The Influence of Economic Policy Uncertainty and Geopolitical Risk on China's Financial Market

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Abstract. Since the global economic crisis in 2008, the world economic, financial and trade exchanges have become more and more close, gradually forming financial integration. However, such integration can lead to risks in one financial market being transmitted and spread quickly to other financial markets. In addition, in the financial market, the introduction of economic policies in various countries and geopolitical risks will also bring significant risks to the financial market. Therefore, based on economic policy uncertainty (EPU) and geopolitical risk (GPR), which are widely used in the literature, this paper combined with the TVP-SVAR model to study the impact of these two uncertain risks on China's financial market.

Keywords: Economic policy Uncertainty, Geopolitical risk, TVP-SVAR-SV model

1 Introduction

Scholars usually focus on the relationship between EPU and major financial markets (Lyu et al.[5], 2021; Xu Y.[7]2021). Although the impact of GPR and financial markets has been paid attention to in the literature (Ding.[3]2021; Yang.[8]2021), there are few studies that put EPU and GPR under the same framework. With the improvement of the opening degree of China's financial market, it is more and more necessary to explore the influence of EPU and GPR on the dynamics of China's financial market. In addition, in the context of the global geopolitical pattern and the networking and complexity of economic and trade relations, it is of great research value to measure the impact of uncertainty on China's financial market.

2 Model

In this paper, the TVP-SVAR-SV model is used to analyze the dynamic impact of uncertainty shocks on financial market shocks in China. This method can flexibly capture the time-varying characteristics between variables and consider the impact difference of uncertainty risk shocks at different time points.

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$$Ay_t = F_1 y_{t-1} + \cdots + F_s y_{t-s} + u_t, t = s+1, \ldots n \quad (1)$$

Where y_t is the k × 1 vector of the observed variable. For example, y_t= (GPR_t, EPU_t, S_t) is used to study the effects of GPR shocks and EPU shocks on financial market returns. F_1, …, $F_t$and A represent the matrix of coefficients, and u_t represents the column vector of structural impact. Suppose ε_t~ N(0, $\sum\sum$). A is the lower triangular matrix for estimating the impact effect of synchronous structures.

The reduced form of SVAR model in Eq. (1) can be expressed as:

$$y_t = B_1 y_{t-1} + \cdots + B_s y_{t-s} + A^{-1} \sum \varepsilon_t, \ \varepsilon_t \sim N(0, \ I_k) \quad (2)$$

$$B_i = A^{-1} F_i \quad (3)$$

Eq. (2) can be expressed as:

$$y_t = X_i \beta + A^{-1} \sum \varepsilon_t \quad (4)$$

Where β is the vector derived by B_i. Set$X_t = I_k \otimes (y'_{t-1}, \ldots, y'_{t-s})$, By introducing a random volatility (SV) process, the TVP-SVAR-SV model can be expressed as:

$$y_t = X_i \beta_t + A_t^{-1} \sum_t \varepsilon_t, \ \ t = s+1, \ldots, n \quad (5)$$

3 Data

In terms of the selection of financial market data, this paper takes the data of CSI 300 stock index, SSE national debt index and the last day of each month of USD/RMB spot exchange rate from January 2010 to December 2023 as the research object, and obtains a total of 156 data. Moreover, the market rate of return is obtained after further logarithmic processing of the data according to Eq.(6). The CSI 300 Stock Index is chosen as the representative of the stock market data because it measures the most representative 300 stocks in the Shanghai and Shenzhen stock markets in China, so it can accurately reveal the volatility and overall trend of the stock market value. The SSE government bond index is generally regarded as an "indicator" of the price changes in the bond market, so this paper chooses this index as a measure of the overall changes in the bond market. The economic policy uncertainty index constructed by Baker et al.[1] (2016) and Huang and Luk[4] (2016) is selected. The geopolitical risk selected by the literature extensively uses the geopolitical risk index developed by Caldara and Iacoviello[2] (2018) as a proxy for geopolitical uncertainty.

$$R_{t,n} = 100 * \left[\log\left(P_{t,n}\right) - \log\left(P_{t,n-1}\right)\right] \quad (6)$$

Table 1 provides a statistical description of the data. Among them, dlbond represents the return rate of the Shanghai Government Bond Index, dlhs300 represents the Shanghai Shenzhen 300 stock Index, and dlrmb represents the return rate of the spot exchange rate between US dollar and RMB. Among the three markets, the average yield of the bond market is the largest, but the standard deviation of the stock market yield is the largest. The three markets have the characteristics of right-leaning, peak and thick tail.

In addition, the skewness and kurtosis of the foreign exchange market yield are larger than those of the other two markets, indicating that the yield data of the foreign exchange market are more discrete.

In order to improve the estimation accuracy of the TVP-SVAR model and avoid "pseudo-regression", this paper first conducts ADF unit root test for each time series, and the results are shown in Table 2. The yield of stock market, bond market and foreign exchange market all meet the unit root test, that is, there is no unit root, but there is unit root of economic policy uncertainty index. Therefore, in this paper, the logarithm of economic policy uncertainty index is processed and then the first-order difference is carried out, and the result of unit root test indicates that the data is stable. Finally, this paper deals with geopolitical risk logarithmically, and the results of the unit root test also show that the null hypothesis can be rejected at the level of 1%.

Table 1. Summary statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Skew.	Kurt.	ADF test	P value
dlhs300	155	0.1221	6.4606	-23.6000	22.9583	0.0562	4.5670	-5.561	0.0000
dlbond	155	0.3110	0.2366	-0.3561	1.0533	0.0270	3.7564	-4.428	0.0003
dlrmb	155	0.0129	1.1011	-3.1134	4.3520	0.9302	6.2003	-4.504	0.0002
GPR	156	92.7350	51.3816	13.5069	453	2.6501	17.3573	-4.493	0.0002
EPU	156	376	267	26.1441	971	0.6191	2.1256	-1.249	0.6521

4 Result

4.1 Parameter Estimation Result

In order to ensure the validity of the model, this paper determines that the optimal lag order is 1 order by AIC and SC criteria of VAR model after verifying the validity of the data. Referring to Nakajima's[6] (2011) practice, this paper sets the sampling times of MCMC to 10000, abandons the first 1000 samples, and takes the last 9000 samples as the parameter estimation of the posterior distribution. Table 2 shows the parameter estimation results of China's financial market. Among them, the invalid factors, except 157.9 and 101.81, are all less than 100, which indicates that valid samples are generated and the results of model measurement are reliable.

Table 2. Estimated results for selected parameters in the TVP-SVAR-SV model

Parameter	Mean	Stdev	95% lower bound	95% upper bound	Geweke	Inef.
GPR-EPU-HS300						
sb1	0.0225	0.0026	0.0182	0.0284	0.325	7.36
sb2	0.0228	0.0027	0.0182	0.0289	0.803	8.12
sa1	0.0832	0.0319	0.042	0.1673	0.194	67.67
sa2	0.1093	0.0696	0.0466	0.32	0.98	157.9
sh1	0.2584	0.0825	0.1337	0.4466	0.582	38.93
sh2	0.1999	0.0726	0.0867	0.3628	0.13	79.95
GPR-EPU-Bond						
sb1	0.0224	0.0025	0.0182	0.0279	0.853	10.49
sb2	0.0228	0.0026	0.0184	0.0286	0.18	13.91
sa1	0.0702	0.0227	0.0396	0.1294	0.464	62.3
sa2	0.0602	0.015	0.0376	0.0947	0.289	42.74
sh1	0.2544	0.0845	0.1201	0.4477	0.328	59.17
sh2	0.2247	0.0773	0.1014	0.4104	0.977	101.81
GPR-EPU-RMB						
sb1	0.0225	0.0025	0.0183	0.0281	0.382	6.7
sb2	0.023	0.0027	0.0185	0.029	0.61	11.47
sa1	0.0684	0.0192	0.0402	0.1136	0.044	34.42
sa2	0.0698	0.0203	0.0417	0.1191	0	38.61
sh1	0.2522	0.0732	0.1351	0.4175	0.017	33.18
sh2	0.2216	0.0837	0.0952	0.4135	0.092	92.12

4.2 Impulse Response Analysis of Different Lag Periods

In order to study the time-varying law of economic policy uncertainty and geopolitical risk on market index, this paper selects 1 period, 3 period and 6 period to represent short term, medium term and long term to study the impact effect, and the results are shown in Figure 1. First, the first graph in the first column of Figure 1 shows the impact of a one-unit EPU shock on the stock market CSI 300 index. With a lag of one period, around 2014, the impact of the economic policy uncertainty index on the CSI 300 Index reached a negative maximum, then began to rise and reached the 2010 level again in 2018, and basically remained at the same level in the following years. On the whole, the impact of EPU on the CSI 300 index is basically negative, and the impact level remains unchanged in most years. In the medium and long term, EPU has little impact on the stock market. The second of the first column of Figure 1 is a graph of the impact of a one-unit GPR shock on the stock market CSI 300 index. Since 2010, the impact of geopolitical risks on the CSI 300 yield has been negative and slowly declining, reaching a minimum in 2015 and then slowly rising. The effect of GPR on CSI 300 is similar to

that of EPU, and basically has no effect on the return rate of stock market index. Secondly, the first figure in the second column of Figure 1 shows the impact of EPU on the return rate of the Shanghai Municipal Debt index. Compared with the stock market, EPU's impact on the bond market lagged behind by one period fluctuated more violently. After reaching the lowest point in 2014, EPU showed an overall upward trend year by year. The impact of GPR on the yield of the Shanghai National Debt index is slightly different. It suddenly rises after reaching its lowest point in 2017, and has been at a high level from 2020 to 2021, but it plummets to negative after 2021. Medium - and long-term bond markets behave similarly to equity markets, with little impact. Finally, the third section of Figure 1 shows the foreign exchange market. The impact of EPU on the central parity rate of RMB gradually increased from negative to positive around 2016. The impact of GPR has always been positive, rising first and reaching a maximum positive impact around 2013, then falling to the lowest value, and then fluctuating and rising. The medium - and long-term forex market is not affected by the overall trend of EPU and GPR.

4.3 Impulse Response Analysis at Specific Time Points

This paper selects three representative time points, namely, the stock market crash in June 2015, the Sino-US trade friction in July 2018 and the global novel coronavirus epidemic in January 2020, and simulates the impact of EPU and GPR on China's financial market in these three periods. First of all, the first part of Figure 2 is the impulse response diagram of the stock market CSI 300 index hit by one unit of EPU or GPR at three specific time points. In stock market disasters, Sino-US trade frictions and global COVID-19 events, there is basically no difference in the impact of EPU on the return rate of CSI 300 index. Specifically, the EPU shock response is negative in the current period and rapidly rises to 0 as time goes by. In these three periods, the impact of GPR on the return rate of CSI 300 is basically no difference, but the impact is opposite to EPU, showing a positive impact in the current period, a rapid decline to a negative impact and then an increase to zero. Secondly, the second section of Figure 2 shows the impulse response of the bond market when it is hit by one unit of EPU or GPR at three specific time points. Specifically, the impact of EPU on the return rate of Shanghai Stock Exchange Bond index is basically consistent, and the positive impact in the current period decreases rapidly and tends to 0 with the increase of the number of lagging periods. In the Sino-US trade war, the current positive impact is the largest, and the stock market disaster is the smallest. There are some differences in the impact of GPR on the return rate of Shanghai Stock Exchange Index. The Sino-US trade war time was similar to EPU, with positive impact in the current period and then decreased to 0. In the time of stock crash, the negative impact of the current period rapidly rises to the positive impact and then decreases to the zero impact. The positive impact of global public health events in the current period will increase first and then decrease rapidly with the increase of lag period and stabilize to 0. Finally, the third section of Figure 2 shows the foreign exchange market. In the impact of EPU, the impact of the Sino-US trade war and the novel coronavirus epidemic on the RMB exchange rate is consistent, positive in the current period, and then rapidly tends to 0. In the stock market crash

event, the impact is also positive in the current period, and it quickly drops to the negative impact and then rises to 0. In the impact of GPR, the stock market crash and the China-Us trade war have the same impact trend. The impact response shows a negative impact in the current period, continues to rise to a positive impact after breaking through 0, and then rapidly declines to a stable zero. The novel coronavirus outbreak event has no negative impact, a positive impact in the current period, then rises to the maximum value, and converges to 0 as the number of lagging periods increases.

5 Conclusion

This paper applies the TVP-SVAR-SV model to analyze the time-varying impacts of economic policy uncertainty and geopolitical risk on China's three financial markets, and draws the following conclusions: First, in the short term, EPU and GPR have the largest impact on the stock market, and the impact effect changes little with the change of year, and is always negative. However, the impact of EPU and GPR on the bond market changes sharply with the year, while the impact of the stock market shows an increasing trend year by year. In addition, as the number of lag periods increases in all markets, the impact of EPU and GPR on the market index gradually decreases. This shows that with the increase of time, China's financial market can effectively adapt to and reduce the impact of EPU and GPR to ensure the stability of the financial market. Second, the degree and duration of the impact of extreme events on financial market returns are also different. On the one hand, these extreme events have alternating positive and negative impacts on agricultural futures; On the other hand, when facing the impact of extreme geopolitical events, there is a lag in the response of different agricultural futures to the impact.

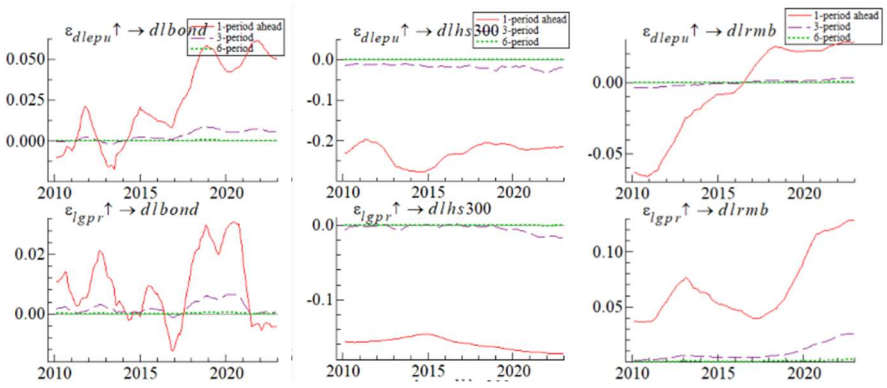

Fig. 1. Impulse response of different lag periods

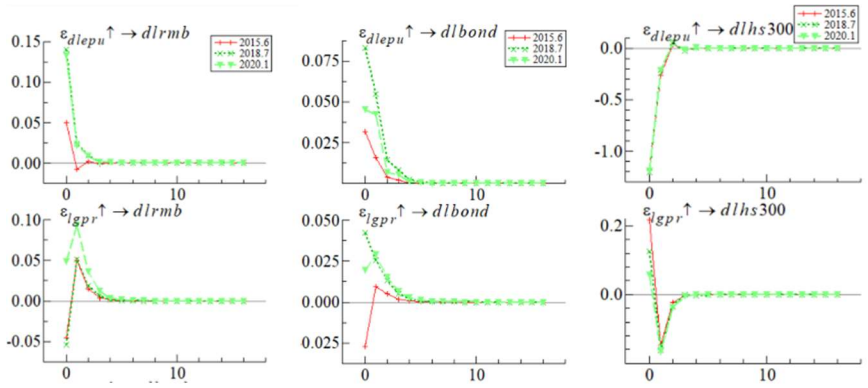

Fig. 2. Impulse response at a specific point in time

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