The Dynamic Correlation between Chinese Stock Market and Oil Prices

Oil is one of the most vital commodities in the global economics and it is considered as the life support of many economics. Consequently, the effects of oil prices on various macroeconomics variables has been studied extensively by plenty of literature.

Naturally we tend to think about the relationship between stock market and oil market, since stock market is one of the most important indicator of macro economy. In fact, in recent literature, numerous studies have examined the relationship of oil price change and stock prices and nearly all show a direct or indirect relationship between these two in different countries or regions. For example, Jones and Kaul (1996) found stocks and oil prices in U.S.A and Canadian market are correlated. Narayan and Narayan (2010) noted oil prices have a positive and statistically significant impact on Vietnam's stock prices. There are also other extant researches studying the relations in Canada, US, Europe, and UK, such as Hammoudeh et al. (2004), El-Sharif et al. (2005), Lanza et al. (2005), Nwala, K. (2007), Basher et al. (2010), and Park and Ratti (2008). Moreover, substantial evidence indicates a negative relationship between oil prices and stock market returns. The first one to reveal the negative impact of oil price on stock market is Jones and Kaul (1996). Other literature have also provided evidence of this negative relationship, such as, Filis (2010), Miller and Ratti (2009), Nandha and Faff (2008), O'Neill, Penm, and Terrell (2008), Park and Ratti (2008), Driesprong, Jacobsen, and Maat (2008), and Ciner (2001).

However, it's interesting that this seemed not the case in China, while most of the literature above focused on U.S. or European counties. Cong et al. (2008) analyzed the impact of oil shocks on Chinese stock market and concluded that Oil price shocks do not show statistically significant impact on the real stock returns of most Chinese stock market indices, except for manufacturing index and some oil companies. The authors explained the results might be related to the information inefficiency of Chinese stock market. Indeed, Chinese stock market is quite different from markets of US and many European countries, due to policy regulation and

protection. It's even a controversial issue that Chinese stock market has a close relationship with macro economy. Zhao and Zhang (2003) noted the stock market has a weak positive correlation with the macro economy while Wang and Tian (2002) argued the correlation is not significant or is negative. Therefore, the case of China is worth investigating. While the dynamic co-movements between stock market and prices has been widely studied among developed countries, there has been relatively little empirical work done to analyze the dynamic correlation of the two in China since Cong et al. (2008). So my paper is going to use data of Chinese market in 2010 - 2020 to analyze this dynamic co-movement relation.

Furthermore, it's notable that many previous literatures found a positive correlation between stock market returns and oil prices during crisis shocks, which is opposite to the normal condition. For example, Filis et al. (2011) concluded that aggregate demand-side oil price shocks will cause a positive correlation between oil prices and stock market returns, for example, Asian crisis, housing market boom, Chinese economic growth, and the latest global financial crisis; while important precautionary demand side oil price shocks will cause a negative correlation, like first and second war in Iraq, 9/11 terrorist attack. Bharn and Nikolovann (2010) also suggests a positive correlation between Russian stock market return and the oil prices caused by three major events, which are September 11th, 2001 terrorist attack, war in Iraq 2003 and the civil war in Iraq in 2006.

Therefore, my paper also tends to explore whether the abnormal positive correlation exist in Chinese market during recent COVID-19 shocks. This empirical study can help the researchers understand the mechanism of oil prices effects on stock market better, especially under special Chinese market circumstances. In fact, this question also has realistic meaning and can lead to meaningful implications for regulation policy maker, banks, and investors. Recently, China Bank released a financial product, "Crude Oil Bao", which is similar to the futures of crude oil. The bank predicted this product would gain profit since stock market has been shocked due to COVID-19. However, the fact is the opposite, resulting in hundreds of millions investor's loss on

this product. So the aim of this studies also includes to provide guidance to financial market regulation policy maker and to help avoid the loss of investors due to misjudgment. Besides, it could also provide support for future research opportunities include policy analysis regarding how to affect the economy and stock market at various level of energy pricing. (Cong et al., 2008)

As for the methods, related literatures mainly use the class of MGARCH models with various regional data. For instance, Bharn and Nikolovann (2010) used a bivariate EGARCH model to examine the dynamic correlation between stock market and oil prices in Russia; Aloui and Jammazi (2009) examined the relationship between crude oil shocks and stock market of UK , French and Japan based on univariate regime-switching EGARCH model; Lee and Chiou (2011) used a univariate regime- switching GARCH model to investigate the correlation between WTI oil prices and S&P500 returns; Cifarelli and Paladino (2010) applied a multivariate CCC-GARCH model; Choi and Hammoudeh (2010) investigated correlations between Brent oil, WTI oil, copper, gold, silver and S&P500 index based on a symmetric DCC-GARCH model; Chang, McAleer, and Tansuchat (2010) used a symmetric DCC-GARCH model to study the relationship between crude oil and FTSE100.

We notice most of the literature applied symmetric DCC-GARCH model. However, Faff and Brailsford (1999), Sadorsky (1999, 2001) have already found that the volatility of oil prices in fact have asymmetric effects on stocks. Therefore, in this paper the author is going to build an asymmetric DCC-GARCH model using python instead of common symmetric DCC-GARCH model, in order to be more fit with the data. The computing process will refer to DCC-GARCH-GJR model in Filis et al. (2011). This paper will also consider different asymmetric DCC-GARCH models with various error distribution, such as Student’s t-distribution, Gaussian and skew Student's t-distribution, to supply a best fit with data.

As to data, this paper is going to use UK Brent crude oil price, serving as the representative of world real oil price, and then use exchange rate to obtain China oil price by adjusting nominal

price. Furthermore, Shanghai stock market is selected as research objects with 2 composite indices and 5 classification indices.

In summary, it can be stated that there are negative correlations between oil prices and the stock market in general, but the opposite during crisis. It have been examined in many European countries, US, UK and other developed countries. Whether this pattern of correlation between stock market and oil prices exist in China is the focus of this paper, especially considering the special case of recent COVID-19 crisis.

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