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Causes and consequences of energy price shocks on petroleum-based stock market using the spillover asymmetric multiplicative error model



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ABSTRACT

We employ the spillover Asymmetric Multiplicative Error Model (SAMEM) to investigate the impacts of the global financial crises and the geopolitical instability in the oil rich countries. Consequently, such these events have a significant impact on the petroleum-based stock markets in the Gulf Cooperation Council (GCC) countries. The geopolitical instability includes several sources such as the Iran nuclear negotiations, the ISIS and other jihadist organizations, the continuous interruption in Iraq, the civil war in Syria, Libya, Yemen, as well as the rivalry between Shiite Iran and Sunni Saudi Arabia is the engine of conflict in the Middle East have a great impact on the oil price fluctuation. We find that the recent global financial crises and the geopolitical instability have a significant impact on both oil and natural gas prices. These shocks also have a significant impact on the selected petroleum-based stock markets during the period (July 18th, 2006–July 30th, 2015). The policy implications of the results are important for portfolio managers in the financial markets and the policy makers in the petroleum-based economies (as represented by the GCC stock markets).

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1. Introduction

There are many sources of the geopolitical instability in the oil rich region such as the ISIS and other jihadist organizations. These groups dominate some oil fields in Iraq, Syria and Libya. They need money to finance their terrorists' attacks and to buy weapons from around the globe and they are selling the oil at a very low price compared to the official relative prices announced in the international markets. The second source of the geopolitical instability in the oil rich region is the rivalry between Shiite Iran and Sunni Saudi Arabia is the engine of conflict in the Middle East. It is well known that Saudi Arabia has the largest reserve of oil in the world. Additionally, the entry of Iran into the global oil market following the easing of sanctions. Iran has reserves of about 158 billion barrels of oil, about 10% of world reserves (as also 34 trillion cubic meters of gas, nearly 20% of world reserves). Its production in 2011, before sanctions targeted its oil industry, was 3.6 mbd; this fell to about 2.8 mbd today, of which 1.1–1.2 mbd is exported. Saudi Arabia kept the supply of oil at a higher level to keep the price at a lower level to decrease the political power of Iran in the region, especially after the successful

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negotiation of Iran's nuclear program with the UN, USA, and Europe.¹ This viewpoint is supported by an unprecedented posture by OPEC: rather than opt for production cuts, which is what it used to do in past, it has decided to let the market decide the price – while maintaining production to protect market share. Thus, the oil market is experiencing the unique situation of being awash with supplies from OPEC and non-OPEC sources. There has been a surge in OPEC production: it was 31.75 mbd in June, an increase of 310,000 b/d over the previous month; it rose to 31.92 mbd in July before falling slightly to 31.88 mbd in August (Tamaiz, 2015). The immediate effect of this has been a massive decline in the revenues of OPEC producers: assuming an average price of \$260/b for 2016 realistic price of \$52/b,² OPEC revenues will be lower by a further \$30 billion. In this complex scenario, analysts are confused as well and revise their forecasts of production and prices practically from month to month. Until recently, the market uncertainty dominates the oil market and the global economy. The determinants of petroleum price shocks are major factors that affect the demand and supply of oil and natural gas. The consequences of the recent shocks such as the 2008–2009 and 2014/2015 busts are damaging to petroleum prices and petroleum-based economies including their stock markets; this costs trillions of US dollars in certain years. In particular, the recent sudden changes in petroleum markets have severe impacts worldwide. In turn, they have led to a deterioration of the wealth of major petroleum-based economies. It is important for policy makers in those countries to understand the causes and consequences of those energy shocks to minimize their negative effects on their economies and markets in the future. In this study, we focus on the causes and consequences of petroleum shocks on selected petroleum-based stock markets. This paper includes two main factors for petroleum price shocks (e.g., the 2007–2009 global financial crisis and the 2010–2015 European debt crisis) (as one determinant of the demand side) and the geopolitical instability in the Gulf region (the 2014/2015 Iranian nuclear negotiations) (as a determinant of the supply side) as the causes of those shocks. Shocks such as these affect the linkages across the markets; these make the linkages between financial markets differ from one period to another. Accordingly, the involved markets exhibit varying forms of relational dynamics, depending on the prevailing financial, political and economic conditions. It is useful to examine these linkages during the recent global financial crises and the ongoing geopolitical instability that constitutes a major abrupt change in both petroleum and petroleum-based stock markets.

The paper investigates the dynamic interdependence between the petroleum and petroleum-based stock markets and considers the selected events by employing the Spillover Asymmetric Multiplicative Error Model (SAMEM) to discern volatility spillovers across the selected markets (WTI-oil, natural gas, Saudi Arabia, Bahrain, Kuwait, Qatar, Oman, Dubai and Abu Dhabi). The SAMEM approach enables us to distinguish between the interactions across the selected markets before and after the selected events. In contrast to the previous linear models (e.g., Diebold and Yilmaz, 2009), this model can be viewed as a nonlinear vector autoregressive model that captures the dynamic interrelationships during the selected events. It is natural to derive the forecasts beginning with the market situations that are observed at meaningful dates of the selected events to represent the interrelationships by means of showing the profile of the responses to individual market shocks.

Our approach constitutes an addition to Engle, Gallo, & Velucchi (2012), who use the Multiplicative Error Model, and to Diebold and Yilmaz (2009), and Corey et al. (2016) Corey, Andre, & Vianna (2016) who adopt a linear VAR model to formulate a number of exogenous variables (petroleum price shocks) to examine the interdependence (i.e., spillovers) of asset returns and/or volatilities for the selected markets.

Our contribution in this study is to develop the spillover multiplicative error model to accommodate the aforementioned financial and geopolitical events to investigate their impacts on the (oil & natural gas) petroleum price volatility and the petroleum-based GCC stock markets. We also analyze the oil and natural gas prices and their relationships to the seven GCC stock indexes of Saudi Arabia, Qatar, Kuwait, Abu Dhabi, Dubai, Bahrain and Oman during the October 18, 2006–July 30, 2015 period, focusing particularly on the selected crisis events that have a negative impact on the demand for oil and natural gas. The second event is the geopolitical instability in the Gulf region (represented by the Iranian nuclear negotiation), which has increased the expectations of increasing the supply of oil and natural gas; this has not been addressed in the literature.

The extension we have made to the model provides much information. First, it is possible to calculate the percentage of the explained volatility due to the transmission from other markets. Second, we test the impact of the demand and supply shocks on the petroleum markets and the petroleum based-stock markets. The outcome is crucial for policy makers in petroleum-based economies. Third, we provide a comparison of the interactions across the selected markets before and after the selected events

The structure of this paper is organized as follows. Section 2 provides the literature review. Section 3 discusses the methodology, and Section 4 offers the descriptive statistics. Section 4 presents the empirical results, and Section 5 present the policy implications and Section 6 concludes the paper.

2. Literature review

The patterns of the market linkages have been analyzed intensively in the time series literature through different approaches, beginning with Granger causality, passing through market cointegration (e.g., Johansen-test), to the vector autoregressive model and the vector error correction model. The pattern then passes through the multivariate regime-

¹ It is a claim by some international affairs analysis and it may contradict with the economic point of view

² It is the expected average price during the 2016. It might range between \$26/b- \$56/b

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