Modelling the Global Price of Oil: Is there any Role for the Oil Futures-spot Spread?

Daniele Valenti[a]

It is widely accepted that crude oil represents the most important and traded commodity in the world. Modelling the real price of oil and understanding the economic factors behind oil price fluctuations provide a useful content resource for institutional and private organizations. In this study, we illustrate the main benefits of accounting for the oil futures-spot spread (henceforth, spread) in a Structural Vector Autoregressive (SVAR) model of the global market for crude oil. The spread is defined as the ratio of oil futures prices over the relative oil spot prices minus one and the free-risk interest rate, after accounting for the time to maturity of the futures contract. According to the theory of competitive storage, the spread can be interpreted as a proxy for the net-convenience yield of oil stocks, although expressed with an opposite sign. This measure is derived by crude oil Brent futures prices with maturity 3-months, since about two-thirds of oil purchases at world level use Brent as a reference price.

Most of the oil market VAR models use an inventory-based detection strategy to identify the speculative demand for crude oil. In contrast, our study provides three main reasons to consider the spread as a reliable measure of oil market expectations. First, the spread accounts for the price discovery role in the futures market. Second, the spread-based model alongside a proper set of identifying assumptions allows to examine the role of oil price speculation by accounting for possible frictions, which may limit arbitrage activity in the global market for crude oil. Finally, the proxies global above-ground crude oil inventories are affected by measurement errors.

Our model provides empirical evidence that, the spread responds to oil price shocks differently, depending on the economic motivations behind each shock. On average, oil supply disruptions and positive shocks to global business cycle cause a large and persistent drop in the spread, consistent with the fact that, inventories are used for consumption and production smoothing, respectively. Conversely, shocks to the demand for storage driven by fears of production shortage cause a small decline in the spread. Finally, the dynamic response functions show a positive relationship between the spread and the real price of oil, triggered by speculative shocks to financial markets. This last type of shock induces an increase in the demand for below-ground crude oil inventories because the future path of the spot price of oil is expected to rise.

Finally, our study provides a clear picture of the historical dynamic of the real price of oil and the spread. To illustrate this point, we focus on four exogenous events in global crude oil markets: the 1990-1991 Persian Gulf War, the 2003–2008 oil price surge, the 2008–2009 global financial crisis and the 2014–2016 oil price slump.

a University of Milan - Department of Environmental Science and Policy (DESP), Milan, Italy. E-mail: daniele.valenti@unimi.it.