

**Relationships between Oil Price Shocks and Stock Market:  
An Empirical Analysis from the Greater China**

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## Abstract

Although a lot of the empirical research have studied the relationship between changes of oil price and economic activity, it is surprising that little research has been conducted on the relationship between oil price shocks and the Greater China region (China, Hong Kong, and Taiwan). Therefore, the main goal of this paper is to apply a detail monthly data from 1997/7 to 2008/9 to fill up this gap. As describe Kilian (2009), Kilian and Park (2008) the effect of U.S. stock market return, we find that the impact of oil price shocks on the Greater China stock prices has been mixed. Firstly, the effect in Taiwan stock market return is completely similar to the U.S. stock market does. Additionally, all three shocks have significantly positive impacts on Hong Kong stock return, which partially contrast to the effect of U.S. stock market. However, contrast to the effect in the U.S. stock market, we find that only global supply shock has a significantly positive impact on China stock return, but global demand shock and the oil specific demand shock have no significant impacts. The reason of no significant impacts is that the positive expectation effect of China's fast economic growth may be almost decayed by the negative effect of precautionary demand driven effect. This result is also consistent with the previous Wang and Firth (2004) empirical findings that the segmented and integrated China stock market is mixed, and it's implies the China stock market is "partially integrated" with the other stock markets and oil price shocks.

*JEL classifications:* C22, C32, F32, F36, G15

*Key words:* Oil price; Oil price shock; Stock market; Chinese stock market; Greater China.

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## 1. Introduction

Higher oil prices might affect the global economy through a variety of channels, including transfer of wealth from oil consumers to oil producers, a rise in the cost of production of goods and services, and impact on inflation, consumer confidence, and financial markets. In a pioneer work, Hamilton (1983) indicated that higher oil prices were responsible for almost all U.S recessions after World War II. Later other researchers extended Hamilton's basic findings using alternative data and estimation

procedures (such as Burbridge and Harrison, 1984; Gisser and Goodwin, 1986). Most of research on the mechanisms of oil price shocks have focused on either products or labor markets. However, research on reallocative effects of oil price shocks in capital markets has lagged behind. As Jones, Leiby and Paik (2004) stated “*Ideally, stock values reflect the market’s best estimate of the future profitability of firms, so the effect of oil price shocks on the stock market is a meaningful and useful measure of their economic impact. Since asset prices are the present discounted value of the future net earnings of firms, both the current and the expected future impacts of an oil price shock should be absorbed fairly quickly into stock prices and returns, without having to wait for those impacts to actually occur.*” Similarly, the bulk of the empirical researches have studied the relationship between oil price changes and macroeconomic activity. However, it is surprising that little research has been conducted on the relationship between oil price shocks and financial markets. Few studies have examined the effects of oil shocks on the stock market and economic activity mainly for a few industrialized countries such as the United States, United Kingdom, Japan, and Canada (such as Lee, 1992; Jones and Kaul, 1996; Huang, Masulis and Stoll 1996; Sadorsky, 1999). Furthermore, little attention has been devoted to inquiring about the impact of the fluctuations in the price of crude oil on stock market for some large-sized newly industrialized economies (NIEs).<sup>1</sup>

Among them, one major development in both oil market and in the international monetary system since the late 1990s is the emergence of China. As the PRC gradually opens her markets to international trade, the concept of the Greater China begins to take shape. Thus far, neighborhood region or culture cluster of the Greater China consists of China, Hong Kong, and Taiwan.<sup>2</sup> Improved relationship between

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<sup>1</sup> See Papapetrou (2001) for detail.

<sup>2</sup> We can see Hatemi and Roca (2004), Johansson and Ljungwall (2009) to discuss the possibility of market integration or market cluster around the world.

these regions, coupled with the return of Hong Kong to the PRC on July 1, 1997, has strengthened ties within the Greater China. There are a lot of studies to investigate the economic relationship among the Greater China, since the three economies adopt export-lead policies, they want to know whether the interaction become stronger due to the growing trade relation among the Greater China. Indeed, as mentioned in Bénassy-Quéré, Mignon and Penot (2007), China accounted for one-fourth of world incremental oil demand over 1995-2004 and one-third in 2004. Looking forward, China is expected to account for 12% of world oil demand in 2025 (instead of 7% in 2005), whereas Western Europe is expected to fall back from 19% in 2005 to 15% in 2025. In addition, as the largest country concerning official reserves in foreign currencies (Taiwan is the 4<sup>th</sup> largest country among them) and the world's fourth largest economy as of 2007, the Chinese economy recorded 11.7% annual average real growth from 2002-2006. However, in contrast to a huge literature on valuation of the relationship between oil price shocks and macroeconomic variables, no empirical work has yet been conducted explicitly so far to disentangle the role of oil price shocks from other underlying determinants driving stock market returns in the Greater China.<sup>3</sup> Therefore, the main goal of this paper is to use the more detail and new monthly data set from 1997/7 to 2008/9 to fill up this gap. We want to distinguish oil price shocks from other macroeconomic shocks and to analyze the relative contributions of these shocks, which help us to gain insight into the sources of past stock market return movements in the Greater China.

In addition, although changes in the price of crude oil are often considered as an important factor for understanding fluctuations in stock prices, there is no consensus about the relation between stock prices and the price of oil among economists. While there is a strong presumption in the financial press that oil prices drive the stock

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<sup>3</sup> See Huang and Guo (2007) for detail.

market, the empirical evidences on the impact of oil price shocks on stock prices have been mixed. Chen et al. (1986) argue that oil prices do not affect the trend of stock prices, while Jones and Kaul (1996) present evidence that favors a negative association. This negative relationship, however, does not receive support by Huang et al. (1996) and Wei (2003). In addition, economists recently began asking whether changes in macroeconomic variables cause oil price changes, leading to the decomposition of those oil price changes into the structural shocks hidden behind such changes (e. g., Kilian, 2009; Kilian and Park, 2008). That is, different sources of oil price changes may imply non-uniform effects on certain macroeconomic variables. Therefore, the conventional wisdom that higher oil prices necessarily cause lower stock prices is shown to apply to oil-market specific demand shocks such as increases in the precautionary demand for crude oil. In contrast, positive shocks to the global demand for industrial commodities cause both higher real oil prices and higher stock prices, which helps explain the resilience of the U.S. stock market to the recent surge in the price of oil in 2008. Oil supply shocks have no significant effects on returns. Finally, oil demand and oil supply shocks combined account for 22% of the long-run variation in U.S. real stock returns of stock. The responses of industry-specific U.S. stock returns to demand and supply shocks in the crude oil market are consistent with accounts of the transmission of oil price shocks that emphasize the reduction in domestic final demand. Since the Greater China has been highly dependent upon energy imports, its imports accounted for 80% of total energy requirements in 2007. Therefore, this paper studies the dynamic interactions between oil price and stock returns utilizing a multivariate vector autogressive model (VAR) approach for these three developing economies, in order to understand the relationship between oil price shocks and the Greater China's stock market.

The remainder of this paper is arranged as follows. Section 2 provides a brief

review of existing work and outlines our contribution to the literature. Section 3 describes the data and empirical methodology applied in this study. Section 4 reports the estimation results. Finally, Section 5 concludes the main findings of our analysis.

## **2. Literature review**

A lot of empirical researches have studied the relationship between oil price shocks and macroeconomic variables. Part of papers investigated the impact of oil price shocks on different countries' real GDP growth rates, inflation, employment, and exchange rates (such as Akram, 2004; Chen and Chen, 2007; Cunado and Gracia, 2005; Davis and Haltiwanger, 2001; Hamilton, 1983, 2003; Hamilton and Herrera, 2004; Hooker, 2002; Huang and Guo, 2007; Lee, Lee and Ratti, 2001; Lee and Ni, 2002; Nandha and Hammoudeh, 2007, among others). However, there is relatively little work on the relationship between oil price shocks and financial markets. Jones and Kaul (1996) tested whether the reaction of international stock markets to oil shocks can be justified by current and future changes in real cash flows and changes in expected returns. They found that in the postwar period, the reaction of United States and Canadian stock prices to oil shocks can be completely accounted for by the impact of these shocks on real cash flows. In contrast, the results for both the United Kingdom and Japan are not as strong. Huang, Masulis, and Stoll (1996) examined the link between daily oil future returns and daily United States returns. Their evidence suggested that oil returns do lead some individual oil company stock returns, but oil future returns do not have much impact on general market indices. Using monthly data over the period 1947-1996, Sadorsky (1999) shown that oil price and its volatility both play important roles in affecting real stock returns. Especially, oil price movements after 1986 explained a large fraction of the forecast error variance in real stock returns than did interest rates. Papapetrou (2001) applied a VAR approach to

examine the dynamic relationship among oil prices, real stock prices, interest rates, real economic activity, and employment for Greece. His empirical evidence found that oil price changes affect real economic activity and employment. Oil prices are important in explaining stock price movement.

Generally speaking, although changes in the price of crude oil are often considered as an important factor for understanding fluctuations in stock prices, there is no consensus about the relationship between stock prices and the price of oil among economists. More specifically, the relevant literature generates mixed views regarding the effect of such oil-price shocks on asset prices, such as stock prices. Kaul and Seyhun (1990) and Sadorsky (1999) state a negative effect of oil-price volatility on stock prices. Papapetrou (2001) reports that an oil price shock has a negative impact on stock, since they negatively affect output and employment growth. Hong et al. (2002) also identify a negative association between oil-price returns and stock-market returns. O'Neil et al. (2008) and Park and Ratti (2008) show that oil price shocks have a statistically significant negative effect on stock prices for an extended sample of 13 developed markets. By contrast, Sadorsky (2001), however, using a multifactor market which takes into consideration the presence of several risk premiums, identifies certain factors, such as exchange rate and interest rate along with oil prices themselves as the main determinants of oil and gas stock returns. He also shows a significant positive relationship between oil prices and stock returns coming from oil and gas firms. Gogineni (2007) and Yurtsever and Zahor (2007) also provide statistical support for a number of hypotheses, such as oil prices positively associated with stock prices, if oil price shocks reflect changes in aggregate demand, but negatively associated with stock price, if they reflect changes in supply. In addition, stock prices respond asymmetrically to changes in oil prices, in a sense that higher oil prices are associated with lower stock prices, while lower oil prices are not associated

with higher stock prices. Furthermore, Wei (2003) concluded that the decline of U.S. stock prices in 1974 cannot be explained by the 1973-74 oil price increase. While all these early conventional literatures have a strong presumption that oil prices drive the stock market, the empirical evidence on the impact of oil price shocks on stock prices has been mixed. Kilian (2009) criticizes all these analyses, because economists treat oil-price shocks as exogenous. Certain work, however, argues that oil prices respond to factors that also affect stock prices (such as Barsky and Kilian, 2002, 2004; Hamilton, 2005; Kilian, 2008). Thus, economists must decompose aggregate oil price shocks into the structural factors that reflect the endogenous character of such shocks. This decomposition of shocks eliminates not only the deficit of previous studies that considered oil prices as exogenous variables with respect to other variables that determine that course of the economy, but also the deficiency of those studies to document the relative importance of such differentiated shocks for the course of asset prices. Therefore, Kilian and Park (2008) shown that the response of aggregate U.S. real stock returns may differ greatly depending on whether the increase in the price of crude oil is driven by global oil-specific demand shocks or by global supply shocks in the crude oil market. Thus, this paper investigates how the explicit structural shocks characterizing the character of oil-price changes affect stock prices across a sample of the Greater China. To response this perspective, in this study we want to know what the impact of these oil price shocks on the Greater China's stock market.

Additionally, with a population exceeding 1.3 billion and an average economic growth of 9.5 per cent over the past four years, China's energy demand has increased spectacularly to meet up with rapid expansion of the industrial and commercial sectors, as well as that of households. However, there is not many studies explaining the relationship among oil price shocks and China's exchange rate and economic activities, such as Huang and Guo (2007) investigated to what extent the oil price



shock and three other types of underlying macroeconomic shocks impact the movements of Chinese real exchange rate. By constructing a four-dimensional structural VAR model, their results suggested that real oil price shocks would lead to a minor appreciation of the long-term real exchange rate due to China's lesser dependence on imported oil than its trading partners included in the Renminbi (hereafter RMB) basket peg regime and rigorous government energy regulations. Bénassy-Quéré, Mignon, and Penot (2007) studied cointegration and causality between the real price of oil and the real price of the dollar over the 1974-2004 period. Their results suggested that a 10% increasing in the oil price coincides with a 4.3% appreciation of the dollar in the long run, and that the causality runs from oil to the dollar. Though the development of a theoretical model, we then investigate possible reasons why this relationship could be reversed in the future due to the emergence of China as a major player in both the oil and the foreign exchange markets. In addition, Zaouali (2007) conducted a quantitative analysis on the potential impact of the rise in oil prices on the Chinese economy. Its GDP has dropped by 0.5 to 0.9 per cent due to the impact of higher oil price, which is nonetheless relatively modest. But the strong investment and the large flow of foreign capital in China were sufficient to counterbalance the negative impact of higher oil prices. However, in contrast to a huge literature on valuation of the relationship between oil price shocks and macroeconomic variables, no empirical work has yet been conducted explicitly so far to disentangle the role of oil price shocks from other underlying determinants driving stock market returns in the Greater China. Therefore, the another main goal of this paper is to separate oil price shocks from other macroeconomic shocks and to analyze the relative contributions of these shocks, which is an important task for us to gain future insight into the sources of the movement of stock market returns in the Greater China.

### **3. The data and empirical methodology**

#### **3.1 Data**

Firstly, we brief describing the stock market situation from the Greater China. Among them, the China 1978 economic reform has lead to the rebirth of her stock market. Later, the accession of China to the WTO and stock market reform in 2003 and 2005<sup>4</sup> has been heralded as a watershed event, making a distinct break in China's economic relations with the rest of the world. The Shanghai Stock Exchange and the Shenzhen Stock Exchange are the two major Chinese emerging capital markets, and the two markets are linked via the national stock exchange automated quotation system. The Shanghai Stock market was officially opened in 1990 and the Shenzhen Stock Market was inaugurated in 1991. Two types of stocks are traded in the two markets: "A" shares and "B" shares. "A" shares are restricted to Chinese citizens and denominated in Chinese currency yuan or RMB, while "B" shares can be bought and sold only by foreigners and settled in foreign currencies (US dollars for Shanghai, Hong Kong dollars for Shenzhen). In this study, we focus on the analysis of "A" shares markets since the "B" shares market has been losing their appeal to foreign investors and "A" shares dominates "B" shares in terms of number of listed companies, trading volume, and market capitalization. In addition, the British territory - Hong Kong has two separate stock exchange before World War II, these merged into the Hong Kong stock exchange in the late 1940s. Gradually, there are four exchange companies in the 1970s, but all four exchanges eventually merged into what is now the stock exchange of Hong Kong. Since the 1990s, the increasing influence of the mainland's economic and financial development has increasingly come to influence

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<sup>4</sup> China stock market reform, such as qualified foreign institutional investors policy (QFII) in 2003, has increased the proportion of shares that freely tradable in the markets in 2005. QFII had handed foreign institutional investors a meager of US\$ 10 billions to invest in domestic equities at a time when market capitalization in 2007 grew to exceed US\$ 3 trillions (see Jiang et al (2008) for detail).

the Hong Kong stock exchange. The first listing of a mainland china company took place in 1993 through the system of the so-called H-shares (shares in mainland China companies listed in Hong Kong). Today, a large number of mainland companies are listed in Hong Kong. The main exchanger company merged with the Hong Kong futures exchange and their clearinghouses in 1999. Finally, the Taiwan stock exchange was formed in 1961, and trading began in 1962. Both equity and fixed income are traded on the Taiwan stock exchange. However, compared to more developed countries, there are a number of restrictions in place. For example, the short-selling of stocks is prohibited, limits on daily price changes over 7%.<sup>5</sup> Overall, as on of the indicator of the Greater China stock market, Johansson and Ljungwall (2009, p.841) show that the number of listed companies grew extremely fast in mainland China to more than four times the number of companies in 2005 compared to in 1995. Similarly, the number of listed companies in Hong Kong and Taiwan more than double during the same period.

Additionally, the data those applied in this paper is monthly from 1997/7 to 2008/9. Firstly, the global oil production change rate data is from US department of Energy, the global real activity change rate is from Kilian's homepage. The China and Hong Kong real import oil price change rate are from China monthly statistics, the Taiwan real import oil price change rate is from AREMOS dataset of Taiwan Economic Data Center. However, all of three economies' real stock index returns are from Taiwan Economic Journal database.<sup>6</sup> The global real activity data, which is calculated by representative single voyage freight rates, is applied to measure the global demand for oil. Kilian (2009) has full explained the reason why adopting the

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<sup>5</sup> There are a lot of studies devoted to the Greater China stock markets for detail discussion, such as Groenewold et al (2004), Girardin and Liu (2007), Johansson and Ljungwall (2009), Wang and Iorio (2007), and Yeh and Lee (2000), among others.

<sup>6</sup> To obtain the rate change rate of all variable, we use take first difference in all variables and use CPI index of these three economies to obtain the real change rate of all variables in our paper.

global real activity indicator to capture the global oil demand effect. Finally, same as originally described by Kilian (2009), all three economies' imported oil price change rate is applied to capture the specific oil demand effect which is driven by the precautionary demand for crude oil. This means that investors will expect the economic and the firm's profit growth rate will reducing when the oil price increases, then they will sell their stocks to prevent the capital loss. In addition, since Shanghai stock market and Shenzhen stock market are the main stock markets of China, we adopt the value weighted return between Shanghai "A" and Shenzhen "A" shares to represent the China stock market return.

### 3.2 Methodology

Since most time series variables have a unit root, we can not use those data without considering their unit root property. Otherwise, spurious regression problem may occur and the results may not be reliable. To avoid this problem, we have to check whether the variables applied in this study have unit root or not. Therefore, we use the ADF test first to check the unit root property as follows.

The ADF test is called the augmented Dicker-Fuller test. By considering the variables are autoregressive process with order  $p$  (AR( $p$ )) process in Said and Dickey (1984), the ADF test can be applied to check whether the high order autoregressive variables have unit root property. Let us illustrate ADF test as follows:

$$y_t = \zeta_1 \Delta y_{t-1} + \zeta_2 \Delta y_{t-2} + \dots + \zeta_p \Delta y_{t-p} + \alpha + \delta t + \rho y_{t-1} + \eta_t, \eta_t \sim N(0, \sigma_\eta^2) \quad (1)$$

where  $y_t$  is the stock return,  $\Delta y_{t-1}, \dots, \Delta y_{t-p}$  are the first difference of the stock return,  $t$  is the trend of the stock return,  $y_{t-1}$  is the lagged term of the stock return, and  $\eta_t$  is an identical independent distribution (*i.i.d.*) white noise process. From Equation (1),  $|\rho| = 1$  represents that the data in question have unit root property, and

we call that the data are nonstationary. On the other hand,  $|\rho| < 1$  represents that the data have no unit root, thus they are stationary process.<sup>7</sup>

We need to continue checking the cointegration relationship if the data have nonstationary property and this implies all variables have long run equilibrium relationship.<sup>8</sup> In addition, we have to take first difference to deal with the nonstationary property if the cointegration relationship does not exist. Thereafter, we use VAR to analyze the relationship among the variables.

Consider a VAR(p) process as following,

$$Y_t = A_0 + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + e_t, \quad e_t \sim N(0, \Omega) \quad (2)$$

where  $Y_t$  contains  $n \times 1$  variables and  $Y_{t-i}$ ,  $i = 1, 2, \dots, p$ , are lagged dependent variables, and  $e_t$  represents the residuals form VAR(p) model. From above, we consider the appropriate order selection by ADF test and VAR(p) process. Here we use the Akaike's information criterion (hereafter AIC, see Akaike (1974)) for the model fitting. AIC is defined as:

$$AIC(M) = -2 \ln[\max \text{likelihood}] + 2M \quad (3)$$

where  $M$  is the number of parameters in the model. The optimal order of the model is chosen by the value of  $M$ , which is a function of  $p$ , such that  $AIC(M)$  is minimum.

After choosing the optimal order for the VAR(p) process, we can collect the residuals from VAR(p) process as above. We give these residuals as a structure, which is adopted by Kilian (2009), to calculate the Structural VAR model (hereafter SVAR). This SVAR is as follows.

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<sup>7</sup> If neither mean nor autocovariance depend on the date  $t$ , the process  $y_t$  is called (weakly) stationary process.

<sup>8</sup> For details, see Engle and Granger (1987).

$$\mathbf{e}_t \equiv \begin{pmatrix} \mathbf{e}_{1t}^{\Delta \text{global oil production}} \\ \mathbf{e}_{2t}^{\text{global real activity}} \\ \mathbf{e}_{3t}^{\text{real price of oil}} \\ \mathbf{e}_{4t}^{\text{China(Hong Kong, Taiwan) stock returns}} \end{pmatrix} = \begin{bmatrix} \mathbf{a}_{11} & 0 & 0 & 0 \\ \mathbf{a}_{21} & \mathbf{a}_{22} & 0 & 0 \\ \mathbf{a}_{31} & \mathbf{a}_{32} & \mathbf{a}_{33} & 0 \\ \mathbf{a}_{41} & \mathbf{a}_{42} & \mathbf{a}_{43} & \mathbf{a}_{44} \end{bmatrix} \begin{pmatrix} \boldsymbol{\varepsilon}_{1t}^{\text{oil supply shock}} \\ \boldsymbol{\varepsilon}_{2t}^{\text{aggregate demand shock}} \\ \boldsymbol{\varepsilon}_{3t}^{\text{oil-specific demand shock}} \\ \boldsymbol{\varepsilon}_{4t}^{\text{other shocks to stock returns}} \end{pmatrix} \quad (4)$$

where  $\varepsilon_t$  represents a white noise process which covariance matrix is an identity matrix. From the above setting, we can calculate the structural impulse response function. By using impulse response function, we could implement impulse response analysis (hereafter IRA) and we could also plot the impact of one unit increase in the  $j$ -th variable's innovation at  $t$  on  $i$ -th variable at date  $t+s$ . In the same time, we could find the response of the key variable's change when shocks occur in other variables. In our paper, we want to use IRA to analyze what's different shock affect to the Greater China stock markets.

## 4. Empirical findings

### 4.1 Basic statistics description and stationary test

From Table 1, we can find that the mean of China stock return is the highest profit among three economies' stock returns. From all stock returns' skewness and kurtosis reflect that the financial time series data have fat tail properties. Firstly, the positive mean of global real activity change rate presents that the global demand will increasing as oil price is higher. This increasing demand effect could explain that there had been a global boom in commodity market in the early twenty one centuries, which is driven by a strong economic growth worldwide. In addition, from the mean of global oil production change rate represents global oil supply shock is also positive,

and this means that the global oil shock will gradually increasing with the higher global demand. Finally, the positive mean of specified oil demand change rate of all markets could reveal that all three economies' oil demand will increasing due to their fast economic growth among the Greater China.

From Table 2, the results of ADF test show that stock returns in all economies have no unit root property. These means that all variables have no persistence impact and the current shock of one market shock to the others will disappear in the future. Hence, we could implement the SVAR estimation and IRA to process our analysis in the following section.

Table 1: Basic Description Statistic unit: %

Variables	GOP	GRA	OSDTW	OSDHK	OSDCN	TWR	HKR	CNR
Mean	0.17	5.70	7.60	1.52	1.47	-0.10	0.40	1.02
Std. Dev.	1.90	52.14	39.06	6.06	6.08	8.10	7.30	8.30
Skewness	-0.33	3.08	1.38	0.13	0.21	0.25	0.07	0.42
Kurtosis	4.45	29.29	5.78	3.88	3.86	3.67	4.37	3.98

Note: 1. GOP means the global oil production change rate, GRA means the global real activity change rate, OSDTW means the specified demand change rate of Taiwan, OSDHK means the specified demand change rate of Hong Kong, OSDCN means the specified demand change rate of China, TWR means Taiwan stock return, HKR means Hong Kong stock return, and CNR means China stock return.

2. The level data used in this paper is from 1997/7 to 2008/9. After first difference, the observation number in our sample is 134.

Table2 : Stationary tests (ADF test)

Variables	Statistic (No trend)	Statistic (Trend)
GOP	-12.16***	-12.13***
GRA	-11.31***	-11.28***
OSDTW	-13.86***	-13.83***
OSDHK	-8.57***	-8.50***
OSDCN	-8.38***	-8.44***
TWR	-10.70***	-10.66***
HKR	-10.79***	-10.75***
CNR	-10.15***	-10.11***

Note : 1. \*\* \*represents 1% significant level.

2. Stationary test in this paper is ADF test. The 1% critical value without trend is -3.48 and 1% the critical value with trend is -4.03.

## 4.2 Estimation results

### 4.2.1 SVAR estimation

In this section, we present the SVAR parameters estimation in Table 3.<sup>9</sup> The structural estimation is from Equation (4) above which is similar to Kilian (2009). Firstly, the global oil production (or supply) shock has significantly positive effect on Hong Kong and China stock markets, which is contract to Kilian (2009), Kilian and Park (2008) finding in U.S. stock market. The reason is obviously that the negative supply shock may hurt to the economy, but the good economic performance of China could mitigate this negative impact.<sup>10</sup> Moreover, this positive effect also benefits to other economies among the Greater China.

Secondly, we can find that the global demand shock is significantly affect to

<sup>9</sup> For VAR estimation, We let the optimal lagged periods for the three models are 24.

<sup>10</sup> China's economic growth rate is 11.1% in 2006, 11.4% in 2007 and 9% in 2008 and the average economic growth rate in the past three years is the largest among all Asian economies.



Hong Kong and Taiwan stock markets but not in China stock market. This finding is reasonable since China's stock market is relatively isolated from the world stock markets and global economy.<sup>11</sup>

Additionally, the specific oil demand shock has a significantly negative impact on Taiwan stock market, which is similar to Kilian (2009) and Kilian and Park (2008) finding in U.S. stock market. The reason is that the specific oil demand shock is driven by precautionary demand for crude oil, which fears about the uncertainty of crude oil price changing in the future. This negative effect will make the investors expect that the capital flow out, and then they will sell the stocks to prevent the capital loss. Consequently, this precautionary effect of specified oil demand shock makes a significantly negative impact on Taiwan stock market. However, the specific oil demand shock has significantly positive affect to Hong Kong, and insignificant affect to China stock market, which means that there could be another effects among them. Such as the expectation on China economic growth still has good performance during the higher oil price period, and this positive effect may larger than or equal to the former negative precautionary demand effect,<sup>12</sup> then the specific oil demand shock has significantly positive affect to Hong Kong, and insignificant affect to China stock market.

Finally, the last "other" shock has a significant positive effect on the stock return, this shock (or residual) is defined beyond and unobservable affect to the stock markets. Consequently, the positive effect means that this is not captured by our model, such as the noise in the Greater China's stock markets or relaxation the limitation of investment in the Greater China, which could make the stock return

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<sup>11</sup> See Wang and Iorio (2007) for detail.

<sup>12</sup> The positive of average economic growth in China from 1997 to 2007 is 9.5% per year. However, this positive effect could become smaller since Chinese capital mobility control is stricter than other economies' does and then China's stock market is relatively isolated from the world stock markets and global economy.

increase.

Table 3: SVAR Parameters Estimation

Regressors	TWR	HKR	CNR
GOP	1.30	4.01**	1.78**
	(0.67)	(0.69)	(0.72)
GRA	2.10**	2.92**	-0.65
	(0.65)	(0.61)	(0.71)
OSD	-1.51**	1.95**	-0.42
	(0.63)	(0.56)	(0.71)
Other	6.50**	5.75**	7.42**
	(0.44)	(0.39)	(0.50)

Note: 1. \*\* represents 5% significant level.

2. The definition of variable is the same in Table 1.
3. In the parentheses is the standard error.

#### 4.2.2 Impulse response analysis

In this section, we can use IRA to investigate how the three shocks affect the three economies' stock markets. Firstly, as described in Kilian (2009), Kilian and Park (2008), we find that the effect in Taiwan stock market is completely similar to the U.S. stock market does in the Figure 1. This means that the response of aggregate Taiwan real stock returns may differ greatly depending on whether the increase in the price of crude oil is driven by demand or supply shocks in the crude oil market. The conventional wisdom that higher oil prices necessarily cause lower stock prices is shown to apply to oil-market specific demand shocks such as increases in the precautionary demand for crude oil. In contrast, positive shocks to the global demand for industrial commodities cause both higher real oil prices and higher stock prices, which helps explain the resilience of the Taiwan stock market, like the U.S. stock market, to the recent surge in the price of oil in 2008. Oil supply shocks have no

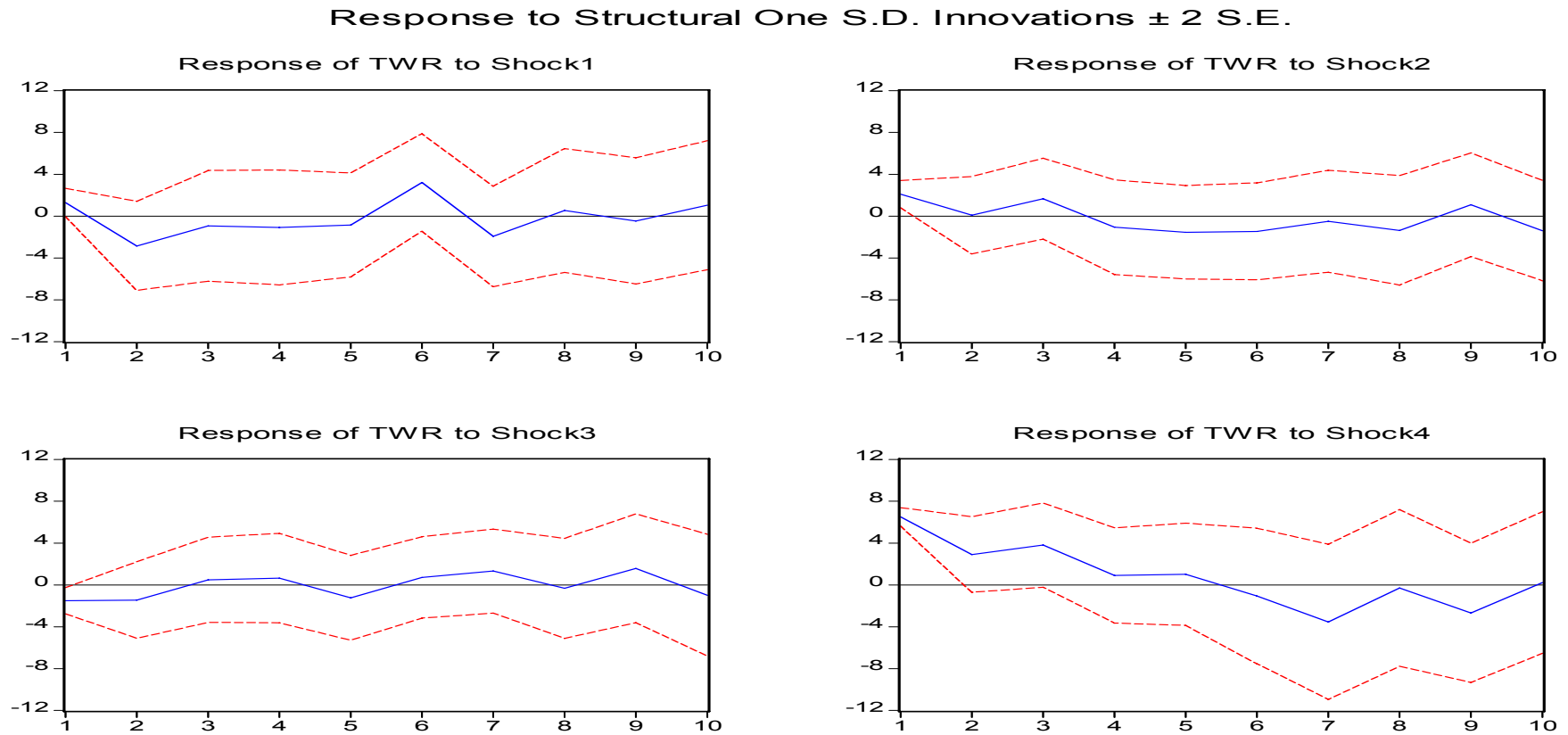
significant effects on returns. The reason of these findings is obviously that the Taiwan stock market, like the U.S. stock market, is closely related to the change of world economy, the capital mobility constraint is almost relaxation as well.

Additionally, we find that all three shocks have significantly positive impacts on Hong Kong stock return in the Figure 2. This finding is partially contract to Kilian (2009), Kilian and Park (2008), who find that the oil specific demand shock is driven by precautionary demand for crude oil then it will have negative effect on stock market. The reason positive effect to Hong Kong stock market is that the positive expectation effect of China's fast economic growth may greater than the negative effect of precautionary demand driven effect. Since the capital mobility is almost perfect in Hong Kong, this positive expectation effect means that the investors expected the China economy still performance well and capital continue to flow in during the higher oil price period. In fact, the average economic growth rate of China from 1997 to 2007 is about 9.5%, which is one of the largest around the world. Consequently, we can find that the response of Hong Kong stock markets to oil-specific demand shock always be positive.

However, we find that only global supply shock has a significantly positive impact on China stock return, but global demand shock and the oil specific demand shock have no significant impacts in the Figure 3. This finding is contrast to Kilian (2009), Kilian and Park (2008), who finds that the global and the oil specific demand shock have significantly affect to U.S. stock market. Since the regulation limit and capital mobility control are stricter than other countries, this make China stock market is more separate and independent to the world economy. Therefore, the reason no significant impact is that the positive expectation effect of China's fast economic growth may be almost decayed by the negative effect of precautionary demand driven effect. This result is also consistent with the previous Wang and Firth (2004) empirical

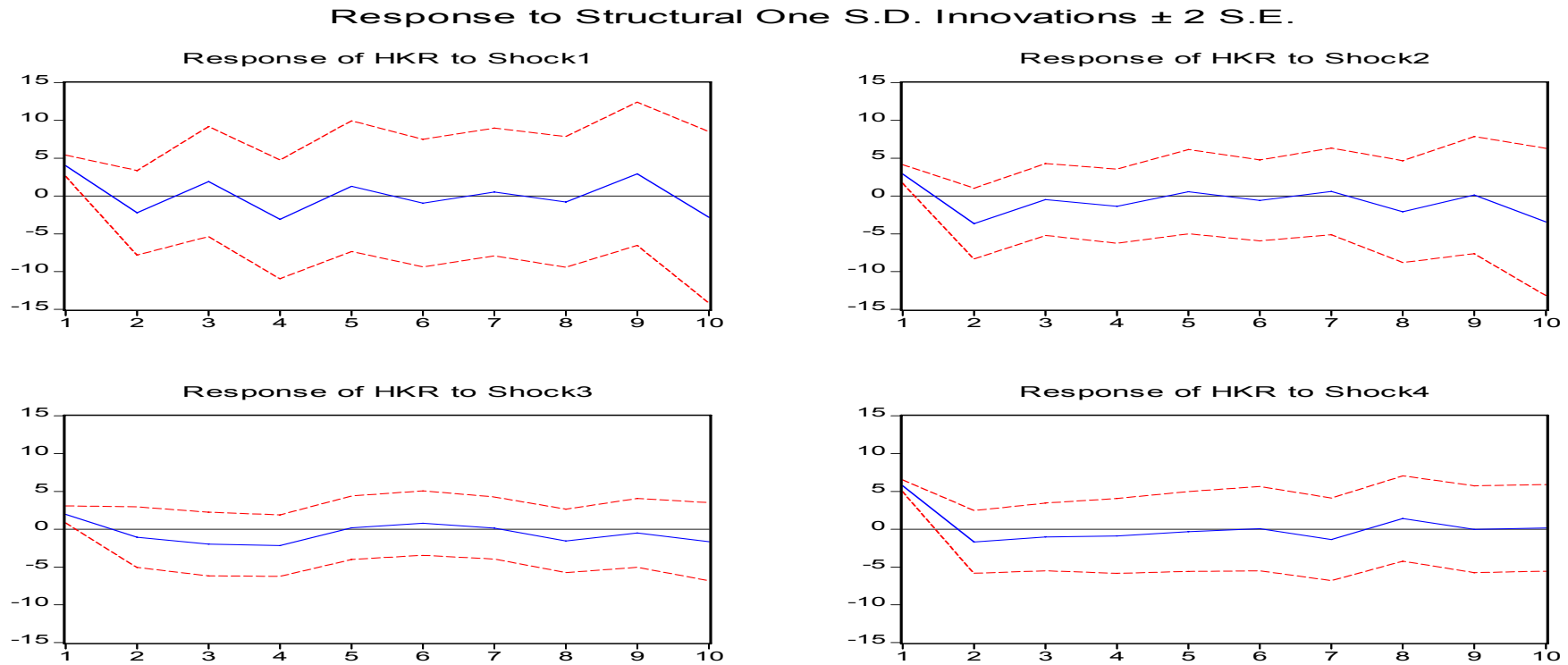
findings that the segmented and integrated China stock market is mixed, and it's implies the China stock market is "partially integrated" with the other stock markets and oil price shocks.

Figure 1: Response of Taiwan Real Stock Returns to Different Shocks



Note: Shock1 means Global Supply Shock, Shock 2 means Global Demand Shock, Shock 3 means Oil Specified Demand Shock, and Shock 4 means Other Shocks.

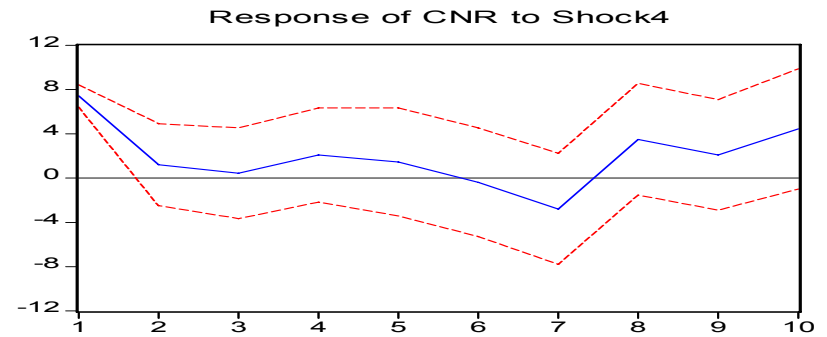
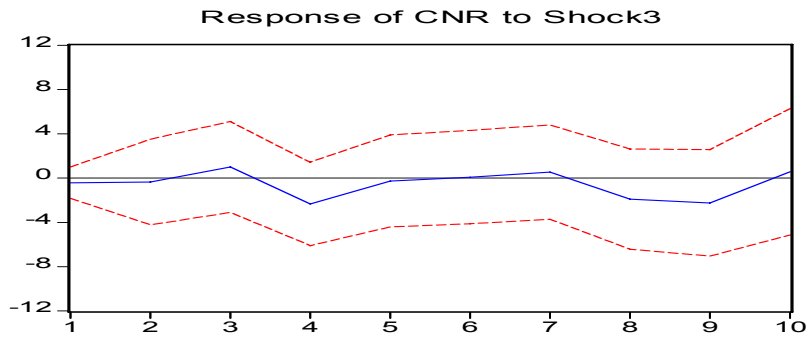
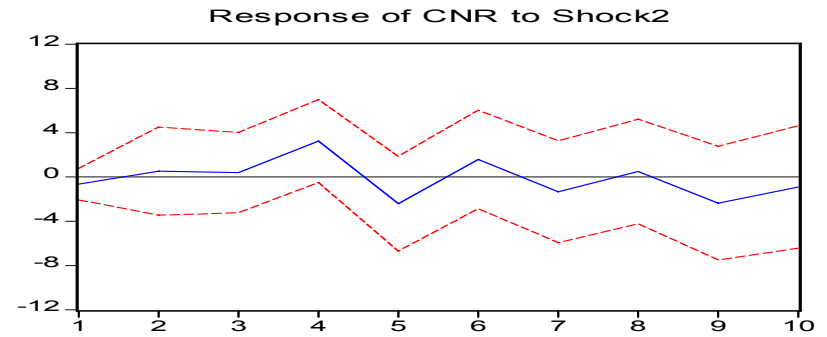
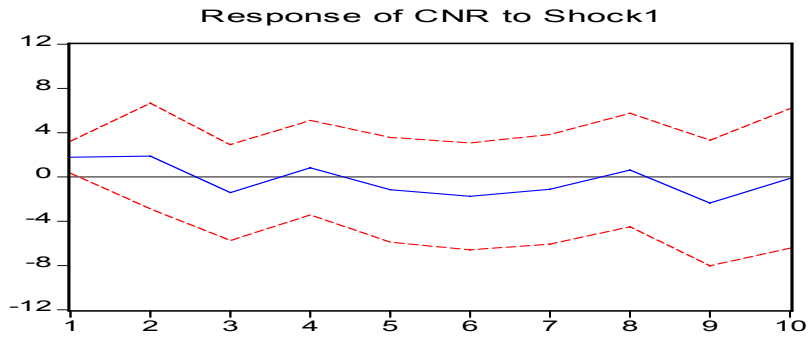
Figure 2: Response of Hong Kong Real Stock Returns to Different Shocks



Note: Shock1 means Global Supply Shock, Shock 2 means Global Demand Shock, Shock 3 means Oil Specified Demand Shock, and Shock 4 means Other Shocks.

Figure 3: Response of China Real Stock Returns to Different Shocks

Response to Structural One S.D. Innovations  $\pm 2$  S.E.



Note: Shock1 means Global Supply Shock, Shock 2 means Global Demand Shock, Shock 3 means Oil Specified Demand Shock, and Shock 4 means Other Shocks.

## **5. Conclusion remarks**

Although a huge empirical research have studied the relationship between oil price changes and macroeconomic activity, it is surprising that little research has been conducted on the relationship between oil price shocks and financial markets. Some studies have examined the effects of oil shocks on the stock market and economic activity, but mainly for a few industrialized countries such as the United States, United Kingdom, Japan, and Canada (See Papapetrou (2001)). Furthermore, one major impact in both oil market and in the international monetary system since the late 1990s is the emergence of China. Bénassy-Quéré, Mignon, and Penot (2007) shown that China accounted for one-fourth of world incremental oil demand over 1995-2004 and one-third in 2004. Looking forward, China is expected to account for 12% of world oil demand in 2025 (instead of 7% in 2005), whereas Western Europe is expected to fall back from 19% in 2005 to 15% in 2025. However, Huang and Guo (2007) find that no empirical work has yet been conducted explicitly so far to disentangle the role of oil price shocks from other underlying determinants driving stock market returns in the Greater China. Therefore, the main goal of this paper to use a detail and new monthly data set from 1997/1 to 2007/12 to fill up this gap.

Additionally, the empirical evidences on the impact of oil price shocks on stock prices have been mixed. Kilian and Park (2008) is the first to show that the response of aggregate U.S. real stock returns may differ greatly depending on whether the increase of the price of crude oil is driven by demand or by supply shocks in the crude oil market. Because the emergence of China is one major development in both oil market and in the international monetary system since the late 1990s, another goal of this paper is to study the dynamic interactions between oil price and stock returns utilizing a VAR approach for the Greater China, in order to understand the



relationship between different oil price shocks and the return of the mainland China's stock market in detail.

From the empirical analysis, we find that the impact of oil price shocks on the Greater China stock prices has been mixed. Firstly, the effect in Taiwan stock market is completely similar to the U.S. stock market does. The reason is obviously that the Taiwan stock market is closely related to the change of world economy, the capital mobility constraint is almost relaxation as well. Additionally, all three shocks have significantly positive impacts on Hong Kong stock return. This finding is partially contract to Kilian (2009), Kilian and Park (2008), who find that the oil specific demand shock is driven by precautionary demand for crude oil then it will have negative effect in the U.S. stock market. We can explain that the positive expectation effect of China's fast economic growth may greater than the negative effect of precautionary demand driven effect. Since the capital mobility is almost perfect in Hong Kong, this positive expectation effect means that the investors expected the China economy still performance well and capital continue to flow in during the higher oil price period. However, we find that only global supply shock has a significantly positive impact on China stock return, but global demand shock and the oil specific demand shock have no significant impacts. This finding is contrast to the effect in U.S. stock market. Since the regulation limit and capital mobility control are stricter than other countries, this make China stock market is more separate and independent to the world economy. Therefore, the reason of no significant impact is that the positive expectation effect of China's fast economic growth may be almost decayed by the negative effect of precautionary demand driven effect. This result is also consistent with the previous Wang and Firth (2004) empirical findings that the segmented and integrated china stock market is mixed, and it's implies the China

stock market is “partially integrated” with the other stock markets and oil price shocks.

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