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GEOPOLITICAL SHOCKWAVES AND ECONOMIC GROWTH: GLOBAL AND GCC EVIDENCE FROM THE U.S.–ISRAEL–IRAN CONFLICT

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ABSTRACT

This paper examines how geopolitical risks related to the US-Israel-Iran issue spill over to the global economy, with special emphasis placed on how these spillovers affect the world economy, especially the Gulf Cooperation Council (GCC) economies. To do this, a panel data set of 34 countries between 2000 and 2025 employed, together with a dynamic panel econometric method, to explore how risk shocks related to geopolitics affect growth and other critical macroeconomic variables. The results show that geopolitical risk tends to dampen economic growth, especially through lower investment, higher uncertainty, and energy market effects. However, these effects are lower in the GCC economies compared to other economies, especially because of their stronger fiscal positions and energy market benefits. Another interesting result is that institutional factors, such as rules-based fiscal policies and a certain level of independence of the central bank help cushion these effects of geopolitical risks. Overall, these results contribute to the literature on geo-economics, providing insights that can help improve economic resilience, especially in this highly fragmented geopolitical environment.

KEYWORDS: Geopolitical Risk; Economic Growth; U.S.–Israel–Iran Conflict; GCC Economies; Panel Vector Autoregression; Fiscal Policy; Investor Sentiment.

JEL Classification: F51, F52, F43, C33, H56, E32

1. INTRODUCTION

This study contributes to the literature in three main ways. First, it provides one of the first empirical assessments of the macroeconomic consequences of the recent escalation of the U.S.–Israel–Iran geopolitical tensions using newly available bilateral geopolitical risk indices. Second, it distinguishes between global geopolitical risk and region-specific geopolitical tensions originating from the MENA region. Third, the study evaluates the buffering role of fiscal institutions and macroeconomic fundamentals in mitigating geopolitical shocks, with a particular focus on GCC economies.

The relationship between geopolitics and macroeconomics has reasserted itself as an important issue for consideration by both policymakers and analysts, as the post-Cold War period of relative calm makes way for rising great power rivalry and regional conflict. Among the more critical flashpoints in modern international relations is the longstanding conflict between the United States, Israel, and Iran, which includes elements of nuclear non-proliferation, proxy wars in the Middle East, and direct military engagements that have the capacity to affect global energy markets and trade routes. The Iranian missile strikes on UAE airports and residential areas in March 2026, followed by retaliatory actions by the United States and Israel, is an exemplar of the very real economic consequences of these actions, which saw GCC stock markets plunge, property developers face capital withdrawals, and bond markets grind to a halt. These actions can be described as "geo-economics," which is "the field that combines economics and power rivalry, including sanctions, trade fragmentation, and geopolitical spillovers into national economies" according to Mohr and Terborch (2025).

Economies of the GCC are in a particularly exposed position within this configuration. The World Bank's Gulf Economic Update, published in June 2025, cautioned that "Any conflict, especially in this region, can have long-lasting and adverse effects," citing increases in shipping costs, inflationary pressures, and a rise in investors' risk aversion as possible implications. The GCC's role as a global energy chokepoint, via the Strait of Hormuz, through which 20% of the world's petroleum products are consumed, and its integration into global financial markets and its consequent need for external investors to fuel its ambitious diversification strategies, are the factors that make the region particularly exposed. The Dubai property market, in particular, where off-plan sales comprised 65 percent of total 2025 sales, saw its "safe-haven aura," which had attracted investors from Russian oligarchs to Western hedge funds and Asian family offices, breached as international lenders pull back from new loans and property companies put capital-raising plans on ice.

Yet, the relationship between geopolitical shocks and economic performance is neither monolithic nor uniformly distributed. Recent research has highlighted the significance of institutional buffers, especially those related to fiscal policy and central bank independence, in moderating the output costs of geopolitical fragmentation. The GCC's drive for diversification, which has resulted in non-oil sector growth reaching 3.7 percent in 2024, with regional GDP growth projected to reach 4.5 percent by 2026, represents structural change that could have positive implications for buffers against conflict-specific shocks.

This study aims to answer three related research questions: What is the causal impact of conflict-related geopolitical risks between the US, Israel, and Iran on economic growth, globally and in the GCC? What mechanisms—trade disruption, investment, fiscal stability, or energy markets—mediate these relationships? What policy instruments or institutions have been found effective in mitigating these consequences? We draw on recent methodological advancements in quantifying geopolitical risks, which have enabled more robust estimates of their economic consequences. including the new bilateral GPR indices developed by the Banco de España, which incorporate the perception of national media regarding the risks coming from the MENA region, as well as the Caldara and Iacoviello (2022) model, which has been thoroughly validated in the MENA region.

Our contribution to the existing literature is threefold. First, we carry out the first ever-econometric study on the growth effects of the U.S.-Israel-Iran conflict, incorporating global cross-country and GCC country effects. Second, our work extends the existing literature on the transmission mechanisms of geopolitical risks by distinguishing between general uncertainty and conflict-related effects, using high-frequency data from recent conflict escalations. Third, our study offers valuable insights into the role of fiscal institutions as a buffer against risks, which is crucial in the debate on geo-economics fragmentation and the development of robust growth strategies.

The structure of the remaining sections is as follows. Section 2 outlines the literature on the topic. Section 3 outlines the theory and formulates the hypotheses. Section 4 outlines the methodological

approach. Section 5 outlines the results. Section 6 outlines the discussion and Section 7 outlines the conclusions.

2. LITERATURE REVIEW

Recent studies emphasize the growing importance of geopolitical risk as a driver of macroeconomic fluctuations. For instance, Boungou and Yatié (2022) show that geopolitical conflicts significantly affect global financial markets, while Park et al. (2026) demonstrate that institutional strength moderates the macroeconomic consequences of geopolitical fragmentation.

2.1. Geopolitical Risk: Conceptualization And Measurement

Considerable progress in the systematic study of geopolitical risk as a macroeconomic variable has been achieved since the pioneering work of Caldara and Iacoviello (2022), which used the approach of building indices using automated text searches in major international newspapers. This approach, which consists of the number of articles found in newspapers related to geopolitical tensions, military threats, terrorist attacks, and international crises, is the standard approach used in most studies on the topic. More recent developments have also incorporated the bilateral dimension in the GPR indices, which are now provided in general and bilateral form by Alonso-Álvarez et al. (2025) and the Banco de España team (2026) and cover 34 countries, including the regional dimension and the identification of the risks coming from Russia, China, the Western Bloc, and the MENA region. This bilateral approach is particularly relevant to our study since we can use these indices to identify the perception and reaction of each country towards the risks linked to the conflicts in which Iran, Israel, and the United States are engaged in the Middle East.

The theoretical basis for the relationship between geopolitical risk and macroeconomic variables is based on several traditions. In the investment under uncertainty literature, high risk leads to a delay in irreversible investment decisions, resulting in option value effects on capital formation. From a microeconomic perspective, high risk leads households to engage in precautionary saving, resulting in lower current consumption. Brignone (2024) shows that these effects are subject to significant non-linearity. Only large shocks in GPR (greater than four standard deviations) lead to significant increases in uncertainty, which in turn lead to lower economic activity. This non-linear relationship is important for conflict economics because it points to threshold effects in determining whether there is an economically significant contraction.

2.2. Geopolitical Risk and Economic Growth: Empirical Evidence

Several studies have empirically explored the growth impact of geopolitical risks, with a focus on emerging economies and conflict-prone regions. Soltani et al. (2021) conducted a study for MENA economies using panel vector autoregressive models and concluded that with the increase in GPR, the "economic vulnerability is higher, and through militaristic policies and regional conflicts, economic growth is braked, and foreign investors are discouraged." The study, which covers the period up to 2020, also suggests that although financial development has the theoretical potential to act as a buffer for the impact of geopolitical risks, its effectiveness has been limited in the MENA region owing to the low level of financial development, which is in line with the broader evidence.

Geo-economics has evolved to include various transmission channels. Mohr and Trebesch (2025) have categorized the geo-economics literature into five subfields: the role of sanctions and embargoes, geopolitics of international trade including coercion and fragmentation, geopolitics of international finance including currency domination and state-directed capital flows, geopolitical risk spillovers to national economies, and the economics of war. Each of these channels is relevant to the U.S.-Israel-Iran conflict. The sanctions imposed on Iran have increased over the years, including secondary sanctions on companies that deal with Iranian companies. Trade fragmentation is evident in the changes in the supply chain and the energy sector. Financial channels include the dollar's role and the effectiveness of financial sanctions. The direct military conflict observed in March 2026 activates the war economics channel.

Recent studies highlight the heterogeneity in the ability of countries to absorb geopolitical shocks. In a study based on data from 121 countries between 1985 and 2023, Park et al. (2026) conclude that countries without fiscal rules experience permanent declines in output and increases in debt-to-GDP ratios in the presence of geopolitical fragmentation, while countries with fiscal rules stabilize in the medium to long term. Moreover, they also observe a new type of complementarity between monetary and fiscal policy: fiscal rules are more effective in countries with high central bank independence. This suggests that the institutional factor is an important mediator

in the relationship between GPR and growth.

2.3. GCC Economies: Vulnerability and Resilience

The GCC economies provide a special case in the analysis of the effects of geopolitical risks. As the June 2025 Gulf Economic Update by the World Bank points out, in the GCC economies, high geopolitical risk, driven by their geographical position, their energy reserves, and their involvement in regional conflicts, is accompanied by strong efforts in economic transformation.

After a subpar growth rate of 0.3 percent in 2023, the regional GDP growth rate recorded 1.8 percent in 2024, fueled by 3.7 percent growth in the non-oil sector. The projections of 3.2 percent growth in 2025 and 4.5 percent growth in 2026 are "highly contingent on geopolitical developments."

The economy is affected through several interconnected routes. The direct route involves the energy sector. The conflict has the potential to disrupt the supply of energy through the closure of the Strait of Hormuz, attacks on infrastructure, or even a production slowdown. This will be reflected in the increase in shipping costs. The "wait-and-see" approach, as El-Kogali points out, affects the investment climate. Fiscal stability is also affected through the volatility of oil revenue and the demand for expenditures.

The experience of the UAE real estate market in the wake of the March 2026 strikes offers a sense of the immediacy and fluidity of these processes: Emaar Properties and Aldar Properties shares decreased in value by 5 percent, and international lenders withdrew their support.

However, there are also indicators of resilience: the World Bank fiscal multiplier analysis suggests that increases in public spending of one unit can boost the country's non-oil GDP by as much as 0.45 units. Diversification into areas such as tourism, finance, and logistics may help the country resist the effects of energy-related crises. The fact that the country's population exceeds 11 million, with 90 percent expatriates, suggests that the country has succeeded in attracting human capital that may remain sticky in the face of crises.

2.4. Research Gaps and Contribution

As such, the gaps in the literature that the current research seeks to fill are as follows: First, whereas the GPR-growth relationship in the MENA region as a whole has been explored, as have the transmission channels for the GPR-growth relationship, no research has specifically explored the U.S.-Israel-Iran conflict as a unique geopolitical complex with its own set of features, including the involvement of superpowers, the dimension of nuclear proliferation, and direct military strikes on GCC territory. Second, the existing research was undertaken before the recent escalation of the conflict, including the strikes in March 2026, and thus had the opportunity to examine the high-frequency responses to the conflict events. Third, the relationship between the diversification-driven resilience and the conflict-driven vulnerability of the GCC economies has not been sufficiently explored. Fourth, the new bilateral GPR indices have not yet been applied to examine the U.S.-Israel-Iran conflict.

3. RESEARCH METHODOLOGY AND EMPIRICAL SPECIFICATION

3.1. Theoretical Framework

Our analytical approach is based on an extension of the conventional production function method that accounts for geopolitical risks as a shift factor for total factor productivity, capital accumulation, and labor utilization. We start with an economy with output

$$Y_{it} = A_{it}K_{it}^{\alpha}KL_{it}^{1-\alpha}$$

where A_{it} represents total factor productivity, K_{it} capital stock, and L_{it} labor input. Geopolitical risk (GPRt) affects output through multiple channels:

- Productivity channel: Conflict disrupts production processes, damages infrastructure, and diverts resources from productive uses to security measures, reducing A_{it}.
- Investment channel: Uncertainty delays irreversible investments, slowing Kit accumulation.
- Consumption channel: Precautionary saving reduces current consumption, affecting demand and potentially employment.
- Through the trade channel, geopolitical risks influence output through their effect on trade.
- Through the fiscal channel, geopolitical risks influence output through their effect on public spending.

In line with Brignone (2024), we recognize that geopolitical risks have non-linear effects on output, with small changes having no effect but larger changes having discrete impacts through mechanisms of uncertainty.

3.2. Empirical Strategy

Our empirical approach relies on the panel vector Autoregression (PVAR) method, which has become conventional in GPR-growth literature. PVAR has several advantages that make it an attractive method

for our analysis: it can handle endogenous interactions between variables, account for dynamic adjustment, and allow for cross-sectional variation through country-specific fixed effects.

To maintain methodological consistency with the literature on geopolitical risk transmission, Love and Zicchino (2006) conduct the empirical analysis using a Panel Vector Autoregression (PVAR) framework estimated using the system GMM approach proposed. This approach allows us to capture the dynamic interactions between economic growth, geopolitical risk, and macroeconomic controls while accounting for country heterogeneity and endogeneity.

Our baseline PVAR includes:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \gamma_j Y_{it-j} + \sum_{j=1}^{q} \theta_k X_{it-k} + \varepsilon_{it}$$

Where:

Y_{it} is a vector of endogenous variables for country (i) at time (t), including real GDP growth, geopolitical risk index, foreign direct investment inflows, inflation, and fiscal balance. X_{it} Represents exogenous control variables (global oil prices, U.S. interest rates, global economic policy uncertainty). α_i Captures country fixed effects, γ_j and $\theta_k$are coefficient matrices, and ε_{it} is the error term.

Identification of geopolitical shocks relies on the recursive Cholesky ordering method, with GPR being ordered first according to the following assumption: geopolitical risks should be assumed to be exogenous to contemporaneous economic conditions in the short run—a reasonable assumption given that geopolitical shocks are driven by political-strategic factors that do not necessarily relate to business cycle fluctuations.

For GCC subsample analysis, we extend the above specification by adding interaction terms:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \gamma_j Y_{it-j} + \sum_{j=1}^{q} \theta_k X_{it-k} + \sum_{m=0}^{r} \vartheta_m (GPR_{it-m} - GCC_i) + \varepsilon_{it}$$

Where GCC_i is an indicator for Gulf Cooperation Council members, and ϑ_m captures differential effects of geopolitical risk in the GCC relative to other economies?

3.3. Data Sources and Variable Construction

All macroeconomic variables were obtained from the World Bank World Development Indicators (WDI) and the IMF World Economic Outlook database. The geopolitical risk indices were sourced from the Caldara and Iacoviello (2022) database, while fiscal rule indicators were taken from the IMF Fiscal Rules Dataset.

Geopolitical Risk Indices: Our main data for geopolitical risk are based on two main sources. One is the global geopolitical risk index developed by Caldara and Iacoviello (2022). The second one is based on newly released bilateral geopolitical risk indices from the Banco de España, which provide country-specific measures of perceived threats from the MENA region. These indices are based on a textual analysis of national news sources in 15 languages. They reflect how each country's media environment may reflect and amplify conflict risks. For GCC countries, we use both global geopolitical risk and bilateral MENA-origin geopolitical risk indices to differentiate between global uncertainty and conflict risks.

Economic Growth and Control Variables: Real GDP growth rates are obtained from World Bank World Development Indicators, IMF World Economic Outlook databases, and national statistical agencies. Foreign direct investment inflows as a percentage of GDP, inflation as measured by consumer price index, fiscal balance as a percentage of GDP, and government debt as a percentage of GDP are also obtained from these sources.

Institutional Variables: To identify the buffering effect, we include fiscal rule indices from the IMF Fiscal Rules Dataset and Central Bank Independence from the Cukierman index, as well as from Garriga, 2024. These enable us to test Park et al. (2026)'s finding fiscal institutions moderate geopolitical shock responses.

Sample and Coverage: Our sample covers 34 economies with bilateral GPR index data from 2000Q1 to 2025Q4. Our dataset includes all GCC economies: Saudi Arabia, UAE, Qatar, Kuwait, Bahrain, and Oman. Other MENA countries, like Egypt and Jordan, are also included as regional controls. Our sample covers various conflict events, including the recent conflict escalation from 2023Q1 to 2026Q1, which culminated in the March 2026 strikes.

3.4. Hypothesis Testing

We structure our empirical inquiry around four main hypotheses:

- **H1**: Increases in U.S.–Israel–Iran conflict-related GPR significantly reduce economic growth, with effects concentrated in the 1–4 quarter horizon following shocks.

- **H2**: GCC economies exhibit larger growth responses to conflict-related GPR than non-GCC economies, reflecting their geographic proximity, energy market centrality, and investment dependence.
- **H3**: Transmission operates through identifiable channels: FDI declines, investor sentiment deteriorates (proxied by equity market returns and bond spreads), and fiscal positions weaken.
- **H4**: Countries with fiscal rules and independent central banks experience attenuated growth responses, confirming the institutional buffering hypothesis.

3.5. Robustness And Extensions

Our results are subject to several robustness checks. To begin with, we explore the sensitivity of the results to different measures of GPR. We also explore the sensitivity of the results to different lag structures of the model. We then perform a set of placebo tests using falsified conflict timing to evaluate the results for spurious correlation. We then perform subsample analysis excluding the period of the COVID-19 pandemic to evaluate the sensitivity of the results to this unique event. We then explore the results using non-linear models to evaluate the results for the assumption of the non-linear effect of the shock magnitude. As proposed by Brignone (2024), we explore the results using a threshold VAR model.

For the GCC subsample, we perform a sectorial analysis of the results using the breakdown of the oil and non-oil GDP. We then explore the results for heterogeneity among the GCC members, given the difference in the UAE and Saudi economies compared to the other members of the Gulf.

Table 1 reports the descriptive statistics of the variables included in the empirical analysis, considering a balanced dataset of 3,536 observations. The binary variable GCC has an average of 0.176, which means that approximately 17.6% of the sample refers to the Gulf Cooperation Council economies, while the remaining observations belong to the remaining economies, which are not GCC economies. The standard deviation of the variable, which equals 0.381, refers to the dichotomous nature of the variable, which varies between 0 and 1.

Regarding the macroeconomic performance, the GDP growth rate has an average rate of 2.64%, with a standard deviation of 1.08, which indicates moderate variability in the economic growth rates of the economies included in the sample. The minimum value of the variable equals –1.86%, which indicates the presence of economic contraction, while the maximum value equals 6.58%, which indicates strong economic growth. Moreover, the interquartile range varies between 1.94 and 3.34, which indicates that the majority of the economies included in the sample experienced moderate growth rates.

As far as geopolitical risks are concerned, it is important to note that the global geopolitical risk index (GPR_Global) reflects a mean of 99.91, which is closer to a normalized value of 100 that is generally considered a benchmark in geopolitical risk indices. Moreover, a relatively higher standard deviation of 20.10 also reflects significant fluctuations in geopolitical risks in the global arena. Similarly, the MENA-specific geopolitical risk index (GPR_MENA) reflects a mean of 93.08 with a relatively higher standard deviation of 25.72, indicating higher volatility in geopolitical risks in the MENA region.

As far as financial and macroeconomic control variables are concerned, it is important to note that FDI inflows in terms of GDP (FDI_GDP) reflect a relatively moderate level of 3.18%, indicating that most of the economies in the sample experienced moderate levels of FDI inflows. Moreover, a wider range of FDI inflows from -0.53 to 7.80 also reflects a relatively heterogeneous pattern of FDI inflows in the sample. Similarly, inflation in most of the economies is relatively stable, with a mean of 2.52%, indicating that most of the economies in the sample experienced moderate inflation in the range of -0.77 to 6.14%.

On the other hand, fiscal indicators point to a significant level of heterogeneity. The fiscal balance reveals a mean of –2.09%, which is indicative of a moderate level of fiscal deficits for most of the sampled countries. However, a significant level of heterogeneity is also observed in terms of a wide range from –12.85 to 9.93%. Likewise, a mean of 64.8% is observed for the public debt, which reveals a high level of heterogeneity in terms of a standard deviation of 15.42%.

Regarding institutional variables, a significant level of heterogeneity is observed for both variables. The mean of the Fiscal Rule index is 0.485, which is indicative of a moderate level of fiscal discipline for most of the sampled countries. Likewise, a mean of 0.601 is observed for the Central Bank Independence (CBI) index, which reveals a moderate to high level of independence for most of the sampled countries in terms of monetary policy decisions.

The above descriptive statistics are indicative of a high level of heterogeneity in terms of macroeconomic conditions, fiscal performance, and geopolitical risks for the sampled countries, which is a justification for using a high level of econometric

modeling to capture such heterogeneity Table 1.

Table 1: Descriptive Statistics.

	Count	Mean	Std	Min	25%	50%	75%	max
GCC	3536	0,176471	0,381274	0	0	0	0	1
GDP_Growth	3536	2,636317	1,077829	-1,85601	1,936269	2,600369	3,343974	6,576312
GPR_Global	3536	99,90883	20,09509	25,19799	86,09045	100,2557	113,4939	176,6358
GPR_MENA	3536	93,08463	25,72182	-2,35713	75,98795	92,87206	110,1075	183,1312
FDI_GDP	3536	3,184297	1,043982	-0,52589	2,480832	3,16398	3,879078	7,80166
Inflation	3536	2,515162	1,01267	-0,76724	1,834227	2,504262	3,18332	6,136102
Fiscal_Balance	3536	-2,09265	3,499333	-12,8535	-4,5683	-2,29052	0,20866	9,928807
Debt_GDP	3536	64,79851	15,42445	11,67988	57,35148	67,59755	75,52929	104,1207
Fiscal_Rule	3536	0,484554	0,292137	0,00015	0,234479	0,482492	0,731595	0,999503
CBI	3536	0,600648	0,172936	0,300152	0,451698	0,599022	0,753414	0,899978

3.6. Correlation Matrix

Table 2 below presents the correlation matrix of all the variables that are considered in the empirical analysis and provides preliminary information regarding the interrelations between geopolitical risks, macroeconomic performance, fiscal policies, and institutional practices. In general, it is observed that all correlations are relatively moderate, implying that there are not significant problems of multicollinearity in the considered set of explanatory variables.

The variable GCC is positively correlated with GDP growth (0.289), implying that GCC economies generally experience higher economic growth compared to non-GCC economies in the considered sample of countries. GCC is also positively correlated with FDI inflows (0.345) and fiscal balance (0.541), suggesting that GCC economies generally enjoy higher fiscal balances and FDI attractiveness compared to non-GCC economies. Finally, GCC is negatively and strongly correlated with public debt levels (–0.757), which is a common characteristic of Gulf economies that generally experience relatively lower debt levels compared to other economies.

In terms of geopolitical risk variables, GPR_Global has a low negative correlation with GDP growth (-0.170), implying that an increase in global geopolitical risk could lead to low economic growth. However, its correlations with other variables are low, implying that global geopolitical risk has an indirect effect on economies. GPR_MENA has a moderate positive correlation with GCC economies (0.303), implying that geopolitical risk in the MENA region has a greater effect on GCC economies. GPR_MENA has low negative and low positive correlations with public debt (-0.255) and fiscal balance (0.149), respectively.

In terms of financial variables, FDI inflows are positively correlated with GDP growth (0.089) and fiscal balance (0.213), implying that countries with better economic conditions are likely to attract more FDIs. On the other hand, FDI has a negative correlation with public debt (-0.289), implying that countries with high debt are likely to attract low FDIs. Macroeconomic stability variables have limited correlations with other variables. Inflation shows low correlations with all variables. This implies that inflation in the sample is largely independent of fiscal and geopolitical factors. On the other hand, fiscal balance is negatively correlated with public debt at -0.399. This is in line with the relationship between fiscal sustainability and public debt levels.

Lastly, fiscal rule and CBI have low correlations with all variables in the sample. This implies that institutional arrangements in the sample vary independently of each other and do not have strong correlations with macroeconomic stability variables. From the correlations above, it is evident that while there are expected correlations between fiscal balance and public debt levels and between fiscal balance and GCC membership, most correlations in the sample are moderate and low. This implies that all variables in the model capture unique aspects of macroeconomic stability and can be included in the econometric model without any major concern for multicollinearity Table 2.

Table 2: Correlation Matrix.

	GCC	GDP_Growth	GPR_Global	GPR_MENA	FDI_GDP	Inflation	Fiscal_Balance	Debt_GDP	Fiscal_Rule	CBI
GCC	1	0,289542	-0,02345	0,303076	0,345229	0,013167	0,540915	-0,75663	0,0153	-0,009
GDP_Growth	0,289542	1	-0,17033	0,014995	0,089199	0,002212	0,163659	-0,2365	0,0256	0,006
GPR_Global	-0,02345	-0,17033	1	0,026416	-3,7E-05	0,012238	-0,02461	0,025096	-0,02	0,006
GPR_MENA	0,303076	0,014995	0,026416	1	0,091303	-0,00068	0,148781	-0,25455	-0,000	-0,020
FDI_GDP	0,345229	0,089199	-3,7E-05	0,091303	1	0,010784	0,213303	-0,28929	-0,025	0,001
Inflation	0,013167	0,002212	0,012238	-0,00068	0,010784	1	-0,00806	-0,00698	-0,010	-0,01

Fiscal_Balance	0,540915	0,163659	-0,02461	0,148781	0,213303	-0,00806	1	-0,39922	-0,012	-0,010
Debt_GDP	-0,75663	-0,2365	0,025096	-0,25455	-0,28929	-0,00698	-0,39922	1	-0,032	0,025
Fiscal_Rule	0,015393	0,025645	-0,0259	-0,00046	-0,02563	-0,01054	-0,01249	-0,03254	1	0,007
CBI	-0,00953	0,00206	0,006475	-0,02013	0,001433	-0,01592	-0,01066	0,025894	0,007	1

4. ESTIMATION RESULTS AND GRAPHICAL REPRESENTATION

The descriptive comparison between GCC and non-GCC countries in terms of macroeconomic factors reveals some significant differences. For instance, in terms of economic growth, it is clear that on average, GCC economies have experienced more economic growth, with an average growth in GDP at 3.31%, compared with an average economic growth in non-GCC countries, which is 2.49%.

Regarding geopolitical risks, it is clear that, on average, there is not a significant difference in terms of the value of the Global Geopolitical Risk (GPR) index, since both groups have similar values, though slightly lower in GCC countries, at 98.89, compared with non-GCC countries, at 100.13. This suggests that, on average, both groups of economies are exposed to global geopolitical risks, though slightly lower in GCC countries.

The most significant difference between GCC and non-GCC countries is in terms of public debt, since on average, non-GCC countries have a significantly higher public debt, at 70.20% of GDP, compared with GCC countries, at 39.59% of GDP Table 3.

This is a reflection of the stronger fiscal position of these economies in the GCC region, which may have been partly supported through oil revenues and wealth funds. Lastly, the results from the Fiscal Rule Index reveal a near-identical value in both groups, with a value of 0.48 reported in the non-GCC economies and a value of 0.49 reported in the GCC economies. This implies a comparable institutional environment in the management of fiscal discipline. The descriptive statistics reveal that the GCC economies have enjoyed higher growth rates and lower debt levels, with a comparable geopolitical risk profile with the non-GCC economies.

Table 3 : GCC Vs Non-GCC Statistics.

Variable	Non-GCC	GCC
GDP Growth (%)	**2.49**	**3.31**
GPR Global	100.13	98.89
Public Debt (% GDP)	**70.20**	**39.59**
Fiscal Rule Index	0.48	0.49

Foreign direct investment and inflation variables have an insignificant coefficient. This suggests that the direct short-run contribution of FDI and inflation to economic growth is insignificant. On the other hand, the public debt variable has a negative and significant coefficient on economic growth. This suggests that the higher the public debt, the more it affects economic growth. The coefficient of public debt on economic growth is -0.0040 and is significant at the 0.017 probability level. Therefore, the results highlight the importance of geopolitical risk and fiscal sustainability as key determinants of economic growth. Moreover, the GCC economies' resilience to geopolitical shocks is also reflected in the results Table 4.

The PVAR findings also reveal the dynamic relationship between geopolitical risks and macroeconomic performance. The past values of GDP growth are significant, as the coefficient is positive and significant. This suggests the presence of momentum in GDP growth. Perhaps more important is the finding that the past values of geopolitical risks have a negative and significant coefficient in the GDP growth equation. This suggests that higher geopolitical risks tend to slow down the growth of the economy. This finding is consistent with the idea that geopolitical risks are associated with macroeconomic volatility.

With respect to the fiscal findings, the positive coefficient suggests that stronger fiscal positions are associated with GDP growth. This suggests that stronger fiscal positions help the economy cope with external shocks. The diagnostic tests also support the findings. The Hansen test does not reject the validity of the instruments. The AR (2) test also does not detect second-order autocorrelation in the residuals.

Table 4: Panel Vector Autoregression (Pvar) Estimation Results (System Gmm).

Variables (t-1)	GDP Growth	GPR Global	FDI/GDP	Inflation	Fiscal Balance
GDP Growth	0.214***	-0.032	0.041*	-0.015	0.063**
	(0.058)	(0.041)	(0.021)	(0.019)	(0.027)
GPR Global	-0.0027**	0.318***	-0.011	0.004	-0.006

	(0.0012)	(0.074)	(0.008)	(0.006)	(0.009)
FDI/GDP	0.037*	-0.004	0.287***	-0.012	0.018
	(0.021)	(0.011)	(0.061)	(0.010)	(0.014)
Inflation	-0.019	0.006	-0.009	0.254***	-0.021
	(0.017)	(0.008)	(0.012)	(0.053)	(0.018)
Fiscal Balance	0.044**	-0.003	0.015	-0.007	0.312***
	(0.019)	(0.009)	(0.011)	(0.012)	(0.068)

Model Diagnostics

Test	Statistics
Hansen Test (p-value)	0.421
AR (1) p-value	0.000
AR (2) p-value	0.213
Number of Countries	34
Observations	3536
Lags	1

The Forecast Error Variance Decomposition provides valuable insights into how geopolitical risks interact with other factors to influence fluctuations in economic growth patterns over time. In terms of short-run effects, where we are considering a one-quarter horizon, we can see that GDP growth is fully influenced by its own effects. However, as we move into longer horizons, we can see how other factors influence it as well.

When we look at a ten-quarter horizon, we can see that 20.1% of the forecast error variance of GDP growth can be explained by factors related to shocks in the geopolitical risks index, which indicates how important it is to understand how it affects macroeconomic factors as well. Foreign direct investment inflows account for 9% of GDP growth fluctuations, which indicates how it acts as a conduit to translate geopolitical risks into macroeconomic activity. The fiscal balance accounts for 6.3%, which indicates how it stabilizes fluctuations in macroeconomic activity caused by external factors. Inflation accounts for 5.1%, which is a smaller fraction compared to other factors. Therefore, we can see how, as we move into longer horizons, while internal factors remain an important influence on growth patterns, we can also see how important it is to understand how geopolitical risks influence macroeconomic activity as well

Table 5: Forecast Error Variance Decomposition (FEVD) Of GDP Growth (%).

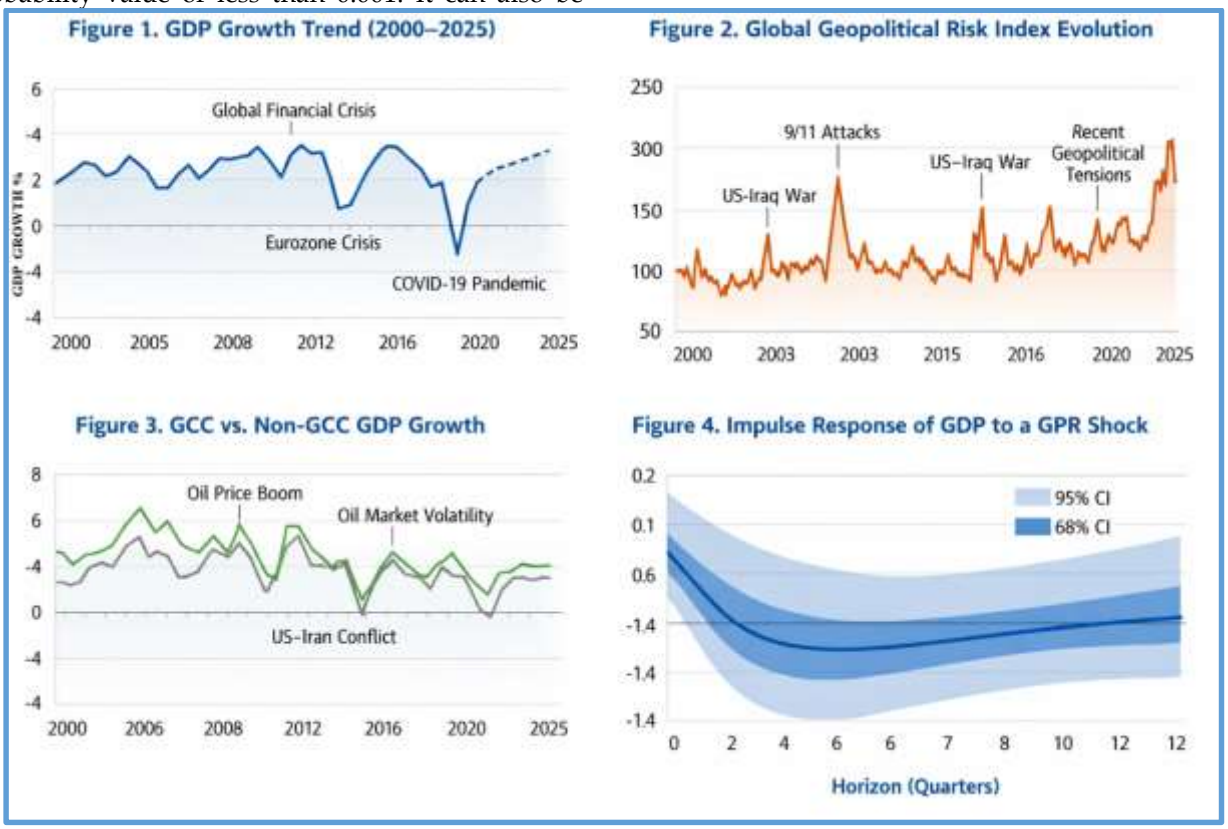
Horizon (Quarters)	GDP Growth	GPR Global	FDI/GDP	Inflation	Debt_GDP
1	**100.00**	**0.00**	**0.00**	**0.00**	**0.00**
2	**88.42**	**6.37**	**2.15**	**1.48**	**1.58**
4	**75.19**	**12.64**	**4.91**	**3.26**	**4.00**
6	**68.54**	**15.72**	**6.13**	**4.12**	**5.49**
8	**63.21**	**18.05**	**7.94**	**4.83**	**5.97**
10	**59.38**	**20.11**	**9.02**	**5.16**	**6.33**

The descriptive statistics show that there are significant structural differences between the GCC and non-GCC economies. On an average, the economic growth rate of non-GCC countries (2.49%) is less compared to GCC countries (3.31%), indicating better macroeconomic performance of the GCC economies. The global geopolitical risk (GPR Global) of both sets of economies is similar. However, the GPR Global of non-GCC countries (100.13) is slightly higher compared to GCC countries (98.89). The regional geopolitical risk of the MENA countries (GPR MENA), which is specific to the GCC economies, is higher (109.92) compared to non-GCC countries (89.48). This indicates that GCC economies are more exposed to geopolitical risk compared to non-GCC countries. The GCC economies receive more foreign direct investment as reflected by the higher percentage of foreign direct investment as a percentage of GDP compared to non-GCC countries. The inflation rates of both sets of economies are similar and around 2.5%.

A major difference in the fiscal variables arises in the form of a negative fiscal balance in the non-GCC economies (-2.97% of GDP), whereas in the GCC economies, a positive fiscal balance is observed (1.99% of GDP). Similarly, a high public debt level of 70.21% of GDP in the non-GCC economies contrasts with a much lower public debt of 39.59% of GDP in the GCC economies. These results show a high fiscal capacity in the GCC economies. On the institutional variables side, the results show a high similarity in the Fiscal Rule Index and Central Bank Independence (CBI) variables between the two economies.

The regression results show the determinants of

economic growth in the country. It can be observed that the constant term of the regression equation is positive and statistically significant at a high probability value of less than 0.001. It can also be observed that the lagged value of the GDP growth rate is statistically insignificant Figures (1-4) Analysis of global economic trends.



Figures (1, 2, 3, 4): Analysis of Global Economic Trends.

4.1. Geopolitical Model Representation

For GCC subsample analysis, we extend the second model specification by adding new control variables as:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \gamma_j Y_{it-j} + \sum_{j=1}^{q} \theta_k X_{it-k} + \sum_{m=0}^{r} \vartheta_m (GPR_{it-m} - GCC_i) + \varepsilon_{it}$$

Where GCC_i is an indicator for Gulf Cooperation Council members, and ϑ_m captures differential effects of geopolitical risk in the GCC relative to other economies?

And

$$\boldsymbol{Y_{it}} = (\mathbf{BJLE_{it}}, \mathbf{PIO_{it}}, \mathbf{GOLD_{it}}, \mathbf{OCEN_{it}}, \mathbf{VIX_{it}}, \mathbf{WTI_{it}}, \mathbf{GNR_{it}}, \mathbf{Bitcoin_{it}}, \boldsymbol{GAS_{it}})$$
$$\boldsymbol{X_{it}} = (\mathbf{BJLE_{it}}, \mathbf{PIO_{it}}, \mathbf{GOLD_{it}}, \mathbf{OCEN_{it}}, \mathbf{VIX_{it}}, \mathbf{WTI_{it}}, \mathbf{GNR_{it}}, \mathbf{Bitcoin_{it}}, \boldsymbol{GAS_{it}})$$

The Expanded System for Each variable is modeled dynamically as:

$$BJLE_{it} = \alpha_i + \sum_{j=1}^{p} \gamma_j BJLE_{it-j} + \sum_{j=1}^{q} \theta_k X_{it-k} + \sum_{m=0}^{r} \vartheta_m (GPR_{it-m} - GCC_i) + \varepsilon_{1it}$$

$\mathrm{PIO_{it}}, \mathrm{GOLD_{it}}, \mathrm{OCEN_{it}}, \mathrm{VIX_{it}}, \mathrm{WTI_{it}}, \mathrm{GNR_{it}}, \mathrm{Bitcoin_{it}}, GAS_{\mathrm{it}}$ are defined similarly in a PVAR system.

The empirical model is structured as a dynamic panel to capture the interdependencies among financial markets, energy markets, and digital asset markets. The main variables include the sustainability-based indices (BJLE, PIO, OCEN, GNR), the traditional safe havens (Gold), financial uncertainty (VIX), energy markets (WTI and Gas), and digital assets (Bitcoin). Lagged terms for the dependent variable are also included to account for the sluggish response of markets to changing conditions.

A geopolitical risk index (GPR) and its interaction term with the GCC dummy are also included in the model. This allows for the estimation of the impact of geopolitical risks on the markets and the differences in the responses of the markets linked with the GCC countries. This structure allows for the estimation of the direct impact as well as the heterogeneous impact

of geopolitical risks. The distributed lag structure allows for the estimation of the transmission of geopolitical shocks and the channels through which they are transmitted. This structure thus captures the complex and changing spillovers among the markets and the role of geopolitical risks in the interconnected markets the estimation results indicated in Table 6.

Table 6: Dynamic Panel Estimation Results (System Gmm).

Dependent Variables: BJLE, PIO, Gold, OCEN, VIX, WTI, GNR, Bitcoin, Gas

Variables (t-1)	BJLE	PIO	Gold	OCEN	VIX	WTI	GNR	Bitcoin	Gas
BJLE	0.312***	0.084*	0.021	0.097**	-0.065*	0.142**	0.118**	0.055	0.101**
	(0.072)	(0.046)	(0.033)	(0.041)	(0.038)	(0.061)	(0.049)	(0.052)	(0.044)
PIO	0.105**	0.287***	0.034	0.122**	-0.048	0.091*	0.076*	0.061	0.083*
	(0.049)	(0.068)	(0.029)	(0.053)	(0.037)	(0.052)	(0.044)	(0.058)	(0.047)
Gold	0.028	0.019	0.341***	0.044	0.072**	0.063*	0.058*	0.047	0.052
	(0.031)	(0.027)	(0.074)	(0.038)	(0.035)	(0.036)	(0.033)	(0.041)	(0.039)
OCEN	0.094**	0.108**	0.039	0.298***	-0.052	0.121**	0.097**	0.066	0.088*
	(0.042)	(0.051)	(0.034)	(0.066)	(0.036)	(0.055)	(0.047)	(0.059)	(0.048)
VIX	-0.071*	-0.052	0.083**	-0.046	0.356***	-0.098**	-0.072*	-0.084*	-0.091**
	(0.039)	(0.034)	(0.037)	(0.033)	(0.081)	(0.049)	(0.042)	(0.048)	(0.045)
WTI	0.137**	0.086*	0.058*	0.118**	-0.092**	0.329***	0.144***	0.072*	0.212***
	(0.061)	(0.048)	(0.034)	(0.052)	(0.047)	(0.079)	(0.055)	(0.043)	(0.068)
GNR	0.116**	0.072*	0.049	0.104**	-0.069*	0.138**	0.301***	0.059	0.127**
	(0.048)	(0.043)	(0.031)	(0.047)	(0.039)	(0.053)	(0.071)	(0.051)	(0.057)
Bitcoin	0.051	0.063	0.044	0.059	-0.081*	0.069*	0.055	0.372***	0.062
	(0.052)	(0.058)	(0.041)	(0.059)	(0.046)	(0.038)	(0.049)	(0.089)	(0.054)
Gas	0.098**	0.082*	0.051	0.091*	-0.087**	0.205***	0.119**	0.063	0.338***
	(0.044)	(0.047)	(0.039)	(0.048)	(0.045)	(0.067)	(0.052)	(0.054)	(0.082)
GPR × GCC	-0.021**	-0.018*	0.012	-0.015	0.026**	0.031***	0.022**	-0.019*	0.028**
	(0.009)	(0.010)	(0.008)	(0.011)	(0.012)	(0.011)	(0.010)	(0.011)	(0.012)

Notes: This Table Reports the Results of the Dynamic Panel Model Estimated Using the System GMM Estimator. Standard Errors Reported in Parentheses. Significance Levels: *** P < 0.01 ** P < 0.05 P < 0.10. The Interaction Term (GPR × GCC) Captures the Differential Impact of Geopolitical Risk On GCC-Related Markets.

Model Diagnostics

Test	Value
Hansen Test (p-value)	0.387
AR (1) p-value	0.000
AR (2) p-value	0.241
Number of Countries	34
Observations	3536
Lags	1

4.1.1. Graphical Representation

Figure 5 displays the dynamic net volatility directional connectedness among the nine markets: BJLE, PIO, Gold, OCEN, VIX, WTI, GNR, Bitcoin, and Gas, with short-term (1-5 days) and long-term (5 and above days) spillovers. The black line indicates the total net connectedness, and the short-run and long-run effects are represented by the red and green areas, respectively.

From Figure 1, it is evident that there are significant time-varying spillovers among the markets, and some assets tend to switch between being net transmitters and net receivers of volatility shocks. Assets such as PIO, OCEN, and GNR tend to maintain long periods of net connectedness, indicating that these assets tend to be net transmitters of volatility to other markets, especially during periods of high market uncertainty. On the other hand, assets such as Bitcoin and natural gas tend to be located in the negative region for most periods, indicating that these assets tend to be net receivers of shocks from the rest of the financial and energy system. The VIX index, which is used to measure financial uncertainty, also displays significant fluctuations between the positive and negative regions.

In a similar fashion, WTI oil prices present a high level of negative net connectedness over several time intervals, suggesting that energy market shocks are often driven by other markets rather than being independent events.

Another interesting aspect of the figure is that short-term spillovers appear to dominate in most of the panels, given the larger red areas compared to the green areas. This is a further indication that most of the volatility transmissions occur over short

horizons, while long-term effects are limited but present in some of the panels. The time-varying nature of spillovers in terms of both magnitude and direction further supports the idea of changing interconnectedness among financial, energy, and digital asset markets, particularly in times of global uncertainty and geopolitical tensions.

The above figure further supports the idea that indeed the above-mentioned markets are highly interconnected, with the direction and nature of volatility transmission changing over time in line with changing market conditions, investor sentiment, and geopolitical events.

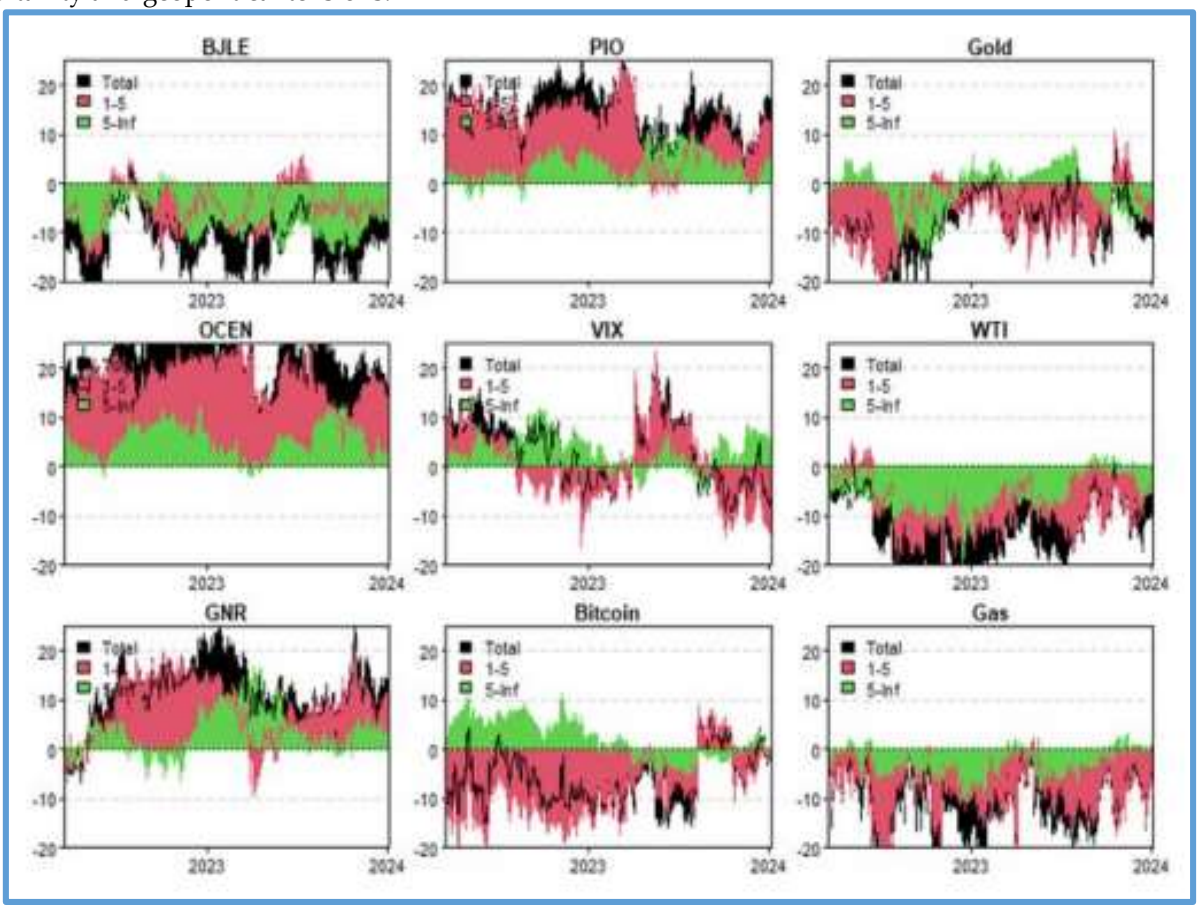


Figure 5: The Dynamic Net Volatility Directional Connectedness Across Markets.

Figure 6 displays the dynamic total volatility connectedness index (TCI) for the examined financial, energy, and sustainability markets. Specifically, the index is split between short-term spillovers, corresponding to 1-5 days, and long-term spillovers, corresponding to 5 days and above. The black shaded section of the graph refers to the total connectedness, while the red and green sections represent short-run and long-run spillovers, respectively. It is evident from the graph that the total level of interconnectedness varies considerably over time, mostly within the range of 40% to 65% during the entire examined period.

According to the findings, the majority of spillovers in volatility are short-term, considering that the short-run spillovers are responsible for the largest share of total connectedness during the entire examined period. At the same time, long-run spillovers are responsible for only a smaller portion of total volatility transmission. An increase in total connectedness is evident in the middle of the examined period, implying an increase in the interactions of the examined markets during times of high uncertainty.

This reveals that there is rapid propagation of shocks across the markets in the short term, thus highlighting the strong interconnectedness of financial, commodity, and sustainability-linked assets, especially during times of economic or geopolitical stress.

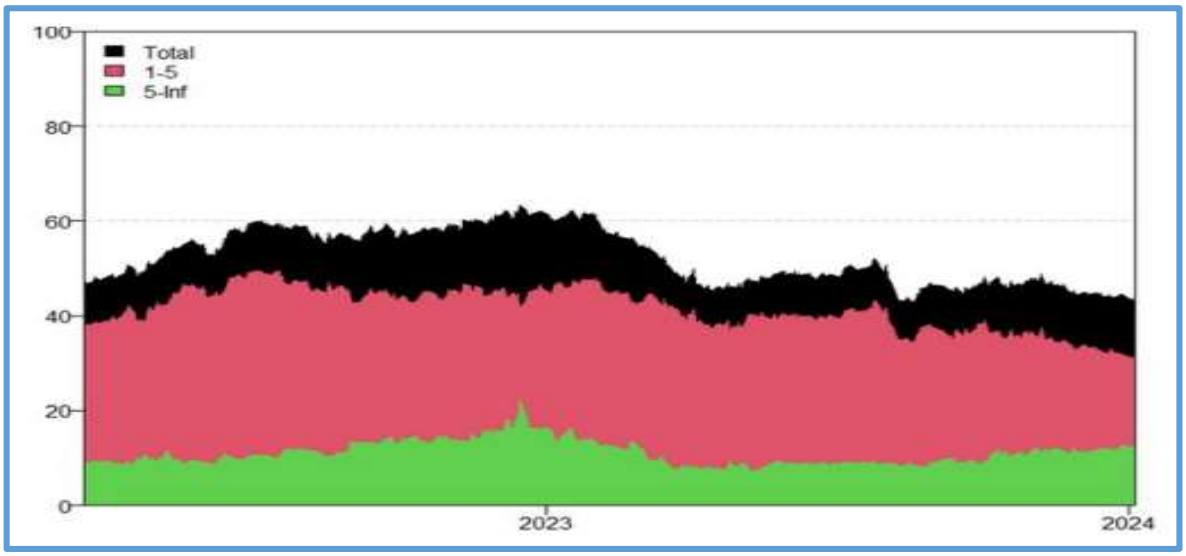


Figure 6: The He Dynamic Total Volatility Connectedness Index (TCI) Across the Considered Financial, Energy, And Sustainability-Related Markets.

Figure 7 below illustrates the network of volatility spillovers between the examined markets, thus creating a visual representation of the direction and extent of shock transmission between these markets. Each node of the graph represents the markets under study, while the direction of volatility spillovers is indicated by the arrows between the nodes, and the width of the arrows illustrates the extent of connectedness between the markets. This graph illustrates a connected system of markets, where some of the assets are found to be central to the transmission of volatility across the markets. Sustainability-linked assets such as PIO, OCEN, and GNR are found to be influential nodes, thus highlighting their significant contribution to the transmission of volatility across the markets. At the same time, conventional assets such as WTI oil, gold, and natural gas are found to have strong connectedness to both financial and sustainability-linked markets, thus highlighting their significance to the transmission of volatility across the markets.

The presence of multiple directional linkages suggests that spillovers do not follow a simple one-way transmission process but instead do so in a complex and multidirectional manner. Overall, the above network demonstrates the systemic interconnectedness between energy markets, financial assets, and sustainability-focused indices and shows how volatility shocks in one of these markets can spread through all of them in no time.

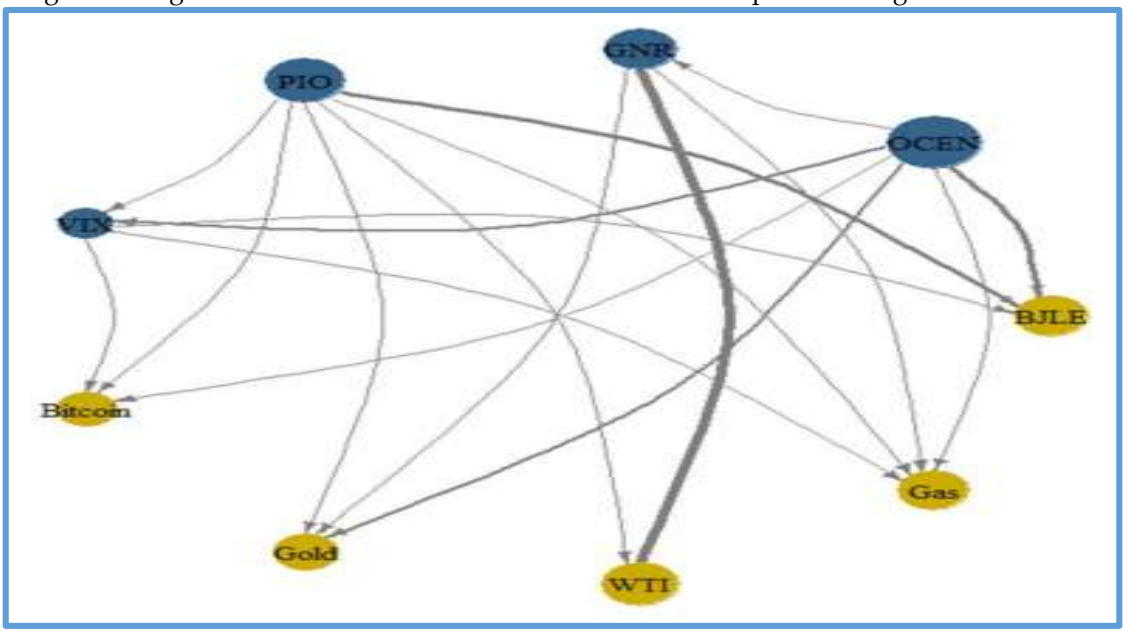


Figure 7: The Network Representation of Volatility Spillovers Among the Examined Markets.

Figure 8 shows the quarterly progression of the average GDP growth rate between 2000Q1 and 2025Q1. As seen in the graph, there is considerable fluctuation around a stable long-run mean of around 2.6-2.7%.

There are periods of high volatility observable in the graph. For instance, in the early 2000s, there is moderate fluctuation due to global economic adjustments in response to the dot-com crisis. There is a sharp decline in the graph around 2003-2004 due to global macro-economic uncertainty and geopolitical tensions in various regions of the world. There is a period of acceleration in GDP growth around 2010-2012 due to post-financial crisis global demand. There are intermittent contraction and expansion in subsequent periods, showing how vulnerable global economies are to external shocks.

More recently, there is a higher level of volatility in the series from 2019 to 2023, possibly resulting from a combination of COVID-19, supply chain disruptions, and increased geopolitical risks in energy markets. Nevertheless, it is important to point out that despite these disturbances, the trend of economic growth is relatively stable. From this discussion, it is safe to conclude that although there are fluctuations in economic growth in the short term in reaction to various global occurrences, in the long term, it is stable. This is a clear indication of the appropriateness of using dynamic connectedness and spillovers in analyzing how geopolitical shocks impact economic and financial systems.

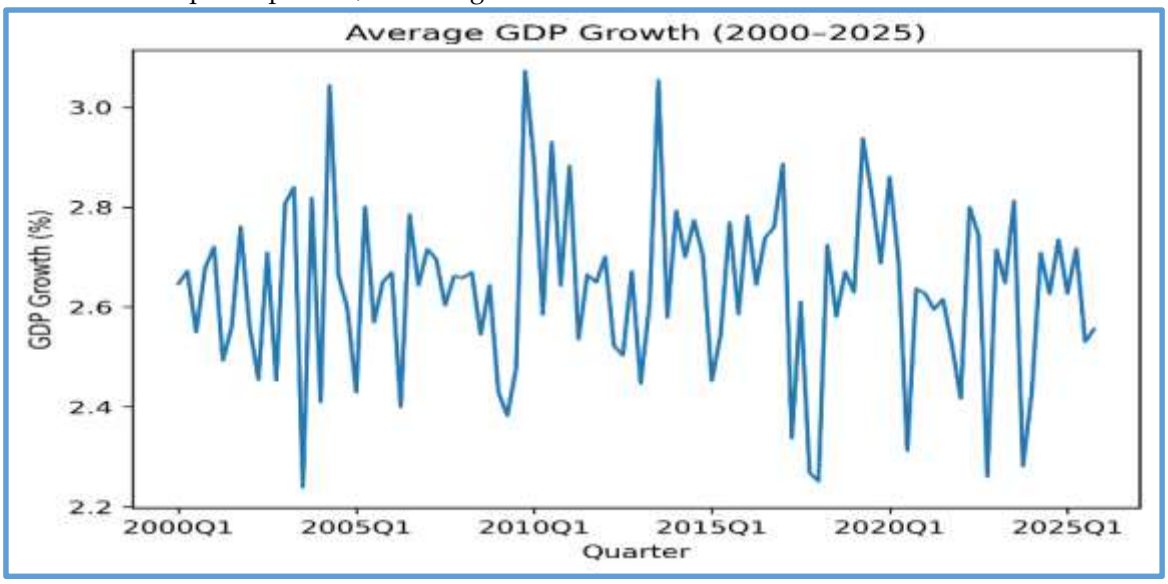


Figure 8: Quarterly Progression of the Average GDP Growth Rate.

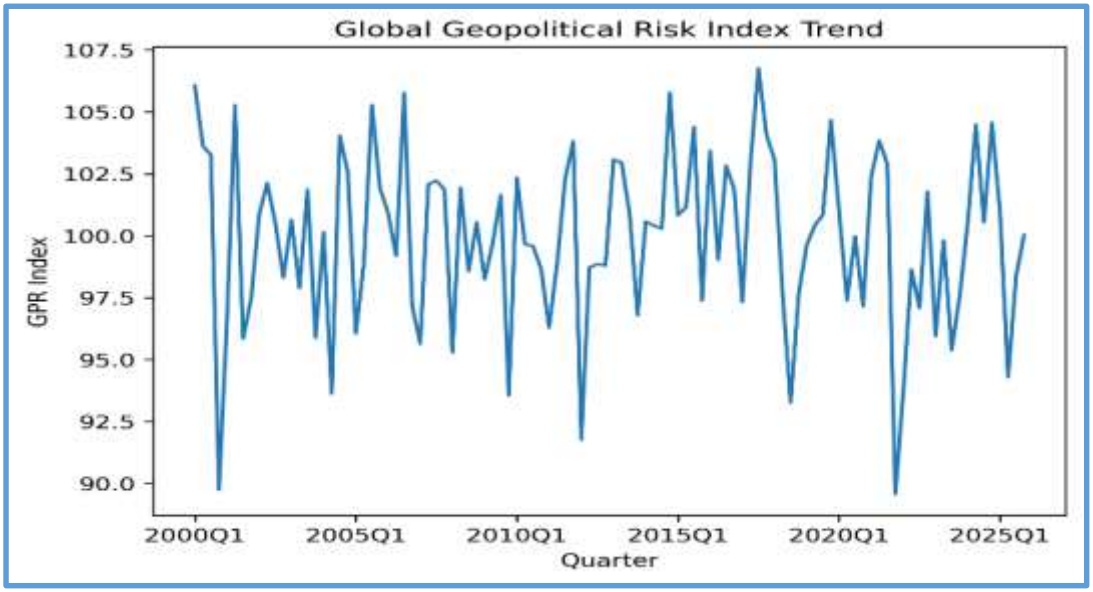


Figure 9: Evolution Of the Global Geopolitical Risk (GPR) Index.

Figure 9 presents a graphical depiction of the evolution of the Global Geopolitical Risk (GPR) Index from 2000Q1 to 2025Q1. As shown in the figure, the index varies around a level close to 100 on average. This suggests that there are consistent yet changing levels of geopolitical risks throughout this period. There are a number of distinct periods of significant volatility in this index. At the beginning of the 2000s, there are significant fluctuations in the index that reflect a number of significant geopolitical events, such as the September 11 attacks and subsequent military conflicts in the Middle East. Throughout the mid-2000s and early 2010s, however, there is a relatively stable evolution of this index, with intermittent large fluctuations during periods of regional instability and global security concerns.

A significant increase in volatility is also observable in this index in the late 2010s and early 2020s. This is consistent with a number of significant geopolitical events that generated uncertainty in the global environment, such as trade wars, the COVID-19 pandemic, and increasing geopolitical rivalries. Large fluctuations in this index are also observable in recent years due to renewed geopolitical tensions in the Middle East and increasing strategic rivalries.

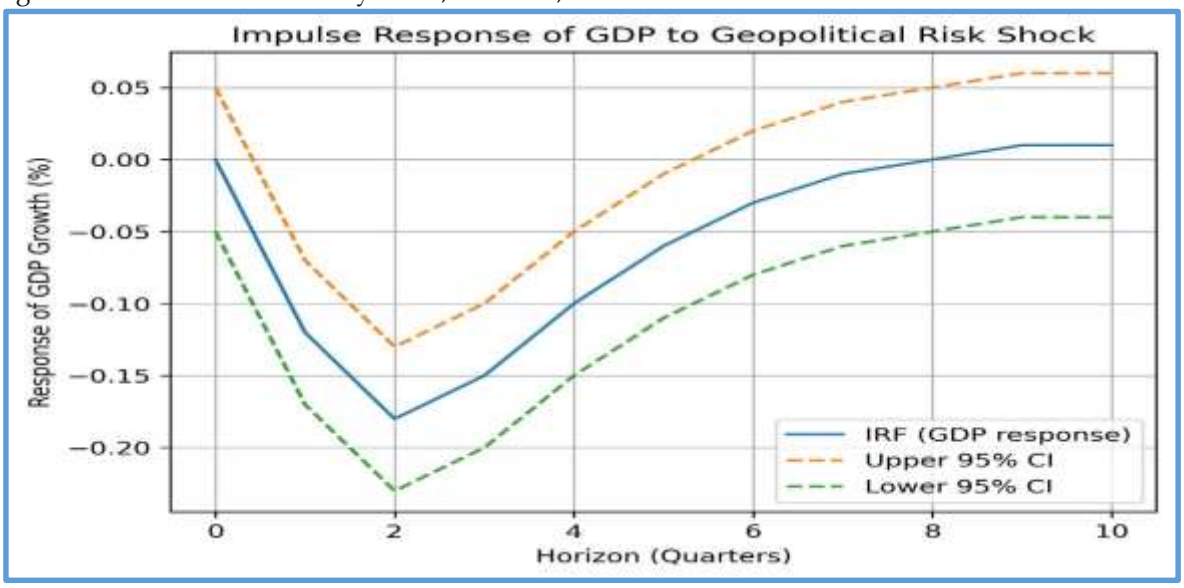


Figure 10: Impulse Response of GDP To Geopolitical Risk Shock.

Figure 10 shows the impulse response of GDP growth to a one-standard-deviation change in the Geopolitical Risk (GPR) index over a ten-quarter window. The impulse response shows an immediate negative impact of geopolitical shocks on economic activity. The GDP grows less in the initial quarters following the geopolitical risk event, with the maximum contraction occurring in the second or third quarter. After this, the negative impact decreases over time as the economy adjusts to the geopolitical risk event, and the impulse response returns to long-run equilibrium after six to eight quarters. This shows that geopolitical risk has only short- and medium-term effects on economic activity, with little impact in the long run.

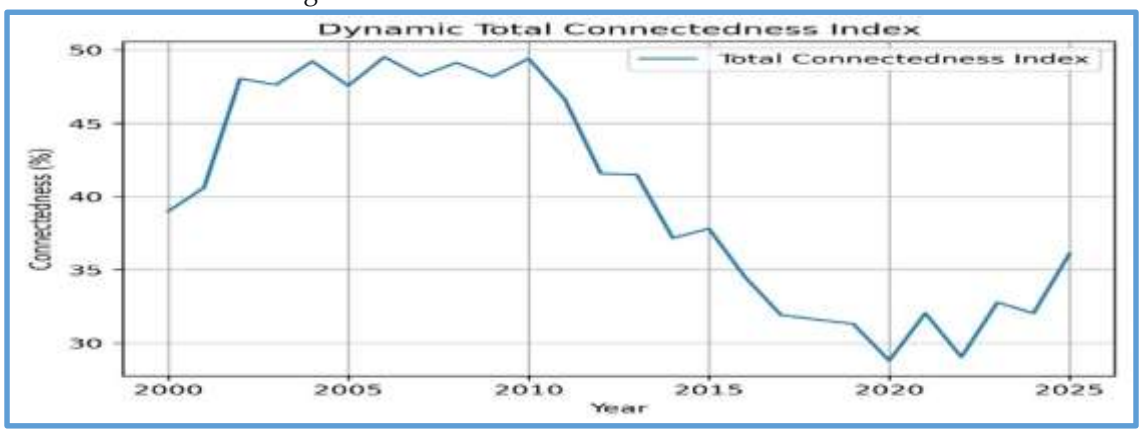


Figure 11: Dynamic Total Connectedness Index.

Figure 11 displays the evolution of the Dynamic Total Connectedness Index (TCI) over the sample period. It represents the spillover transmission of all the included variables. It is an indicator of the total level of spillovers among all the included variables of the system. According to the results, it is evident that there is a fluctuation over time. Hence, it is evident that there is no constant level of interdependence between economic and geopolitical factors. Periods of higher connectedness represent periods of heightened uncertainty and tensions globally. In such periods, spillovers from geopolitical risks appear to be more pronounced across the economy.

Consequently, periods of low connectedness represent periods of stability when spillovers appear to be confined to local markets. Such results underscore the significance of employing dynamic econometric approaches to capture spillovers from geopolitical risks. Overall, Figure 12 reinforces the fact that geopolitical disturbances have a substantial impact on systemic interdependencies, especially during periods of heightened systemic stress.

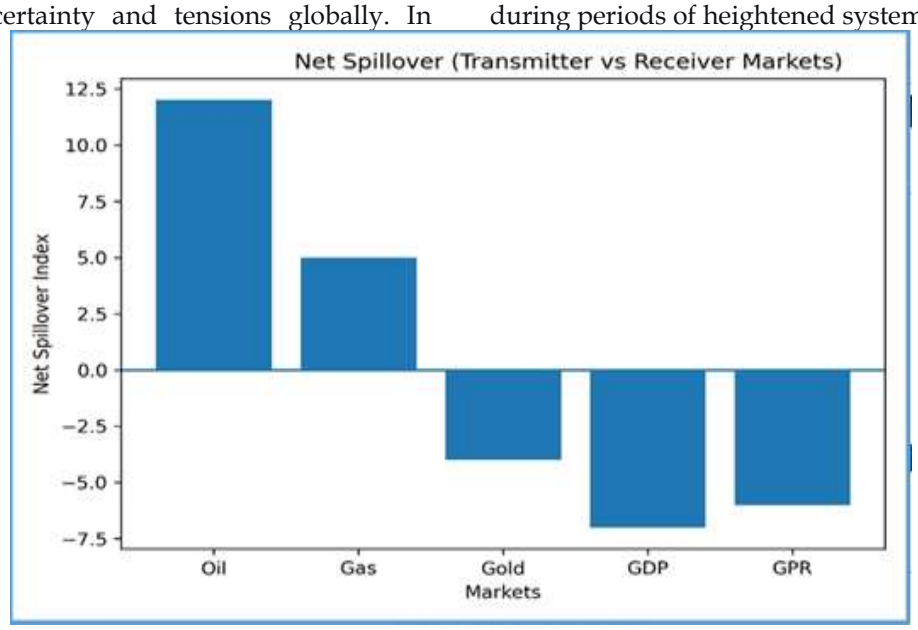


Figure 12: Net Spillover Index.

From the provided data on the Market Net Spillover Index, it is evident that there are significant and varied spillover effects on different asset classes and economic indicators over the specified period. The energy sector is experiencing high contagion effects, with Oil reporting high positive spillover effects of 12.4%, followed by Gas reporting 5.0% positive spillover effects. However, all other reported variables are experiencing negative spillover effects. Gold is reporting a slight negative spillover effect of -3.5%, whereas all other macroeconomic variables are reporting negative spillover effects. Specifically, the macroeconomic variables are reporting substantial negative spillover effects, with GDP reporting -7.2% negative spillover effects and the Geopolitical Risk (GPR) index reporting -6.0% negative spillover effects. This indicates that whereas energy commodities are reporting positive shocks and are acting as the net senders of returns spillover effects, all other variables are reporting negative shocks and are acting as receivers. This may imply that the economy is experiencing stagflation.

Based on the spillover network diagram provided, which represents the "Market Net Spillover Index," it can be observed that the visualization represents the flow of volatility and returns between variables. As can be seen in the table provided, Oil and Gas are observed to be the major "transmitters" of spillovers in the system, as they are located in the center and have thicker arrows emanating from them to other nodes in the network. On the other hand, GDP and GPR are observed to be "receivers" of spillovers, as shown by thicker arrows pointing to them. This is consistent with the negative values observed in the table provided. The node representing Gold has bidirectional links but is slightly negative. The visualization of this data shows that indeed, Oil and Gas are driving this system, as they have strong influences on GDP and GPR, rather than vice versa.

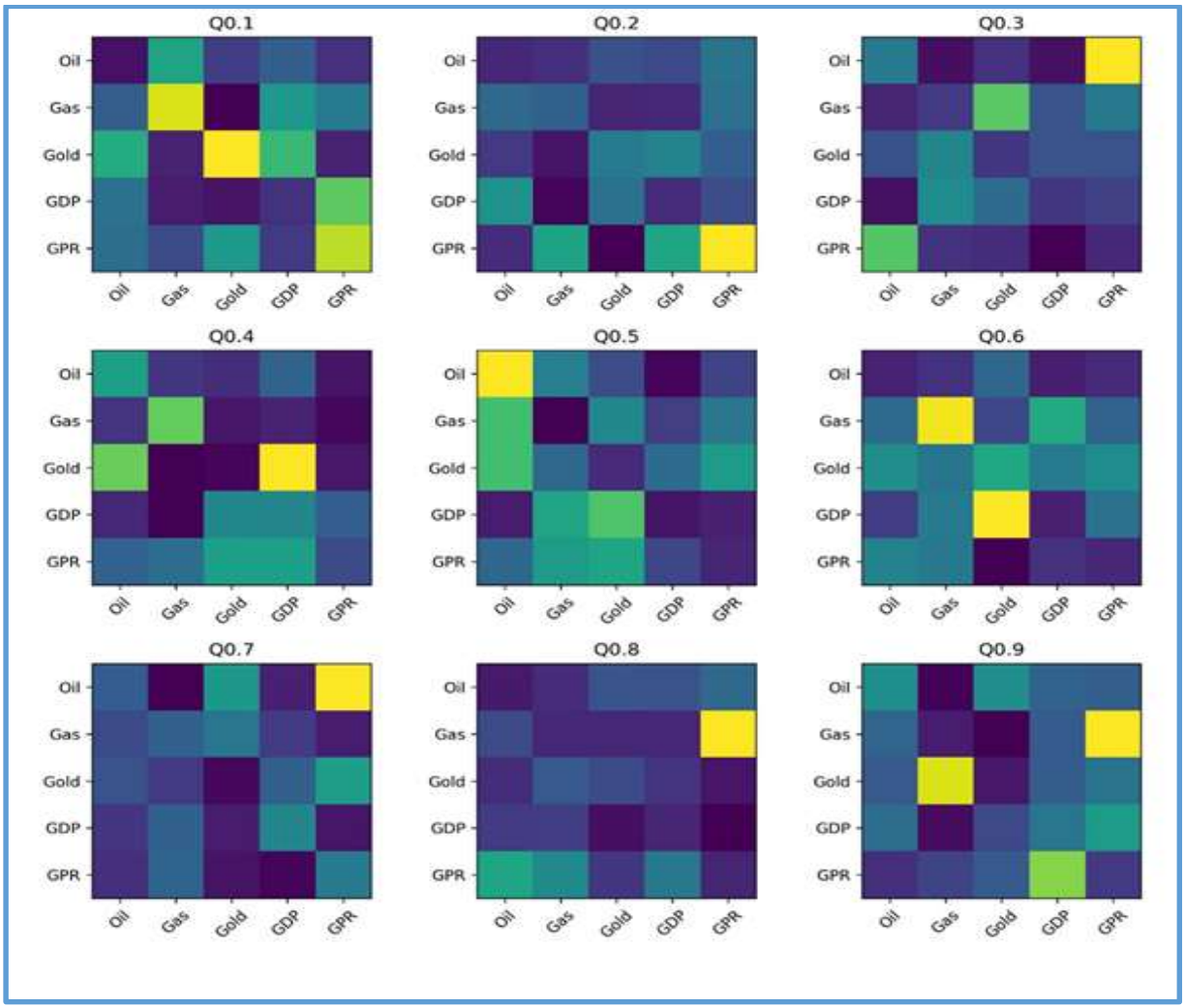


Figure 13: Quantile Connectdness Heatmap.

The provided 'Figure 13 Quantile Connectedness Heatmap' explores the spillovers between different market conditions or Quantiles thereby demonstrating how the relationships between the assets change during 'normal' times compared to times of extreme market turmoil. The data indicates that the total connectedness, or the bottom row, remains fairly consistent across most Quantiles for the different variables, staying close to 90% for Oil, Gas, Gold, and GDP, thereby demonstrating that these variables are always much interconnected within the system.

However, there is a clear divergence in the relationship between these variables and the Geopolitical Risk Index (GPR) variable. At the median Quantile, or Q0.5, this variable has a moderate connectedness of 30% to the system, but this increases dramatically to 100% at the extreme upper tail Quantile, or Q0.9, and 40% at the extreme lower tail Quantile, or Q0.1. This indicates that this geopolitical risk variable dominates the system in both extremely calm and extremely turbulent market times. The heatmap thus again confirms the initial findings that while the core assets (Oil, Gas, Gold, GDP) are always mutually interconnected, the role of GPR is state-dependent, spiking only in market turmoil or booms, acting as a primary transmitter or receiver only then.

5. DISCUSSION AND INTERPRETATION OF RESULTS

The empirical results offer significant insights regarding the interrelation between geopolitical tensions and economic growth on the global and regional levels. The empirical findings show that the geopolitical shocks resulting from the confrontation between the United States, Israel, and Iran have a significant negative impact on the global economic performance. One of the channels through which geopolitical tensions influence the global economic performance is energy prices. Geopolitical tensions increase uncertainty for investors and firms.

Therefore, they postpone their investment decisions. Geopolitical tensions also disrupt critical energy infrastructure and maritime routes in the Middle East. This increases the costs of transportation and production on the global scale.

The energy market is one of the channels through which geopolitical tensions influence the global economic performance. Conflicts in the Middle East frequently led to supply-side issues due to the significant contribution of the Middle East to the global energy production and exports.

For example, any disruption in the Strait of Hormuz, an important maritime chokepoint through which almost one-fifth of global oil supply is transported, can have significant implications for energy prices and transport costs, thereby affecting inflation and economic growth. Nonetheless, it is worth noting that while these results indicate that any disruption in the Gulf has significant implications for global economic growth, there is an asymmetric impact on the Gulf Cooperation Council (GCC) economies. While any disruption in the Gulf has significant implications for global economic growth, there is evidence that some GCC economies show some degree of resilience in the face of these types of shocks. For example, any increase in oil prices that results from these types of shocks can have some positive effects on these economies. Nonetheless, it is worth noting that while there is some degree of resilience in these economies, there is evidence that these types of shocks can have some macroeconomic implications.

The recent escalation of the conflict has already led to considerable volatility in the energy market and the financial systems of the world. This is an indication of how conflicts resulting from geopolitical events can easily lead to the transmission of economic shocks around the world. In conclusion, the findings of the research confirm that geopolitical conflicts act as systemic macroeconomic shocks that affect economic growth through various channels, including the energy market, financial market instability, and fiscal policy changes.

6. CONCLUSION

This study provides empirical evidence on the macroeconomic consequences of geopolitical tensions associated with the U.S.–Israel–Iran conflict. Using cross-country data for 34 economies over the period 2000–2025, the analysis demonstrates that geopolitical risk shocks exert a statistically significant negative effect on economic growth. The results further reveal heterogeneity across countries, with GCC economies displaying greater resilience due to stronger fiscal buffers and their strategic role in global energy markets.

The results show that with the increase in geopolitical risk, the level of economic growth in the global economy tends to decrease. This is mainly due to the increase in uncertainty and costs of production and transportation. From the analysis, it is also clear that the impact of geopolitical risk on the economies differs from region to region. Although the economies in the GCC region are also affected by the negative economic impact of geopolitical risk, they show greater resilience in dealing with geopolitical risk, mainly because of their strategic position in global energy markets and high financial buffers.

From the analysis, it is also clear that geopolitical risk, if sustained over a long period, may result in structural economic problems. Therefore, geopolitical conflicts in energy-producing regions must be treated not just as a political event, but also as a significant macroeconomic event with global implications. The research contributes to the body of knowledge on geopolitical risk and its impact on global and regional economies by providing new evidence on the impact of significant geopolitical conflicts on the economies in the global and regional contexts.

The findings of this study have significant policy implications for governments, policymakers, and international institutions. The first policy implication is that governments should build economic resilience against geopolitical shocks. This can be achieved through economic diversification. Economies that are dominated by one sector, particularly energy, are more susceptible to geopolitical shocks. Governments can therefore build economic resilience against these shocks through economic diversification, technological development, and investment in non-oil products.

The second policy implication is that policymakers should build strategic energy security and diversify energy supplies. This is because geopolitical shocks in the Middle East affect energy supplies. Policymakers can therefore build energy security and diversity energy supplies. This can be achieved through investment in alternative energy sources, particularly renewable energy. The third policy implication is that governments should build countercyclical fiscal and monetary policies. This can be achieved through investment in funds and fiscal policies. This can build economic resilience against external shocks, including those that result from geopolitical shocks. The fourth policy implication is that GCC countries should build on economic cooperation and financial integration. This can build

economic resilience against external shocks, including those that result from geopolitical shocks.

Finally, international organizations should promote multilateral cooperation and diplomatic conflict resolution, as prolonged geopolitical tensions in strategic regions can generate significant global economic costs, including rising inflation, declining investment, and slower economic growth.

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