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Unraveling the Causal Relationship between Inflation Uncertainty and Rates of inflation in GCC Countries

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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.

Keywords

The inflation rate, Inflation Uncertainty, economic policy uncertainty, linear Causal, Panel Granger Causality, GCC Countries

JEL Classification Code: C01, C22, C54, B22, E61

1. Introduction

The COVID-19 pandemic has had a severe impact on the world economy, particularly on economies that export commodities with fluctuating pricing (Shehabi, 2022). 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 (World Bank, 2020). 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.

2. 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 (World Bank, Gulf Economic Update, 2019). 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 (ESCWA, 2020). The Gulf States have made considerable investments in modern infrastructure, communication,

education, healthcare, transportation, and government institutions with a seemingly limitless source of petrodollars (Kirk, D, 2015).

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-1990s (Ha, Kose, and Ohnsorge 2019). 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 (ONS, 2022).

Economic Policy Uncertainty and high rates of global inflation:

There is a large literature that discusses the relationship between EPU and macroeconomic indicators (Abdullah, 2020). Granger Causality Tests (GCT) were performed largely to determine whether economic policy uncertainty granger causes GCC stock market returns. According to Vector Autoregression (VAR) study, economic policy uncertainty in the US has a negative response to GCC stock market performance. Arouri (2014) In another work, we estimate various specifications using panel data approaches. We discover that an increase in EPU has a negative effect on stock returns; this effect is durable and interacts with changes in oil prices; and an increase in EPU has a delayed positive effect on volatility. S.-Y. (2018), G. (2019), and S.A. (2019) These research focused on the economic downturns of EPU and the impact of EPU on company financing decisions. Specifically, the findings of previous studies demonstrated that firms choose a more conservative strategy in high EPU economies due to high borrowing costs (G.; Durnev, 2017), (C.E, 2017), and (B.; Pástor, 2016). As a result, torporations spend less on capital (H.; Ion, 2015). A study (Svetlana., R., & Arne., G., 2020) investigates the relationship between the level of uncertainty in the European Union region. An increase in EPU indicates that enterprises are less likely to adopt debt financing options, indicating a negative association between EPU and leverage finance. However, as of the date of submission of this work, I had not come across any research or a scholarly paper that examined the causal relationship between economic policy uncertainty and high worldwide inflation rates.

The substantial body of scholarship on the relationship between inflation and inflation uncertainty stretches back more than 30 years, when (Okun, 1971) discovered a positive relationship between the inflation rate and inflation variability for 17 OECD nations. Following that, Friedman's (1977) Nobel talk on the real effects of inflation sparked substantial debate in the literature. Friedman suggested that an increase in inflation will increase uncertainty about inflation, which was later developed and validated by (Ball, 1992). (Pourgerami and Maskus, 1987) and (Ungar and Zilberfarb, 1993) investigated the relationship between inflation and inflation uncertainty and discovered evidence that high inflation reduces inflation uncertainty. Examining the other causal relationship, that the inflation rate is determined by inflation uncertainty, (Cukierman and Meltzer, 1986) discovered evidence for the notion that when there is ambiguity about rises in inflation, high rates of inflation result. (Holland, 1995) discovered the same causation, but with a negative link between variables.

Uncertainty regarding inflation has two economic consequences. First, inflation uncertainty drives businesses and consumers to make economic decisions that differ from the ones they would make otherwise. Analysts call these impacts ex ante because they foresee future inflation. The second type of influence occurs after the decision has been made, or ex post. These impacts occur when inflation differs from expectations. Ex ante consequences. Uncertainty regarding inflation can have an ex-ante impact on the economy through three channels. First, anxiety about inflation influences financial markets by rising long-term interest rates. Second, uncertainty about inflation leads to doubt about other factors crucial in economic decisions. Finally, the unpredictability of inflation pushes enterprises to devote resources to mitigate the related risks (Golob, 1994).

3. 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. (2016) 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 (2016) 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.

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 (Akaike 1969) and Morf 1978. 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 (Granger, 1969; Lütkepohl, 2005, p. 41). To reveal underlying mechanisms utilizing Granger causality, the VAR model has been frequently used in econometric analysis (Granger & Newbold, 1986) and neuroscience (Tang, Bressler, Sylvester, Shulman, & Corbetta, 2012).

The Granger causality test is carried out. Granger causality (Granger 1969) is an econometrics concept that focuses on understanding the correlations between two time series. According to Granger (1969), causality is defined in terms of predictability, based on the notion that the effect cannot precede the cause. Following that, Goebel et al. (Goebel, Roebroeck et al. 2003) 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**

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

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. y_t, utilizing data from a collection of p series past values (y_{t-1}, y_{t-2},…, y_{t-p}). Hence, consider a *k*-dimensional *vector autoregressive model* (VAR) of order *p*, defined by

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

where $\mathbf{u}_t$ is an error vector of random variables with zero mean and covariance matrix $\mathbf{\Sigma}$ given by

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

and **v** and $\mathbf{A}_i$ ($i=1,2,...,p$) 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, previous 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, y_{jt} may Granger cause the signal y_{lt}, without any implication that $y_{lt\ Granger}$ causes y_{jt}.

In practice, we use a truncated wavelet expansion, given by

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

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

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

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

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

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

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

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

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 (Blalock 1961). 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 (1969) 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 (1988), which is applicable to homogeneous panels with a few time-series observations (T), and the methods of Dumitrescu and Hurlin (2012) and Emirmahmutoglu and Kose (2011), which are applicable to heterogeneous, large-T panels, are two prominent examples. Abrigo and Love (2016) implemented the GMM methodology of Holtz-Eakin, Newey, and Rosen (1988) in Stata with the command PVAR granger, but the method of Dumitrescu and Hurlin (2012) is available in both EViews and Stata; see, for example, the command xtgcause by Lopez and Weber (2017).

4. 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.

Econometric equations for inflation in GCC econ0mics

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.

VAR Granger Causality Approach in GCC Economics

Table 6 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 (2003) test and the Fisher-type tests proposed by Choi (2001), 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 hypoth.

Panel Granger causality test

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.

5. 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 (Laurence, 1992) 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.

6. 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.

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