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Oil prices, exchange rates and emerging stock markets ☆

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ABSTRACT

While two different streams of literature exist investigating 1) the relationship between oil prices and emerging market stock prices and 2) the relationship between oil prices and exchange rates, relatively little is known about the dynamic relationship between oil prices, exchange rates and emerging market stock prices. This paper proposes and estimates a structural vector autoregression model to investigate the dynamic relationship between these variables. Impulse responses are calculated in two ways (standard and the recently developed projection based methods). The model supports stylized facts. In particular, positive shocks to oil prices tend to depress emerging market stock prices and US dollar exchange rates in the short run. The model also captures stylized facts regarding movements in oil prices. A positive oil production shock lowers oil prices while a positive shock to real economic activity increases oil prices. There is also evidence that increases in emerging market stock prices increase oil prices.

1. Introduction

The recent surge in oil prices over the past 8 years has generated a lot of interest in the relationship between oil prices, financial markets and the economy (see, for example, Blanchard and Gali, 2007, and Herrera and Pesavento, 2009). Crude oil spot prices, measured using West Texas Intermediate crude oil, closed out the year 2002 at $29.42 per barrel.[1] By June of 2008 spot oil prices had risen to $133.93 per barrel. Over this same time period, the US dollar fell against other major traded currencies and emerging market stock prices rose (Fig. 1). While there exists a literature on the relationship between oil prices and stock prices, and a separate literature on the relationship between oil prices and exchange rates, the relationship between these two streams has, however, not been that closely studied, especially within the context of emerging market stock prices. The purpose of this paper is to use a structural vector autoregression (SVAR) model to bring these two literatures together.

Understanding the relationship between oil prices, exchange rates and emerging stock market prices is an important topic to study because as emerging economies continue to grow and prosper, they will exert a larger influence over the global economy. By some estimates, emerging economies will account for 50% of global GDP by 2050 (Cheng et al., 2007) and the majority of economic growth. Over the period 1990 to 2007 real GDP in China and India grew at average annual rates of 10.0% and 6.3% respectively.[2] By comparison, OECD countries grew at an average annual rate of 2.5% over this same period. At these growth rates the Chinese economy will double every 7 years and the Indian economy will double every 11 years. Along with this economic growth comes a voracious demand for energy products such as oil. In 2009, the US was the largest consumer of oil in the world, accounting for 22% of the global oil demand. China, at 10% of the world total, had overtaken Japan to become the second largest oil consuming nation (Table 1). While the demand for oil in developed economies is holding steady or declining slightly, the demand for oil in emerging economies is rapidly growing. The International Energy Agency (IEA) (2009, p. 81) predicts that between 2008 and 2030, China and India will have average annual growth rates in oil consumption of 3.5% and 3.9% respectively (compared to the 1.0% average annual growth rate for the world). China alone will account for 42% of the global increase in oil demand between 2008 and 2030.

Some emerging economies, like China, are accumulating large reserves of foreign currency (mostly US dollars) and this will make them a bigger player in the world financial markets. Some estimates place China's reserves of foreign exchange and gold at $2.206 trillion as of December 2009.[3] Managing this amount of money and protecting

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[1] http://research.stlouisfed.org/fred2/data/OILPRICE.txt.

[2] International Energy Agency (2009, p.62).

[3] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2188rank.html.

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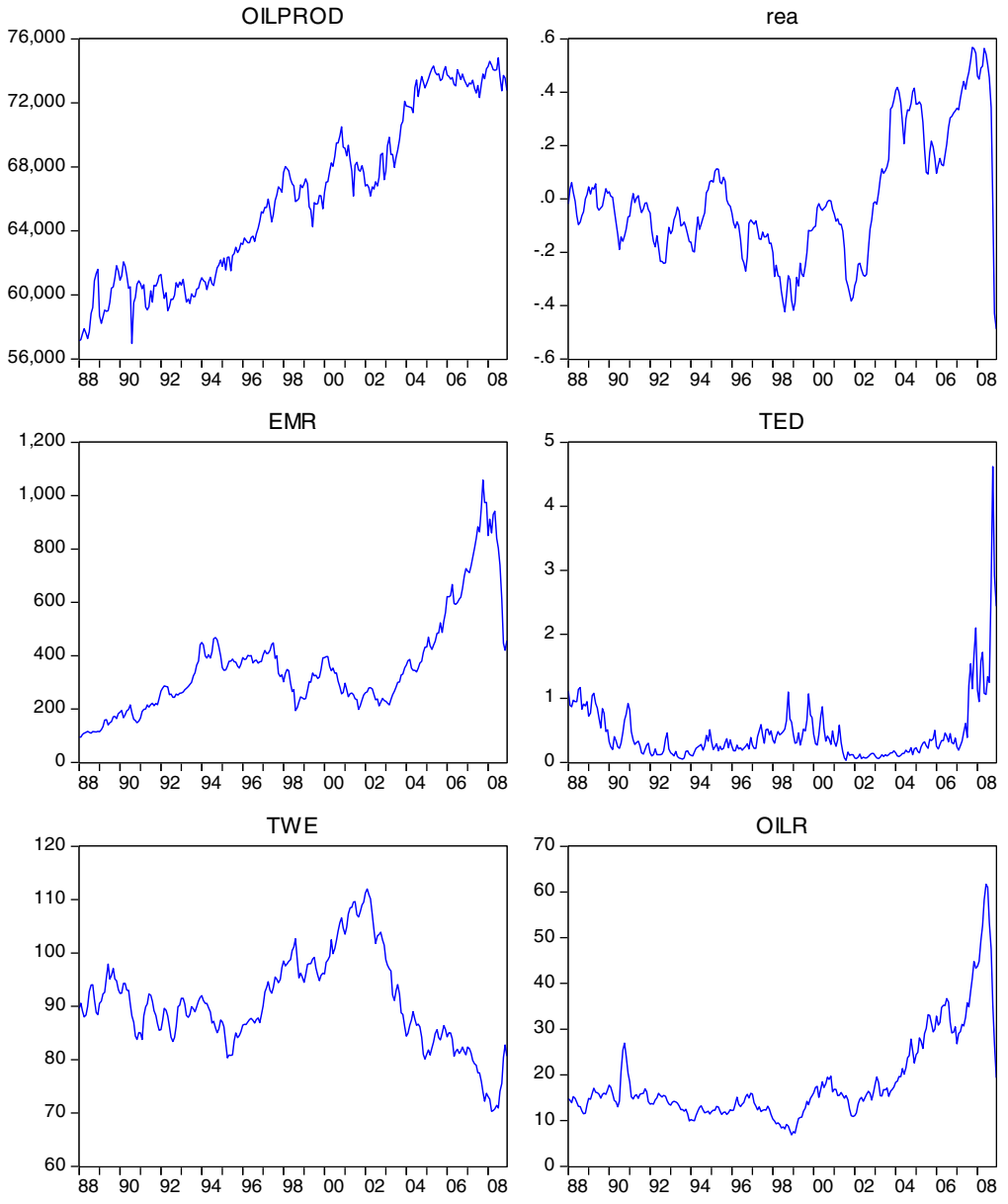

Note: OILPROD (global oil production); rea (logarithm of global real economic activity); EMR (real emerging market equity price index); TED (spread between a 3-month Eurodollar T-bill and a 3-month UST-bill); TWE (trade-weighted US dollar exchange rate index); and OILR (real oil prices).

Fig. 1. Global oil production, real economic activity, emerging market stock prices, the US treasury/Euro interest rate spread, exchange rates, and oil prices.

its store of value will mean that China will have not only a greater participation but also a greater influence over global financial capital markets.

Shocks or unexpected price hikes originating from the oil market have been captured in different ways.[4] Hamilton (2003) defines an oil price shock as a net oil price increase, which is the log change in the nominal price of oil relative to its previous 3 year high if positive, or zero otherwise. However, Kilian (2008a) argues that this measure of oil price shocks does not necessarily filter out oil price changes due to exogenous political events or wars because oil price shocks may be demand-driven.[5] Furthermore, nominal oil price shocks do not mean that there are corresponding real oil price shocks. In order to account for these problems, Kilian (2009) uses a vector autoregression (VAR) with three variables, the oil supply, the real price of oil and a proxy variable for global demand for industrial commodities measuring global real economic activity. He identifies, based on a recursive structure, three oil shocks: an oil supply shock, an oil-market specific shock and a global demand shock. Kilian (2009) treats these shocks as pre-determined in secondary ordinary least squares regressions analyzing their effects on the US economy.[6] We model the oil market as in Kilian (2009), however, we use a much less restrictive set-up for the analysis of the effects of oil shocks that treats all variables as endogenous and allows for rich dynamics in the interrelations across markets.[7]

[4] This literature has been focusing on the US and European economies.

[5] See Kilian and Vigfusson (2009) on empirical evidence against such price asymmetries. See also Hamilton (2010).

[6] See also Kilian (2008b) for a different definition of oil shocks that are treated as strictly exogenous. These concepts correspond to weak and strong exogeneity in Engle et al. (1983).

[7] We do not require the statistically un-testable assumption of pre-determinedness. Also, our approach does not cause problems with autocorrelated errors and generated regressors (the estimated oil shocks used in secondary regressions) when constructing confidence intervals (see Kilian, 2009).