A STRATEGY OF LNG EXPORTING COUNTRIES FOR TRADING IN THE NORTHEAST ASIAN REGION: PRICE COMPETITION, LEADERSHIP, OR COLLUSION?

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Overview

This study estimated oligopolistic structures which may arise at LNG trading in the Northeast Asian region and investigated strategies for pricing of LNG exporting countries. Indonesia and Qatar were considered as LNG exporting countries and it was supposed that they have used two strategic variables, which are LNG spot price and LNG forward(long-term contract) price when they export their LNG to Korea and Japan. Four strategies for pricing which are Bertrand competition, price leadership of Indonesia, price leadership of Qatar, and price collusion were considered and this study selected the model which fitted the data best using pairwise tests for nonnested hypotheses of Vuong(1989). This study and the results can be used as a fundamental research for empirical studies of LNG trading. In addition, since this study investigated strategies for pricing of LNG exporting countries, this study can contribute to establishing policies and strategies of LNG importing countries.

Most of LNG traded in the Northeast Asian region have been traded as a long-term contract of which the duration is 10 years or more. This long-term contract, which contains disadvantageous clauses to importing countries and oil-indexed pricing mechanism, makes LNG trading inflexible. In academic researches, Liski and Montero(2006) argued that forward trading allows firms to sustain collusive profits and Choi and Heo(2016) found that Korea and Japan have paid a premium for LNG by time-series analyses. Forward trading, however, may make commodity market more competitive as Allaz(1992) and Allaz and Vila(1993) argued. Therefore, to clarify the oligopolistic structure of LNG trading in the Northeast Asia and to help importing countries establish effective policies and strategies, structural and empirical study about pricing strategies of exporting countries should be conducted first.

Methods

Simultaneous equation models which consist of consumers' demand functions and the first order condition for maximizing producer's profit functions, like Gasmi et al.(1992) and Carter and MacLaren(1997), were set up. This study postulated oligopolistic situations of a 1-importing country(Korea or Japan) and 2-exporting countries (Indonesia and Qatar) and two strategic variables which are LNG spot price and LNG forward(long-term contract) price. This study also supposed that exporting countries maximize integrated profits, which means profit sharing, when they set prices under the collusive pricing condition. Furthermore, expected utility functions of an importing country and expected profit functions of exporting countries were set to consider the re-negotiation of LNG forward price. The basic functions in this study are expressed as equation (1) to (4).

$$q_i^S = \alpha_i + \beta_i^{S1} P_i^{S1} + \beta_i^{S2} P_i^{S2} + \eta_i^{F1}P_i^{F1} + \eta_i^{F2}P_i^{F2} \qquad \textit{for all i = 1, 2} \qquad (1)$$

$$\Pi = P_i^S q_i^S + P_i^F q_i^F - C_i(q_i^S + q_i^F) \qquad \textit{for all i = 1, 2} \qquad (2)$$

$$EU_i = E[(P_i^{Si} - P_i^{Fi})q_i^F] - (\theta_i^D/2)Var[(P_i^{Si} - P_i^{Fi})q_i^F] \qquad \textit{for all i = 1, 2} \qquad (3)$$

$$E\Pi_i = E(\Pi_i) - (\theta_i^D/2)Var(\Pi_i) \qquad \textit{for all i = 1, 2} \qquad (4)$$

Equation (1) is a demand function of an importing country for LNG spot volumes from each exporting country and equation (2) is a profit function of exporting countries(i=1, 2). Equation (3) is an expected utility function of a risk-averse importing country for the forward price which is expressed as a mean-variance form and equation (4) is an expected profit function of risk-averse exporting countries. Using equation (1) – (4) and solving the maximization problems, simultaneous equation models which consist of 2-demand functions, 2-first order conditions for pricing LNG spot volumes, and 2-first order conditions for adjusting the prices of forward prices were constructed. Regardless of oligopolistic situations, the simultaneous equation models can be expressed as a general form of the model but constraints for each parameter vary according to strategies of LNG exporting countries.

Results

The results of Vuong(1989)'s hypotheses tests of 4 models for Japan are shown in Table 1. As shown in Table 1, the collusive pricing model for spot LNG volume is better than any other models and it is statistically significant. Therefore, from March 2000 to February 2011, the model that Indonesia and Qatar set the spot LNG price collusively and they set the forward LNG price under the Bertrand competition fits the data best in the case of Japan.

Table 1. Results of Vuong(1989)'s Tests (The Case of Japan, Before Fukushima Disaster)

	Spot: Leadership (Indonesia) Forward: Bertrand	Spot: Leadership (Qatar) Forward: Bertrand	Spot: Collusion Forward: Bertrand
Spot: Bertrand Forward: Bertrand	1.661*	3.654***	-10.225***
Spot: Leadership (Indonesia) Forward: Bertrand	-	4.930***	-11.792***
Spot: Leadership (Qatar) Forward: Bertrand	-	-	-14.878***

Null Hypothesis: Each model fits the data equally
*, **, and *** denotes that null hypothesis is rejected at 10%, 5%, 1% significe level, respectively.
Negative test statistics mean that the model in the column fits better.
Positive test statistics mean that the model in the row fits better.

Conclusions

Among the 4 oligopolistic situations, Indonesia and Qatar set the spot LNG price collusively and earned the collusive profit when they export the spot LNG volumes to Japan. Therefore, although it only considered the small part of this research, major LNG importing countries in the Northeast Asia like Korea and Japan have a need to establish a close cooperation even when they import spot LNG volumes. In addition, the efforts to make an efficient spot market for LNG are required to import LNG at competitive prices.

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