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Asymmetric dependence between economic policy uncertainty and stock market returns in G7 and BRIC: A quantile regression approach

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ABSTRACT

This paper employs the quantile regression techniques to examine the dependence structure between economic policy uncertainty (EPU) and stock market returns in G7 and BRIC. We find new evidence to support the view that EPU will reduce stock market returns, with the exception of France and the UK. Our results show that eight out of ten stock markets reveal asymmetric dependence with EPU. Moreover, there is no dependence between EPU and France/the UK stock market.

1. Introduction

The effect of economic policy uncertainty constructed by Baker et al. (2013) on economic activities has received increasing attention among researchers and policy-makers (Colombo, 2013; Bloom, 2014; Li et al., 2015). Unlike previously research papers which focus on the relationship between EPU and the US economic activity (Jones and Olson, 2013), the aim of this paper is to contribute towards the effects of economic policy uncertainty on stock market performance in G7 and BRIC. In particular, according to Baur's (2013) approach, we explore the structure and degree of dependence between EPU and stock market returns in G7 and BRIC using Koenker's (1978) quantile regression techniques that permit us to analyze potential asymmetric dependence. Thus, we are able to investigate differences in dependence across stock returns of positive and negative sign. Moreover, understanding how the returns react to economic policy uncertainty when the stock market is bullish or bearish could be very useful to investors and policy-makers (Chevapatrakul, 2015).

2. Methodology

In this paper we firstly employ the panel quantile regression model with fixed effect (Koenker, 2004) that takes into account unobserved country heterogeneity to investigate the effect of EPU on stock market returns of G7 and BRIC. In addition, we should eliminate the influence of the lagged return ($\beta(\tau)$) and effect of both extreme positive as well as extreme negative previous month's

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returns ($\gamma(\tau)$) in the following regression model, which also covers the presence of asymmetry dependence and estimates the slope parameter at different quantiles. Consider panel quantile regression model with fixed effects as

$$Q_{RE_{t,i}}(\tau|RE_{t-1,i}, LEPU_{t,i}) = \alpha_i + \beta(\tau)RE_{t-1,i} + \gamma(\tau)RE_{t-1,i}I(|RE_{t-1,i}| > RE^q) + \theta(\tau)LEPU_{t,i} \quad (1)$$

where $RE_{t,i}$ is the monthly return of country i at month t. $LEPU_{t,i}$ is the logarithm of economic policy uncertainty index of country i at time t. $Q(\tau|\bullet)$ denotes a conditional quantile function of stock market return, evaluated at τ th quantile, where $\tau \in (0, 1)$. $\beta(\tau)$ is the coefficient of the lagged return. The $\theta(\tau)$ measures the dependence degree of stock returns at τ th quantile to $LEPU_{t,i}$, which is the focus of this study. The indicator variable $I(|RE_{t-1,i}| > RE^q)$ is equal to one if the stock return i at month $t-1$ exceeds a certain threshold RE^q and zero otherwise. RE^q is selected to be the 95% quantile of the unconditional distribution of absolute returns of the respective stock.

Using panel quantile regression model, we could obtain the overall effect of EPU on G7 and BRIC. To examine whether economic policy uncertainty has any significant influence on the stock market returns in each country, quantile autoregression approaches (Koenker and Xiao, 2006) are used. Similarly, we also eliminate the influence of the lagged return ($\beta_{j,i}(\tau)$) and extreme return ($\gamma_i(\tau)$) in the following regression model.

$$Q_\tau(RE_{t,i}|F_{t-1},\ LEPU_{t,i}) = \alpha_i(\tau) + \sum_{j=1}^{p}\beta_{j,i}(\tau)RE_{t-j,i} + \gamma_i(\tau)RE_{t-1,i}I(|RE_{t-1,i}| > RE^q) + \theta_i(\tau)LEPU_{t,i} \quad (2)$$

where F_{t-1} is the lagged return of the respective stock. $\beta_{j,i}(\tau)$ is quantile specific autoregressive parameter. The lag order p is determined by Bayesian Information Criterion. The $\theta_i(\tau)$ measures the dependence degree of stock returns at τth quantile to $LEPU_{t,i}$, which is ours target parameter.

3. Data

In this paper we use monthly data of the economic policy uncertainty indices for G7 countries, that is, Canada, Germany, France, Italy, the UK, Japan and the USA, as well as, for BRIC countries, namely, Russia, China and India. It is worth noting that the choice of countries and sample period is directed by data availability provided by Baker et al. (2013). Despite the fact that our study is limited to countries, it represents a tremendous portion of the global economy. To measure the dependence structure more accurately, we use exchange rates, obtained from the Investing.com, to convert local stock prices to dollars. The stock prices are: FCHI for France, GDAXI for Germany, N225 for Japan, S&P 500 for USA, FTSE 100 for UK, GSPTSE for Canada, MIB for Italy, MICEX for Russia, BSESN for India and SSECI for China. Monthly stock returns are calculated as $RE_{i,t} = 100 \times \log(P_{i,t}/P_{i,t-1})$, where $P_{i,t}$ is the monthly stock market indices that are extracted from Yahoo Finance (http://finance.yahoo.com/). The logarithm of economic policy uncertainty (i.e. *LEPU*) indices are used and obtained from the website (http://www.policyuncertainty.com/). The descriptive statistics results are presented in Table 1.

As evident in Table 1, EPU indices have a positive average value, with a low standard deviation. With regard to stock market returns, we observe a positive mean values, with the exception of Italy and Japan. We also notice that Japan and India present the lowest and highest mean values respectively. Stock market returns are fairly volatile, as shown by the standard deviation. Furthermore, the J-B statistics indicate that none of the series is normally distributed, except for the EPU indices of Germany, Italy, Japan and India. According to the ADF unit root test, all variables are stationary.

The unconditional correlation between each stock market returns is reported in Table 2. It shows that the correlation is not low, which means that the integration among these stock markets is very high. Germany–France, Italy–France and the UK–France are the high correlations between their stock markets, however, lower correlation in China and other countries. That is, compared to other stock markets, the integration is not high between China and other countries. The highest/lowest correlation is Germany–France and Italy–China, respectively.

The problem with simple correlation coefficients is that it can only capture linear relationships and does not exhibit time-varying behavior. In this subsection, we provide a rolling correlation analysis of the stock returns. The rolling correlation analysis could address the time-varying nature of the correlation coefficients. A different picture emerges when the correlations are calculated in a rolling window. Take the USA as an example,[1] Fig. 1 presents the rolling correlation coefficients between the USA and other countries. It shows that the correlation coefficients are time-varying and include some periods where it is negative (China and the USA), which is a desired feature for portfolio diversification. Table 3 provides further information on the descriptive statistics of the rolling correlation coefficients. The range of the correlation coefficients is very wide. For example, the maximum correlation between stock returns in France and Germany is as high as 0.972 but the minimum figure is −0.275 in China and India. According to the Table 3, there are only the negative correlations between China and other countries. Nevertheless, the degree of integration among these countries is gradually increasing.

[1] The results of other countries can be available upon request to the corresponding author.