AN EMPIRICAL STUDY ON JOINT PRODUCTION IN ENERGY MARKET

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Overview

In the process of mineral production, several minerals are produced together. This distinguishing feature is called the joint production. The results of joint production are categorized as main product, byproduct and co-product according to their economic importance. Common examples of joint production are petroleum products such as gasoline, kerosene, diesel, etc. Another case can be found in metal production.

The main object of this study is to see if there is a causal relationship between the prices of jointly produced products. Production dependence may result in a relationship in prices. If the price of a mineral rises, it could increase the total production and the production of the jointly produced mineral, too. That is, as the price of a related product changes, the price of the product may change, too. There are several studies dealing with joint productive feature of petroleum products. Also, there are several others studying price relationship of minerals. However, there is hardly any empirical study analyzing price relationship considering joint production. In this study, analysis of the price relationship of jointly produced petroleum products was conducted using Granger-causality test. Targeted products are gasoline, kerosene, and diesel and monthly data from January 1996 to December 2012 are used.

Methods

Basically, time-series data are used in this study. To analyze time-series, a method which is more precise than traditional OLS should be considered. Applying OLS to analyze time-series data, spurious regression is likely to occur. To avoid a spurious regression, stationarity should be checked in advance. In this study ADF test, PP test and KPSS test are conducted to check stationarity. Even if each variable is not stationary, linear combination of those can be stationary. In this case, the variables are said to be co-integrated. Existence of co-integration implies that there is a long-term relationship among variables. When it comes to causality analysis, VAR model can be set up, using differenced variables so that each term in VAR model is stationary.

Results

Conducting unit root tests, level series of prices are found to have a unit root in all three cases and 1^{st} differenced series are found to be stationary. From co-integration test, the null hypothesis of the rank being 1 was not rejected in all three cases. That is to say, there exist co-integrations between the selected petroleum products.

The result of Granger-causality test is as follow: Among the jointly produced petroleum products, change in the price of gasoline granger causes change in the price of kerosene, change in the price of kerosene granger causes change in the price of diesel, and changes in the prices of diesel and gasoline mutually granger cause change of the other.

Granger causality represents statistical causality. This implies that cases in which granger causality was found may be used to see the prices of jointly produced minerals. The analysis of this study may provide an insight to use the studies on minerals in an indirect way.

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