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A STUDY ON REGIONALIZATION OF THE WORLD CRUDE OIL AND GASOLINE MARKET USING COINTEGRATION AND CAUSALITY ANALYSIS

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Overview

Discussions on regionalization of the world crude oil market have given important implications to establish national energy policies. Especially, Korea who imports about 80% of annual oil consumption from single region may be faced with a crucial problem, if the world crude oil market is regionalized.

After Adelman (1984)'s research, there have been steady efforts to analyze regionalization of the world crude oil market. Weiner (1991) developed concepts of regionalization and claimed that the world oil market is highly regionalized on the correlation and regression results on price adjustment. Ripple and Wilamoski (1995) re-evaluated Weiner's data series focusing on the correlation analysis and concluded that the market for crude oil has become increasingly more integrated.

Gülen(1997, 1999) suggested cointegration analysis to investigate the regionalization hypothesis. He stated if prices of similar quality crude oils from different regions do not move together, that is prices are not cointegrated, that means the market is regionalized. He analyzed the regionalization hypothesis with monthly prices over 1980-95 period for fifteen crude oils on his 1997 paper, and with weekly prices over 1991:4-1996:52 period on his 1999 paper. He claimed that the cointegration result strongly indicate that the world oil market is unified.

In a recent issue of *The Energy Journal*: "Testing for Market Integration: Crude Oil, Coal, and Natural Gas" (Vol. 27(2), 2006), Bachmeier and Griffin used the error correction model with daily price data to analyze the degree of market integration. They stated that the advantage of the error correction model is that it embodies cointegration analysis, but also provides readily interpretable summary statistics on the degree of market integration. On results, they claimed that the world oil market is a single, highly integrated economic market.

By the way, above mentioned studies only tested contemporary co-movements. However we should consider time lagged co-movements as well as contemporary co-movements. Moreover, the analysis of time lagged co-movements can be another measure to test market integration. In this study, we proposed Granger causality analysis to analyze the regionalization considering time lagged co-movements. To test the regionalization hypothesis, we chose four weekly crude oil prices (Dubai, Brent, WTI, and Tapis) and three gasoline prices (Rotterdam, New York Harbor, and Singapore) over 2002:1-2005:12 period.

Methods

We used cointegration and Granger causality method considering the asymmetry in lag-length. To consider asymmetric lags, we calculated Akaike's final prediction error following Hsiao(1981)'s argument. In case that the long-run equilibrium exists between prices, we used error correction model to test causality. And we used conventional autoregressive model in case that the long-run equilibrium does not exist.

Results

We could find out three cointegration relationships among crude oil prices. And we could find out that there exist one or more causal relationships among all oil prices.

Conclusions

The cointegration result indicates that long-run equilibrium did not exist between Dubai price and the other prices. In the manner of previous studies, we should conclude that Dubai market is regionalized. However, we could find out the causal relationship between Dubai price and the other prices. Therefore, though there may exist a little inefficiency in the market, we could conclude that world crude oil market is unified supporting Adelman(1984)'s hypothesis.

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