Foreign Uncertainty and Housing Distribution Market in Korea

Ji-Hong Jeon*

Abstract

Purpose – We investigate the relationship between economic policy uncertainty (EPU) of the US and China and housing distribution economy in Korea using EPU indexes of two countries and the economic indicators in Korea.
Research design, data, and methodology – We use the data such as the Korean housing price stability index (HPSI), housing purchase price index (HPPI), housing lease price index (HLPI), banking stock index (BSI), and consumer price index (CPI) with EPU indexes from January 1999 to December 2017. As an empirical methodology, we select the vector error correction model (VECM) due to the existence of cointegration.
Result – As results of the impulse response function, the impact of the US EPU index has initially a negative response on the Korean HPSI, HPPI, and HLPI referring the housing distribution market including the economic variables, BSI, and CPI. Likewise, the impact of index in China has initially a negative response on economic indicators except the BSI in Korea.
Conclusions – This study shows that the EPU index of the US has significantly negative relationships on all economic indicators in Korea. In this study, we reveal EPU of the US and China has dynamic impact on housing distribution economy returns in Korea.

Keywords: Economy Policy Uncertainty Index, Housing Stability, Housing Distribution Market.

JEL Classifications: C32, D80, E60, E66.

1. Introduction

Now the impact of the US and China on the global economy is huge. Especially in the past, such as the global financial crisis, the economic crisis of advanced countries has had a ripple effect on the economic market of developing countries. For example, in the result of the US subprime crisis in 2007, many Asian and European countries, including Korea, are known to have an adverse impact on the national economy and housing distribution market.

We have interesting research questions in the study. Can economic policy uncertainty (EPU) of two powerful nations, the US and China, affect the Korean economy, especially the housing distribution market? Also, if affecting Korea's housing distribution market, will EPU of the United States and China be more influential? Baker, Bloom, and Davis (2016) develop the EPU indexes of more than 20 countries including the US, Japan, and Korea by indexing the frequency of terms in E(Economy), P(Policy), U(Uncertainty)

based newspapers. The EPU index was usually used to study the relationship between EPU and economic indexes.

The purpose of this study is to investigate the impact of housing distribution market in Korea, which is the most sensitive to the Korean people, on the Korean housing distribution market through EPU of the US and China. Specially, we make the housing price stability index (HPSI) which is based on the big data related to the housing purchase price and housing lease price stabilities, which are used in 15 leading newspapers in Korea.

There are a number of previous papers on the US housing market, stock market, and financial markets such as EPU, inflation, economic downturn, and EPU. Friedman (1968), Greenspan(2004), Bachmann, Elstner, and Sims (2013), Bekaert, Hoerova, and Doca(2013), Born and Pfeifer (2014), and Caldara, Fuentes-Albero, Gilchrist, and Zakrajšek (2016) study that EPU stimulates people's psychology more and affects the economy negatively. Brunnermeier and Julliard(2008) and Ngene, Sohn, and Hassan(2017) argue that EPU and the housing market are inversely related. As uncertainty grows, housing market growth and investment are adversely affected rather than stock market, and the housing prices may become worse in the recession.

* First Author and Corresponding Author, Adjunct Professor, School of Business, Hanyang University, Korea.
  Tel: +82-2-2220-2435, E-mail: cellc@hanyang.ac.kr

Wang and Kim(2014) try to clarify the relationship between China's economic fluctuations and China's interest rates and housing prices. Andre, Bonga-Bonga, Gupta, Muteba, and John(2017) suggest that the US EPU, based on newspaper articles, would help predict housing market trends.

This study attempts to analyze the Korean housing distribution market which is considered to be most important to the people in the real economy market of Korea by applying the EPU index in the US and China.

2. Literature Review

There are also previous studies on economics and economic policies mainly including housing markets. Alesina and Rodrik(1994) argue that as wealth and income inequality increase, the rate of taxation increases, and the economic growth slows down. The results show that land unevenness and import ownership have a negative correlation with the next economic growth. Case, Quigley, and Shiller(2005) study that the impact of housing market changes on consumption for 14 countries, including the US. Changes in house prices affect household consumption more than stock changes.

Colombo(2013) examines the impact of US EPU on macroeconomic variables such as consumer price index(CPI) in Europe using Structural vector autoregression(VAR). The US EPU has led to a significant decline in production and prices in the European industry. They also find that the impact of EPU in the United States has a huge impact on the macroeconomy than in the European counterpart. Rebi (2014) studied the relationship between lending and the housing market using the Vector Error Correction Model (VECM). Although mortgage lending in banks had a large role in increasing house prices, it was not related to the interest rate, but there was significantly a positive correlation with the exchange rate.

There are many studies on economic policies and housing market in Korea. Kim(2004) examines, housing prices, consumer spending, and inflation in Korea have been studied and the causal relationship between house prices and inflation has been explained. House prices are affecting the housing market and macroeconomic variables, and the sharp decline in interest rates and consumer credit growth are the factors that increase housing prices in Korea. The increase in housing prices is an important predictor of inflation because it affects workers' salary increases. CPI inflation is attributed to the housing purchase price index (HPPI) and the housing lease price index(HLPI). Lee(2010) finds the impact of domestic and foreign news shocks in the financial markets. As a result, foreign news shocks such as the US interest rate and exchange rate have more volatility in domestic financial variables than domestic news shocks.

Yu and Lee(2010) studied the housing policy and housing market instability developed by the government in the past

by Roh, Nu Hyun as the Korean President using GDP, CPI, and money supply as macroeconomic variables that affected the destabilization of housing prices in Korea. Corporate bond returns, money supply, and building construction permits were significant, but the government's housing policy changed several times to stabilize housing, but it had no effect on housing prices. It showed that excessive housing policy had adversely affected the consumers' sense of buying house. Choi(2015) documents the relationships between the present and future of housing prices.

Lee(2018) finds the uncertainty of economic policy in the United States on the Korean economy as a whole. Jeon (2018) finds that the dynamic relationships between EPU of Asian countries including Korea and housing market in Korea. It shows that there is a negative relation between the EPU index and housing economy in Korea.

3. Sample and methodology

3.1. Sample

We gather monthly data from January 1999 to December 2017 for this study. The key variables are economic variables that show EPU indexes of the US and China on the Korean housing distribution market, including the CPI, housing purchase price index(HPPI), housing lease price index(HLPI), and banking stock index(BSI), which are closely related to the housing distribution market. In addition, we have created a new indicator for stability in the Korean housing distribution market with the so-called housing price stability index(HPSI). Data sources collect EPU indexes from Baker et al. (2016), which index EPU. As a economic index, the CPI is collected from Statistics Korea(KOSTAT). The HPPI and HLPI are data from Kookmin bank(KB), one of the largest banks in Korea. The BSI is supplied by Fnguide.

Baker et al.(2016) compare human and EPU indexes calculated by computer to get P(Policy) term in EPU index. To measure it, they calculate the fraction of sample articles in 10 newspapers at which EPU includes "House" term is equal to one in each quarter for 28 years, multiply by the EU rate, and normalize the human EPU index to 100 during the corresponding period. To take the computer EPU index, they use the fraction of audit-sample articles at which EPU included "Congress" term is equal to one. They investigate a correlation value between the human and computer EPU indexes has 0.93.

HPSI data has been published in Korea Press Foundation (KPF) using news big data. In detail, it is collected from 8 leading metropolitan newspapers: Kyungghyang Shinmum, Kukmin Daily, Naeil Shinmum, Munhwa Daily, Seoul Shinmum, Segye Daily, Hankyoreh, and Hankookilbo, and 7 leading economic newspapers: Maeil Business News Korea, Moneytoday, Seoul Economic Daily, Asia Business Daily, Financial News, Korea Economic Daily, and Herald

Business. HPSI is composed of quantitative news articles including two words about the stability of the housing purchase price and the housing lease price. In other words, the number of articles containing two words from 1999 to 2017 is collected, and then the monthly sum is obtained. The basic value is based the sum on January 2015, which is the baseline year of the other indexes, and the index is made by dividing the monthly sum by the basic value. Equation (1) represents the method to estimate the HPSI. We find the descriptive statistics of variables as Table 1.

HPSI = [(the stability of the housing purchase price) + (the stability of the housing lease price)] / Basic Value* 100(%)

Table 1: Descriptive Statistics

	US EPUI	China EPUI	HPSI	HPPI	HLPI	BSI	CPI
Mean	4.705	4.746	4.944	4.354	4.246	5.427	4.435
Median	4.686	4.702	5.152	4.429	4.197	5.466	4.462
Min.	3.801	2.204	1.802	3.920	3.648	4.597	4.165
Max.	5.647	6.543	6.387	4.630	4.624	5.949	4.640
S.D.	0.371	0.693	0.871	0.219	0.249	0.344	0.148
N	228	228	228	228	228	228	228

Note: EPUI, HPSI, HPPI, HLPI, BSI, and CPI indicate separately Economy Policy Uncertainty Index, Housing Price Stability Index, Housing Purchase Price Index, Housing Lease Price Index, Banking Stock Index, and Consumer Price Index.

3.2. Methodology

We analyze whether there is a unit root to examine the stationary for variables to determine the model of this study. In this case, the first-order difference data have no unit root but the variables have a cointegration in log-level variables. We have to use the VECM not VAR because the inherent information of the first-order difference variables is lost and the long-term equilibrium relation in the time series exists. As a result, the first-order difference data has not a unit root but there is a cointegration in the log-level variables. Therefore, we find out a long and short-term relation between the EPU index and other variables, so that the VECM is used. In Equation (2), we study the dynamic relation between EPU indexes of the US and China and economic indicators using in Korea the VECM.

$$\triangle Y_t = \sum_{i=1}^{k-1} \Phi_i \triangle Y_{t-i} + \alpha \beta' Y_{t-k} + \Omega + \epsilon_t \qquad (2)$$

$\triangle$: first difference operator
Y_t: $(p \times 1)$ vector as variables are I(1)
p: EPU Indexes in the US and China, HPSI, HPPI, HLPI, BSI, and CPI
i: lag order
k: maximum number of lag order
t: time

Φ_i: $p \times p$ short-run coefficients matrix
$\alpha \beta' Y_{t-k}$: error correction term with lag
α: adjustment parameters
β': cointegration vectors
Ω: vector of deterministic components
ϵ_t: $p \times 1$ vector of disturbances

4. Results

4.1. Unit Root Tests

The data has a unit root that take the natural logarithm in the real variables in Table 2. In the unit root tests by Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), we find the time series have a stationary because the first difference data has no unit root.

Table 2: Unit Root Tests

		ADF		PP	
		Log-Level	1st Difference	Log-Level	1st Difference
US EPUI	Con.	-3.149	-8.585***	-5.715	-6.138***
	Con. & Trend	-3.457	-8.570***	-20.685	-20.627***
China EPUI	Con.	-2.397	-9.632***	-6.474	-8.808***
	Con. & Trend	-3.520	-9.615***	-29.416	-29.345***
HPSI	Con.	-2.769	-9.607***	-5.029	-6.192***
	Con. & Trend	-2.747	-9.662***	-28.143	-28.241***
HPPI	Con.	-1.916	-3.739***	-2.307	-1.048***
	Con. & Trend	-1.652	-3.996***	-5.345	-5.554***
HLPI	Con.	-2.414	-2.672***	-3.123	-3.130***
	Con. & Trend	-3.691	-2.975***	-5.049	-5.351***
BSI	Con.	-2.254	-6.422***	-2.216	-2.746***
	Con. & Trend	-2.916	-6.386***	-14.932	-14.900***
CPI	Con.	-2.259	-7.306***	-2.252	0.285***
	Con. & Trend	0.508	-7.706***	-11.243	-11.454***

Note:
1. EPUI, HPSI, HPPI, HLPI, BSI, and CPI indicate separately Economy Policy Uncertainty Index, Housing Price Stability Index, Housing Purchase Price Index, Housing Lease Price Index, Banking Stock Index, and Consumer Price Index.
2. Con, Con. & Trend denote constant, and constant and trend separately.
3. ***, **, * mean 1%, 5%, 10% levels.

4.2. Cointegration Test

We need to find out long-term equilibrium relationship for variables by the Johansen Test. As a result of Johansen test, we find that there is a cointegration in the time series as Table 3.

Table 3: Cointegration Test

Ho	Trace	5% Critical Value	λmax	5% Critical Value
r=0	204.80	124.24	87.70	45.28
r≤1	117.09	94.15	50.22	39.37
r≤2	66.86*	68.52	28.31	33.46
r≤3	38.55	47.21	17.41	27.07
r≤4	21.13	29.68	12.33	20.97
r≤5	8.79	15.41	6.39	14.07

Note: * means 5% levels.

4.3. Granger Causality Test

As a result of Granger causality tests by Granger (1980), we find the causal relationship between the EPU index in the US and China and economic indicators in Korea. In Table 4, the null hypothesis (Ho) means that the EPU index does not cause economic indicators, or economic indicators do not cause.

The US EPU index does significantly cause all economic indicators in Korea. Therefore, the US EPU has a great impact on the Korean economy. Whereas economic indicators except for the HPSI in Korea have significantly a causal relationship with the US EPU. In addition, the EPU index of China does significant significantly cause all economic indicators in Korea. On the other hand, economic indicators except for the HLPI and CPI in Korea have significantly a causal relationship with the EPU index in China.

Table 4: Granger Causality Tests

	Ho	Chi-sq
HPSI & US EPUI	HPSI ⇏ US EPUI	0.095
	US EPUI ⇏ HPSI	11.911***
HPPI & US EPUI	HPPI ⇏ US EPUI	3.052*
	US EPUI ⇏ HPPI	4.399**
HLPI & US EPUI	HLPI ⇏ US EPUI	3.177*
	US EPUI ⇏ HLPI	17.818***
BSI & US EPUI	BSI ⇏ US EPUI	7.844*
	US EPUI ⇏ BSI	8.933*
CPI & US EPUI	CPI ⇏ US EPUI	13.091**
	US EPUI ⇏ CPI	21.574***
HPSI & China EPUI	HPSI ⇏ China EPUI	11.766**
	China EPUI ⇏ HPSI	8.367***
HPPI & China EPUI	HPPI ⇏ China EPUI	4.912**
	China EPUI ⇏ HPPI	9.211***
HLPI & China EPUI	HLPI ⇏ China EPUI	1.345
	China EPUI ⇏ HLPI	16.140***
BSI & China EPUI	BSI ⇏ China EPUI	11.004***
	China EPUI ⇏ BSI	7.022*
CPI & China EPUI	CPI ⇏ China EPUI	0.261
	China EPUI ⇏ CPI	9.530*

Notes:
1. ⇏ means "does not Granger Cause".
2. ***, **, * mean 1%, 5%, and 10% levels.
3. EPUI, HPSI, HPPI, HLPI, BSI, and CPI indicate separately Economy Policy Uncertainty Index, Housing Price Stability Index, Housing Purchase Price Index, Housing Lease Price Index, Banking Stock Index, and Consumer Price Index.

4.4. VECM Analysis

The optimal time difference must be set before executing the VECM. We select Lag 4 by AIC in Table 5.

Table 5: Lag Order Selection

lag	AIC	HQIC	SBIC
0	-3.357	-3.315	-3.252
1	-23.817	-23.478	-22.975
2	-24.795	-24.158	-23.216*
3	-25.366	-24.431*	-23.049
4	-25.381*	-24.149	-22.327

Note: * means the lag selected.

In Table 6, the US EPU index has significantly a negative correlation with economic indicators in Korea. This implies that if the US EPU index worsens, the Korean economy will worsen and consumption will lessen, leading to a drop in the CPI, as well as in the HPPI, HLPI, and the BSI. On the other hand, if the EPU index of China increases, unlike the impact of the US index, the HPPI in Korea is not affected so much. Of course, the HLPI, BSI, and the CPI are positive but not significant.

Table 6: Estimation Results of VECM

|	US EPUI	China EPUI
Housing Price Stability Index (HPSI)	-0.315** (0.139)	0.171** (0.077)
Housing Purchase Price Index (HPPI)	-0.002** (0.000)	0.000* (0.000)
Housing Lease Price Index (HLPI)	-0.002** (0.001)	0.001 (0.000)
Banking Stock Index (BSI)	-0.048* (0.025)	0.014 (0.014)
Consumer Price Index (CSI)	-0.002* (0.000)	-0.000 (0.000)

Notes:
1. ***, **, * mean 1%, 5%, and 10% levels.
2. ( ) means standard errors.

4.5. Impulse Response Function

In the VECM, we investigate the Impulse Response Function (IRF) for each variable of Korea for EPU indexes in the US and China. In Figure 1, we find that variables of Korea have different responses to impulse of the EPU indexes of the US and China.

The initial response of the HPSI, HPPI, HLPI, BSI, and CPI to the impact of the US EPU index is moving in the negative direction. Only the response of the BSI has been steadily declining to the negative direction. The HPPI and the HLPI are steadily rising in the positive direction.
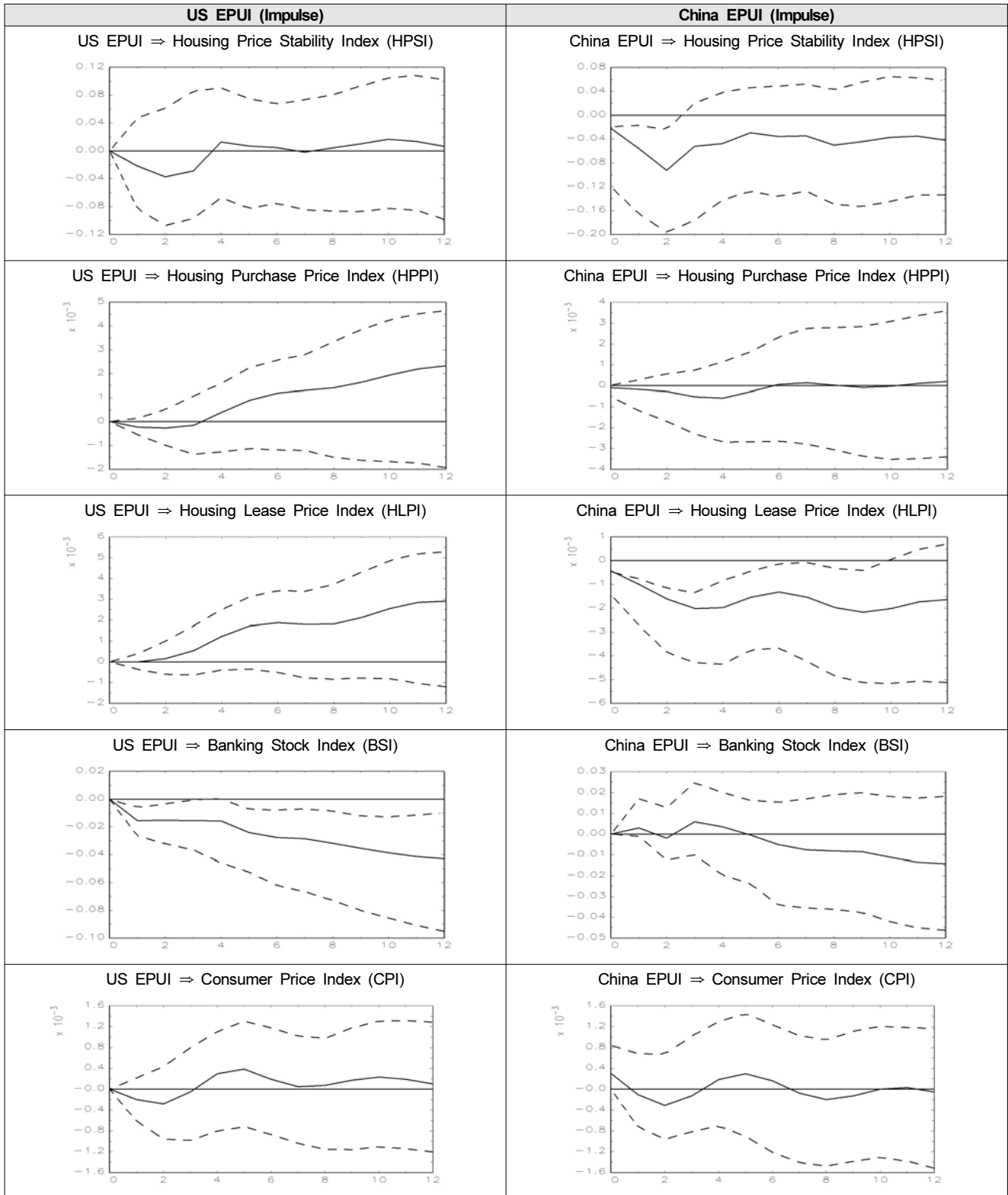
Note: The dotted line means 95% confidential interval and the thick line means the impulse response.

Figure 1: Responses to EPU Index Shocks in the US and China

Except for the BSI, the impulse of China EPU index is all moving in the negative direction for economic indicators at the beginning. In addition, the HPSI and HLPI are moving in the negative territory. On the other hand, the HPPI and CPI are crossing in the negative and positive direction, and recovering toward the zero point.

Except for the BSI, the impulse of EPU indexes of the US and China are shifting toward a negative direction for economic indicators in the beginning. By and large, the response of the HLPI tends to continue to rise in the positive direction due to the impulse of the EPU index of the US. Whereas, the impact of the EPU index of China to HLPI tends to decline toward a negative response at the beginning. In addition, the BSI response has been declining steadily toward the negative direction in 4 months since the impulse of the EPU index in the US and China. The CPI response to the impulse of the EPU index in the US and China are crossing in the negative and positive direction, and recovering toward the zero point.

5. Conclusions

We study that the EPU of the US and China, which is a major country of the world trade economy, is closely related to the economy in Korea. That is to say, we use EPU

indexes of the US and China with economic indicators of Korea such as the HPSI, HPPI, HLPI, BSI and CPI. The monthly data for 19 years from January 1999 to December 2017 are collected, and the model is used for the empirical analysis using the VECM.

As a result of Granger causality test, we find that EPU indexes of the US and China has an effect on the economic indicators of Korea. In particular, the US EPU is significantly associated with all economic indicators in Korea used in this study. Judging from Granger causality, this implies that the EPU indexes of the US and economic variables of Korea are closely related to each other.

As the result of the empirical analysis of the VECM, the US EPU index has significantly a negative correlation with economic indicators in Korea. In other words, if the US EPU index rises, the housing economy in Korea will deteriorate and consumption will shrink, affecting the CPI. In addition, this will lead to stable housing prices through newspapers, one of the mass media, and it is affected by the HPPI, HLPI and BSI. On the other hand, empirical analysis shows that the EPU index of the US has more impact than it of China on the HPPI and HLPI returns in Korea.

In this study, the results are as follows. First, we find that economic indicators in Korea are greatly affected by the US EPU index. In this study, we indirectly examine that EPU of the US gives a significant impact on the housing distribution market in Korea by using EPU index of US. This implies that all economic indicators in Korea have a negative

correlation with the US EPU index. In other words, the higher EPU, the more likely it is that the economy of the country will deteriorate.

This study has different distinctions from other previous studies. First, previous research has investigated the relation between interest rate, exchange rate, industrial production index and EPU in the countries. But this study examines the relationship between the EPU index of the US and China and economic variables in Korea such as HPPI, HLPI, BSI and CPI. Second, we use HPSI which is based on the big data related to the stabilities of the housing purchase price and housing lease price, which are used totally in 15 leading newspapers in Korea. In this way, we find that it is beneficial to observe the EPU for the US and China to understand trends of Korean housing distribution market in detail.

We can apply other economic indexes of Korea other than the variables used in this study. If we apply to investment, interest rate, other results that we do not get can be derived, and the impact of EPU index on the economic market can be forecasted differently. In addition, we try to analyze the impact of the EPU index on the housing distribution market in various countries such as Europe and Asia.

Finally, this study compares the effects of EPU indexes of the US and China on economic indicators in Korea. This study suggests that we contribute the speedy understanding for the trend of housing distribution market and the government's housing policy when we follow periodically EPU indexes in the US and China.

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