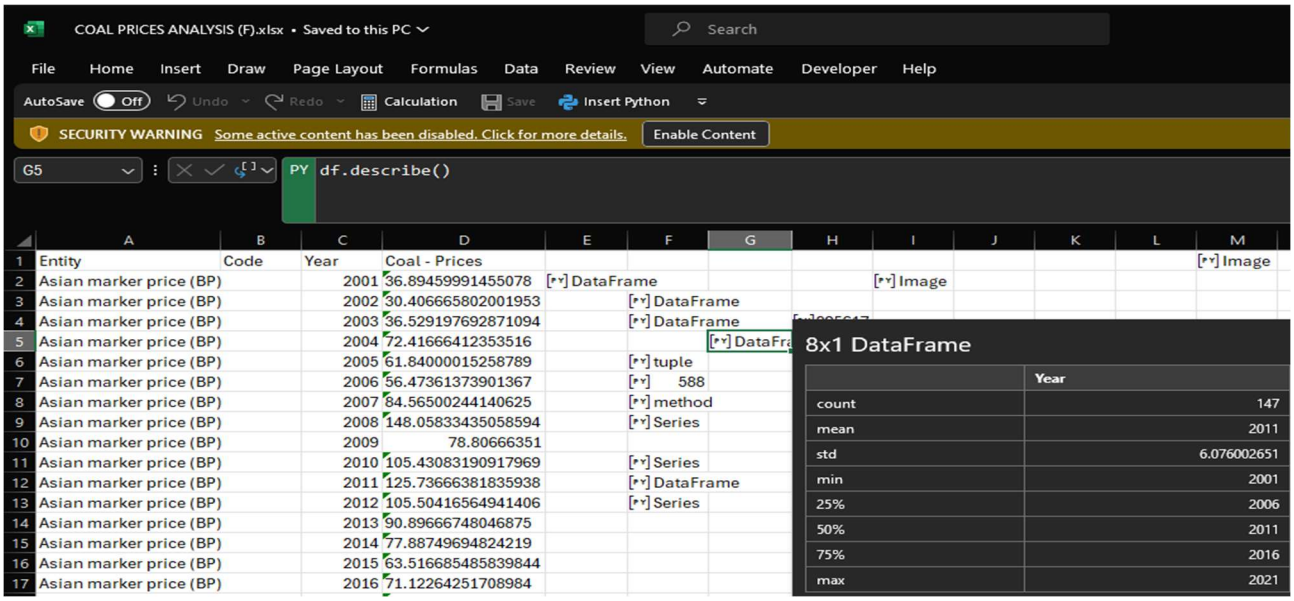
Search
File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details. Enable Content
F4
PY df.tail()
5x4 DataFrame
Entity Code Year Coal - Prices
142 US Central Appalachian coal spot price index (BP) None 2017 63.82529067993164
143 US Central Appalachian coal spot price index (BP) None 2018 72.84400939941406
144 US Central Appalachian coal spot price index (BP) None 2019 57.16398239135742
145 US Central Appalachian coal spot price index (BP) None 2020 42.76636887
146 US Central Appalachian coal spot price index (BP) None 2021 68.53813934326172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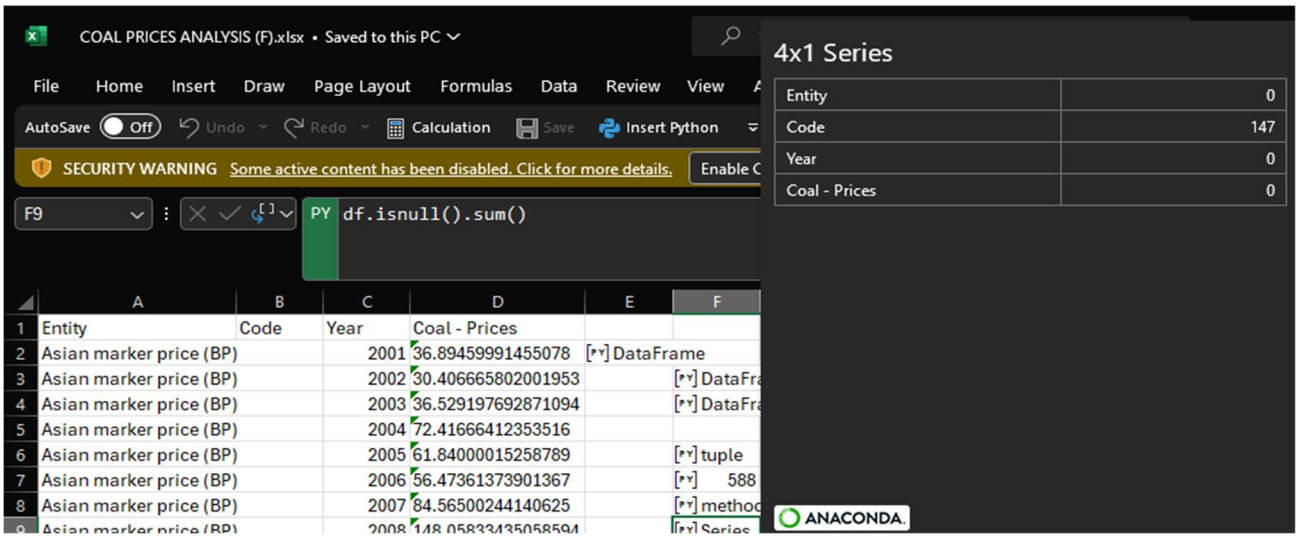
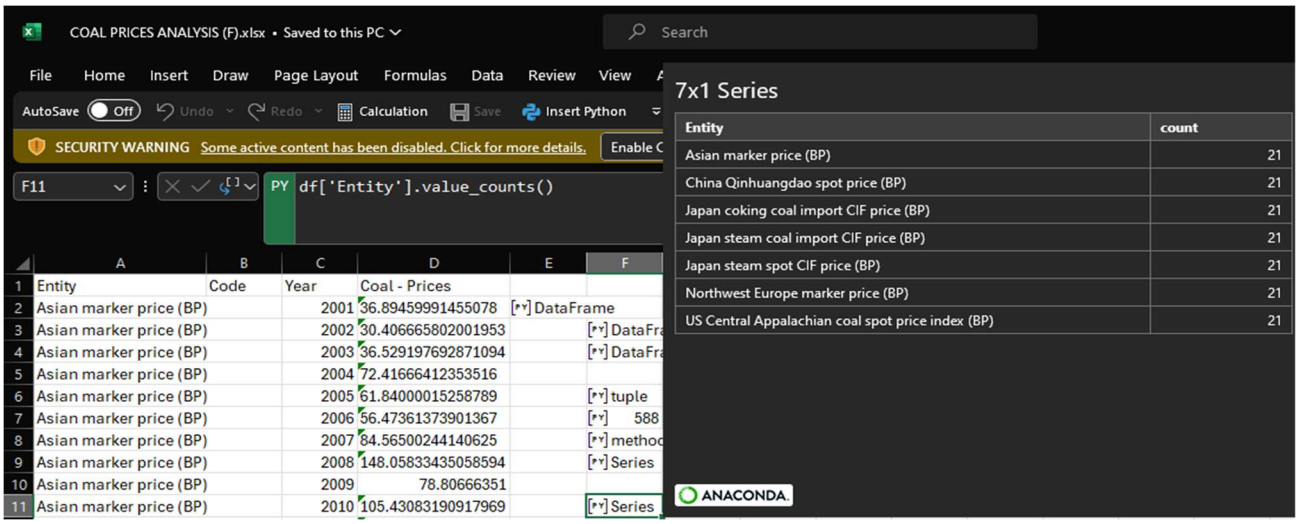
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details. Enable Content
G5
PY df.describe()
8x1 DataFrame
Year
count 147
mean 2011
std 6.076002651
min 2001
25% 2006
50% 2011
75% 2016
max 2021


COAL PRICES ANALYSIS (F).xlsx • Saved to this PC
File Home Insert Draw Page Layout Formulas Data Review View
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details.
F9
PY df.isnull().sum()
4x1 Series
Entity 0
Code 147
Year 0
Coal - Prices 0
ANACONDA.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Search
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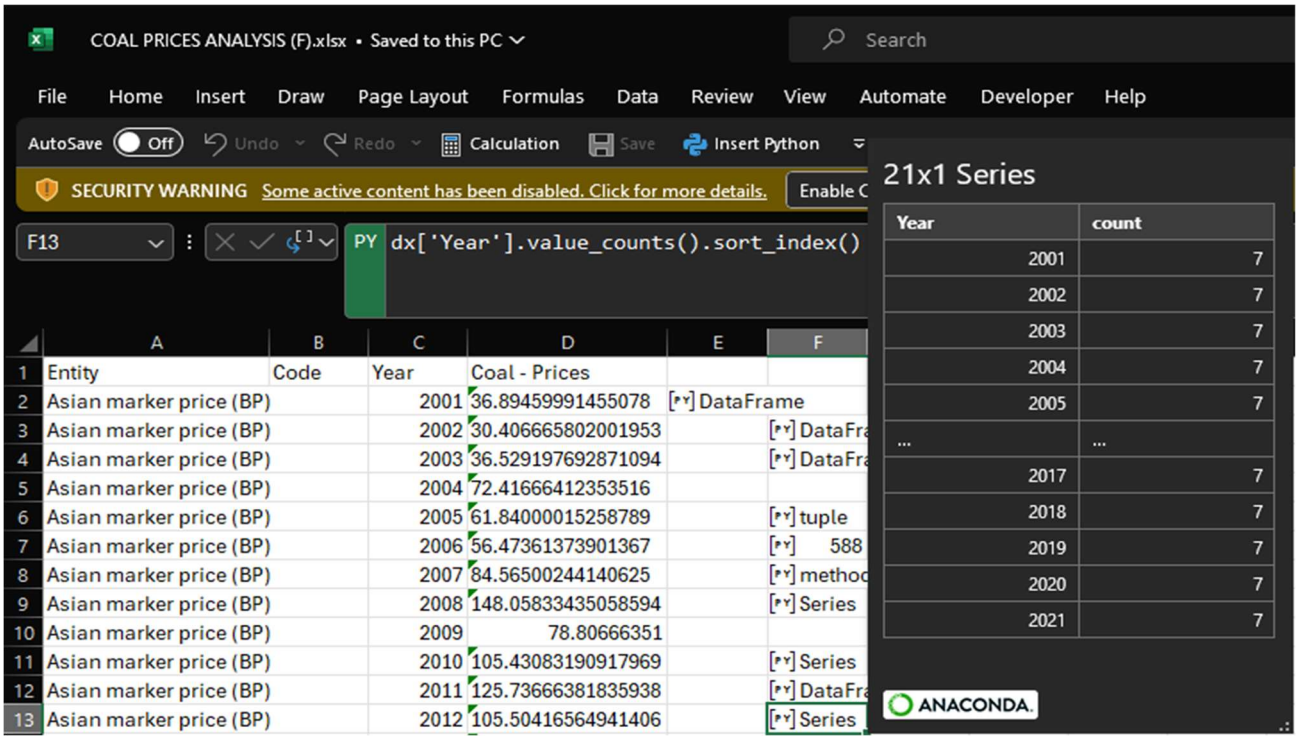
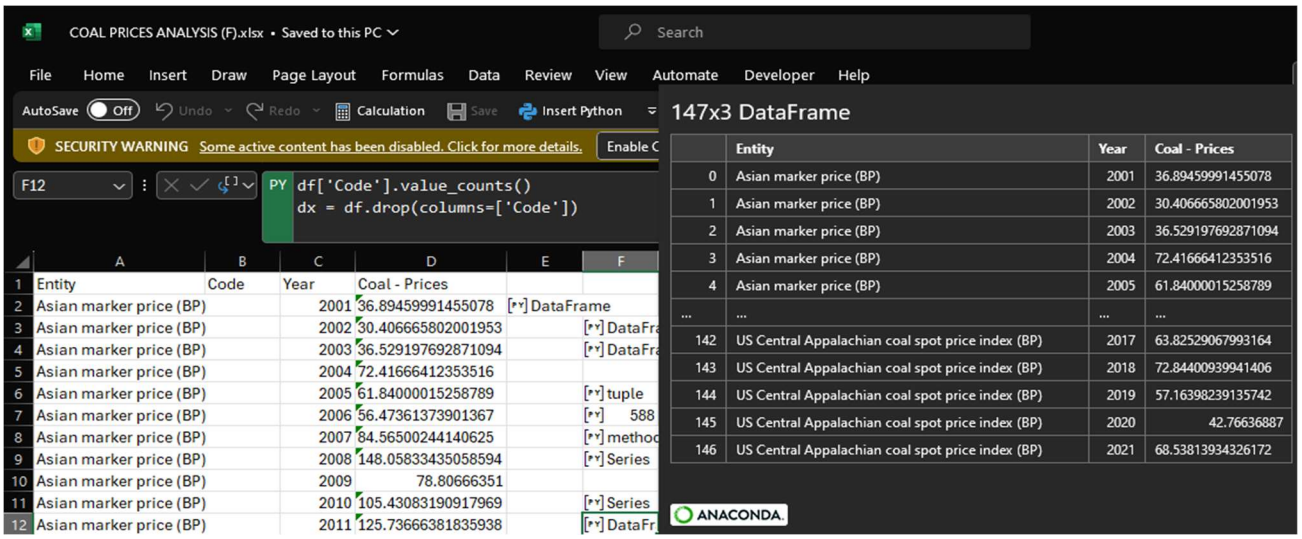
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details.
F11
PY df['Entity'].value_counts()
7x1 Series
Entity count
Asian marker price (BP) 21
China Qinhuangdao spot price (BP) 21
Japan coking coal import CIF price (BP) 21
Japan steam coal import CIF price (BP) 21
Japan steam spot CIF price (BP) 21
Northwest Europe marker price (BP) 21
US Central Appalachian coal spot price index (BP) 21
ANACONDA.


COAL PRICES ANALYSIS (F).xlsx • Saved to this PC
Search
File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help
AutoSave Off Undo Redo Calculation Save Insert Python
SECURITY WARNING Some active content has been disabled. Click for more details.
F13
PY dx['Year'].value_counts().sort_index()
21x1 Series
Year count
2001 7
2002 7
2003 7
2004 7
2005 7
... ...
2017 7
2018 7
2019 7
2020 7
2021 7
ANACONDA.



	Entity	Code	Year	Coal - Prices
1	Asian marker price (BP)		2001	36.89459991455078
2	Asian marker price (BP)		2002	30.406665802001953
3	Asian marker price (BP)		2003	36.529197692871094
4	Asian marker price (BP)		2004	72.41666412353516
5	Asian marker price (BP)		2005	61.84000015258789
6	Asian marker price (BP)		2006	56.47361373901367
7	Asian marker price (BP)		2007	84.56500244140625
8	Asian marker price (BP)		2008	148.05833435058594
9	Asian marker price (BP)		2009	78.80666351
10	Asian marker price (BP)		2010	105.43083190917969
11	Asian marker price (BP)		2011	125.73666381835938
12	Asian marker price (BP)		2012	145.16250610351562

	Entity	Year	Coal - Prices
0	Asian marker price (BP)	2001	36.89459991455078
1	Asian marker price (BP)	2002	30.406665802001953
2	Asian marker price (BP)	2003	36.529197692871094
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...	...	...	...
142	US Central Appalachian coal spot price index (BP)	2017	63.82529067993164
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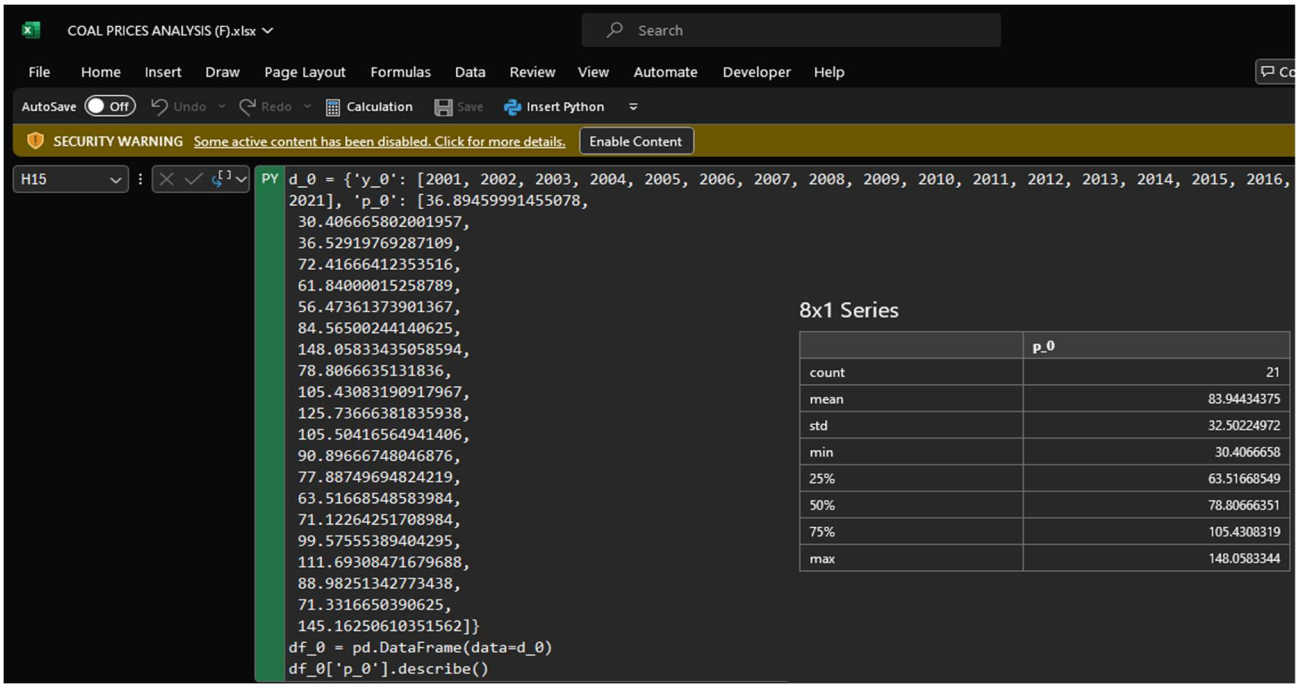
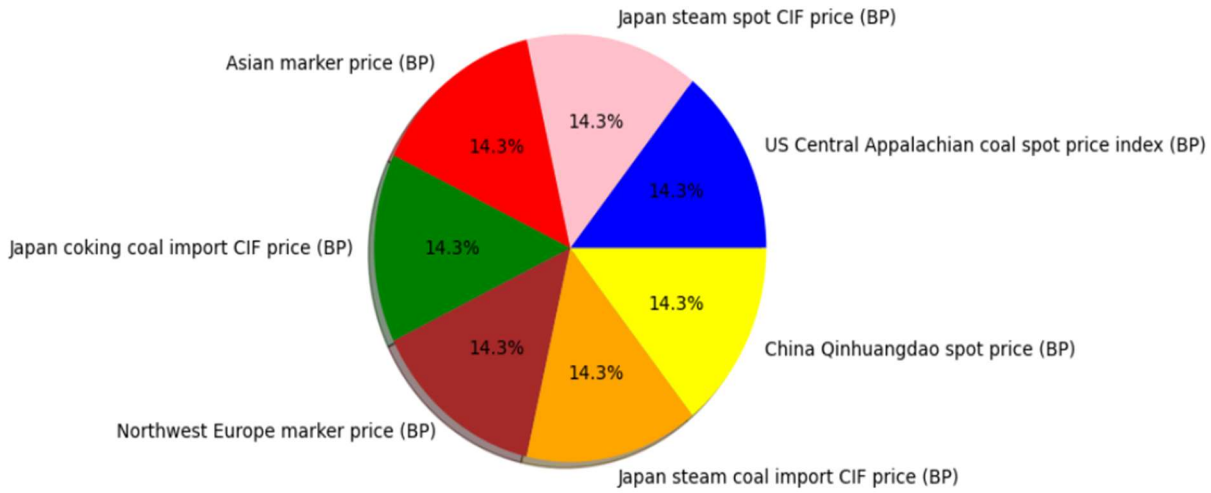
144	US Central Appalachian coal spot price index (BP)	2019	57.16398239135742
145	US Central Appalachian coal spot price index (BP)	2020	42.76636887
146	US Central Appalachian coal spot price index (BP)	2021	68.53813934326172

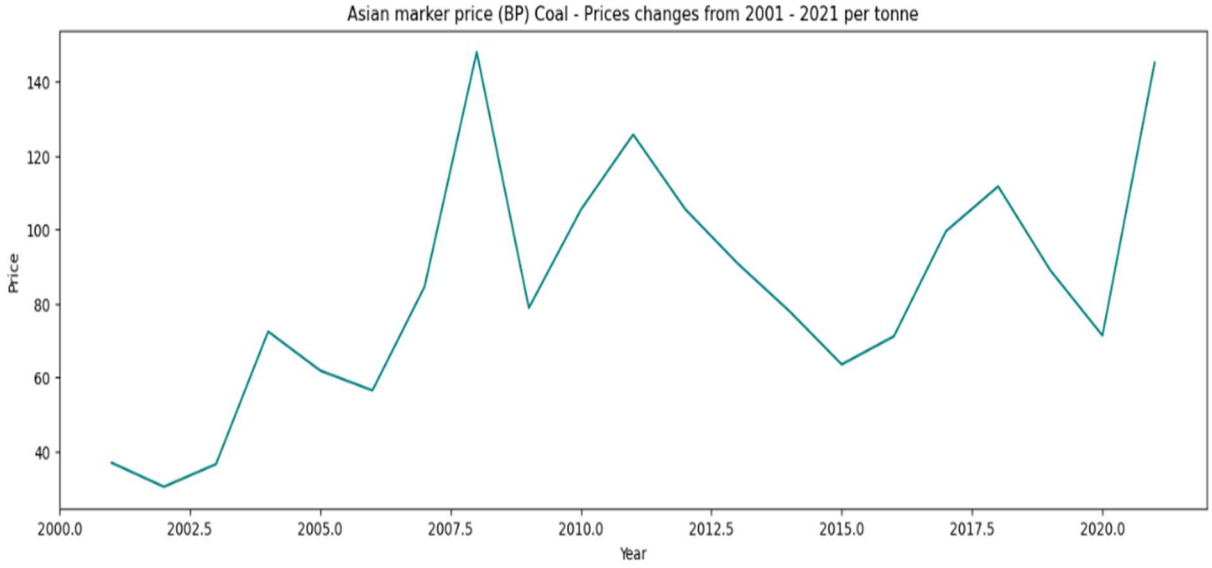


	p_0
count	21
mean	83.94434375
std	32.50224972
min	30.4066658
25%	63.51668549
50%	78.80666351
75%	105.4308319
max	148.0583344

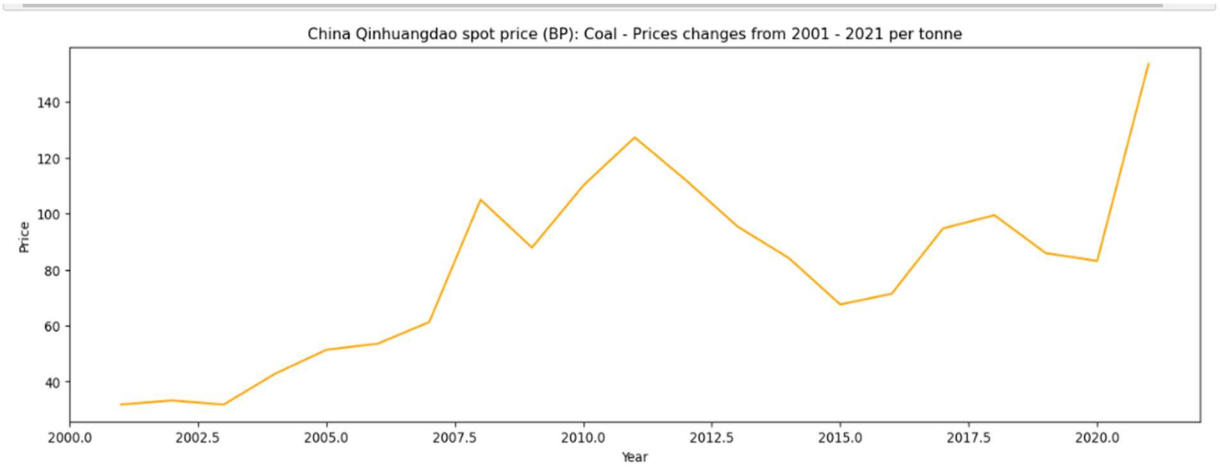
```
PY entity = ('US Central Appalachian coal spot price index (BP)', 'Japan steam spot CIF price (BP)', 'Asian marker price (BP)', 'Japan
   coking coal import CIF price (BP)', 'Northwest Europe marker price (BP)', 'Japan steam coal import CIF price (BP)', 'China Qinhuangdao
   spot price (BP)')
   ent_counts = (21, 21, 21, 21, 21, 21, 21)

   colors = ('blue','pink', 'red', 'green', 'brown', 'orange', 'yellow')
   plt.figure(figsize = (16, 5))
   plt.pie(
       ent_counts,
       labels=entity,
       autopct='%1.1f%%',
       colors=colors,
       shadow=True
   )
   plt.show()
```



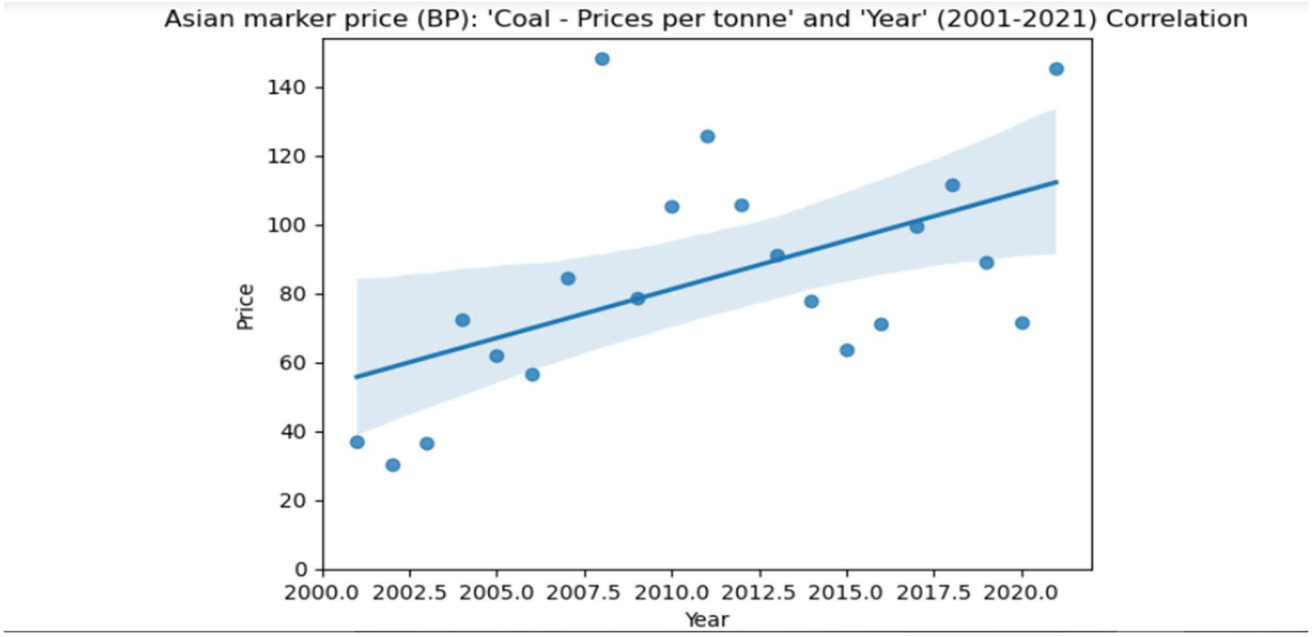

```
PY an = dx.loc[0:20]
   n1_0 = an["Coal - Prices"].tolist()
   x_0 = (2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021)
   y_0 = (36.89459991455078,
    30.406665802001957,
    36.52919769287109,
    72.41666412353516,
    61.84000015258789,
    56.47361373901367,
    84.56500244140625,
    148.05833435058594,
    78.8066635131836,
    105.43083190917967,
    125.73666381835938,
    105.50416564941406,
    90.89666748046876,
    77.88749694824219,
    63.51668548583984,
    71.12264251708984,
    99.57555389404295,
    111.69308471679688,
    88.98251342773438,
    71.3316650390625,
    145.16250610351562)
   plt.figure(figsize = (16, 5))
   plt.title("Asian marker price (BP) Coal - Prices changes from 2001 - 2021 per tonne")
```



```
PY  33.19486618041992,
    31.744373321533203,
    42.76045989990234,
     51.34153747558594,
    53.52624130249024,
    61.22782516479492,
    104.97216033935548,
    87.86170196533203,
    110.07920837402344,
    127.26840209960938,
    111.88970947265624,
    95.41863250732422,
    84.11642456054688,
    67.5318832397461,
    71.34886169433594,
    94.72347259521484,
    99.4467544555664,
    85.89109802246094,
    83.09520721435547,
    153.5463409423828)
plt.figure(figsize = (16, 5))
plt.title("China Qinhuangdao spot price (BP): Coal - Prices changes from 2001 - 2021 per tonne")
plt.xlabel("Year")
plt.ylabel("Price")
plt.plot(x_1, y_1, color ="orange")
plt.show()
```

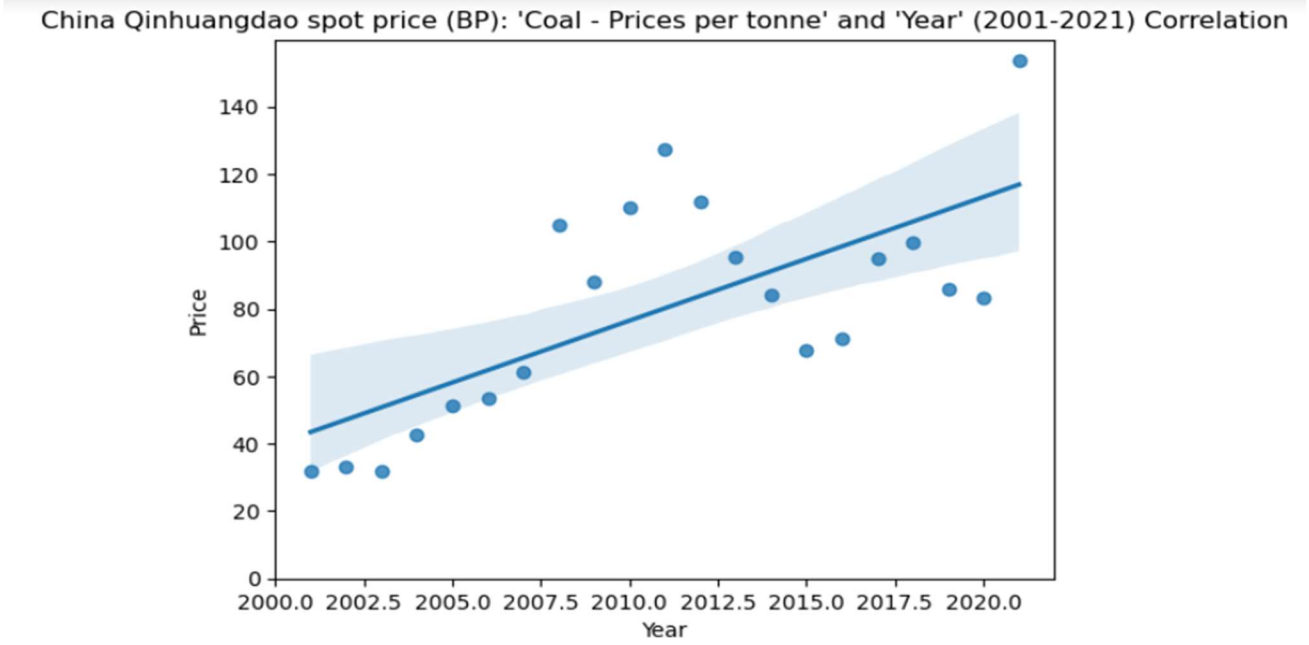



```
PY  sns.regplot(x="y_0", y="p_0", data=df_0)
    plt.title("Asian marker price (BP): 'Coal - Prices per tonne' and 'Year' (2001-2021) Correlation")
    plt.xlabel("Year")
    plt.ylabel("Price")
    plt.ylim(0,)
```

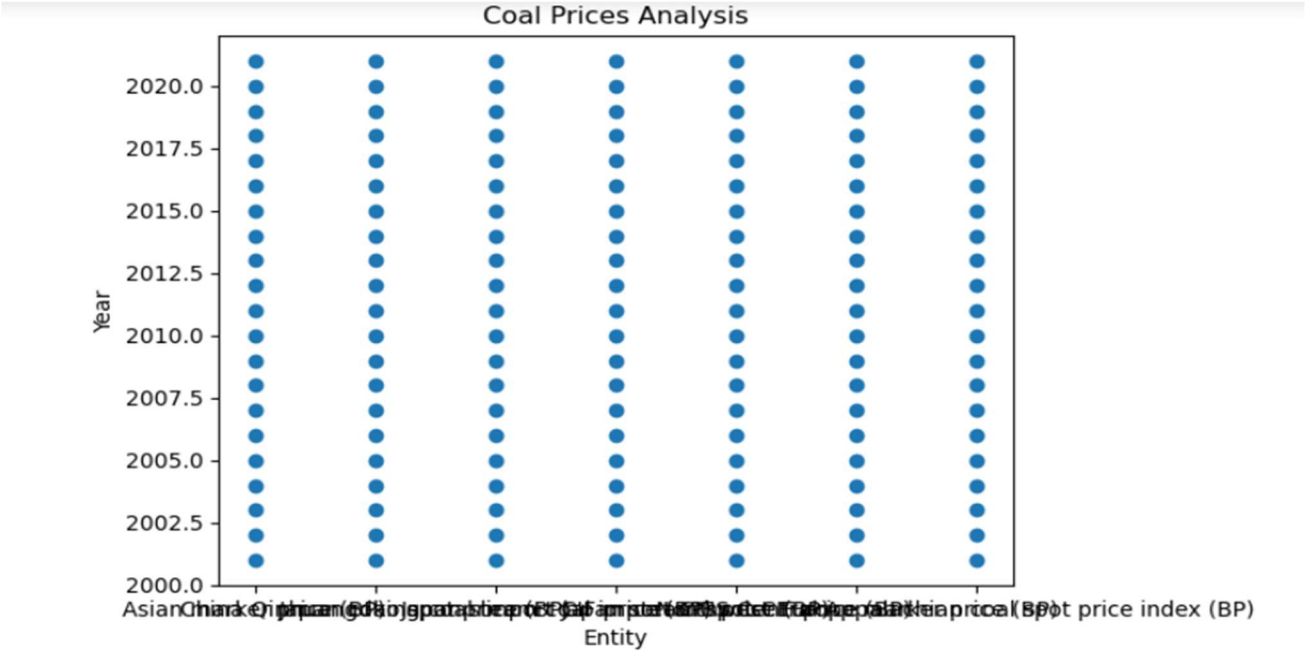



```
PY sns.regplot(x="y_1", y="p_1", data=df_1)
   plt.title("China Qinhuangdao spot price (BP): 'Coal - Prices per tonne' and 'Year' (2001-2021) Correlation")
   plt.xlabel("Year")
   plt.ylabel("Price")
   plt.ylim(0,)
```

C D E F G H I J K L M N O P Q



```
PY plt.scatter(df['Entity'], df['Year'])

   # Adding Title to the Plot
   plt.title("Coal Prices Analysis")
   # Setting the X and Y labels
   plt.xlabel('Entity')
   plt.ylabel('Year')
   plt.show()
```



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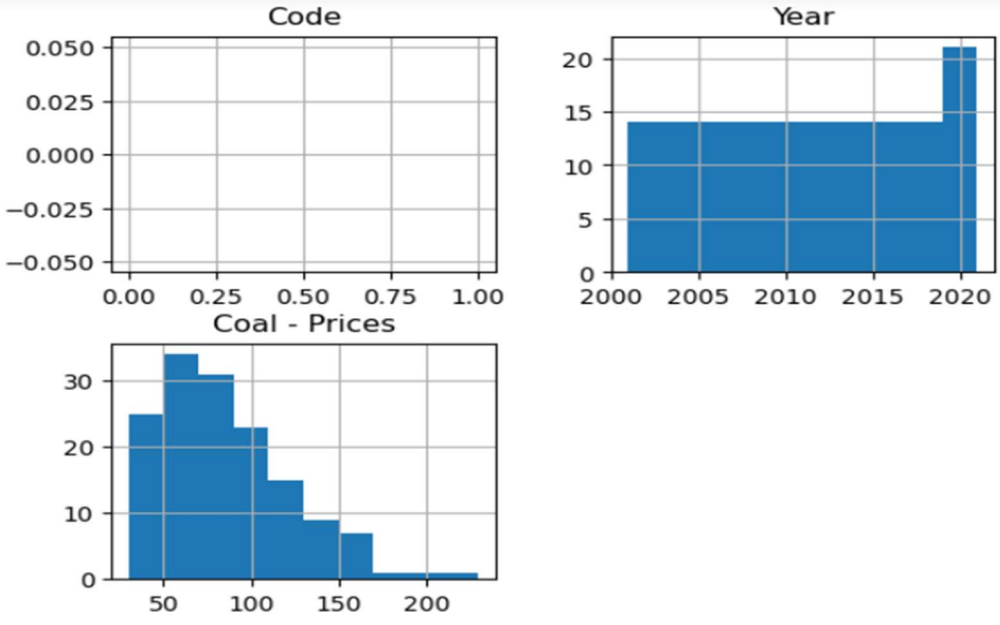
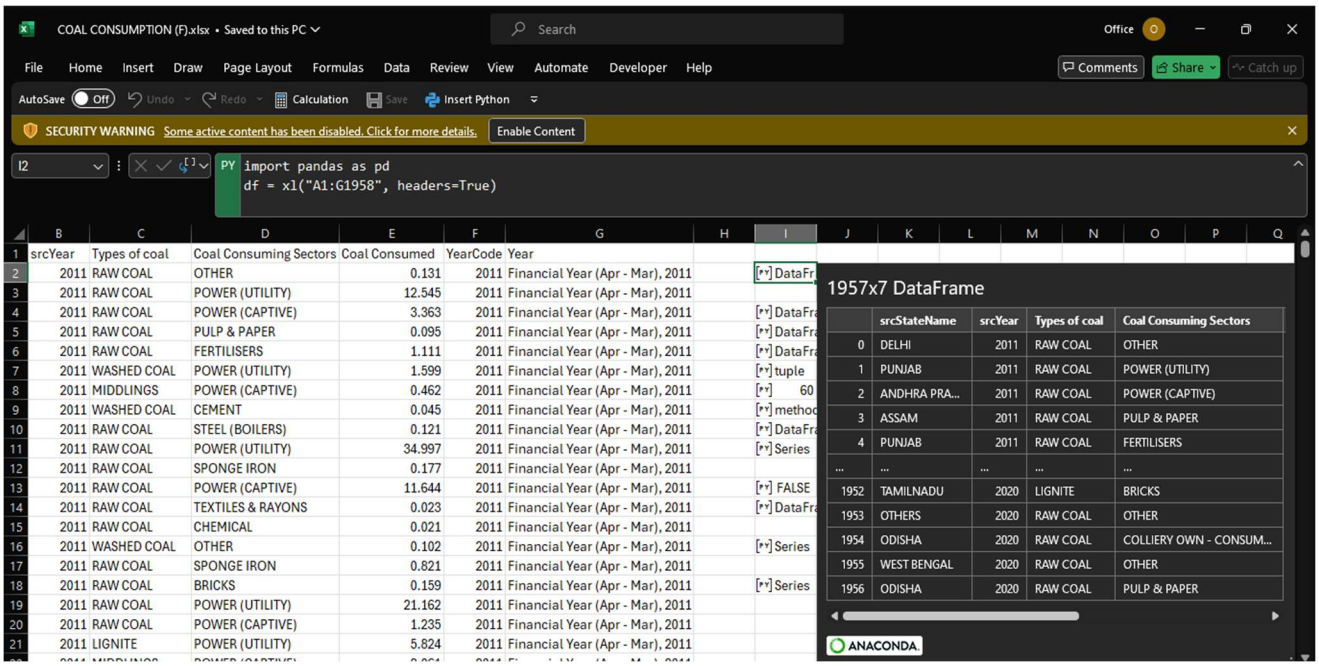
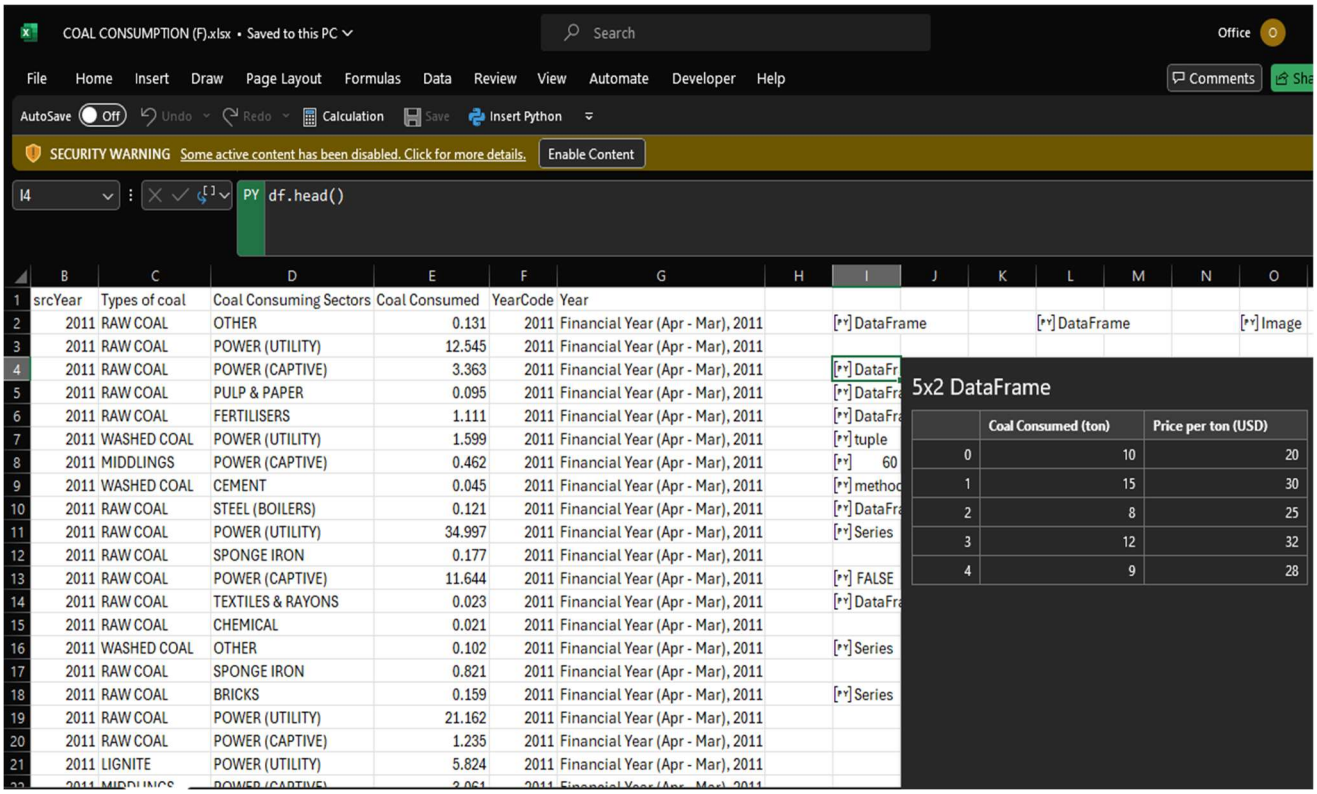
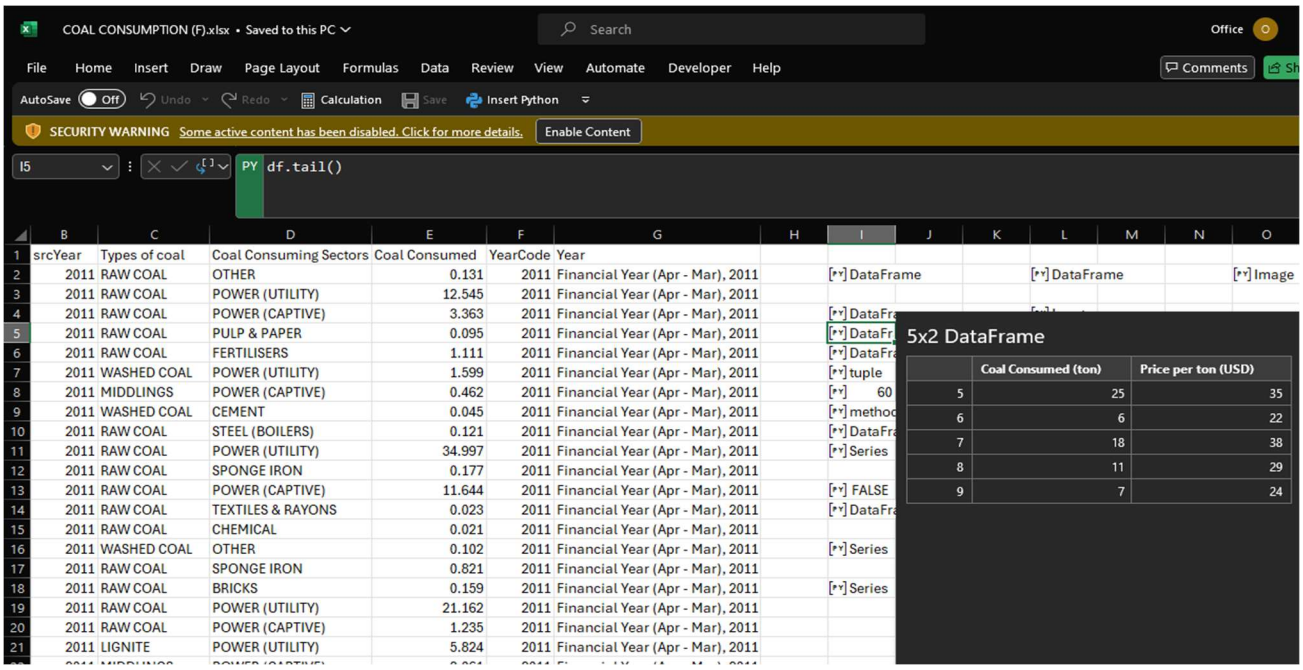
```
PY df.hist(grid=True)
   plt.title("Coal Prices Distribution ($)")
   plt.show()
```



INDIAN COAL CONSUMPTION



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SECURITY WARNING Some active content has been disabled. Click for more details.
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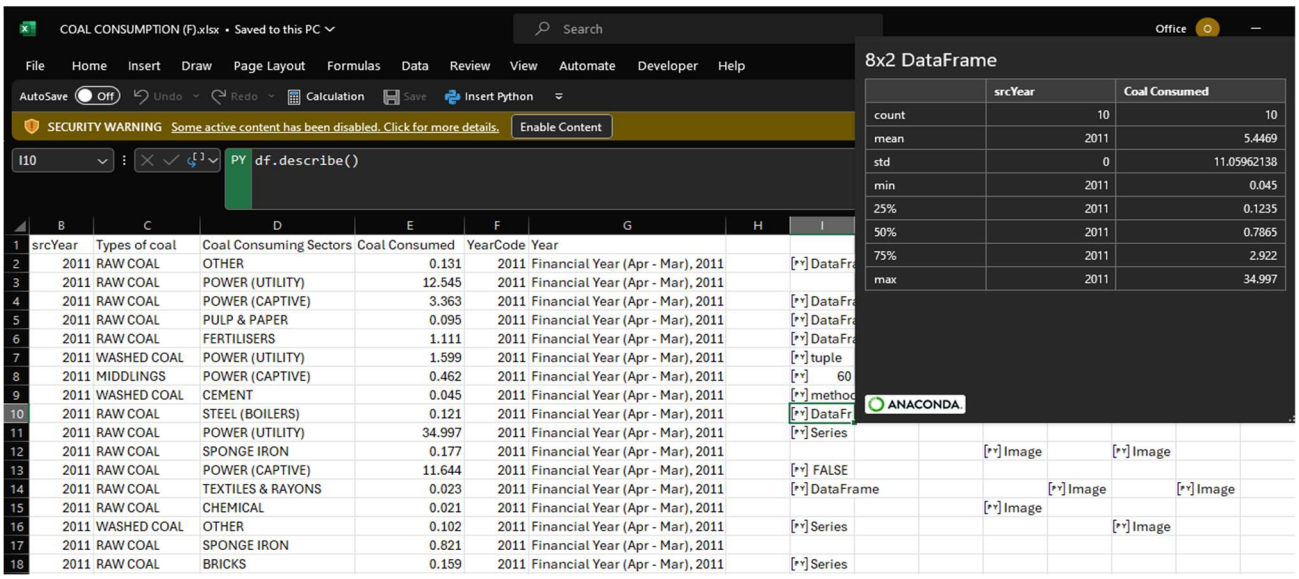
I5
PY df.tail()
5x2 DataFrame
Coal Consumed (ton)
Price per ton (USD)
5 25 35
6 6 22
7 18 38
8 11 29
9 7 24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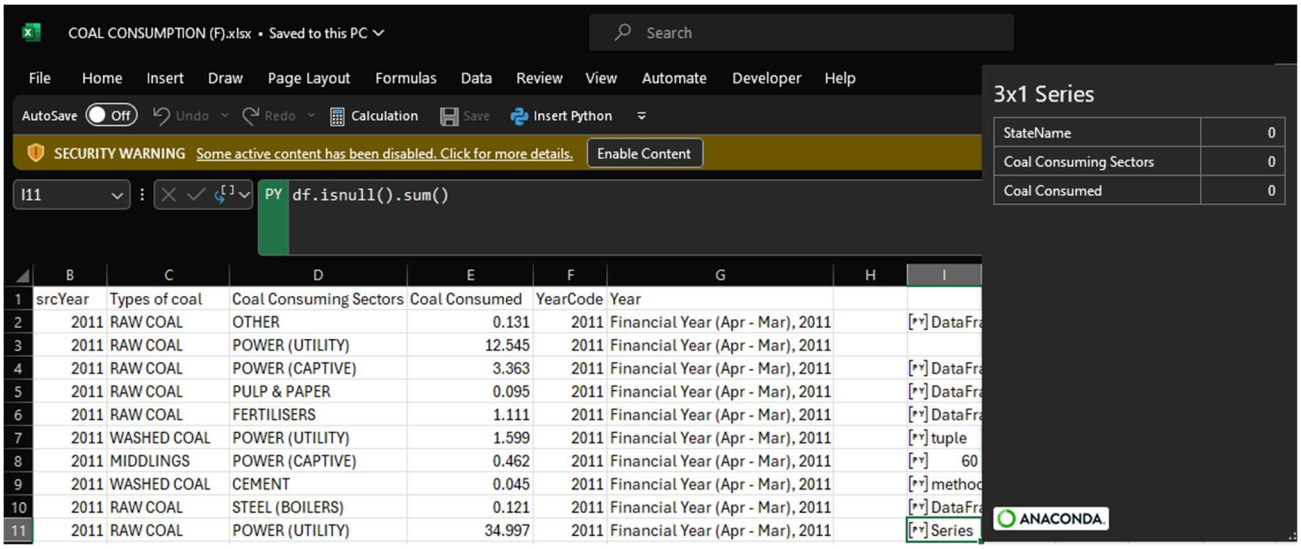
I10
PY df.describe()
8x2 DataFrame
srcYear
Coal Consumed
count 10 10
mean 2011 5.4469
std 0 11.05962138
min 2011 0.045
25% 2011 0.1235
50% 2011 0.7865
75% 2011 2.922
max 2011 34.997
ANACONDA.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SECURITY WARNING Some active content has been disabled. Click for more details.
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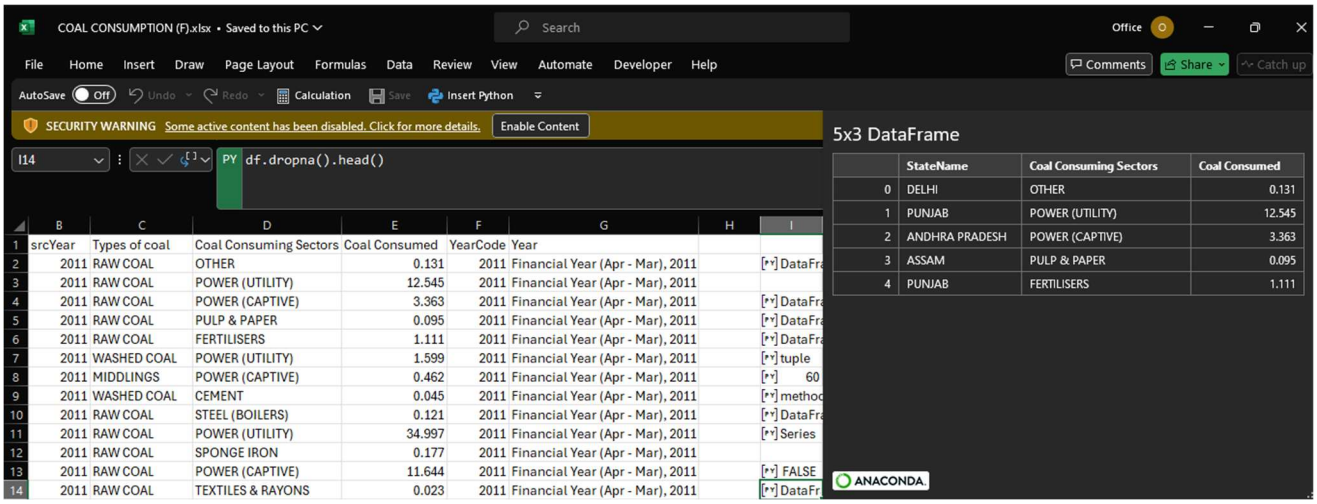
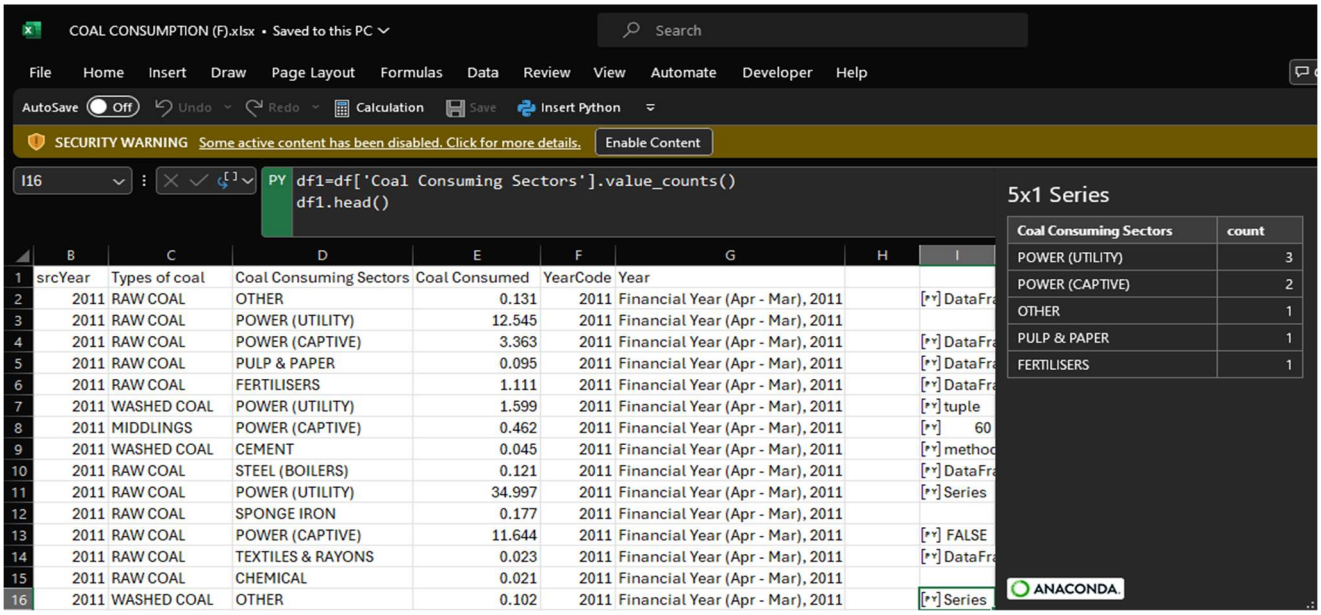
I11
PY df.isnull().sum()
3x1 Series
StateName 0
Coal Consuming Sectors 0
Coal Consumed 0
ANACONDA.



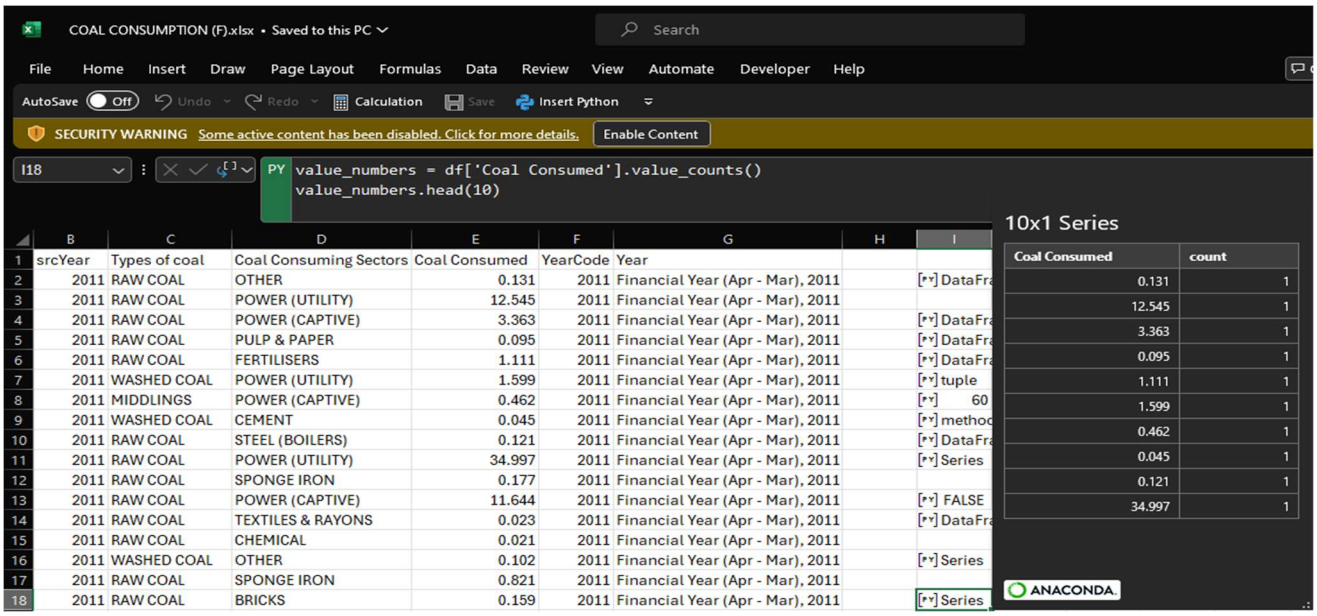
	StateName	Coal Consuming Sectors	Coal Consumed
0	DELHI	OTHER	0.131
1	PUNJAB	POWER (UTILITY)	12.545
2	ANDHRA PRADESH	POWER (CAPTIVE)	3.363
3	ASSAM	PULP & PAPER	0.095
4	PUNJAB	FERTILISERS	1.111

	B	C	D	E	F	G	H	I
1	srcYear	Types of coal	Coal Consuming Sectors	Coal Consumed	YearCode	Year		
2	2011	RAW COAL	OTHER	0.131	2011	Financial Year (Apr - Mar), 2011		DataFra
3	2011	RAW COAL	POWER (UTILITY)	12.545	2011	Financial Year (Apr - Mar), 2011		
4	2011	RAW COAL	POWER (CAPTIVE)	3.363	2011	Financial Year (Apr - Mar), 2011		DataFra
5	2011	RAW COAL	PULP & PAPER	0.095	2011	Financial Year (Apr - Mar), 2011		DataFra
6	2011	RAW COAL	FERTILISERS	1.111	2011	Financial Year (Apr - Mar), 2011		DataFra
7	2011	WASHED COAL	POWER (UTILITY)	1.599	2011	Financial Year (Apr - Mar), 2011		tuple
8	2011	MIDDLINGS	POWER (CAPTIVE)	0.462	2011	Financial Year (Apr - Mar), 2011		60
9	2011	WASHED COAL	CEMENT	0.045	2011	Financial Year (Apr - Mar), 2011		metho
10	2011	RAW COAL	STEEL (BOILERS)	0.121	2011	Financial Year (Apr - Mar), 2011		DataFra
11	2011	RAW COAL	POWER (UTILITY)	34.997	2011	Financial Year (Apr - Mar), 2011		Series
12	2011	RAW COAL	SPONGE IRON	0.177	2011	Financial Year (Apr - Mar), 2011		
13	2011	RAW COAL	POWER (CAPTIVE)	11.644	2011	Financial Year (Apr - Mar), 2011		FALSE
14	2011	RAW COAL	TEXTILES & RAYONS	0.023	2011	Financial Year (Apr - Mar), 2011		DataFr



Coal Consuming Sectors	count
POWER (UTILITY)	3
POWER (CAPTIVE)	2
OTHER	1
PULP & PAPER	1
FERTILISERS	1

	B	C	D	E	F	G	H	I
1	srcYear	Types of coal	Coal Consuming Sectors	Coal Consumed	YearCode	Year		
2	2011	RAW COAL	OTHER	0.131	2011	Financial Year (Apr - Mar), 2011		DataFra
3	2011	RAW COAL	POWER (UTILITY)	12.545	2011	Financial Year (Apr - Mar), 2011		
4	2011	RAW COAL	POWER (CAPTIVE)	3.363	2011	Financial Year (Apr - Mar), 2011		DataFra
5	2011	RAW COAL	PULP & PAPER	0.095	2011	Financial Year (Apr - Mar), 2011		DataFra
6	2011	RAW COAL	FERTILISERS	1.111	2011	Financial Year (Apr - Mar), 2011		DataFra
7	2011	WASHED COAL	POWER (UTILITY)	1.599	2011	Financial Year (Apr - Mar), 2011		tuple
8	2011	MIDDLINGS	POWER (CAPTIVE)	0.462	2011	Financial Year (Apr - Mar), 2011		60
9	2011	WASHED COAL	CEMENT	0.045	2011	Financial Year (Apr - Mar), 2011		metho
10	2011	RAW COAL	STEEL (BOILERS)	0.121	2011	Financial Year (Apr - Mar), 2011		DataFra
11	2011	RAW COAL	POWER (UTILITY)	34.997	2011	Financial Year (Apr - Mar), 2011		Series
12	2011	RAW COAL	SPONGE IRON	0.177	2011	Financial Year (Apr - Mar), 2011		
13	2011	RAW COAL	POWER (CAPTIVE)	11.644	2011	Financial Year (Apr - Mar), 2011		FALSE
14	2011	RAW COAL	TEXTILES & RAYONS	0.023	2011	Financial Year (Apr - Mar), 2011		DataFra
15	2011	RAW COAL	CHEMICAL	0.021	2011	Financial Year (Apr - Mar), 2011		
16	2011	WASHED COAL	OTHER	0.102	2011	Financial Year (Apr - Mar), 2011		Series



Coal Consumed	count
0.131	1
12.545	1
3.363	1
0.095	1
1.111	1
1.599	1
0.462	1
0.045	1
0.121	1
34.997	1

	B	C	D	E	F	G	H	I
1	srcYear	Types of coal	Coal Consuming Sectors	Coal Consumed	YearCode	Year		
2	2011	RAW COAL	OTHER	0.131	2011	Financial Year (Apr - Mar), 2011		DataFra
3	2011	RAW COAL	POWER (UTILITY)	12.545	2011	Financial Year (Apr - Mar), 2011		
4	2011	RAW COAL	POWER (CAPTIVE)	3.363	2011	Financial Year (Apr - Mar), 2011		DataFra
5	2011	RAW COAL	PULP & PAPER	0.095	2011	Financial Year (Apr - Mar), 2011		DataFra
6	2011	RAW COAL	FERTILISERS	1.111	2011	Financial Year (Apr - Mar), 2011		DataFra
7	2011	WASHED COAL	POWER (UTILITY)	1.599	2011	Financial Year (Apr - Mar), 2011		tuple
8	2011	MIDDLINGS	POWER (CAPTIVE)	0.462	2011	Financial Year (Apr - Mar), 2011		60
9	2011	WASHED COAL	CEMENT	0.045	2011	Financial Year (Apr - Mar), 2011		metho
10	2011	RAW COAL	STEEL (BOILERS)	0.121	2011	Financial Year (Apr - Mar), 2011		DataFra
11	2011	RAW COAL	POWER (UTILITY)	34.997	2011	Financial Year (Apr - Mar), 2011		Series
12	2011	RAW COAL	SPONGE IRON	0.177	2011	Financial Year (Apr - Mar), 2011		
13	2011	RAW COAL	POWER (CAPTIVE)	11.644	2011	Financial Year (Apr - Mar), 2011		FALSE
14	2011	RAW COAL	TEXTILES & RAYONS	0.023	2011	Financial Year (Apr - Mar), 2011		DataFra
15	2011	RAW COAL	CHEMICAL	0.021	2011	Financial Year (Apr - Mar), 2011		
16	2011	WASHED COAL	OTHER	0.102	2011	Financial Year (Apr - Mar), 2011		Series
17	2011	RAW COAL	SPONGE IRON	0.821	2011	Financial Year (Apr - Mar), 2011		
18	2011	RAW COAL	BRICKS	0.159	2011	Financial Year (Apr - Mar), 2011		Series

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L2

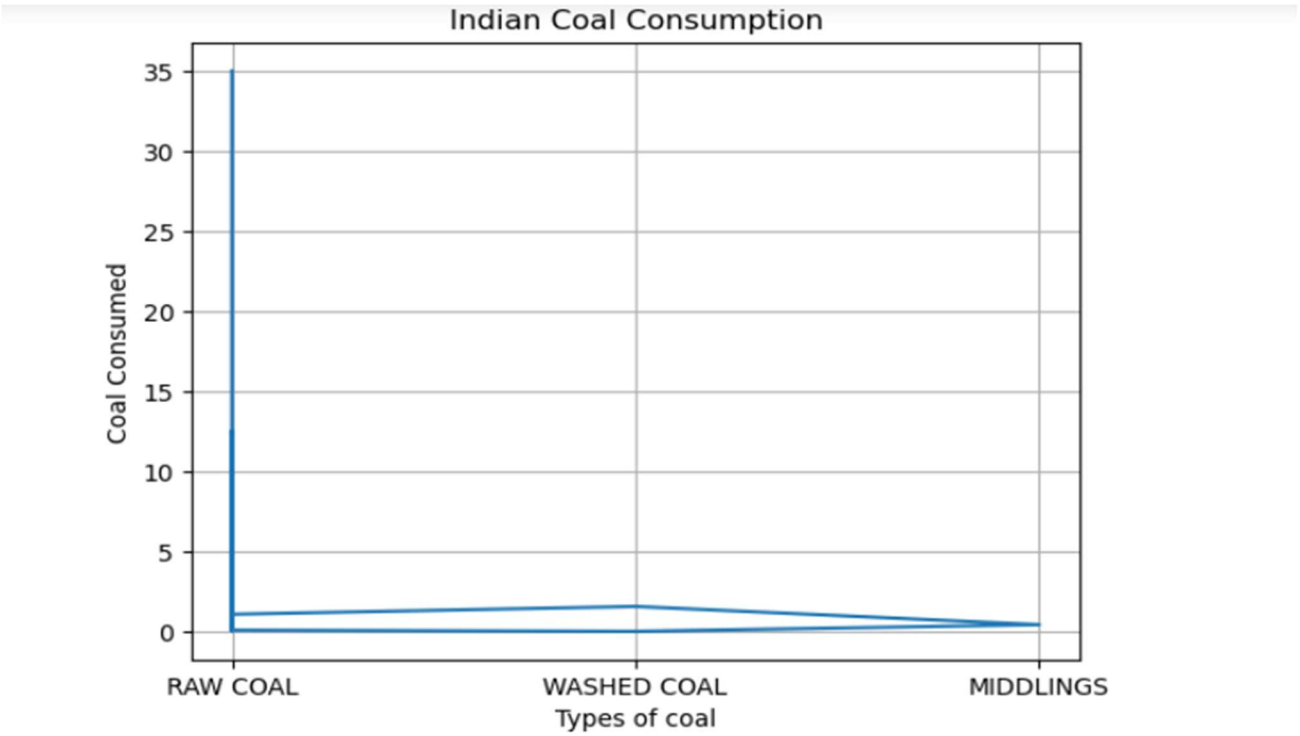
```
PY df.head(10)
```

	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	Year																	
2	Financial Year (Apr - Mar), 2011		DataFrame			DataFr												
3	Financial Year (Apr - Mar), 2011																	
4	Financial Year (Apr - Mar), 2011		DataFrame			Image												
5	Financial Year (Apr - Mar), 2011		DataFrame															
6	Financial Year (Apr - Mar), 2011		DataFrame			Image												
7	Financial Year (Apr - Mar), 2011		tuple															
8	Financial Year (Apr - Mar), 2011		60			Image												
9	Financial Year (Apr - Mar), 2011		method															
10	Financial Year (Apr - Mar), 2011		DataFrame															
11	Financial Year (Apr - Mar), 2011		Series															
12	Financial Year (Apr - Mar), 2011					Image												
13	Financial Year (Apr - Mar), 2011		FALSE															
14	Financial Year (Apr - Mar), 2011		DataFrame															
15	Financial Year (Apr - Mar), 2011					Image												
16	Financial Year (Apr - Mar), 2011		Series															
17	Financial Year (Apr - Mar), 2011																	
18	Financial Year (Apr - Mar), 2011		Series															
19	Financial Year (Apr - Mar), 2011																	

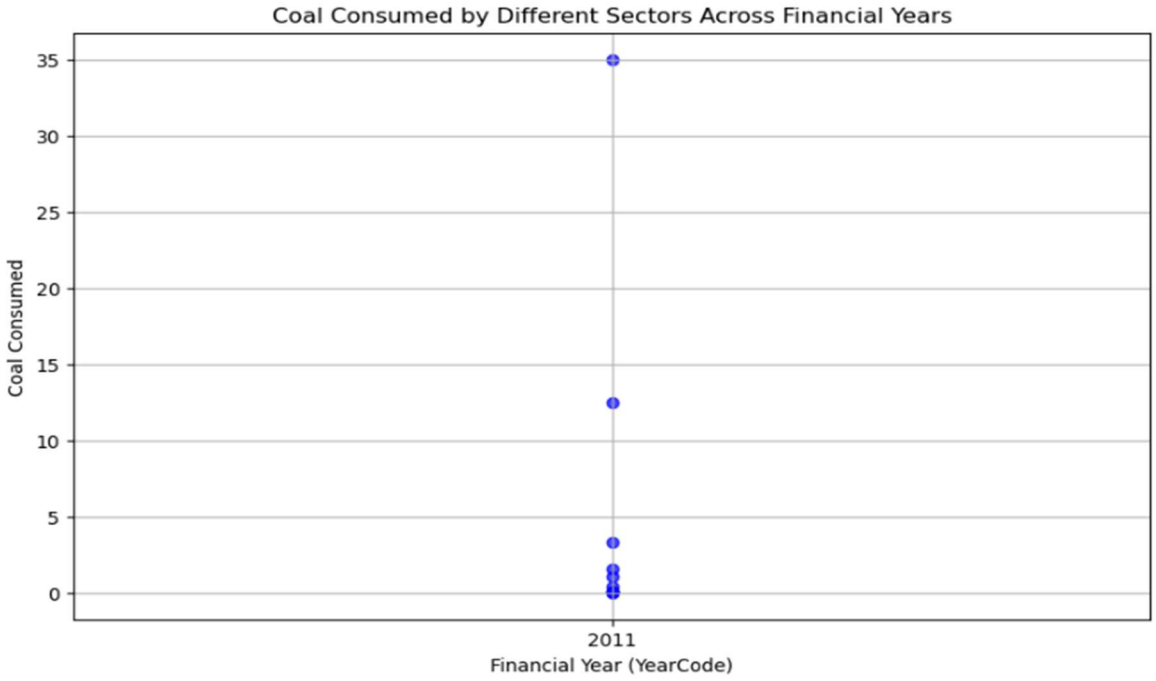
10x7 DataFrame

	srcStateName	srcY...	Types of coal	Coal Consuming Sect...	Coal Consu...	YearC...	Year
0	DELHI	2011	RAW COAL	OTHER	0.131	2011	Financial Year (Apr - Mar), 2011
1	PUNJAB	2011	RAW COAL	POWER (UTILITY)	12.545	2011	Financial Year (Apr - Mar), 2011
2	ANDHRA PRA...	2011	RAW COAL	POWER (CAPTIVE)	3.363	2011	Financial Year (Apr - Mar), 2011
3	ASSAM	2011	RAW COAL	PULP & PAPER	0.095	2011	Financial Year (Apr - Mar), 2011
4	PUNJAB	2011	RAW COAL	FERTILISERS	1.111	2011	Financial Year (Apr - Mar), 2011
5	DELHI	2011	WASHED C...	POWER (UTILITY)	1.599	2011	Financial Year (Apr - Mar), 2011
6	WEST BENGAL	2011	MIDDLINGS	POWER (CAPTIVE)	0.462	2011	Financial Year (Apr - Mar), 2011
7	KARNATAKA	2011	WASHED C...	CEMENT	0.045	2011	Financial Year (Apr - Mar), 2011
8	ANDHRA PRA...	2011	RAW COAL	STEEL (BOILERS)	0.121	2011	Financial Year (Apr - Mar), 2011
9	MAHARASHT...	2011	RAW COAL	POWER (UTILITY)	34.997	2011	Financial Year (Apr - Mar), 2011

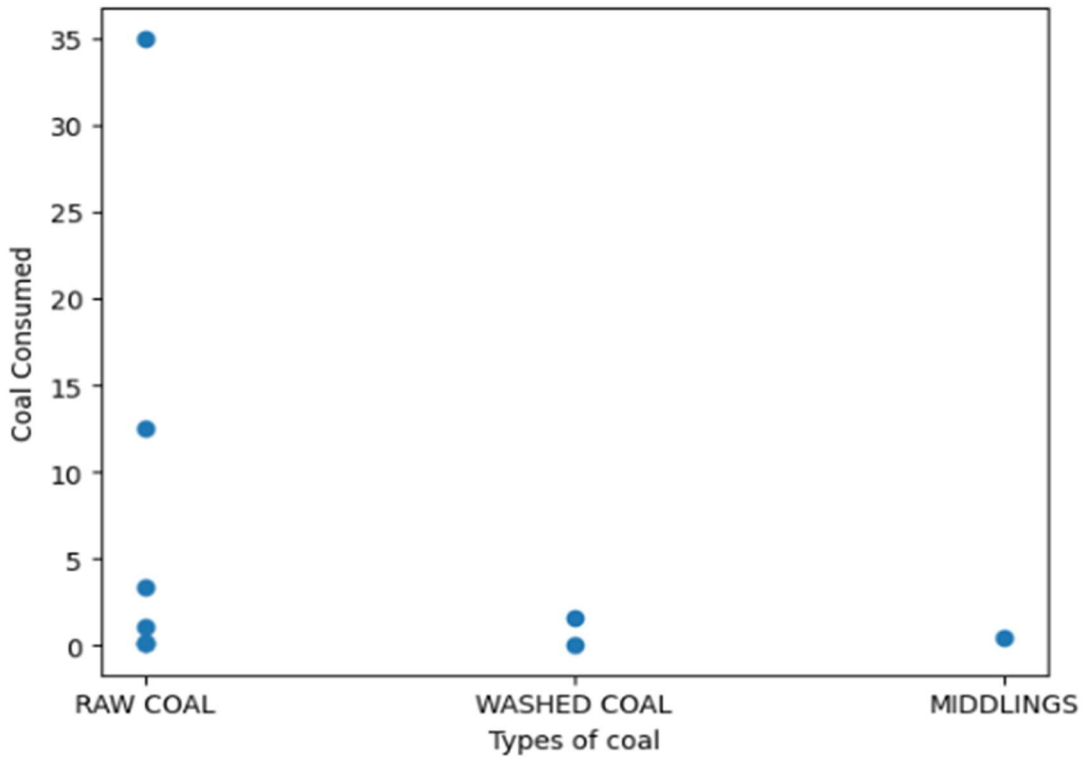
```
PY x = np.array(['RAW COAL','RAW COAL','RAW COAL','RAW COAL','RAW COAL','WASHED COAL','MIDDLINGS','WASHED COAL','RAW COAL','RAW COAL'])
   y = np.array([0.131,12.545,3.363,0.095,1.111,1.599,0.462,0.045,0.121,34.997])
   plt.title("Indian Coal Consumption")
   plt.xlabel("Types of coal")
   plt.ylabel("Coal Consumed")
   plt.plot(x, y)
   plt.grid()
   plt.show()
```



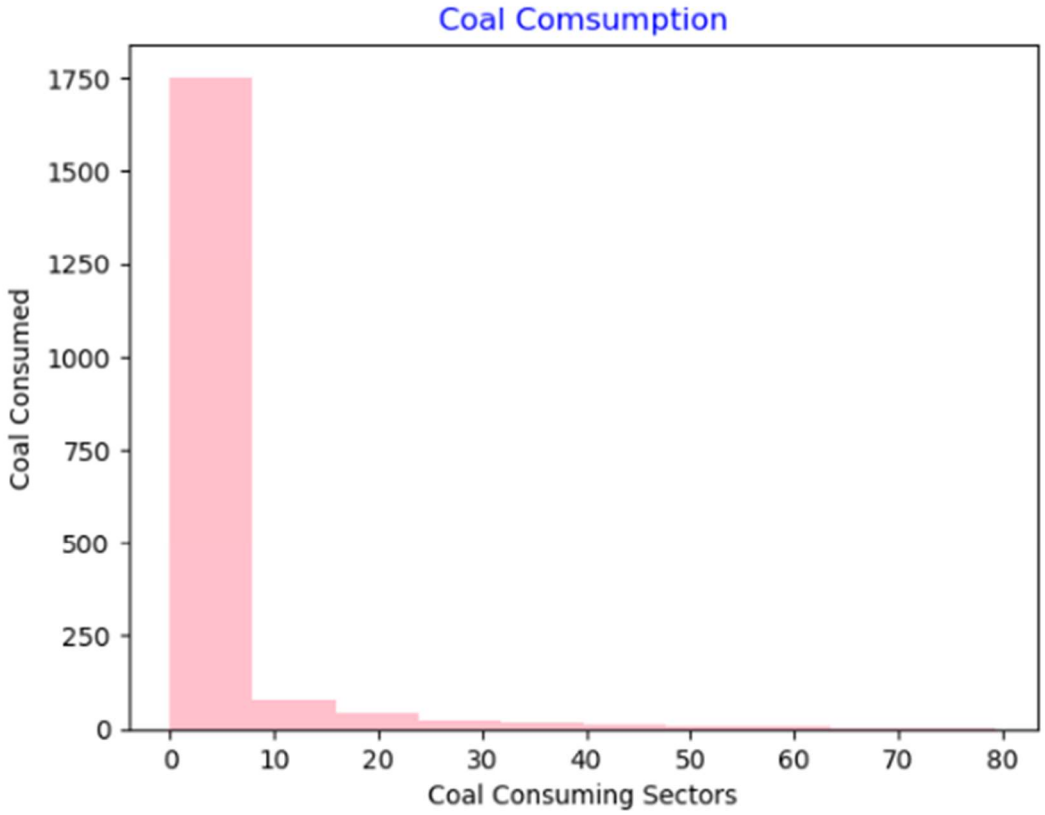
```
PY df = pd.DataFrame({
   'src StateName': ['DELHI', 'PUNJAB', 'ANDHRA PRADESH', 'ASSAM', 'PUNJAB', 'DELHI', 'WEST BENGAL', 'KARNATAKA', 'ANDHRA PRADESH',
   'MAHARASHTRA'],
   'srcYear': [2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011],
   'Types of coal': ['RAW COAL', 'RAW COAL', 'RAW COAL', 'RAW COAL', 'RAW COAL', 'WASHED COAL', 'MIDDLINGS', 'WASHED COAL', 'RAW COAL',
   'RAW COAL'],
   'Coal Consuming Sectors': ['OTHER', 'POWER (UTILITY)', 'POWER (CAPTIVE)', 'PULP & PAPER', 'FERTILISERS', 'POWER (UTILITY)', 'POWER (
   CAPTIVE)', 'CEMENT', 'STEEL (BOILERS)', 'POWER (UTILITY)'],
   'Coal Consumed': [0.131, 12.545, 3.363, 0.095, 1.111, 1.599, 0.462, 0.045, 0.121, 34.997],
   'YearCode': ['2011', '2011', '2011', '2011', '2011', '2011', '2011', '2011', '2011', '2011']
   })
   plt.figure(figsize=(10, 6))
   plt.scatter(df['YearCode'], df['Coal Consumed'], c='blue', alpha=0.7)
   plt.xlabel('Financial Year (YearCode)')
   plt.ylabel('Coal Consumed')
   plt.title('Coal Consumed by Different Sectors Across Financial Years')
   plt.grid(True)
   plt.show()
```



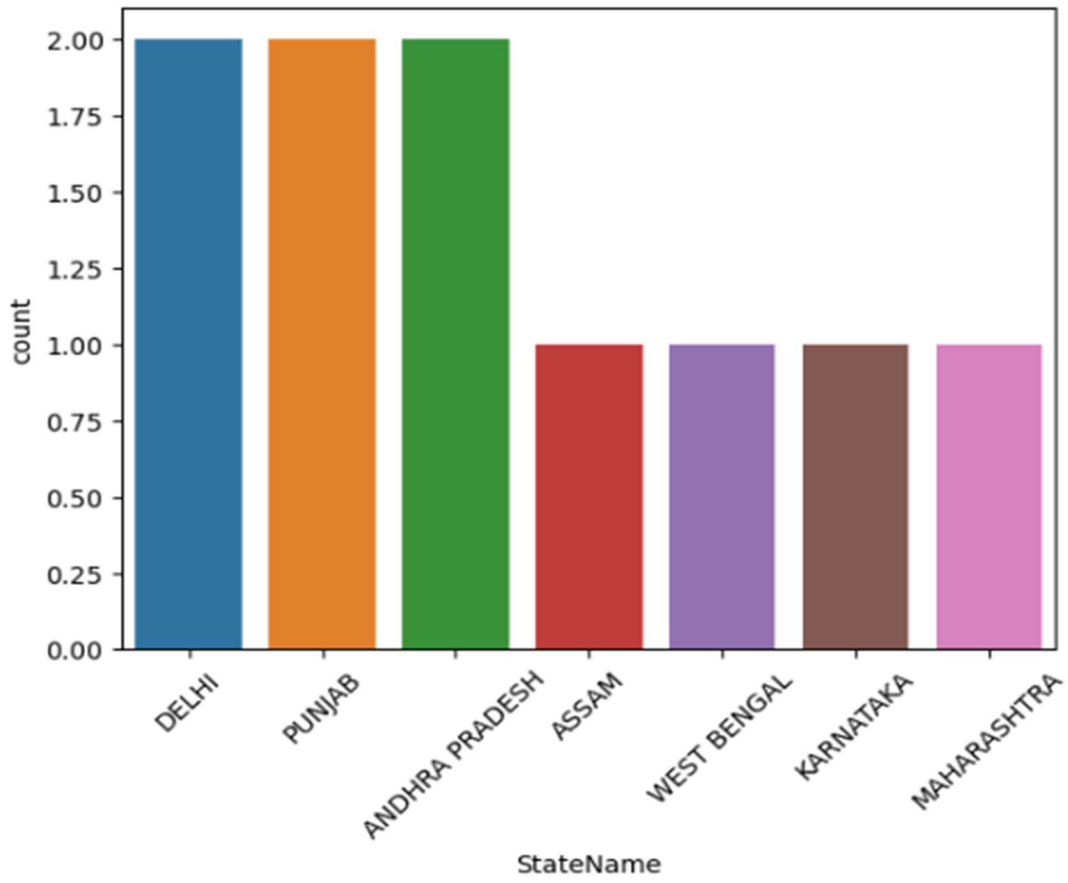

```
PY x = np.array(['RAW COAL','RAW COAL','RAW COAL','RAW COAL','RAW COAL','WASHED COAL','MIDDLINGS','WASHED COAL','RAW COAL','RAW COAL'])
   y = np.array([0.131,12.545,3.363,0.095,1.111,1.599,0.462,0.045,0.121,34.997])
   plt.xlabel('Types of coal')
   plt.ylabel('Coal Consumed')
   plt.scatter(x, y)
   plt.show()
```



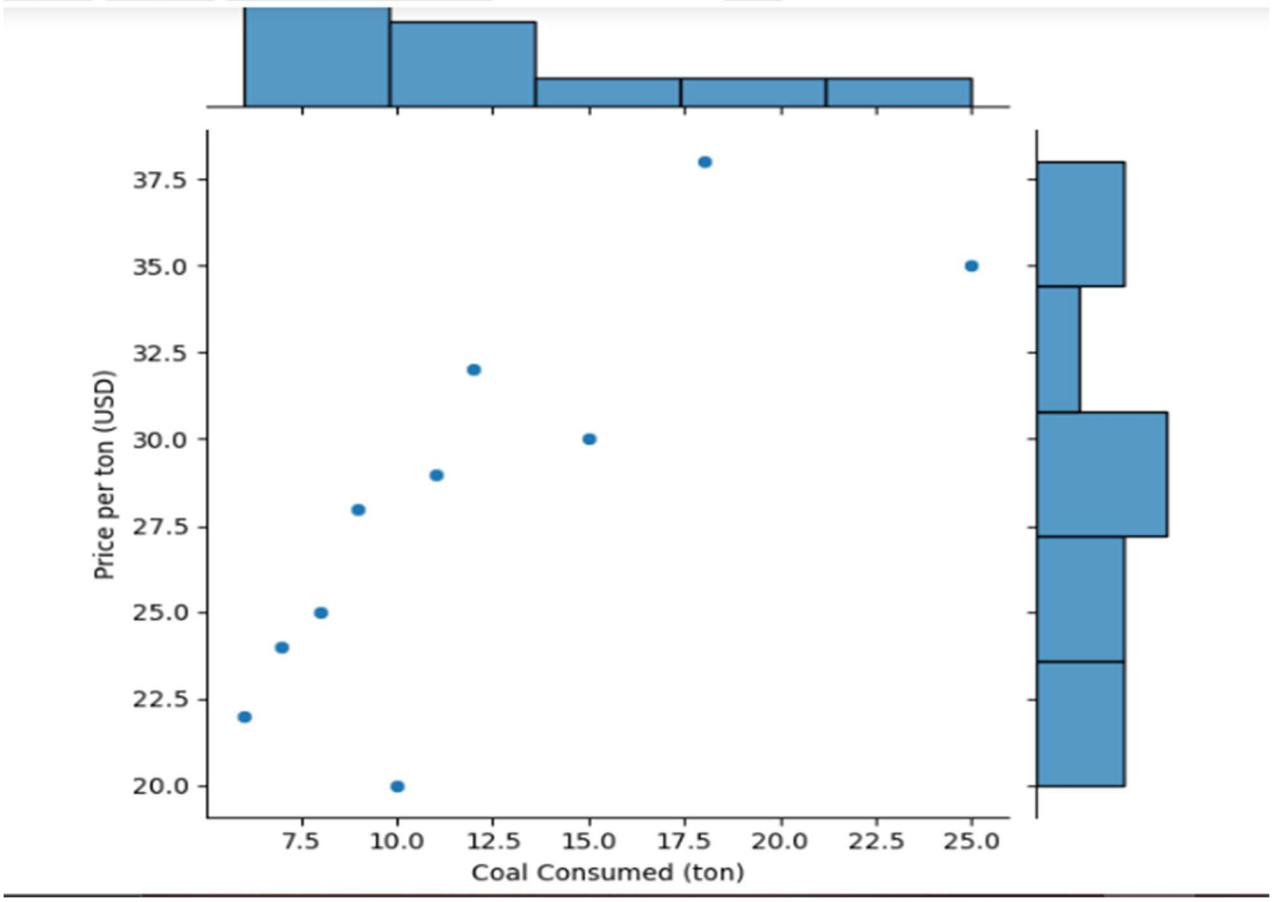

```
PY plt.hist(df['Coal Consumed'],color = "pink")
   plt.title("Coal Comsumption",color = 'blue')
   plt.xlabel('Coal Consuming Sectors')
   plt.ylabel('Coal Consumed')
   plt.show()
```



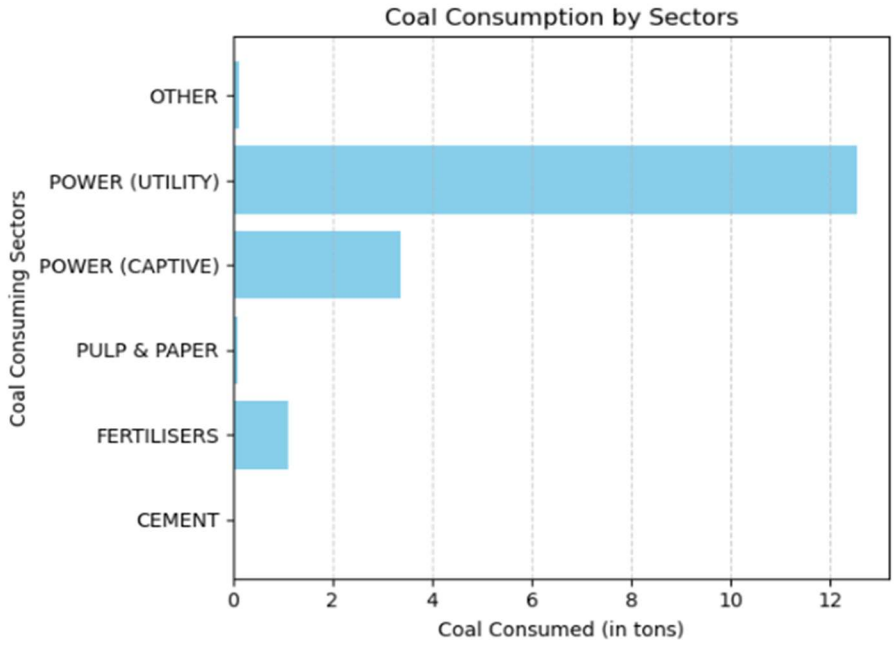
```
PY data = {'StateName': ['DELHI', 'PUNJAB', 'ANDHRA PRADESH', 'ASSAM', 'PUNJAB', 'DELHI', 'WEST BENGAL', 'KARNATAKA', 'ANDHRA PRADESH',
'MAHARASHTRA'],
        'Coal Consuming Sectors': ['OTHER', 'POWER (UTILITY)', 'POWER (CAPTIVE)', 'PULP & PAPER', 'FERTILISERS', 'POWER (UTILITY)',
'POWER (CAPTIVE)', 'CEMENT', 'STEEL (BOILERS)', 'POWER (UTILITY)']}
df = pd.DataFrame(data)
sns.countplot(x = "StateName", data=df)
plt.xticks(rotation=45)
plt.show()
```



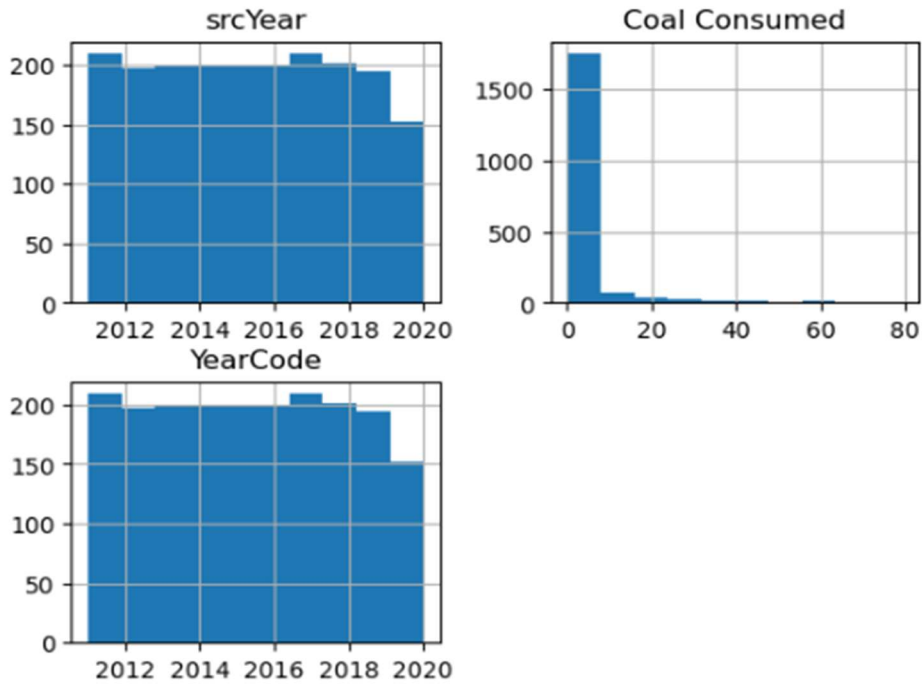

```
PY data = {'Coal Consumed (ton)': [10, 15, 8, 12, 9, 25, 6, 18, 11, 7],
        'Price per ton (USD)': [20, 30, 25, 32, 28, 35, 22, 38, 29, 24]}
df = pd.DataFrame(data)
sns.jointplot(x = "Coal Consumed (ton)", y = "Price per ton (USD)", data=df)
plt.show()
```



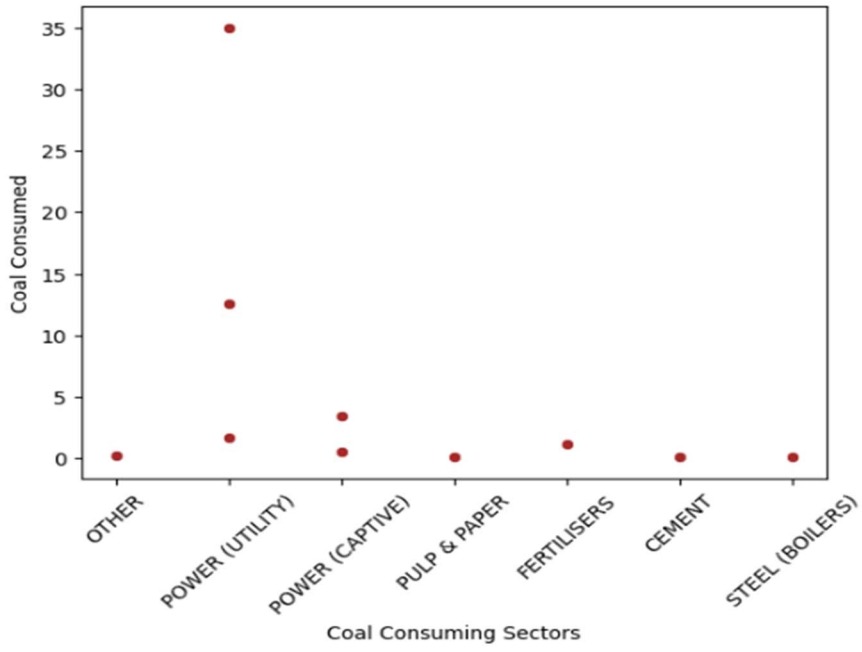

```
PY coal_sectors = ['OTHER', 'POWER (UTILITY)', 'POWER (CAPTIVE)', 'PULP & PAPER', 'FERTILISERS', 'CEMENT']
   coal_consumption = [0.131, 12.545, 3.363, 0.095, 1.111, 0.045]
   plt.barh(coal_sectors, coal_consumption, color='skyblue')
   plt.xlabel('Coal Consumed (in tons)')
   plt.ylabel('Coal Consuming Sectors')
   plt.title('Coal Consumption by Sectors')
   plt.gca().invert_yaxis()
   plt.grid(axis='x', linestyle='--', alpha=0.6)
   plt.tight_layout()
   plt.show()
```



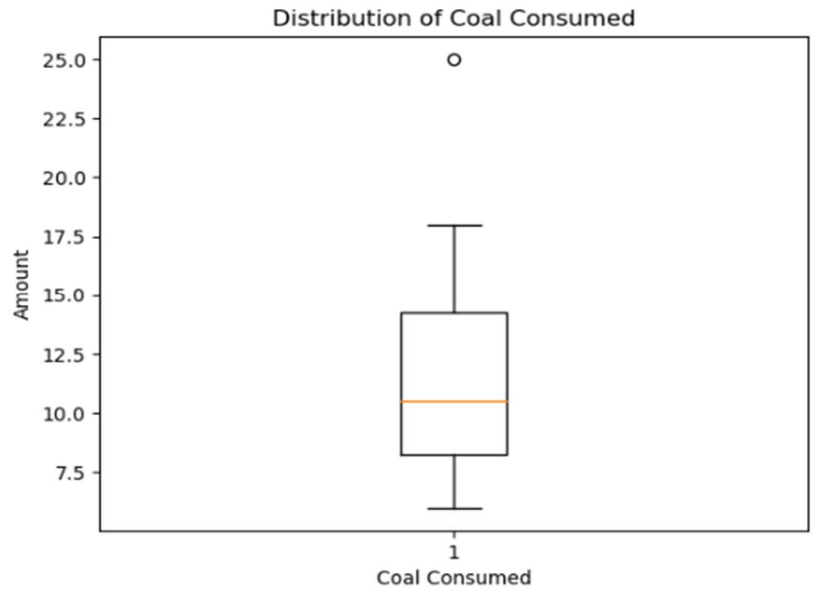
```
PY df.hist(grid=True)
   plt.title("Indian Coal Consumption")
   plt.show()
```



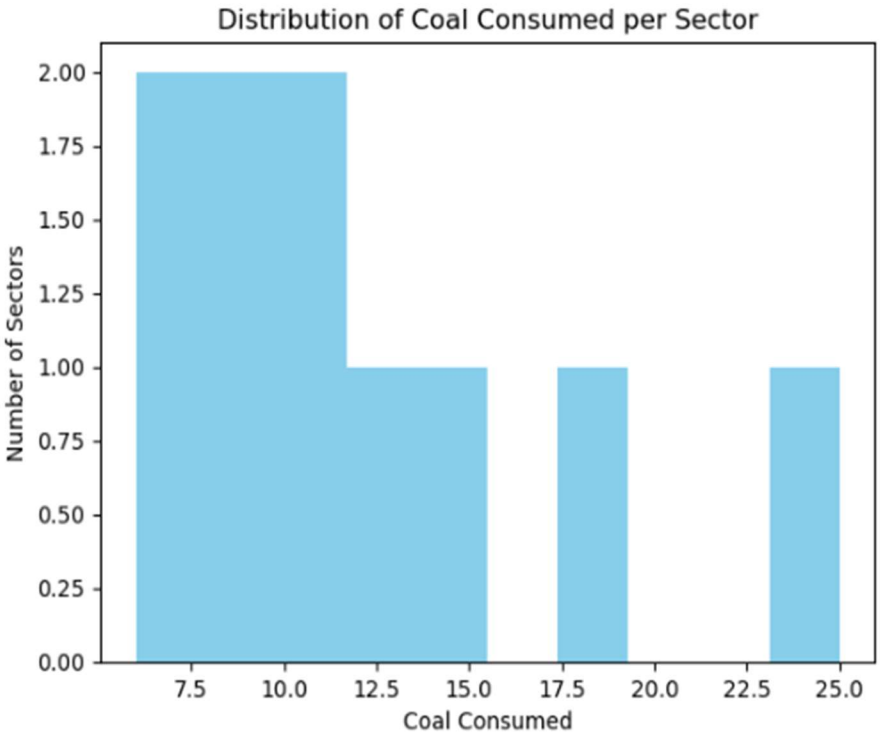

```
PY data = {'StateName': ['DELHI', 'PUNJAB', 'ANDHRA PRADESH', 'ASSAM', 'PUNJAB', 'DELHI', 'WEST BENGAL', 'KARNATAKA', 'ANDHRA PRADESH',
   'MAHARASHTRA'],
           'Coal Consuming Sectors': ['OTHER', 'POWER (UTILITY)', 'POWER (CAPTIVE)', 'PULP & PAPER', 'FERTILISERS', 'POWER (UTILITY)',
   'POWER (CAPTIVE)', 'CEMENT', 'STEEL (BOILERS)', 'POWER (UTILITY)'],
           'Coal Consumed': [0.131, 12.545, 3.363, 0.095, 1.111, 1.599, 0.462, 0.045, 0.121, 34.997]}
   df = pd.DataFrame(data)
   sns.scatterplot(x = "Coal Consuming Sectors", y = "Coal Consumed", data=df,color = 'brown')
   plt.xticks(rotation=45)
   plt.show()
```



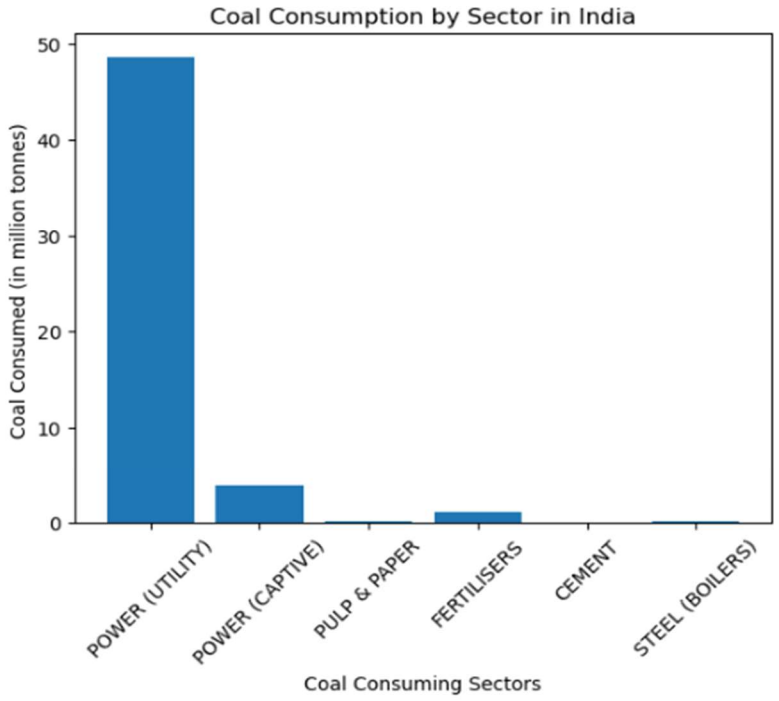
```
PY coal_consumed = [10, 15, 8, 12, 9, 25, 6, 18, 11, 7]

   plt.boxplot(coal_consumed)
   plt.xlabel('Coal Consumed')
   plt.ylabel('Amount')
   plt.title('Distribution of Coal Consumed')
   plt.show()
```




```
PY coal_consumed_per_sector = [10, 15, 8, 12, 9, 25, 6, 18, 11, 7]
   plt.hist(coal_consumed_per_sector,color = 'skyblue')
   plt.xlabel('Coal Consumed')
   plt.ylabel('Number of Sectors')
   plt.title('Distribution of Coal Consumed per Sector')
   plt.show()
```



```python
sectors = ['POWER (UTILITY)', 'POWER (CAPTIVE)', 'PULP & PAPER', 'FERTILISERS', 'CEMENT', 'STEEL (BOILERS)']
coal_consumption = [48.542, 3.825, 0.095, 1.111, 0.045, 0.121]
plt.bar(sectors, coal_consumption)
plt.xlabel('Coal Consuming Sectors')
plt.ylabel('Coal Consumed (in million tonnes)')
plt.title('Coal Consumption by Sector in India')
plt.xticks(rotation=45)
plt.show()
```



RESULT

The Result of this Coal Prices Analysis project is a portal that depends on the data available and the focus of the analysis . Effective data visualization helps stakeholders make informed decisions based on clear and comprehensible insights from the data . Data visualization in coal prices analysis for Bharat Coking Coal Limited (BCCL) typically provides insights into various aspects of the coal market . Some potential results have might be obtain that is Trends Over Time , Price Distribution , Geographical Insights , Market Factors , Cost Analysis , Demand and Supply Analysis . Analysing coal prices is essential for BCCL to navigate the complex and dynamic coal market. By understanding the factors influencing coal prices and utilizing robust analytical methods, BCCL can make informed decisions that enhance its competitiveness and financial performance. This analysis will support strategic planning, operational efficiency, and market positioning, ensuring the company's long-term success in the coal industry.

As for Coal Consumption project that help stakeholders understand consumption patterns, identify trends, and make informed decisions about production, distribution, and policy measures . It can provide valuable insights into how coal is consumed across different sectors, regions, and over time . Some potential results and insights that can be obtained that is Consumption Trends Over Time , Sector-wise Consumption , Geographical Insights , Industrial Consumption Analysis , Environmental Impact , Cost Analysis , Policy and Regulation Impact , Demand-Supply Balance . Coal consumption analysis is a vital component of BCCL's efforts to enhance operational efficiency, manage costs, and reduce environmental impact. By leveraging advanced data analytics and predictive modelling, BCCL can achieve significant improvements in its coal consumption practices, contributing to sustainable and responsible mining operations.

DECLARATION

We here by declare that the work , which is being presented in the project , titled **" COAL PRICES ANALYSIS AND COAL CONSUMPTION "** submitted by me [PRAKSHI PRIYA] to BCCL , Dhanbad and " **SIKSHA 'O' ANUSANDHAN University**, Bhubaneswar fulfilment of the requirement for the award of Degree of **" BACHELOR'S OF TECHNOLOGY "** in Department of Computer Science and Engineering is a record of Internship Project and our own investigation carried under the guidance of **MR. AVINASH KUMAR NANDAN** , System Department BCCL , Dhanbad . The information has been collected from genuine and authentic sources . The work has been submitted in fulfilment of the requirement of **BACHELOR'S OF TECHNOLOGY .**

NAME : PRAKSHI PRIYA

BRANCH : CSE [DATA SCIENCE]

REG NO : 2241016464