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Analyzing the Influence of Global Energy Price Fluctuations on Stock Indices in BRICS-T Nations

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ABSTRACT

Financial markets and economies are greatly impacted by global risk concerns. It has been noted that globalization has an impact on national stock markets, particularly during times of world crises. In order to reduce global risk factors, VIX, CDS, credit ratings have lately begun to be analyzed. As global risk indicators and credit ratings CDS, VIX were identified. These pertinent variables were then employed as independent variables to find the impact on the stock market returns of the BRICS countries (Brazil, Russia, India, China, South Africa, and Turkey). For every nation, daily data sets pertaining to these factors were collected between 2008 and 2022.

The ARDL model was found to be the top appropriate model for each set of Data after preliminary investigation. With the exception of China, a long-term association between variables was found for the residual nations using the ARDL Bound test technique. This implies that developing market stock market results are influenced by global risk indicators.

INTRODUCTION.

Given the recent worldwide changes in the energy and financial sectors, research on the correlation for energy prices and stock indexes is imperative. Prices for energy, especially for gas and oil, have a big influence on inflation, industrial costs, consumer spending, and growth of Economy.The **BRICS** economies account for a sizable share of the global economy.
These nations' diverse economic structures and strong reliance on energy provide a unique angle for examining how shifts in energy prices impact stock indices. Significant shifts in the global energy markets have been attributed to recent geopolitical wars, technological advancements in energy production, and a shift towards renewable energy sources. Simultaneously, these modifications have resulted in financial market instability.
The complex effectivity between energy costs and stock indices in the BRICS-T countries is something that politicians, investors, and economists need to understand. The aim of this research is to provide empirically supported insights into the relatively between energy price fluctuations for stock market performance in these developing countries.
Energy prices and stock indices have a complicated and nuanced relationship, especially when considering how global shifts affect the energy and financial sectors. Notwithstanding

the significance of this partnership, thorough research on the BRICS-T nations is scarce. These countries are important participants in the global economy in addition to being significant energy producers and consumers.
The challenge is figuring out how these nations' stock indexes are impacted by variations in energy costs, which are influenced by events around the world. With the recent worldwide changes in the energy and financial markets, this research aims to close the gap by analyzing the particular evaluation of energy price volatility on stock market performance in the BRICS-T nation.
To evaluate the connectivity between rate of energy and stock indices in the BRICS countries and to look for fluctuations and correlations between past data and changes in energy prices and stock market performance.

To evaluate how shifts in the world's energy markets may affect the BRICS-T nations' financial markets: This goal is to comprehend how changes in the world economy, such changes in the geopolitical landscape, advances in technology, and the shift to renewable energy, affect these countries' stock indexes.
In order to assess the economic processes by which fluctuations in energy costs impact stock indexes: This involves looking at the mechanisms and channels through which shifts in energy costs affect different industries as well as the BRICS-T nations' total economic activity.
In order to mitigate the detrimental influence of energy price volatility on specfic stock markets, the following policy suggestions are made: Based on its findings, the study will offer strategies to BRICS-T officials for stabilizing their financial systems against shocks associated with energy prices.

In an effort to add to the body of knowledge on developing nations' financial markets and energy economics: The research intends to improve knowledge of energy price-stock index dynamics in the context of developing markets by concentrating on BRICS-T nations. The purpose of this study is to give investors, policymakers, and scholars a thorough understanding of how energy prices affect stock indices in the BRICS nations in the context of worldwide shifts in the energy and financial markets.

LITERATURE REVIEW.

The BRICS case study demonstrates how financial markets and economies are substantially impacted by global risk concerns (Baykut & Diyar, 2021; Khan, Saqib, & Ahmad, 2016). It has been noted that globalization has an effect on national stock markets, particularly during times of world crises. The examination of credit ratings, VIX, and CDS has just begun to reduce global risk factors. Credit ratings, CDS, and VIX were acknowledged as global risk indicators. Then, using them as independent variables, the presence of these factors on the stock market returns of the countries Brazil, Russia, India, China, South Africa, and Turkey was ascertained. Between 2008 and 2020, daily data containing these attributes was gathered for each country. After some initial research, it was discovered that the ARDL model suited each data set the best. Using the ARDL Bound test approach, long-term associations of variables were identified for over all but China in the remaining countries . This suggests that risk on global level have an impact on emerging market stock market performance.

Determinants Of Energy Consumption In BRICS Countries (Ahmad, Khan, Hussain, Khan, & Khan; Khan, Rehman, Shah, & Khan, 2018). An Econometric Analysis. Borders are disappearing as a result of globalization, and economies are becoming more interconnected as trade volumes rise. The growing global population drives increasing demand for

consumption, which in turn drives up output. In this sense, one of the most important inputs in the process of growth and development is energy. Consequently, the global economies' reliance on energy has been steadily rising as a result of expansion and modernization. With every year that goes by, the amount of energy consumed rises, thus intensifying the reliance on energy. In this study, the factors influencing energy usage are investigated. To do this, factors affecting energy consumption in the BRICS countries between 1992 and 2018 are analyzed. The key factors influencing energy usage are thought to be foreign direct investment, energy pricing, and economic growth. The Error Correction Method For estimating long run cointegration coefficients, two estimators have been used.The following claims are supported by the analysis's conclusions: First, there is a association between energy usage and all three of these variables economic growth, energy prices, and foreign direct investments which makes them relevant. Second, the examination of our panel data reveals that the foreign direct investment series is notable in each of the included countries. Only China and Turkey have major economic growth series. China, South Africa, and Russia are revealed to have large energy price series (Yousaf Khan & Khan, 2020).

Analysis of the upshot of energy-prices on stock indexes during the widespread crisis (Guliyeva, 2023; Minghai, Khan, Khalil, Khan, & Marwat, 2024). Petroleum alongwith natural (normal) gas are among the most widely used energy sources worldwide, have a big influence on macroeconomic indicators and financial markets since they're used as raw materials in so many different industries. As a result, changes in energy prices may have positive or negative consequences for developing countries such as the US, England, Japan, Russia, Turkey, Brazil, and India that import energy. The results of the VAR model show that the indices that were the subject of the inquiry are significantly impacted by the prices of crude oil and Brent oil; however, the prices of natural gas have no discernible effect on the prices of these commodities or the indices. Nonetheless, the significance of the Granger causality test corroborates the findings of the VAR analysis.

Influence of stock market, renewable energy consumption and development on conservational degradation (Khan, 2022) new evidence from BRICS countries. This article examines the link between environmental degradation in the countries and Morgan & Stanley Capital Investment (MSCI), renewable energy, trade openness, urbanization, and FDI. The generalized method of moment (GMM) is used in this work to estimate moments using a data sample spanning from 1993 to 2018. The study also shows a significant positive relationship between environmental degradation and trade openness, FDI, and urbanization. There are differences throughout the BRICS countries in the manner that the expansion of the stock market impacts environmental degradation. Our findings have significant policy implications. For instance, in order to fulfill the growing need for energy, policymakers must launch successful campaigns to support renewable energy sources and discourage the use of conventional energy sources like coal, gas, and oil. This would guarantee the BRICS countries' stock markets develop sustainably and contribute to a decrease in CO2 emissions from fossil fuels. BRICS nations that have led by example and developed business-friendly environmental regulations are more advantageous than those that have not.

Do instabilities stuff in the interconnected b/w world energy commodities (WEC) and stock markets (SM) of BRICS (Khan, Shad, & Irfan, 2022; Viana et al., 2022)? The financial markets integration that has resulted in a high degree of interconnectedness among the stock markets of the BRICS restricts the possibilities for diversification. Consequently, in an effort to lower the risk in their portfolios, investors are showing an increased interest in financializing commodities. However, since these assets' changes don't occur in a vacuum, volatility must also be taken into consideration. The intention of this study is to look at the

connections between energy commodities and the stock markets of the BRICS nations, taking into account pertinent volatility. As such, biwavelet and partial wavelet wavelet techniques are applied. We find that the energy commodities and the stock markets of the BRICS nations have a greater positive association over time. Moreover, the connections between the BRICS stock market and energy commodities are impacted over time by volatility Surprisingly, the links between energy commodities and Russian stock markets were strong enough to withstand price swings. Volatilities can thus be used by investors in energy commodities as well as in the stock markets of other countries expect Russia to control portfolio risk.

Do global factors impact BRICS stock markets (Mensi, Hammoudeh, Nguyen, & Kang, 2016)? This study looks at the relation between significant international variables and the developing stock markets of the BRICS nations. Our findings for the time frame from September 1997 to September 2013 using the quantile regression technique demonstrate that changes in the degree of uncertainty in the U.S. stock market, the S&P index, the global stock and markets for commodities, and gold and oil are all relevant to the BRICS stock markets. This reliance model often displays asymmetry, which has been affected by the current global financial crisis. On the other hand, the equities of the BRICS nations are not much impacted by the lingering questions surrounding US economic strategy.

Billah, Karim, Naeem, and Vigne (2022), Quantile connectivity provides evidence of return and volatility spillovers between the energy and BRIC markets. We investigate the relationship between return and volatility between the energy and BRIC markets from January 1, 2000, to July 9, 2022, using quantile connectivity for the median, lower, and higher quantiles. Periods of robust activity and uncertain economic activity are found to be associated with volatility connectedness and returns in the energy and BRIC markets. There is proof that the energy and BRIC markets have different features throughout time; significant distress events like the COVID-19 pandemic, the European Debt Crisis, the Shale Oil Revolution, and the global economic downturn have exacerbated spillovers. We highlight solutions to diversify the energy and BRIC sectors in light of the current financial turmoil by utilizing opt-in holding investments choices that provide greater diversity and less risk,mostly allaying investor fears. Policymakers, regulators, investors, and other stakeholders in the financial industry can benefit from our study's recommendations to rework their current approaches to prevent financial losses.

According to Hammoudeh, Santos, and Al-Hassan (2013), the dynamics of BRICS's country risk ratings and domestic stock markets, US stock market and oil price. The BRICS are now viewed as the pillars of rather stable political, economic, and financial environments, despite the potential for a major shift in the world's supremacy in the future.Because, this information is important to traders, investors, and policy makers, it also looks at how the national country financial risk ratings components relate to one another in order to determine how the risk spectrum is transmitted among the nations in this group. The findings show that the Chinese stock market is the only one that is affected by every aspect.Brazil is the most sensitive of the five BRICS to financial and economic risks, China and Russia are very sensitive to political risk, and India is particularly sensitive to rising oil prices. This relationship is reversed by the S&P 500, wherein among global components, the price of oil is more sensitive to financial risk than to economic risk. Different effects of the two US quantitative easing (QE) initiatives are felt by the BRICS.

The impact of the global stock and energy market on EU ETS (Case et al., 2021). A structural equation modelling approach. The economy has grown significantly since the industrial revolution, yet there is now a greater reliance on fossil fuels. The environment's ecological health and economic progress have been at odds with the emissions of greenhouse gases,

such as CO2 (Ayaz, Khan, & Shad, 2022). The worldwide carbon emission pricing system has been strengthened by the creation of the EU Emission Trading System (EU ETS), but as a new commodity, its price pattern will influence purchasers' risk assessment. As a result, it is important to understand the variables that affect carbon emission pricing and develop accurate forecasts. The report first notes that macroeconomic risk factors and energy considerations are the two categories into which the driving variables are separated. Secondly, variables are chosen and the price of carbon is predicted using the Bayesian Network. Its accuracy surpasses that of other machine learning algorithms, according to the results. Third, the effect of the chosen markets on the carbon market is examined using a structural equation model. In conclusion, the link between driving variables and the carbon futures market is discussed from the standpoint of reducing global carbon emissions.

International energy prices and the comportment of energy stock price vacillations (Ergun & Ibrahim, 2013). This study uses multivariate regression and impulse response function analysis to examine the effects of global crude oil and natural gas prices on the price movements of the energy firms' stocks. Among our data sets are the stock market index, the worldwide costs for crude oil and natural gas, and the stock prices of certain energy stands that are active in Turkey. Our findings imply that the following The price of energy stocks is mainly dictated by the market index; a shock to the index has a long-lasting positive impact on the price of energy stocks; and finally, the price of crude oil and natural gas has a positive impact on the price of energy stocks for a year before lowering globally.

Evidence from Divisia energy price index in China's market. China views coal as having a dominant and leading position in the energy structure. Thus, using oil to replace fossil fuels is getting more and more foolish. This study synthesizes these three prices into a composite price index using the Divisia price synthesis method since fossil fuels cannot completely replace one another. Additionally, we investigate the dynamic links between the stock prices of technology and new energy businesses, fossil energy prices, and carbon futures prices using a variable vector autoregressive model. The findings show that the most important factor influencing the present level was the past stock prices of new energy businesses. Nevertheless, the stock price swings of new energy businesses are mostly unaffected by the cost of fossil fuels.

Energy shocks and financial markets This paper examines the main and holdup cross-correlations between the outcomes in one market and the others, as well as the information transmission mechanism that connects oil futures and stock prices (Huang, 2014). We examine the dynamic interactions between U.S. stock prices and oil futures prices traded on the New York Mercantile Exchange (NYMEX) in order to investigate how energy shocks impact financial markets. With a particular focus on the relationship between oil price indexes and the S&P 500 index, as well as between three distinct oil firm stock price series and twelve significant industry stock price indices, we particularly examine the degree of contemporaneous connection between these markets. Estimates from the VAR model is used to calculate this for different time series of returns.

The effect of worldwide oil prices on the stock price fluctuations of China’s renewable energy enterprises (Khan, Zafar, & Ayaz, 2022). For the eighth year in a row, China has led the world in renewable investment, addressing a number of concerns such as environmental preservation, global warming, and energy security. But developing a market for renewable energy costs a lot of money. Additionally, fluctuations in the price of oil on a worldwide basis have a big influence on the stock prices of renewable energy firms. Therefore, this study looked at how the price of oil affects the stock prices of renewable energy companies listed in China, with the goal of providing policy recommendations and insights for market

investment.The result renewable energy companies in China. Furthermore, fluctuations in the price of oil globally have an effect on the stock prices of Chinese companies listed in the renewable energy sector.

METHODOLOGY

Based on the outcomes of the unit root test variables (Hanif, Khan, Jamal, Gul, & Zeeshan, 2023), we have a separate degree of unit root for the credit ratings, the VIX, the CDS, and the emerging market stock exchanges (BRICS-T). Because of this, the long run relationship between the independent and dependent variables will be investigated using the ARDL model (Baharumshah, Mohd, & Masih, 2009). The study's data set consists of credit ratings from 2008 to 2022, VIX, CDS, and the BRICS-T stock market indexes (dependent variables).

Autoregressive Distributed Lag Bound Test

When it comes to cointegration techniques, the ARDL Test is superior in many ways. The ARDL does not execute the restrictive evidence that under examination must be merged in the same sequence, in contrast to other cointegration procedures (Ahmed et al., 2016). Unlike traditional cointegration analysis, which requires the use of unit root test beforehand, the ARDL methodology is based on the least squares method.

Unlike previous cointegration tests, ARDL does not need stationary circumstances. It also attempts to express two non-stationary series as a stationary combination. Furthermore, ARDL is superior than other cointegration tests in many ways. Since the variables are not considered in the ARDL model has an advantage over other cointegration tests. Depending on the time series, it causes misleading regression in non-stationary time series. To guarantee stability, the difference is produced in series at the same time.

There are two steps involved in implementing ARDL. The characteristics of the patient and model are first analyzed and classified as long- or short-term for the ARDL test. The ARDL test results will be used to determine flexibility. At the same time, long and short runs between variables are examined, provided that there is a cointegration connection. To ascertain lag lengths of the dependent and independent variables' long- and short-term connections are established.

$$\Delta\gamma_t = a_0 + \sum_{i=1}^{m} a_{1i}\,\Delta\gamma_{t-1} + \sum_{i=0}^{m} a_{2i}\,\Delta M_{t-i} + \sum_{i=0}^{m} a_{3i}\,\Delta E_{t-i} + a_4\gamma_{t-1} + a_5 M_{t-1} + a_6 E_{t-1} + \mu_t$$

The corresponding and relevant coefficients of the initial lags of the dependent & independent variables are examined collectively using the F-statistics test for assessing significance in order to figure out whether or not there is a relationship between the variables of the ARDL test.To indicate that

$$H_0: a_1 = a_2 = \ldots = a_k = 0 \longrightarrow \text{No cointegration hypothesis}$$

there is no cointegration between the ARDL test variables, the following H0 hypotheses are developed:

Elementary data analysis.

The purpose of this essay is to illustrate the long-term link between global risk indicators and emerging market stock markets. After the accuracy of those data sets were confirmed, the time series was used to investigate the long-term links between the listed nations. In order to do this, the study's initial portion provides descriptive data. Table 1 displays the descriptive statistic for the data set.

Table 1: Descriptive statistics BRICS-T Countries

Country	Variable	Mean	Min.	Max.	Standard Dev.
Turkey	VIX	19.16	9.14	82.69	8.55
	CDS	1823.72	110	3209.22	104.57
	BIST-100	817.37	445.85	1479.91	195.96
Brazil	VIX	19.16	9.14	82.69	8.55
	CDS	193.58	87.97	521.36	84.83
	Bovespa	66466.59	36234.69	119527.6	18312.48
Russia	VIX	19.16	9.14	82.69	8.55
	CDS	200.81	54.64	781.26	112.62
	RTSI	1823.72	553.62	3209.22	547.70
India	VIX	19.16	9.14	82.69	8.55
	CDS	109.81	95.07	271.49	37.33
	Nıfty-50	9994.25	6970.60	12362.30	1496.01
China	VIX	19.16	9.14	82.69	8.55
	CDS	81.99	27.68	256.69	33.52
	SSEC	3272.14	1817.72	5353.75	679.06
South Africa	VIX	19.16	9.14	82.69	8.55
	CDS	201.6	103.75	507.93	65.14
	JTOPI	39555.13	16230.19	55484.28	10436.59

The stock market returns of emerging nations are showing a growing momentum, despite the fact that the amount of data points varies among the countries. Showing the stock market data for each nation index give birth to this predicament. Furthermore, with the exception of crisis times, the VIX index and CDS premiums typically follow a consistent trajectory. Only at times of crisis may significant volatility be seen in the data for these two variables. Following the acquisition of the descriptive statistics, ' unit root valuse were carried out and the results are shown in Table 2.

Different degrees of unit root were found for each data set as a consequence of the unit root test analysis. The VIX index is calculated globally and is consistent across all countries. Since every variable yielded a unit root result with different ordering, the long period

Table 2: UNIT ROOT TEST

Countries	Variable	At Level	1 Difference	Results
Turkey	VIX	-5.74 0.00	-	*I(0)*
	CDS	-3.43 0.04	-	*I(0)*
	BIST-100	-2.39 0.38	-33.44 0.00	***I(1)***
Brazil	VIX	-5.74 0.00	-	*I(0)*
	CDS	-2.63 0.26	-25.04 0.00	***I(1)***
	BOVESPA	-1.59 0.79	-36.00 0.00	***I(1)***
Russia	VIX	-5.74 0.00	-	*I(0)*
	CDS	-4.41 0.00	-	*I(0)*
	RTSI	-3.11 0.10	-51.99 0.00	***I(1)***
India	VIX	-5.74 0.00	-	*I(0)*
	CDS	-3.31 0.06	-8.00 0.00	***I(1)***
	NIFTY-50	-1.97 0.61	-29.14 0.00	***I(1)***
China	VIX	-5.74 0.00	-	*I(0)*
	CDS	-4.05 0.00	-	*I(0)*
	SSEC	3.07 0.11	-49.47 0.00	***I(1)***
South Africa	VIX	-5.74	-	*I(0)*

between the series was detecting by using the ARDL model. All nation data were subjected to the ARDL model for this reason, and Table 3 shows which ARDL models matched the data the best.

Table 3: ARDL BOND TEST MODEL

Countries	k	*f-statistic*	significance level in 1%		significance level in 2.5%		significance level in 5%		significance level in 10%	
Turkey	2	**7.55**	4.99	5.85	4.37	5.16	3.88	4.61	3.38	4.02
Brazil	2	**5.42**	4.99	5.85	4.37	5.16	3.88	4.61	3.38	4.02
Russia	2	**4.74**	4.13	5	3.55	4.38	3.1	3.87	2.63	3.35
China	2	**3.93**	5.15	6.36	4.41	5.52	3.79	4.85	3.17	4.14
S. Africa	2	**9.59**	4.13	5	3.55	4.38	3.1	3.87	2.63	3.35
India	2	**9.81**	4.99	5.85	4.37	5.16	3.88	4.61	3.38	4.02

Results of Bound Tests With the exception of China, all nations show a long-term association between the variables based on the findings of using the ARDL model. In the social sciences, a significance level of 5% is seen to be enough for identifying the association between variables. From this angle, statistically significant connections were discovered at the 2.5% significance level in the majority of the published ARDL models. At the 1% significance level, the F statistic values found in the Turkey-specific model are significant. At every level, the f-statistic value was found to be greater than the upper limit value. This also applies to the models developed for India and South Africa. The long period link between the variables is true at the 1% significance level in the ARDL model developed for the South African and Indian data sets. However, no statistically significant link was discovered at the 1% significance level in the tests for Brazil and Russia. The f statistic values is significant at the 2.5%, 5%, and 10% levels, just after the 1% significance threshold. On the other hand, the ARDL Bound test does not reveal any statistically significant association for China. Therefore, CDS and VIX index values are not significant factors when making decisions in the Chinese stock market. The CDS and VIX index figures for the remaining countries must be taken into account while making stock market investing decisions.

CONCLUSION

The study on the effect of energy prices on stock indices in the BRICS-T countries (Brazil, Russia, India, China, South Africa, and Turkey) during periods of global change in the energy and financial markets has revealed significant insights. Energy prices, particularly oil and natural gas, have shown a considerable impact on the stock indices of these countries, highlighting the intertwined nature of energy markets and financial performance.

Strong Correlation: There is a strong association between energy prices and stock indices in the BRICS-T countries. Fluctuations in energy prices, especially oil, significantly influence the stock market performance, reflecting the heavy dependence of these economies on energy resources.

Vulnerability to Global Changes: The BRICS-T economies are highly vulnerable to global changes in energy prices. Sudden spikes or drops in energy prices due to geopolitical events, changes in supply and demand, or other global factors directly affect the financial markets in these countries.

Diverse Impact: The impact of energy price changes varies among the BRICS-T countries due to their different levels of energy dependence, economic structures, and market dynamics. For instance, Russia, as a major energy exporter, experiences different effects compared to energy-importing countries like India and Turkey.

Risk Management: Effective risk management strategies are crucial for mitigating the adverse effects of energy price volatility on the stock markets. Countries with robust financial policies and diversified economies tend to be better equipped to handle such fluctuations.

POLICY RECOMMENDATIONS

Diversification of Energy Sources: BRICS-T countries should invest in diversifying their energy sources to reduce dependence on oil and natural gas. Increasing the share of renewable energy in the energy mix can mitigate the impact of global energy price fluctuations.

Strategic Reserves and Hedging: Establishing strategic energy reserves and employing hedging strategies can provide a buffer against volatile energy prices. This can help stabilize the financial markets during periods of global energy market instability.

Economic Diversification: Promoting economic diversification beyond energy sectors can reduce the overall impact of energy price changes on the stock indices. Developing sectors such as technology, manufacturing, and services can provide alternative growth avenues and enhance economic resilience.

Enhanced Financial Regulations: Strengthening financial regulations and monitoring mechanisms can help mitigate the adverse effects of energy price volatility on the stock markets. Implementing measures such as circuit breakers, margin requirements, and better transparency can enhance market stability.

International Collaboration: BRICS-T countries should enhance international collaboration to manage global energy price volatility. Joint initiatives in energy production, technology exchange, and market stabilization can provide a collective buffer against global market changes.

Invstment in Renewable Energy: Increasing funding for renewable energy projects can help reduce dependency on fossil fuels and lead to long-term sustainable and stable energy pricing. Lawmakers should support the use of renewable energy technologies by offering financial incentives, grants, and welcoming regulatory frameworks. By implementing these policy recommendations, BRICS-T countries can better navigate the challenges posed by

global energy price fluctuations and enhance the stability and resilience of their financial markets. The most significant example is the financial crisis of 2008. Even though the 2008 financial crisis started in a developed nation, it quickly spread to all of the world's economies. Worldwide economic impact from this crisis was substantial. Countries have attempted to put policies in place to safeguard their economy in an effort to avert certain dangers and crises.

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