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Unraveling the causal relationship between inflation uncertainty and rates of inflation in GCC countries: Evidence from a mixture of causal (linear) relationships models, and (causal inference with panel data)

Abstract

This study investigates the links between rising inflationary pressures and monetary policy uncertainty (Inflation Uncertainty) in the GCC economies. After discovering cross-sectional dependency among the countries as an index of their reciprocal developmental traits, we used the bootstrap panel Granger causality approach. Individual nation research reveals that only KSA has a bidirectional correlation between high global inflation rate pressures and economic policy uncertainty, whereas Bahrain has no causality. The United Arab Emirates and Qatar exhibit bidirectional causality between high global inflation rate pressures and domestic economic policy uncertainties. Domestic economic policy uncertainty has no bearing on KSA's high global inflation rate pressures; thus, there is a one-way causality from high global inflation rate pressures to domestic economic policy uncertainty in KSA. Overall, economic policy uncertainty influences high global inflation rate pressures in these nations, while high global inflation rate pressures and domestic economic policy uncertainty mutually impact each other. Overall, the GCC countries would benefit from an augmented Taylor rule that includes financial stability as an extra monetary policy aim. It is necessary to make a more general adjustment in the model dynamics underlying the shock transmission mechanism. JEL Classification Code: ECM, PNARDL, PVAR, Eviews12, ARDL, NCSS12

Keywords: the inflation rate, inflation uncertainty, economic policy uncertainty, linear causal, panel granger causality, GCC countries

Volume 8 Issue 2 - 2024

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Received: December 11, 2023 | **Published:** March 19, 2024

Introduction

The COVID-19 pandemic has had a severe impact on the world economy, particularly on economies that export commodities with fluctuating pricing.[1] The COVID-19 epidemic, combined with a drop in worldwide demand for oil and its pricing, hit the GCC countries with a health catastrophe and a shock that rattled commodities markets. The COVID-19 pandemic, which has resulted in approximately 175 million cases of the virus and 3.7 million deaths worldwide (Bank 2022), has affected the Gulf Cooperation Council countries with approximately 1.7 million infections, but deaths have been less than 12,600 as of mid-April 2021 among a population of 58.7 million people[2] With global oil consumption expected to fall by 5% in 2020 due to stagnant global economic activity and a 29% decline in oil prices, OPEC member nations were compelled to cut crude oil production by 1.3 million barrels per day in 2020, down from 17.5 million barrels per day in 2019. In 2019. The Russian assault on Ukraine added fresh crises to the mix, causing supply chains to be disrupted and inflation rates to soar, affecting measures of economic policy uncertainty.

In emerging markets, high or chronic inflation is sometimes regarded as a phenomenon. It also happens when there is widespread fear about inflation. This year, rising inflation was a key theme. Inflation has been driven by supply and demand forces in many countries, which are frequently exacerbated by external shocks or non-economic reasons. On the demand side, this is primarily due to excess consumption as a result of extremely accommodating monetary and fiscal policies in advanced economies. On the supply side, supply chain bottlenecks, restricted labor markets, and continuing underinvestment in fossil fuel extraction will have a detrimental impact. The war in Ukraine has recently exacerbated supply-side limitations, resulting in increased energy and commodities prices in early 2022.

Because of the growing interdependence of numerous economies, the world is currently characterized by increased economic policy uncertainty. Sudden or anticipated changes in macroeconomic policy, both at home and abroad, can interrupt macroeconomic activity, causing decision-making delays and raising risk. When the course of such macroeconomic measures is unknown, both domestic and foreign decision-making may become more complicated. It is critical to comprehend the underlying source of uncertainty spillover into the macroeconomy. Thus, the overarching goal of this research is to investigate the causal connections between high global inflation rate pressures and economic policy uncertainty in the GCC economies. (Kingdom of Saudi Arabia, UAE, State of Qatar, Kingdom of Bahrain, Sultanate of Oman, and Kuwait).

The study employs a variety of approaches and models related to measuring causal relationships (linear), such as (the Granger Causality Test), to measure and interpret the type of causal relationships between economic policy uncertainty and the rate of inflation in the Gulf Cooperation Council, an important economic bloc in our world and influential in the global economy. The relationship between economic

policy uncertainty and high rates of global inflation is revisited in this research. It reproduces the expected consequence of a positive association. The higher the inflation rate, the greater the sense of policy uncertainty. Inflation rate volatility affects economic activity, causing macroeconomic policy changes and a sense of anxiety. On these grounds, we examine the following hypotheses. This is accomplished through the use of a variety of causal relationship models:

Null Hypothesis (H0): There is no significant causal relationship between (INF) and (EPU). In each country separately in the GCC countries.

Hypothesis 1 (H1): There is a significant causal relationship between (INF) and (EPU). In each country separately in the GCC countries.

Null Hypothesis (H0): There is no significant causal relationship between (INF) and (EPU). In all the GCC countries.

Hypothesis 1 (H1): There is a significant causal relationship between (INF) and (EPU). In all the GCC countries.

The remainder of this study is structured as follows: Following that, we provide a brief overview of GCC economies, review relevant literature in the "Literature Review" section, present the econometric models and data used in our analysis in the "Data and Methodology" section, interpret the results obtained in the "Empirical Results" section, present policy implications of our findings in the "Policy Implications" section, and finally present conclusions and recommendations in the "Conclusion" section. The working hypothesis is that groups of nations with comparable political and economic backgrounds, structure, and social composition between 1992 and 2022 will be characterized by the same causal link between inflation and inflation uncertainty. This hypothesis is partially supported by empirical evidence.

The rest of the paper is organized as follows. Section 2 discusses and identifies the GCC economies in Brief. It discusses the extent of the openness of these countries which in itself explains why their price levels depend on their trading partners' price level and high inflation rates. It identifies other factors besides economic policy uncertainty and high rates of inflation. Empirical methodology, data, and the definition of the variables used in this paper are discussed in Section 3. In empirical estimation, the Granger causality test and Panel Granger Causality, and relevant variables are in logarithm form and as a result, parameter estimates provide estimates (determinants) of the domestic inflation in the GCC economies. Section 4 presents empirical results and Section 5 concludes the paper with a summary of results and policy implications.

Literature review

The GCC economies in brief

The Gulf Cooperation Council (GCC) consists of six Middle Eastern countries: Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman. The GCC was founded in May 1981 in Riyadh, Saudi Arabia. The GCC's goal is to achieve unity among its members based on shared goals and similar political and cultural identities rooted in Arab and Islamic traditions. The council's presidency is rotated on an annual basis.

The GCC countries have an abundance of natural resources. Oil and natural gas revenues are important components of national income, accounting for up to 50% of GDP, export profits, and fiscal earnings in 2019.[3] The region's economic and social structures have seen considerable modifications since the discovery of oil in the early twentieth century. The region's physical, cultural, and demographic aspects were altered by the oil boom of the 1970s. As a result, advances in physical infrastructure, education, and healthcare have resulted in rapid economic development.[4] The Gulf States have made considerable investments in modern infrastructure, communication, education, healthcare, transportation, and government institutions with a seemingly limitless source of petrodollars.[5]

High inflation rates

Regardless of the price index investigated, inflation volatility has been trending downward in advanced economies since the mid-1980s and downward in emerging market and developing economies (EMDEs) since the mid-1990.[6] In recent decades, a variety of structural factors have led to decreased inflation. These variables appear to have lowered inflation and altered inflation's sensitivity to global and domestic shocks.[7]

Economic policy uncertainty and high rates of global inflation

Regardless of the price index used, inflation volatility has been decreasing in advanced economies since the mid-1980s, and in emerging markets and developing economies (EMDEs) since the mid-1990s.[5] In recent decades, a number of structural variables have helped to reduce inflation. These qualities appear to have decreased inflation and changed its vulnerability to global and domestic shocks.[8] We discovered that an increase in EPU has a long-term negative impact on stock returns that interacts with changes in oil prices, as well as a delayed positive effect on volatility.[9–11] These research focused on economic downturns in EPU and their impact on corporate financing decisions. Previous study has revealed that firms adopt a more conservative strategy in high EPU economies due to high borrowing costs.[12,13] As a result, firms cut their capital expenditures.[14] A study investigates the relationship between degrees of uncertainty in the European Union region. An increase in EPU implies that firms are less.[15]

The extensive research on the relationship between inflation and inflation uncertainty extends back more than 30 years, when Okun,[16] found a positive relationship between inflation rate and inflation variability in 17 OECD nations. Following that, Friedman's Nobel talk,[17]on the true effects of inflation sparked a major debate in the literature. Friedman hypothesized that an increase in inflation would increase uncertainty about inflation, which Ball later developed and demonstrated.[18] Investigated the relationship between inflation and inflation uncertainty, discovering that high inflation reduces inflation uncertainty.[19,20] Examining the other causal relationship, that the inflation rate is determined by inflation uncertainty Cukierman and Meltzer,[21] revealed evidence for the theory that when there is uncertainty about future inflation increases, inflation rates rise. Holland,[22] discovered the same causation, but with a negative correlation between the variables.

Inflationary uncertainty has two economic consequences. First, inflation uncertainty influences enterprises and consumers to make different economic decisions than they would otherwise. Analysts refer to these ramifications as ex-ante since they forecast future inflation. The second type of influence occurs after a decision has been made, often known as ex-post. These repercussions occur when inflation deviates from expectations. Ex ante consequences. Inflationary uncertainty can have an ex ante impact on the economy through three channels. First, rising long-term interest rates are a result of inflationary concerns in financial markets. Second, anxiety over inflation puts doubt on other factors influencing economic decisions. Finally, the unpredictable nature of inflation forces enterprises to invest resources to mitigate associated risks.[23]

Data and methodology

Data

We use annual time series data from 1992 to 2022 for each GCC country to determine the causal relationship between inflation uncertainty and high rates of inflation. Baker et al.,[24] established the EPU indices. We use historical data for the Kingdom of Saudi Arabia, the United Arab Emirates, the State of Qatar, the Kingdom of Bahrain, the Sultanate of Oman, and Kuwait to calculate the degrees of domestic EPU in their respective economies.

The (TEPU) index is the sum of the (EPU) indices of six nations, weighted by their relative shares of current-price GDP. The Kingdom of Saudi Arabia, the United Arab Emirates, the State of Qatar, the Kingdom of Bahrain, the Sultanate of Oman, and Kuwait are the six countries. Davis,[25] constructed a GDP-weighted average of their EPU indices for each month in three steps: First, each national (EPU) index was renormalized to a mean of 100; second, a regression-based method was used to assign missing values to affected countries in order to generate a balanced panel of (EPU) indices; and third, GDP data from the IMF's World Economic Outlook Database were used to compute the GDP-weighted average of the (EPU) indices, yielding the annual (TEPU) index for each country. Except for the policy uncertainty indexes, all data came from the Bloomberg terminal. The data set includes 30 observations spanning the years July 1992 to 2022. Natural logarithms are used to express all 30-time series. The statistics of the data are shown in Table 1. Table 1's Panel A provides summary data for all variables included in the study.

The EPU index data is based on the frequency of policy-related economic concerns being covered in the press, which serves as a proxy for monetary-policy-related economic uncertainty (Inflation Uncertainty). There are numerous uncertainty measures for industrialized economies, but little is mentioned about emerging and developing economies since EPU indices for developing countries are limited in time scope. http://www.policyuncertainty.com produces the EPU index, which provides a scaled measure of the appearance of uncertainty in economic news. From 1992 to 2022, the world witnessed many sorts of regional and worldwide financial crises, such as the 2007-2009 global financial crises, the second Gulf War 1990-1992, the 2010 European debt crisis, the 2020 Corona pandemic, and Russia's war on Ukraine 2022 (Table 1).

Table 1 Summary statistics for the uncertainty variable in the GCC countries

	Mean	SD	Skewness	Kurtosis	Jarque–Bera
EPUKSA	8.9653	0.2697	1.0505	4.3581	23.17*** (0.000)
EPUKW	8.9267	0.2686	0.9935	3.0787	18. 63*** (0.000)
EPUQAT	9.0882	0.2252	− 0.3512	2.8836	14.16*** (0.000)
EPUUAE	8.196	0.2726	− 0.1802	1.5654	18.22*** (0.000)
EPUOM	8.676	0.2134	0.3409	5.0888	13.27*** (0.000)
EPUBH	7.3431	0.28	0.7003	2.3053	12.29*** (0.000)
TEPU	6.2608	0.251	0.7874	3.5871	30.65*** (0.000)

Source: Prepared by the researcher from the outputs of the E-views13 package.

The p values for the Jaque-Bera test are indicated in parentheses. TEPU = Uncertainty in the GCC countries' overall economic policy; (EPUKSA, EPUKW, EPUQAT, EPUUAE, EPUOM, and EPUBH) = each country separately. * Indicates rejection of the null of normalcy at a 10% level of significance; ** indicates rejection at a 5% level of significance; and *** shows rejection at a 1% level of significance.

The movement of the Global Economic Policy Uncertainty Index is depicted in Figure 1. Where we see a consistent volatility in the movement of the index during the study period, with the index rising at times and falling at others. We can easily see the impact of economic crises and conflicts on the index's movement.

The movement of the Inflation Uncertainty in the GCC Economics index is depicted in Figures 2–7. Where we see a consistent volatility in the movement of the index during the study period, with the index rising at times and falling at others. We can easily see the impact of economic crises and conflicts on the index's movement (Figures 2–7).

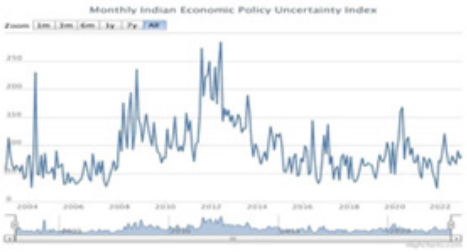

Figure 1 Economic policy uncertainty index.

Source: https://www.policyuncertainty.com/

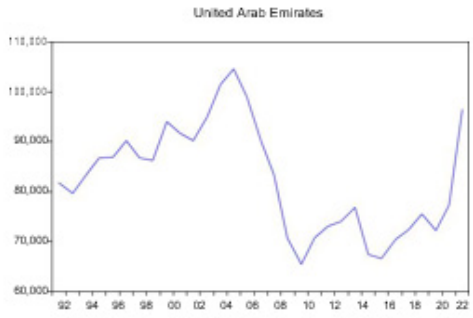

Figure 2 Inflation uncertainty AUE.

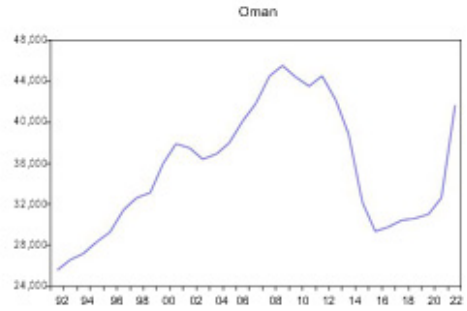

Figure 3 Inflation uncertainty Oman.

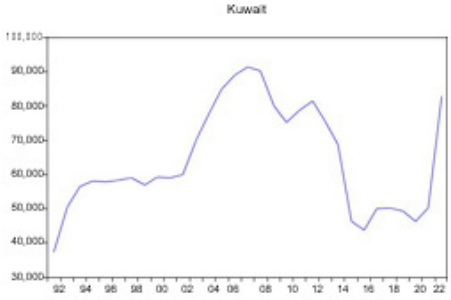

Figure 4 Inflation uncertainty Kuwait.

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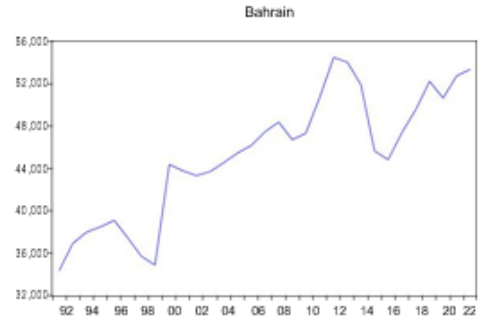

Figure 5 Inflation uncertainty Bahrain.

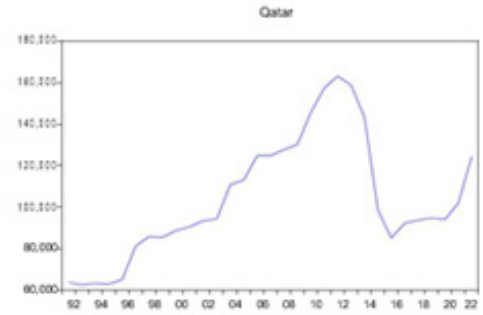

Figure 6 Inflation uncertainty Qatar.

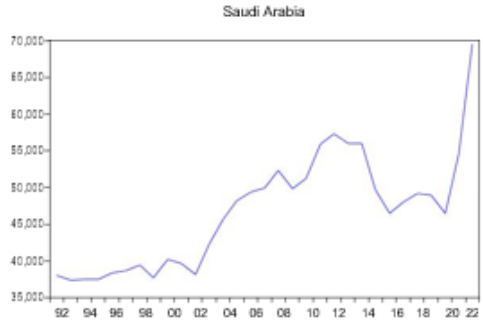

Figure 7 Inflation uncertainty KSA.

Unconditional linear correlation

Table 2 shows the findings of a preliminary analysis of the movement between the EPU pairs by analyzing the unconditional correlation between the pairs. The results demonstrate that all of the pairings' correlation coefficients are positive, showing that the EPUs travel in the same direction in pairs. The data also show a substantial link between the AUE-KW pair and the KSA-QATAR pair, with a modest association between the BH-OM pair.

Table 2 Unconditional linear correlation

	EPU_{KSA}	EPU_{KW}	EPU_{QAT}	EPU_{UAE}	EPU_{OM}	EPU_{BH}
EPU_{KSA}	1					
EPU_{KW}	0.003	1				
EPU_{QAT}	0.004	0.041	1			
EPU_{UAE}	0.008	0.002	0.007	1		
EPU_{OM}	0.006	0.009	0.001	0.002	1	
EPU_{BH}	0.007	0.006	0.004	0.003	0.015	1

Source: Prepared by the researcher from the outputs of the E-views13 package.

Granger causality test 1969

Wiener-Granger proposed the first time series causal impact measurement notation. A causal influence of one time series on another can be determined if the forecast of one time series can be improved by incorporating knowledge from the second. Granger used this notation in the context of the linear vector auto-regression VAR model of stochastic processes.[26,27] The variance of the prediction error is utilized in the AR model to test prediction improvement. Assume two time series; if the inclusion of past measurements from the second time series reduces the variance of the first time series' autoregressive prediction error in the present, one can argue that the second time series has a lower variance.

Granger causality is a causality concept derived from the idea that causes do not always occur after effects and that if one variable is the cause of another, knowing the status of the cause at an earlier point in time can help predict the effect at a later point in time.[28,29] To reveal underlying mechanisms utilizing Granger causality, the VAR model has been frequently used in econometric analysis Granger & Newbold,[30] and neuroscience.[31]

The Granger causality test is carried out. Granger causality,[32] is an econometrics concept that focuses on understanding the correlations between two time series. According to Granger,[31] causality is defined in terms of predictability, based on the notion that the effect cannot precede the cause. Following that, Goebel used Granger causality to describe interregional connection in fMRI data as well as to discover the direction of information flow between brain regions. The VAR model for time series data was created by following the procedures below: Individual variable stationarity is examined. The lag is calculated using lag-length selection criteria. A VAR model with adequate lags is constructed. The Lagrange test is used to determine residual autocorrelation.

Formally, consider a k-dimensional multivariate time series yet

$\mathbf{y}_t = [\, y_{1t}\, y_{2t\ldots}\ \ y_{kt}\,]'$,

Composed of k time series taken at time t. The Granger causality identification is based on the improvement in future value forecasts of the series. yt, utilizing data from a collection of p series past values (yt-1, yt-2,…, yt-p). Hence, consider a k-dimensional vector autoregressive model (VAR) of order p, defined by

$\mathbf{y}_t \ \square\ \mathbf{v} \square \mathbf{A}_1\mathbf{y}_{t-1} \square \mathbf{A}_2\mathbf{y}_{t-2} \square \ldots \square \mathbf{A}_p\mathbf{y}_{t-p} \square \mathbf{u}_t$,

where ut is an error vector of random variables with zero mean and covariance matrix **Σ** provided by

$$\mathbf{\Sigma} = \acute{\mathbf{O}} = \begin{bmatrix} \sigma_{11}^2 & \sigma_{21} & \cdots & \sigma_{k1} \\ \sigma_{12} & \sigma_{22}^2 & \cdots & \sigma_{k2} \\ \sigma_{13} & \sigma_{23} & \cdots & \sigma_{k3} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{1k} & \sigma_{2k} & \cdots & \sigma_{kk}^2 \end{bmatrix}$$

and v and Ai (i=1,2,...,p) are coefficient matrices given by

The VAR model makes it simple to identify Granger causality. The VAR model shows that the series yjt does not produce ylt if and only if the coefficient ajli=0 for any i. In other words, pre
vious yjt values help anticipate future ylt values. As a result, Granger causalities can be found by searching for the VAR representation, and the direction of causality can be understood as the direction of information flow. Furthermore, Granger causality relationship is not necessarily reciprocal, for example, yjt may Granger cause the signal

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ylt, without any implication that ylt Granger causes yjt. In practice, we use a truncated wavelet expansion, given by

$$a_{lmi}(t) = c_{-1,0}^{(i)}\varphi(t) + \sum_{j=0}^{J}\sum_{k=0}^{2^j-1} c_{j,k}^{(i)}\psi_{jk}(t)$$

$$y_t = a_1 + \sum_{i=1}^{n}\beta_i x_{t-i} + \sum_{j=1}^{m}\gamma_j y_{t-j} + e_{1t}$$

$$x_t = a_2 + \sum_{i=1}^{n}\theta_i x_{t-i} + \sum_{j=1}^{m}\delta_j y_{t-j} + e_{2t}$$

$$y_t = a_1 + \sum_{j=1}^{m}\gamma_j y_{t-j} + e_{1t}$$

$$y_t = a_1 + \sum_{(i=1)}^{n}\beta_i x_{(t-i)} + \sum_{(j=1)}^{m}\gamma_j y_{(t-j)} + e_1 t$$

$$H_0: \sum_{i=1}^{n}\beta_i = 0 \text{ or } x_t \text{ does not cause } y_t$$

$$H_1: \sum_{i=1}^{n}\beta_i \neq 0 \text{ or } x_t \text{ does cause } y_t$$

$$F = \frac{\left(RSS_R - RSS_U\right)/m}{RSS_U/\left(n-k\right)}$$

Panel granger causality

The fundamental difficulty for statistical analysis in the social sciences has been how to make causal conclusions from nonexperimental data for nearly half a century.[33] For almost as long, there has been universal agreement that longitudinal data is the best type of nonexperimental data for generating causal inferences. Unfortunately, there hasn't been nearly as much agreement on the best ways to analyze such data. The literature on longitudinal data analysis is far too extensive for a thorough examination in this paper, but here are some of the key concepts.

Predictive (Granger) causality and feedback are critical components of applied time-series and longitudinal panel-data analysis. Granger,[31] created a statistical concept of causation between two or more time-series variables, according to which a variable x "Granger-causes" a variable y if the variable y can be better predicted using both x and y's previous values rather than just y's past values. The concept of "Granger causality" has found widespread use in economics, medicine, chemistry, physics, biology, engineering, and other disciplines. Granger causality is also beneficial when the data contains many time series, as in panel data. Methods for assessing Granger causality using panel-data models have received a lot of attention and are commonly available in conventional econometric software. The generalized method of moments (GMM) approach of Holtz-Eakin, Newey, and Rosen,[34] which is applicable to homogeneous panels with a few time-series observations (T), and the methods of Dumitrescu and Hurlin[35] and Emirmahmutoglu and Kose,[36] which are applicable to heterogeneous, large-T panels, are two prominent examples. Abrigo and Love[37] implemented the GMM methodology of Holtz-Eakin, Newey, and Rosen[38] in Stata with the command PVAR granger, but the method of Dumitrescu and Hurlin[39] is available in both views and Stata; see, for example, the command xtgcause by Lopez and Weber.[40]

Econometric strategy, (Empirical Results)

Modeling the relationship between inflation uncertainty and rates of inflation in GCC countries

The stationarity of the data series was verified using the ADF, PP, and KPSS tests to model the link between inflation and inflation uncertainty. Following the stationarity test, we provided the calculated CPI and inflation uncertainty equations. The Granger-causality test was used to determine whether there is a link between inflation and inflation uncertainty. Finally, the sign of the association between the two variables was determined using a VAR model.

Testing the series stationarity

The stationarity of the time series for each country was tested in the first stage. The stationarity tests used include the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, when the null hypothesis is non-stationarity, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, if the null hypothesis is stationarity. Following the application of these tests, the results presented in Table 3 were obtained.

Table 3 Unit root tests

Country	ADF	PP	KPSS
Saudi Arabia	−11.54	−12.06	0.94
The UAE	−6.19	−15.57	0.65
Qatar	−4.44	−19.32	0.57
Bahrain	−2.37	−12.37	1.43
Kuwait	−7.32	−18.18	0.87
Oman	−2.52	−11.97	1.95

Source: Prepared by the researcher from the outputs of the E-views13 package.

Econometric equations for inflation in GCC economics

The AR(p) models were calculated to simulate inflation for the countries under study, where p is the order of the auto-regression models and ranges between 1 and 12. Table 4 shows the outcomes of the data processing.

VAR granger causality approach in GCC economics

Table 5 shows the value of the statistics F and the probability associated with it as utilized in the Granger test. These findings demonstrate the presence or absence of a strong relationship between inflation and inflation uncertainty. Table 5 shows the sign of the link between inflation and inflation uncertainty, whether positive or negative, for 3, 6, 9, and 12 delays. A VAR model with inflation and conditional variances was used to identify the sign. For all GCC economies, the study found a positive link between inflation and inflation uncertainty. For these countries, neither the Friedman-Ball nor the Pourgerami and Maskus theories were confirmed.

Panel granger causality

Panel unit root tests

We use the Im-Pesaran and Shin test and the Fisher-type tests proposed by Choi which are based on the Phillips-Perron tests to test for the stationarity of our lnEPUGCC and lnINFGCC variables prior to the Granger causality analysis. The null hypothesis in both tests is that all panels (i.e. all countries) in the sample contain a unit root. This hypothesis is tested against an alternative hypothesis that there is a positive share of stationary panels (as in the Im-Pesaran-Shin test) or that at least one of the panels is stationary (as in the Fisher-type tests).

The results of the two tests are shown in Table 6. Both do not reject the null hypothesis of lnEPUGCC non-stationarity, but they do reject it with respect to lnINFGCC. In this regard, the Phillips-Perron test always rejects H0, whereas the Im-Pesaran-Shin test rejects the null only when the number of lags is 1 or 2. We use them as a guideline, however, because when we use the Akaike Information Criterion

(AIC) to determine the best number of lags, we discover that it falls between 1 and 2 for both variables (1.9 for lnINFGCC and 2.1 for lnEPUGCC). When the two variables are assessed in first differences, the tests always reject the null hypothesis.

Table 4 Econometric equations for inflation and inflation uncertainty in GCC

Country	Lags	SIC	AIC	Econometric Equation Modeling
Saudi Arabia	1,3,6,9	7.52	7.59	$\pi_t = \underset{(3.49)}{7.22} + \underset{(9.74)}{0.53}\pi_{t-1} - \underset{(-3.56)}{0.19}\pi_{t-2} + \underset{(6.49)}{0.26}\pi_{t-3} + \underset{(2.95)}{0.06}\pi_{t-6}$
The UAE	1,4,8,12	6.99	7.06	$\pi_t = \underset{(1.45)}{5.5} + \underset{(3.58)}{0.15}\pi_{t-1} - \underset{(-3.56)}{0.019}\pi_{t-4} + \underset{(32.48)}{0.1}\pi_{t-8} + \underset{(11.56)}{0.51}\pi_{t-12}$
Qatar	1, 3, 12	6.68	6.74	$\pi_t = \underset{(2.25)}{4.19} + \underset{(4.68)}{0.27}\pi_{t-1} - \underset{(3.13)}{0.15}\pi_{t-2} + \underset{(32.48)}{0.31}\pi_{t-12}$
Bahrain	1, 3, 6, 12	7.59	7,67	$\pi_t = \underset{(3.31)}{4.98} + \underset{(7.33)}{0.40}\pi_{t-1} - \underset{(-2.84)}{0.1}\pi_{t-3} + \underset{(3.66)}{0.11}\pi_{t-6} + \underset{(4.42)}{0.09}\pi_{t-12}$
Kuwait	3,6,12	6.56	6.61	$\pi_t = \underset{(4.65)}{2.52} - \underset{(-3.22)}{0.18}\pi_{t-3} + \underset{(2.80)}{0.16}\pi_{t-6} + \underset{(5.02)}{0.29}\pi_{t-12}$
Oman	1, 12	7.18	7.22	$\pi_t = \underset{(2.40)}{28.72} + \underset{(7.22)}{0.41}\pi_{t-1} + \underset{(2.01)}{0.09}\pi_{t-6}$

Source: Prepared by the researcher from the outputs of the E-views13 package.

Table 5 VAR granger causality

Country	Null hypothesis	3 lags	6 lags	9 lags	12 lags
Saudi Arabia	Inflation does not Granger Cause Inflation Uncertainty	174.2	1843.7	1926.6	1977.8
		0	0	0	0
		(+)	(+)	(−)	(−)
	Inflation Uncertainty does not Granger Cause Inflation	65.1	78.9	112.7	147.2
		0	0	0	0
		(+)	(−)	(−)	(−)
The UAE	Inflation does not Granger Cause Inflation Uncertainty	354.8	4854.6	4215.7	7892.2
		0	0	0	0
		(+)	(+)	(+)	(+)
	Inflation Uncertainty does not Granger Cause Inflation	29.8	33.9	56.8	74.1
		0	0	0	0
		(+)	(−)	(−)	(−)
Qatar	Inflation does not Granger Cause Inflation Uncertainty	5.9	7.6	6.9	13.8
		0	-0.1	-0.53	-0.31
		(+)	(+)	(+)	(+)
	Inflation Uncertainty does not Granger Cause Inflation	5.6	6.9	13.9	13.9
		0	-0.1	-0.08	-0.3
		(+)	(+)	(+)	(+)
Bahrain	Inflation does not Granger Cause Inflation Uncertainty	21.4	27	33	37.2
		0	0	0	0
		(+)	(+)	(+)	(+)
	Inflation Uncertainty does not Granger Cause Inflation	21.8	29.5	31.8	32
		0	0	0	0
		(+)	(+)	(+)	(+)
Kuwait	Inflation does not Granger Cause Inflation Uncertainty	109.2	205.6	268.2	226
		0	0	0	0
		(+)	(−)	(−)	(−)
	Inflation Uncertainty does not Granger Cause Inflation	13.9	15.3	47.8	61.8
		0	-0.01	0	0
Oman	Inflation does not Granger Cause Inflation Uncertainty	(+)	147.6	152.2	170
		135.1	0	0	0
		(+)	(−)	(−)	(−)
	Inflation Uncertainty does not Granger Cause Inflation	17.2	25.3	52.8	77.8
		(+)	0.01	0	0

Source: Prepared by the researcher from the outputs of the E-views13 package.

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Table 6 Panel unit root test

Im, Pesaran and Shin test				
lags	**lnEPU$_{GCC}$**	**lnINF$_{GCC}$**	**ΔlnEPU$_{GCC}$**	**ΔlnINF$_{GCC}$**
1	-4.0215**	0.789	-21.581**	-12.471**
2	-1.2014*	1.024	-15.258**	-11.247**
3	2.247	0.654	-9.875**	-10.985**
4	2.748	0.541	-14.251**	-5.784**
Fisher-type test (based on Philipps-Perron tests)				
1	-15.258**	-14.257**	-12.251**	-7.251**
2	-9.875**	-7.581**	-11.253**	-5.255**
3	-8.247**	-6.258**	-9.585**	-3.257**
4	-5.985**	-14.25**	-13.278**	-1.258**

Source: Prepared by the researcher from the outputs of the E-views13 package.

Panel granger causality test

Table 7 displays the Granger causality test findings for the entire sample. We examine causality in both directions, first from ln EPUGCC to ln INFGCC and then vice versa. We find that the p-value of the Z statistic is always statistically significant at 5%, allowing us to conclude that there is a causal relationship between growing inflation uncertainty and GCC inflation rates. Instead, when testing for the reverse direction of causality, the statistic is never statistically significant: this suggests that, on average, the accumulation of rates of inflation in the GCC is not driven by inflation uncertainty.

Table 7 Panel Granger causality test

EPU$_{GCC}$ --> INF$_{GCC}$	
Z	8.224
W	18.275**
INF$_{GCC}$ --> EPU$_{GCC}$	
Z	4.257
W	0.375

Source: Prepared by the researcher from the outputs of the E-views13 package.

Policy implications

Uncertainty about the impact of monetary policy is expected to contribute more to inflation uncertainty than uncertainty about monetary policy itself, at least in the short run. Most evidence implies that monetary policy takes six to a year to affect inflation. As a result, a change in monetary policy today will have only a minor impact on inflation projections for the next six months to a year. However, the near-term inflation picture will remain complicated by uncertainties regarding the impact of previous monetary policy initiatives. This explanation is comparable to Ball's formal economic model. Policymakers in Ball's model[18] have diverse views on inflation; some will disinflation while others will not. Because the public is unsure who will govern policy in the future, the public is unsure whether rising inflation will be decreased.

Conclusion

Conclusions, limitations, and future research

This research contributes to the literature by finding a strong relationship between inflation uncertainty and high inflation rates. When inflation uncertainty is strong, inflation rates rise. Inflation uncertainty has a powerful enough influence on major macroeconomic variables to overpower economic, political, and institutional considerations. Theory suggesting a link between monetary policy uncertainty and high inflation rates might be examined further by incorporating the main macroeconomic factors in future studies. The GCC countries' prevalent tendency has been that high inflation has had a favorable influence on inflation uncertainty. The group of nations with early economic reforms is distinguished by the fact that inflationary uncertainty has had a direct impact on inflation. High uncertainty causes low inflation in KSA, QATAR, and AUE. No empirical evidence was discovered to indicate a specific type of behavior regarding the relationship between inflation and its uncertainty for the other set of nations (Oman, Bahrain, and Kuwait), and the countries in this group had varied economic and political patterns between 1992 and 2022. The causality analysis of the relationship between inflation and inflation uncertainty for these groups of countries is a future direction of our research, depending on the monetary strategy adopted by the monetary authorities to ensure price stability: inflation targeting or exchange rate policy. Interest rate hikes in major central banks are anti-economic measures. Therefore, GCC countries' monetary authorities should incorporate financial stability as an additional objective of their monetary policy. And that there is an incomplete pass-through effect of inflation uncertainty on domestic inflation in GCC economics. Our findings provide new insights into the inflation uncertainty to macroeconomic variables pass-through that might be useful to policymakers in GCC economics. The main takeaway from these findings is that financial sector oversight should be handled in a way that encourages a stable and moderate inflation rate. It is critical that governments develop appropriate regulatory regulations, exercise oversight over financial institutions, and competently administer interest rates appropriate for the country's GCC membership. The paper concludes that governments should improve financial market infrastructure and encourage the use of financial services. Improving the breadth of financial institutions and increasing credit accessibility can lead to more financial inclusion, higher investment, and economic growth, all of which can help to prevent inflationary forces and unnecessary credit expansion.

Data availability

The economic policy uncertainty data were supplied by https://www.policyuncertainty.com/about.html and economic policy uncertainty is under license and so cannot be made freely available.

Acknowledgments

None.

Conflicts of interest

Author declared there is no conflicts of interest.

Funding

None.

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