“MASTER PUPPETEER OR MYTHICAL PREJUDICE: CAUSAL NEXUS OF OIL WITH STOCK, BOND AND GOLD RETURNS IN THE BRICS NATIONS”

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Abstract

Oil has an unparalleled role in the economic landscape of the world. Wars have been fought over it. Nations have been brought to their knees over its shortage. Even two decades into the new millennium, oil still wields control over the world with dominant authority.

The present study juxtaposes this dominance of oil with the rise of the BRICS nations, first identified to hold enormous potential to re-write the economic hierarchy of the world at the turn of the 21st century. The central question pursued is whether oil prices impact the stock returns, bond returns and gold returns of the BRICS nations.

Time series data from April 2016 to March 2021 is analyzed by the econometric tests of Regression, ARDL and TYDL to study the impact of oil in explaining the stock returns, bond returns and gold returns of the BRICS nations, the direction of the causal relationships and the existence of long-run cointegration.

The study discovers that oil still plays a major role in the stock market returns, bond returns and gold returns of the BRICS nations and thus may potentially hold a barring in determining their rise on the economic ladder of the globe.

Keywords: BRICS, Oil prices, Time series, Ordinary least square, Toda-Yamamoto causality test, Autoregressive Distributed Lag

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DECLARATION

I, Lynessa Lynette Linson, hereby declare that this dissertation for Master of Commerce Degree in Accountancy titled **'Master Puppeteer or Mythical Prejudice: Causal Nexus of Oil with Stock, Bond and Gold Returns in the BRICS Nations'** is a bonafide record of original research work done by me under the guidance and supervision of Dr. (Ms.) Guntur Anjana Raju, Professor, Goa Business School, Goa University and that the same has not been previously formed the basis for the award of any degree, diploma or certificate or similar title of this or any other University.

Place: Goa University
Date: 25/06/2021

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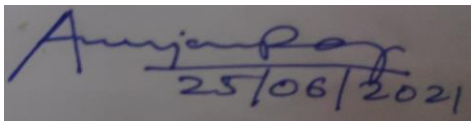
CERTIFICATE

This is to certify that the dissertation titled **'Master Puppeteer or Mythical Prejudice: Causal Nexus of Oil with Stock, Bond and Gold Returns in the BRICS Nations'** is a bonafide record of the original work done by Miss. Lynessa Lynette Linson, under my guidance and supervision and the same has not been previously formed the basis for the award of any degree, diploma or certificate or similar title of this or any other University.



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Lynessa Lynette Linson

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
BC	Before Christ
BRIC	Brazil, Russia, India, China
BRICS	Brazil, Russia, India, China, South Africa
CUSUM	Cumulative Sum control chart
G20	Group of Twenty
G6	Group of Six (France, West Germany, Italy, Japan, United Kingdom and United States)
GDP	Gross Domestic Product
IBGE	Brazilian Institute of Geography and Statistics
IMF	International Monetary Fund
IT	Information Technology
JSE	Johannesburg Stock Exchange
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
TYDL	Toda-Yamamoto Causality test
USD	United States Dollar
VAR	Vector Autoregression

CHAPTER 1:

THE RISE OF BRICS IN THE MILIEU OF OIL DOMINATION: AN INTRODUCTION

1.1. Oil in the story of Human progress

The story of human history has been shaped and re-shaped by a once-obscure, sticky substance like Oil. Its unparalleled role in writing the narrative of economic development around the globe would be hard to foresee for the ancient Babylonians who were among the first recorded users of oil to waterproof their boats around 3000 B.C. Thousands of years later, oil still stands at the center of economic growth and progress. Fortunes have been changed by its possession. Wars have been fought over it. Nations have been brought to their knees over its shortage. Even two decades into the new millennium, oil still wields control over the world with dominant authority.

Despite its ancient origins right from the cradle of human civilization, the dramatic rise of oil in the last two centuries has been exponential. The pivotal discovery of the world's first commercially viable oil well in the United States of America gave birth to the modern oil industry in the mid-19th century. It was also around this time that kerosene emerged as a cheap fuel that was used for lighting homes. The surge of demand for kerosene coupled with new techniques that allowed deeper drilling combined to generate an 'oil rush' that changed the course of human progress.

The invention of the first motor car in 1885 was a milestone event in the global domination of oil. Gasoline, a cheap by-product of kerosene, was the fuel that ran this new invention. Demand for oil witnessed an acceleration that made the world take notice.

Less than one decade into the 20th century, in the year 1908, oil was first discovered in the Middle East amidst a phenomenally growing demand for this 'Black Gold'. Shortly after, when World War 1 broke out in 1914 the nations of the world were forced to realize their intense dependence on oil for defence needs. Access to Middle Eastern oil became a strategic priority for running warships, tanks and trucks. By 1944, after the Second World War had ended, it was evident to world leaders that oil had been a key factor determining the victors in the war. The importance of oil as a commodity had been firmly established on the global stage.

The Suez Canal crisis of 1956 demonstrated the role of oil in altering the power dynamics on the global economic fabric. As the dependency of Western nations for oil began continually increasing, it was around this time that the Middle Eastern nations recognised the strength of their bargaining power. Oil was one of the few essential commodities that Britain did not produce, and such a move resulted in Britain having to pay a higher price for oil.

Ever since then, oil has dominated the narrative of the modern world. Right from the 1973 Oil crisis through the Gulf War of 1990 and until today, the story of oil is intricately inter-woven with that of economic growth and stability.

1.2. BRICS: The Emerging Centre of the Global Economic Landscape

Quah (2011) defined the Economic centre of Gravity as "the average location of the planet's economic activity measured by GDP generated across nearly 700 identifiable locations on the Earth's surface."

Until around 1980, the global economy's centre of gravity was firmly rested in the mid-Atlantic. This came as no surprise due to the fact that North America and Western Europe at this point in time held the greatest share of economic activity around the world.

However, the needle began moving at the turn of the century. By the beginning of the 2000s, the resurgence of economic development in the East forcefully pulled the gravity towards itself. The rise of China and India along with the rest of Asia was a major catalyst for this dramatic change.

This demonstrates how game-changing the rise of these nations was, which had long been viewed in a passive and reactive role along the periphery of global power corridors. In particular, Brazil, Russia, India and China exhibited a growth story that prompted Jim O' Neil (2001) to coin the term BRIC (Brazil, Russia, India and China) to capture the importance of these economies on the global stage. As these nations continued on their spectacular rise, Wilson and Purushothaman (2006) predicted that in less than 40 years, these economies as a whole had the potential to be much larger than the G6 countries in USD terms.

The original four BRIC nations began their journey together with their first formal summit in June 2009. A little over a year later, 24 December 2010 marked the entry of South Africa and the group was renamed BRICS to incorporate its expansion.

The significance of the BRICS nations lies in their proven role as the five major emerging economies of the world. At this juncture, it may be noted that an emerging economy can be described as a nation that satisfies two criteria: a fast speed of economic development and government guidelines favouring economic liberalization and the implementation of a free-market system, (Arnold et al.,1998).

However, despite sharing the stage as the five major emerging economies, the BRICS nations are uniquely placed on many aspects. Interestingly, they represent four continents among themselves, with Brazil situated in South America, Russia in Europe, India and China located in Asia and South Africa in the continent of Africa. Thus, approximately 27% of the Earth's land surface is covered by members of the BRICS nations. More importantly, 41.53% of the world population is concentrated in the BRICS nations.

Members of G20, as of 2018, these five countries had a combined nominal GDP of US$19.6 trillion, about 23.2% of the gross world product, 32% of World's GDP PPP and an estimated US$4.46 trillion in combined foreign reserves.

We now analyse each member of the BRICS nation in finer detail.

1.2.1. Brazil

Figure 1.1: Political Map of Brazil

Source: World Atlas

The world's fifth-largest country by area and its sixth most populous, Brazil holds the distinction of being the largest country in both South America as well as Latin America. Blessed with the Amazon basin, Brazil has a unique environmental heritage which makes it worthy of being one among the 17 ‘Mega-diverse’ countries of the world.

The economic history of Brazil is equally rich. While it was a colony of the Kingdom of Portugal, Brazil saw the rise of a sugar economy in 1540. Over a century later, the sugar production witnessed a downfall and coincided with the period of great financial difficulties in Brazil in the aftermath of its independence. According to Leff (1982, 1997), from the time of Brazil's independence in 1822, its rate of GDP growth failed to outpace its population growth.

The emergence of the coffee economy played a huge role in changing the tide for the nation, and the economy grew considerably in the second half of the nineteenth century. By the late 1930s, the dwindling capacity of coffee production, political unrest and war threatened the nation once more, however Brazil bravely introduced major structural changes to protect its economy. The post-war period until 1962 marked the phase of intense import substitution, followed by rapid industrial expansion from 1968 to 1973.

In fact, in the second half of the 1950s, a series of programs were enacted with the goal of orienting the industrialization process and removing any bottlenecks. As a result of the post-1964 policies, external trade for Brazil expanded spectacularly and the industrial sector experienced growth along with modernization.

In the present scenario, Brazil has emerged as the largest national economy in Latin America, being the world's ninth largest economy and the eighth largest in purchasing power parity (PPP) according to 2018 estimates. It is still considered one of the world's major breadbaskets, having been the largest producer of coffee for the last 150 years.

Besides, Brazil is also the largest producer of various other agricultural commodities as well as the world's largest producer of amethyst, topaz and agate. Similarly, in 2019, Brazil was the second largest exporter of processed foods in the world.

The tertiary sector (trade and services) also plays a very important role in the growth narrative of Brazil, and represented 75.8% of the country's GDP in 2018, according to the IBGE.

1.2.2. Russia

Figure 1.2: Political Map of Russia

Source: World Atlas

Russia is the world’s largest country, consisting of more than one-eighth of the Earth's inhabited land area, extending to eleven time zones and spanning two continents. It is also the most populous country in Europe.

Russia has been described as a potential superpower, commanding the world's second-most powerful military. It is also ranked very high in the Human Development Index backed by a universal healthcare system and free university education.

The economy of Russia is the world's eleventh-largest by nominal GDP and the sixth-largest by PPP. According to the World Bank, Russia's GDP per capita by PPP was $29,181 in 2019. By the end of December 2019, Russian foreign trade turnover reached $666.6 billion. Russia's exports totalled over $422.8 billion, while its imported goods were worth over $243.8 billion. As of August 2020, foreign reserves in Russia are $438 billion.

Importantly, oil plays a significant role in Russia’s economic story. Russia has been bestowed with enormous natural resources, however oil and natural gas are predominant among these. In fact, oil, natural gas, metals, and timber account for more than 80% of Russian exports abroad. Such is its critical role that in 2016, the oil-and-gas sector accounted for 36% of federal budget revenues. Even more, in 2019, the Natural Resources and Environment Ministry estimated the value of natural resources to 60% of the country's GDP.

Another major achievement of the Russian economy is that it has one of the lowest foreign debts among the major economies of the world. It also ranked an impressive 28th of 190 countries in the 2019 Ease of Doing Business Index. An important factor for this might be the flat tax rate of 13% in Russia which is the world's second most attractive personal tax system for single managers after the United Arab Emirates.

A confluence of various factors has enabled Russia to script this staggering story of success. Firstly, it possesses 7.4% of the world's total arable land. Since 2016, Russia has been the largest exporter of wheat in the world. So also, its research and development budget is the ninth-highest in the world, with an expenditure of approximately 422 billion rubles on domestic research and development.

Tourism too is a major industry in the nation, accounting for about 4% of country's GDP in 2020. Russia was also ranked 39th in the Travel and Tourism Competitiveness Report 2019.

1.2.3. India

Figure 1.3: Political Map of India

Source: World Atlas

It was in 2015 that India became the world's fastest growing economy with a 7.5% estimated GDP rate. It was been widely recognized that India holds the potential to emerge as a world superpower due to a confluence of factors that are in its favour. The location of India and its abundant potential for solar energy are key advantages that drive this possibility.

India has the world's second largest population but an important reality is that it has approximately 65% of its population below the age of 35. This results in a demographic dividend that could shape the emergence of India as a central player on the world stage. The reason being that having a young population leads to a low dependency ratio, healthy

savings and investment rates as well as increasing globalization in India and its integration into the global economy. So also, with 500 million workers, the Indian labour force is the world's second-largest as of 2019. The large population also means that nearly 60% of India's GDP is driven by domestic private consumption and it continues to remain the world's sixth-largest consumer market.

Besides, Indians also possess foreign language skills and live in the world’s largest democratic republic. At the political level as well, India has developed relationships with world powers like the United Kingdom, the European Union, Japan, Russia, and the United States.

In terms of the economy, the economy of India is currently the world's third largest in terms of real GDP (PPP) after the United States of America and the People's Republic of China. According to the World Bank, India overtook China to become the fastest-growing major economy in the world as of 2015. Growing at 9% per year, India is also the world's second largest producer of food next to China.

The economy slowed in 2017, due to the double shocks of "demonetization" in 2016 and the introduction of the Goods and Services Tax in 2017. However it has once again marched ahead on the path to recovery. Today, India is the world's largest manufacturer of generic drugs, and its pharmaceutical sector fulfills over 50% of the global demand for vaccines. The Indian IT industry - a major exporter of IT services with $191 billion in revenue and employing over four million people – also deserves a mention.

According to the International Monetary Fund (IMF), on a per capita income basis, India ranked 142nd by GDP (nominal) and 124th by GDP (PPP) in 2020.

1.2.4. China

Figure 1.4: Political Map of China

Source: World Atlas

The "Rise of China" has been named the top news story of the 21st century by the Global Language Monitor. Historically as well, China accounted for around one-quarter of the global GDP until the late 1700s and approximately one-third of the global GDP in 1820 around the time that the Industrial Revolution was beginning in Great Britain.

In the modern era, the economic reforms in 1978 resulted in China driving the world's fastest-growing major economy, with growth rates averaging 10% over 30 years. In the current economic milieu, the potential of China to emerge as the Superpower of the world cannot be underestimated. China has been the world's largest economy since 2014 when measured by Purchasing Power Parity. It has been the second largest when measured by nominal GDP since 2010. Moreover, it has four of the world's top ten most competitive financial centers in the 2020 Global Financial Centres Index.

It is the world's largest producer of rice and is among the principal sources of wheat, corn (maize), tobacco, soybeans, potatoes, sorghum, peanuts, tea, millet, barley, oilseed, pork, and fish. Similarly, its industry provides a firm base for its exponential rise, with Industry and construction accounting for 46.8% of China's GDP.

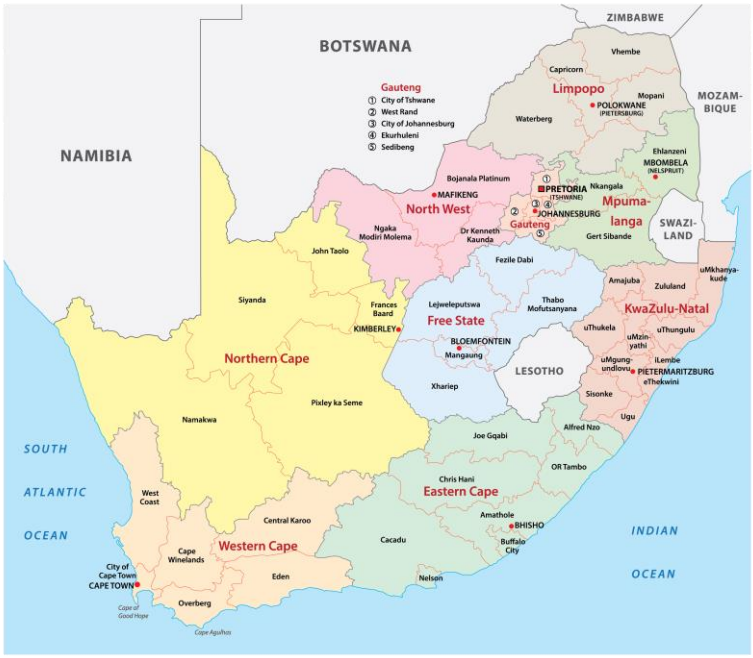
China is the largest recipient of foreign direct investment in the world as of 2020, receiving inflows of $163 billion. It is also the second largest creditor nation in the world. As at the end of June 2020, foreign investors had bought a total of US$440 billion in Chinese stocks. So also, the total value of China's bond market topped US$15.4 trillion (second only to that of the U.S. with US$40 trillion) as of the beginning of September 2020.

China has stamped itself as the world's largest manufacturing economy and exporter of goods. It is also the world's fastest-growing consumer market and second-largest importer of goods. With 778 million workers, the Chinese labour force has also proven to be the world's largest as of 2020. The nation ranks 31st on the Ease of Doing Business Index and 28th on the Global Competitiveness Report. China also ranks an impressive 14th on the Global Innovation Index. This comes as no surprise as the nation in fact ranks No. 1 globally in patents, utility models, trademarks and industrial designs.

Interestingly, as of 2020, China is home to the largest companies in the Fortune Global 500 and 129 are in fact headquartered in China. It is also home to more than two hundred privately-held tech unicorns, each with a valuation of over $1 billion, the highest number in the world.

1.2.5. South Africa

Figure 1.5: Political Map of South Africa



Source: World Atlas

The name "South Africa" is derived from the country's geographic location at the southern tip of Africa. The caves in Gauteng Province have been called the “Cradle of Humankind” for the containing some of the oldest archaeological and human-fossils ever discovered.

With a long coastline that stretches more than 2,500 km and along the South Atlantic and Indian oceans, South Africa is the 24th-largest country in the world. It has a rich heritage of biodiversity, being home to lions, African leopards, South African cheetahs, southern white rhinos, blue wildebeest, kudus, impalas, hyenas, hippopotamuses and South African giraffes. It also is endowed with more than 22,000 different higher plants.

The economic history of South Africa has multiple hues. In 1870 diamonds were discovered in Kimberley, while in 1886 some of the world's largest gold deposits were discovered in Transvaal, quickly transforming the economy into a resource-dominated one.

Since then, mining has been the main driving force behind the history and development of Africa's most advanced economy.

Agriculture has been another major factor propelling progress. In 2018, South Africa was the 14th largest producer of sugarcane, 12th largest producer of maize, 11th largest producer of grape and 7th largest producer of pear. The chief exports include corn, diamonds, fruits, gold, metals and minerals, sugar, and wool.

The tourism sector of South Africa is yet another critical component of the economy, as the nation is a popular tourist attraction, with tourists pouring in from around the world. South Africa also has a sophisticated financial structure, with the JSE Limited, the largest stock exchange on the African continent, ranking 17th in the world in terms of total market capitalization, which stood at $1,005 Trillion as of August 2020

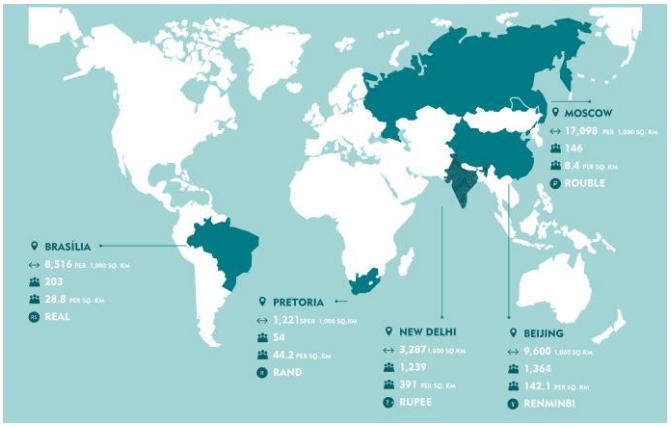
South Africa has been classified by the World Bank as a newly industrialized country, with the second-largest economy in Africa, and the 33rd-largest in the world. What makes its journey commendable is the way its foreign exchange reserves increased from $3 billion to nearly $50 billion, creating a diversified economy with a growing and sizable middle class, within two decades of ending apartheid.

1.3. BRICS Nations: A Comparative Analysis

The BRICS nations, although grouped together under a common promise of emerging nations are extremely diverse with distinct complexities. They do not represent a homogenous group of nations, but rather a kaleidoscope of nations with varying histories, strengths and challenges.

As captured by Figure 1.6. the BRICS nations do not share similar geographical conditions or continents.

Figure 1.6. The BRICS nations on the World Map



Source: UK India Business Council

The differences do not end at geographical separations. The figure below offers an interesting overview of the five BRICS nations in their fundamental parameters of area and population characteristics:

Table 1.1: General Overview about the BRICS nations as of 2019

	Area of territory (1000 km²)	Capital city	Mid-year population (million persons)	Population density (persons per km²)	National currency
Brazil	8516[1]	Brasília	210[2]	24.7	Real — R$
Russia	17,125	Moscow	147	8.6	Rouble — Rub
India	3287	New Delhi	1338[3]	407[3]	Rupee — ₹
China	9600	Beijing	1398	146	Renminbi — RMB
South Africa	1221	Pretoria	59	48.1	Rand — ZAR

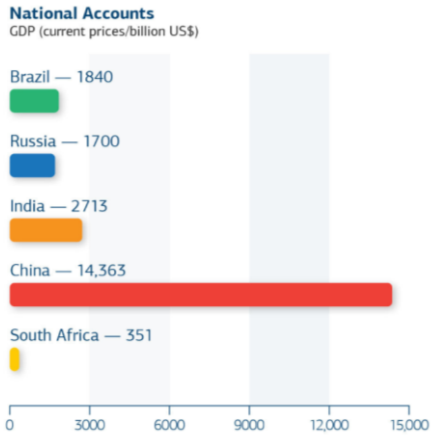
Source: BRICS Joint Statistical Publication 2020

Thus it is evident that the BRICS nations are diverse in terms of their size of area as well as population. Russia is the largest in terms of territory, while China and India lead in terms of population. South Africa has the least area as well as population.

Two decades after the acronym BRICS was coined, China has consistently proved to be a notch higher than the other nations, namely Brazil, Russia, India and South Africa. The sustained economic outperformance of China is evident in its real GDP which has grown

979.9% since 2001, compared with 480.8% for second-placed India and 188.9% for the group laggard South Africa.

Figure 1.7. GDP (current prices/billion US$) of the BRICS nations



Source: BRICS Countries Statistical Indicators, BRICS-Russia 2020

As crystalized by the above figure, China's lead in terms of GDP is beyond debate and extremely substantial. In fact, the Covid-19 pandemic has solidified the lead of China even further. According to the International Monetary Fund, China is the only BRICS economy predicted to expand this year. The world's second largest economy was predicted to end the year 1.9% bigger after recovering from a 6.8% contraction in the first quarter. This is in stark contrast to the predictions of a 10.3% contraction for India, -5.8% for Brazil, -4.2% for Russia and -8% for South Africa.

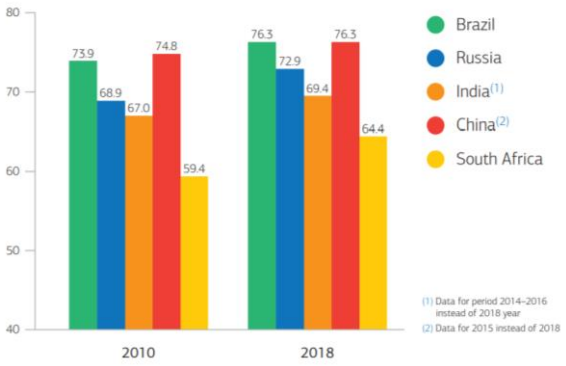
Figure 1.8: Unemployment rate (%) in the BRICS Nations

Source: BRICS Countries Statistical Indicators, BRICS-Russia 2020

The disparity among these five nations is also jarring in the unemployment rate, as represented by the figure above. In this crucial aspect, China once again outperforms its group peers with the lowest unemployment rate of 3.6% South Africa has the highest unemployment rate in the group, followed by Brazil, India and Russia.

Besides the economic indicators of GDP and Employment, a nation's progress depends heavily on the quality of its human assets. It is worthwhile to note the differences among the BRICS nations in this respect.

Figure 1.9: Life expectancy at birth (in years) in the BRICS nations

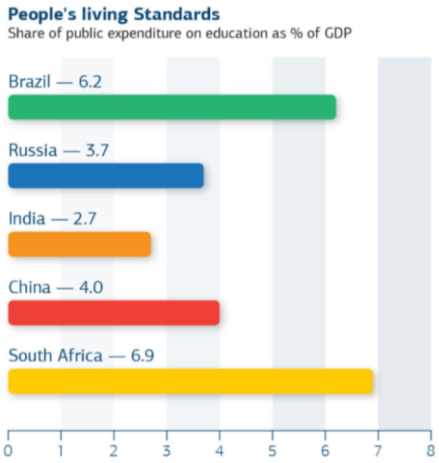


Source: BRICS Joint Statistical Publication, 2020

As visualized above, even in terms of indicators such as life expectancy China leads the pack, although Brazil's progress is commendable. With Russia in the second position and India in the third, South Africa lags behind the BRIC nations in the life expectancy indicator as well.

While discussing the investment of the nations in building up human resources, education and health serve as the two critical yardsticks for analysis. Let us therefore delve into this aspect of the BRICS nations.

Figure 1.10: Share of public expenditure on education as % of GDP in the BRICS nations

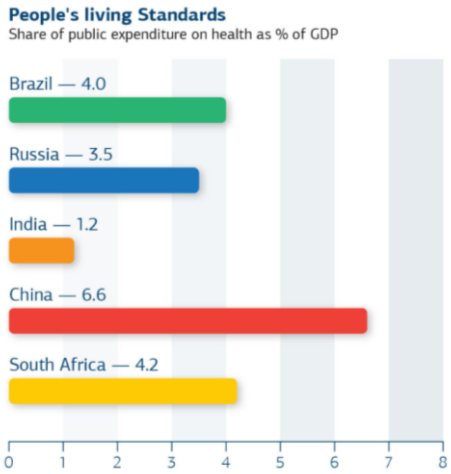


Source: BRICS Countries Statistical Indicators, BRICS-Russia 2020

Education may be rightly hailed as one of the surest paths to progress, and South Africa and Brazil have clung to this truth as witnessed in the figure above. With 6.9% and 6.2% share of public expenditure on education as a percentage of GDP respectively, these two nations represent the BRICS nations most heavily allotting public expenditure for the cause of education.

Equally critical as investment in an educated population is an investment in a healthy population. Figure 1.11 evaluates this important aspect in the five BRICS nations:

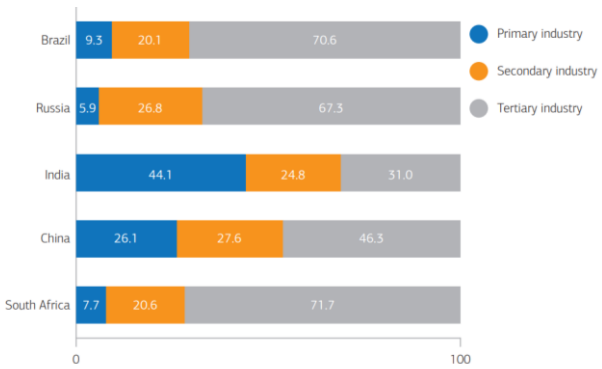
Figure 1.11: Share of public expenditure on health as % of GDP in the BRICS nations



Source: BRICS Countries Statistical Indicators, BRICS-Russia 2020

In terms of prioritizing health, China allots the highest percentage of public expenditure towards this critical aspect. 6.6% of China's GDP is invested towards health, as compared to 1.2% of India, 3.5% of Russia, 4% of Brazil and 4.2% of South Africa.

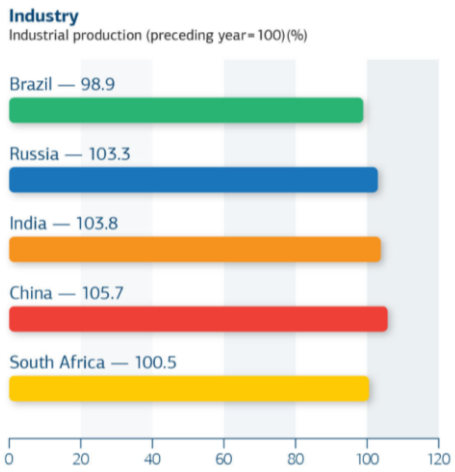
Figure 1.12: Employment by Industry in 2018 (%) in the BRICS nations



Source: BRICS Joint Statistical Publication, 2020

When it comes to the employment categorized by industry as well, the BRICS nations display much diversity. India has the highest percentage among the five in employment in the Primary industry, while Russia has the least. The secondary industry in all nations has an employment ranging from 20% to 27% of the workforce, approximately. Brazil and South Africa have around 71% of the population engaged in the tertiary sector, followed by Russia at 67.3%

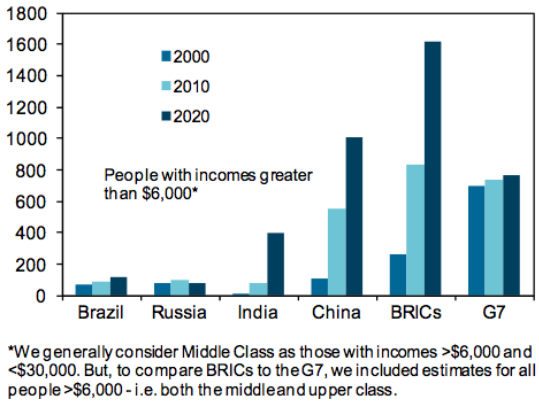
Figure 1.13: Industrial production in BRICS nations



Source: BRICS Countries Statistical Indicators, BRICS-Russia 2020

As the figure above argues, when it boils down to industrial production, the BRICS nations seem to be in a closer league. China leads, although with a small margin with India and Russia following close behind. South Africa and Brazil lag behind by a small difference.

Figure 1.14: Millions in BRICS predicted to enter Middle income bracket by 2020



Source: Goldman Sachs

Finally, as evident in the graph above, China is also the nation with the highest number of the population to enter the middle income bracket defined as those with incomes greater than $6000. India although second, was found to have large ground to cover to reach China's position.

1.4. Research Gap

Tremendous work has been done prolifically to encapsulate the patterns of behaviour exhibited by stocks, bonds, gold and oil in relation to each other. However, most of the past literature has centered on examining the bilateral linkages between any two of the variables.

Secondly, a disproportionate amount of literature has focused its lens on developed countries while the research in emerging economies lags behind significantly.

A study focusing uniquely on the two fundamental financial instruments, i.e. stocks and bonds and the two fundamental commodities of gold and oil is required to better understand these intricate dynamics. Particularly, in the context of the BRICS nations, such a study gains particular significance.

1.5. Motivation for Research

Even in the 21st century, oil continues to determine the fortunes of modern economies. It acts directly, dictating global economic trends and winners and losers on the international stage based on its strategic availability and prices. Moreover, it also exerts an influence on other significant financial indicators, like gold, stocks and bonds.

This power of oil is still predominant when the BRICS nations are at the cusp of dominating the world on the economic stage. So the question is imperative: Does oil truly influence gold price returns, stock returns and bond returns in these nations? And what is the strength and direction of this relationship, if any?

Therefore, the present study is an attempt to unravel the short-term relationship and long-term cointegration of oil with stocks, bonds and gold in the BRICS nations.

1.6. Research Questions

In pursuit of the role of oil in determining the stock returns, bond returns and gold returns of the BRICS nations, the following research questions have been formulated:

1) What is the impact of oil prices on the returns of stocks, bonds and gold?
2) What is the direction of the causality between oil prices and stock returns, bond returns and gold returns, in case they have any causality at all?
3) Do oil prices share a long-run association with stock returns, bond returns and gold returns?

1.7. Aims and Objectives:

Based on the research questions as formulated above, the following objectives have been framed for the study:

1. To examine the impact of oil prices on the stock returns, bond returns and gold returns of the BRICS nations.
2. To analyze the causality of oil prices on stock returns, bond returns and gold returns in the BRICS nations.
3. To examine the long-run association between oil prices and stock returns, bond returns and gold returns in the BRICS nations.

1.8. Research Methodology

The study is based on quantitative analysis. Secondary data on daily historical oil prices, stock market returns, bond returns and gold returns will be obtained from the Bloomberg database for the duration of April 2016 till March 2021.

The Econometric tools used for analysis will be as follows:

a) Descriptive statistics including Mean, Median, Mode, Standard deviation, Skewness, Kurtosis and Jarque-Bera statistics

b) Unit root test – The ADF Test will be employed to test the stationarity of data which is an essential requirement.

c) Time Series Regression, along with Residual diagnostics and Stability diagnostics will be performed to understand the dynamic variables from observational data

d) The direction of the relationship will be studied using the TYDL Test

e) The long term relationship will be analysed with the help of the ARDL/Bound test

1.9. Significance of the Study

The significance of the present study stems from the fact that the world is witnessing a transition of the center of economic power. The BRICS nations are being watched closely by the international community due to their potential to emerge as the next superpowers within the next few decades.

However, the BRICS nations are not a homogenous group of nations. Rather they are nations at varying points of development, with unique histories, different strategic advantages and separate challenges to face on the path of achieving their potential. The access to oil resources is a key factor that distinguishes the BRICS nations. Hence, this study is an attempt to understand the presence of an impact and its extent in terms of oil determining the stock market returns, bond returns and gold returns in these individual BRICS nations, all three of which are crucial for economic development.

The study will benefit not only policymakers, investors and market participants but also academicians, in expanding our understanding of these delicate dynamics especially in the context of emerging economies.

1.10. Limitations of the Study

The following are the limitations of the present study:

1) The study considers the impact of oil on only three variables, namely stock market returns, bond returns and gold returns. Other potentially critical variables have not been studied.
2) The study is also restricted to the BRICS nations and does not study nations beyond Brazil, Russia, India, China and South Africa.

3) Another limitation is the duration selected which limits the scope of the study to a period of over five years.

1.11. Chapterization Scheme:

The chapterization scheme followed by the study is as follows:

Chapter 1: The Rise of BRICS in the milieu of Oil domination: An Introduction

The introductory chapter sets the stage for the centrality of oil in the forming of major world economies. It juxtaposes the historic importance of oil in explaining the rise and fall of the economic story of the world, with the potential of economic domination found in the BRICS nations at the turn of the millennium. The likely complex role of oil in the tale of BRICS nations with reference to stock returns, bond returns and gold returns is introduced in this chapter.

Chapter 2: Review of Literature

The review of literature presents a bird's eye view of the important progress made in the realm of the relationship of oil with stock market returns, bond returns and gold returns. It spells out the lack of consensus in the very existence of a relationship, and even more intriguingly muddy disagreement on the nature of this relationship that has received intense scrutiny.

Chapter 3: Examining the impact of Oil on Stock returns, Bond returns and Gold returns of the BRICS nations: Employing the Ordinary Least Square

The chapter explores the question of whether oil is a significant variable in explaining the stock returns, bond returns and gold returns of Brazil, Russia, India, China and South Africa. The preliminary quantitative analysis is performed using Descriptive statistics. Further, the stationarity of the data is examined using the Augmented Dickey-Fuller test for unit root testing. Finally, the chapter concludes with the results and interpretation of the Time Series regression using OLS (ordinary least square) method.

Chapter 4: Analyzing Causality between Oil and Stock returns, Bond returns and Gold returns of the BRICS nations: A Toda-Yamamoto approach

Chapter 4 attempts to determine the causality of the relationship between oil and the variables under study. The existence of the relationship and its direction is analyzed by employing the TYDL test which is a modification of the Granger causality test.

Chapter 5: Unraveling the Long-Run cointegration between Oil and Stock returns, Bond returns and Gold returns of the BRICS nations

In order to understand the long-run cointegration between oil and the variables under study, namely stock returns, bond returns and gold returns in the five BRICS nations, the ARDL test is employed. The results are interpreted and analyzed in Chapter 5.

Chapter 6: Findings, Conclusion and Suggestions

The final chapter of the study highlights the key findings uncovered through the examination of the complex and dynamic relationship shared by oil prices with stock returns, bond returns and gold returns in the context of the BRICS nations. Meaningful conclusions are drawn based on the findings and appropriate suggestions are offered where necessary.

CHAPTER 2

REVIEW OF LITERATURE

2.1. Theoretical underpinning of the behaviour of Oil with Stock, Bond and Gold Markets:

A major reason why world leaders and policy makers cannot ignore the importance of oil is because not only does oil have a direct impact on a nation's economic trajectory, but it also indirectly influences the performance of other major economic indicators such as the stock market, gold price returns and bond returns.

The fascinating study of the interactions of oil with various other financial assets and commodities lies at the core of intense academic scrutiny. The sheer volume of research literature in this domain bears a powerful testament to the significance of grasping these relationships, in all their complexity. An overwhelming of the past research has gravitated towards these bilateral linkages, especially in terms of oil and stock markets (Jones and Kaul, 1996; Arouri et al., 2012; Mollick and Assefa, 2013) and oil price with gold price (Ewing and Malik, 2013). The various strands of related literature are enunciated as below:

2.1.1. Oil and Stock Market: A Classical Riddle

The centrality of stock markets in any discussion of finance is well beyond any iota of doubt. Stock markets have long been considered as an indicator of a country's social mood, economic strength and development (Hamilton, 1983, 1996, 2004; Kilian, 2009; Mork et al., 1994). They have been hailed as the barometer that reflects that economic health of a nation. Any conversation about economic development revolves around the stock market performance of a country.

The emphasis is not new. More than eight decades ago, Williams (1938) concluded that equity markets spearhead the economy by four to six months in advance. Remarkably, Levine (1991) constructed an endogenous growth model demonstrating how stock markets emerged to distribute risk and shaped investment incentives in a manner that impacts stable growth rates.

The causal nexus between stocks and oil stands at the receiving end of intense academic inquiry. The form and strength of these two Goliaths of the financial world has been tested and re-tested consistently. At a theoretical level, a rise in oil prices would lead to increased cost of production and inflationary pressure. This would drag down the earnings of companies and with it, the stock prices. The inflation would simultaneously result in lower stock returns.

However the apparent simplicity of this story is deceptive. The true nature of the oil-stock link has remained elusive, with the confounding question that baffles researchers to this day – Do oil prices and stock markets move in tandem or in opposite directions?

Oil and stock markets are complex systems with instability governing both. Earlier contributions on the link between oil prices and stock returns were dominated by studies focused on the US (Ciner, 2001; Huang et al., 1996; Jones & Kaul, 1996; Sadorsky, 1999). Subsequently, a large body of work has emerged exploring the oil-stock nexus in other developed countries. In fact, a central part of this line of research provides a multi-country analysis of the impact of oil price changes on the stock markets of the main developed economies, including the US, the major European countries and Japan (Apergis & Miller, 2009; Cuñado & Pérez de Gracia, 2014; Ding, Kim, & Park, 2016; Lee & Zeng, 2011; Miller & Ratti, 2009; Park & Ratti, 2008). In addition, a more recent strand of literature

has addressed the oil-stock nexus in developing countries (Al Janabi et al., 2010; Aloui, Hammoudeh, & Nguyen, 2013; Basher & Sadorsky, 2006; Narayan & Narayan, 2010).

What is note-worthy is that despite the vast quantity of literature pinpointed at this relationship, there has not been a clear consensus on either the existence of a relationship or its form. This shape-shifting chameleon of a relationship has produced puzzling and contrary results.

2.1.2. Oil and Bonds: The delicate balance

Corporate bonds play a crucial role in helping companies raise a stable source of long term funds. Its benefits are even more strongly felt for companies that have longer term cash flows, making equity investors feel wary of the associated risks and reducing the ease of availability of long-term bank financing (Singh 2011; Khanna and Varottil 2012).

Moreover, the debt market enables the diversification of risk and indeed supports robust economic development. Thus, developing a strong bond market has been a matter of deep concern and importance for policy makers all around the world. The slower development of the market in Asia has in fact drawn the interest of many researchers who have weighed in on the causes and consequences of such a phenomenon. Goswami and Sharma (2011) put forth that the economies' dependence on the banking system against the backdrop of a developed equity market generated an inertia that restricted the development of the local debt market in Asia. Sundaresan (2006) proposed measures for the development of corporate bond market in India, with an emphasis on structural reforms in the areas of bankruptcy codes, legal contract enforcement, corporate governance and investor protection.

Thus, we can establish the importance of corporate bonds to an economy. Further, even though not immediately apparent, oil does manage to play a role in influencing the bond market returns. In comparison to the monolithic amount of studies dedicated to untangle the stock and oil nexus, the studies committed to examining the bonds and oil conundrum are dwarfed. The link between the two is important, given that oil price shocks lead to changes in discretionary income and influence demand for bonds, which in turn influences bond returns.

2.1.3. Oil and Gold: The historical heavy weights

The dominance of gold in financial literature is interesting. While its use for industrial purposes is limited, the unique footprint of this metal in human history, culture and nostalgia has earned it a place of rare prominence. Several authors have argued very strongly that gold has a monetary role, not very different from currency. It has even been considered as a financial tool that holds the characteristics of a currency and a commodity within the same time along with its liquidity feature (Bhunia and Mukhuti, 2013).

The empirical evidence on the gold – financial markets relationships has been minutely document by numerous studies, for example, Longin and Solnik (2001) and Ang and Chen (2002) examine asymmetry in stock returns using exceedance correlation. Another extensive branch of literature has debated the role of Gold as a Hedge v/s a Safe Haven (Hillier et al. 2006; Baur and Lucey 2010; Baur and McDermott 2010; Qadan and Yagil 2012; Hood and Malik 2013; Miyazaki and Hamori 2013). Yet another theme explored has shown that gold has strengthened linkages with other financial assets owing to the financialization of commodities (Domanski and Heath 2007; Baur 2011; Tang and Xiong 2012; Silvennoinen and Thorp 2013; Miyazaki and Hamori 2014).

While studies have shown that gold does function as safe haven even in extreme financial market conditions (Baur & Lucey, 2010), there are finer intricacies to this conclusion. For instance, Baur and Mcdermott (2010) analysed the role of gold as a safe haven and found that gold is both a hedge and a safe haven for major European and the US stock markets but not for Australia, Canada, Japan, and BRIC countries.

Thus, together, oil and gold represent two of the most widely traded commodities with a rich legacy. They have persevered through the sands of time to emerge as two of the most popular indicators of the modern, globalized world. The theoretical underpinning of the link between these two historical heavy-weights arises due to the inflation brought in by rising oil prices which prompts hedging in the form of investment in gold. Crystalizing this argument, Narayan et al. (2010) suggest that investors use the gold market to hedge against inflation when the oil prices are increasing, and the oil prices can be used to forecast the gold prices and vice versa.

2.2. The elusive relationship of Oil with Stock, Bond and Gold Market:

Due to the sheer importance of oil in determining economic pathways of nations, its linkages and causality with other fundamental financial assets like stocks and bonds and a strategic commodity like gold has been widely studied from various angles and with different econometric approaches. Bafflingly however, this relationship has held on to its secret with various studies arriving at conflicting results.

2.2.1. Studies that indicate a positive relationship

The research focussed on the oil and gold nexus has hinted at a positive relationship between the two. Using annual data from 1960–2005, Baffes (2007) showed that the prices of precious metals, including gold, strongly respond to the price of oil. A similar result was

produced by Zhang and Wei (2010), who, based on daily data from 2000–2008, found that a rising oil price drives up the price of gold, but they did not find a reverse link. Another milestone occurred when Reboredo (2013) analyzed the oil-gold dependence structure using copula approach for the period 2000-2011, and found a positive and significant relationship between them, suggesting that gold cannot hedge against oil price volatility.

Moreover even the conventional wisdom that stock and oil have a negative relationship was challenged by recent studies by Bashar (2006), Mohanty et al. (2011), and Wang et al. (2013), among others, which emphasize that the relationship between oil and stock markets is positive for oil-exporting countries and negative for oil-importing countries.

2.2.2. Studies that point towards a negative relationship

Early influential studies on the oil and stock relationship, including those of Jones and Kaul (1996), Sadorsky (1999), Nandha and Faff (2008), Miller and Ratti (2009) indicated that oil prices influence stock markets negatively.

Clues in the past literature studying the nexus between oil and bonds have hinted at a bi-directional relationship. Kang et al., (2014) utilized a structural vector autoregressive model to investigate how the demand and supply shocks driving the global crude oil market affect real bond returns of the US at monthly frequency. They found that a positive oil market-specific demand shock is associated with significant decreases in real returns of an aggregate bond index. Later Demirer et al., (2019) using daily data, among other results, found that not only demand, but also supply shocks in the oil market, tend to negatively impact the bond returns of the US.

2.2.3. Studies that argue for a non-existent relationship

There are strong arguments on both sides regarding the controversial nature of the relationship between oil and stocks. And yet, there is also another argument which maintains that the oil-stock relationship is actually not significant (Henriques and Sadorsky, 2008; Apergis and Miller, 2009; Sukcharoen et al., 2014).

CHAPTER 3:

Examining the impact of Oil on Stock returns, Bond returns and Gold returns of the BRICS nations: Employing the Ordinary Least Square

3.1. Descriptive Statistics:

The characteristics of the raw data obtained for the study are an essential basis in quantitative analysis. The mean describes the average of the series while the Midpoint defines the midpoint of the series. The maximum and minimum values highlight the largest and smallest values in the series. The Standard deviation is a classic measure of the amount of dispersion from the average value of the series. The skewness denotes the asymmetry of the distribution while the kurtosis points towards the height and sharpness of the central peak. Finally, the Jarque-Bera statistics provide an indication of whether the time series being studied is normally distributed or not.

Table 3.1: Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
Brazil Stock	84143.43	83913.10	125076.6	48471.70	19363.26	0.0734	1.926159	60.35100	0.0000
Brazil Bond	1062.190	1053.969	1220.838	829.8730	91.52708	-0.09247	1.883355	65.97673	0.0000
Brazil Gold	186.3098	154.5703	353.9230	119.0459	70.80123	1.163749	2.809894	284.0304	0.0000
Russia Stock	2451.604	2343.880	3589.830	1817.820	431.3307	0.596002	2.454704	89.92019	0.0000
Russia Bond	100.6190	100.8335	103.7680	96.04900	2.091694	-0.29571	1.873395	57.07059	0.0000

Russia Gold	478.7020	460.9500	600.7000	376.3000	71.36903	0.276224	1.655530	22.53653	0.0000
India Stock	10573.80	10630.40	15314.70	7546.450	1605.344	0.526342	3.446304	67.21852	0.0000
India Bond	104.1974	104.7000	108.3500	99.92000	1.769626	-0.62889	2.411897	66.35225	0.0000
India Gold	35108.72	31220.00	55922.00	27208.00	7493.820	1.107174	2.832643	254.1699	0.0000
China Stock	3837.349	3790.050	5807.720	2964.840	579.5258	1.090983	3.842248	276.7090	0.0000
China Bond	219.5102	219.0988	252.8940	197.5975	13.27537	0.611359	3.015647	80.68309	0.0000
China Gold	13155.34	12252.00	19060.00	10480.00	2070.637	1.111490	2.946806	261.4387	0.0000
South Africa Stock	49355.58	49576.33	63187.54	34239.30	3940.514	0.558984	4.900014	252.3103	0.0000
South Africa Bond	91.75690	91.97800	97.94300	75.42600	2.658332	-1.35973	8.254681	1817.458	0.0000
South Africa Gold	81.41034	80.10000	101.5000	33.20000	14.01971	-0.67118	3.745681	5.698489	0.0000

Source: E-views computation and Author's compilation

The descriptive statistics shown above reveal that Brazil has the highest stock return mean at 84143.43 while Russia has the lowest at 2451.604. A similar narrative is seen in bond returns, wherein Brazil has the highest average at 1062.190 while South Africa has the lowest at 91.75690. India has the highest mean value when it comes to gold returns,

standing at 35108.72 while the lowest average for gold returns is found in South Africa at 81.41034.

Interestingly in Brazil, Russia and South Africa it is the stock returns which display the highest standard deviation as compared to bond returns and gold returns. However in the nations of India and China, the highest standard deviation is noticed in gold returns which is more than what is observed in the stock market returns and bond returns.

The skewness of stock returns is the highest in China at 1.090983. This is followed by Russia at 0.596002, South Africa with 0.558984, India at 0.526342 and finally Brazil at 0.073451. Thus, the stock returns in China are substantially skewed positively. There is a moderate positive skewness in Russia, South Africa and India when it comes to stock returns while Brazil is nearest to having zero skewness.

The bond returns are negatively skewed for all BRICS nations, except China where is stands at 0.611359. In terms of gold returns, South Africa is the only nation to display negative skewness of -0.671185 while the remaining four original BRIC nations have positively skewed gold returns.

Brazil and Russia have a platykurtic distribution for all three variables, that is, stock returns, bond returns and gold returns. On the other end of the spectrum is South Africa which possesses a leptokurtic distribution for stock returns, bond returns and gold returns as the value is above 3 in all three cases. When it comes to India, we observe a leptokurtic distribution for stock returns and a platykurtic distribution for bond returns and gold returns. In the case of China, the leptokurtic distribution occurs for stock returns and bond returns, while gold returns display a platykurtic distribution.

3.2. Unit Root Test:

An important pre-condition in time series analysis is the stationarity of data used for the study. When the data proves to have a constant mean and variance over a period of time, the constraint of time can be safely eliminated and it is indeed possible to extend the conclusions drawn from the data set to the future. This is of utmost importance as the basic purpose of examining past data is to look into the future and predict the future.

In order to test the stationarity of data, we employ Unit Root tests. The present study uses the widely employed Augmented Dickey Fuller test (ADF test) to test for stationarity.

The ADF test rests on the null hypothesis that the Data has a unit root (in other words, it is non-stationary). We are able to reject this null hypothesis only if the probability values are less than 0.05. Thus, if the probability values are less than 0.05, we reject the null hypothesis and conclude that the series is stationary.

The equation in order to carry out the ADF test is illustrated below:

$$\Delta y_t = \alpha y_{t-1} + x_t\delta + \beta_1 \Delta y_{t-2} + \ldots. + \beta_p \Delta y_{t-p} + v_t$$

Where in,

α = coefficient of y_{t-1} to be estimated

X_t = optimal exogenous regressor consisting of a constant, or constant and trend

δ = coefficient of x_t to be estimated

B_t = coefficients to be estimated

p = Lag order of AR(p) process

v_t = white noise

The results of the ADF test for each of the study variables are presented in the form of tables below. The probability values are recorded at Level as well as at First Difference.

Table 3.2: Unit root analysis

Variables	Brazil		Russia		India		China		South Africa	
	ADF at level	ADF at first difference	ADF at level	ADF at first difference	ADF at level	ADF at first difference	ADF at level	ADF at first difference	ADF at level	ADF at first difference
Stock Returns	-1.24	-11.5372	-2.12	-34.4328	-2.05	-12.3842	-1.98	-34.3468	-3.28	-35.5735
	(0.658)	(0.0000)	(0.233)	(0.0000)	(0.26)	(0.0000)	(0.29)	(0.0000)	(0.01)	(0.0000)
Bond Returns	-0.322	-36.2702	-0.923	-17.8665	-1.28	-24.9647	-2.47	-35.5236	-4.26	-30.4692
	(0.919)	(0.0000)	(0.781)	(0.0000)	(0.63)	(0.0000)	(0.12)	(0.0000)	(0.00)	(0.0000)
Gold Returns	-1.738	-33.8735	-0.607	-18.7058	-0.99	-32.7442	-1.28	-33.0757	-1.95	-9.4706
	(0.4114)	(0.0000)	(0.865)	(0.0000)	(0.75)	(0.0000)	(0.63)	(0.0000)	(0.30)	(0.0000)

*The numerator denotes the t-statistics and the denominator () denotes the probability value.

Source: E-Views computation and Author's compilation

The results of the ADF test make it clear that all variables are integrated either at level or at first difference. It has been found that only South Africa stock returns and South Africa bond returns are stationary at Level. The rest of the variables are found to be stationary at First difference according to the ADF test.

3.3. Regression Analysis:

Regression analysis is a powerful technique that can enable us to gauge the impact of oil on each of the variables, i.e. Stock returns, Bond returns and Gold returns in each of the BRICS nations. The tool sheds light on whether oil makes a significant impact on the variable under consideration and if so, the extent of the impact is revealed.

For this purpose, oil has been considered as an Independent variable and each variable under study has been separately chosen as the dependent variable.

The standard regression equation follows the following pattern:

$Y_i = f(X_i, \beta) + e_i$

Wherein,

Y_i = dependent variable

f = function

X_i = independent variable

β = Beta value or coefficient

e_i = error term

The regression results of the impact of oil on the various variables are presented as follows:

Table 3.3: Regression Analysis

Variables	Brazil		Russia		India		China		South Africa	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Stock Returns	129.20	0.0094	-2.390	0.0305	39.419	0.0000	-2.361	0.1153	161.12	0.0000
Bond Returns	-2.049	0.0000	-0.068	0.0000	-0.020	0.0000	-0.143	0.0000	0.0900	0.0000
Gold Returns	-2.770	0.0000	4.7619	0.0000	-284.8	0.0000	-76.79	0.0000	-2.250	0.0000

Source: E-Views computation and Author's Compilation

The regression results provide us with important insight of whether oil can be considered as a significant factor in explaining each of the variables under study.

An analysis of the regression results testifies that oil is a significant factor in explaining the returns of stocks, bonds and gold in all the BRICS nations, except the stock returns of China. This is inferred based on the fact that the probability values of all variables, except China stock returns are less than 0.05. Thus, the null hypothesis that oil is not a significant variable can be rejected at 5% significance level.

The coefficients explain the impact of 1 unit change in oil prices on the respective dependent variables. It can be seen that a one unit increase in the price of oil results in a positive increase (to the extent of Beta or coefficient values) in the stock returns of Brazil, India and South Africa. It leads to a negative impact in the stock returns of Russia. As noted above, oil is not a significant factor in explaining the stock returns of China.

Further, a one unit increase in oil prices leads to decreasing bond returns in the BRIC nations i.e. Brazil, Russia, India and China. However it leads to a positive change of 0.0900 in the case of South Africa.

Similarly, a one unit increase in oil prices leads to decreasing gold returns in Brazil, India, China and South Africa. However the results bear witness that in the case of Russia, a one unit increase in oil prices leads to increasing gold returns by 4.7619.

CHAPTER 4:

Analyzing Causality between Oil and Stock returns, Bond returns and Gold returns of the BRICS nations: A Toda-Yamamoto approach

4.1. Causality between Oil and Stock returns, Bond returns and Gold returns: Theoretical Framework

The causality that may run between oil prices and the returns of equity stocks, bonds as well as gold has been a subject of fascination for numerous researchers around the world. Recently Xiao and Wang (2020) investigated the dynamic complexity between oil and equity markets. The study employed the Kernel method Granger Causality Index and the Transfer Entropy to uncover nonlinear bidirectional causal relationships between two major crude oil returns and eight representative stock returns globally. Previously, Ding, Kim and Park (2016) had studied daily data from 1 January 1996 to 12 October 2012 in order to decipher whether the relationship between crude oil and stock markets proves to be a causal relationship in tails. With the help of the quantile causality test, they discovered that - except for the Shanghai returns – the remaining four chosen stock index returns granger cause the Dubai crude oil returns over almost all quantiles.

The causality between oil prices and bond markets has also aroused a similar intrigue among academicians. In fact, in a breakthrough paper, Coronado, Gupta, Nazlioglu and Rojas (2021) analyzed the time varying causality between the Government bonds and oil returns of the United States with evidence from over one and half centuries of data. Their painstaking research threw light on the existence of bi-directional spillovers over the entire sample period.

Thai-Ha Le and Youngho Chang (2011) on the other hand pursued the interesting question of whether the oil and gold prices share a relationship of correlation or causation. Using monthly data from January 1986 to April 2011 they reached the conclusion that the impact of oil price on gold prices is not asymmetric and also not non-linear. More recently, Gulfen Tuna (2017) arrived at the conclusion that the causality relationship from oil to gold is valid only for positive shocks, while on the other hand, the causality relationship from gold to oil holds for both positive as well as negative shocks.

4.2. TYDL (modified Wald) Test:

Toda and Yamamoto (1995) introduced a modification of the Granger causality test that was based on the estimation of augmented VAR model (k+dmax). In this context, k is the optimal lag on the first VAR model whereas dmax refers to the maximum integrated order on the VAR model.

The causality test is invaluable in determining the ability of one time series to forecast another. It goes beyond regression and tests for the ability to predict future values of the dependent time series.

In particular, the TYDL approach to Granger causality offers the chief advantage of being employable irrespective of the order of integration of the underlying variables. Secondly, it also can be used irrespective of the variables being cointegrated or not. Owing to the above reasons, the present study employs the TYDL test in its analysis of causality.

Thus, the TYDL test was used in order to study the existence of, direction of the causality between each of the study variables and oil prices. The aim was to uncover if there exists causality or not. Further, in the instances where the causality did exist, the goal was to examine if the causality was unidirectional or bi-directional in nature.

The results of the Toda-Yamamoto test are detailed as follows:

Table 4.1: Toda Yamamoto Causality (modified Wald) Test:

Null Hypothesis	Chi-Square	Probability	Granger Causality
Oil does not granger cause Brazil Stock returns	199.6642	0.0000***	Unidirectional causality
Brazil stock returns do not granger cause Oil	17.95943	0.0825	Oil → Brazil Stock
Oil does not granger cause Brazil Bond returns	120.7811	0.0000***	Unidirectional causality
Brazil Bond returns do not granger cause Oil	7.395180	0.6877	Oil → Brazil Bond
Oil does not granger cause Brazil Gold returns	1.952348	0.3767	There is no Causality
Brazil Gold returns do not granger cause Oil	0.545722	0.7612	
Oil does not granger cause Russia Stock returns	11.43365	0.0033***	Unidirectional causality
Russia stock returns do not granger cause Oil	1.959463	0.3754	Oil → Russia Stock
Oil does not granger cause Russia Bond returns	1.109531	0.5742	There is no Causality
Russia bond returns do not granger cause Oil	1.156002	0.5610	
Oil does not granger cause Russia Gold returns	0.063583	0.8009	There is no Causality
Russia Gold returns do not granger cause Oil	0.335743	0.5623	
Oil does not granger cause India Stock returns	120.3691	0.0000***	Bi-directional causality
India Stock returns do not granger cause Oil	42.87399	0.0000***	Oil ↔ India Stock
Oil does not granger cause India Bond returns	0.188314	0.9101	There is no Causality
India Bond returns do not granger cause Oil	0.629002	0.7302	
Oil does not granger cause India Gold returns	0.783958	0.6757	There is no Causality
India Gold returns do not granger cause Oil	0.551489	0.7590	
Oil does not granger cause China Stock returns	5.297045	0.0708	There is no Causality
China stock returns do not granger cause Oil	2.775117	0.2497	
Oil does not granger cause China Bond returns	0.909402	0.6346	There is no Causality
China Bond returns do not granger cause Oil	0.061321	0.9698	
Oil does not granger cause China Gold returns	45.58846	0.0000***	Unidirectional causality
China Gold returns do not granger cause Oil	2.571700	0.2764	Oil → China Gold

Oil does not granger cause South Africa Stock returns	102.9110	0.0000***	Bi-directional causality Oil ↔ South Africa Stock
South Africa Stock returns do not granger cause Oil	56.14713	0.0000***	
Oil does not granger cause South Africa Bond returns	34.08667	0.0000***	Unidirectional causality Oil → South Africa Bond
South Africa Bond returns do not granger cause Oil	5.216364	0.1566	
Oil does not granger cause South Africa Gold returns	0.725173	0.3945	There is no Causality
South Africa Gold returns do not granger cause Oil	0.076872	0.7816	

*** denotes significance level at 1%

Source: E-Views computation and Author's Compilation

The results of the Toda-Yamamoto test provide us with careful insight into the direction of causality among the variables under study and oil prices. From the results, it is evident that some variables share unidirectional causality with oil prices, some exhibit a bi-directional causality and some variables show evidence of no causality.

There is no causality running between Brazil gold returns, Russia bond returns, Russia gold returns, India bond returns, India gold returns, China stock returns, China bond returns and South Africa gold returns and Oil prices. This prohibits any attempt to predict the future values of the time series based on oil prices, and vice-versa.

A unidirectional or one-way causality is evident in the relationship of Brazil stock returns, Brazil bond returns, Russia stock returns, China gold returns and South Africa bond returns with oil prices. The TYDL test reports that oil does indeed granger cause the above-mentioned returns. Thus in effect, oil prices may be employed to forecast the future movement of these time series.

A bi-directional causality is hinted at in the relationship between Indian stock returns and Oil prices, as well as South Africa stock returns and Oil prices.

CHAPTER 5:

Unraveling the Long-Run cointegration between Oil and Stock returns, Bond returns and Gold returns of the BRICS nations

5.1. Long Run Association between Oil prices and various Market Returns: Theoretical Scaffolding

As equally as the short run relationship, it is important to gain an insight into the long run association between oil prices and the returns of the stock market, bond market and gold market. A review of literature opens up the window to the various studies that have attempted to answer this crucial question.

Abdul Rahman (2020) analyzed evidence from Saudi to study the long run association of stock prices and crude oil prices. Using the method of Vector Auto Regression, the study pointed at the existence of a long run association between stock and crude oil prices of Tadawul. Similarly, a long term relationship was also discovered between oil price risk and the Tehran stock market returns in a study conducted by Nejad, Jahantigh and Rahbari (2016) which examined this relationship in the presence of structural breaks during the period of 2003-2014.

Lee, Huang and Yang (2012) in turn explored the long run asymmetric cointegration, along with causal relationships, between the West Texas Intermediate Crude Oil and Gold prices in the futures market. The findings, based on data from May 1994 to November 2008 revealed the existence of an asymmetric long run adjustment between the variables under study.

5.2. ARDL Test for Long run cointegration and CUSUM Test:

The literature review indicates the presence of a long run association between oil prices and the various market returns in different parts of the world during the periods considered for the respective studies. It is now important to analyze the long run association between oil prices and the stock returns, bond returns and gold returns in the BRICS nations for the duration under study.

Since the stationarity tests have revealed the order of integration to be either I(0) or I(1) it is now possible to conduct the Autoregressive Distributed Lag (ARDL) test to analyze the dynamic movements of the variables in time series over a long-term period.

We first begin by depicting the ARDL model selected for each country for each of the variables under study:

Table 5.1: ARDL Model Selected:

Variables	Brazil	Russia	India	China	South Africa
Stock Returns	(8,8)	(4,8)	(6,8)	(5,0)	(8,8)
Bond Returns	(5,7)	(2,8)	(8,0)	(5,7)	(3,8)
Gold Returns	(5,8)	(2,0)	(1,0)	(5,8)	(3,3)

Source: E-Views computation and Author's Compilation

The critical values of F-statistic to decide the existence of a long run cointegration are furnished in the table below:

Table 5.2: Critical values for the ARDL Modeling approach:

Critical Values			
I(0) Bound		I(1) Bound	
10%	5%	10%	5%
4.04	4.94	4.78	5.73

Source: E-Views computation and Author's Compilation

We now compare the critical values with the F-statistics obtained for each variable under study for each BRICS nations. The table below highlights the F-statistics obtained.

Table 5.3: F-statistic for each variable under study:

Variable	Brazil	Russia	India	China	South Africa
Stock Returns	52.8826	121.9458	94.8188	136.3396	77.6228
Bond Returns	1.201183	168.9223	33.3697	95.7711	156.8555
Gold Returns	4.275718	82.7561	535.7502	163.6910	15.46875

Source: E-Views computation and Author's Compilation

The ARDL test is useful to determining if any long-run cointegration exists between the variables under study to oil prices. If the f-statistic is found to be higher than the value of the upper bound, then we can conclude there exists a long-run relationship between the variables.

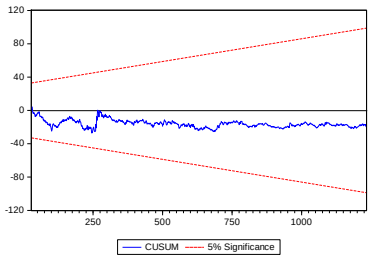
On the other hand, if the f-statistic obtained is lower than the lower bound, we are compelled to conclude that there exists no long-run relationship between the variables.

However, if the f-statistic lies between the upper and lower bounds, then the results are said to be inconclusive.

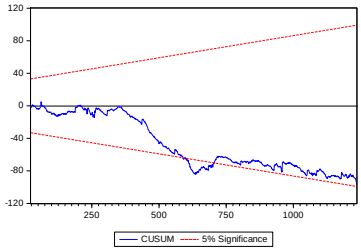
The table presented above thus concludes that Brazil bond returns and Brazil gold returns are the only two variables which have no long run relationship with oil prices. However, each of the other variables prove conclusively to have a long-run relationship with oil prices on account of having an F-statistic that is higher than the upper bound.

The plot of Cumulative Sum of Recursive Residuals of BRICS countries:

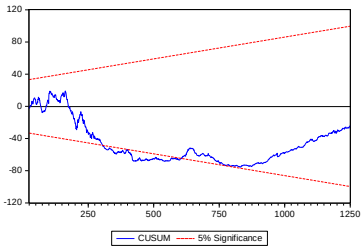
Brazil Stock Returns



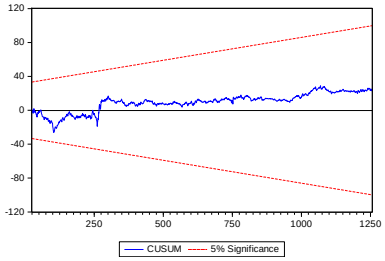
Brazil Bond Returns



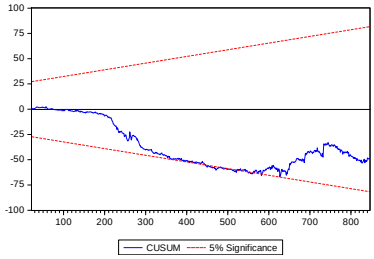
Brazil Gold Returns



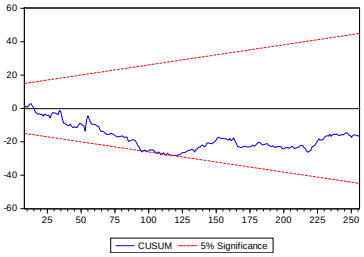
Russia Stock Returns



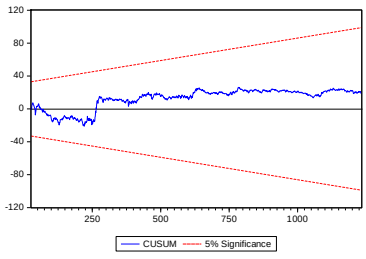
Russia Bond Returns



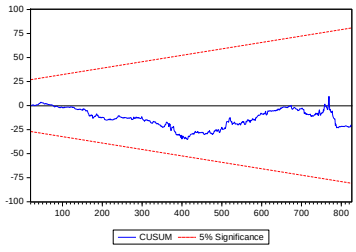
Russia Gold Returns



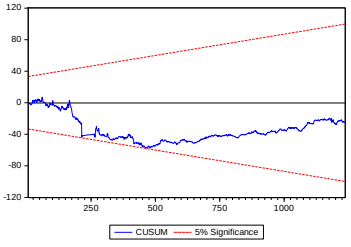
India Stock Returns



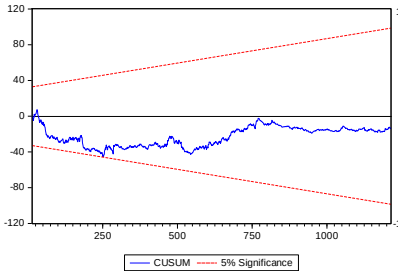
India Bond Returns



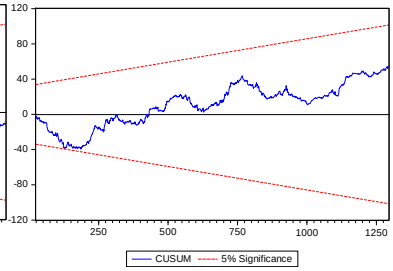
India Gold Returns



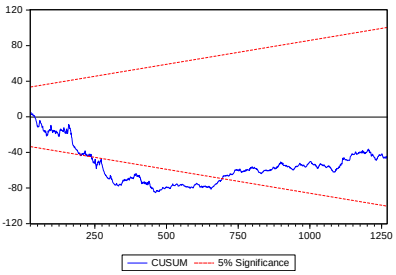
China Stock Returns



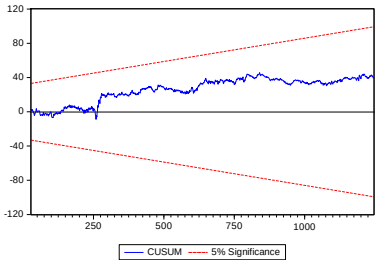
China Bond Returns



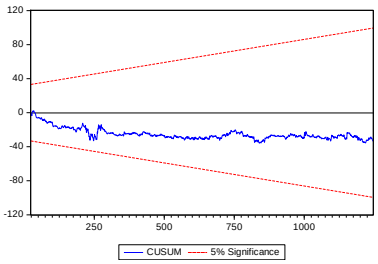
China Gold Returns



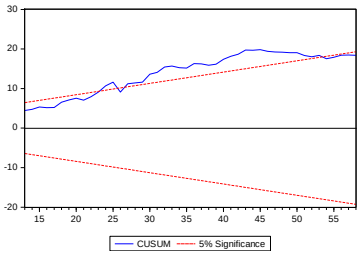
South Africa Stock Returns



South Africa Bond Returns



South Africa Gold Returns



CHAPTER 6:

FINDINGS, CONCLUSION AND SUGGESTIONS

6.1. Findings of the Study:

The twentieth century was a dramatic period in human history, with Two World Wars, countless economic face-offs and trade rivalries determining the winners and losers. However, the role played by oil in this entire narrative leaps off the pages and becomes self-evident. It was oil that became the silent catalyst to tip the winners in the race to economic prosperity or the lack of it that caused the downfall of historic powers that dominated the world.

Towards the turn of the millennium, the sands on the economic surface seemed to shift once again. It was at this time that Brazil, Russia, India, China and South Africa showed promise to lead the new economic sovereignty of the world in the 21st century. However, the puzzle posed by oil still remained: Would it play a deciding role in the rise of these nations?

Two decades after the new millennium, this study is an attempt to capture the impact of oil prices and its fascinating relationship with the stock returns, bond returns and gold returns of the five BRICS nations. In a world where renewable energy has received a thrust unseen before, and yet stands beneath the overwhelming shadow of crude oil dependency, it was imperative to examine the impact of oil prices on the key economic variables of stock returns, bond returns and gold returns of the BRICS nations.

The time period considered for the study ranged from April 2016 to March 2021. An attempt was made to examine the impact of oil as an independent variable on each of the dependent variables using Time series regression. Further, the direction of causality among

these myriad relationships was examined using the TYDL approached. Finally the long-run relationship dynamics were explored with the help of the ARDL approach.

The study yielded some interesting findings. Firstly, the study found evidence to argue that oil is indeed a significant variable in explaining the stock returns, bond returns and gold returns in the BRICS nations. Besides only one variable which was the stock returns of China, oil emerged as a statistically significant variable in explaining the stock returns, bond returns and gold returns of Brazil, Russia, India, China and South Africa.

The Toda-Yamamoto test was employed to test the causality and its direction. The findings revealed that oil prices granger cause Brazil stock returns, Brazil bond returns, Russia stock returns, China gold returns and South Africa bond returns in a unidirectional manner. This indicates that oil prices may prove to be helpful to forecast the future movement of the above variables but not the other way round, i.e. Brazil stock returns, Brazil bond returns, Russia stock returns, China gold returns and South Africa bond returns cannot be used to predict the future movement of oil prices.

The ARDL test examined the long-run cointegration of the variables under study with oil prices. The findings suggest that all variables, except two (the bond returns and gold returns of Brazil) share a long-run cointegration with oil prices.

6.2. Conclusions of the Study:

The findings put forth by the study underline the importance of oil prices in the narrative of the BRICS nations. It may be concluded that oil still plays the deciding role to a large extent even in the new millennium, especially in the context of the five major emerging economies of Brazil, Russia, India, China and South Africa (BRICS).

The findings indicate that oil prices explain, granger cause and share a long-run cointegrating relationship with the stock returns, bond returns and gold returns of the BRICS nations in a majority of cases. None of the BRICS nations are immune to the impact of oil when it comes to at least one of the three major variables of the study (stock returns, bond returns and gold returns) which are critical for the economic health of the nations.

6.3. Suggestions:

The present study has reinforced the importance of oil in determining the ability of the BRICS nations to achieve their potential and emerge as economic super-powers. Oil prices cannot be afforded to be ignored by the BRICS nations on their way to dominate the globe on the economic playing field.

Even in the face of the rising importance of renewable sources of energy, the BRICS nations may be advised to carefully monitor the oil prices as they still dictate stock returns, bond returns and gold returns in these nations to a large extent.

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