

Analysis of stock market fluctuations in response to oil shocks using bivariate

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Oil Shocks in general are very impactful events in economic histories of countries. As oil remains a primary source of energy even after years of research for alternative sources, its trade is still very unstable due to various underlying international political and economic factors. According to Killian (2009) the major factors behind oil shocks are either shocks in supply of oil or in the aggregate demand of oil based or industrial commodities. The stock market, by its nature, is very sensitive to fluctuations in the price of oil. By the experience obtained from the historical oil shocks, the fall in asset prices and increased market volatility as a result of oil shock has become common knowledge among investor community.

Although there is wide consensus over the consequences of the oil shocks, its causes have split academicians into two sects. A minority of academics (Chen et al. , 1986; Huang et al. , 1996; Jones and Kaul, 1996; Sadorosky, 1999; Wei, 2003) believe that oil price is exogenous with respect to macroeconomic and financial conditions and accredit fluctuations of oil price mainly on political stability of the Middle East. The majority, on the other hand, hold the view that oil prices are indeed endogenous in the case and the advancement in the demand supply mechanism of the global oil markets. The movements in stock markets are strictly based on the origin of the shock. The effects of supply side shocks and demand side shocks on variables such as GDP, inflation and uncertainty are distinct. This implies that tracing the real origin of the shock is essential to derive any substantial information for prediction of market movements for practical purposes. The study focuses on US market volatility and tries to answer the following questions pertaining to the oil shocks.

1. How differently do the markets respond in case of supply side shocks and demand side shocks.
2. How differently do oil exporters and importers experience oil shocks?

Scope of the study

The study aims to examine the specific impact of supply and demand side shocks on expected, unexpected returns and uncertainty index of the US stock markets over the period 1975-2013. The study builds on a study (Killian et al. , 2009) which focused on European stock markets for a relatively shorter period. The study proposed that the cause of hikes in aggregate demand itself contributes to the volatility and widely differs in terms of the set of variables and their magnitude that are impacted. This study focuses on verifying the aforementioned proposals and its validity in the case of US markets. Since numerous studies have claimed and verified to reach a consensus that supply side shocks have no direct significant impact on volatility (Abhyankar et al. , 2013; Baumeister et al. 2010, Degiannakis et al. , 2014; Güntner, 2013; Kang and Ratti, 2013a; Kilian et al. , 2009).

The study also ventures into the field of causal effect of rumours and expectations of oil supply shocks and resulting price fluctuations. Future changes in prices tend to impact cash flows and present market volatility. Log linearization is applied on market volatility and oil price fluctuations to find patterns of movement along cash flows and risk premiums and discounts on bond in the existing market conditions.

Objectives

The objectives of the study are as follows:

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1. To analyse stock market movements in relation with changes in oil price changes.
2. To find the difference in changes of returns and cash flows due to the various underlying reasons of demand hikes.
3. To find and establish a relationship between expected returns and cash flows during shock.

Data and Methodology

The volatility of the U. S. stock market was measured using the closing daily prices for the S&P500 index sourced from Yahoo! finance. However, since there are reasons to believe that different industries might experience different reactions to oil price shocks, for instance because of heterogeneity in the level of energy intensity, we also consider a set of portfolios containing shares of firms in the same sector.

For this part of the analysis, we use the data available on the website of Ken French. Realised volatility (RV) is used to proxy the variability of stock price indices. In line with Schwert (1989), RV is calculated as the sum of the squares of daily real log-returns. All empirical results are based on annualised realised volatility, although for accuracy RV was used thereafter. The historic changes in oil prices and aggregate demand of oil based and industrial commodities were obtained from Killian (1990). The data for oil production in the market was estimated by using a combination of variables such as growth in oil supply, change in real prices and growth in economic activity.

Although the data collection and analysis was focused on US stock markets, the robustness check shows that the result of the study remains despite changes in sampling frequency, model specifications and volatility proxy. This implies that the results of the study can be extended to most countries without any significant modifications. A VAR model of order 24 and Killian's scheme of identification were used for estimation of 30 day periodic data from 1973 to 2013. Structural residuals were derived from the data running from February 1975 to December 2015.

The next step included estimation of three distinct bivariate VAR models such as RV and one of the oil shocks uit. Impulse responses were derived from VAR models of order 12. The lag order was modified to 18 and 24 to check for discrepancies but the results obtained from these higher order lag periods were similar therefore, the lag period was fixed at 12.