Stock markets and energy prices

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Abstract. Concerns about the effects of oil prices on stock markets ebb and flow with the rise and fall in oil prices themselves. This paper reviews selected empirical evidence on the relationship between energy price shocks and stock markets. Existing evidence indicates that although a general increase in oil prices tends to favor stock markets of energy-exporting countries more than their oil-importing counterparts, a demand-led rise in oil prices tends to favor stock markets across the globe through the stimulating impact on the aggregate economy. Whereas, supply-driven surge in oil price shocks carries a less significant role in explaining fluctuations in stock returns. A brief assessment on the role of speculation in driving oil prices during 2007–2008 is also presented.

Keywords: Oil price shocks; Stock returns; Speculation.

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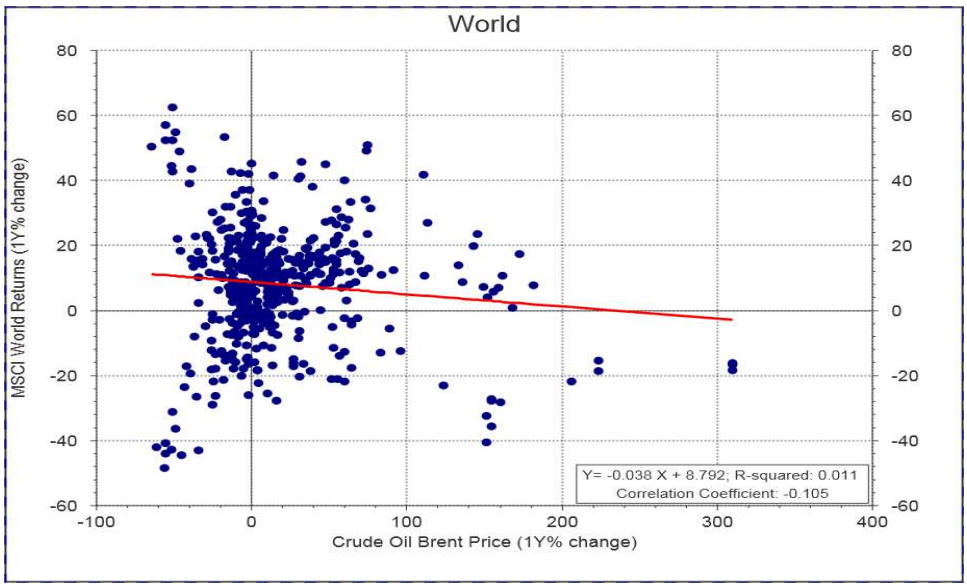
1. Introduction

By now there exists a burgeoning literature studying the impact of energy prices shocks (hereafter oil price shocks) on aggregate economic activity including the stock market. Available surveys by Brown and Yücel (2002), Jones et al. (2004) and Kilian (2008) find consequences of rising oil prices are slower GDP growth and possible recession, higher unemployment rates and higher price levels.[3] In particular, these surveys discuss the mechanisms by which oil price shocks channeled into the real economy, which include the classic supply-side effect, income transfers effect, real balance effect and monetary policy. Unlike the delayed effect of oil price shocks on the real economy, both the current and the expected future impacts of an oil price shock are absorbed into stock prices/returns fairly quickly, without having to wait for those impacts to actually occur (Jones et al., 2004). This shows why the concern about the impact of oil prices on stock markets ebb and flow with the rise and fall in oil prices themselves.

Figure 1. Oil price change vs. world equity returns (1Y% change)



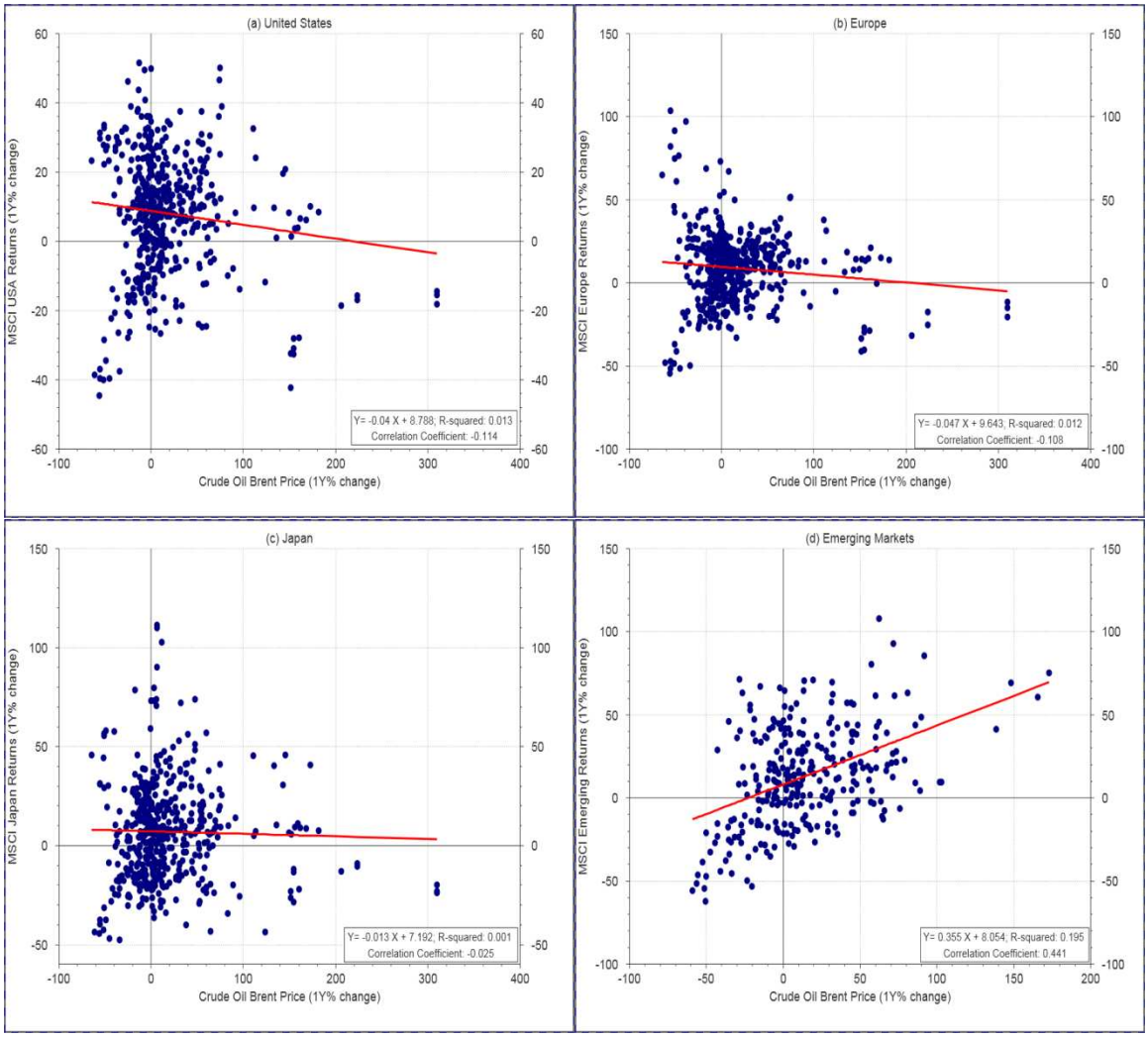
Source: Author's calculation using Reuters Datastream. Monthly data over 1970–2013 period.

Figure 1 compares the year-on-year change in crude oil (Brent) prices against the corresponding year-on-year change is MSCI world equity price index. The scatter plot depicts a minor negative correlation between oil prices and world equity returns. Importantly, the data displays a large

[3] Hamilton (2011) points out that 10 of the 11 postwar US recessions have been preceded by a sharp increase in the price of oil.

variation. For example, when looking at situations where oil prices had increased by over 100%, world equity returns ranged from as high as 40% to as low as –40%. In contrast, a 50% drop in oil prices was associated with an ever higher variability in equity returns (from over 60% to nearly –50%). This suggests asymmetric responses of equity returns to oil price increases and decreases.

Figure 2. Oil price change vs. equity returns (1Y% change)



Source: Author's calculation using Reuters Datastream. Monthly data over 1970–2013 period for USA, Europe and Japan. For emerging market the data period is 1986–2013.

However, looking at the oil-equity relationship at a more disaggregated level reveals some interesting stylized facts. Figure 2 compares the year-on-year change in crude oil (Brent) prices against the corresponding year-on-year change is MSCI stock return indices for the United

States, Europe, Japan and emerging countries. We find that whereas the oil-equity relationship is very weak in advanced countries (i.e., USA, Europe and Japan), changes in oil prices have a strong positive impact on equity returns in emerging countries. In the past decade, demand for oil by emerging countries such as China and India grew at a very strong pace on the back of strong economic expansion in these countries. This in turn had positively affected stock markets in emerging countries. Hence, despite the sharp increase in oil price due to higher demand, stock markets in emerging countries didn't face sharp corrections because negative impacts from higher oil prices were overshadowed by positive spillover effects of aggregate demand expansion in emerging countries. Furthermore, the fact that the long-run relationship between oil price change and equity returns is weakly negative in advanced countries, as shown in Figure 2, suggests that understanding the composition of oil price change (reflecting oil demand shocks versus oil supply shocks) is importing in studying the statistical relationship between oil prices and stock markets.

As is elaborated later in the paper, whereas earlier literature generally finds an adverse effect of oil price shocks on stock markets, more recent empirical evidence shed light on the notion that not all oil price shocks are alike and the responses of macroeconomic aggregates vary depending on the origin of the shocks. The key element that separates the theoretical and empirical work on oil price shocks between earlier and more recent literature is that whereas the former predominantly treated oil price shocks as exogenous, that latter considered them as endogenous. The main justification for treating oil price shocks as endogenous comes from the notion that changes in macroeconomic aggregates can also influence oil prices, as is observed in the past decade regarding the influence of emerging countries' economic growth on the demand for oil and hence the global price of oil. This reverse causality was first highlighted by Barsky and Kilian (2002), which sets the basis for a fresh approach in understanding the relationship between oil price shocks and macroeconomic aggregates.

The rest of the paper is organized as follows. Section 2 discusses the transmission channels of oil price shocks into stock markets. Section 3 outlines several measures of oil price shocks (both exogenous and endogenous) that have been proposed in the literature. Section 4 presents selected empirical evidence regarding the impact of oil price shocks on stock markets. Section 5

summarizes some recent evidence on the role of speculation as a contributing factor to the 2007–2008 oil price spike. Section 6 concludes the paper.

2. Transmission channels of oil price shocks into stock markets

The literature has proposed several complementary mechanisms by which stock prices may be directly affected by changes in oil price. Some relevant channels includes (i) cash-flow channel, (ii) investment channel, (iii) interest rate channel and (iv) exchange rate channel.

2.1 Cash-flow channel

The relationship between oil price changes and stock prices can be explained using an equity pricing model. In an equity pricing model, the price of equity at any point in time is equal to the expected present value of discounted future cash flows. Using the notations of Huang et al. (1996), this can be expressed formally as:

$$p = \frac{E(c)}{E(r)} \tag{1}$$

where p is the stock price, c is the cash flow stream, r is the discount (or interest) rate and $E(\cdot)$ is the expectation operator. The realized stock returns, R, can be expressed approximately as:

$$R = \frac{d(E(c))}{E(c)} - \frac{d(E(r))}{E(r)} \tag{2}$$

where $d(\cdot)$ is the differentiation operator. Since oil—along with labor, capital and materials—represents important components into the production of most goods and services, changes in the prices of these inputs affect cash flows. In the absence of complete substitution between the factors of production, rising oil prices increase production costs, which, in turn, dampen cash flows and reduce stock prices. As shown in equation (2), stock returns are affected by systematic movements in expected cash flows and discount rates.

2.2 Investment channel

There are two main channels by which energy price shocks may cutbacks or shifts firms' investment expenditures. First, an increase in energy prices raises the marginal cost of production, especially for firms with higher cost share of energy such as automotive, electrical equipments and chemicals. Second, high energy prices may lead consumers to spend less on

goods causing a reduction in demand for firm's output. Since investment is part of the market value of firms, lower investment is likely to adversely affect firms' stock prices.

2.3 Interest rate channel

The discount rate used in the denominator of equation (1) is a positive function of the market interest rate. When a country faces inflationary pressure from rising oil prices, its central bank can control inflation by raising interest rates. Higher interest rates make bonds look more attractive than stocks leading to a fall in stock price. Using equation (1), it can be shown that an increase in r will increase the denominator of the RHS, assuming no change in the numerator for simplicity, will reduce the stock price p in the LHS. The overall impact of rising oil prices on stock prices depends of course on whether a company is a consumer or producer of oil and oil related products. Since there are more companies in the world that consume oil than produce oil, the overall impact of rising oil prices on stock markets is expected to be negative.

2.4 Exchange rate channel

The exchange rate provides an indirect channel linking stock prices to oil prices. As oil is traded in the US dollar, changes in the dollar relative to other currencies automatically create a *numeraire* effect on the price of oil for customers outside the US. For example, a weak US dollar implies that oil becomes less expensive in terms of local currency for consumers in non-dollar countries, which could increase their demand for oil. Given the supply inelasticity of oil in the short run, this will inevitably results in higher prices for oil. The reverse causality from oil price to the US dollar can also result since an increase in oil prices implies more dollars are required to buy the same amount of oil bought in the last period. As a result, demand for the US dollar increases leading to an appreciation of the dollar relative to other currencies. Furthermore, from the lens of international savings-investment relation, higher oil prices imply higher revenues for oil-exporters and lower savings in oil-importing countries. Considering that a portion of oil export revenues is recycled back in the US in the form of investment (real and financial) could result in a stronger dollar. See Coudert et al. (2008) for a survey of theoretical and empirical work on the relationship between oil prices and exchange rates.

3. What is an oil price shock?

Finding a reliable measure for oil price shock is not straightforward given the complexity and diversity of factors shaping the crude oil market. Below we summarize some of the most commonly used measures of oil price shocks.

3.1 Oil price change

Perhaps the simplest way to define an oil price shock (o_t) is by taking the log difference of nominal oil price, as employed in Hamilton (1983):

$$o_t = \Delta \log(op_t) = \log(op_t) - \log(op_{t-1}), \tag{3}$$

where op_t is the crude oil price. Later, Mork (1989) extended Hamilton's (1983) analysis by isolating positive and negative movements in oil prices in order to capture the asymmetric effect of oil prices on economic activity. Mork's (1989) decomposition is given as:

$$oil\ price\ increase = \Delta \log(op_t) > 0, \tag{4}$$

$$oil\ price\ decrease = \Delta \log(op_t) < 0. \tag{5}$$

One limitation with the above naive measures is that if the price of oil increases by 10% today followed by a 15% drop in oil price tomorrow, one would generally not consider such price movements as alarming. To overcome this behavioral bias, Hamilton (1996) suggested looking at the net oil price increase (NOPI) within a specified time. Then, the 1-year nominal net oil price increase is defined as:

$$NOPI = \max\{0, \log(op_t) - \max\{\log(op_{t-1}), \log(op_{t-2}), \dots, \log(op_{t-12})\}\}, \tag{6}$$

which is the difference between the current oil price and the previous year's maximum if positive, or zero otherwise. Such nonlinear transformation oil prices helps us to isolate the component of the price of crude oil that can be attributed to political events in the Middle East.

Lee et al. (1995) pursued a related idea based on a GARCH (Generalized Autoregressive Conditional Heteroskedasticity) representation of oil prices, arguing that changes in oil prices exert greater impact on the real economy when oil prices have been stable then when oil prices are volatile. To capture this asymmetric effects, they proposed a scaled specification of oil price shock based on a GARCH(1,1) model:

$$\Delta \log(op_t) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \Delta \log(op_{t-i}) + e_t,$$

$$e_t|\Omega_{t-1} \sim N(0, h_t),$$
$$h_t = \beta_0 + \beta_1 e_{t-1}^2 + \beta_2 h_{t-1},$$

where h_t denotes the conditional variance of the changes in oil prices. Then the scaled oil price (SOP) is constructed by:

$$SOP = \widehat{e_t} / \sqrt{\widehat{\mathrm{h}_\mathrm{t}}}. \quad (7)$$

An application of the above four measures can be found in Chen (2010).

3.2 The CAPM approach

Building on Pettengill et al. (1995), Basher and Sadorsky (2006) employed an international multifactor capital asset pricing model to examine the impact of oil price risk on stock market. Their conditional approach, which separates positive market returns from negative market returns, involves two steps. In the first step, oil price beta is estimated from the following model:[4]

$$R_t = c + \beta_{ot} OIL_t + \varepsilon_t \quad (8)$$

where R_t is excess stock return, the slope parameter β_{ot} represents oil price beta (measuring oil price risk), OIL_t denotes oil returns and the remaining variation is captured in the error term ε_t.

In the second step, the oil beta from period t is matched with realized stock returns from period $t + 1$. The unconditional relationship between stock returns and oil price risk is estimated as follows:

$$R_t = \gamma_0 + \gamma_{o1} \beta_{ot} + \varepsilon_{2t} \quad (9)$$

while the conditional relationship between realized return and risk is specified as follows:

$$R_t = \gamma_0 + \gamma_{o2} D \beta_{ot} + \gamma_{o3} (1 - D) \beta_{ot} + \varepsilon_{3t} \quad (10)$$

where D is a binary dummy variable that takes on a value of one (zero) if oil price returns are positive (non-positive). Under this framework, symmetry between 'up' and 'down' oil price changes can be tested from the hypothesis that $\gamma_{o2} + \gamma_{o3} = 0$ against the alternative, $\gamma_{o2} + \gamma_{o3} \neq 0$. Additional risk factors such as skewness or kurtosis can be studied by adding such risk factors to equations (9) and (10). The above regression equations are estimated using the

[4] For illustration purpose, only one factor is included in equation (8). The original regression uses a multi-factor regression model.

ordinary least squares and applying the rolling regression approach to allow the factors to vary with time. Recently, Guermat and Freeman (2010) proposed an improvement of the conditional beta model that has lower standard errors than those generated by earlier models.

3.3 The structural VAR approach

In response to the weaknesses of traditional VAR-based measures of oil price shocks, Kilian (2009) developed a structural vector autoregression (SVAR) model of crude oil market that is able to distinguish oil price movements driven by exogenous shocks from those reflecting endogenous responses to other kinds of structural shocks. In particular, Kilian (2009) considers three demand and supply shocks: (i) *oil supply shocks* denoting the shocks to the current physical availability of crude oil, (ii) *aggregate demand shocks* representing shocks to the current demand for crude oil driven by fluctuations in the global business cycle and (iii) *precautionary demand shocks* reflecting shocks driven by shifts in the precautionary demand for oil. The precautionary demand basically reflects concerns over the net demand for oil (consumption minus supply) on world markets. Building on Kilian (2009), Kilian and Park (2009) investigated the impact of these structural shocks on the US stock market. The structural VAR representation of crude oil market is given as:

$$A_0 y_t = \alpha + \sum_{i=1}^{n} A_i y_{t-i} + \varepsilon_t \tag{11}$$

where ε_t is a vector of orthogonal structural innovations and y_t consists oil supply, an index of global economic activity, oil price and real stock return. After imposing exclusion restrictions, the structural shocks are linked to the reduced-form innovations e_t in the following way:

$$e_t \equiv \begin{pmatrix} e_t^{\Delta global\ oil\ production} \\ e_t^{global\ real\ activity} \\ e_t^{real\ price\ of\ oil} \\ e_t^{stock\ returns} \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{pmatrix} \varepsilon_t^{oil\ supply\ shock} \\ \varepsilon_t^{aggregate\ demand\ shock} \\ \varepsilon_t^{oil-market\ specific\ demand\ shock} \\ \varepsilon_t^{other\ shocks\ to\ stock\ returns} \end{pmatrix} \tag{12}$$

According to model (12), the stock market is impacted by all three oil demand and supply shocks contemporaneously, while the stock market affects the crude oil market with a delay. However, the block-recursive structure of model (12) reflects a particular causal chain among the variables that may not always satisfy the causal properties of the data. Recently, Basher et al. (2012) extended Kilian's (2009) model using a less restrictive set-up, while Juvenal and Petrella (2012)

extended it to a factor-augmented vector autoregressive framework to extract oil shocks using hundreds of macroeconomic and financial variables.

4. Empirical evidence

Having discussing the transmission channels and measures of oil price shocks, this section summarizes the findings of selected empirical work on the relationship between oil prices and stock markets. These findings are presented separately for *oil-importing*, *oil-exporting* and *emerging* countries. This distinction is the logical consequence of the evidence that the responses of stock markets to energy price shocks are heterogeneous. Table 1 lists world top net exporters and importers of crude oil in 2011.

Table 1. Top world net oil importers and exporters of oil, 2011
(1000 barrels per day)

Top net oil importers			Top net oil exporters		
Rank	Country	Imports	Rank	Country	Exports
1.	United States	8,814	1.	Saudi Arabia	8,168
2.	China	4,577	2.	Russia	7,514
3.	Japan	4,344	3.	UAE	2,601
4.	India	2,430	4.	Kuwait	2,353
5.	Germany	2,235	5.	Nigeria	2,268
6.	South Korea	2,170	6.	Iran	2,198
7.	France	1,716	7.	Iraq	1,811
8.	Spain	1,355	8.	Norway	1,752
9.	Italy	1,301	9.	Angola	1,752
10.	Netherlands	951	10.	Venezuela	1,509
11.	Taiwan	907	11.	Algeria	1,461
12.	Singapore	876	12.	Qatar	1,458
13.	Belgium	634	13.	Kazakhstan	1,375
14.	Turkey	634	14.	Canada	1,308
15.	Poland	550	15.	Mexico	827

Source: U.S. Energy Information Administration, www.eia.gov

4.1 Oil-importing countries

Using a standard cash flow dividend model, Jones and Kaul (1996) reported a stable negative reaction of aggregate stock returns to oil shocks in Canada and the US, but noticed that oil shocks cause excess volatility in stock prices in Japan and the UK. Using a VAR approach, Huang et al. (1996) found that oil futures do not have much impact on broad-based market

indices like the S&P 500, except in the case of oil company stock returns. Using both VAR and GARCH approaches, Sadorsky (1999) concluded that oil prices drive fluctuations in real stock returns in the US, and the relationship has intensified after 1986. Recently, using a VAR framework, Park and Ratti (2008) obtained a statistically significant impact of oil price changes on real stock returns contemporaneously or within one month for the US and 13 European countries (except for Norway). Chen (2010) found that a higher oil price does push the US stock market from a bull market into bear territory, although the probability of being trapped in a bearish regime is rather weak.

However, a common limitation of the above VAR-based analyses is that they all treated oil price shocks as exogenous and therefore did not account for the possibility that global macroeconomic condition can influence the price of oil. To overcome this limitation, Kilian and Park (2009) considered oil price shocks as endogenous and decomposed oil shocks into supply and demand shocks to account for the changing nature of the global crude oil market (see the discussion in Section 3.3). Kilian and Park (2009) found that an increase in the real price of oil has very different implications for US real stock returns, depending on the underlying structural shocks. Their findings suggest that oil supply shocks are less important for understanding changes in stock prices. Instead, oil price shocks driven by a combination of 'aggregate demand shocks' and 'precautionary demand shocks' help explain a large amount of movements in the US stock market. The combined demand and supply shocks account for 22% of the long-run variation in the US real stock returns.

The usefulness of Kilian (2009) and Kilian and Park (2009) approaches was soon incorporated in multi-country examination of the effects of oil market shocks on stock market. An earliest attempt is made by Apergis and Miller (2009), who use Kilian's (2009) SVAR framework to study the effect of structural oil market shocks on the stock prices in eight developed economies. Their findings complement the evidence in Kilian and Park (2009), showing that international stock market returns do not respond in a large way to oil market shocks. Similar results were reported by, among others, Filis et al. (2011) and Günter (2011).

4.2 Oil-exporting countries

A number of papers studied the relationship between oil price shocks and stock markets in oil-exporting countries. Unlike the negative consequences for oil-importing countries, the mechanisms for propagating oil price shocks are significantly different for oil-exporting countries. First and foremost, higher oil prices result an immediate transfer of wealth from oil-importers to oil-exporters. When this wealth (or income) is transmitted back to the economy, economic activity expands in response. It is this positive perceived effect on the macroeconomy that leads to higher activity in stock markets during an oil price boom (see Bjørnland, 2009). In particular, there are four channels through which stock prices can affect the real economy: (i) the wealth effect on consumption, (ii) the Tobin's Q effect on investment, (iii) the balance sheet effect on private investment (via the credit channel) and (iv) the confidence effect on private spending.[5]

Bjørnland (2009) found that higher oil prices have a stimulating effect on the Norwegian economy, where the maximum effect is reached after 14–15 months having a 4–5% increase in stock returns. This finding is later confirmed by Günter (2011), who found significantly positive impact of oil price shock on stock returns for Norway, but an insignificant impact on Canadian stock returns. Bhar and Nikolova (2010) found that changes in global oil prices have a significant impact on the level of equity returns and volatility in the Russian equity markets. Oskooe (2012) found that the variance of oil price fluctuations does not cause the variance of stock returns in Iran, while Babatunde et al. (2013) documented that stock returns in Nigeria exhibit insignificant positive response to oil price shocks.

Compared to the advanced oil-exporting countries of Canada and Norway, the countries of the Gulf Cooperation Council (GCC)[6] has a broader oil sector, accounting for over 45% of global oil reserve. More fundamentally, oil export revenue is the primary source of government's budget and expenditure and the main driver of aggregate demand. It is therefore not surprising that a number of studies have documented favorable, yet conflicting, evidence of oil price changes on

[5] See Altissimo et al. (2005) for a detailed review on the theoretical and empirical evidence regarding the transmission of asset price effects to economic activity.

[6] This includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

stock returns in GCC countries. Hammoudeh and Aleisa (2004) found that Saudi Arabia's stock market is strongly linked to NYMEX[7] and can, in fact, exert influence on future changes in oil futures prices. Mohanty et al. (2011) report that, except for Kuwait, GCC stock markets have significant positive exposures to oil price shocks.[8] Arouri and Rault (2012) showed that oil prices and stock markets in GCC countries are cointegrated, and save for Saudi Arabia, oil price increases have a positive impact on stock prices.[9]

4.3 Emerging economies

Recently, a growing literature has begun to examine the impact of oil price shocks on stock returns in emerging economies, whose demand for oil has increased dramatically in recent years. Basher and Sadorsky (2006) found that oil price risk plays an important role in pricing stock returns in 21 emerging stock markets. Extending Basher and Sadorsky's (2006) framework to 25 emerging countries, Aloui et al. (2012) concluded that the oil sensitivity of stock returns matters during rising oil markets, especially for emerging markets exhibiting a positive correlation with oil. Moreover, emerging stock returns that are positively correlated with oil tend to be more sensitive to exchange rate fluctuations. Bhar and Nikolova (2009) concluded that the responses of BRIC (Brazil, Russia, India and China) stock markets to oil price changes depend on whether these countries are net-exporter or net-importer of oil. Using a structural VAR framework, Basher et al. (2012) concluded that global crude oil supply shock has little effect while global demand shocks have a small but persistently positive impact on emerging market equity prices. Positive exchange rate shocks generate a downward but insignificant pressure on emerging stock prices. Importantly, their results reveal that while oil price shocks carry a small and weak significant effect on emerging stock prices, increases in emerging market stock prices also lead to an increase in oil prices. The latter result is consistent with the recent surge in demand for oil by emerging countries. In a related analysis, Ratti and Vespignani (2013) reported that the strong

[7] The New York Mercantile Exchange (NYMEX) is a commodity futures market.

[8] The lack of exposure of the Kuwaiti stock market to oil price changes is attributed to insider trading activity by domestic business entities.

[9] Lower trading turnover and over dependence on oil-importing countries are cited as potential explanations for the negative impact of oil prices on stock market in Saudi Arabia.

rebound in oil price during 2009 was driven by positive shocks to money supply in the BRIC countries.

Summing up, existing evidence indicates that stock markets' response to oil price shocks differ greatly in terms of their magnitudes, durations and directions, depending on whether the countries under examination are net-importer or net-exporter of oil, and whether oil shocks are driven by demand of supply components (see Wang et al., 2013). In particular, although a general increase in oil prices tends to favor stock markets of energy-exporting countries more than their oil-importing counterparts, a demand-led rise in oil prices tends to favor stock markets through the stimulating impact on the aggregate economy. Whereas, supply-driven surge in oil price shocks carries a less significant role in explaining fluctuations in stock returns.

5. The Role of speculation

The unprecedented surge in oil price from 2003 to mid-2008 and the dramatic fall in the second half of 2008 prompted many to question the role of speculation in driving the oil price. Speculators are investors who buy and sell oil futures but never take physical possession of actual barrels of oil. The hypothesis of speculation-driven oil price hike culminated after Masters's (2008) testimony to the US congress, where he pointed out that more than 90% of petroleum trading involves speculators' exchanging "paper" barrels with one another.

Masters's hypothesis has attracted the attention of a new strand of the literature examining the role of speculation in the oil/commodity market. Singleton (2011) reported that flows from institutional investors have contributed significantly to the 2008 boom/bust in oil prices. Tang and Xiong (2012) concluded that the rapid financialization of commodities since early 2000s influenced prices of commodities to be determined by factors other than their supply and demand components. Henderson et al. (2012) reported a similar result arguing that hedging trades by financial institutions played an important role in price formation in the commodities futures markets. Moreover, Juvenal and Petrella (2012) showed that speculative demand did materially contribute to the increase in oil prices from 2004 to mid-2008.

However, using a proprietary dataset from the U.S. Commodity Futures Trading Commission, Buyuksahin and Harris (2011) find little evidence that hedge funds and other financial traders contributed to the rise in oil price between 2000 and 2008. Recent contributions by Hamilton and Wu (2013), Kilian and Murphy (2013) and Kilian and Lee (2013) suggest that market fundamentals, not financial speculation, drive the price of oil. These findings reflect the surveys by Irwin and Sanders (2011) and Fattouh et al. (2013) that challenge the notion that increased speculation in oil futures markets played an important role in determining oil prices during the past decade.

The apparent tension between the two strands of research regarding the role of speculation as an important determination of oil price is likely to continue. However, if the 2003–2008 oil price surge was solely due to the unprecedented increase in demand from emerging Asia, rather than the financialization of oil futures market, why then oil prices continue to remain at a persistently higher level amid slow global economic recovery reflecting a modest rise in world's consumption of oil? The recent price gyration of gold highlight the point that although physical gold demand (like oil) is from emerging Asian economies, its market price is determined by financial markets in the US and Europe. At a time when the world is awash with cheap liquidity, it is tempting to partly blame speculators for higher oil prices.

6. Concluding Remarks

In economics, it is often easier to predict the long term than the short term. Although the short term link between oil price shocks and stock markets will continue to be driven by temporary supply worries, demand fluctuations and speculative activities, the long term relationship is likely to be shaped by two structural events. First, for good and bad the shale gas boom in the United States and elsewhere in the world is very likely to lead to a collapse of global oil prices. The drop in world oil prices will inevitably affect stock markets in oil-exporting countries, particularly those in the Middle East. Second, as populations are rapidly aging in developed countries, the role of equities in the global financial system may be reduced as demand for defined-contribution retirement plans and alternative investments such as private equity grows. Hence, the combination of declining global oil prices and changing behaviors of investors against equities will inevitably have widespread effects on the economy, and particularly on

investing itself. Understanding the dynamics of these structural shifts in relation to the study of stock markets and energy prices will likely become the focus of future research.

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