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Economic Policy Uncertainty and Stock Market Returns in Pacific-Rim Countries: Evidence based on a Bayesian Panel VAR Model

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Abstract

This paper examines the role of Economic Policy Uncertainty (EPU) on the stock market returns in a sample of 6 countries which includes Australia, Canada, China, Japan, Korea and the US using monthly data from January 1998 to December 2014. For our purpose, we use a restricted Panel Vector Autoregressive (PVAR) model estimated using the Stochastic Search Specification Selection (SSSS) prior (PVAR-SSSS). In order to account for international uncertainty spillovers, the impact of the own country's EPU shocks and the US EPU shocks are considered. The main results suggest that stock market returns have not been significantly affected by the increased policy uncertainty levels observed during the last decade, except in the cases of Canada and the US. When uncertainty spillovers are considered, only Japanese and Korean stock market returns are influenced by US EPU shocks.

Keywords: Economic policy uncertainty; stock returns; panel vector autoregressive model; Pacific-rim countries.

JEL classification: C32; G10.

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1. Introduction

In the wake of the financial crisis, economic policy uncertainty has raised a lot of interest due to its potential negative effects on economic activity (Bloom et al., 2007; Bloom, 2009; Antonakakis et al., 2013; Pastor and Veronesi, 2012, 2013; Aasveit et al., 2013; Shoag and Veuger, 2013; Baker et al., 2015; Brogaard and Detzel, 2015; Gulen and Ion, 2015). For example, the Federal Open Market Committee (2009) and the International Monetary Fund (2012, 2013) have suggested that uncertainty about US and European fiscal, regulatory, and monetary policies has contributed to a steep decline in 2008-2009. Furthermore, many authors, such as Baker et al. (2015) have also suggested that the high levels of policy uncertainty are behind the weak recoveries after the 2007 financial crisis.

The economic literature points to different channels through which uncertainty might negatively affect economic growth. Considering the demand side of the economy, in a highly uncertain environment, firms will reduce investment demand and delay projects (Bernanke, 1983; McDonald and Siegel, 1986; Dixit and Pindyck, 1994), while households will reduce their consumption of durable goods (Carroll, 1996). On the other hand, and considering the supply side, firms' hiring plans will be also negatively affected by high uncertainty levels (Bloom, 2009). Policy uncertainty is also believed to have these potential effects on different macroeconomic variables (Friedman, 1968; Pastor and Veronesi, 2012, 2013; Fernández-Villaverde et al., 2015).

Among the different measures of policy uncertainty, the economic policy uncertainty index based on newspaper coverage frequency proposed by Baker et al.

(2015) has become a benchmark[1] for measuring economic policy uncertainty (Sum, 2012a, 2012b; Antonakakis et al., 2013, 2016; Gulen and Ion, 2015).[2] Figure A2 in the Appendix plots the EPU indices of the countries considered in the paper. The historical evolution of the US EPU index, for example, shows that policy uncertainty sharply increased after several events, such as Black Monday's stock market fall in 1987, the 9/11 attack and the 2nd Gulf War. According to this index, the highest policy uncertainty levels correspond to the 2011 debt-ceiling dispute. It is innegable the international influence of the U.S. economy as an exporter of international uncertainty spillover effects (Klößner and Sekkel, 2015; Yin and Han, 2014) which justifies the analysis of the impact of this variable on international stock market returns.

When the EPU indexes for Australia, Canada, China, Japan and Korea are considered, the data reveals that the indexes reached their peaks in 2011, coinciding with different national events together with high international political uncertainty also due to the Eurozone fear, except in the case of Japan, where the index reached the highest level in 2010 with the Bank of Japan monetary easing. In Canada, although the index spikes in 1995 with the Quebec Referendum and in 2008 with the collapse of Lehman Brothers, it also reaches its highest level in 2011, as it does in Australia (Baker et al., 2015). In Korea, the main spikes in the indexes correspond to the enforcement of the \`real-name financial transactions law' in August 1993 under Kim regime and the death of Il-Sung Kim in July 1994. Other episodes with high EPU indexes coincide with the bankruptcy of Daewoo Motors in 2000, the beginning of Roh regime and the disaster at a subway station in Daeggo in 2002, and the global financial crisis initiated

[1] As an example of the great number of papers that have used this data, see the web page http://www.policyuncertainty.com/research.html.

[2] Alternative measures of policy uncertainty can be found in Mumtaz and Zanetti (2013), Mumtaz and Surico (2013), Mumtaz and Theodoridis (2015), Carriero et al., (2015) Jurado et al., (2015), Ludvigson et al., (2015) and Rossi and Sekhposyan (2015), among others. See Strobel (2015) for a review of alternative approaches to measure uncertainty.

by the collapse of Lehman Brothers. Again, the index reached its peak in 2011 with the serial bankruptcy of savings bank and the death of Jung-II Kim (Choi and Shim, 2016). In China, the index spikes with the township and village enterprises bankruptcy in 1995-96, privatization and restructuring in 1997-2000, accession to World Trade Organization in 2001, global financial crisis in 2008-2009, and euro crisis in 2010. The Chinese index also reaches its peak when Xi-Li Administration began with legislation aimed at corruption and poverty in 2011 (Kang and Ratti, 2015). These high levels of policy uncertainty are considered as one of the key differences of the on-going recovery from previous recoveries, by some authors, such as Bloom et al. (2015), and attests to the severity of the recent crisis (Yin and Han, 2014).

The impact of policy uncertainty on stock market returns has been already studied in the literature. However, although the results seem to suggest that uncertainty negatively impact stock returns (Pastor and Veronesi, 2012; Antonakakis et al., 2013; Kang and Ratti, 2013, 2015; Chuliá et al., 2015; Chen et al., 2016), the results are far from conclusive. Given the dominance of the U.S. economy, Sum (2012a,b) examine the existence of international uncertainty spillovers and find that US EPU shocks have a non-significant in the stock returns in China, Brazil and India, while Momim and Masih (2015) find the same results when analysing their impact on the BRICS countries. Li et al. (2015) examine the causal link between US economic policy uncertainty and stock returns in India and China, and they do not find evidence of causality between the two variables. Furthermore, an increase in US policy uncertainty could positively affect international stock markets, since it could lead to an improvement in foreign stock markets through the diversification channel of investor portfolios (Mensi et al., 2014, 2016; Balcilar et al., forthcoming).

In this context, the objective of this paper is to analyse the effect of economic policy uncertainty on stock market returns in a sample of six Pacific-rim countries, which includes Australia, Canada, China, Japan, South Korea and the US using monthly data from January 1998 to December 2014, by means of estimating a restricted PVAR estimated using the Stochastic Search Specification Selection (SSSS) prior (PVAR-SSSS) of Koop and Korobilis (2016). While, the choice of the US economy is natural given its global influence on other financial markets, the decision to look at the Pacific-rim countries is driven by the increased transmission of stock market return among these markets over recent periods (Balcilar et al., 2015). The main contributions of the paper are the following: First, the PVAR methodology, rather than time-series based approaches, applied in this paper is an excellent way to examine international transmission of different shocks allowing for cross-sectional dependence, given interconnectedness of the world economy. So, by using a panel approach we gain in efficiency over time series models, but using non-homogenous coefficients allows us to obtain impulse responses for each of the six countries separately rather than an average impulse response obtained under standard panel data approaches. The cost of overparameterization due to the usage of heterogeneous coefficients in the PVAR, is in turn, solved using the Bayesian methods proposed by Koop and Korobilis (2016). Second, and in order to account for international uncertainty spillovers, we not only analyze the impact of the own country's EPU shocks, but also the U.S. EPU shocks on the various stock markets. Furthermore, the sign and persistence of these spillovers based on impulse response functions will help us understand the mechanism through which international uncertainty spillovers affect stock market returns and for how long.

To the best of our knowledge, this is the first paper to use impulse responses in a heterogeneous coefficient Bayesian PVAR model to analyze the impact of own and US EPU shocks on stock returns of Pacific-rim countries.[3] Hence, we extend this literature on stock market and EPU, primarily based on time-series approaches, which in turn, fail to account for cross-sectional dependence in international stock markets and thus, could be leading to inaccurate inferences. In addition, our study also deviates from the existing time series works, which primarily look at G7 or BRICS countries. The remainder of the paper is structured as follows. Section 2 discusses the methodology used in the paper. Section 3 describes the data and shows the empirical analysis. Section 4 summarizes the main findings.

2. Methodology: The Panel VAR Framework with the Stochastic Search Specification Selection (SSSS) Prior

In this paper we are interested in modeling stock returns and uncertainty for each country using a Vector Autoregressive (VAR) model but also allow for linkages among countries. In such a setup, Panel VAR (PVAR) is the appropriate tool since it uncovers all sort of static and dynamic dependencies. Specifically, a PVAR model allows for (i) dynamic interdependencies (DI) which occur when one country's variables affect another country's lagged variables, (ii) static interdependencies (SI) which occur when the correlations between the VARs' errors of two countries are non-zero, and (iii) cross-section heterogeneities (CSH) which occur when two countries have VARs with different coefficients. Furthermore, given the autoregressive structure of a PVAR

[3] While Chang et al., (2015) and Wu et al., (2016) have used PVAR model to analyze the causality between EPU and stock returns of OECD countries, both these studies do not present impulse responses, and hence are silent about the persistence of EPU shocks on stock returns and its associated statistical significance. Besides, these studies do not look at the impact of US uncertainty on stock returns of other markets.

endogeneity problems are solved. However, an unrestricted PVAR is heavily over-parameterized. For example, in a PVAR with P lags, N countries, each country with G variables, we have $P(NG)^2$ autoregressive coefficients, and $NG(NG+1)/2$ parameters in the error covariance matrix. Consequently, the total number of possible restrictions on DIs, SIs and CSHs is also huge. Thus, the researcher is faced with an over-parameterized unrestricted model and a large number of potentially interesting restricted models. Recently, Koop and Korobilis (2016) develop methods which allow the researcher to select among all possible combinations of restricted PVARs and find a parsimonous PVAR which deals with the overparametrization problem. In the following subsection we briefly review the PVAR analysis framework for a model with lag length of one (P=1) which is a reasonable assumption for financial variables.

Let y_{it} a vector of G dependent variables for country i at time t, $i = 1,2,..,N$, $t = 1,2,..,T$. In this paper Let $y_{it} = (EPU_{it}, RETURNS_{it})'$, where EPU_{it} and $RETURNS_{it}$ stand for the logarithm of economic policy uncertainty index and stock returns for country i at time t, respectively. The ordering of the EPU before the stock returns is in line with the evidence of stock market predictability emanating from uncertainty as provided by Bekiros et al., (2016, forthcoming). In other words, EPU acts as a leading indicator for stock returns. The PVAR equation of country i is written as:

$$y_{it} = A_{i1}y_{1,t-1} + \cdots + A_{ii}y_{i,t-1} + \cdots + A_{iN}y_{N,t-1} + u_{it}, \quad (1)$$

Where A_{ij} are $G \times G$ matrices for each $i, j = 1,2,..,N$, and $u_{it} \sim N(0, \Sigma_{ii})$ with $G \times G$ covariance matrices Σ_{ii}.

The unrestricted PVAR model is defined as:

$$Y_t = AY_{t-1} + U_t, \quad (2)$$

where $Y_t = (y'_{1t}, \dots, y'_{Nt})'$ is a $NG \times 1$ vector of endogenous variables, $U_t \sim (0, \Sigma)$ with Σ a full $NG \times NG$ matrix. It is assumed that $cov(u_{it}, u_{jt}) = \Sigma_{ij} \neq 0$, where Σ_{ij} denotes the covariance matrix between the errors of country i and country j.

Within the unrestricted PVAR in equation (2), Koop and Korobilis (2016) define three categories of restrictions. First, $N(N-1)$ dynamic interdependency (DI) restrictions can be defined by imposing $A_{ij} = 0$ for $i, j = 1,2,.., N$ and $\neq j$, implying no DIs from country j to country i. Second, we can construct $N(N-1)/2$ static interdependency (SI) restrictions by setting $\Sigma_{ij} = 0$ for $i, j = 1,2,.., N$ and $\neq j$, implying no SIs between country i and country j. Third, $N(N-1)/2$ cross section heterogeneity (CSH) restrictions can be defined. By imposing $A_{ii} = A_{jj}$ for $i, j = 1,2,.., N$ and $i \neq j$ we impose homogeneity between two countries, i and j. The authors developed a stochastic search algorithm, the Stochastic Search Specification Selection (SSSS) algorithm, which explicitly tests all possible $2^{N(N-1)}$ DI restrictions and all possible $2^{N(N-1)/2}$ CSH restrictions. It is clear that the SSSS algorithm takes into account the panel structure of the model in equation (2).

The SSSS algorithm of Koop and Korobilis (2016) is based on the Stochastic Search Variable Selection (SSVS) hierarchical prior (see George and McCullogh (1993); George et al (2008)). Within the SSSS prior the DI restrictions can be expressed as:

$$vec(A_{ij}) \sim (1 - \gamma_{ij}^{DI}) N(0, \underline{\tau}_1^2 \times I) + \gamma_{ij}^{DI} N(0, \underline{\tau}_2^2 \times I), \quad (3)$$

$$\gamma_{ij}^{DI} \sim Bernoulli(\pi^{DI}), \ \forall\, i \neq j, \quad (4)$$

where $\underline{\tau}_1^2$ is "small" and $\underline{\tau}_2^2$ is "large" so that, if $\gamma_{ij}^{DI} = 0$, A_{ij} is shrunk to be near zero, and if $\gamma_{ij}^{DI} = 1$, a relatively noninformative prior is used. According to the SSSS prior the CSH restrictions are:

$$vec(A_{ii})\sim(1-\gamma_{ij}^{CSH})N\left(A_{jj},\underline{\xi}_1^2\times I\right)+\gamma_{ij}^{CSH}N\left(A_{jj},\underline{\xi}_2^2\times I\right), \quad (5)$$

$$\gamma_{ij}^{CSH}\sim Bernoulli(\pi^{CSH}),\ \forall\, i\neq j, \quad (6)$$

where $\underline{\xi}_1^2$ is "small" and $\underline{\xi}_2^2$ is "large" so that, if $\gamma_{ij}^{CSH}=0$, A_{ii} is shrunk to be near , anA_{jj} and if $\gamma_{ij}^{CSH}=1$, a relatively noninformative prior is used.

SI restrictions have the following form:

$$vec(\Psi_{ij})\sim(1-\gamma_{ij}^{SI})N(0,\underline{\kappa}_1^2\times I)+\gamma_{ij}^{\Sigma I}N(0,\underline{\kappa}_2^2\times I), \quad (7)$$

$$\gamma_{ij}^{SI}\sim Bernoulli(\pi^{SI}),\ \forall\, i\neq j, \quad (8)$$

where $\underline{\kappa}_1^2$ is "small" and $\underline{\kappa}_2^2$ is "large" so that, if $\gamma_{ij}^{SI}=0$, Ψ_{ij} (and thus $\Sigma_{ij}=\Psi_{ij}^{-1\prime}\Psi_{ij}^{-1}$) is shrunk to be near zero, and if $\gamma_{ij}^{SI}=1$, a relatively noninformative prior is used. Following Koop and Korobilis (2016) we use the following prior for the error variances:

$$\psi_{ij}^{ii}\sim\begin{cases}N(0,\underline{\kappa}_2^2), & if\ k\neq l\\ Gamma\left(\underline{\rho}_1,\underline{\rho}_2\right), & if\ k\neq l\end{cases}.$$

Furthermore, as in Koop and Korobilis (2014), we set $\underline{\tau}_1^2=\underline{\xi}_1^2=\underline{\kappa}_1^2=0.01$ to ensure tight shrinkage towards the restrictions. For the other hyperparameters we set $\underline{\tau}_2^2=\underline{\xi}_2^2=\underline{\kappa}_2^2=10$, $\underline{\rho}_1=\underline{\rho}_2=0.01$, and $\pi^{DI}=\pi^{CSH}=\pi^{SI}=0.5$, which are relatively noninformative choices.

3. Data and Empirical Results

3.1. Data

Our analysis comprises of two variables, namely, the stock returns and the EPU. We look at six Pacific-rim countries (Australia, Canada, China, Japan, South Korea and the US) over the monthly period of 1998:01 to 2014:12, with the start and end date being purely driven by data availability of the EPU variable. Stock returns are defined as the first-difference of the natural log of the stock index. The data on stock indices are obtained from the macroeconomic indicators database of the OECD. The data on the EPU indices for the six countries are obtained from www.policyuncertainty.com, and are based on the work of Baker et al., (2015). The authors construct indices for major economies of the world by quantifying month-by-month searches for newspaper coverage on terms related to policy-related economic uncertainty. For inclusion in the index, the articles must contain all of the three terms of economy, policy and uncertainty simultaneously. The EPU index is converted into its natural logarithmic form. As can be seen from the summary statistics in Table A1 in the Appendix, South Korea (US) has the highest average stock returns (EPU), and Japan (Australia) has the lowest average stock returns (EPU). China has the highest standard deviation for both the stock returns and EPU, while Australia (US) has the lowest corresponding values of the standard deviation for the stock returns (EPU). Further, all stock returns are non-normal at the one percent level, while for the EPU, non-normality holds at the 1 percent level for China and the US, and at 10 percent level for Canada. The data on stock returns and EPU have been plotted in Figures A1 and A2 respectively, in the Appendix of the paper.

3.2. Empirical Results

We now turn our attention to the main focus of the paper; we carry out impulse response analysis to investigate the effects of EPU shocks on stock returns, based on a restricted PVAR model estimated using the SSSS prior (PVAR-SSSS) of Koop and Korobilis (2016). The results are shown in Figures 1 and 2.

Figure 1 illustrates impulse response functions of stock returns to own country's EPU. For China, Japan and Korea impulse responses are not statistically different from zero, suggesting that stock market returns have not been significantly affected by the increased policy uncertainty levels in these countries. However, in Canada and the US the effects to their own EPU are negative and statistically significant, suggesting that in an environment of policy uncertainty, some variables such as investment levels could be reduced, affecting, thus, economic growth and stock market returns. Surprisingly, in the case of Australia the impulse response function appears to be positive. This result calls for further research on how economic policy uncertainty levels might affect investors' expectations on future uncertainty levels, their investment levels and thus, stock market returns. In other words, if investors expect uncertainty to increase further in the future, then stock market activity might increase following a shock to EPU. An alternative explanation is provided by Chang et al., (2015) regarding the positive correlation between stock returns and uncertainty. These authors suggest that, higher uncertainty leads to lower interest rates, which in turn, boosts the stock market.

In order to account for the possible international spillovers from the US economic policy uncertainty, or to analyze how international stock markets react to global market uncertainty, Figure 2 shows the responses of stock returns to the US EPU shocks. In the cases of Australia, Canada and China, impulse responses are not statistically different from zero, that is, they show that stock market returns in these countries are not significantly affected by global policy uncertainty levels, and they are consistent with the papers by Sum (2012a, b), Momin and Mashi (2015) or Lie et al. (2015), among others. In the case of Japan the response is positive and increasing in the first month, but it slowly decreases afterwards. In Korea, the effect is positive but decreasing. The positive, temporary and significant relationship between stock market returns in Japan and Korea and the US EPU shocks could be explained due to the favorable opportunities that investors could gain by the temporary diversification of their portfolios (Mensi et al., 2014, 2016; Balcilar et al., 2015, forthcoming) in these countries after a global increase in policy uncertainty levels. The results suggest, thus, that after an increase in the US EPU levels, investors are more likely to invest in the stock markets in Japan and Korea than in Canada, Australia or China. For the US case, the results state that an increase in the policy uncertainty will lead to a decrease in US stock returns, as usually found in the literature (Baker et al., 2015).

4. Conclusions

The high economic policy uncertainty (EPU) levels observed during the last decade, together with the data availability to measure it explain the great amount of papers that have already analyzed the macroeconomic impact of EPU shocks on different variables. In this context, this paper examines the role of EPU shocks on the stock returns in a sample of countries which includes Australia, Canada, China, Japan, Korea and the US using monthly data from January 1998 to December 2014, by means of estimating a restricted PVAR estimated using the SSSS prior (PVAR-SSSS) of Koop and Korobilis (2016). In order to account for international uncertainty spillovers, the impact of the own country's EPU shocks and the U.S. EPU shocks are considered.

The main results suggest that, in most of the cases, stock market returns have not been negatively affected by the increased policy uncertainty levels observed during the last decade. For example, when own country's policy uncertainty is considered, this variable has a negative impact on stock returns only Canada and the US. On the contrary, there is no evidence of a negative relationship between policy uncertainty and stock market returns in Australia, Japan, Korea and China. These results suggest that the high levels of policy uncertainty present in the last decade has not been associated with a negative behaviour in the stock market returns in these countries.

Furthermore, when the existence of international spillovers are considered, the results suggest that the US EPU shocks have a positive and significant effect on the stock market returns in Korea and Japan, suggesting that international uncertainty leads to an improvement in these two stock markets through the diversification channel of investor portfolios, as already suggested in Mensi et al. (2014, 2016) and Balcilar et al. (forthcoming). On the contrary, we do not find evidence of US uncertainty spillovers on the stock markets returns in Canada, Australia and China. The lower correlation between the US stock market returns with the Japanese and Korean stock markets might explain why an increase in international policy uncertainty is associated with an increase in the stock market returns in Japan and Korea, and not in Canada, Australia and China. The benefits of international diversification faced by investors due to the increase in the US policy uncertainty will be higher in those first countries.

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Figure 1: Responses of stock returns to a shock to own country EPU index from the PVAR with SSSS prior

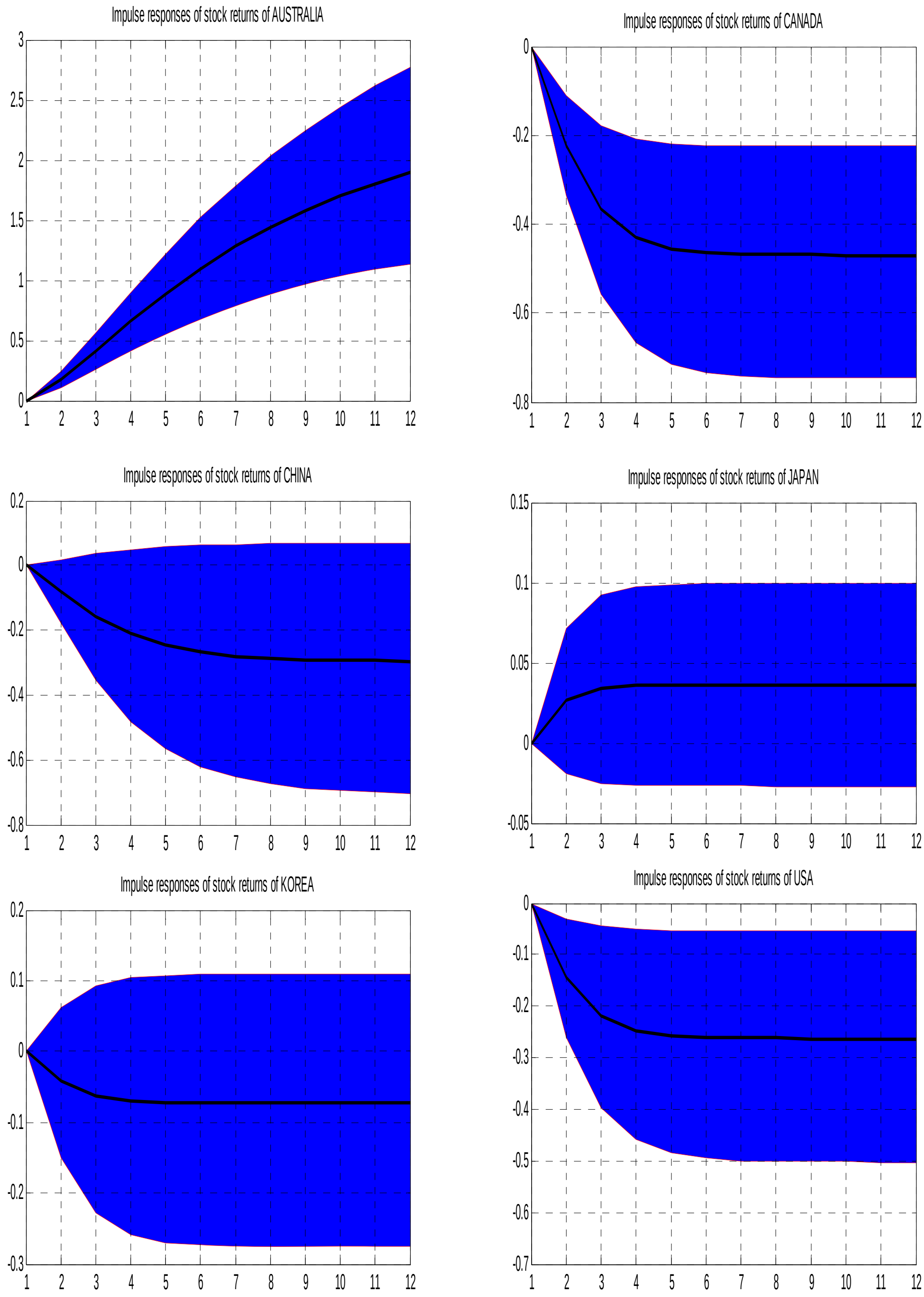
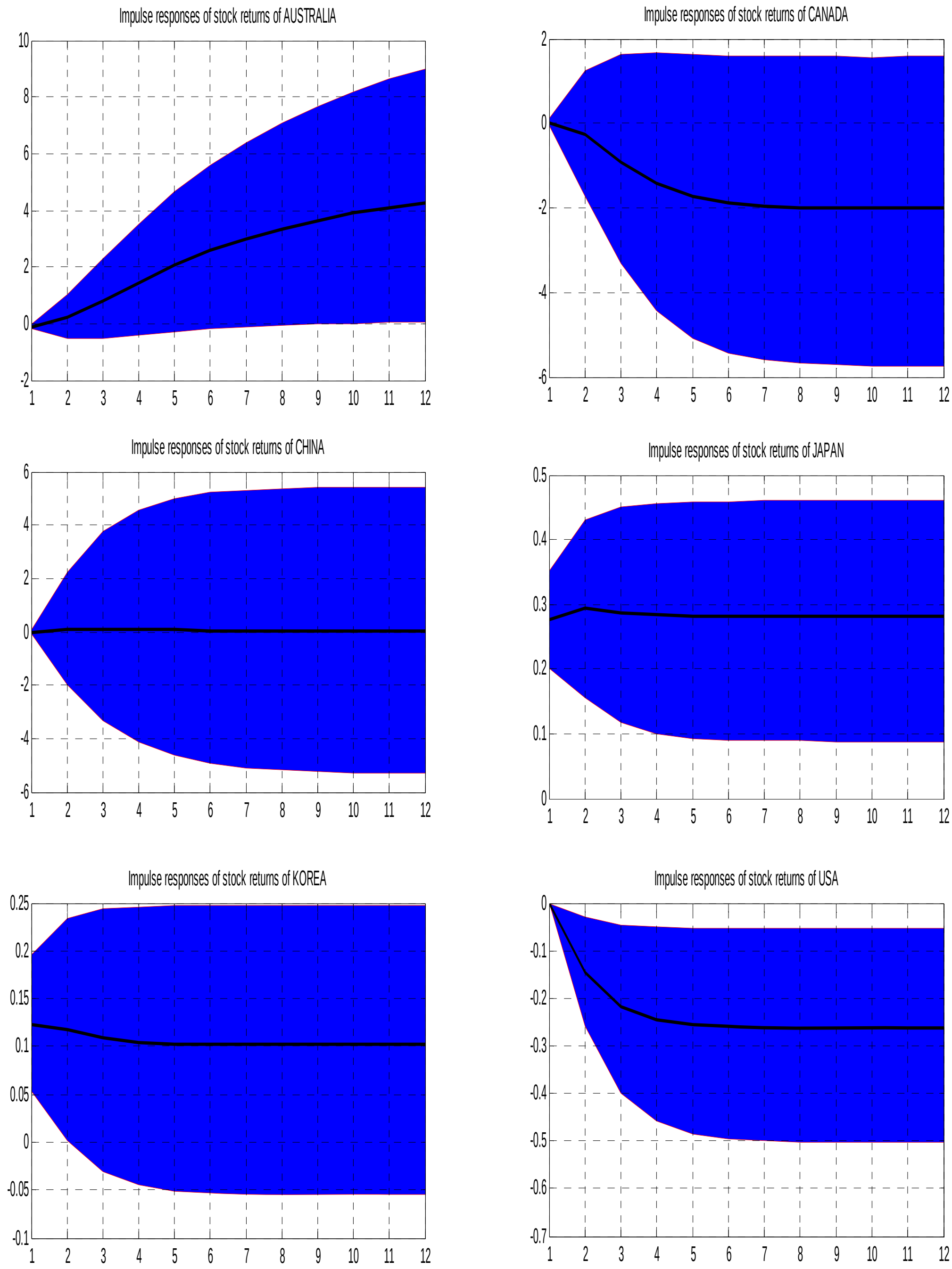


Figure 2: Responses of stock returns to a shock to the U.S. EPU index from the PVAR with SSSS prior



APPENDIX:

	Variable											
	Stock Returns						EPU					
Statistic	Australia	Canada	China	Japan	South Korea	US	Australia	Canada	China	Japan	South Korea	US
Mean	0.3690	0.3736	0.1637	0.0779	0.7863	0.3467	4.4433	4.6475	4.5620	4.5713	4.5796	4.6521
Median	0.9017	1.1911	0.0351	-0.0791	1.2833	0.9320	4.4790	4.6250	4.5846	4.6055	4.6050	4.5956
Maximum	9.8245	11.1872	26.9644	11.2563	20.7196	11.9270	5.8202	5.9911	5.8958	5.3217	5.6160	5.5018
Minimum	-15.1131	-24.9987	-24.9749	-24.7912	-22.0491	-25.4720	3.2450	3.4044	2.2046	3.5583	3.1640	4.0466
Std. Dev.	3.4354	4.3501	7.4013	5.0074	6.8316	4.0762	0.5681	0.5472	0.6048	0.3569	0.4580	0.3261
Skewness	-0.9139	-1.7852	0.3259	-0.5685	-0.0861	-1.6270	0.1242	0.1633	-0.5023	-0.1356	-0.1979	0.3191
Kurtosis	5.1617	11.2445	4.5185	4.9967	4.0264	10.7074	2.3875	2.3173	3.8104	2.4748	2.8189	2.1756
Jarque-Bera	68.1194	686.1195	23.2088	44.8761	9.2065	594.9289	3.7140	4.8688	14.1612	2.9693	1.6098	9.2390
Probability	0.0000	0.0000	0.0000	0.0000	0.0100	0.0000	0.1561	0.0877	0.0008	0.2266	0.4471	0.0099

Note: Note: Std. Dev. stands for standard deviation; Probability corresponds to the Jarque-Bera test which tests the null hypothesis of normality.

Figure A1. Stock returns, monthly data, 1998:M1-2014:M12.

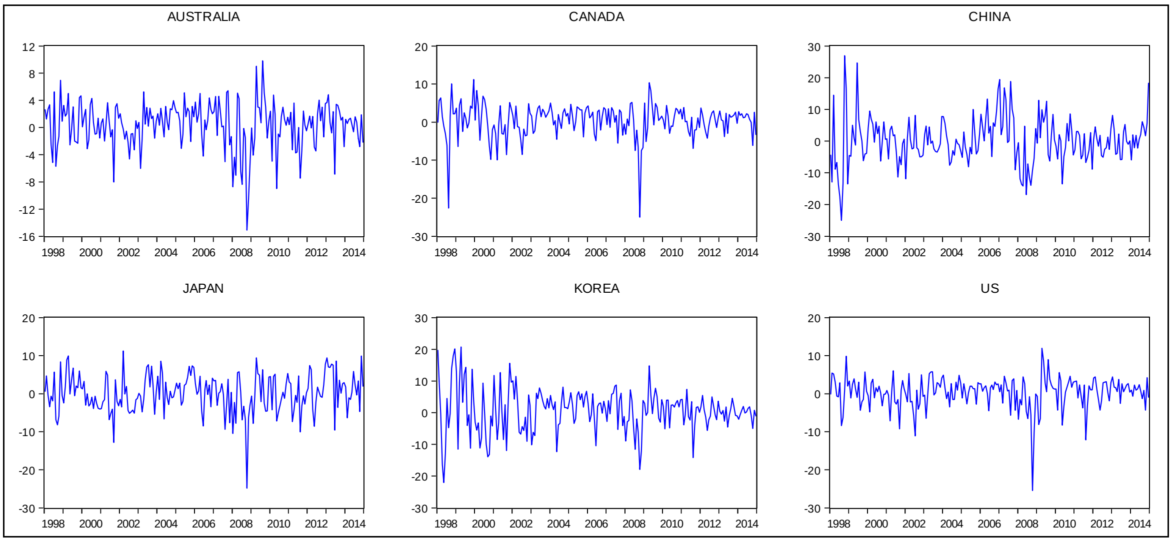


Figure A2. Economic Uncertainty Policy (EPU) indices (in logs), monthly data, 1998:M1-2014:M12.