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A Comparative Analysis of New York Mercantile Exchange and London Stock Exchange

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Abstract: This study tries to explore the dynamic relationship between the NYMEX commodities – including Gold, Silver, Natural Gas, FTSE-100, FTSE-350 index and macroeconomic factors from (2000 to 2024). It gives a historical insight into the both exchanges and uses the empirical methodology. The use of secondary data and statistical measures such as descriptive statistics, correlation analysis and the OLS regression modeling and SARIMAX modeling has been utilized, the research indicates how fluctuations in the global commodity markets and the domestic economic shifts the stock mark performance. There is significant interdependence between certain commodities and the stock market movements. GDP growth emerging as the key driver. The study highlights how the commodities like gold act as the safe -haven asset during the market volatility. The forecasting of the NYMEX commodities and FTSE 100 has been done for the upcoming 36 months i.e. (2025 - 2027). The interconnectedness of the global markets and the critical macroeconomic factors in shaping stock index behaviour have been analyzed which provides a great insight for the investors and various other stakeholders.

Keywords: *NYMEX, Financial Markets, LSE, FTSE-100, GDP , FTSE-350*

Statement of Problem: New York Mercantile Exchange and London Stock Exchange plays a crucial role in the global financial market. Various studies have conducted the research on the impact of macroeconomic factors on the NYMEX Commodities and London Stock exchange, but the comparative analysis of NYMEX commodities and London Stock Exchange has not been conducted. The Comparative analysis of both the exchanges gives an in-depth analysis of both the exchanges. New York Mercantile Exchange and London Stock Exchange plays a significant role not only in the financial markets but also it influences the daily life of the individuals.

1.Introduction

Financial markets play a very crucial role in the global economy as they are fundamental to the economic development. These are structured platforms for the investment, capital formation. These financial markets are the backbone of a nation's economy. These markets facilitate the capital allocation, risk management and the investment. Among these markets stocks exchanges and the commodity markets serves as the distinct yet interconnected functions. The London Stock Exchange (LSE) is one of the oldest and the most significant equity markets which represents the UK's economic strength through the indices such as the FTSE – 100. On the other hand, the New York Mercantile Exchange (NYMEX) is a leading commodity future exchange, which primarily deals with the energy products (Crude oil, Natural gas) and the precious metals (gold, silver). The Relationship between the commodity markets and the stock indices has been widely debated in the financial literature. Some studies suggests that the commodity price movements influence the stock market returns, particularly in the economy's dependent on the energy and raw material. Others argue that the stock indices and the commodities behave as the diversification tools, where the price fluctuations often respond to the macroeconomic shocks. Therefore, it becomes essential to understand the relationship between these markets for the investors, policymakers, and the researchers as it provides valuable insights into the market stability, inflationary trends and portfolio diversification. While the stock market primarily

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reflects the corporate performance and investor confidence. Commodity markets are driven by the supply demand dynamics, making them more volatile, this interplay raises the critical question: To what extent do the commodity price fluctuations impact the stock market movements. Understanding the differences between NYMEX and LSE isn't just about comparing two exchanges—it is about identifying broader trends in global finance.

Financial Markets are subject to volatility. Whether it is the sudden spike in the oil prices or a regulatory shift or the geopolitical shift. The markets react in accordance to events and activities that revolves around the world. The market reaction is influenced by the systemic events and in turn also influences further various economies. This paper aims to provide an insight into the New York Mercantile Exchange and London Stock Exchange and the influence these exchanges can have on the economic growth in this uncertain world.

At the heart of this research is a simple yet important question: What makes a financial exchange successful in the 21st century? Is it the ability to adapt to crises, embrace technology, or attract global capital? By exploring NYMEX and LSE's journeys from 2000 to 2024, this study will not only compare their histories but also shed light on influence they have on the economies. This paper will dive deeper into the impact of both the exchanges on the two of the most influential nations of G7, AUKUS, G20 grouping.

2.Historical view of financial market from Ancient to Modern times

2.1 Financial markets in Vedic Era (1500 -500 BCE)

Financial Markets which are considered as the beating heart of the financial system have played a crucial role in shaping the economy of the world since ages. Early Financial practices trace its origin from the Vedic period in India (1500BCE-600BCE), The Rigveda clearly mentions the concept of Rina (debt), interest rate (vrddhi), taxation (Bali), trade (vanijya)and are well documented in the Vedic scriptures. Rigveda (10.32.13)" rnam krtva ghrtam pibet ", if translated "take a loan and enjoy ghee "the verse suggested borrowing for consumption was socially acceptable, Coinage system and barter system is well described with the verse "suvarnam hiranyan ayam va apnam asti "in satapatha brahmana, if translated "Gold, Silver and metal objects serve as currency ".

2.2 Financial markets in Mauryan Age (322-185 BCE) and Gupta period and beyond

Kautilya Artha shastra has entire chapters which suggest commodity trading where it was the market inspector often called (panyadhyaksha) who regulated the commodity process. Agriculture produce, metals, salt, spices, textiles and live stocks were traded, which suggests that no other civilization had such a structured commodity market regulation. As Mauryan period(322BCE-185BCE) preceded, Artha Shastra by Kautilya described taxation, banking, financial regulations. Important trade structures emerged which included Pataliputra , Ujjain and Taxila .Evolution of Banking and credit occurred during Gupta period , where metal coin became widespread , the concept of promissory note emerged where money lenders and banking house issued hundi .Hindu Temples in south India pertaining to chola dynasty and Vijayanagar empire (Brihadeswara temple , Chidambaram temple) acted as grain banks , farmers deposited grain in temple and received credits , therefore played a very prominent role in the financial transactions , they acted as the lending and deposit institutions. Chettiar bankers in south India managed large scale lending for trade and agriculture. Taking in account the well-organized lending, deposits, financial regulations, ancient India was the first one to have a well-organized financial

2.3 India's ancient financial markets as the foundation of the International Financial Markets and the linkages between them

India's ancient commodity trading laid the foundation for the organized exchanges much like today's New York Mercantile exchange (NYMEX), the principles such as standardized contracts, warehousing, price controls and financial instruments in ancient India parallel modern commodity exchange in many ways. Ancient India's Mandis and temple storage systems functioned similarly to NYMEX's commodity futures and delivery mechanism. India's early financial instruments like Hundis and Forward Contracts Resemble Modern Derivatives used on NYMEX. Later on, developing on the Indian concept, this further widespread to rest of the world such as Greece, roman empire. Ancient Greece developed

money markets in Athens where traders used credit instruments and commodity trading. Medieval Fairs in France and England served as the early markets for commodities and credit instruments, which drew similarities to the mandis of the ancient India. before the formal stock markets Merchants and traders used to pool capital to finance trade expeditions, The emergence of the stock market was driven by merchants, governments, and business to pool resources, manage risk and expansion of the trade activities. Modern stock market traces their origin to the Dutch east India company (VOC), which in 1602 became the first publicly traded company. the need of capital to expand the global trade operations open the doors to public investors to buy shares. shareholders received the dividends based on the profit of the company, marking the birth of equity investments. The New York Mercantile Exchange (NYMEX) has been at the heart of global commodities trading for decades, which shapes the prices of natural gas, and metals that impact industries and consumers alike. Over the certain years, the NYMEX has evolved from a traditional trading floor like Bombay stock exchange in to a fully digital marketplace, which responds to global events, economic trends, and tech advancement like AI integration.

3. Evolution of NYMEX and London Stock Exchange

3.1 Origin of NYMEX

In 1872, a group of Manhattan dairy traders came together to form the Butter and Cheese Exchange of New York, with the aim of regulating the commodity and allowing effective trading between its members. This butter and cheese trading organisation later expanded, allowing the inclusion of other agricultural commodities, to become the New York Mercantile Exchange in 1882. They were originally confined to eggs, potatoes and poultry. This was between 1970 – 1980, when the exchange went up with Metals and Energy. The fossil fuel crisis caused volatility in the energy sector during the hassle period. NYMEX would later integrate with the COMEX in the 1980s. The NYMEX became the leading exchange for both metals and energy, a situation that continues to this day. Hence, the time of 1990s to 2000s was the very much dominating period for the NYMEX. In the year 2006, NYMEX went for public offering which strengthened the position trading exchange considerably in financial markets. By the start of the 21st century, NYMEX was a powerful player in the energy and metals markets. The contracts of West Texas Intermediate crude oil were used to set the global set oil prices of the world. Growing oil needs from China and India in the early 2000s raised prices. In 2008, crude hit historic highs of $147 per barrel on geopolitical instability and market speculation. But, during the global financial crisis, there was a crash as demand collapsed and oil price underperformed during the 2000s. The CME Group bought NYMEX, the biggest derivatives exchange operator in the world, in 2008. The NYMEX was fully integrated into a worldwide financial system, marking the advent of a global trading environment. Shouting traders in open-outcry trading pits disappeared around 2000s as electronic trading gained prominence and replaced the pit trading. The CME platform allowed investors around the world to trade NYMEX contracts. As a result, this development has made the market faster and much more accessible. The 2010s were marked by volatile oil price. In 2014, U.S shale oil production rose dramatically, increasing global oil supply and resulting in a price drop. Oil traded above $100 per barrel entered 2016 at the level of nearly $30 per barrel. In doing so, NYMEX helped to create a commercial opportunity for hedging and speculation. Thus, it allowed companies to shield themselves from risks.

Covid And Post -Covid Scenario

In 2020, the COVID-19 outbreak caused a second major blow to the market as global oil demand collapsed. For the first time in history, NYMEX crude oil futures went negative. This strange phenomenon happened because there were not any facilities to store the oil. The traders could not store them anymore, which is why they had to pay the buyers to take the contracts off their hands. This incident shows the complexity and risk in the commodity market. Beyond oil, gold and metals have become a mainstay of NYMEX. The uncertainty resulting from the financial tsunami of 2008, and later the pandemic of COVID-19 in 2020, led to the highest-ever gold prices in the market. The exchange is also getting into green energy trading through contracts for carbon credits and emissions allowances in accordance with global sustainability initiatives. In the future, NYMEX is continually working on new challenges. Renewable energy, digital finance and AI-driven trading are reshaping the commodity markets. Even with market volatility created by geopolitical tensions, NYMEX is the

most important financial market in the world, ensuring liquidity and price discovery for the most strategic commodities in the world.

3.2 Origin of London Stock Exchange

The history of the London Stock Exchange is traced back to 17th century. The roots of this exchange lie in the coffee houses of the London. The moment it laid the foundation is related to John Castaing, a dealer, who started publishing the list of stocks and the commodity prices at the Jonathan Coffee House in the London. This list is called the course of the Exchanges and Other things. It is believed to be the first stock price list in London. In the year 1801, the London stock exchange was officially established. It then later expanded its business. Over the past 20 years, the London Stock Exchange (LSE) has undergone significant changes. As a venerable organization that has been running successfully for years, the institution is no stranger to unsolicited crisis. Besides, it has the ability and confidence of rising to any challenge. In the early 21st century, LSE was establishing itself as an important institution in European and world finance. The FTSE 100, the London Stock Exchange's (LSE) flagship index, was recognised worldwide as a benchmark in the global market tracking top 100 companies. But in the early 2000s, the dot-com bubble burst, causing tech stocks to crash, and there was the fallout from the global financial crisis which caused all the market instability. In the 2010s, LSE acquired Borsa Italiana and a range of other domestic and international exchanges. As a result, the exchange turned into a primary venue for bond trading, exchange-traded funds (ETFs) and alternative investments. Through the development of the Alternative Investment Market (AIM), adaptation of small-size high-growth companies to raise capital was enabled. 2016 saw the biggest disruption for LSE when there was a vote in favour of leaving the EU in the UK. Brexit challenged London's status as a financial centre. Many firms started thinking of moving to Frankfurt, Paris, or Amsterdam. Even in the face of worries, LSE continued to evolve its regulations for the better. Technology has played an important role in the evolution of LSE. The way securities are bought and sold now that algorithmic trading, high-frequency trading (HFT), and artificial intelligence have taken off has changed. Today, many transactions take place in milliseconds using electronic trading system. The emergence of sustainability financing is another major shift. LSE has established itself as a leader for green bonds and ESG (Environmental, Social and Governance) investing, financing instruments for climate-friendly initiatives. With the world becoming increasingly sustainable, LSE is ahead of many exchanges in this respect.

Covid And Post -Covid Scenario

The global pandemic of COVID-19 in the year 2020 has been another defining moment for LSE. Stock market crashes happened in March all over the world. Yet, the exchange helped stabilize the markets, maintain liquidity, and let companies raise capital during the crisis. LSE remains a global powerhouse despite growing competition from New York and Hong Kong and Frankfurt exchanges. It remains relevant in the face of technological innovation, changing market dynamics and expansion into a new set of financial products. NYMEX and LSE have changed a lot between 2000 and 2024. In response to changing energy markets, NYMEX changed a lot from oil price boom and bust to renewable energy use. Despite the financial crises, Brexit, and the rise of FinTech, LSE has secured a crucial position in finance. Going forward, these exchanges will continue to be key to shaping global economies and trends in investment.

Literature Review

Financial markets are essential for economic growth as they allocate capital and manage risk. Stock exchanges are places where shares get traded. They include the London Stock Exchange (LSE). Commodity exchanges include the New York Mercantile Exchange (NYMEX) where energy products, metals and agricultural products get traded. Several enterprises have inquired into the way these markets have a tendency to co-vary, their impact on a macro syndicate and those markets in globalization (Mishkin, 2007) . Financial experts have studied the relationship between commodity prices and stock indices widely through literature. Findings by Jones & Kaul, (1996) show that oil price shocks significantly affect stock market returns in developed economies, frequently leading to increased inflationary pressures and higher production costs. The performance of the stock market is affected by the crude oil price volatility according to Hamilton (2009). Furthermore, corporate earnings, production costs, and consumer sentiment are all significantly impacted. According to Narayan & Sharma (2011), gold and silver are safe-haven assets during downturns in the stock market that have seen a negative relationship

between commodities and stocks. But how strong that relationship is depends on the economic cycle, monetary policies and external shocks. The New York Mercantile Exchange is one of the world's foremost commodity exchanges. It lends trading platforms to energy commodities and metals. Researchers have studied the wider economic effects of these items. As identified by Büyükşahin & Robe (2014), commodities' financialization has caused them to correlate more with equities and, thus, lose their diversification role. Kilian and Zhou (2018) examined the impact of oil price changes on stock markets and found that supply-driven oil shocks have a larger effect than demand-driven oil shocks. Gorton and Rouwenhorst (2006) examined the diversification benefits of commodities. They found that commodities are correlated with traditional financial assets over the long-term. Both the studies suggest that NYMEX commodities result in stock market changes but the extent is subject to macroeconomic conditions as well as investor behaviour. The London Stock Exchange (LSE) is the world's oldest stock market and is affected by domestic and international macroeconomic variables. Many studies mention the factors affecting the FTSE 100 index. According to Chen, Roll & Ross (1986) stock prices are determined by both macroeconomic variables like interest rates and inflation; and industrial production. Per Dimic et al. (2015), a negative UK GDP growth forecast drives up the FTSE 100. Also, during periods of uncertainty, investors flock to defensive sectors. Global commodity price shocks can influence the LSE's sectoral performance. Degiannakis, et al. (2018) examine energy and mining stocks' roles in this trend. Considering these findings, it is crucial to investigate if the commodities from NYMEX affect the returns of FTSE 100 and its sectoral indices. Various researchers compared the commodity exchanges with stock exchanges and tried to establish their linkage. However, Erb & Harvey (2006) proved that commodities are a hedge against inflation, but not the stocks as they are far more responsive to the movement of interest rates. According to Baur & Lucey (2010), gold may be viewed by investors as a hedge against stock market volatility. However, the relationship between gold and equities will change over time. During a recent investigation into what the authors refer to as the "excess co-movement" of commodities, Pindyck & Rotemberg (1990) found that macroeconomic shocks frequently cause asset prices to change in "lockstep." The relationship between NYMEX commodities and LSE indices will throw light on the global financial linkages, the studies suggest.

Research Gap

There are few studies, which have conducted a comparative analysis between NYMEX and LSE over a period of (2000-2024). The role of macroeconomic factors in mediating this relationship remains underexplored. There is limited literature on the impact of NYMEX commodities on FTSE 100 indices. This paper aims to fill these gaps by conducting an empirical analysis using historical data, statistical modelling, and hypothesis testing.

Research Methodology

This study uses the empirical method to test the hypothesis. The study draws the correlation and volatility patterns of both the exchanges; A comprehensive historical data has been extracted of both the exchanges from the year 2000 to 2024. The data is cleaned by removing the null values and missing values. The descriptive statistics has been calculated for the FTSE 100, FTSE 350 and NYMEX commodities, and graph of each relevant variable has been carved out, then the returns are calculated of each index and commodities and correlation matrix is drawn along with the heat map of the correlation matrix. First the correlation matrix of London stock exchange indices and the and the price of NYMEX commodities are carved; the second correlation matrix is constructed for the variables of LSE and macroeconomic indicators. The third correlation matrix has been prepared for the NYMEX commodities and the macroeconomic indicators. Once the correlation was carved out, the impact of NYMEX and the FTSE 100 has been measured with the use of regression analysis. This study uses the Python for the data cleaning, data analysis and data visualization.

This study relies exclusively on the secondary data, the historical data of both the exchanges have been sourced from the various sources such as Investing.com, Yahoo Finance, London Stock Exchange official website. The macroeconomic historical data of bank rate and the GDP growth rate has been extracted from the Bank of England, FRED, OECD data, World Bank Data.

Objective of the study:

1. To study the correlation between NYMEX commodities and the FTSE 100

2. To analyze the volatility patterns between NYMEX commodities and the FTSE 100

3. To study the impact of the different macroeconomic factors (Interest rates& GDP growth) in the relationship between NYMEX commodity prices and the London Stock Exchange (FTSE100)

Hypothesis

H1: There exists a significant relationship between NYMEX commodity prices and FTSE 100 index, suggesting the fluctuations in global markets influence the UK stock market.

H2:UK macroeconomics factors significantly influence the relationship between NYMEX commodities and the FTSE 100 index.

H3: There is a significant relationship between the NYMEX Gold prices and US GDP growth rate

H4: There is a significant relationship between NYMEX Silver prices and US GDP growth rate

H5: There is a significant relationship between NYMEX Natural gas prices and US GDP growth rate

H6: There is significant relationship between NYMEX Gold prices and US Fed rate

H7: There is significant relationship between NYMEX Silver Prices and US Fed rate

H8: There is significant relationship between NYMEX Natural gas Prices and US Fed rate

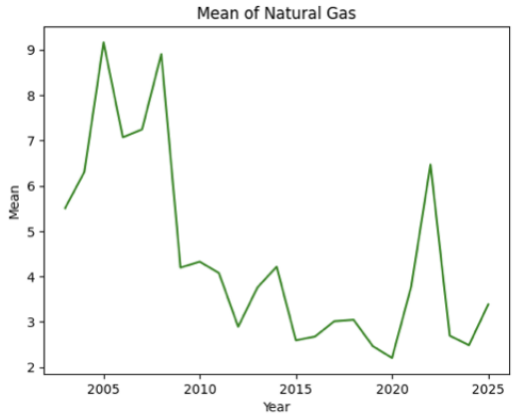
Variable Description

Symbol	VARIABLES	DESCRIPTION
UKX	FTSE 100	Bench mark stock market index representing 100 largest companies listed on the London Stock exchange, which covers major sectors including finance, energy, healthcare, consumer good as the key indicator of the UK's economic health.
NMX	FTSE 350	Index combining FTSE 100 and FTSE 250, representing the 350 largest companies on the London stock exchange, provides a broader view of UK equity market.
GC	NYMEX(GOLD)	Highly liquid commodity traded on the NYMEX and is considered as the safe haven asset. Its prices are influenced by inflation rates and market volatility.
SI	NYMEX(SILVER)	Precious metal, having more industrial usage as compared to the gold, making its price sensitive to both economic cycles and the investment demand
NG	NYMEX (NATURAL GAS	Key energy commodity with the pricing influenced by the supply – demand dynamics, weather pattern and global economic activity.
GDP	GDP GROWTH RATE (UK & US)	Measures the economic performance of the country by assessing the percentage change in the value of all the goods and services produced over a specific period.
IR	UK BANK RATE /US FED RATE	Key Interest rates used to control the inflation and stimulus

Results:

Descriptive statistics of each NYMEX commodities and LSE indices have been visualized into the form of line graph from the year 2000 to 2024. Descriptive statistics contains Mean and Standard Deviation of the NYMEX

Descriptive Statistics of NYMEX -Natural Gas (2000-2024)



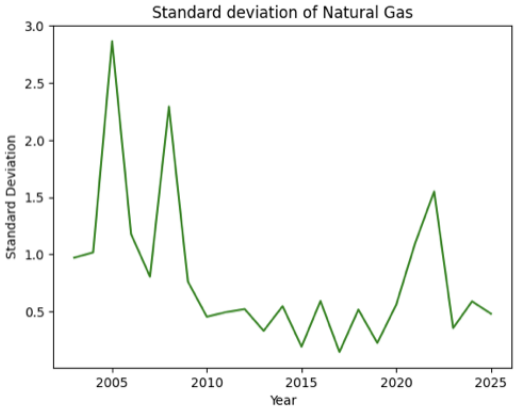


Fig 3: highlights the mean of natural gas price ***Fig 4: highlights the standard deviation of natural gas price***

Source: Authors' compilation ,Python generated, based on data from Yahoo Finance

(Gold, Silver, Natural Gas) and FTSE 100.

The Early 2000s saw the sharp increase in the prices. There were significant spikes during the period of 2000 to 2008-year end, which was followed by the collapse during the 2008 financial crises. From 2000- 2014 the shale price revolution led to the massive increase in the United States natural gas production, which led to decrease in the prices. The period between 2015-2016 was the time when prices hit the record low due to the continued oversupply, weak demand and mild winters. Highly saturated markets led to the downward pressure on the price. Though prices started to recover slightly in 2017 to 2019 due to the increased LNG exports and the rising demand. COVID -19 crashed the prices, In this period due to supply chains disruptions. It was the 2022 which was record high as the Russia – Ukraine war disrupted the global energy markets, causing prices to spike. There was strong demand for the US LNG exports and these sorts of geopolitical tensions drove the prices upward. In the Year 2003 the market saw a return to the lower price level but started recovering in 2024.

Descriptive Statistics of NYMEX -Silver (2000-2024)

NYMEX Silver Prices began to rise gradually in early 2000s due to increased industrial demand and weakening of U.S dollar, however in 2008 financial crises caused a sharp but a temporary decline due to priority of the investor for the gold as the safe haven. Aftermath the 2008 crisis, the silver prices surged dramatically as the central banks around the world adopted the quantitative easing and stimulus measures, Silver reached multi decade high during this period. Silver prices saw a prolonged decline after 2011 as the global economy stabilized and U.S. dollar strengthened. Silver saw moderate recover during 2016-2019, though prices remained volatile influenced by U.S. – China trade war. Silver prices crashed in early 2020 due to global slowdown by COVID-19 pandemic, but in the later part of the year due to unveiling of stimulus measures by the central banks the prices rebounded. Silver prices experienced extreme volatility in 2023 due to various reason – of which some are geopolitical tensions, higher interest rate and the stronger U.S. dollar weighted on the price.

Descriptive Statistics of NYMEX -Silver (2000-2024)

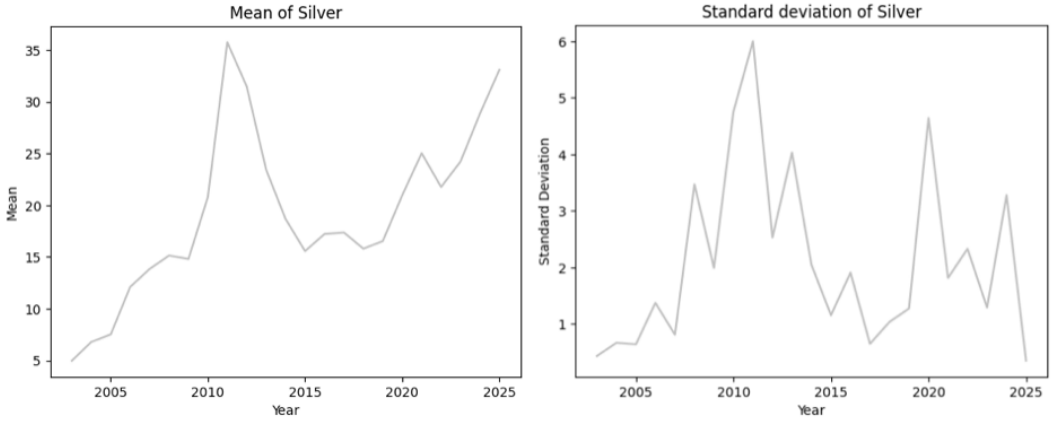


Fig 5: highlights the mean of silver prices ***Fig 6: highlights the standard deviation of silver prices***

Source: Python generated, based on data from Yahoo Finance

During the period of 2000 to 2005, there was a steady increase in the with the occasional volatility due to weakening of U.S dollar and rising geopolitical tensions (Iraq War, 9/11 attack) and increased demand from emerging markets. Gold started to regain its role as the safe haven. The period from 2005 to 2010 saw a sharp increase to record high. The 2008 financial crisis marked the turning point for the gold prices. Fear of inflation and currency devaluation drove investors to gold. Prices surged to record high during this period, peaking in 2011. After reaching record highs in 2011, gold prices entered a prolonged decline. The stabilized global economy and stronger US dollar and reduced inflation fear contributed to the downward trend. The period between 2015 to 2020 saw moderate

Descriptive Statistics of NYMEX -Gold (2000-2024)

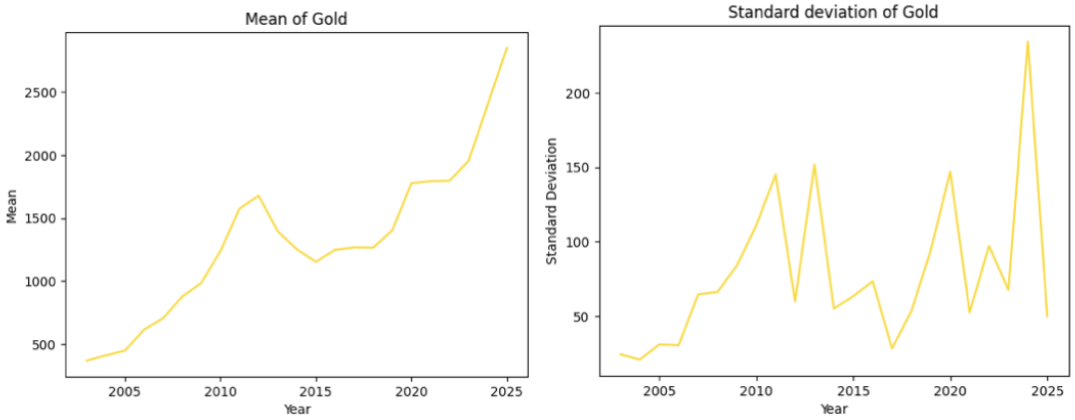
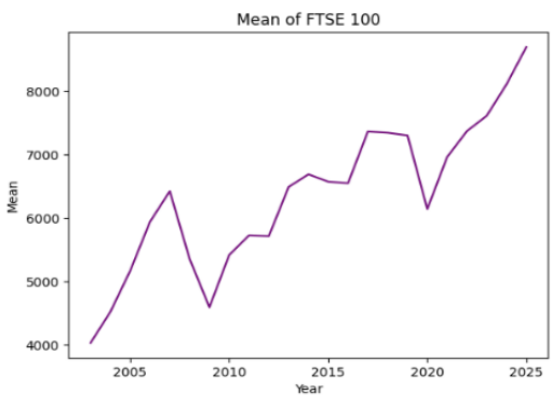


Fig 5: highlights the mean of gold prices ***Fig 6: highlights the standard deviation of gold prices***

Source: Python generated, based on data from Yahoo Finance

recovery with the significant volatility due to geopolitical tension (U.S. – China Trade war). There was initial drop in 2020 due to the black swan event, but was followed by the strong recovery.

Descriptive Statistics of FTSE-100 (2000-2024)



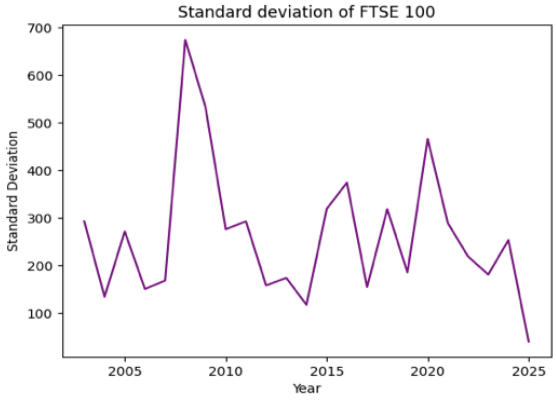
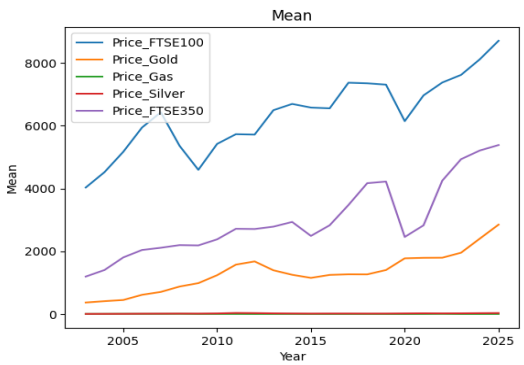


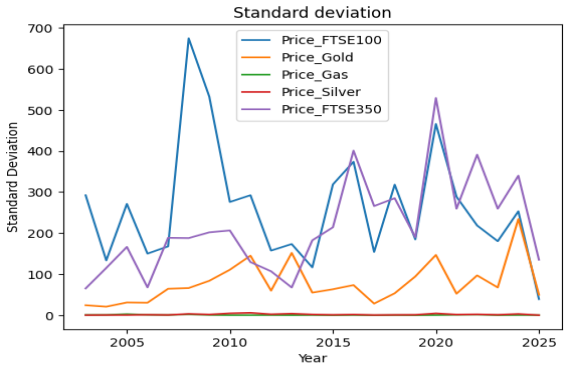
Fig 5: highlights the mean of gold prices

Fig 6: highlights the standard deviation of gold prices

Source: Python generated, based on data from Yahoo Finance

The FTSE-100 saw a initial decline by the gradual recovery as it was impacted by burst of the dot-com bubble in 2000-2001, leading to the sharp decline. The index however recovered as the global markets stabilized and the economic growth resumed. The period of (2005-2010) saw a sharp decline followed by the partial recovery. The 2008 global financial crises caused a significant drop in FTSE -100 with the index losing nearly half of its value. The FTSE-100 recovered post central bank interventions. The period of 2010 – 2015 saw the gradual recovery with the volatility, followed by volatility with some growth in the period of 2015 to 2020. The FTSE-100 experienced volatility during this period due to the Brexit (2016). Which caused the sharp drop in the pound, even in 2020 there was the sharp decline followed by recovery due to stimulus measures by central bank. The period of 2020-2024 saw recovery, but with volatility owing out to the reason of Russia -Ukraine Crises.





Step – 2 Calculation of return

Year	Price_FTSE100	Price_Gold	Price_Gas	Price_Silver	Price_FTSE350
2004	0.121590	0.117932	0.144949	0.365829	0.174851
2005	0.143300	0.090502	0.452748	0.106573	0.285711
2006	0.149665	0.368371	-0.228344	0.610108	0.131200
2007	0.081517	0.149167	0.024435	0.143722	0.034689
2008	-0.166259	0.242800	0.229462	0.093584	0.039914
2009	-0.142608	0.123188	-0.528614	-0.021628	-0.004478
2010	0.179630	0.256909	0.030852	0.404657	0.088276
2011	0.057138	0.271689	-0.057815	0.718044	0.141286
2012	-0.002094	0.064959	-0.290544	-0.119805	-0.002600
2013	0.135854	-0.168180	0.299211	-0.255700	0.027811
2014	0.030670	-0.102619	0.122525	-0.203081	0.053798
2015	-0.017365	-0.079157	-0.385357	-0.165677	-0.151566
2016	-0.003569	0.082541	0.032688	0.106164	0.136532
2017	0.124475	0.015346	0.126023	0.008320	0.227798
2018	-0.002609	-0.001770	0.010365	-0.089762	0.200099
2019	-0.005744	0.109418	-0.190874	0.046276	0.012359
2020	-0.159127	0.266018	-0.105863	0.267694	-0.417975
2021	0.133440	0.008832	0.716430	0.193721	0.150656
2022	0.058957	0.001982	0.709876	-0.130226	0.503329
2023	0.032807	0.088470	-0.583279	0.112906	0.160907
2024	0.065280	0.229874	-0.077513	0.191210	0.056078
2025	0.072658	0.185272	0.361241	0.146717	0.033384

Table – 2, Source: Python generated, based on data from Yahoo Finance

Step -3 Correlation Matrix

Correlation Matrix :1

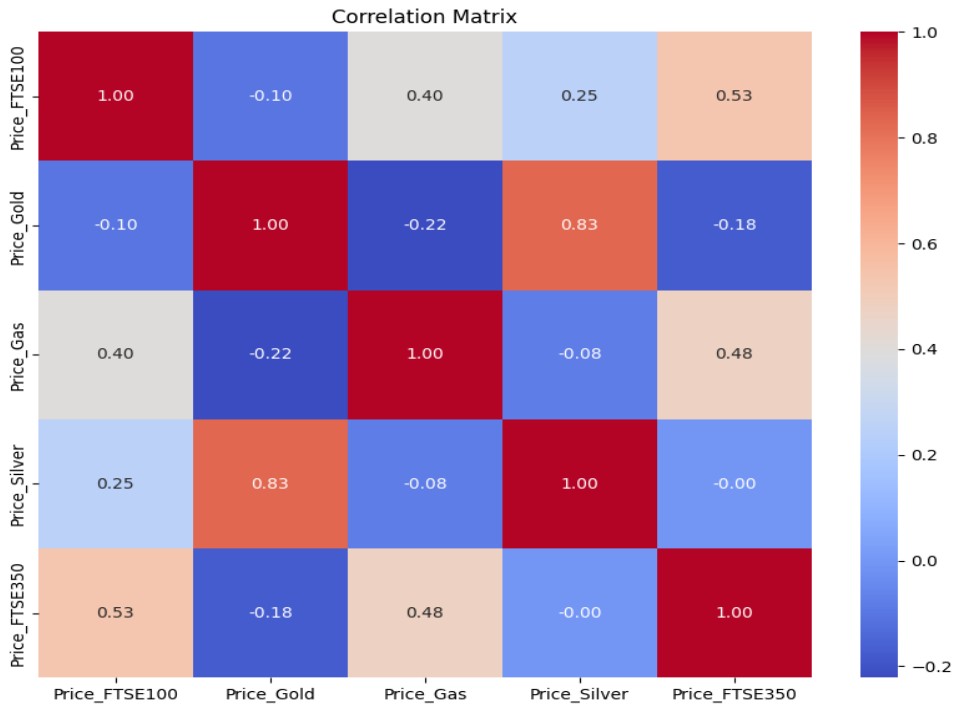


Fig – 7 , Source: Python generated

Correlation matrix -1

1. FTSE 100 And FTSE 350 prices indicates a moderate to strong positive relationship in the correlation matrix 1
2. FTSE 100 and NYMEX gas prices indicates a moderate positive relationship in correlation matrix -1
3. FTSE-100 and NYMEX gold prices have very weak negative relationship as indicated in correlation matrix -1

Correlation Matrix :2

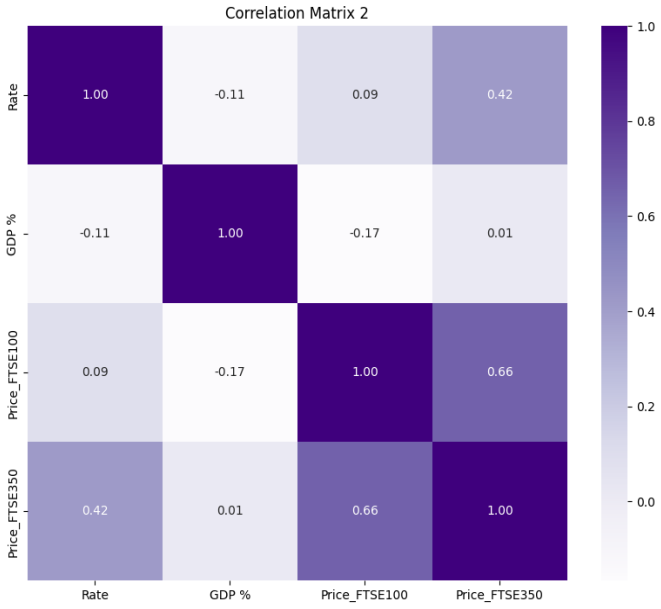


Fig – 8, Source: Python generated

Correlation Matrix -2

4. FTSE 100 and FTSE 350 prices have moderately strong positive relationship.
5. FTSE 350 prices and Bank of London Rate has moderate positive relationship.
6. FTSE -100 prices and Bank rate have weak positive relationship.

Correlation Matrix :3

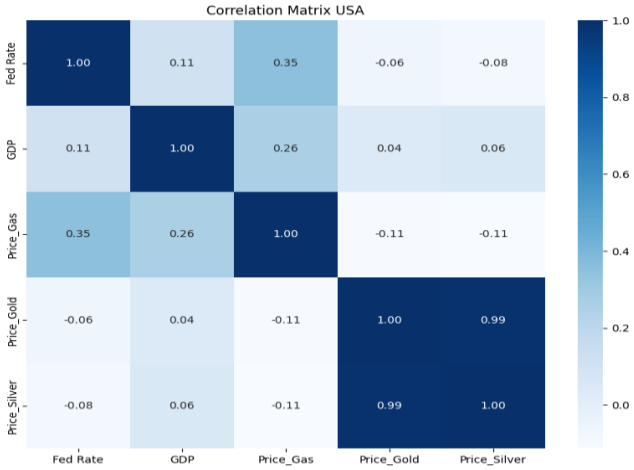


Fig – 10, Source: Python generated

Correlation matrix 3

1. Price of NYMEX- old and NYMEX- silver have strong positive relationship
2. Prices of NYMEX -gas and Fed rate have weak positive relationship
3. Prices of NYMEX-gas and GDP have weak positive relationship
4. Prices of NYMEX gold and GDP have weak positive relationship

As per the results of correlation matrix between NYMEX-commodities and FTSE-100, there exists a moderate to very weak relationship between the two. The relationship varies between moderate to weak in accordance with the commodity. FTSE 100 and NYMEX gas prices indicates a moderate positive relationship in correlation matrix -1, which draws that the to some extent when NYMEX -natural gas prices increase, FTSE-100 tends to rise as well. This shows the energy sector influence on the FTSE-100. The correlation between them is moderate, but not strong due to Supply side volatility in the Gas market.

FTSE-100 and NYMEX gold prices have very weak negative relationship as indicated in correlation matrix -1, which suggests that when FTSE-100 rises, gold prices tend to decline slightly due to risk on vs risk off sentiments, hedging behaviour and global economic dynamics. Risk on vs Risk off sentiments is explained by the further detailing – Stock markets usually perform well during the period of economic growth and investor confidence, that is risk on sentiment. Whereas the hold, being a safe haven tends to gain value during the market uncertainty or economic downturns, that is risk of sentiment. But this inverse link isn't strong or consistent as market diversification influences both markets differently. In case of NYMEX- Silver there is a weak positive relationship between the two, which suggests that while economic growth, industrial demand and commodity cycle can occasionally push market upwards, their movement are not tightly linked.

On the basis of these results, we do not get strong enough evidences to confirm a significant relationship between the NYMEX commodities and the FTSE-100 that reflects global market fluctuations. Therefore, we accept the Null Hypothesis. (H1).

VARIABLES	SIGNIFICANT RELTIONSHIP EXISTENCE	HYPOTHESIS	CONCLUSION
NYMEX Commodity Prices and FTSE-100 index	NO	H1	NULL HYPOTHESIS ACCEPTED
Influence of Macroeconomic factors between the NYMEX commodities and FTSE 100	YES	H2	FAIL TO ACCEPT NULL HYPOTHESIS
NYMEX Gold prices and US GDP growth	NO	H3	NULL HYPOTHESIS ACCEPTED
NYMEX Silver prices and US GDP growth	NO	H4	NULL HYPOTHESIS ACCEPTED
NYMEX Natural gas price and US GDP growth	YES	H5	FAIL TO ACCEPT NULL HYPOTHEIS
NYMEX Gold price and US Fed Rate	NO	H6	NULL HYPOTHESIS ACCEPTED

NYMEX Silver price and US Fed Rate	NO	H7	NULL HYPOTHESIS ACCEPTED
NYMEX Natural gas price and US Fed Rate	YES	H8	FAIL TO ACCEPT NULL HYPOTHEIS

OLS- Regression analysis

```
                            OLS Regression Results
==============================================================================
Dep. Variable:          Price_FTSE100   R-squared:                       0.635
Model:                            OLS   Adj. R-squared:                  0.569
Method:                 Least Squares   F-statistic:                     9.577
Date:                Sat, 22 Feb 2025   Prob (F-statistic):            0.00390
Time:                        19:01:27   Log-Likelihood:                 18.231
No. Observations:                  14   AIC:                            -30.46
Df Residuals:                      11   BIC:                            -28.54
Df Model:                           2
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         -0.0199      0.033     -0.612      0.553      -0.091       0.052
Rate           0.0111      0.010      1.133      0.281      -0.010       0.033
GDP %          0.0191      0.005      3.991      0.002       0.009       0.030
==============================================================================
Omnibus:                       10.312   Durbin-Watson:                   1.534
Prob(Omnibus):                  0.006   Jarque-Bera (JB):                6.214
Skew:                          -1.280   Prob(JB):                       0.0447
Kurtosis:                       5.026   Cond. No.                        7.74
==============================================================================
```

Fig -11 Source: Python generated, on the basis of dataset

Graphical Representation of OLS- Regression

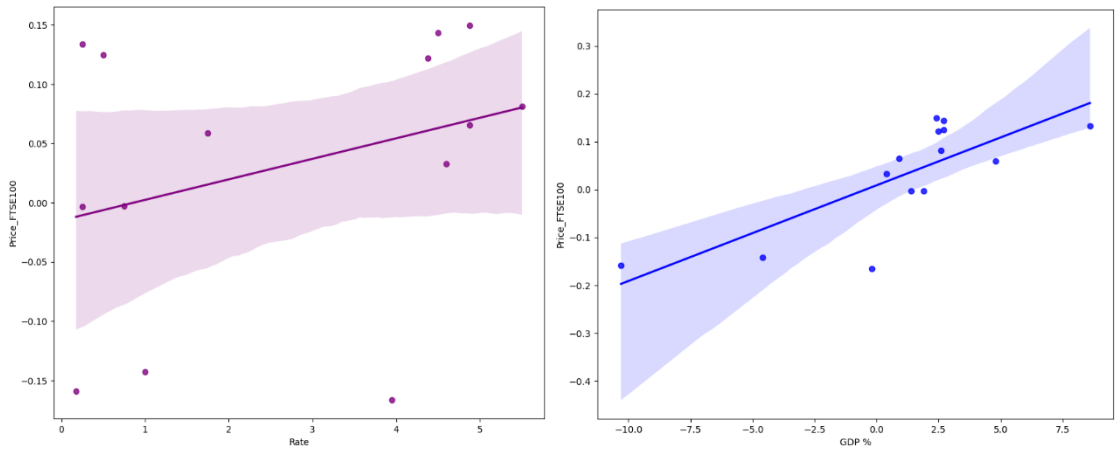


Fig 12 Source: Python generated, on the basis of results of OLS regression (author's compilation)

To test the influence of Macroeconomic factors on the FTSE-100, Ordinary Least Square Regression analysis has been utilized. Where dependent variable is Prices of FTSE-100 and the test conducted on the observation of 25 years (2000-2024). Df model is 2, which indicates there are two predictors included in the regression. OLS regression results shows that the model explains the 63.5 % of the variance in the FTSE-100 index on the basis of regression analysis. GDP (p value) is statistically significant, which suggests that broader economic performance of the UK directly impacts

the FTSE-100 responsiveness to the global price fluctuations. and the overall model has a good R square and a significant F statistic, but bank rate does not show a significant influence indicating that the interest changes during the study period did not have a substantial impact on the FTSE-100, therefore the GDP is the key driver, therefore we reject the null hypothesis (H2).

SARIMAX (Seasonal Autoregressive Integrated Moving Average with the extraneous regression) is applied on the historical data to for the advanced time series forecasting. Here in this case the historical data of FTSE -100, NYMEX Gold, NYMEX Silver, NYMEX Natural gas, NYMEX is analyzed using the SARIMAX for the forecasting of the 24 months prediction of the respective commodities and FTSE-100

For the forecasting of the NYMEX commodities and FTSE -100 SARIMAX takes in account the prices of the NYMEX (Silver, Gold, Natural Gas, FTSE-100). NYMEX Silver is

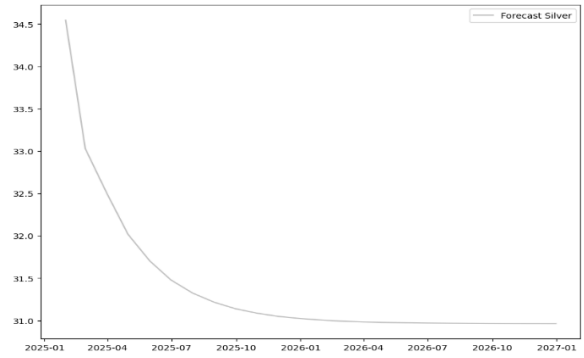


Fig 13: Silver forecasting (2025 – 2027)

Generated by Python on the basis of the SARIMAX

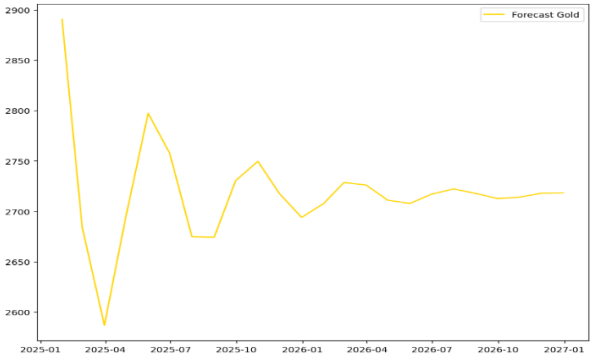


Fig 14: Gold forecasting (2025 – 2027)

Generated by Python on the basis of the SARIMAX

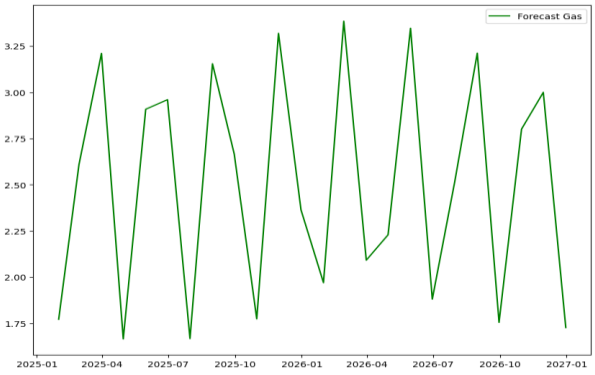


Fig 15: Natural gas forecasting (2025 – 2027)

Generated by Python on the basis of the SARIMAX

Fig 16: FTSE 100 forecasting (2025 – 2027)

Generated by Python on the basis of the SARIMAX

On the basis of the results of the forecast of NYMEX commodities and FTSE – 100, it can be interpreted that the NYMEX (Silver) prices will steadily fall in the upcoming 36 months (2025-2027) whereas the NYMEX (Gold) prices will fall drastically in the 4th quartile of 2025 and will recover steadily in the rest of the 2025 and will be consistent afterwards. The price of the NYMEX (natural gas) and NYMEX (FTSE 100) will consist of multiple ups and downs.

Conclusion:

This study examines the complex relationship between the NYMEX-Commodities which includes Gold, Silver, Natural Gas and the FTSE-100. While also evaluating the impact of key Macroeconomics indicators such as GDP growth rates and Bank rate. The study uses the Descriptive Statistics, Correlation Analysis and OLS regression modelling. The research studied the fluctuations in the global commodity markets, stock markets and how the economic conditions impact the market behaviour.

The findings highlights that there is a intricate relationship between the commodity market, stock market indices and the macroeconomic factors. The results indicates that while certain commodities are the risk diversifiers during the market volatility, others respond directly to the economic cycle and the policy changes. However, despite the comprehensive coverage I acknowledge my certain limitations in this research. The reliance on the historical data may not actually fully capture the future market dynamics, especially the unforeseen global events Future studies can build upon this work by incorporating the real time data and the broader macroeconomics variable and sector specific analysis and deeper insights into the market behaviour. This research contributes to broader discourse on the market interdependence by offering a clear understanding of how the NYMEX commodities, UK macroeconomics indicators and the FTSE-100 interact. These insights provide a valuable for the investors, policymakers and the financial analysts to make more informed decisions, taking into the account interplay between the global commodities and the financial market

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