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The dynamic correlation between policy uncertainty and stock market returns in China

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HIGHLIGHTS

- We examine the dynamic correlation between policy uncertainty and stock returns.
- We use a VAR model, SVAR model, and DCC-MGARCH model to capture the correlation.
- We find that the stock market is significantly related to policy uncertainty.

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ABSTRACT

The dynamic correlation is examined between government's policy uncertainty and Chinese stock market returns in the period from January 1995 to December 2014. We find that the stock market is significantly correlated to policy uncertainty based on the results of the Vector Auto Regression (VAR) and Structural Vector Auto Regression (SVAR) models. In contrast, the results of the Dynamic Conditional Correlation Generalized Multivariate Autoregressive Conditional Heteroscedasticity (DCC-MGARCH) model surprisingly show a low dynamic correlation coefficient between policy uncertainty and market returns, suggesting that the fluctuations of each variable are greatly influenced by their values in the preceding period. Our analysis highlights the understanding of the dynamical relationship between stock market and fiscal and monetary policy.

1. Introduction

The effects of policy uncertainty on the stock market have been the focus of scholarly attention in recent years. Baker et al. and Brogaard and Detzel both found that policy uncertainty is correlated with instability and fluctuations in stock prices [1,2]. Ozoguz empirically uncovered the negative relation between the level of uncertainty and asset valuations by using the state probabilities estimated from two-state regime-switching models [3]. Sum shows that changes in policy uncertainty in the United States were negatively linked to the returns of five ASEAN stock markets [4].

The key step to study the correlation with stock market returns is how to quantitatively measure the policy uncertainty. Shi adopted a dummy variable to understand the returns driven by a range of factors related to policy, expansion, and the news [5]. Bernanke and Kuttner constructed a formular for measuring policy change [6]. Worthington measured policy change by observing the ruling party, minister tenure, and election-related information [7]. Kim et al. quantified the national politics by establishing the PAI index, while Wang divided policy factors into 16 categories and introduces these into a regression equation in the form of virtual variables [8,9]. Finally, Kang et al. used the GARCH (1, 1) model to construct an economic policy impact index [10].

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Here, we use publicly available monthly data[1] from January 1995 to December 2014 to examine the dynamic correlation between stock market returns, proxied by using the Shanghai Composite Index, and policy uncertainty based on the index introduced in Ref. [1] (the PUI hereafter). To examine whether stock market volatility can be explained by policy uncertainty, we firstly carry out a preliminary analysis on the interaction between policy uncertainty and stock market returns by means of a VAR model. Then, an SVAR model is adopted to analyze the contribution to the change of endogenous variables for each structural shock and evaluate the relative importance of shocks in the change of specific variables. In other words, we capture the extent to which policy uncertainty affects stock market returns and vice versa by using the variance decomposition method. After obtaining the correlation between the two variables, we further construct a time-varying dynamic conditional correlation (DCC) model to test the dynamic and intrinsic correlations between policy uncertainty and stock market returns.

Our results indicate a significant correlation between policy uncertainty and stock market returns, which is in accord with the findings of Antonakakis et al. [11]. However, the results of the DCC-MGARCH model show that the dynamic correlation coefficient between policy uncertainty and stock market returns is low and the fluctuations for each variable are largely influenced by their values in the preceding period, which may be dampened by irrational investment in the Chinese stock markets and defective stock market mechanisms.

The remainder of this paper is organized as follows. Section 2 presents the methodology. Section 3 gives the datasets and results of the empirical study, and Section 4 concludes.

2. Methodology

2.1. VAR model

For two given series, the binary Vector Auto Regression (VAR) model can be written as:

$$\begin{cases} y_{1t} = \beta_{10} + \beta_{11} y_{1,t-1} + \cdots + \beta_{1p} y_{1,t-p} + \gamma_{11} y_{2,t-1} + \cdots + \gamma_{1p} y_{2,t-p} + \varepsilon_{1t} \\ y_{2t} = \beta_{20} + \beta_{21} y_{1,t-1} + \cdots + \beta_{2p} y_{1,t-p} + \gamma_{21} y_{2,t-1} + \cdots + \gamma_{2p} y_{2,t-p} + \varepsilon_{2t} \end{cases} \tag{1}$$

where $\{\varepsilon_{1t}\}$ and $\{\varepsilon_{2t}\}$ are both white noises, which means no autocorrelation. However, the perturbation terms of the two equations are allowed to exist concurrent to the correlation:

$$\mathrm{Cov}(\varepsilon_{1t}, \varepsilon_{2s}) = \begin{cases} \sigma_{12}, & t = s \\ 0, & t \neq s. \end{cases} \tag{2}$$

By combining Eqs. (1) and (2), we obtain:

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} \beta_{10} \\ \beta_{20} \end{pmatrix} + \begin{pmatrix} \beta_{11} \\ \beta_{21} \end{pmatrix} y_{1,t-1} + \cdots + \begin{pmatrix} \beta_{1p} \\ \beta_{2p} \end{pmatrix} y_{1,t-p} + \begin{pmatrix} \gamma_{11} \\ \gamma_{21} \end{pmatrix} y_{2,t-1} + \cdots + \begin{pmatrix} \gamma_{1p} \\ \gamma_{2p} \end{pmatrix} y_{2,t-p} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}. \tag{3}$$

Let $y_t = \begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix}$, $\varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$

$$y_t = \underbrace{\begin{pmatrix} \beta_{10} \\ \beta_{20} \end{pmatrix}}_{\Gamma_0} + \underbrace{\begin{pmatrix} \beta_{11} & \gamma_{11} \\ \beta_{21} & \gamma_{21} \end{pmatrix}}_{\Gamma_1} y_{t-1} + \cdots + \underbrace{\begin{pmatrix} \beta_{1p} & \gamma_{1p} \\ \beta_{2p} & \gamma_{2p} \end{pmatrix}}_{\Gamma_p} y_{t-p} + \varepsilon_t. \tag{4}$$

We define the coefficient matrix of y_{t-p} as $\Gamma_0, \Gamma_1, \ldots, \Gamma_p$ and obtain:

$$y_t = \Gamma_0 + \Gamma_1 y_{t-1} + \cdots + \Gamma_p y_{t-p} + \varepsilon_t \tag{5}$$

where $\{\varepsilon_t\}$ is the vector white noise process.

2.2. SVAR model

The Structural Vector Auto Regression (SVAR) model is defined as:

$$A y_t = A\Gamma_1 y_{t-1} + \cdots + A\Gamma_p y_{t-p} + A\varepsilon_t \tag{6}$$

where y_t is a $k \times 1$ vector, ε_t is a simplified disturbance term and a white noise. Matrix A is a non-degenerate matrix. Let $A\varepsilon_t = B\mu_t$. By moving $A\Gamma_1 y_{t-1} + \cdots + A\Gamma_p y_{t-p}$ to the left side of Eq. (6), we obtain the SVAR model

$$A\left(I - \Gamma_1 L - \cdots - \Gamma_p L^p\right) y_t = A\varepsilon_t = B\mu_t \tag{7}$$

[1] Please see http://www.policyuncertainty.com.