Modelling risk spillover between oil price shocks and stock market returns in the BRICS

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Overview

With the rapid development of futures, options and other derivatives, oil market has become more financialized which is involved into the global financial system. It means oil price changes are not only exogenous shocks to macroeconomic variables, but also exposed to systemic financial risk with other financial markets. Especially, speculative activities and capital flows globally have strengthened their comovement. The 2008 global financial crisis presents a good interpretation that both stock market and oil market have experienced a significant turbulence almost simultaneously affected by the global economic recession. Therefore, research on the relationship between oil price changess and stock market returns has received a increased concern by researchers and market investors, which can provide an useful anticipation for portfolio strategies and risk avoidance.

However, following Kilian's (2009) work, not all oil price shocks are alike. It's because the causes of oil price fluctuations are different. For example, the impact of hurricanes on oil prices is supply-side shock, the global financial crisis impact on oil prices is aggregate demand shock and the shock from Libyan war is precautionary demand shock (Ji and Guo, 2015). Obviously, different origins of oil price shocks depict different transmission path of depedence structure and risk spillover between oil price shocks and stock market returns. The most previous literatures often follow Kilian's (2009) frawework and employ SVAR to model the linear and static relationship between oil price shocks and its influences on stock market returns. They ignored the importance of examining the relationship between oil prices and stock markets in a time-varying and nonlinear environment.

This paper extends the previous studies and tries to combine dynamic copula models with SVAR model to caputure the dynamic dependence and risk spillover between all oil price shocks and stock market returns in the BRICS countries by measuring upside and downside CoVaR.

The paper is organised as follows: After the introduction the second section proposes the research methodology. Section 3 conducts the empirical analysis and the last Section concludes the paper.

Methods

In this paper, the modelling process is divided into three stages. Firstly, Following Kilian (2009), a SVAR model is constructed to decompose oil prices into three type price shocks series, including oil supply shocks, aggregate oil demand shocks and oil market specific demand shocks. Second, CoVaR is bulit to measure the upside and downside spillover risk and four time-varying copula-GARCH models are constrcted to measure the CoVaR. Finally, VaR of stock market returns is also estimated and some tests are made to test the presence of difference between VaR and CoVaR and asymmetry effect between upside risk and downside risk.

Results

In our empirical findings, the dynamic dependences between three type oil price shocks and five stock market returns in the BRICS present separately characteristics. Firstly, oil supply shocks present smallest dependence with stock returns in the BRICS compared with the other two type oil price shocks. It is in accordance with the fact that oil price shocks are mainly driven by oil market specific demand shocks and then by aggregate demand shocks. Secondly, aggregate demand oil price shocks always present positive depedence with stock returns in Brazil, Russia and india, while that in China and South Africa present both negative and positve depedences. Thirdly, oil market specific demand shocks present largest depedence with stock returns in almost all the five countries. It's because that oil market specific demand shocks reflect the uncertainty in oil market which include more exogenous information also influencing stock market.

When we quantify the VaR and CoVaR risk measures for oil price shocks and stock returns, it's found that the upside and downside VaR and CoVaR trajectories display a similar trend with slight differences in magnitude for all the BRICS except South Africa. A significant abrupt change is observed during the 2008-2009 period which can be attributed to the global financial crisis. When we compare the difference between VaR and CoVaR for the same stock market, it's found that there is significant risk spillover effect from oil price shocks to stock markets for alomost all the cases. It indicates that oil market also has a systemic risk for stock market in the emerging countries. Furthermore, we examine the asymmetric effect beteen upside and downside risks. It's found that there are asymmetric upside-downside risk spillover effects from aggregate demand oil shocks and oil market specific demand shocks to Brazil, Russia and India's stock markets.

Conclusions

In summary, our empirical results provide strong evidences that the dependences between oil price shocks and stock returns in the BRICS are not constant but instead they vary over time. Especially, the dependence structures between different type oil price shocks and stock returns present different which reinforces our contribution to differentiate the effect of different origins of oil price shocks. Our findings verify the risk spillover effects from oil price shocks to the emerging stock markets and also the asymmetric effect between upside risks and down risks. These findings have importance implications for investors, portfolio managers and market traders.

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