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The source of global stock market risk: A viewpoint of economic policy uncertainty

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ABSTRACT

This study explores the effect of economic policy uncertainty (EPU) in four countries or regions (China, Japan, Europe, and the *United States*) on the contagion risk of investments in the global stock market. The stock returns of 22 stock markets worldwide are analyzed to determine which region's EPU exhibits the greatest effect on regional systematic risk in the global stock market and on volatility risk in individual stock markets. First, all of the samples, the markets of different continents and the spillover indices of the developed and emerging markets, are calculated to observe the dynamic correlation among these markets with the aim of quantifying regional systematic risk and further examining the contagion *risk effect of EPU. The results indicate the following: EPU in China is the most influential, and its contagion risk spreads to different regional markets, except for Europe; the effect of EPU in the United States is inferior to that in China*; EPU in Japan merely influences contagion risk in emerging markets; contagion risk in European markets is not influenced by the four EPU indices; and EPU in Europe is not influenced by contagion risk in the global stock market. However, according to the volatility risk in each market, the EPU in Europe and China respectively influence Asian countries and European countries the most. These results may be attributable to the extremely high trade dependence among these countries because the performance of international enterprises is mainly determined by the economic policies of their trading partners.

1. Introduction

Since 2010, numerous studies have discussed the individual and overall effects of economic policy uncertainty (EPU). Regarding the individual effects, the behaviors of enterprises are influenced by economic policies, and thus the operational risk of enterprises increase under EPU. Similarly, when public investors are incapable of judging future market and policy developments when making investments, they may withdraw from markets or request high *expected rates of return* to subsidize investment risk. Overall, policy uncertainty influences the effectiveness of policy intervention on the overall economy. For example, examining whether EPU moderates the effect of monetary policy on an overall economy, Aastveit et al. (2013) reports that, if EPU is high, then the effectiveness of monetary policy decreases because the effect of *monetary* shocks on economic activities is weakened.

Some studies discuss the effect of EPU on the overall economy from the perspective of structural vector autoregressive (VAR), such as the studies conducted by Alexopoulos and Cohen (2009), Bloom (2009), Caggiano et al. (2014), Leduc and Liu (2015), and Nodari (2014). These studies all adopt the VAR model to estimate the effect of the uncertainty shocks of a variable on other overall variables. However, this research method merely observes the unexpected changes resulting from a policy or sector and cannot explain the changes caused by the overall EPU. Baker et al. (2013) construct the indicators of EPU. Through these substitute variables, subsequent studies can determine the overall economic changes caused by EPU from an objective and overall perspective.

Thus far, numerous studies have employed various indicators of EPU to explore the effect of EPU on crucial topics such as corporate governance (Zhang et al., 2015), investment behavior (Wang et al., 2014), economic development (Scheffel, 2015), monetary policy effects (Aastveit et al., 2013), commodity markets (Wang et al. 2015), the relationship between stock and bond markets (Li et al., 2015), stock price (Ko and Lee, 2015), and stock market volatility (Liu and Zhang, 2015). For the public, if the EPU in an economy is high, then the economic policies are difficult to anticipate, which indicates a high investment risk. All of the aforementioned studies explore the effect of a single country's EPU on that country or on relevant markets. However, the present study aims to analyze which country's EPU exhibits contagion risk effects on the global market and to further explore, from the perspective of global investment, which economy's policy risk causes stock market volatility. We adopt the EPU indices of four countries and regions constructed by Baker et al. (2015) to observe their effect on regional systematic risk in the global stock market and on volatility risk in individual markets.

With the increased liberalization of international trade, interactions among the real economies of all countries have grown in intensity. In addition, the circulation of a single currency in Europe has established

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the transnational integration of European currency and promoted trade cooperation among other regions. This trend of international integration has rendered the economic performance of each country, whether large or small, prone to the influences of other countries' policies. The global upsurge of transnational financial investments since 2000 substantially increased the systematic risk in financial markets, particularly stock markets, in all countries. Consequently, the financial crises that have occurred since 2000 (e.g., the subprime mortgage crisis in the United States in 2007, the financial crisis precipitated *by* the collapse of Lehman Brothers in 2008, and the European debt crisis in 2010) were not merely national or regional financial crises but crises that severely hit the global economy.

The global economy is not merely influenced by financial crises. The United States, Europe, Japan, and China have implemented expansionary policies in response to possible long-term economic recession caused by the aftermath of financial crises. However, devaluation policies such as the expansionary fiscal policy, an easy-money policy, or the beggar-thy-neighbor policy all interfere with the global economy. Since 2011, the International Monetary Fund has repeatedly warned in the World Economic Outlook Report and Global Financial Stability Report that the hot money derived from expansionary policies may lead to another financial crisis; particularly, if the bubbles caused by overinvestment in China's housing market were to burst, then another financial crisis would occur (International Monetary Fund, 2011, 2012).

China's stock market crash occurred in June 2015.[1] The global stock market was also affected by a black swan event that occurred two months later on August 24, 2015, during which China's two major composite indices underwent a one-day drop that exceeded 8%, the Dow Jones stock index in the United States plunged more than 1000 points in the opening minutes, and stock indices in Japan and European countries had also dropped more than 4%. Although the one-day event was experienced the worst in China, the cause of the collapse, according to *The New York Times* of the United States and the *Financial Times* of the United Kingdom, was because plans by the US *Federal Reserve* System ("the Fed") to raise interest rates caused investor panic (i.e., an occurrence of taper tantrum). From this perspective, EPU in a large country can be internationally contagious.

Previous studies researching the relationship between EPU and stock markets have focused on exploring a country's EPU and its relationship with the local stock market and have mainly centered on EPU in the United States (e.g., Liu and Zhang, 2015). Studies on the transnational effect of EPU have focused on the effect of EPU in the United States on Europe (e.g., Sum, 2012; Colombo, 2013). The US economy and the European stock market have always been highly correlated; however, with the occurrence of several global financial crises, which region's EPU influences the global stock market the most? Does EPU affect regional systematic risk or influence volatility risk in individual markets? Does contagion risk in developed and emerging markets originate from the same source? This study aims to answer these questions.

Uncertainty increases economic upheaval and thus heightens stock market investment risk. The effect of EPU in a large economy on investment risk in the global stock market can be considerable. In addition to the increased operational risk of enterprises listed on stock markets, the rapid flow of transnational investment funds because of uncertainty also causes stock market volatility. The policies of a large economy can result not only in the bubble and collapse of one country but also in a global financial crisis. Therefore, understanding whether a large economy is experiencing stable growth is critical to stock market investors for minimizing investment risk. However, which type of economic uncertainty is most influential? From the upheaval of which economy does the investment risk in different stock markets originate? Following the occurrences of several global financial crises, we must determine what sources of economic uncertainty mainly influence different stock markets, in order to accurately assess the risk of investing in a market.

This study analyzes 22 stock markets from January 1995 to September 2015 in Asia, Europe, the Americas, and other regions to explore the effect of EPU in China, Japan, Europe, and the United States on these stock markets. We research two types of risk that may affect stock markets: (1) The first type of risk indicates that, if several stock markets are influenced by a country's EPU, then systematic risk in these stock markets is heightened. Therefore, we first explore the dynamic correlation among stock markets and their causal relationships with EPU. (2) The second type of risk involves the risk in individual stock markets. By estimating the relationship between EPU and the conditional volatility of individual stock markets, we can examine whether contagion risk from EPU in these four regions spreads to the stock markets of every country.

Section 2 explains how we measure the contagion risk effect of EPU on regional systematic risk and on volatility risk in individual stock markets. Section 3 explains the samples pooled in this study and the empirical results. Finally, Section 4 concludes the study.

2. Empirical methodology

2.1. Economic policy uncertainty and regional systematic risk

We aim to analyze which region's policy uncertainty mainly influences investment risk in the global stock market. First, regional systematic risk is measured. To measure changes in systematic risk, the correlation among regional stock market returns must be estimated. The measurement of market spillover effects proposed by Diebold and Yilmaz (2012) is employed because it can be used to quantitatively analyze information transfer effects among various markets.

This study follows Diebold and Yilmaz (2012) in constructing the VAR models based on a generalized VAR framework in which variance decompositions are invariant to the variable ordering. This method parses the forecast error variance into parts that are attributed to various shocks. This variance decomposition enables us to investigate the directional spillovers across markets. By using rolling windows of data, we can estimate the rolling spillover index. This study used a 24-month rolling estimation window. The dynamic spillover charts can examine how spillovers across the stock markets change through time. Changes in spillover indices reveal dynamic information transfer among regional stock markets and the high or low correlation among them. The methodology is described as follows.

To estimate the correlation among the number of N stock markets, a covariance stationary N-variable VAR(p) model is first constructed:

$$R_t = \sum_{i=1}^{p} \psi_i R_{t-i} + \varepsilon_t, \tag{1}$$

where R_t is a vector of stock market returns and $\varepsilon \sim (0, \Sigma)$ is a vector of the disturbances distributed independently and identically. This expression can be rewritten as the moving average representation expressed as

$$R_t = \sum_{i=1}^{\infty} B_i \varepsilon_{t-i}, \tag{2}$$

where B_i represents the $N \times N$ coefficient matrices following $B_i = \varphi_1 B_{i-1} + \varphi_2 B_{i-2} + \cdots + \varphi_p B_{i-p}$, with $B_i = 0$ for $i < 0$ and B_0 as an $N \times N$ identity matrix. Then by the variance decompositions, the model calculates the fraction of the error variance in forecasting R_i, which is due to shocks to R_j, where$\forall\, j \neq i$ for each i. The respective variance shares are defined as the fraction of the H-step ahead error variances in forecasting R_i that are due to R_i, for $i = 1, 2, \cdots, N$. Here, the cross

[1] The Composite Index of the Shanghai Stock Exchange (abbreviation: SSE Composite Index) in China dropped almost 35% from June 12, 2015, to July 9, 2015; simultaneously, the Composite Index of the *Shenzhen Stock Exchange* (abbreviation: SSE *Composite Index) in China dropped* 40%.