EDA of COMMODITIES

SAKET JHA

SAKETJHA0324@GMAIL.COM

Crude Oil, Natural Gas, Heating Oil, RROB Gasoline, Brent Crude Oil & Other Fuels Futures Data.

Historical data on Fuels and Energy Futures like Oil or Gas from Kaggle

Link To Dataset - https://www.kaggle.com/datasets/guillemservera/fuels-futures-data

About Dataset:

This dataset provides comprehensive and up-to-date information on futures related to oil, gas, and other fuels. Futures are financial contracts obligating the buyer to purchase and the seller to sell a specified amount of a particular fuel at a predetermined price and future date.

Use Cases:

Trend Analysis: Scrutinize patterns and price fluctuations to anticipate future market directions in the energy sector.

Academic Research: Delve into the historical behavior of oil and gas prices and understand the influence of global events on these commodities.

Trading Strategies: Develop and test trading tactics based on the dynamics of oil, gas, and other fuel futures.

Risk Management: Utilize the dataset for hedging and risk management for corporations involved in the extraction, refining, or trading of fuels.

Column Descriptions:

Date: The date when the data was documented. Format: YYYY-MM-DD.

Open: Market's opening price for the day.

High: Peak price during the trading window.

Low: Lowest traded price during the day.

Close: Price at which the market closed.

Volume: Number of contracts exchanged during the trading period.

Ticker: The unique market quotation symbol for the future.

Commodity: Specifies the type of fuel the future contract pertains to (e.g., crude oil, natural gas)

Crude Oil EDA

Data-frame:

	ticker	commodity	date	open	high	low	close	volume
0	CL=F	Crude Oil	2000-08-23	31.950001	32.799999	31.950001	32.049999	79385
1	CL=F	Crude Oil	2000-08-24	31.900000	32.240002	31.400000	31.629999	72978
2	CL=F	Crude Oil	2000-08-25	31.700001	32.099998	31.320000	32.049999	44601
3	CL=F	Crude Oil	2000-08-28	32.040001	32.919998	31.860001	32.869999	46770
4	CL=F	Crude Oil	2000-08-29	32.820000	33.029999	32.560001	32.720001	49131
...	...	...	...	...	...	...	...	...
5840	CL=F	Crude Oil	2023-11-27	75.309998	76.230003	74.059998	74.860001	289562
5841	CL=F	Crude Oil	2023-11-28	75.070000	77.019997	74.639999	76.410004	286618
5842	CL=F	Crude Oil	2023-11-29	76.559998	78.089996	75.669998	77.860001	322170
5843	CL=F	Crude Oil	2023-11-30	77.750000	79.599998	75.050003	75.959999	559169
5844	CL=F	Crude Oil	2023-12-01	75.589996	76.760002	73.930000	74.070000	559169

5845 rows × 8 columns

Statistics of Dataset:

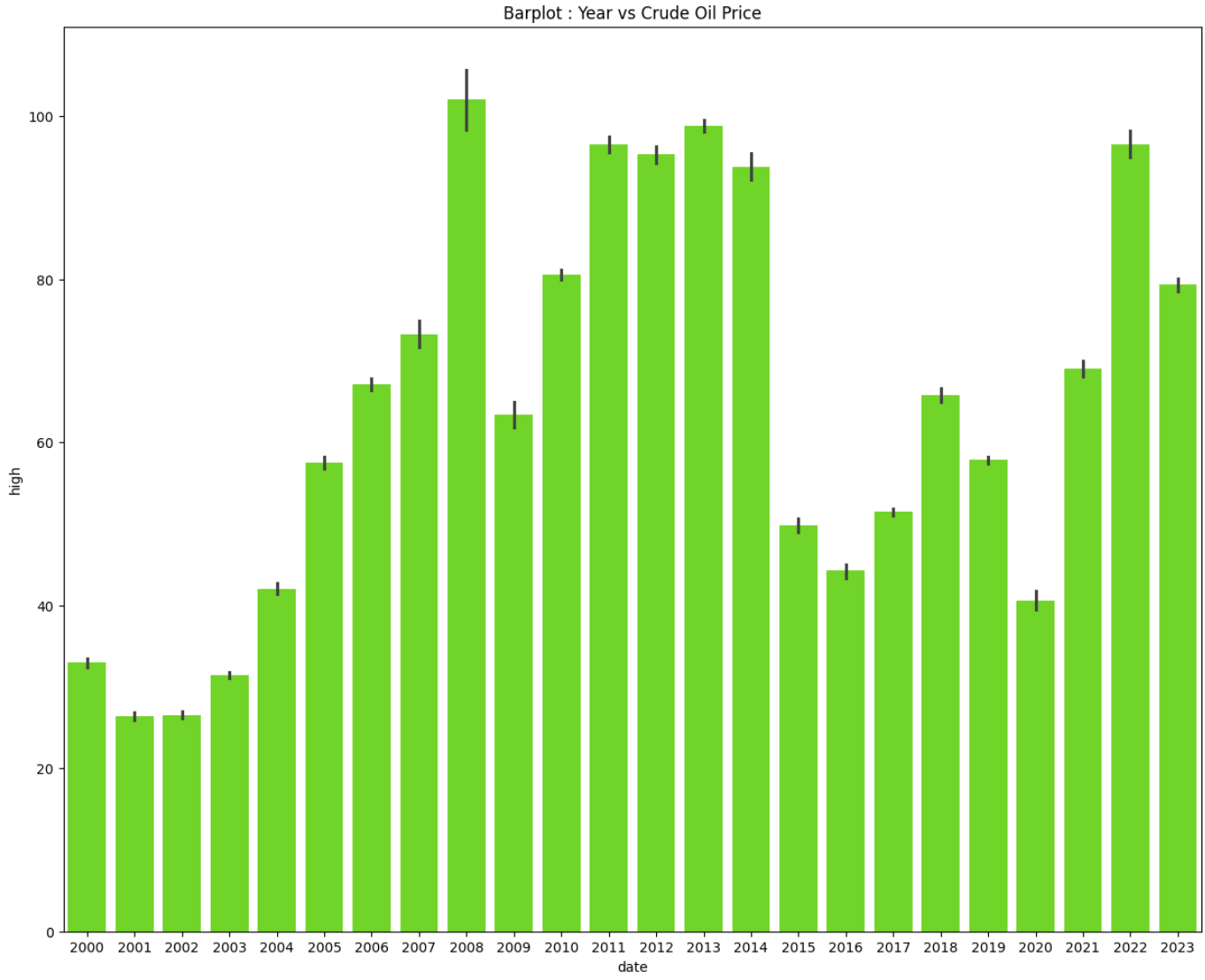
	date	open	high	low	close	volume
count	5845	5845.000000	5845.000000	5845.000000	5845.000000	5.845000e+03
mean	2012-04-20 13:59:51.377245440	64.166866	65.162147	63.097379	64.160349	3.038125e+05
min	2000-08-23 00:00:00	-14.000000	13.690000	-40.320000	-37.630001	0.000000e+00
25%	2006-07-05 00:00:00	44.820000	45.849998	43.770000	44.750000	1.163680e+05
50%	2012-04-20 00:00:00	61.970001	62.919998	61.130001	62.009998	2.710940e+05
75%	2018-02-13 00:00:00	83.820000	85.199997	82.290001	83.760002	4.008360e+05
max	2023-12-01 00:00:00	145.190002	147.270004	143.220001	145.289993	2.288230e+06
std	NaN	25.494428	25.768844	25.189056	25.502668	2.141222e+05

Highlights of Statistics:

- Crude Oil price was at its Peak on 2008-07-03 .
- Crude Oil price was at its Low on 2020-04-20.
- Mean Crude Oil High Price is $65.162147.
- STD of Crude Oil is around $25.
- Maximum Volume Crude Oil Traded is 2288230.
- On this dates Crude Oil was not traded.

	ticker	commodity	date	open	high	low	close	volume
36	CL=F	Crude Oil	2000-10-13	35.930000	35.959999	34.900002	35.049999	0
63	CL=F	Crude Oil	2000-11-21	35.400002	35.700001	35.000000	35.150002	0
121	CL=F	Crude Oil	2001-02-16	29.200001	29.250000	29.100000	29.160000	0
137	CL=F	Crude Oil	2001-03-13	27.799999	27.900000	27.450001	27.450001	0
262	CL=F	Crude Oil	2001-09-10	27.750000	28.000000	27.570000	27.629999	0
263	CL=F	Crude Oil	2001-09-14	29.980000	29.980000	29.450001	29.530001	0
5678	CL=F	Crude Oil	2023-04-06	80.370003	80.959999	79.650002	80.699997	0

Barplot : Year vs Crude Oil Prices :



Highlights:

- In Year 2008 Peak of Crude Oil was Recorded.
- In Year 2020 Low of Crude Oil was Recorded.
- Balanced Years were 2011,2012,2013,2014,2022
- Prices Of Crude Oil were low in year 2004,2015,2017,2020

Crude oil: Year 2008

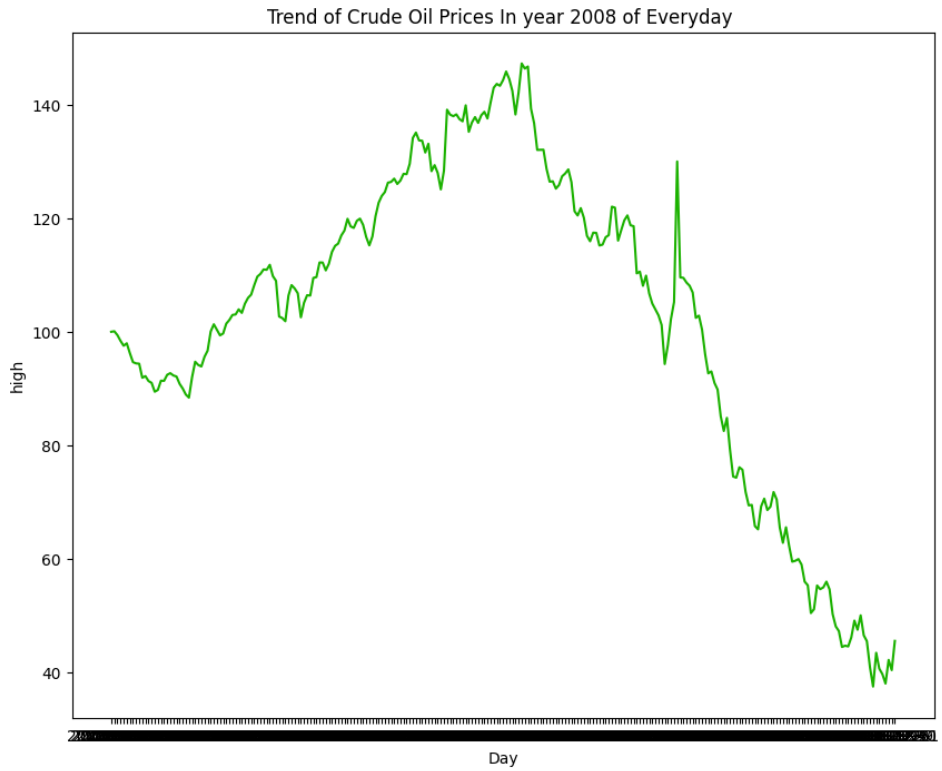
The high crude oil prices in 2008 were influenced by a combination of factors, contributing to a significant spike in the cost of oil during that period. Some key factors include:

CRUDE OIL 2008 STATISTICS

	Unnamed: 0	open	high	low	close	volume
count	253.000000	253.000000	253.000000	253.000000	253.000000	253.000000
mean	1964.000000	99.962016	102.052530	97.631384	99.751541	276093.517787
std	73.179004	28.096147	28.318620	28.111354	28.421601	64910.143177
min	1838.000000	34.759998	37.500000	32.400002	33.869999	64554.000000
25%	1901.000000	88.800003	90.830002	87.010002	88.949997	236045.000000
50%	1964.000000	104.970001	106.540001	102.849998	104.830002	280295.000000
75%	2027.000000	121.000000	122.730003	118.160004	121.180000	316987.000000
max	2090.000000	145.190002	147.270004	143.220001	145.289993	508749.000000

1. Global Economic Growth: In the years leading up to 2008, there was robust global economic growth, particularly in emerging economies like China and India. Increased economic activity typically leads to higher demand for energy, including oil.

2. Weak U.S. Dollar: The U.S. dollar experienced a period of weakness in the mid-2000s. Since oil is priced in U.S. dollars globally, a weaker dollar made oil more affordable for countries using other currencies, contributing to increased global demand.



3. Supply and Demand Imbalance: There was a perceived imbalance between global oil supply and demand. Rapid economic growth in emerging markets, coupled with increased industrialization and urbanization, led to higher oil consumption. At the same time, there were concerns about the adequacy of oil production capacity to meet this growing demand.

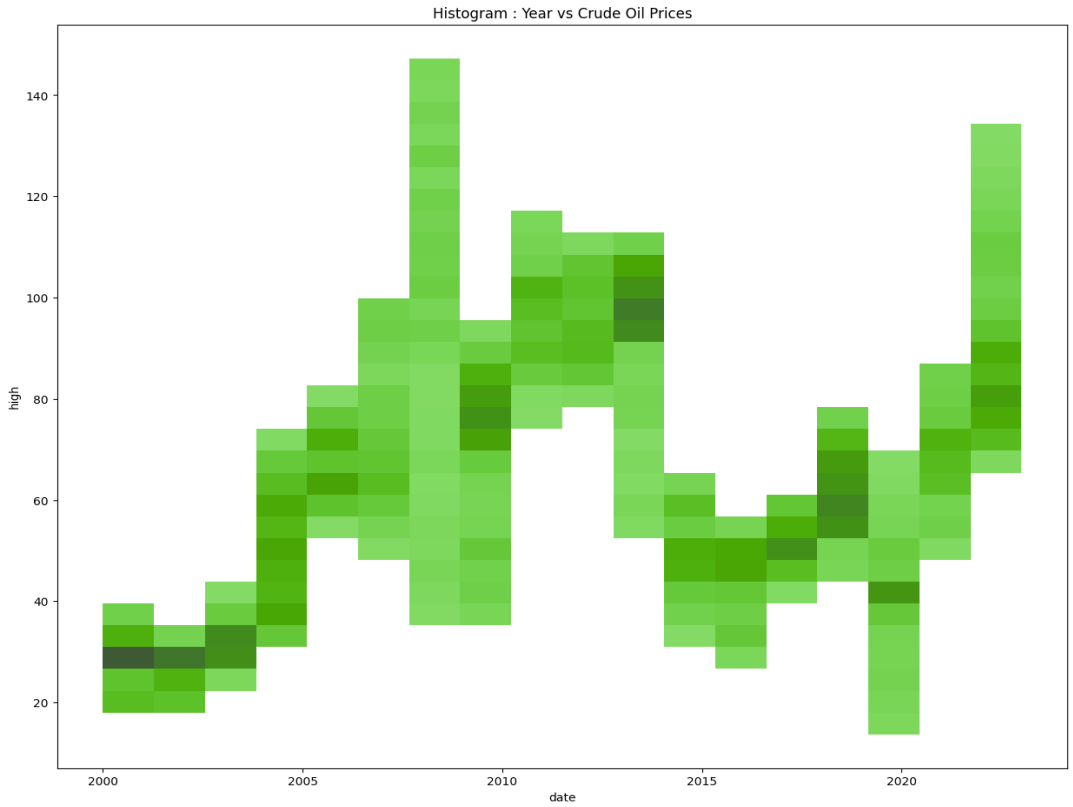
4. Geopolitical Tensions: Geopolitical factors, including tensions in oil-producing regions, contributed to concerns about potential disruptions in the oil supply. Unrest in the Middle East, particularly in Iraq and Iran, raised concerns about the stability of oil production in the region.

5. Financial Speculation: The commodities market experienced increased financial speculation, with investors seeking returns in the commodities sector. This speculative activity contributed to higher oil prices as investors bet on the continued rise in demand.

6. OPEC Production Cuts: The Organization of the Petroleum Exporting Countries (OPEC) implemented production cuts in an attempt to support higher oil prices. These cuts, combined with geopolitical uncertainties, added upward pressure on prices.

7. Infrastructure and Refining Constraints: Bottlenecks in oil infrastructure, including refining capacity, also played a role. Limited refining capacity in some regions created concerns about the ability to convert crude oil into usable products.

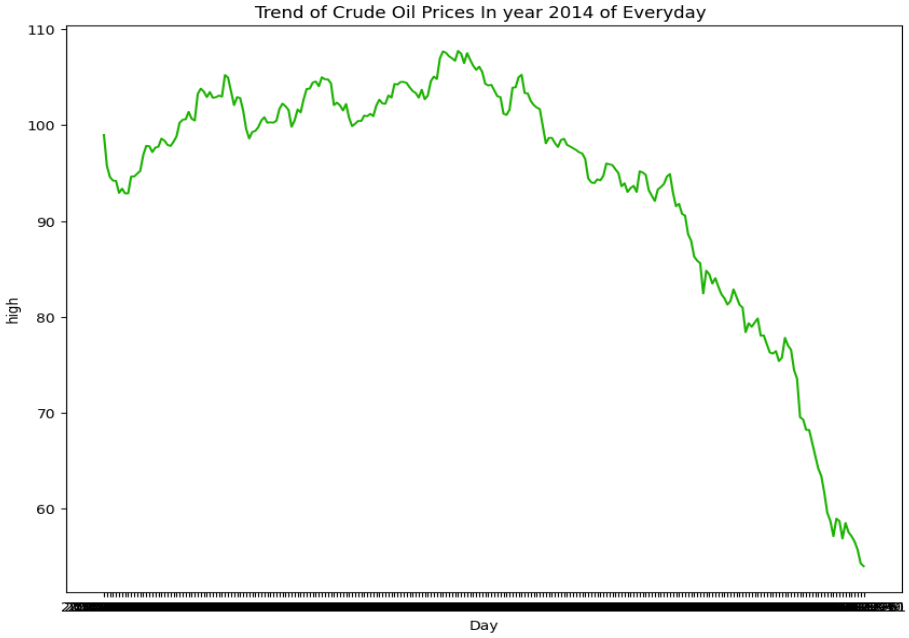
The combination of these factors created a perfect storm for soaring oil prices in 2008. However, it's essential to note that the situation changed dramatically later in the year and into 2009. The global financial crisis and economic downturn led to a sharp contraction in demand for oil, causing prices to collapse from their mid-2008 highs. By the end of 2008, oil prices had fallen significantly from their peak levels.



Crude Oil : Year 2011-2014

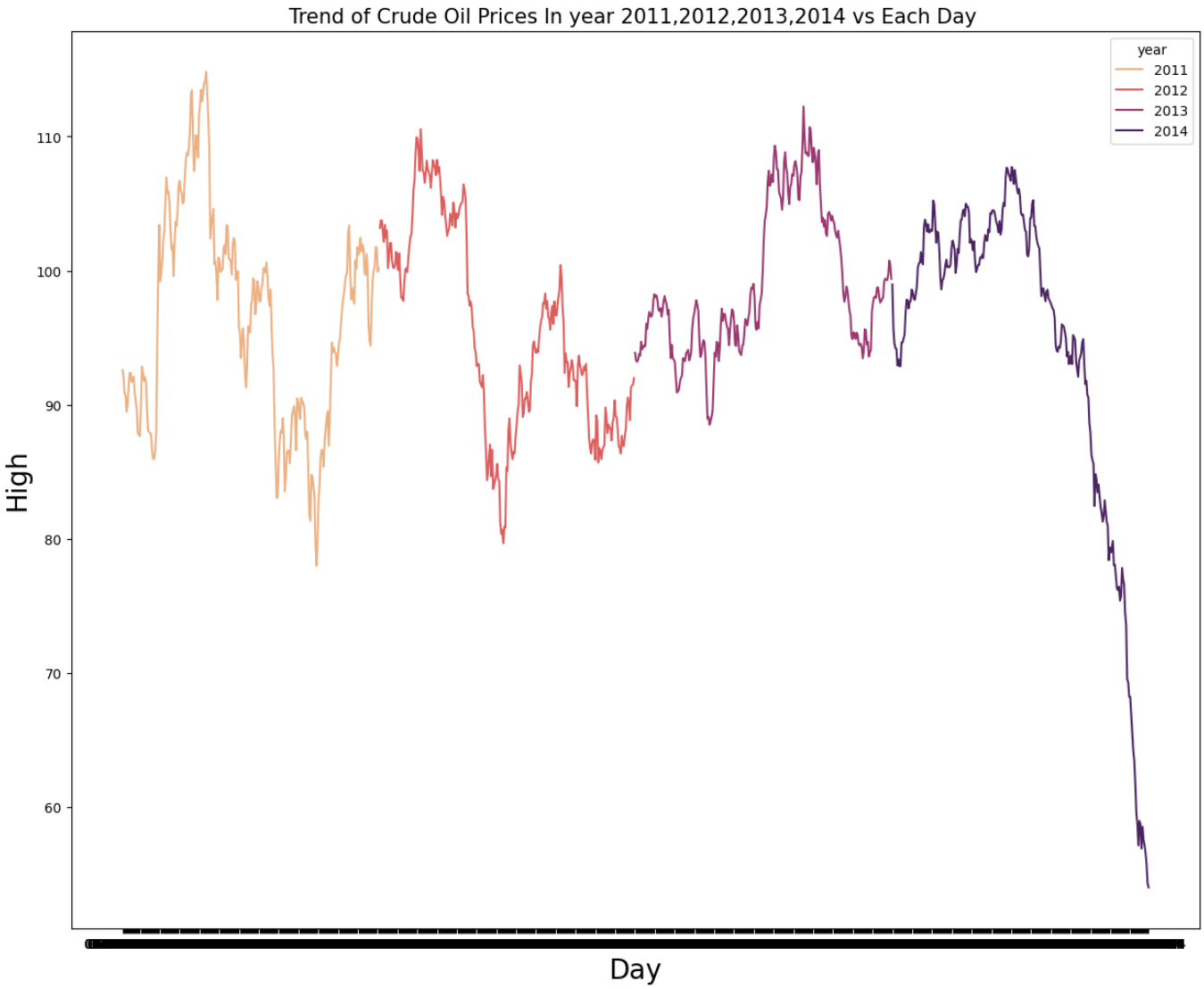
The stability in crude oil prices from 2011 to 2014 can be attributed to a combination of factors that balanced the global oil market during that period. Some key factors include:

1. Global Economic Recovery: Following the global financial crisis of 2008, there was a gradual recovery in the global economy. Economic growth, particularly in emerging markets, increased demand for oil. However, this growth was not so rapid as to create significant imbalances in supply and demand.



2. Increased Oil Production: During this period, there were advancements in oil extraction technologies, particularly in the United States through the development of hydraulic fracturing (fracking) techniques. This led to a surge in U.S. oil production, contributing to a more abundant global oil supply.

3. OPEC Production Levels: The Organization of the Petroleum Exporting Countries (OPEC) generally maintained stable production levels during this period. While there were occasional fluctuations, OPEC countries collectively worked to manage oil production to avoid drastic price swings.



4. Geopolitical Stability: Compared to some periods of the past and future, geopolitical tensions and disruptions were relatively lower during the years from 2011 to 2014. This stability reduced concerns about potential disruptions in global oil supply.

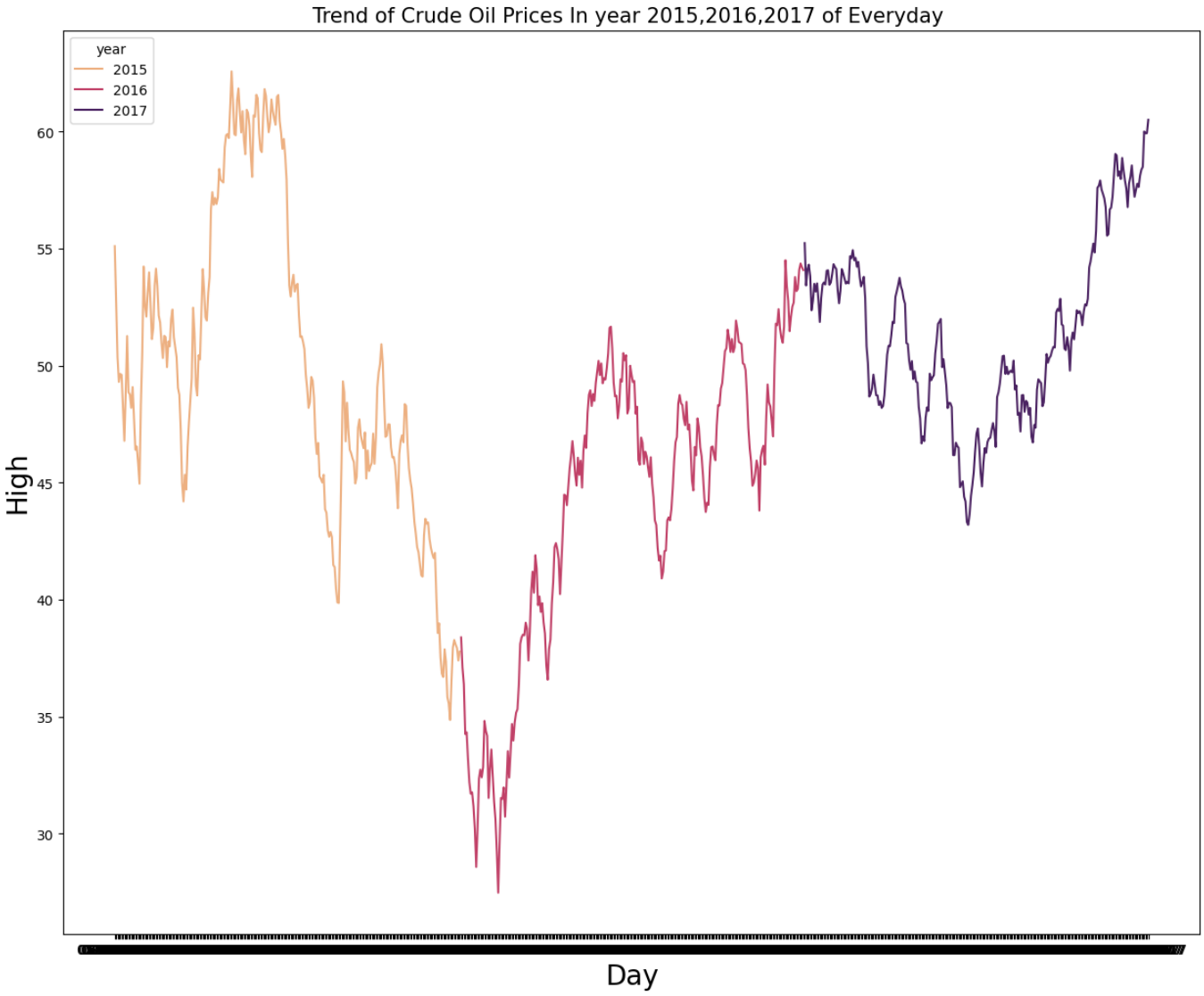
5. Dollar Stability: The U.S. dollar remained relatively stable during this time, which also contributed to a steady oil market. Since oil is priced in U.S. dollars, a stable dollar can help maintain a sense of predictability in oil prices.

6. Global Oil Inventories: Adequate global oil inventories helped mitigate concerns about sudden shortages. The stability in inventories was partly due to the relatively balanced supply and demand dynamics during this period.

7. Demand Growth Matching Supply Increases: The gradual recovery of the global economy and the increase in oil production were, to a large extent, balanced by a corresponding rise in demand. This matching of supply and demand growth contributed to a more stable pricing environment.

It's important to note that while prices remained relatively stable during this period, they are still influenced by various factors and can fluctuate based on changes in the geopolitical landscape, economic conditions, technological advancements, and other unforeseen events. After 2014, the dynamics in the oil market started to shift again, leading to fluctuations in oil prices in subsequent years.

Crude Oil : Year 2015-2017



The significant drop in crude oil prices from later half of 2015 to 2017 can be attributed to a combination of factors that created a substantial imbalance between global oil supply and demand. Some key factors include:

1. Oversupply and Shale Revolution: One of the primary drivers was the substantial increase in oil production, particularly from the United States, driven by the shale revolution. Advances in hydraulic fracturing (fracking) and horizontal drilling allowed the U.S. to extract oil from shale formations, leading to a surge in domestic production. This added significant volumes to the global oil market, contributing to oversupply.

2. OPEC Decision Not to Cut Production: In November 2014, the Organization of the Petroleum Exporting Countries (OPEC), led by Saudi Arabia, decided not to

reduce oil production levels in response to the oversupply. Instead, OPEC maintained its production levels in an attempt to protect its market share and, in some interpretations, to make shale oil production less economically viable.

3. Geopolitical Tensions: The annexation of Crimea by Russia in March 2014 escalated geopolitical tensions in the region. The move was widely condemned by the international community, leading to sanctions imposed on Russia by Western nations, including the United States and the European Union.

4. Russian Energy Exports: Russia is a major exporter of oil and natural gas, and any geopolitical tensions involving Russia can raise concerns about potential disruptions to its energy exports. These concerns may contribute to higher oil prices as traders factor in a risk premium.

5. Strong U.S. Dollar: The U.S. dollar strengthened during this time, making oil more expensive for countries using other currencies. This had a dampening effect on global oil demand.

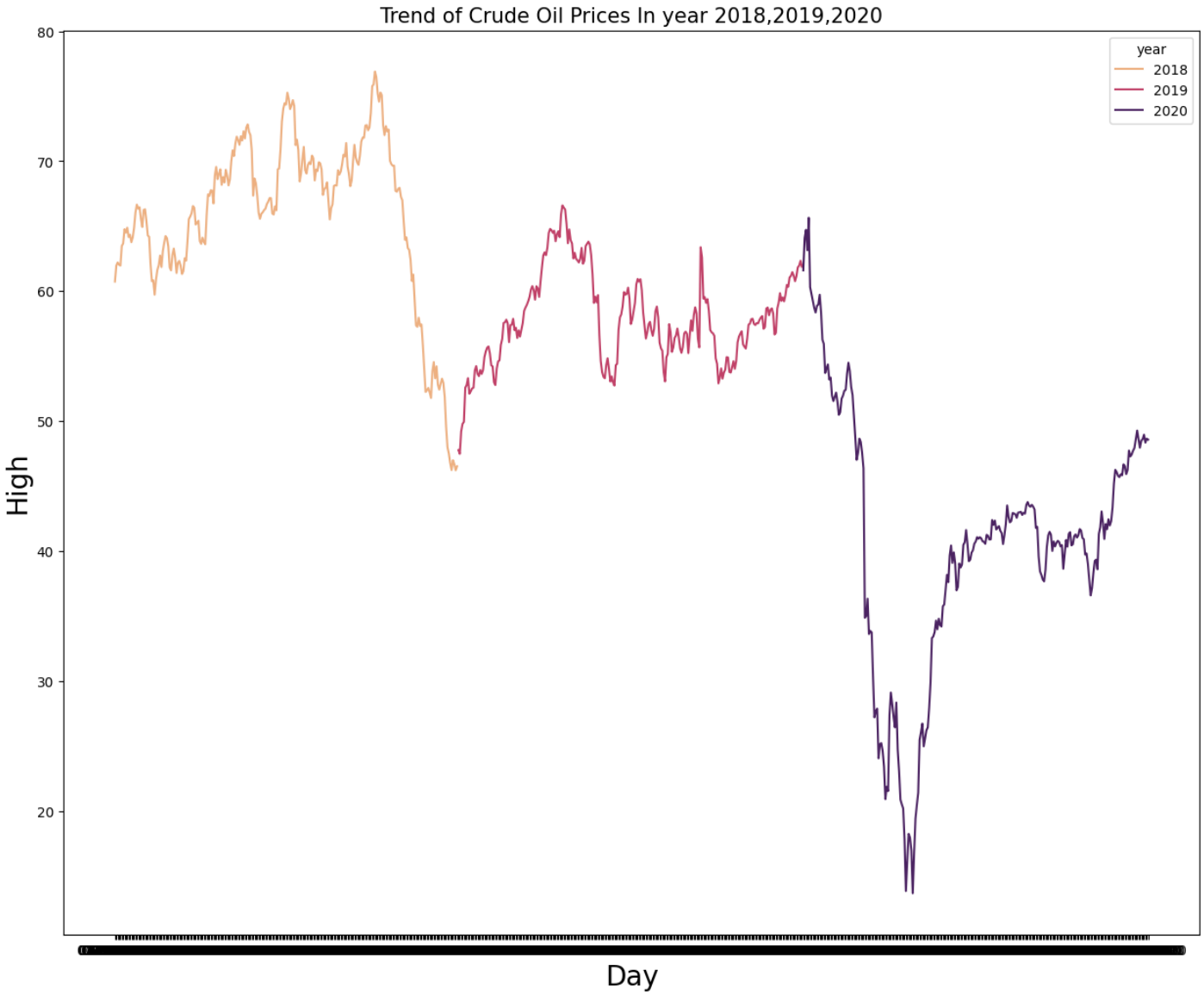
6. Market Reaction: Following the annexation of Crimea, there was a short-lived spike in oil prices as markets reacted to the geopolitical uncertainties. However, the impact on oil prices was relatively limited compared to other factors influencing the market at the time.

The combination of these factors led to a significant oversupply of oil in the global market, causing prices to plummet. The price of crude oil dropped from over $100 per barrel in mid-2014 to below $30 per barrel in early 2016. The period from 2014 to 2017 marked a challenging time for oil-producing countries and companies, as they had to adjust to the new market realities and lower oil prices.

Crude Oil : Year 2018-2020

Statistics

	Unnamed: 0.1	Unnamed: 0	year	open	high	low	close	volume
count	756.000000	756.000000	756.000000	756.000000	756.000000	756.000000	756.000000	7.560000e+02
mean	125.501323	4731.500000	2019.002646	53.802050	54.720463	52.775675	53.743981	5.689594e+05
std	72.796014	218.382692	0.817033	13.103373	12.770830	13.624666	13.308718	2.459175e+05
min	0.000000	4354.000000	2018.000000	-14.000000	13.690000	-40.320000	-37.630001	6.017900e+04
25%	62.750000	4542.750000	2018.000000	45.185001	46.187501	44.069999	45.317501	3.978588e+05
50%	125.500000	4731.500000	2019.000000	56.314999	57.105000	55.419998	56.250000	5.860470e+05
75%	188.250000	4920.250000	2020.000000	63.570000	64.125002	62.777500	63.405001	7.212852e+05
max	252.000000	5109.000000	2020.000000	76.180000	76.900002	74.930000	76.410004	2.288230e+06



The outbreak of the COVID-19 pandemic in late 2019 had far-reaching implications across various sectors of the global economy, and the oil and gas industry was no exception. This report aims to provide a detailed analysis of the impact of COVID-19 on crude oil prices, examining the key factors that influenced the fluctuations and the industry's response.

Initial Shock and Demand Destruction:

The first major blow to crude oil prices came as countries implemented lockdowns and travel restrictions to curb the spread of the virus. With businesses shutting down, flights grounded, and people staying at home, the demand for oil plummeted. This sudden demand destruction triggered a sharp decline in crude oil prices, as the market faced an oversupply situation.

OPEC+ and the Price War:

Concurrently, a significant event unfolded in the oil markets as the OPEC+ alliance, led by Saudi Arabia and Russia, failed to reach an agreement on production cuts in March 2020. This led to a price war, with both nations increasing oil production to gain market share. The combination of the demand slump and the supply surge contributed to a historic collapse in oil prices, with West Texas Intermediate (WTI) briefly turning negative in April 2020.

Government Interventions and Production Cuts:

Recognizing the severity of the situation, major oil-producing nations, including OPEC, OPEC+ members, and the G20, intervened to stabilize the market. Several agreements were reached to implement significant production cuts to rebalance supply and demand. These interventions played a crucial role in preventing a prolonged period of extremely low oil prices.

Global Economic Recovery and Oil Demand Rebound:

As countries gradually lifted restrictions and initiated vaccination campaigns, the global economy started on the path to recovery. This led to a rebound in oil demand, particularly in sectors such as transportation and manufacturing. The positive sentiment surrounding economic recovery contributed to a gradual increase in crude oil prices.

Volatility and Uncertainty:

Despite the recovery, the oil market remained volatile, with uncertainties surrounding new COVID-19 variants, geopolitical tensions, and the pace of economic revival. This volatility made it challenging for market participants to accurately predict future price movements.

Energy Transition and Long-Term Implications:

The COVID-19 pandemic accelerated discussions around the energy transition, with increased emphasis on sustainable and renewable energy sources. As the world reevaluates its energy policies, the oil and gas industry faces long-term challenges, including potential shifts in investment patterns and changes in consumer behavior.

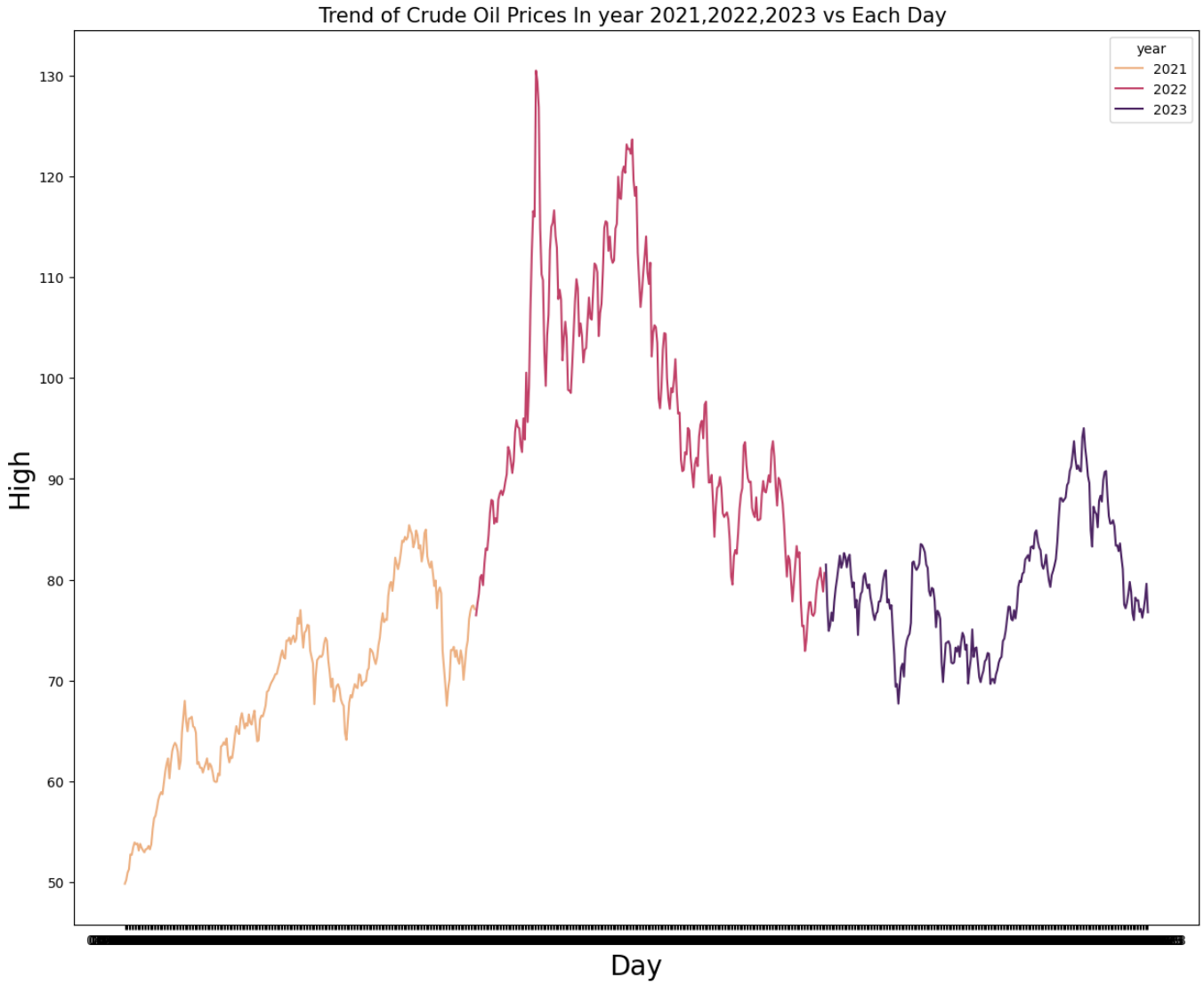
Conclusion:

In conclusion, the impact of COVID-19 on crude oil prices was multifaceted, involving a sudden demand collapse, a price war, and subsequent interventions to stabilize the market. While the industry has shown resilience in adapting to changing circumstances, the long-term implications include considerations for energy transition and a potential restructuring of the global oil market. Monitoring these trends will be essential for stakeholders in navigating the evolving landscape of the oil and gas industry.

Crude Oil : Year 2021 to 2023

STATISTICS

	year	open	high	low	close	volume
count	735.000000	735.000000	735.000000	735.000000	735.000000	735.000000
mean	2021.972789	80.220422	81.718789	78.605524	80.200204	350310.851701
std	0.811578	14.454963	14.975672	13.834984	14.376116	127311.374101
min	2021.000000	47.380001	49.830002	47.180000	47.619999	0.000000
25%	2021.000000	70.720001	72.055000	69.674999	70.870003	287042.000000
50%	2022.000000	78.449997	79.650002	76.919998	78.389999	344700.000000
75%	2023.000000	87.855000	89.340000	86.180000	87.725002	419863.000000
max	2023.000000	124.660004	130.500000	120.790001	123.699997	872244.000000



Introduction:

The period from 2021 to 2023 witnessed significant fluctuations in crude oil prices, shaped by a multitude of factors, including the ongoing recovery from the COVID-19 pandemic, geopolitical events, and global economic dynamics. This report aims to provide a comprehensive analysis of the trends in crude oil prices during this timeframe.

Global Economic Recovery and Demand Dynamics:

The years 2021 to 2023 marked a gradual but uneven global economic recovery from the impacts of the COVID-19 pandemic. As vaccination efforts progressed, many countries saw increased economic activity, contributing to a rise in the demand for oil. Sectors such as transportation and manufacturing, which were heavily affected in the previous years, showed signs of resurgence.

OPEC+ Actions and Production Policies:

The Organization of the Petroleum Exporting Countries (OPEC) and its allies (OPEC+) played a crucial role in influencing oil prices during this period. OPEC+ continued to implement production adjustments to balance the market, responding to evolving demand and supply dynamics. Decisions on production quotas had a direct impact on oil prices and market stability.

Geopolitical Events and Supply Disruptions:

Geopolitical events, including tensions in the Middle East and production disruptions in key oil-producing regions, contributed to periodic spikes in oil prices. Conflicts and geopolitical uncertainties influenced market sentiment, creating volatility in crude oil prices.

Energy Transition and ESG Considerations:

The focus on environmental, social, and governance (ESG) factors gained prominence during this period. Increasing emphasis on sustainability, coupled with the global push towards renewable energy sources, impacted investor perceptions and influenced capital allocation within the oil and gas industry. These factors had implications for long-term oil price trends.

Inflation and Economic Policy:

Inflationary pressures and central bank policies also played a role in shaping oil prices. The response of central banks to inflation concerns, interest rate decisions, and fiscal policies had repercussions on global economic conditions, thereby influencing oil market dynamics.

Technological Advances and Industry Efficiency:

Advancements in technology and improved operational efficiency within the oil and gas sector contributed to the industry's ability to navigate changing market conditions. Innovations in extraction techniques, exploration technologies, and operational practices influenced production costs and overall market dynamics.

Future Outlook and Risks:

As we look ahead, the future of crude oil prices remains subject to a range of uncertainties. Ongoing geopolitical tensions, the pace of the energy transition, and global economic developments will continue to impact oil markets. Additionally, unforeseen events such as natural disasters or public health crises could introduce further volatility.

The analysis of crude oil prices from 2021 to 2023 underscores the complex interplay of factors influencing the market. Stakeholders in the oil and gas industry must remain vigilant, adapting strategies to navigate evolving dynamics, including geopolitical shifts, technological advancements, and the ongoing global transition towards sustainable energy sources. A comprehensive understanding of these factors will be crucial for informed decision-making in the coming years.