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Trilemma of pandemic-related health emergency, economic policy uncertainty and partisan conflict in the United States: A time-varying analysis evidence

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Abstract
The events in the year 2020, especially the ravaging coronavirus (COVID-19) pandemic has further exposed the vulnerability and connectedness associated with human health and the global economy. In the United States, amid the COVID-19 pandemic, the recent political polarization, especially the sharp divide between the Republican and Democrat party has further demonstrated the heightened partisan conflict in the country. From this basis, the current study examines the time-varying Granger causality between pandemic-related health emergency, partisan conflict, and economic policy uncertainty (EPU) in the United States over period January 1996 to June 2020. While there is an evidence of common time-varying Granger causality between August 2005 and September 2006 from pandemic-related health emergency to partisan, the evidence of Granger causality from partisan conflict to pandemic is common in the period of January to May 2009. In addition, the Granger causality between partisan conflict and EPU is obviously common between February and May 2020. As a policy concern, we are of the opinion that mechanism toward diffusing the heightened political divide in the United States is essential and be pursued for the country's economic and health sector challenges.

Keywords Pandemic · Partisan Conflict · Economic Policy Uncertainty · Time-Varying Approach · Time Series · United States

JEL Classification E3 · H3 · I18

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1 Introduction

With the heightened partisan conflict in the United States, particularly between the two political parties of Democrats and the Republicans, there has been a growing concern regarding how the economic policies coupled with some uncertainties of this giant nation. More importantly, there is growing concern on how the government and policymakers are reacting to shocks the economy is facing in terms of COVID-19 pandemic which has claimed about 310,000 lives as at 15 December 2020.[1] It is paramount to state here that, the level of interconnectedness and interaction among nations affect political and economic outlooks, which somehow directly or indirectly create tension and a perception of political and economic instabilities. For instance, an economy that is associated with increasing economic policy uncertainty alongside heightened partisan conflict and unresolved pandemic issues, could be overwhelmed such that constrained policymakers in making appropriate, corrective and productive economic policies. Consequently, the question at the back of the authors mind is, are these variables (economic policy uncertainty, partisan conflict, and health-related issue such as pandemic) mutually exclusive? Is it possible for an economy to experience this situation simultaneously or is the interaction among the variables particular to a certain economic, political or financial era? If they were not mutually exclusive, what would be the impact on the economy? These questions among others motivate the authors to examine the topic under investigation.

For better understanding of the interconnectedness and interaction between these variables, this study provides an example of mutual exclusivity situation pertaining to the events associated with the variables, and followed by the potential impacts on the economy. First, we discuss a situation where interaction between the variables is mutually exclusive, i.e. when economic policy uncertainty, partisan conflict and pandemic-related health emergency cannot happen simultaneously. In this situation, we assume either, economic policy uncertainty predict pandemic, pandemic predict partisan conflict or partisan conflict predict economic policy uncertainty and vice versa at a particular period. During a pandemic situation as aggravated by economic uncertainty, stable and less political divide between the parties (both in the Congress and in Senate) could proffer immediate solution. On the other hand, should pandemic-related health emergency heightened partisan conflict, the situation might not necessarily lead to economic policy uncertainty. Lastly, when partisan conflict causes economic policy uncertainty this situation could delay the policymakers' immediate response to curtail pandemic as seen presently in the United States.

Thus, we are of the opinion that, these variables might not necessarily occur at the same specific period. However, in a complex situation where the interactions between the variables occur at the same time (not mutually exclusive) then critical and immediate agreement actions should be taken. It requires, adopting a more balanced and less politically bias economic policy to mitigate the heightened partisanship, scientific experts that are non-partisan to implore health or pandemic-related regulations that could further heighten partisan conflict. We are of the position that, the services of such experts are to be optimized especially when there is a health emergency as that of COVID-19 pandemic.

The aim of this current study is as follow: (i) to test if there is an existence of Granger causality between the variables and whether its date-stamped or not (ii)

[1] This motivates the authors to examine the interaction between the variables under observation.

whether the interaction and interconnectedness between the variables under observation are mutually exclusive or not (iii) if they are or not, what are the potential impacts on economic stability and hence economic growth of an economy that is experiencing heightened partisan conflict, economic policy uncertainty and pandemic-related health emergency at the same time, which in this case, United States. To achieve our research objectives, we start by estimating a lag augmented VAR model suggested by Dolado and Lütkepohl (1996), Toda and Phillips (1994) and Toda and Yamamoto (1995) to conduct Granger causality test, using the Bayesian information criteria (BIC) with a maximum of 12 lags to implement the time-varying causality (TVC) tests. The time-varying causality employed is based on the forward window, recursive evolving and rolling-window algorithms, using a monthly frequency time series dataset between the periods January 1996 to June 2020 based on availability of data.

This study is an addition to literature on economic policy uncertainty-pandemic-partisan conflict relationships. This current study establishes the fact that first; there is an existence of Granger causality relationship running from economic policy uncertainty to partisan conflict, from pandemic-related health emergency to partisan conflict and vice versa. Second, this study also establishes that, the causality relationships between the variables are date-stamped. Third, we found that, the causality nexus between the variables is mutually exclusive. Thus, policy suggestions from this study would be of interest to policymakers, government, authors, scholars and interested individuals most especially of economies with high partisan conflict, pandemic and economic policy uncertainty to come up with workable policies that would facilitate social, political and economic stability for an all-inclusive economic stability and hence growth both in the short- and long run.

The study is broken into four different parts: Section one covers the introduction, where we discuss the motivation and contributions of the study. We proceeded in section two on the discussions of the data and econometric methodology adopted for empirical analysis. We present and discuss results in Section 3, while conclusion and potential policy suggestions is render in Section 4 of the study.

2 Data and methodology

2.1 Data

In this study, we use the United States' categorical data[2] from the Economic Policy Uncertainty (EPU) (2019). While the index of partisan conflict[3] (PC) was retrieved from the Federal Reserve Bank of Philadelphia (2020), the World Pandemic Uncertainty index (from https://worlduncertaintyindex.com/data/) is employed as a proxy

[2] Categorical Data include a range of sub-indexes derived only from news data by employing the World News database of over 2,000 US newspapers. The sub-indexes encompass economic, uncertainty, and policy terms and some categorical policy terms.

[3] The Partisan Conflict Index tracks the degree of political disagreement among U.S. politicians at the federal level by measuring the frequency of newspaper articles reporting disagreement in a given month. Higher index values indicate greater conflict among political parties, Congress, and the President.

for pandemic-related health emergency (Pand) related uncertainty.[4] In addition, the monthly dataset employed cover the period January 1996 to June 2020 based on data availability for EPU. Following Wang et al. (2016) and Antonakakis et al. (2018), we define the volatility as the absolute return $V_t = \left|lnP_t - lnP_{t-1}\right|$. In addition to the graphical presentation of the examined series (see Fig. 1), the statistical properties of each series is presented in Table 1. The variables are investigated under log return form in order to reduce the possibility of any problem arising from heteroscedasticity. The positive values although with a negative value of the skewness show higher probability of higher increases among the series. From the Kurtosis of the series, we notice that distribution is peaked and possesses thick tails. Excitingly, the series are positively skewed, with positive kurtosis, signifying a non-normal distribution, i.e., the relationship between series is highly nonlinear. This is confirmed by the rejection of the null of normal distribution by Jarque–Bera (JB) test at ($p < 0.01$) significant level. This result justify the use of the rolling and recursive rolling time-varying bootstrapping method through the thick-tailed distribution of the series.

3 Methodology

We start by estimating a VAR model using the Bayesian information criteria (BIC) with a maximum of 12 lags to implement the time-varying causality (TVC) tests. The critical values are obtained from a bootstrapping procedure with 499 replications, and the empirical size of 5%, controlled over a three-year period. Next, we check the stationarity of the log-return variables. Based on ADF test results reported in Table 1, we observe that all variables are stationary in level, i.e., I(0) (see Table 1). Then, the time-varying causality based on the forward window, recursive evolving and rolling-window algorithms are conducted by setting the additional lag parameter d equal to zero.[5]

The lag augmented VAR suggested by Dolado and Lütkepohl (1996) and Toda and Yamamoto (1995) to conduct a Granger causality test for a possible integrated variable y_t may be written as

$$Y = \tau\Gamma^{'} + X\Theta^{'} + B\Phi^{'} + \varepsilon \tag{1}$$

where $Y = (y_1, \ldots, y_T)^{'}_{T\times n}$, $\tau = (\tau_1, \ldots, \tau_T)^{'}_{T\times 2}$, $\tau_t = (1, t)^{'}_{2\times 1}$, $X = (x_1, \ldots, x_T)^{'}_{T\times np}$, $x_t = (y^{'}_{t-1}, \ldots, y^{'}_{t-p})_{np\times 1}$, $\Theta = (\beta_1, \ldots, \beta_p)_{n\times np}$, $B = (b_1, \ldots, b_T)^{'}_{T\times nd}$, $b_t = (y^{'}_{t-p-1}, \ldots, y^{'}_{t-p-d})^{'}_{nd\times 1}$, $\Phi = (\beta_{p+1}, \ldots, \beta_{p+d})_{n\times nd}$ and $\varepsilon = (\varepsilon_1, \ldots, \varepsilon_T)^{'}_{T\times n}$ with d is the maximum order of integration for y_t.

The Wald test of the restrictions imposed by the null hypothesis $H_0 : \boldsymbol{R}\theta = 0$ is given by,

[4] The World pandemic uncertainty (2020) index is computed by using the following keywords in the Economist Intelligence Unit country reports: Severe Acute Respiratory Syndrome, SARS, Avian flu, H5N1, Swine flu, H1N1, Middle East respiratory syndrome, MERS, Bird flu, Ebola, Coronavirus, Covid-19, Influenza, H1V1, World Health Organisation, and WHO.

[5] For more details, please see Shi et al., 2018.

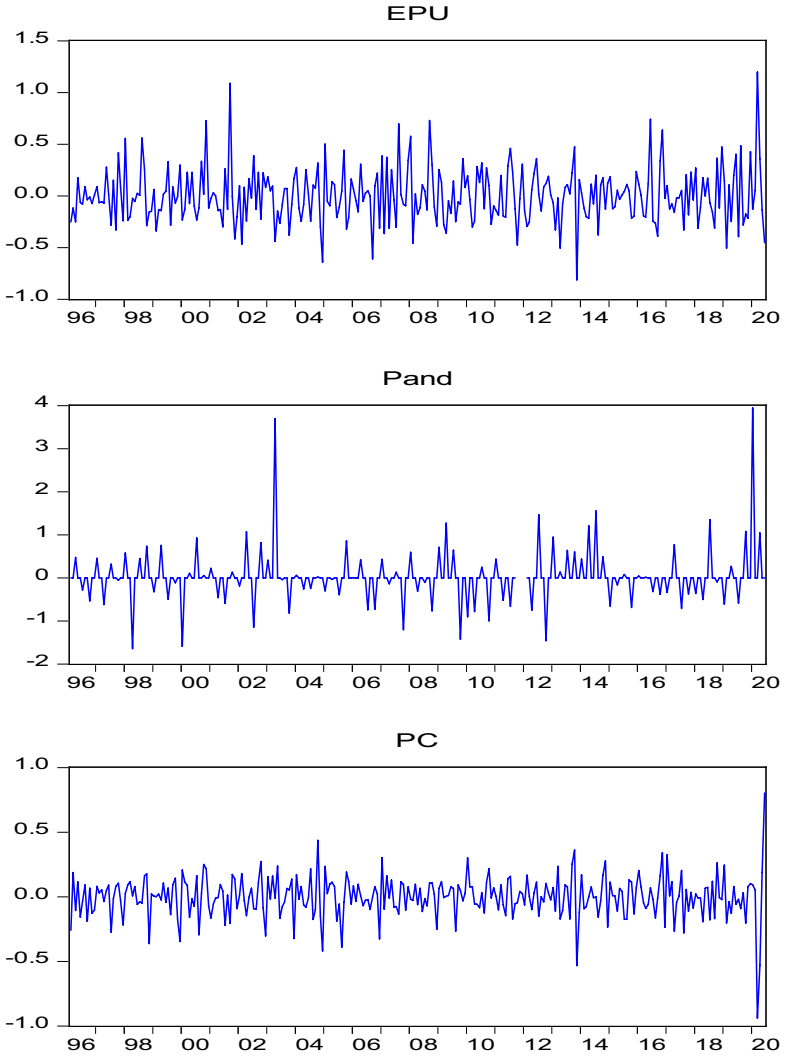

Fig. 1 Graphical representation of dataset returns

$$w = \left[\boldsymbol{R}\hat{\theta}\right]' \left[\boldsymbol{R}(\hat{\Omega} \otimes (X'QX)^{-1})\boldsymbol{R}'\right]^{-1} \left[\boldsymbol{R}\hat{\theta}\right] \tag{2}$$

where $\hat{\theta} = vec(\hat{\Theta})$ represents the row vectorization with $\hat{\Theta}$ is the OLS estimator $\hat{\Theta} = X'QX(X'QX)^{-1}$, $\hat{\Omega} = T^{-1}\hat{\varepsilon}'\hat{\varepsilon}$ and $\boldsymbol{R}$ is a $m \times n^2p$ matrix where m is the number of restrictions. The Wald statistic is asymptotically χ^2_m under the null hypothesis and assumption of conditional homoscedasticity.

Shi et al. (2018, 2020) introduced a real time – varying causality test based on supremum (sup) Wald statistic sequences using a forward recursive (Thoma 1994)), a rolling

window (Swanson (1998)) and a recursive-evolving algorithm (Phillips et al. (2015a, b)). For the recursive evolving procedure, the Wald statistic over $[f_1, f_2]$ with a sample size fraction of $f_w = f_2 - f_1 \geq f_0$ is denoted by $W_{f_2}(f_1)$ and the sup Wald statistic is given by

$$SW_f(f_0) = \sup_{(f_1,f_2) \in \wedge_0, f_2 = f} \{W_{f_2}(f_1)\}, \tag{3}$$

where $\wedge_0 = \{(f_1, f_2) : 0 < f_0 + f_1 \leq f_2 \leq 1, \text{and} 0 \leq f_1 \leq 1 - f_0\}$ for some minimal sample size $f_0 \in (0, 1)$ in the regressions. The forward expanding and rolling window procedures are special cases of the recursive evolving procedure (see Shi et al. (2018)).

In a simple switch case, the dating rules are giving for the three procedures by:

$$\text{Forward} : \widehat{f}_e = \inf_{f \in [f_0, 1]} \{f : W_f(0) > cv\} \text{ and } \widehat{f}_f = \inf_{f \in [\widehat{f}_e, 1]} \{f : W_f(0) < cv\} \tag{4}$$

$$\text{Rolling} : \widehat{f}_e = \inf_{f \in [f_0, 1]} \{f : W_f(f - f_0) > cv\} \text{ and } \widehat{f}_f = \inf_{f \in [\widehat{f}_e, 1]} \{f : W_f(f - f_0) < cv\} \tag{5}$$

Recursive evolving:

$$\widehat{f}_e = \inf_{f \in [f_0, 1]} \{f : SW_f(f_0) > scv\} \text{ and } \widehat{f}_f = \inf_{f \in [\widehat{f}_e, 1]} \{f : SW_f(f_0) < scv\} \tag{6}$$

where cv and scv are the critical values of the W_f and SW_f statistics, respectively. $\widehat{f}_e$ and $\widehat{f}_f$ are the estimated first chronological observation whose test statistic respectively exceeds or falls below the critical value for the origination and termination points in the causal relationship. Based on the simulation experiments in Shi et al. (2018), the recursive evolving window procedure advances the best results.

4 Empirical findings

Table 1 reports descriptive statistics. We observe that PC presents the lowest average, while the Pand exhibits the highest average returns. In addition, the PC presents the lowest risk average, followed by the EPU and Pand. The PC is skewed to the left, as indicated by the significant negative value of the skewness. Thus, the null hypothesis of normality is rejected for all series at the 1% level, as indicated by the Jarque–Bera test. Moreover, the evidence of stationarity is also provided alongside break dates for each of the variables by using the Lee and Strazicich (2003) approach (see Table 2 of the appendix).

Concerning the time-varying Granger causality investigation, the result offers bidirectional Granger causality between the EPU and partisan conflict, and pandemic and partisan conflict. The results for the causality running from EPU to partisan conflict and causality running from partisan conflict to EPU are respectively presented in Figs. 2 and 3. In specific, the time-varying causality running from EPU to PC (see Fig. 2) is viewed from the homoscedastic and heteroscedastic consistent approaches. In the first panel, the forward expanding window (homoscedasticity)

Table 1 Summary statistics

	EPU	Pand	PC
Mean	0.0029	0.0196	-0.0010
Median	-0.0203	0.0000	0.0031
Maximum	1.1983	3.9455	0.8033
Minimum	-0.8128	-1.6414	-0.9395
Std. deviation	0.2660	0.5095	0.1617
Skewness	0.7077	2.7758	-0.5269
Kurtosis	4.9742	24.8070	8.5780
Jarque–Bera	72.049*	6097.552*	393.409*
ADF	-13.070*	-16.907*	-15.063*

* denotes significance at the 1% level

procedure fail to detect Granger causality while the heteroscedastic consistent approach detects three episodes of Granger causality running from economic policy uncertainty to partisan conflict at the 5% statistically significant level. The three episodes are respectively between December 2001 to June 2002 (7 months), December 2004, and October 2005. As for the rolling window in the second panel, the rolling window (homoscedasticity) procedure detects Granger causality from EPU to PC in three episodes (September 2008, February 2016, and between October and November 2016). However, the rolling window (heteroscedasticity) procedure detects Granger causality from EPU to PC in the two episodes of June 2003 to August 2003 and in February 2016 to March 2016. The recursive rolling window tests as shown in the third panel suggest five and seven sub-periods for the homoscedastic and heteroscedastic consistent approaches respectively each at 5% statistically significant level. The recursive rolling window-homoscedasticity revealed causality for the period of December 2001 to April 2002, June 2002 to July 2002, April 2016 to June 2016, November 2016, and for a year period (January 2019 to February 2020). On the other hand, the recursive rolling window-heteroscedastic revealed causality for the period of October 2021 to August 2002, October 2002 to November 2002, June 2003 to October 2003, December 2004, February 2016 to June 2016, February 2019 to June 2019, and August 2019 to March 2020.

On the other hand, the time-varying causality from Partisan conflict to EPU at 5% statistically significant level in the forward window (see Fig. 3). Importantly, there exist a long period episode of September 2005 to June 2020 (Homoscedasticity) and of March 2007 to June 2020 (Heteroskedasticity). This potentially explains the sharp divide (across political party line) in the economic policies of the United States in recent time. Similar to this is the evidence of time-varying causality from the recursive window with long period episode between January 2007 and of February 2007 (Homoscedasticity) to June 2020 (Heteroskedasticity). However, shorter episodes were detected in the rolling window for Homoscedasticity (September 2005 to March 2006 and January 2011 to August 2011) and Heteroskedasticity (October 2005 to February 2006, August 2009 to October 2009, and January 2011 to August 2011).

Moreover, the time-varying causality from pandemic-related health emergency to Partisan conflict does not suggest any significant causality episode from both the

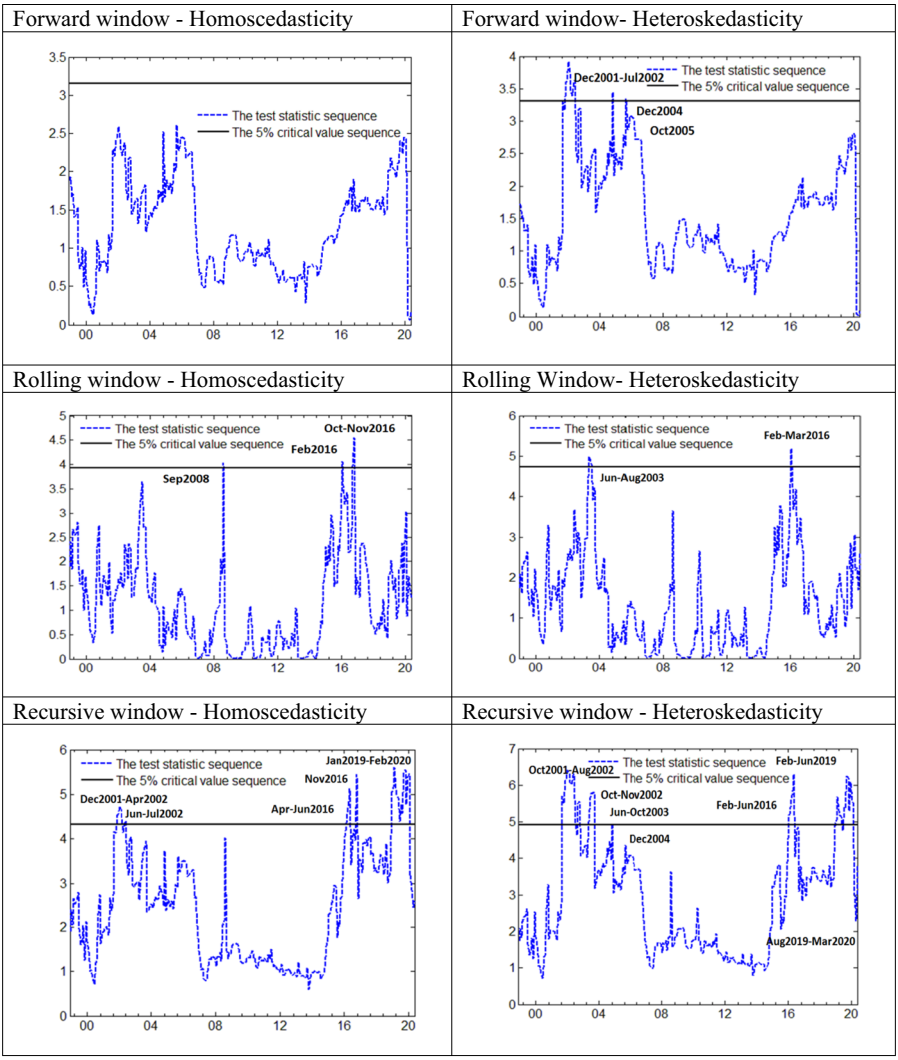

Fig. 2 Time – varying causality running from EPU to Partisan conflict

homoscedastic and heteroscedastic consistent approaches of the forward expanding window (see first panel of Fig. 4). In the second panel, a one-month (October 2003) episode of causality from pandemic to partisan conflict is depicted by the rolling window (homoscedasticity) procedure at 5% statistically significant level. Concerning the rolling window (heteroscedasticity) procedure, three episodes of causality from Pand to partisan conflict are statistically significant at 5% level. The first episode is a four-month period (July 2003 to October 2003), the second period is between November 2005 to March 2006, and the last episode is captured between February to March 2020. In addition, the recursive rolling window-homoscedasticity

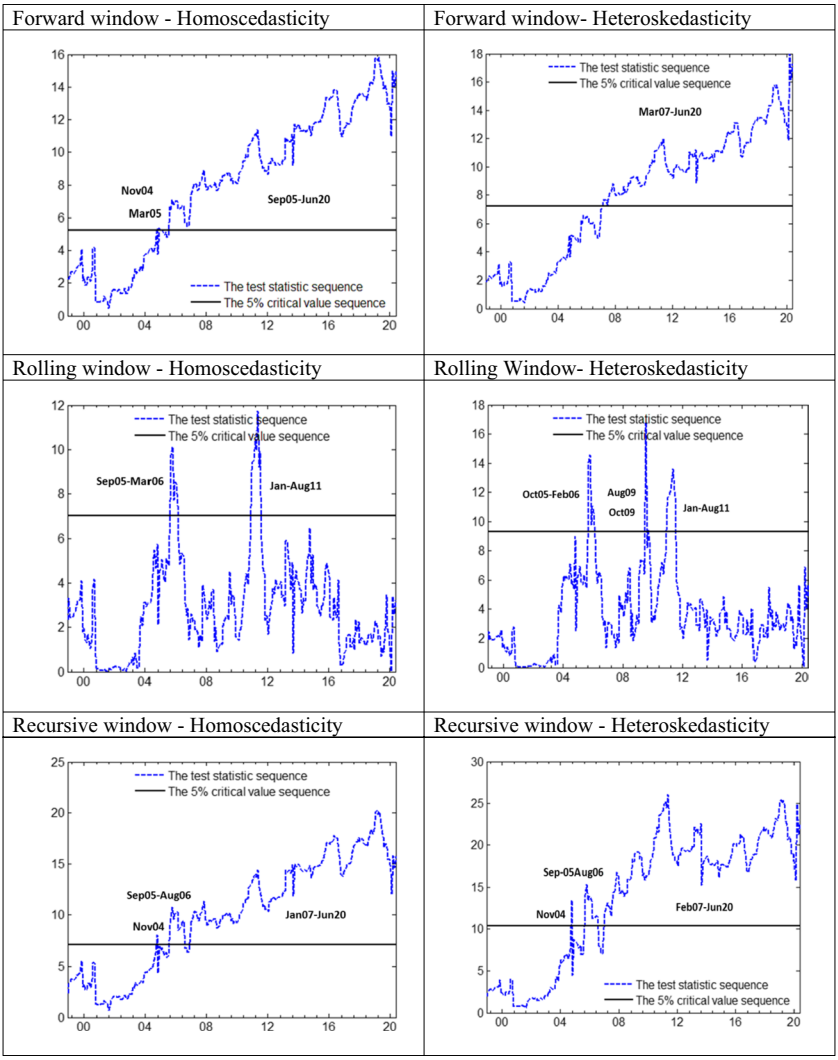

Fig. 3 Time – varying causality running from Partisan conflict to EPU

in the third panel suggest a 5% statistically significant level causality from pandemic-related health emergency to partisan conflict only in two periods (October 2003 and August 2006 to September 2006). However, at 5% statistically significant level, the recursive rolling window-heteroscedasticity approach reveled three episodes (July 2003 to October 2003, August 2005 to July 2009, and February 2020 to March 2020) of causality running from pandemic to partisan conflict. Although there is no record of pandemic during the above observed periods to the magnitude of the COVID-19 that has rattled the world since the first months of 2020, the world was without other global health emergencies. For instance, there was Swine flu (a

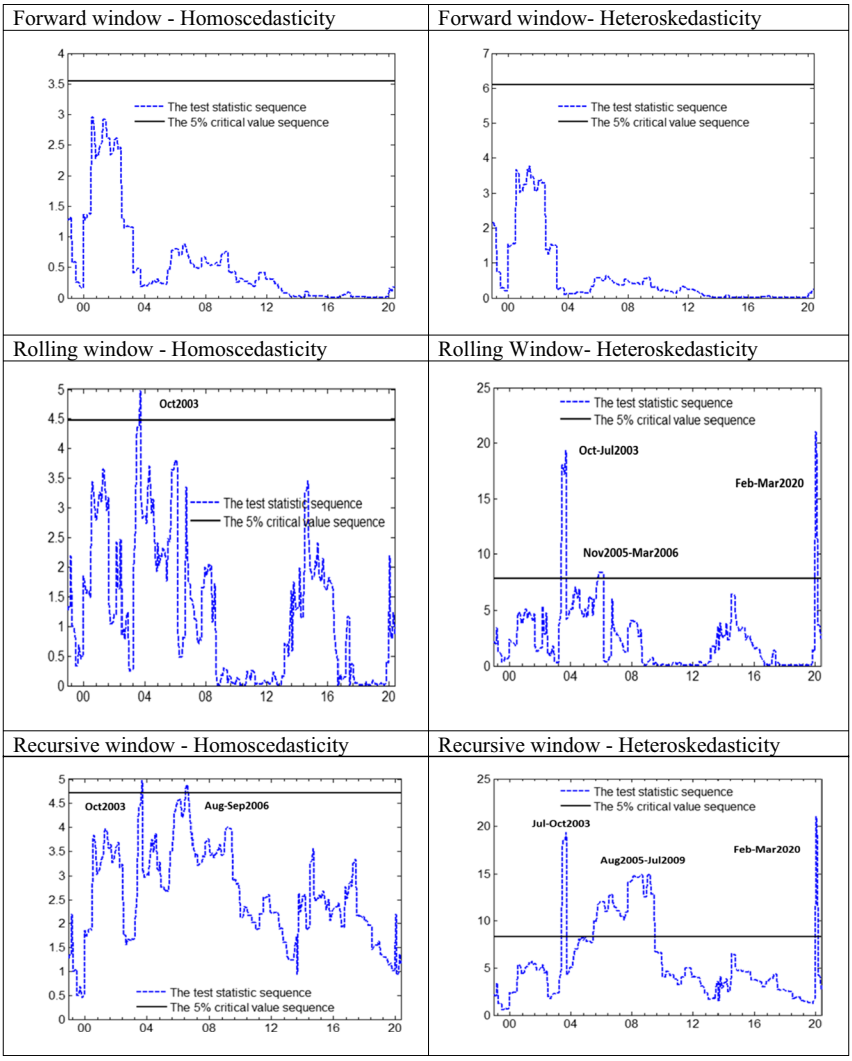

Fig. 4 Time – varying causality running from Pandemic to Partisan conflict

viral infectious disease) that caused the 2009 to 2010 global flu (pandemic) outbreak (National Health Service 2019). Thus, this evidence further validates the relevance of the World pandemic uncertainty index considering that it accounts for SARS, Avian influenza/flu, Swine flu, MERS, Ebola, Covid-19, other Influenza, and H1V.

Additionally, Fig. 5 illustrates the time varying causality from partisan conflict to pand. For the forward window, there is no detection of a time-varying causality. However, at 5% statistically significant level, there is a short episode of causality for the rolling window stochastic between January and March 2009 (Homoscedasticity) and three episodes between January and March 2009, October to December 2010,

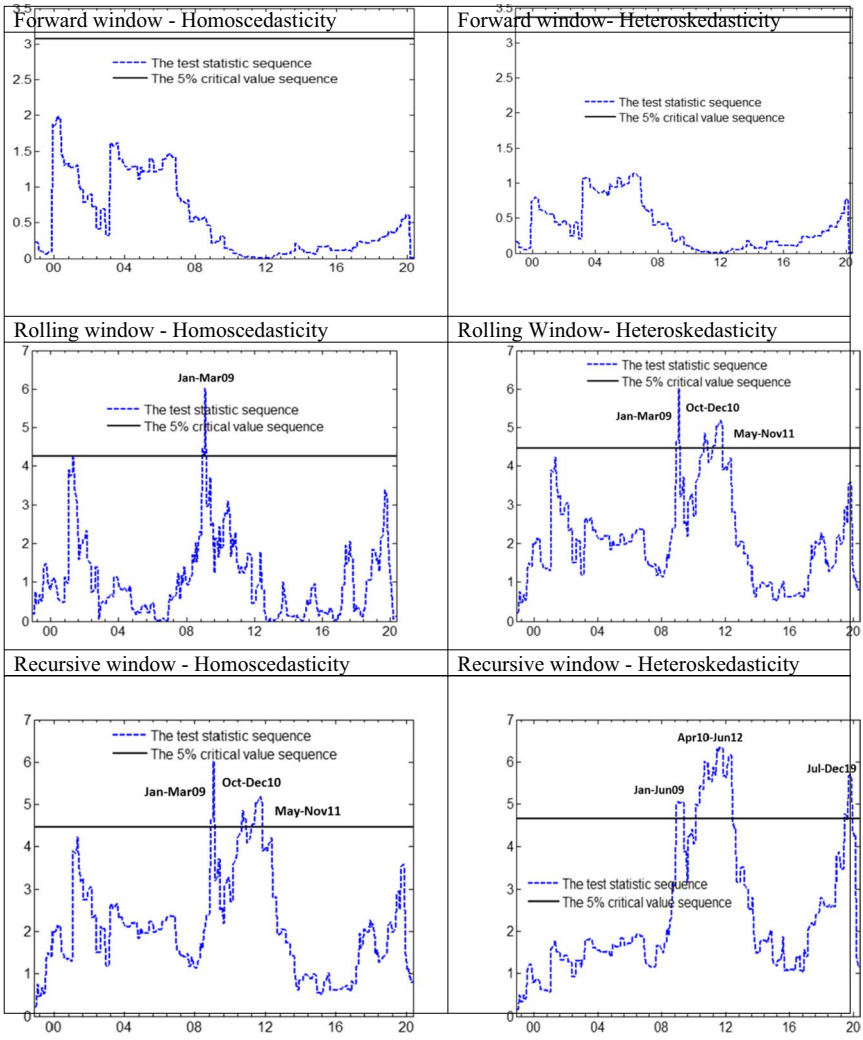

Fig. 5 Time – varying causality running from Partisan conflict to Pandemic

and from May to November 2011 (Heteroscedasticity). Similarly, a three-episode in each of recursive window homoscedasticity (January to March 2009, October to December 2010, and May to November 2011) and heteroscedasticity (January to June 2009, April 2010 to June 2012, and July to December 2019) were detected at 5% statistically significant level. As earlier reiterated, the larger period of 2009 to 2010 is associated with the global flu (pandemic) outbreak, thus justifying the evidence of causality between political polarization and pandemic-related health emergency in the United States. The connectivity of political partisanship with pandemic-related health emergency issue is not unrelated with the fiscal policy that is central to key political decisions in the United States. For instance, the prompt

response and bipartisanship approach of the United States' Congress to the SARS outbreak prompted the creation of pandemic Global Disease Detection (GDD) Program in 2004 (Center for Disease Control and Prevention 2021).

5 Conclusion and policy perspectives

In the current year, where almost every aspect of the human life has been significantly impacted by the contagion prowess of the coronavirus pandemic, uncertainty in the economic policies across the global economies has remained volatile. In the United States, the world largest economy by Gross Domestic Product, the decades of political polarization that has characterized the country has further been deepened by the divided opinions (between the Democratic and Republican party) on the handling of the United States' COVID-19 outbreak. In light of the aforementioned, the current study employed a time-varying approach to reveal the evidence of Granger causality among the economic policy uncertainty, pandemic-related health emergency, and partisan conflict over the period of January 1996 to June 2020.

Importantly, the study revealed time varying causality from economic policy uncertainty to partisan conflict and from pandemic-related health emergency to partisan conflict at different episodes. In specific, a handful of episodes are statistically significant at 5% level for the time-varying bidirectional causality from economic policy uncertainty to partisan conflict and from pandemic to partisan conflict. These episodes occurred between December 2001 and July 2002 that captures the aftermath effect of the September 11 2001 terrorist attack in the United States. In addition, a series of periods in 2008 and 2016 were all statistically significant causality episodes. While the events of the Global Financial Crisis (GFC) might explain the episode in 2008, the two episodes in 2016 are characterized by the uncertainty resulting from the inception of the new United States administration. The time varying causality from partisan conflict to EPU is characterized of a long period episode that is dated to 2005 and until the last period of the data (June 2020). This is a significant indication that the recent sharp divides in the political ideologies of the Republican and Democratic Party of the United States is a pointer to the country's economic policy direction. Lastly, especially for the causality from pandemic-related health emergency to partisan conflict that were revealed in 2003 and 2020, these could be explained by the outbreak of the severe acute respiratory syndrome (SARS), other major disease outbreaks, and prevailing COVID-19 pandemic respectively.

For policy directive, two relevant perspectives are outlined. Foremost, adopting a more balanced and less politically bias economic policy could mitigate the heightened partisanship in the United States. In addition, scientific experts especially that are non-partisan are unlikely to implore health or pandemic-related regulations that could further heighten partisan conflict. Thus, the services of such experts are to be optimized especially when there is a health emergency as the COVID-19 pandemic.

Appendix

Table 2 Lee and Strazicich unit root test with break dates

Variables	Test statistics (tau)	Break date	Break date	Lag length
EPU (Level)	-8. 2781*	2013M10	2018M01	1
Pand (Level)	-8.8022*	2003M12	2018M01	5
PC (Level)	-7.0990*	2010M01	2016M10	4

* denotes 1% statistically significant level

Availability of data and material Corresponding authors can provide data used in the study on appropriate request.

Declarations

Ethics approval and consent to participate NA

Consent for publication NA

Competing interests There is no conflict of interests reported by the authors.

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