Dynamic Adjustment of Crude Oil Price Spreads

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There are over 200 different kinds of crude oil which can be put in groups according to their density and sulphur content. In its natural, unrefined state, the most valuable crude oil is the 'light and sweet' variety with high API gravity and low sulphur content; it flows freely at room temperature and can be separated into high quality petroleum products at low cost. The least useful crude is 'heavy and sour' variety with low API gravity and high sulphur content; it is extremely viscous and contains a higher proportion of impurities. Crude oil and crude oil spreads (the price differentials between different oil streams) are traded internationally by private and corporate investors. The most widely traded crudes are WTI, Brent and Dubai/Oman; they are considered benchmarks and are often used to hedge against price fluctuations of crudes for which there is no liquid market.

The key contribution of this paper is to offer an analysis of short run and long run dynamic adjustment of differentials between a range of pairs of benchmark and non-benchmark crudes of different quality. The main objectives of this paper are to qualify whether the behaviour of the benchmarks is representative of non-benchmark crudes; to

confirm whether or not the asymmetry found in the price adjustment of benchmark crudes holds for other crudes; and to establish whether observed quality characteristics of crudes affect the path of adjustment of crude oil spreads. This has been an issue of topical interest and very recently some studies have aimed to tackle this issue. We employ novel econometric procedures that are more powerful than recently applied methods, and on a much wider selection of crude oil pairs than previous studies. Our findings can be summarised as follows.

First, all pairs of crude oils were found to co-move over time indicating a highly integrated crude oil market. This result confirms the findings of recently concluded studies by showing that all crudes, irrespective of their properties, are traded in highly integrated markets. Secondly, we have found that almost all price differentials adjust asymmetrically following an external shock. This implies that the response of crude oil markets can be different in relation to positive shocks and negative shocks. The type of asymmetry is also found to differ from one oil price spread to another. In some cases the difference is based on the state, i.e., whether the spread is positive or negative; in other cases the difference is based on the direction, i.e., whether the spread is increasing or decreasing. Thirdly, we have found that within our sample, the speed of adjustment tends to be higher in the differentials which do not include heavy crudes. The implication is that the behaviour of spreads between benchmark crudes, which are mostly high quality, is not representative of the dynamics of spreads between non-benchmark crudes. Fourthly, the results show that the quality differential cannot explain the adjustment dynamics fully. This observation is important because it indicates that there are other factors determining the adjustment of crude oil spreads and thereby broadens the avenue for further research on the movement in crude oil price spreads. Finally, we have identified no particular pattern in the short run and long run

dynamics, despite the large number of pairs employed in our investigation. We therefore conclude that policy recommendations drawn from an investigation involving various benchmarks should be treated with caution in their application to the wider crude oil market.