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THE IMPACT OF ECONOMIC, GEOPOLITICAL, AND CLIMATE UNCERTAINTY ON STOCK MARKET RETURNS IN MENA COUNTRIES: EVIDENCE FROM AN SVAR MODEL

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Abstract: This paper examines the impacts of global economic policy uncertainty (GEPU), geopolitical risk (GPR), and climate policy uncertainty (CPU) on stock returns of 10 MENA countries using the SVAR approach from January 2003 to August 2023. The results show that global economic policy uncertainty exerts significant negative effects on stock returns for all countries except Lebanon, Morocco, and Tunisia. Geopolitical risk and climate policy uncertainty have no impact on stock returns. These results imply that global economic uncertainty is a systematic risk factor that can be used to forecast stock returns. Moreover, the results also provide implications for policymakers to regulate markets in maintaining financial stability and investors to respond to future shocks from these global economic factors with respect to risks and opportunities.

Keywords: Economic policy uncertainty, Geopolitical risk uncertainty, Climate policy uncertainty, Stock returns, SVAR model,

1. Introduction

Over the past two decades, the global economic and political environment has undergone a profound transformation, marked by a continuous rise in uncertainty. The globalization of economies, recurring geopolitical tensions, financial and health crises, and worsening environmental risks have contributed to increasing the complexity of the context in which financial markets operate. In this climate of instability, investors are increasingly facing major challenges in terms of risk management and anticipation of market fluctuations. The increased volatility of financial asset prices, the amplification of exogenous shocks, and the growing interconnectedness between economies make investment decisions more uncertain and expose markets to sometimes excessive or asymmetric reactions to information. Among the multiple sources of uncertainty affecting financial markets, three dimensions are attracting increasing interest in the economic and financial literature: economic policy uncertainty, geopolitical risk, and more recently, climate policy uncertainty. Economic Policy Uncertainty (EPU), conceptualized and measured by Baker and al (2016), refers to ambiguities and unpredictable changes in the conduct of fiscal, monetary, and regulatory policies.

This uncertainty can influence the decisions of economic agents, reduce investments, and disrupt expectations in financial markets. Geopolitical Risk (GPR), on the other hand, encompasses international tensions, armed conflicts, terrorist threats, and diplomatic breakdowns, the effects of which can provoke strong reactions on stock markets, particularly in emerging economies and politically unstable areas. More recently, a new form of uncertainty has emerged as a central concern: climate policy uncertainty. As the effects of climate change become increasingly visible, governments are being forced to adopt energy transition policies, strict environmental regulations, and climate commitments that can profoundly affect economic structures and market behavior.

Climate uncertainty, measured through the Climate Policy Uncertainty (CPU) index, reflects the ambiguity surrounding the implementation, effectiveness, and coherence of climate policies. This uncertainty can generate market reactions, alter asset valuations, and influence capital flows, particularly in countries where economies are sensitive to energy prices or heavily dependent on polluting industries. In this context, the objective of this study is to jointly analyze the impact of these three dimensions of uncertainty – global economic policy uncertainty (GEPU), geopolitical risk (GPR), and climate policy uncertainty (CPU) – on stock market returns of countries in the MENA region (Middle East and North Africa). This region constitutes a particularly relevant field of analysis, due to its vulnerability to geopolitical shocks, its high exposure to climate issues (particularly via the energy sector), and its gradual integration into global financial markets.

To conduct this analysis, we use the methodological framework of the structural vector autoregressive (SVAR) model, which allows us to identify the dynamic effects of exogenous shocks on endogenous variables, while taking into account the temporal interdependencies between the series. This study contributes to the literature in several ways. It adopts an integrated approach by simultaneously examining the effect of three major forms of global uncertainty—economic, geopolitical, and climate—on stock markets in the MENA region, a geographical area that has been little explored from this perspective. Unlike previous work that often focuses on a single type of uncertainty or on developed economies, our analysis offers a more comprehensive and realistic view of the risks facing emerging markets. By mobilizing a structural vector autoregression (SVAR) model, it allows for the identification of exogenous shocks and a better understanding of the transmission mechanisms between global uncertainties and regional stock market dynamics. The study thus provides useful empirical evidence for policymakers and investors, highlighting the particular vulnerability of MENA markets to global turbulence and uncertainties related to the climate transition.

The remainder of the article is structured as follows. Section 2 presents a literature review and the research hypotheses formulated based on previous work. Section 3 details the methodology used, the SVAR model selected, and the data used. Section 4 presents and discusses the empirical results. Finally, Section 5 concludes the study by proposing practical implications and avenues for future research.

2. Literature review and hypotheses:

Geopolitical risks and economic and political uncertainties have significant effects on financial markets and macroeconomic indicators. Previous literature has shown that geopolitical risk (GPR) and global economic policy uncertainty (GEPU) have an impact on stock returns and volatility. The first strand of the literature is related to the impacts of global economic uncertainty on stock market returns. Arouri and al. (2016) show that increased economic uncertainty leads to lower stock prices and that this effect is stronger during periods of extreme volatility.

Alqahtani and (2020) also examined the effects of US economic policy uncertainty on the stock markets of the Gulf Cooperation Countries and determined that these uncertainties had negative long-term effects on stock prices in Bahrain and Kuwait. Batabyal and (2021) showed that EPU can significantly predict stock market returns in Canada. The impact tends to be negative, confirming previous findings from other major economies and stock markets.

Similarly, using regime-switching VAR models, Kundu and (2022) showed that stock market returns and volatility of G7 countries respond to economic policy uncertainty under differential market conditions, namely, bull and bear markets. Examining the impact of EPU and the COVID-19 shock on stock returns of 16 global stock indices, Chiang (2021) finds a negative relationship between stock returns and EPU of a country.

Hypothesis 1: Global economic policy uncertainty (GEPU) shocks have a statistically significant impact on stock market returns of MENA countries.

The second strand of literature is related to the impacts of geopolitical risk. The causal relationship between these variables is widely documented. Caldara and Iacoviello (2018) examined the effect of geopolitical risk on the stock market using the GPR World Index, and they prove the negative influence of geopolitical risk on stock returns. Apergis and al. (2018) and Bouri and al. (2018) empirically showed that the global geopolitical risk index can be useful in predicting stock returns in the US market. Hoque and al. (2019) document that geopolitical turbulence has an asymmetric effect on stock markets of different countries.

Balcilar and al. (2018) study the impact of geopolitical tensions on G7 stock markets using the non-parametric quantile causality test. They find strong evidence of causality for the majority of stock returns in Europe. Similarly, Salisu and al. (2022) showed that GPR is a significant predictor of stock returns in advanced economies, and that stock markets in these countries are also vulnerable to GPR. The same results found by Salisu and (2022) on emerging markets, using the GARCH-MIDAS approach. Based on quantile-on-quantile regression, Umar and al (2022) the impact of geopolitical risk (GPR) generated by the Russo-Ukrainian conflict on European and Russian bond, equity, and commodity markets.

They find that most assets are in a mix of negative and positive relationship with GPR. Using a three-regime Markov switch approach, Hoque and al. (2020) demonstrate the regime-dependent effects of global GPR and country-specific GPR on stock returns in five fragile economies. Bouras and al. (2019) examined the effects of global GPR and country-specific GPR on stock returns and volatility in 18 emerging countries, and found that both global GPR and country-specific GPR create volatility in stock returns. Alqahtani and al. (2020) showed that the global GPR and Saudi Arabia's GPR have some predictability on stock returns in GCC countries. Sekmen (2020) analyzed the effects of geopolitical risks on the stock market in 14 developing countries with time-varying causality analysis, and determined that stock market returns and volatility were determined by geopolitical risks during periods of rising geopolitical risks. While a limited number of studies examining these two factors together. Based on the quantile regression method for the period 1997-2018, Kannadhasan and al. (2020) analyzed the effects of GRP and EPU on the stock markets of developing Asian countries. They found that the effect of EPU was negative in all quantiles, whereas GPR was negatively related in the lower quantiles and positively related in the middle and upper quantiles.

Das and al. (2019) examine the effect of EPU and GPR on financial pressure. They argue that the impact of US-centric macroeconomic shocks in developing countries is heterogeneous in terms of causality among developing countries and the effect of EPU is larger and more significant than the other two shock indicators. Using the ARDL methodology, Alqahtani and al. (2021) examine the long-term impact of oil prices, price uncertainty, and local and global geopolitical risks on GCC stock markets. They show that each GCC country reacts differently to geopolitical uncertainty shocks. Except Saudi Arabia shows no long-term reaction to its local geopolitical risks. However, the EPU and GPR indices have been used to examine their relationship with alternative investment instruments such as gold and Bitcoin (Kyriazis, 2021). Extensive research has been conducted on commodities, particularly on gold's returns during periods of economic recession or high uncertainty. Based on SVAR model, Chai and al (2019) examine the time-varying effects and cross-country differences of GEPU on gold prices. They show that the effects of GEPU shock on gold prices evolve over time.

Zhu and al. (2020a), Zhou and al. (2020b) examine the impact of GPRs on Chinese rare metal (RM) stock returns and volatility in the short term. GPRs have a positive impact on Chinese RM stock returns before 2012, but this impact appears to be negative thereafter. Using Hacker and Hatemi-J's (2012) bootstrap causality test, Yilanci and al. (2021) show that there is no causal link between geopolitical risk and precious metal prices, and that there is causality of economic policy uncertainty at all prices except gold. For example, using the recursive evolving window approach, Wu and al. (2021) found that Twitter-based measures of economic policy uncertainty mostly positively affect the returns of associated cryptocurrencies during the COVID-19 pandemic period. Using the GARCH-MIDAS model, Fang and al. (2019) found that global EPU had a significant positive relationship with Bitcoin's long-term volatility. In recent years, the dependence of economic policy uncertainty (EPU) and geopolitical risk (GPR) on crude oil prices has attracted more attention in the literature (Mei et al. (2019), Cunado et al. (2020), Su et al. (2020).

Colon and al (2021) examine the effect of uncertainty on the top 25 cryptocurrencies. They find that the cryptocurrency market can serve as a strong hedge against geopolitical risks in most cases, but it could be considered a weak hedge and refuge against economic policy uncertainty during a bull market. Bouoiyour and al. (2019) document a positive and strong impact of geopolitical acts on oil price dynamics, while the effect of threats appears moderate or insignificant.

Sun and al. (2020) that the relationship between economic policy uncertainties and oil prices in the short term is weak but increases steadily in the longer term, especially when major historical political or financial events have occurred. Smales (2021) studied the relationship between GPRs and oil price and stock

market volatility. The findings confirm that an increase in GPRs is associated with positive oil returns, while it has a negative effect on stocks. Based on the nonparametric bivariate quantile causality test and wavelet coherence,
Wang and al. (2022) show that GPR and EPU will lead to changes in oil prices in the international market. Similarly, using the nonlinear autoregressive distributed lag (NARDL) model, Kisswani and al. (2021) showed a long-run asymmetric effect of EPU and GPR on WTI oil prices. The same results found by Gu and al. (2021), using the TVP-VAR model, they find a correlation between EPU and GPR indices and oil markets.

Hypothesis 2: Geopolitical risk (GPR) shocks have a statistically significant impact on stock market returns of MENA countries.
The third strand of literature relates to the impacts of climate policy uncertainty on stock returns. Several studies have examined the relationship between climate policy uncertainty and stock returns, although most have focused on developed country stock markets and energy markets.
Using the NARDL model, Sarker et al. (2022) examine the asymmetric effects of climate policy uncertainty (CPU), geopolitical risk (GPR), and crude oil prices (WTI) on the realized volatility of clean energy price (CEP) returns in the United States. The authors provide evidence that the effects of CPU, GPR, and WTI on CEP returns and realized volatility differ in the short and long run and are asymmetric. Using Gavriilidis' (2021) textual index of climate policy uncertainty, Bouri and al. (2022) show that climate policy uncertainty is an important determinant of the performance of green energy stocks relative to brown energy stocks. Based on the volatility of stocks in different sectors, Lv and al. (2023) show that the Climate Policy Index (CPU) has significant predictive power for the volatility of the energy, materials, industrials, consumer discretionary, healthcare and utilities sectors.
Using the CPU index, He and al. (2022) examine the predictability of oil industry stock returns. The authors show that CPU is a strong predictor of future oil industry stock returns both in-sample and out-of-sample. Treepongkaruna and al. (2023) find a statistically and economically significant negative relationship between a firm's exposure to climate policy uncertainty, as measured by a stock's covariance with a news-based CPU index, and subsequent-month stock returns. Using the NARDL model and Granger causality test, Sarker and al. (2023) examine the asymmetric effects of climate policy uncertainty (CPU) and global energy price uncertainty (GEPU) on Bitcoin prices. The authors find asymmetry effects in both the short and long run, indicating that the positive impact of CPU and GEPU is unique compared to the negative effects on BTC in the short and long run equilibrium.
Zeng and al. (2022) predict the effects of China Economic Policy Uncertainty Index (CEPU) and Climate Policy Uncertainty Index (CPU) on Wind Carbon Neutral Concept Index (CNCI) volatility and show that both CPU and CEPU indices significantly affect CNCI volatility.

Hypothesis 3: Climate policy uncertainty (CPU) shocks have a significant effect on stock returns in MENA countries.
Although much research has focused on the effects of global economic uncertainty (GEPU) and geopolitical risk (GPR) on financial market returns, the majority of these studies focus primarily on developed economies, including the G7 countries, the United States, or certain Asian nations. In comparison, equity markets in the MENA region remain largely neglected, despite their high exposure to geopolitical tensions and global economic fluctuations. Furthermore, climate policy uncertainty (CPU), although increasingly studied, remains primarily addressed in the context of advanced economies or sectors linked to green energy and raw materials.
Very little work has simultaneously examined the impact of GEPU, GPR, and CPU indices, and even less in the specific context of MENA countries. This lack of research prevents a comprehensive understanding of the potential interactions between these forms of uncertainty on the stock markets of a region that is strategic in both energy and environmental terms. Therefore, this study aims to be innovative by proposing a joint analysis of the effects of shocks linked to the GEPU, the GPR and the CPU on stock market returns in MENA countries. It contributes to filling a significant gap in the literature by providing an original empirical perspective on a little-explored region, particularly from the perspective of climate uncertainty.

3. Data and descriptive statistics:

This study aims to examine the impact of global economic policy uncertainty (GEPU), geopolitical risk uncertainty (GPR), and climate policy uncertainty (CPU) on stock returns in MENA countries. The sample includes ten MENA countries: Lebanon, Egypt, Kuwait, Morocco, Oman, Qatar, Turkey, Saudi Arabia, Tunisia, and the United Arab Emirates (UAE). We collected monthly data on MENA stock markets from January 2003 to August 2023 from the website: www.investing.com. GEPU is one of the most widely used global risk indicators to assess the impact of uncertainty on the performance of global financial markets (Arouri et al., 2016; Baker et al., 2016). The Geopolitical Risk (GPR) index constructed by Caldara et al. (2021) includes conflict, political instability, and terrorist incidents. CPU is a text index recently constructed by Gavriilidis (2021) based on the article-wide frequency of eight major US newspapers covering climate policy news in US newspapers. The detailed description and data sources of the GEPU index, GPR index, and CPU index used in this article are from this website: www.policyuncertainty.com.

The variables we use in our study are the monthly stock market return (REND), the Global Economic Policy Uncertainty Index (GEPU) developed by Davis (2016), the Geopolitical Risk Index (GPR), and the Climate Uncertainty Index (CPU). All data used in this article are monthly, transformed as a natural logarithmic difference, i.e. REND=$\ln(P_{i,t}/P_{i,t-1})$,$\Delta GEPU_{i,t} = ln(GEPU_t/GEPU_{t-1})$, $\Delta GPR_{i,t} = ln(GPR_t/GPR_{t-1})$ et $\Delta CPU_{i,t} = ln(CPU_t/CPU_{t-1})$.

Before proceeding with any further investigation, the stationarity properties of the data series under observation must be assessed. Table 1 reports the descriptive statistics and ADF and PP unit root tests for the MENA stock return series and three types of uncertainties. The average monthly stock market return is positive for all countries. The Turkish stock market has the highest average return, followed by Egypt and Saudi Arabia. In contrast, the Tunisian stock market has the lowest average return among the MENA markets.

In terms of standard deviation, Turkey and Egypt have the most volatile stock markets in the region, while the Tunis and Morocco stock markets have the lowest deviations in their monthly returns. The skewness coefficients for all return series are negative, except for the stock returns in Lebanon and the UAE. Additionally, all returns have positive excess kurtosis, indicating fat tails relative to the normal distribution. All series have a non-normal distribution, as indicated by the Jarque-Bera test. Regarding the results of the unit root tests, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test statistics consistently indicate that the hypothesis of the presence of the unit root is rejected at 1% for all series, which in turn indicates that they are stationary. Panel B of Table 1 describes the correlation coefficients between the variables. Looking at the correlation matrix in Panel B (Table 1), we can see that the stock market correlations of MENA countries are quite low, with most values close to zero. This may be due to different economic and political factors in each country. However, there are some exceptions, such as the positive correlations between stock market returns of Saudi Arabia and the UAE, as well as Morocco and Tunisia.

Table 1: The stock market return series and three uncertainties

Panel A : Summary statistics

	Tunisia	Oman	Jordan	Turkey	Egypt	Lebanon	Marocco	Qatar	Saudi Arabia	UAE	GPR	GEPU	CPU
Mean	0.008681	0.003625	0.003438	0.014291	0.012080	0.004431	0.005846	0.007185	0.006536	0.008384	-0.001807	0.002972	0.004728
Median	0.006701	0.004052	-0.000922	0.022792	0.014368	-0.003348	0.006822	0.006157	0.013979	0.007013	-0.008406	-0.013507	-0.007584

Maximum	0.126264	0.162380	0.351575	0.242251	0.311920	0.390130	0.183381	0.259595	0.178952	0.359073	0.715417	0.625206	1.232682
Minimum	-0.142611	-0.313154	-0.332824	-0.262915	-0.403312	-0.235360	-0.233793	-0.296004	-0.297753	-0.271862	-0.600151	-0.495071	-1.701375
Std.Dev	0.035123	0.049129	0.055262	0.080188	0.091342	0.064836	0.044093	0.073808	0.072624	0.064397	0.193325	0.180703	0.388520
Skewness	-0.268621	-1.262055	-0.204786	-0.222596	-0.347460	1.689504	-0.578716	-0.433046	-0.835614	0.062905	0.352468	0.547688	-0.253996
Kurtosis	5.224935	11.05006	16.30889	3.568673	5.450038	12.77228	8.077486	5.488411	4.840824	8.551882	4.359092	4.197293	4.128370
Jarque-Bera	51.29821	696.9177	1736.007	5.107173	63.50483	1046.878	265.5550	67.97671	60.52856	301.9673	22.95230	25.78498	14.99374
Observation	236	236	236	236	236	236	236	236	236	236	236	236	236
ADF	-12.69598^{***}	-7.257511^{***}	-14.77452^{***}	-15.07473^{***}	-12.83451^{***}	-13.13494^{***}	-13.37589^{***}	-13.72504^{***}	-12.74228^{***}	-12.24159^{***}	-19.51788^{***}	-11.95051^{***}	-10.43748^{***}
PP	-13.19376^{***}	-12.42268^{***}	-15.19765^{***}	-15.11515^{***}	-13.19376^{***}	-13.23907^{***}	-13.41471^{***}	-13.86032^{***}	-12.92329^{***}	-12.69165^{***}	-27.57107^{***}	-22.42462^{***}	-57.96724^{***}

Panel B : Correlation Matrix

	Tunisia	**Oman**	**Jordan**	**Turkey**	**Egypt**	**Lebanon**	**Marocco**	**Qatar**	**Saudi Arabia**	**UAE**	**GPR**	**GEPU**	**CPU**
TUNISIA	1												
OMAN	0.2475	1											
JORDAN	0.1734	0.4126	1										
TURKEY	0.1494	0.2388	0.1557	1									
EGYPT	0.1009	0.3157	0.3032	0.3257	1								
LEBANON	0.1181	0.3267	0.2979	0.1660	0.2626	1							
MAROCCO	0.1947	0.3064	0.1580	0.2395	0.1919	0.1929	1						
QATAR	0.0411	0.4648	0.3235	0.2869	0.3384	0.2126	0.1285	1					
SAUDI	0.1452	0.4711	0.3062	0.2756	0.3185	0.2591	0.1393	0.4849	1				
UAE	0.0916	0.5252	0.4147	0.2033	0.1988	0.1668	0.1405	0.5071	0.5005	1			

GPR	0.0253	-0.0180	0.0438	0.0294	0.0752	0.0066	-0.0160	0.0729	0.0829	-0.0355	1		
GEPU	0.0151	-0.1699	-0.0822	-0.1911	-0.0829	0.0125	-0.1239	-0.1520	-0.1379	-0.1256	0.0370	1	
CPU	0.0275	-0.0408	0.0234	0.0179	-0.0170	0.0257	-0.0686	-0.0819	-0.0118	-0.0419	-0.0021	0.2505	1

Note: This table reports descriptive statistics and preliminary tests for the data used. ***, **,*, indicate the stationary level at 1%, 5% and 10% respectively.

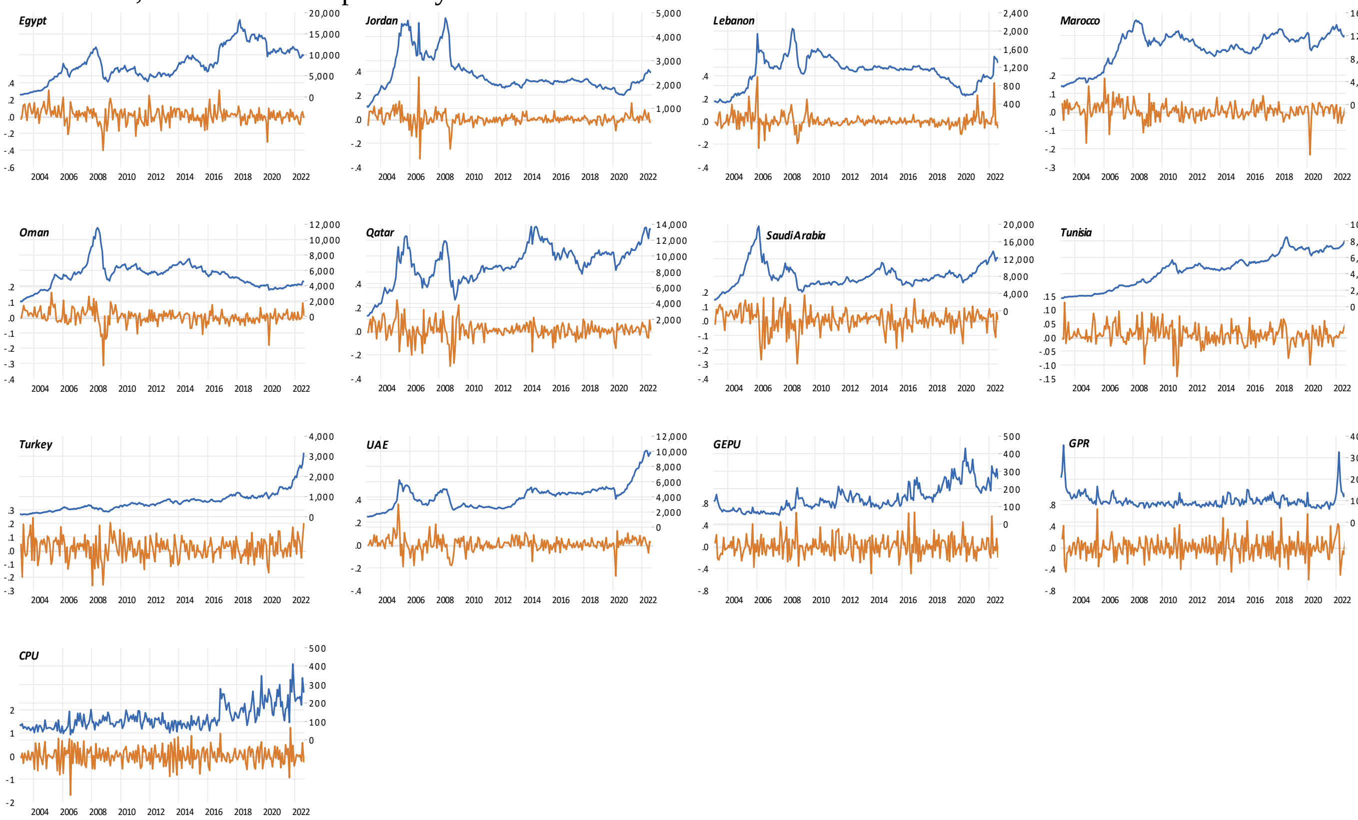


Figure 1 : Monthly price and returns of sample variables

4. Methodology:

According to the standard specified by Kilian (2009), the structural VAR model is used to capture the effects of ΔGEPU, ΔGPR and ΔCPU on stock returns in MENA countries. The structural representation of the p-order VAR model is:

$$A_0 y_t = \alpha + \sum_{i=1}^{p} A_i y_{t-i} + \varepsilon_t \qquad (1)$$

With $y_t = [\Delta GEPU, \Delta GPR, \Delta CPU, REND]$ is a vector of 4 variables. In the equation p is the lag length of the SVAR model and it is chosen according to the optimal Akaike Information Criterion (AIC) length for each country (see Table 2). ε_t refers to a vector of mutually uncorrelated structural innovations. Assuming that A_0 is reversible, the reduced form VAR is obtained by multiplying both sides of equation (1) with A_0^{-1}. Thus, the reduced form of the VAR model is represented as follows:

$$y_t = A_0^{-1}\alpha + \sum_{i=1}^{p} A_0^{-1} A_i y_{t-i} + e_t \qquad (2)$$

With: $e_t = A_0^{-1}\varepsilon_t$ is the vector of residuals estimated in the reduced form and can be represented as follows:

$$\begin{bmatrix} e_t^{\Delta GEPU} \\ e_t^{\Delta GPR} \\ e_t^{\Delta CPU} \\ e_t^{REND} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{\Delta GEPU} \\ \varepsilon_t^{\Delta GPR} \\ \varepsilon_t^{\Delta CPU} \\ \varepsilon_t^{REND} \end{bmatrix} \quad (3)$$

With element 0 in the matrix denotes that there is no immediate impact expected from specific shocks and the non-zero elements a_{ij} (i=1, ... ,4 ; j=1,…,4) denote the coefficients of the i responses to shocks j. $\varepsilon_t^{\Delta GEPU}$ denotes the shock of change in global economic uncertainty, $\varepsilon_t^{\Delta GPR}$ captures the shock of change in geopolitical risk, $\varepsilon_t^{\Delta CPU}$ denotes the shock of change in the climate policy uncertainty index and ε_t^{REND} denotes the shock of changes in stock returns.

Table 2: Optimal lag value for vector autoregression (VAR) model

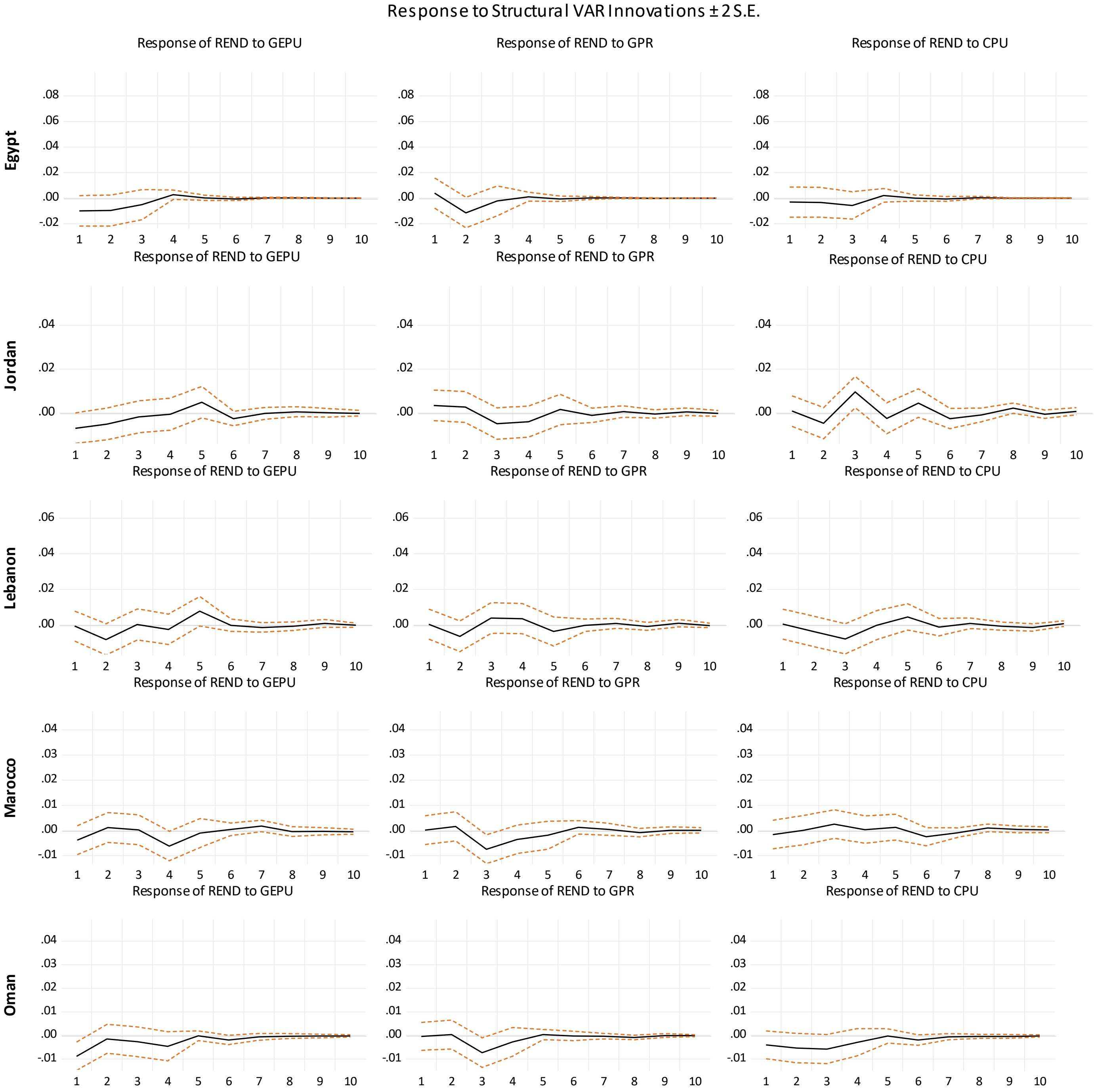
Country	AIC
Egypt	2
Jordan	4
Lebanon	4
Marocco	4
Oman	3
Qatar	3
Saudi Arabia	3
Tunisia	2
Turkey	2
UAE	3

5. Results and discussion:

5.1. Impulse response functions :

Figure 2 shows the short-term dynamic responses of stock returns to different shocks in each of the MENA countries. The first column shows that the economic policy uncertainty shock (GEPU) has significant negative effects on stock returns for about four months for all MENA countries except Lebanon, Morocco, and Tunisia, indicating that increased global economic policy uncertainty leads to lower stock prices. Moreover, our result is consistent with the findings of many previous studies that global economic uncertainty shocks have significant negative impacts on stock returns (Tsai 2017, Arouri 2014). These results validate hypothesis 1. From the second column, we note that geopolitical risk has insignificant positive effects in the short term for all countries except Oman and UAE which show an insignificant negative effect. These results are consistent with those of Esayed et al. (2019), Bouras et al. (2018) and Caldara et al. (2018), while they are contradictory with those of Bouri et al. (2018). Theoretically speaking, if the domestic economy and stock market remain strong during geopolitical risk shocks, it is possible that investors may be less sensitive to geopolitical risks in this region due to a long experience of political instability and armed conflict. This result does not support Hypothesis 2. The third column shows that climate uncertainty risk has an insignificant effect on stock market returns across all MENA countries. This result therefore does not support the third hypothesis, which states that climate uncertainty has a significant impact on stock markets in the region.

5.2. Variance decomposition – Stock returns :



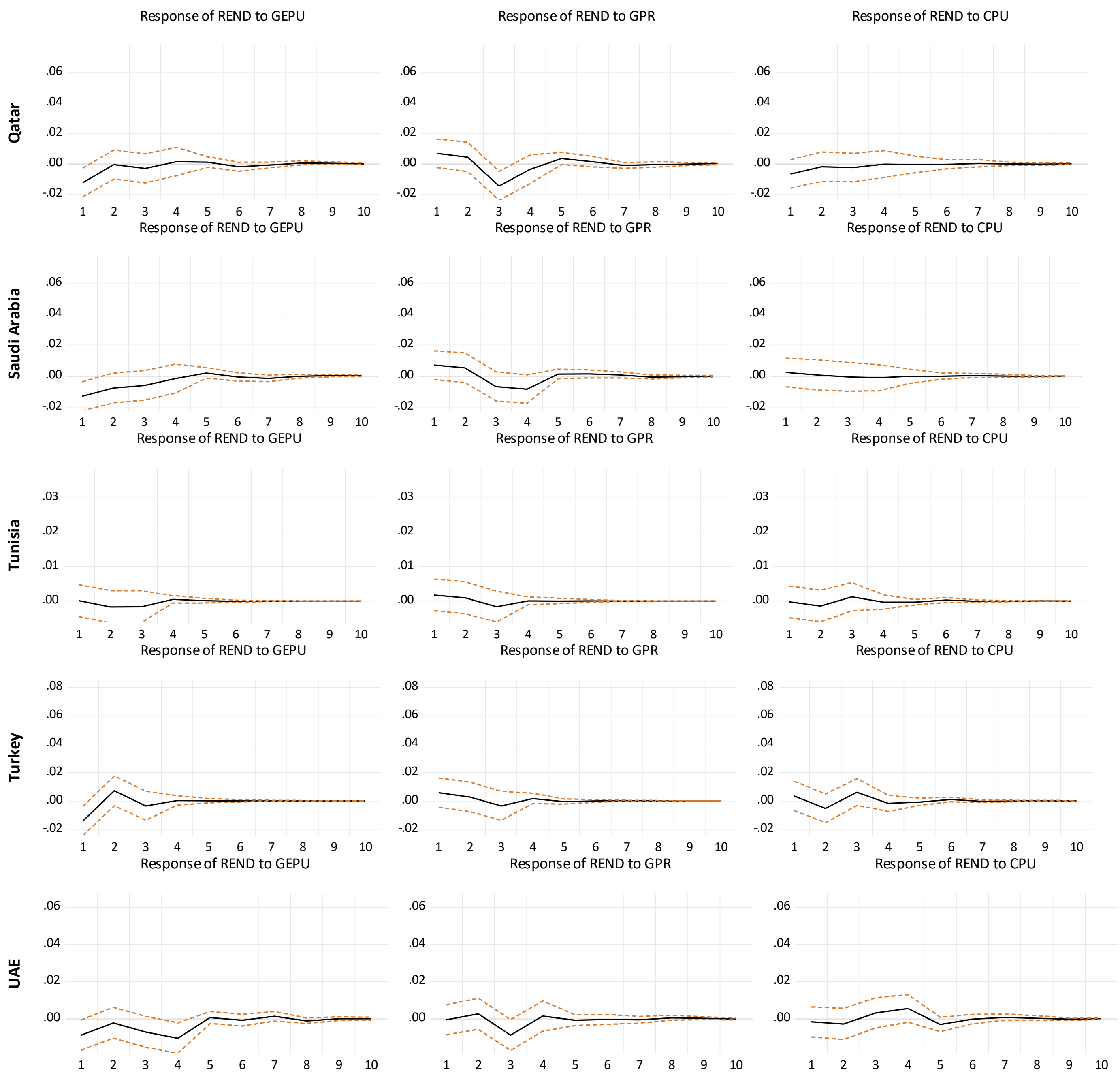


Figure 2: Responses of stock returns to structural shocks

5.2. Variance decomposition – Stock returns :

Variance decomposition analysis (Table 3) allows us to assess the relative contribution of different types of uncertainty – economic (GEPU), geopolitical (GPR) and climate (CPU) to the variation in stock market returns in ten countries in the MENA region. At the first horizon (t=1), shocks related to global economic uncertainty (GEPU) explain a significant share of the variance in returns in some countries such as Oman (3.66%), Turkey (3.11%), Saudi Arabia (3.32%), the United Arab Emirates (2.03%) and Qatar (2.95%), while their influence remains marginal in Tunisia (0.0014%), Lebanon (0.0085%), Morocco (0.77%) or Jordan

(1.69%). As the time horizon lengthens, this contribution gradually increases. At the ten-month horizon (t=10), the GEPU share reaches 5.63% in the United Arab Emirates, 4.99% in Saudi Arabia, 4.42% in Tunisia, 4.30% in Oman and approximately 3.33% in Jordan. This indicates a growing influence of global economic uncertainty on the region's stock markets.

In contrast, the contribution of geopolitical shocks (GPR) remains relatively stable and modest in most countries. It exceeds 5% only in Qatar (5.40%) and Lebanon (3.68%), but remains below 2% in countries such as Tunisia (0.52%), Turkey (0.87%) or Egypt (1.76%). As for climate policy uncertainty (CPU), its effects are generally very low: it reaches a maximum of 4.73% in Jordan, 3.58% in Oman, and fluctuates around 1% or less in most other markets.

Overall, these results confirm that global economic uncertainty is the predominant factor in explaining stock return variations in the MENA region, while geopolitical and climate shocks exert a more limited influence. These observations are consistent with previously obtained impulse responses, and suggest a heightened sensitivity of the region’s financial markets to global macroeconomic dynamics rather than to specific geopolitical or environmental risks.

Table 3: Variance decomposition

	Schoks	**Tunisia**	**Oman**	**Jordan**	**Turkey**	**Egypt**	**Lebanon**	**Marocco**	**Qatar**	**Saudi Arabia**	**UAE**
t=1	**GEPU**	0.001443	3.663604	1.690370	3.108425	1.225936	0.008451	0.771672	2.946569	3.317682	2.031902
	GPR	0.253070	0.008728	0.417627	0.525596	0.192321	0.004246	0.001284	0.898660	0.956953	0.010870
	CPU	0.003659	0.741699	0.028538	0.192522	0.117995	0.005702	0.135215	0.872945	0.105638	0.076654
	Stock return	99.74183	95.58597	97.86347	96.17346	98.46375	99.98160	99.09183	95.28183	95.61973	97.88057
t=2	**GEPU**	0.219984	3.635230	2.535048	3.857879	2.260257	1.558130	0.829988	2.907741	4.331795	2.082330
	GPR	0.314595	0.014345	0.654430	0.640086	1.709573	0.957330	0.138716	1.235589	1.448929	0.180183
	CPU	0.168784	2.040208	0.783430	0.620037	0.245837	0.322580	0.133496	0.933606	0.111318	0.276051
	Stock return	99.29664	94.31022	96.02709	94.88200	95.78433	97.16196	98.89780	94.92306	94.10796	97.46144
t=3	**GEPU**	0.423961	3.598836	2.525018	4.005501	2.548157	1.526645	0.806380	2.962620	4.920795	3.168590

	GPR	0.516723	2.226477	1.407195	0.824060	1.751424	1.291546	2.919396	4.998616	2.252112	2.030523
	CPU	0.293897	3.234214	3.762132	1.192715	0.619563	1.713801	0.461776	1.015140	0.114364	0.485469
	Stock return	98.76542	90.94047	92.30566	93.97772	95.08086	95.46801	95.81245	91.02362	92.71273	94.31542
t=4	**GEPU**	0.442118	4.324014	2.456951	4.002756	2.623607	1.637655	2.646653	2.948320	4.882511	5.569680
	GPR	0.516893	2.447372	1.868542	0.866454	1.761362	1.551151	3.450526	5.164108	3.492528	2.002965
	CPU	0.300124	3.449447	3.831364	1.239232	0.669816	1.688712	0.455839	1.000354	0.135877	1.147913
	Stock return	98.74086	89.77917	91.84314	93.89156	94.94521	95.12248	93.44698	90.88722	91.48908	91.27944
t=5	**GEPU**	0.443411	4.303632	3.142272	4.002311	2.623572	2.917269	2.667701	2.956613	4.949804	5.552899
	GPR	0.516844	2.440088	1.906501	0.870039	1.765257	1.810804	3.587309	5.354427	3.519207	2.009454
	CPU	0.309216	3.435008	4.381355	1.248326	0.669751	2.106153	0.532368	1.002993	0.136085	1.370906
	Stock return	98.73053	89.82127	90.56987	93.87932	94.94142	93.16577	93.21262	90.68597	91.39490	91.06674
t=6	**GEPU**	0.444019	4.416684	3.330258	4.001707	2.629759	2.916007	2.666037	3.023046	4.954137	5.564467
	GPR	0.516936	2.422678	1.931481	0.869908	1.765183	1.810622	3.646297	5.379106	3.550366	2.012289
	CPU	0.315577	3.559336	4.559841	1.263357	0.673977	2.136194	0.828299	1.005754	0.136441	1.371303
	Stock return	98.72347	89.60130	90.17842	93.86503	94.93108	93.13718	92.85937	90.59209	91.35906	91.05194

t=7	**GEPU**	0.444019	4.424722	3.329092	4.001632	2.630129	2.955385	2.818158	3.032433	4.990729	5.597326
	GPR	0.516935	2.423319	1.940698	0.870012	1.765256	1.826393	3.648008	5.396646	3.555184	2.020633
	CPU	0.315780	3.566213	4.579656	1.265079	0.674953	2.153981	0.864687	1.005456	0.138305	1.383877
	Stock return	98.72327	89.58575	90.15055	93.86328	94.92966	93.06424	92.66915	90.56547	91.31578	90.99816
t=8	**GEPU**	0.444019	4.422455	3.326406	4.001660	2.630229	2.961335	2.822707	3.036203	4.990619	5.625493
	GPR	0.516969	2.450281	1.942425	0.870035	1.765352	1.838200	3.676300	5.401671	3.561926	2.025254
	CPU	0.316013	3.568676	4.708458	1.265217	0.674952	2.161957	0.914512	1.005701	0.138371	1.384992
	Stock return	98.72300	89.55859	90.02271	93.86309	94.92947	93.03851	92.58648	90.55642	91.30908	90.96426
t=9	**GEPU**	0.444021	4.424223	3.325956	4.001657	2.630283	2.976798	2.827681	3.038163	4.991538	5.625354
	GPR	0.516973	2.449870	1.949879	0.870033	1.765353	1.860501	3.676518	5.402153	3.564854	2.025955
	CPU	0.316167	3.573972	4.718569	1.265589	0.675022	2.205730	0.922702	1.007072	0.139149	1.386382
	Stock return	98.72284	89.55194	90.00560	93.86272	94.92934	92.95697	92.57310	90.55261	91.30446	90.96231
t=10	**GEPU**	0.444021	4.425167	3.325646	4.001655	2.630283	2.976616	2.840818	3.038507	4.992134	5.625211
	GPR	0.516973	2.449955	1.950876	0.870032	1.765356	1.861710	3.676235	5.402234	3.564987	2.027050
	CPU	0.316175	3.575317	4.732646	1.265654	0.675039	2.218799	0.926144	1.007112	0.139183	1.386404

Stock return	98.72283	89.54956	89.99083	93.86266	94.92932	92.94287	92.55680	90.55215	91.30370	90.96134

6. Conclusion

In a global environment marked by increasing economic, geopolitical and environmental uncertainties, this study aimed to empirically analyze the effect of three major sources of uncertainty – global economic policy uncertainty (GEPU), geopolitical risk (GPR) and climate policy uncertainty (CPU) – on stock market returns of the main countries in the MENA region. By mobilizing a structural vector autoregressive (SVAR) model on monthly data from January 2003 to August 2023, we were able to identify the transmission dynamics and the differentiated effects of these exogenous shocks on the region's financial markets. The results show that uncertainty shocks related to global economic policy have significant negative effects on stock market returns in most countries in the region, with the notable exceptions of Lebanon, Morocco, and Tunisia, which appear relatively less sensitive to these disruptions. In contrast, shocks related to geopolitical risk do not have significant effects on MENA stock markets, which could reflect some structural resilience or an integrated anticipation of these risks by market participants. As for uncertainty related to climate policy, it is starting to produce measurable effects in some countries, particularly those whose economies are heavily dependent on fossil fuels or engaged in environmental transition policies. This research makes an original contribution to the literature by providing a joint and dynamic assessment of several sources of global uncertainty in a region that has been little studied in this context. It also highlights the growing importance of climate issues in the stability of emerging financial markets, and thus provides useful elements for public decision makers, regulatory authorities and investors wishing to better integrate global risks into their strategies. However, this study is not without limitations. First, the SVAR approach relies on assumptions of linearity and stability of relationships between variables, which may limit the model's ability to capture asymmetric or nonlinear effects, particularly in times of crisis. Second, although the GEPU, GPR, and CPU indices are widely used, they remain approximations of the concept of uncertainty and may not perfectly reflect the reality perceived by economic actors in each country. Furthermore, the analysis aggregates stock returns at the national level without taking into account the sectoral structure of financial markets, which could mask differentiated internal dynamics. Finally, the study remains limited to contemporary and short- to medium-term effects, without exploring long-term impacts or potential interactions between different forms of uncertainty. These limitations open several avenues for future research, including the exploration of nonlinear models (such as TVP-VAR models or regime-switching approaches), the integration of additional financial variables (such as volatility or capital flows), or the use of higher-frequency data to better capture the immediate responses of markets to uncertainty shocks.

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