The contagious effect of economic policy uncertainty in the post-crisis period

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Abstract

Purpose – This study aims to analyze the contagious effects of economic policy uncertainties in the USA on the economies of its important trading partners, such as Japan, Canada, Mexico and the Eurozone.

Design/methodology/approach – In the study using the uncertainty index created by Baker et al. (2016), the interaction between variables was analyzed with structural VAR (SVAR) models.

Findings – According to the results obtained from the analysis, economic policy uncertainties in the USA had significant effects on the economies of its high-volume trading partners. The internal debt crisis experienced in the Eurozone after the 2008 crisis caused the European Central Bank to respond to the economic policy uncertainties in the USA with contractionary monetary policies, unlike other countries. In addition to these results, Mexico, which has a more fragile economic structure than other countries in the analysis, was more impacted by increasing uncertainties, as expected.

Originality/value – The present study aimed to bring a new perspective to the literature by evaluating the contagiousness of local uncertainty in the globalizing world and the monetary policies implemented as a precaution against this situation on an empirical plane.

Keywords Economic policy uncertainty, SVAR, Monetary policy

Paper type Research paper

1. Introduction

> I have found a flaw, I don't know how significant or permanent it is. But I have been very distressed by that fact.

Alan Greenspan, the former FED chairman who is considered by many authorities as one of those responsible for the global crisis, described the global crisis in this way. The point that made these seemingly simple words important was that Greenspan said them. *The Guardian* [1], one of the oldest media outlets in the UK, described this statement as a confession. Although the criticism seemed reasonable, it was a very difficult prediction that the sharp decline in the real estate market in the USA in 2008 would turn into a crisis, big enough to compare it with the Great Depression. Indeed, this situation was unlikely to happen compared to the recent economic crises. Since the effects of local events such as the Internet bubble (dot-com bubble) and Black Monday were limited to a certain geography or class, the current crisis was expected to have similar limited effects (Varoufakis, 2011). However, the current global crisis was unlike any recent crisis with its speed and influence. Therefore, upon examining the traditional methods adopted against this crisis, it could be observed that they were insufficient in many aspects.

It was certainly not a coincidence that the local events in the USA had transoceanic effects, as in the 2008 crisis. In particular, the fact that the US dollar had reserve currency status and the

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trade network spread almost all over the world paved the way for a butterfly effect caused by the events occurring there. Although it was thought that the US economy would lose its global power after the withdrawal from the Bretton Woods agreement, the expected situation did not occur completely, and the effects of positive or negative developments in the US economy on almost all countries of the world continued (Liu L., 2014; Park & Um, 2016; Trung, 2019; Wang & Han, 2021; Azad & Serletis, 2022). In parallel, this paper addresses the question, "How effective are fluctuations in economic policy uncertainties in the US on macroeconomic indicators of its high-volume trading partners?". In other words, this article focuses on the contagious effect of uncertainties and explains this effect through trade relations.

The measuring of economic uncertainties has very broad literature, including many different methods. In addition to econometric methods and traditional surveys, the news-based uncertainty calculation method, which has recently become very popular, is also at the center of this article. The index created by Baker *et al.* (2016) was preferred to represent the economic uncertainties in the structural VAR models estimated by adding constraints, and the effects of changes in this index on the macroeconomic variables of the selected countries were examined.

The findings obtained from the analysis are very important in terms of showing in general terms that the uncertainties that can be experienced in the world economies may have national and international effects. Particularly, the rapid spread of a regional crisis in the real estate market in the USA and its transformation into a global crisis caused uncertainties and the contagious effects of crises to become popular topics in the economic literature. The findings of the present study draw attention to two different points. The first of these is that the effects of economic uncertainties in the USA on trading partners continue despite the measures taken by countries and the regulations they made after the 2008 crisis to prevent a new crisis. The second is that Mexico is more vulnerable than developed economies such as Japan, Canada and the Eurozone in the face of increasing uncertainties. Considering that Mexico's exports mostly consist of goods and services sold to the USA, it can be said that a possible decrease in demand in the USA can easily affect the Mexican economy. It is very important for countries to seek alternative commercial partnerships and reduce their commercial dependence on each other in order to limit the spread of crises.

2. Historical development and literature review of economic uncertainty

Although this study is not a theoretical study that focuses on the historical origins of the concept of uncertainty, it would be useful to mention the difference between the concepts of uncertainty and risk before examining studies in the literature. Despite their high similarities, there are significant differences between these two concepts. Frank Knight is one of the first economists who revealed these differences in the economic literature. According to Knight (1921), measurability is the main difference between risk and uncertainty. From this point of view, while risk is a situation which can be measured with certain calculation methods and the probabilities of which can be calculated, uncertainty is not measurable. Keynes (1921), who studied uncertainty and risk in similar periods, indicated that the future would always be uncertain and economic decision-makers would always make future-oriented decisions with the data from the past. The main similarity in the approach of these two economists to the concepts of risk and uncertainty is the idea of the immeasurability of uncertainty. However, unlike Knight and Keynes, uncertainty has recently become a concept that different methods can measure. After the recent publication of Galbraith's book entitled "*The Age of Uncertainty*," the issue of financial uncertainty has again attracted researchers' attention (Al-Thaqeb & Algharabali, 2019).

Nowadays, different variables are used as indicators of uncertainty in the economic and political sense, despite Knight and Keynes' idea of the immeasurability of uncertainty.

Although there are different methods and indices for measuring uncertainty, it can be said that there is a consensus that uncertainty generally has negative effects.

Indices created based on the news in newspapers are among the most common methods to calculate uncertainty in the literature. The uncertainty index created by Baker *et al.* (2016) for 12 countries [2] is frequently referenced. In this index created based on the news in 10 leading newspapers in the USA [3], the words representing categories such as "uncertainty," "economy" and "politics" were selected, and the frequency of articles containing these words was investigated. From 1985 to 2010, the level values of each newspaper were standardized according to a standard deviation of one unit, and the monthly average of all selected newspapers was taken. Finally, the series obtained from 1985 to 2009 were normalized according to an average of 100. Unlike the others, the uncertainty index calculated for the USA contains two components: the number of federal tax law provisions that will expire and the disagreement between economic forecasters. These components are based on the report prepared by the Congressional Budget Office (CBO) and the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters, respectively. Tax law provisions that will expire include temporary tax measures that cause increased uncertainty for many businesses and households. These law provisions are often highly sensitive to short-term political developments and are likely to be amended before the congress approves them.

The methodology employed by Baker *et al.* (2016) became quite popular, and many researchers calculated the economic uncertainty index for different countries using the said methodology (Cerda, Silva, & Valente, 2016; Zalla, 2017; Armelius, Hull, & Köhler, 2017; Ghirelli, Pérez, & Urtasun, 2019; Luk, Cheng, Ng, & Wong, 2020). It was observed that uncertainty indices explained changes in different economic and financial variables quite well. Upon reviewing studies in the literature, it is observed that it significantly explains changes in variables such as financial markets (Liu & Zhang, 2015; Chen, Jiang, & Tong, 2017; Debata & Mahakud, 2018; Lei & Song, 2020; Batabyal & Killins, 2021; Chang, 2022), investments (Kang, Lee, & Ratti, 2014; Wang, Chen, & Huang, 2014; Drobetz, Ghoul, Guedhami, & Janzen, 2018; Choi, Furceri, & Yoon, 2021; Nguyen & Lee, 2021; Qamruzzaman, Karim, & Jahan, 2022) and exchange rates (Krol, 2014; Bartsch, 2019; Liming, Ziqing, & Zhihao, 2020; Wang, Li, & Wu, 2022; Smales, 2022; Sohag, Gainetdinova, & Mariev, 2022).

In addition to the indices created based on the news, the volatility of economic and financial variables is another frequently used indicator of uncertainty. Continuous changes in financial and economic data significantly affect the decision mechanisms of economic actors, especially during crisis periods. During periods of high volatility in the markets, investors are much more sensitive to new news and information than in normal periods, which also leads to significant changes in the trading volume in the markets. Therefore, researchers consider volatility in the markets as an indicator of uncertainty. The uncertainties calculated using ARCH-type models are frequently used, especially for variables such as inflation (Grier & Perry, 1998; Kontonikas, 2004; Berument & Dincer, 2005; Lawton & Gallagher, 2020), exchange rate (Caporale, Ali, & Spagnolo, 2015; Iyke & Ho, 2020) and oil price (Ahmed & Wadud, 2011; Bashar, Wadud, & Ahmed, 2013; Güney, 2020).

Although there are numerous studies in the literature on the measurement of uncertainty and the interaction of countries with their macroeconomic variables, there are few studies on the contagiousness of uncertainty between countries. Despite the similarity of the present study to other studies in the literature in terms of the variable used to represent uncertainty in econometric analysis, it differs from other studies in terms of examining the cross-border effects of uncertainty and interpreting these effects through commercial relations. In particular, the selection of the countries subject to econometric analysis according to their trading volume with the USA and the fact that they have different economic dynamics allowed the inferences made from the analysis results to be more diverse.

3. Econometric framework

The VAR models introduced to the literature by Sims (1980) were proposed as an alternative to the system of simultaneous equations. All variables in VAR models are dependent variables, and each variable is a function of its own lagged values and the lagged values of other variables in the model. VAR models are based on three basic principles (Watson & Teelucksingh, 2002, pp. 228).

(1) There is no internal–external distinction between variables in the model.

(2) There is no zero-type constraint.

(3) The model is not based on any economic theory.

Although they are used widely, the last principle has caused VAR models to be subject to significant criticism. SVAR models have been proposed to overcome the non-theoretical nature of standard VAR models. Due to the economic infrastructure created by the restrictions added to the VAR matrix, SVAR models are more suitable for the complex structure of macroeconomic variables. Equations (1) and (2) represent the SVAR model:

$$B_0 Y_t = B_1(L) Y_t + A\omega_t \tag{1}$$

$$B_1(L) = \sum_{i=1}^{p} B_{1i} L^i \tag{2}$$

In equation (1), Y_t represents the $nx1$ vector of variables at time t, B_0 and A denote the coefficient matrices and ω_t refers to the error term. The reduced form of the model can be expressed in equations (3)–(5):

$$Y_t = C(L) Y_t + \varepsilon_t \tag{3}$$

$$C(L) Y_t = B_0^{-1} Y_1(L) \tag{4}$$

$$B_0 \varepsilon_t = A\omega_t \tag{5}$$

ε_t obtained from the reduced form equation is assumed to be white noise. The correlation between structural form error terms and the reduced form error terms is defined in equation (5). Similar to VAR models, since it will also be very difficult to interpret the statistical significance of coefficients in SVAR models, the interaction between the variables is interpreted using the variance decomposition analysis and the impulse response analysis.

The series used in this study are divided into three groups (Table A6). The uncertainty of economic policies (Unc) in the USA represents external shocks, short-term interest rates (R), monetary supply (M1) represent monetary policy shocks and the consumer price index (CPI) and industrial production index (IP) represent macroeconomic shocks. The constraint matrices used in the model are shown in matrix number six.

$$\begin{bmatrix} e_{unc} \\ e_r \\ e_{m1} \\ e_{cpi} \\ e_{ip} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & C2 & 0 & 0 \\ 0 & C1 & 1 & C3 & 0 \\ 0 & 0 & 0 & 1 & C5 \\ 0 & 0 & 0 & C4 & 1 \end{bmatrix} \begin{bmatrix} u_{unc} \\ u_r \\ u_{m1} \\ u_{cpi} \\ u_{ip} \end{bmatrix} \tag{6}$$

In matrix number 6, it was assumed that the two variables representing monetary policy shocks were affected by changes in each other, and the CPI was among the determinants of the monetary supply. The fact that macroeconomic variables were also affected by each other was also among the model's assumptions.

4. Data and empirical findings

This study examined the effects of economic policy uncertainties in the USA on its important trading partners. In this regard, the uncertainty index calculated by Baker *et al.* (2016) was used to represent the concept of uncertainty [4]. Furthermore, two dummy variables were defined to prevent the effect of unexpected breakdowns experienced on a global scale on econometric findings [5].

When the change in the uncertainty index over time in Figure 1 is examined, three breaking points, one of which is based on economic reasons (the 2008 crisis) and two of which are based on non-economic reasons (September 11 terrorist attacks and COVID-19 pandemic), are remarkable. Unlike the instant rises and falls during the September 11 attacks and the pandemic, high fluctuations experienced in the 2008 crisis maintained their effects over a longer period.

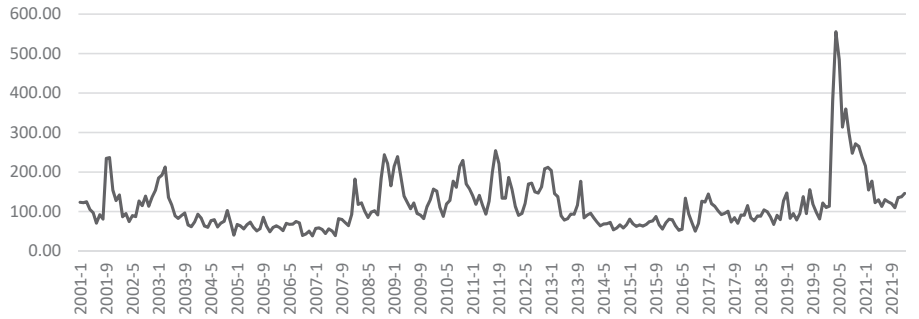
The stationarity assumption is among the most important assumptions underlying time series analysis. In cases when this assumption cannot be met, the reliability of the hypothesis tests, confidence intervals and the obtained results decrease (Stock & Watson, 2020, pp. 582). Although non-measurement-based heuristic methods such as graphical analysis are used in some cases to examine the stationarity assumption in the econometric literature, the most reliable method to test this assumption is unit root tests based on mathematical measurements. In this study, the ADF and PP unit root tests were used to examine the stationarity of the variables. According to the results in Table 1, it was observed that the variables used in the analysis were not stationary at the level values and became stationary when the first difference was taken.

The BDS (Brock, Dechert and Scheinkman) test determined the suitability of the estimated models to the linear analysis methods. The test developed by Brock, Scheinkman, Dechert and LeBaron (1996) tests the independent and identically distributed series. Considering the results of the test performed based on the error terms of the estimated VAR models, it was concluded that the linear methods used in the analysis were suitable (Table A1). Furthermore, Table A2 presents descriptive statistics for the variables to be used in the econometric analysis, and it was observed that the range in the data of Mexico is higher than that of other countries.

The optimum lag length for the SVAR models established with the variables satisfying the stationarity condition was determined based on the LR information criterion (Table A3) [6]. Diagnostic tests tested the reliability of the models estimated using the determined optimum lag lengths. According to the findings, the estimated models had no autocorrelation and varying variance problem (Tables A4 and A5). Furthermore, AR characteristic roots were examined to test the model's stability, and it was found that all of them were within the unit circle (Figure A1).

After determining that the estimated models met certain econometric assumptions, the impulse response analysis was used to examine the interaction between the variables.

According to the results in Figure 2, the economic policy uncertainty in the USA significantly affected the macroeconomic variables of the US's high-volume trading partners.



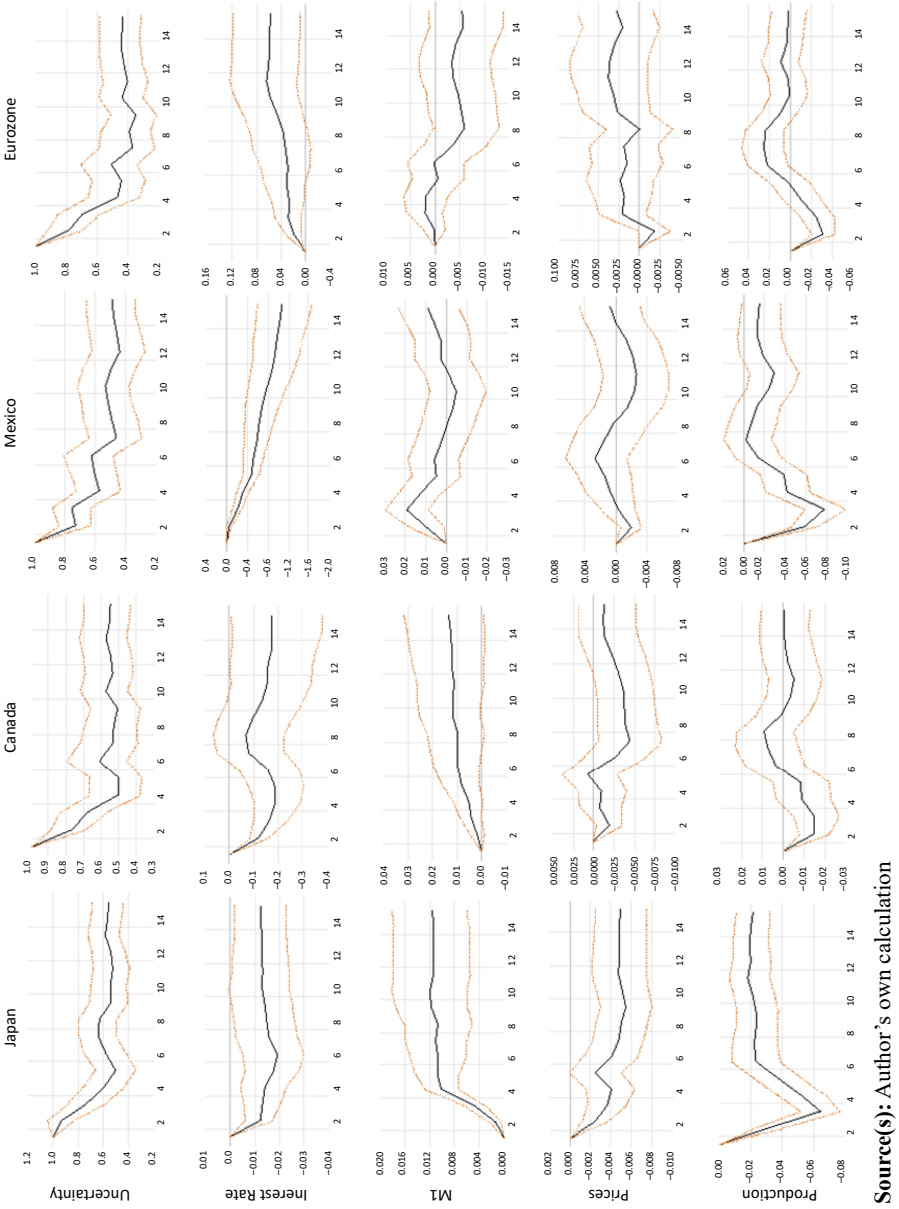
Source(s): Author's own calculation

Figure 1.
US economic policy uncertainty

Table 1.
ADF and PP unit root test

	Japan		Canada		Mexico		Eurozone	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
LUNC	−0.32 (n)	−0.21 (n)	−0.32 (n)	−0.21 (n)	−0.32 (n)	−0.21 (n)	−0.32 (n)	−0.21 (n)
R	−1.39 (i)	−1.37 (i)	−2.07 (i)	−0.98 (n)	−0.08 (n)	−0.16 (n)	−1.76* (n)	−2.94*** (n)
LM1	1.87 (i)	−2.34 (i)	−1.79 (i)	−2.01 (i)	−2.56 (t + i)	−2.83 (t + i)	−2.08 (t + i)	−2.29 (t + i)
LCPI	1.81 (n)	−1.81 (n)	−2.35 (t + i)	−4.37 (n)	−2.74 (t + i)	−8.44 (n)	−1.76 (i)	−2.48 (t + i)
LIP	−2.86* (i)	−2.87* (i)	−3.29* (t + i)	−2.77 (t + i)	−0.01 (n)	−0.12 (n)	−0.23 (n)	−0.43 (n)
ΔLUNC	−11.70 (n)***	−14.37 (n) ***	−11.70 (n) ***	−14.37 (n) ***	−11.70 (n) ***	−14.37 (n) ***	−11.70 (n) ***	−14.37*** (n)
ΔR	−10.26 (i) ***	−10.30 (i) ***	−5.64 (n) ***	−5.37 (n) ***	−3.96 (n) ***	−3.73 (n) ***	−6.00 (n) ***	−5.98*** (n)
ΔLM1	−6.20 (t + i) ***	−6.18 (t + i) ***	−5.84 (t + i) ***	−5.99 (t + i) ***	−0.63 (n) ***	−13.60 (i) ***	−8.14 (i) ***	−8.48*** (i)
ΔLCPI	−8.80 (n) ***	−8.66 (n) ***	−8.53 (i) ***	−8.37 (i) ***	−6.57 (t + i) ***	−6.60 (i) ***	1.01 (n)	−12.72*** (i)
ΔLIP	−10.52 (n) ***	−11.02 (n) ***	−9.12 (n) ***	−9.73 (n) ***	−10.04 (n) ***	−12.96 (n) ***	−10.26 (n) ***	−11.98*** (n)

Note(s): Δ = first difference, L = Logarithm
***, ** and * indicate significance at 1%, 5% and 10%, respectively
i(intercept), t+ı (trend + intercept), n(without trend or intercept)
Source(s): Author's own calculation



Source(s): Author's own calculation

Figure 2.
Impulse response to a US economic policy uncertainty shocks

However, the ECB has developed a different policy against the increasing uncertainties than other countries. While the debt crisis after the 2008 crisis was the first of the main reasons for this difference, the second was that the economic dynamics of the countries within the monetary union managed by the ECB differed. Upon comparing the obtained results with the study by Colombo (2013), which examines the period before the 2008 crisis, it is seen that the ECB implemented different monetary policies in the post-crisis period.

In addition to these findings, an increase in policy uncertainties led to a deflationary effect in countries where the national currency is more stable, such as Japan and Canada. However, it did not have a significant effect on prices in Mexico. One of the most important reasons for this situation is the continuous depreciation of the Mexican peso in the medium and long terms. The protectionist motive caused by the increased uncertainty index on households and companies had a negative impact on both total output and total demand. This adverse effect also causes deterioration in the macroeconomic variables of countries such as Japan, Canada and Mexico, which have significant trade volumes with the USA.

The highly contagious effect of economic policy uncertainty in the USA is among the indicators of how destructive a possible local crisis in the USA can be worldwide. Although these devastating effects are expected to be felt primarily in countries with high trade volumes with the USA, they will inevitably create a domino effect in a short time. After the 2008 crisis, central banks, whose main task is maintaining price stability, have been observed to be insufficient against global crises. Therefore, unconventional monetary policy instruments such as Credit Expansion and Asset Purchases emerge as an important alternative to reduce the negative effects of possible crises.

Like other studies in the literature, the obtained results indicate that the increasing uncertainty in the USA has adversely affected its trading partners due to the trade network that has developed recently (Colombo, 2013; Istiak & Alam, 2020; Dakhlaoui & Aloui, 2016). Furthermore, similar to the studies in this field, it was concluded that developing countries are more vulnerable to increasing uncertainty (Kido, 2018; Li, 2021). Considering the above-mentioned findings, it is seen that the measures taken by countries against a new global crisis, especially after the 2008 crisis, did not yield the expected results. Especially developing countries such as Mexico, which are dependent on a single region or market in foreign trade, need to take more decisive measures in the face of increasing uncertainties. It is very important that the countries affected by increasing uncertainties, particularly Mexico, reduce their commercial dependence on a single country by creating alternative trade routes with regional trade agreements. Furthermore, countries' control of their dependence on foreign demand by expanding their domestic markets is an effective measure that can be taken against increasing uncertainties.

5. Conclusion

Changes in the foreign trade strategies of the USA in recent years have led to a new era in which global balances have changed. In particular, Donald Trump, who won the 2016 presidential election, was among the most important actors in the changing strategies. The trade wars with China, the new trade agreements to be made by the UK after Brexit, and the harsh criticism of NAFTA by President Trump caused the US's trading partners to determine new strategies. This study examined the effects of the economic policy uncertainties in the USA after the 2008 global crisis on the macroeconomic variables of the US's high-volume trading partners. It is among the study results that increases in the uncertainty index developed by Baker *et al.* (2016) significantly affect the countries included in the econometric analysis. Furthermore, it was observed that the debt crisis experienced in the Eurozone after the global crisis forced the ECB to act differently from other countries in the face of uncertainty shocks. In particular, Mexico, which has a more fragile structure than other countries included in the analysis, was more severely affected by uncertainty shocks.

Moreover, there are some limitations in the sample set of the study. While the adverse effects of the pandemic worldwide have not been fully eliminated yet, the tension between Russia and Ukraine and the resulting energy crisis in Europe have significantly reduced the predictability of international markets. The fact that the dataset failed to provide a broader perspective is one of the most obvious limitations of this study. Furthermore, the effect of increasing uncertainty only on macroeconomic variables was examined. Studies to be conducted in the following years using a larger dataset and adding financial variables to the model will reach more comprehensive inferences on the concept of contagious uncertainty. In addition, there are uncertainties in the US economy at the center of the study. Although the USA is regarded as one of the countries at the center of world trade considering the trade volume, examining the effects of uncertainties spreading from countries such as the UK, China and India, which constitute a significant part of world trade, will also provide very useful inferences. Moreover, similar to Shehzad, Xiaoxing, Bilgili and Koçak (2021), the results to be obtained from reversing the direction of causality will also be very useful in providing a different perspective.

Notes

1. https://www.theguardian.com/business/2008/oct/24/economics-creditcrunch-federal-reserve-greenspan
2. Australia, Brazil, Canada, France, Germany, India, Italy, Mexico, South Korea, Russia, UK and USA
3. *USA Today*, *Miami Herald*, *Chicago Tribune*, *Washington Post*, *Los Angeles Times*, *Boston Globe*, *San Francisco Chronicle*, *Dallas Morning News*, *New York Times* and *Wall Street Journal*.
4. All data (2012M01-2022M01) used in the study were obtained from the address "fred.stlouisfed.org."
5. Dummy variables were defined to prevent the effects of the Brexit process (June 2016) and the COVID-19 pandemic (March 2020) on the model.
6. According to the LR information criterion, the optimum delay length was five in the model established for Japan, six in the model established for Canada and the Eurozone and seven in the model established for Mexico.

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Appendix

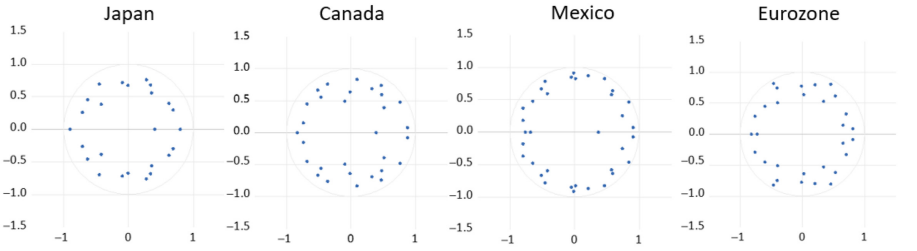

Figure A1.
AR roots graph

Source(s): Author's own calculation

		UNC	R	M1	CPI	IPI
Japan						
m = 2	BDS Statistic	−0.0047	−0.0046	−0.0001	−0.0013	0.0049
	Prob	0.3433	0.6404	0.9837	0.8367	0.3665
m = 3	BDS Statistic	−0.0035	−0.0040	−0.0018	−0.0068	0.0022
	Prob	0.4399	0.7388	0.6064	0.3234	0.6794
m = 4	BDS Statistic	−0.0019	−0.0001	−0.0013	−0.0066	0.0003
	Prob	0.5355	0.9947	0.5724	0.2304	0.9291
m = 5	BDS Statistic	−0.0015	0.0009	−0.0009	−0.0051	0.0015
	Prob	0.4369	0.9105	0.4767	0.1927	0.5769
m = 6	BDS Statistic	−0.0005	0.0034	−0.0001	−0.0037	0.0013
	Prob	0.6540	0.6036	0.9017	0.1471	0.3882
Canada						
m = 2	BDS Statistic	0.0077	0.0109	0.0013	0.0036	0.0091
	Prob	0.0837*	0.0230**	0.7152	0.3567	0.0254**
m = 3	BDS Statistic	0.0080	0.0106	−0.0001	0.0055	0.0100
	Prob	0.0462**	0.0195**	0.9717	0.1118	0.0116**
m = 4	BDS Statistic	0.0055	0.0058	−0.0014	0.0051	0.0099
	Prob	0.0414**	0.0729*	0.4949	0.0240**	0.0006***
m = 5	BDS Statistic	0.0037	0.0031	−0.0021	0.0016	0.0067
	Prob	0.0224**	0.1220	0.0669	0.2203	0.0003***
m = 6	BDS Statistic	0.0035	0.0024	−0.0021	0.0001	0.0039
	Prob	0.0001***	0.0389**	0.0179	0.1565	0.0004***
Mexico						
m = 2	BDS Statistic	0.0190	0.0016	0.0031	−0.0015	−0.0049
	Prob	0.0001***	0.7697	0.3371	0.7646	0.2385
m = 3	BDS Statistic	0.0200	0.0047	0.0004	−0.0012	0.0076
	Prob	0.0000***	0.3859	0.8899	0.7930	0.8654
m = 4	BDS Statistic	0.0114	0.0037	0.0003	−0.0025	0.0001
	Prob	0.0024***	0.3604	0.8476	0.4409	0.9780
m = 5	BDS Statistic	0.0053	0.0018	−0.0005	0.0005	0.0001
	Prob	0.0321**	0.4965	0.6439	0.7953	0.9390

Table A1.
BDS test results

(*continued*)

		UNC	R	M1	CPI	IPI
m = 6	BDS Statistic	0.0038	0.0011	−0.0004	0.0004	−0.0004
	Prob	0.0134**	0.4972	0.4815	0.7273	0.7973
Eurozone						
m = 2	BDS Statistic	0.0069	0.0347	−0.0027	−0.0071	0.0027
	Prob	0.0912*	0.0000***	0.5512	0.0663**	0.3642
m = 3	BDS Statistic	0.0093	0.0437	−0.0027	−0.0003	0.0019
	Prob	0.0119**	0.0000***	0.5173	0.9328	0.4810
m = 4	BDS Statistic	0.0054	0.0399	−0.0006	0.0005	0.0010
	Prob	0.0317**	0.0000***	0.8295	0.8330	0.6188
m = 5	BDS Statistic	0.0042	0.0308	−0.0006	0.0008	0.0010
	Prob	0.0050***	0.0000***	0.7403	0.5064	0.4371
m = 6	BDS Statistic	0.0038	0.0216	−0.0003	0.0007	−0.0002
	Prob	0.0000***	0.0000***	0.8014	0.2672	0.8082

Note(s): ***, ** and * indicate significance at 1%, 5% and 10%, respectively. Method: Standard Deviations. Value: 0.7
Source(s): Author's own calculation

Table A1.

		Mean	Maximum	Minimum	Skewness	Kurtosis	Jarque-Bera
Japan	UNC	−0.0006	1.2115	−0.7435	0.9654	6.8052	91.0355
	R	−0.0032	0.0290	−0.0710	−2.2976	12.5762	564.0943
	M1	0.0054	0.0304	−0.0005	3.2775	21.6016	1944.9440
	CPI	0.0005	0.0207	−0.0080	2.3878	19.1251	1414.1350
	IPI	−0.0007	0.0626	−0.1065	−1.2163	8.7834	196.8274
Canada	UNC	−0.0006	1.2115	−0.7435	0.9654	6.8052	91.0355
	R	−0.0058	0.2944	−0.7844	−4.1498	30.6310	4161.7740
	M1	0.0082	0.0374	−0.0042	1.3401	5.6388	70.7343
	CPI	0.0015	0.0115	−0.0072	0.0382	2.8715	0.1118
	IPI	0.0009	0.0434	−0.1384	−3.7994	29.9953	3932.4470
Mexico	UNC	−0.0006	1.2115	−0.7435	0.9654	6.8052	91.0355
	R	0.0089	0.4700	−0.5500	−0.2060	4.6516	14.4874
	M1	0.0097	0.0686	−0.0471	0.4918	3.6346	6.8512
	CPI	0.0034	0.0169	−0.0102	−0.3054	4.8635	19.2276
	IPI	0.0002	0.1744	−0.2903	−4.5085	58.0765	15573.6100
Eurozone	UNC	−0.0006	1.2115	−0.7435	0.9654	6.8052	91.0355
	R	−0.0149	0.1626	−0.1898	−1.5414	11.2602	388.6693
	M1	0.0071	0.0327	−0.0115	0.4716	5.7169	41.3545
	CPI	0.0012	0.0128	−0.0156	−0.6097	4.1887	14.4984
	IPI	0.0006	0.1315	−0.2137	−2.8388	31.9611	4354.8970

Source(s): Author's own calculation

Table A2. Descriptive statistics

	LR	FPE	AIC	SC	HQ
Japan	5th lag	2nd lag	2nd lag	0th lag	1st lag
Canada	6th lag	2nd lag	2nd lag	1st lag	1st lag
Mexico	7th lag	7th lag	8th lag	1st lag	1st lag
Eurozone	6th lag	2nd lag	2nd lag	0th lag	1st lag

Source(s): Author's own calculation

Table A3. Lag length selection

	Lag	LRE stat	DoF	Prob
Japan	1	43.25	25	0.01
	2	38.56	25	0.04
	3	30.38	25	0.21
	4	25.36	25	0.44
Canada	1	22.34	25	0.62
	2	33.33	25	0.12
	3	28.81	25	0.27
	4	23.13	25	0.57
Mexico	1	42.83	25	0.01
	2	19.01	25	0.80
	3	46.90	25	0.01
	4	38.74	25	0.04
Eurozone	1	37.38	25	0.05
	2	18.43	25	0.82
	3	22.37	25	0.61
	4	25.37	25	0.44

Table A4. Autocorrelation test results

Source(s): Author's own calculation

	Chi-square	DoF	Prob
Japan	759.97	765	0.54
Canada	929.58	915	0.36
Mexico	1069.75	1065	0.45
Eurozone	965.11	915	0.12

Table A5. White heteroskedasticity test results

Source(s): Author's own calculation

Variables	Source
Economic Policy Uncertainty Index for United States	Federal Reserve Bank of St. Louis – USEPUINDXD
M1 for Canada	Federal Reserve Bank of St. Louis – MANMM101CAM189S
Consumer Price Index for Canada	Federal Reserve Bank of St. Louis – CANCPIALLMINMEI
Total Industry for Canada	Federal Reserve Bank of St. Louis – CANPROINDMISMEI
3-Month or 90-Day Rates and Yields for Canada	Federal Reserve Bank of St. Louis – IR3TIB01CAM156N
M1 for Japan	Federal Reserve Bank of St. Louis – MANMM101JPM189S
Consumer Price Index for Japan	Federal Reserve Bank of St. Louis – JPNCPIALLMINMEI
Total Industry for Japan	Federal Reserve Bank of St. Louis – JPNPROINDMISMEI
3-Month or 90-Day Rates and Yields for Japan	Federal Reserve Bank of St. Louis – IR3TIB01JPM156N
M1 for Mexico	Federal Reserve Bank of St. Louis – MANMM101MXM189N
Consumer Price Index for Mexico	Federal Reserve Bank of St. Louis – MEXCPIALLMINMEI
Total Industry for Mexico	Federal Reserve Bank of St. Louis – MEXPRINTO02IXOBSAM
3-Month or 90-Day Rates and Yields for Mexico	Federal Reserve Bank of St. Louis – IR3TIB01MXM156N
M1 for Euro Area	Federal Reserve Bank of St. Louis – MANMM101EZM189S
Consumer Price Index for Euro Area	Federal Reserve Bank of St. Louis –CP0000EZ19M086NEST
Total Industry for Euro Area	Federal Reserve Bank of St. Louis – EA19PRINTO01IXNBSAM
3-Month or 90-Day Rates and Yields for Euro Area	Federal Reserve Bank of St. Louis –IR3TIB01EZM156N

Table A6. Data sources

Source(s): Author's own calculation