



Research paper

The assessment of liquefied natural gas (LNG) demand reversibility in selected OECD countries

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ARTICLE INFO

Article history:

Received 3 February 2018

Received in revised form 26 April 2018

Accepted 30 May 2018

JEL classification:

F14

Q37

R41

R49

Keywords:

LNG

Asymmetric effects

Reversibility

Dynamic panel

ABSTRACT

Experience has shown that there is a relationship between demand and price, contrary to the short-term mode, which is expected to be inverted between price and value, and the effects of lowering and rising prices follow reverse. But symmetric results; in the long run, there may be unlawful reactions. It would seem that the effect of the price increase and its effect on the amount with its photo mode is not the effect of the price decline. To illustrate the effects of price symmetry, the price can be broken down into three parts, the maximum price, the lowering price, and the increasing price, according to the Getely method. The main objective of this paper is to investigate the effects of the LNG product in the OECD countries. The study uses seasonal data from 2011–2015 for selected countries (Japan, South Korea, United States, United Kingdom, and Spain). Dynamic panel method is also used to estimate the model of this research. According to research findings, long-term and short-term elasticities of effective factors on LNG demand in selected countries have been calculated. The results show that LNG demand in the selected importing countries is relatively reversible in the short and long-term.

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1. Introduction

Natural gas is regarded as an important source of energy supplies in the new century. Today, many technologies have been developed for extracting, transporting, and utilizing gas resources. In addition, the rapid development of the gas industry has influenced some important technologies introduced since the mid-twentieth century. However, it has faced a lot of difficulties due to the nature of the natural gas transmission, and the pipeline has many problems at long distances even using the easiest means of transportation.

In those cases where short distances and markets are large, pipelines usually have the lowest cost for transporting natural gas without considering specific political and geographic locations. However, the factors considered as limiting gas pipelines include transferring distance, determining the pressure boost stations, marine and blue barriers, crossing populated areas, and environmental issues, and political problems.

In addition, more pipelines and pressure boost stations are required for longer transmission distance. Further, it is evident that this plays a significant role in increasing the price of the final product. Given the technology available to transport gas for

remote areas, the LNG method, as an economic method, can largely overcome the difficulties of carrying gas. In general, two separate markets are available for liquefied natural gas trading. First, the Atlantic market including the exports to Mediterranean markets, or Atlantic Mediterranean markets. Import markets include Europe, America, and the Caribbean, as well as Norway, Libya, Nigeria, Trinidad and Tobago and Egypt, with the largest share of LNG exports. Second, Asia Pacific market includes Japan, Korea, China and Taiwan as the importers of this market. Typically, the Asia Pacific market will take a larger share of international trade. The following factors are regarded as some of the most important factors in increasing the global LNG trade:

- Increased competition among suppliers of new LNG technologies
- Increased demand for LNG in importing countries and the addition of emerging markets to this market
- Scale-scale savings in designing new natural gas conversion facilities to LNGs
- Reducing LNG production costs due to the growth of technical progress in this area
- Enhancing global attention to environmental issues, reaching the proximity of the global carbon tax, and increasing in plant production costs, and enhancing the need for clean fuel
- High prices of natural gas and the willingness of gas producers to extract and produce even remote resources.

The present study aimed to evaluate the asymmetric effects of the price on LNG demand and its sub-target, as well as the

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short-term and long-term elasticities of other variables affecting the demand for liquefied natural gas in selected countries. In fact, it tries to analyze the variables affecting LNG imports in light of expanding this industry in the world. All data were seasoned to more assess the asymmetric effects of the price more accurately. Data related to LNG and gas prices through the pipeline were monthly and the data on national income, energy consumption, population and LNG demand were annual. To this aim, Japan, South Korea, Spain, the United Kingdom and the United States were selected. These countries are regarded as the only countries having the highest volume of LNG imports worldwide.¹

Based on the literature review related to the LNG markets and the problems related to convergence in hydrocarbon reserves, those variables affecting the amount of LNG demand according to theoretical economic basis were taken into consideration. Then, the price of LNG in selected countries was analyzed by implementing Getely's method, using theoretical bases of the model, and finally estimating the model by using dynamic panel data. Finally, conclusions and policy recommendations were made.

2. Background of the study

So far, most of the studies conducted in this area have focused on examining the asymmetric effects of hydrocarbon reserves and relating the reversibility of hydrocarbon reserves to the oil price. However, less attention has been paid on other transmission energy, especially Olive. For example, some focused on studying the problems related to asymmetric effects with positive oil shocks in the early 1970's, followed by the recession in the world economy. In addition, the effects of oil shocks on the macroeconomic structure were evaluated in some other studies.

Alam et al. (2017) reviewed Australia's current gas reserve, industries, markets, and LNG production capabilities. Now, Australia is regarded as one of the world's major natural gas producers and exporters and is expected to continue a dominating role in the world gas market in future.

In another study, Varahrami et al. (2015) studied the asymmetric effects of natural gas prices on their consumption in the household sector by using the Cooke model during 1991–2012 and concluded that change in the effects of natural gas price on asymmetric household consumption. In addition, long and short-term gas price stretches, natural gas stretch, and short-term natural gas demand were evaluated in this study.

Regarding the future of LNG trade in the United States, Moryadee et al. (2014) has the potential of exporting LNG by the country by relying on significant reserves of unconventional gas in the US. In addition, its impact on LNG global trade was evaluated within the framework of a game theory model.

Further, Taklif (2013) examined the cooperation of the elected members in the Gas Exporting Countries Forum based on the game theory approach. First, an LNG shipping cost matrix was developed from the elected member states of the exporter in the LNG to the selected LNG countries by examining the structure of the LNG carriage cost and its global business model. Finally, this matrix was utilized to study the game theory approach in the selected countries.

Furthermore, regarding the LNG product, Mansurkiaee (2009) estimated the relationship between crude oil prices and LNG Liquefied Petroleum and recommended some appropriate strategies for exporting gas through LNG to Iran.

Getely and Hillard (2001), in another study, estimated three separate models for OECD and non-OECD oil and non-OECD high demand growth by implementing integrated data during 1971–1997. The results indicated that long-term tensions and long-term

earnings were -0.64 and 0.56 for OECD countries, respectively, -0.17 and 0.68 , respectively for non-OECD countries, and -0.12 and 0.95 , respectively for non-OECD countries with high growth.

Regarding all the above-mentioned studies, most of the research on price symmetry highlighted the effects of price fluctuations on macroeconomic variables. In addition, a large number of studies were conducted on the asymmetric and reversible effects of the dependent variable in the market for exchange rate and deposit, investment and consumption issues. However, to the best of our knowledge, no research has been conducted on effects of assessing price symmetry in the global LNG market.

3. Methodology

In order to conduct the present study, the United States, Spain, Britain (Atlantic market), and Japan and Korea (Asian-Pacific market) were selected. To this end, the following variables were considered:

Imported LNG Prices: The price of LNG is considered as one of the most important factors affecting the level of imported LNG. According to demand law and the inverse relationship between price and quantity, an increase in LNG prices leads to a reduction in the amount of imported demand and a decrease in the price of LNG. In the economic term, assuming that other conditions are stable, an increase or decrease in price is regarded as the demand for the movement of the curve. In the demand side of hydrocarbon reserves, it seems that the effect of changing demand for these reserves such as oil on its demand in the long run is greater than its effects in the short term. For example, fuel consumers cannot quickly change their consumption habits through rising oil prices while it is possible in the long run (Mousavi et al., 2014).

Asymmetric LNG Prices: The effects of prices on energy demand behaviors are asymmetric due to the irreversible effects of technology improvement and demand-side management. Technology increases or equipment efficiency increases when the price of imported LNG increases in developed countries. In addition, this improvement is institutionalized in the industrial structure so that if a reduction in price occurs in the future, this effect is not reversible (Taghvi Nejad, 2006).

GDP (or national income): LNG imports are directly related to the level of industrial activity in the community, the amount of gas consumed in the domestic and commercial sectors, as well as the amount of agricultural production Arbox and Perobelli (2010).

Gas pipeline price: A pipeline can be used as a substitute for natural gas. For example, the price set for LNG in the Henry hub is closely related to the price of natural gas from the pipeline in the United States, which means that they are competing for successive commodities. As it was already mentioned, in order to determine the transmission path to transfer gas, different conditions such as the amount of transmission distance, the existence of sea, political-economic barriers, and the like should be considered. For example, South Korea and Japan are shipping all their gas through LNG due to the sea and high gas pipeline costs from the sea (Rahimi, 2007).

Population growth: Clearly, population growth results in increasing the demand for hydrocarbon reserves such as natural gas. In other words, the higher population leads to the greater demand for energy.

3.1. Imported LNG prices decomposition

In 1993, Mory divided the price changes of oil into two categories in order to examine the existence of a synonymous relationship between economic activity and oil prices. The sharp rise in oil prices in 1973 has had some implications for the world's

¹ BP Statistical Review of World Energy (2013).

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