DETERMINANTS OF OFFICIAL OPEC CRUDE PRICES

AN ECONOMETRIC ANALYSIS

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To my Parents, Sisters
and Brothers, with
special dedication
to Fareed

DETERMINANTS OF OFFICIAL OPEC CRUDE PRICES

AN ECONOMETRIC ANALYSIS

by

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Table of Contents

Chapter I

Introduction

Research on energy has quite subsided for the last five years. The main reason for that is the continuing drop in oil prices. Like other matters of human interest, work in this field is inspired by an immediate pressure; in this case, rising oil prices and shrinking supplies. However, if another "energy crisis" is to be avoided, research must continue even though it seems that there is no cause for concern at the moment.

Although oil is a fascinating business, the international oil market stands as an enigma for most economists. The most puzzling question has always been what factors determine the price of oil. The high premium or rent element on oil prices is widely acknowledged. Yet how that amount is determined, whether prices are set by international oil companies or by the producing countries' governments, is still at issue.

Even though work in this area is fairly recent, a large body of literature has accumulated, with a wide variety of theories and hypotheses. Theories based on free competition have failed in predicting the market behavior, but those assuming an oligopolistic market structure seem to be more promising.

The present study deals, in general, with the international oil market, its structure and operation, and the role of the Organization of Petroleum Exporting Countries (OPEC). Specifically, this study focuses on the determination of OPEC crude oil prices.

To facilitate an objective analysis of the issue, a linear regression model is employed. This model was originally developed by Morris Adelman in 1972, and later elaborated and tested by Phillip Verleger. The hypothesis tested is that the official price of crude oil, as set by OPEC, is determined by the value of crude in the spot market. In other words, the price of crude is determined by the prices of products derived from it. This hypothesis logically follows from the fact that demand for crude oil is a derived demand determined by the demand for petroleum products.

The hypothesis is tested for the three main types of crude produced by OPEC, and it covers the

period 1976-1985. Another regression is run for the period of falling prices from 1981 to 1985 to determine if any difference occurs in the parameter estimates. It was not possible to run the test for the period of rising prices, which preceded this period, due to lack of data. However, the results are compared to the findings of Lowinger and Ram (1984) who ran the same test for periods of rising as well as falling prices.

The study is limited to the impact of the spot market on the official prices of crude. It does not investigate the factors that determine prices in the spot market, a subject involved enough to be tackled in a separate study. The next step, after establishing that the spot market has such an impact on OPEC decisions, would be to study the determination of spot prices.

Chapter II presents the historical and the institutional background against which the analysis should be viewed. It deals with the development of the oil market and the structural changes it has experienced. It also discusses in some detail the formation of OPEC and its impact on the market. In addition, the chapter examines the spot market and how it operates, with special reference to the Rotterdam

market. The role of the consuming countries and traders is also reviewed.

Chapter III is a review of literature and development of thought in this area. It represents the theoretical framework of the analysis. The major works on the oil market are reviewed, with emphasis on those that relate most to the analysis in this thesis. Thus, the chapter forms a good synopsis for the main works reviewed.

Chapter IV explains the basic model, its theoretical premises, the hypothesis to be tested and the estimation techniques.

Chapter V reviews, in detail, the empirical results of the estimated model and compares them with previous studies, particularly those of Verleger and Lowinger and Ram.

The implications of the findings of the study are presented in chapter VI. This chapter summarizes the major points of the analysis and the conclusions to be drawn from it, as well as make recommendations for future research. The data and explanation of calculation methods and basic definitions are included in the Appendix.

Chapter II

Structure and Development of the Oil Market

The international oil market is unique in its structure and operation. It has perhaps undergone more radical change than any other industry in history. This chapter discusses the structure of the oil market and traces the major changes that it has experienced. Particular attention is given to the formation and development of OPEC and the spot market. Also a brief account is given on the Rotterdam spot market which serves as the case study in this analysis.

Development of the Oil Market

Before the 1960s the oil market was firmly controlled by a group of giant international companies known as the "Majors" (Sampson 1975). Those companies were Exxon, Socal, Mobil, Texaco, Gulf, Royal Dutch Shell and British Petroleum.

They managed to control the market through a highly integrated system, both vertically and horizontally. Each individual company had control over its operations from the wellhead to the gas station. At the same time, the companies coordinated production and market shares in order to avoid imbalances. This was reflected in the agreements that were designed to protect each company's market share such as the "Red-Line" and the "As-Is" agreements (Danielson 1982, p. 118-21). These agreements represented an effective division of producing areas among the companies.

The majors were no less a cartel than OPEC. In fact, they were more coherent and, hence, more effective than OPEC because they had far more homogeneous interests and objectives than OPEC members. Thus, the major oil companies successfully cartelized the market for a long period of time. There was no oil trade outside the channels of those companies or what was known as "third-party" trading. This lack of access to markets by other parties was the main reason for the failure of the Iranian nationalization (Danielson 1982, p.144-45) of the oil industry in 1951.

Outside the U.S., production was based on the concession system, whereby each company was granted a

vast area of land for long periods of time for exploration and production purposes. Each national government's share was a small fixed amount of money per barrel of production known as the "royalty." That led to constant struggle between the companies, who restricted output in order to keep prices above marginal cost, and the governments, who wanted higher levels of production in order to raise the royalty.

Pricing of crude oil was an exclusive prerogative of the companies. The system of pricing used was known as the "basing-point system." Prices of crude oil from all destinations were determined in relation to prices of crude at two base points, the U.S. Gulf and London, after adjusting for transportation costs and quality differences. Prices set by the companies were known as the "posted prices" (Rouhani 1971, p. 208).

The concession system prevailed for quite a long time, during which the companies had absolute control over the market. However, by the 1960s entry of independent companies, such as Amoco and Getty, and the emergence of new producing areas, such as North Africa, enhanced competition among the majors. In addition, the rising awareness in the producing countries presented

another source of pressure that eventually led to the breakdown of the concession system.

The most important institutional phenomenon that gradually replaced the concession system, and laid the basis for the formation of OPEC, was production sharing. Production sharing was first introduced in Venezuela (Rouhani 1971, p. 46) providing for fifty-fifty sharing between the companies and the governments in the mid 1940s. This arrangement means that the companies and the governments share, according to specified percentages, the proceeds of sales after the cost of operation has been deducted.

Another form of country-company relationship was the service contract, that was introduced by France in a contract with the Iranian Oil Company in 1966 (Rouhani 1971, p. 63). In that type of arrangement the company is hired like any regular contractor to perform the job of exploration and production for a fee.

Towards the end of the 1950s, oil prices started falling steadily. The producing countries began forming their own oil companies to engage in oil export-import operations and to supervise the foreign companies work. There were mounting pressures from new sources of production and from new oil companies, but

the main cause of concern for the producing countries was the declining trend of crude prices. The reason was that as prices dropped, the companies cut production, which in turn reduced the royalty for the governments.

In 1959, the companies reduced the posted prices further, thereby providing the immediate cause for the formation of OPEC in 1960 (Park 1976, p. 16). The establishing members were Venezuela, Iraq, Iran, Saudi Arabia and Kuwait. OPEC's first decision was to stop the decline in the posted prices immediately, and to raise the tax or the royalty on production.

Even though that was considered a fatal mistake by the companies, it is hard to conceive that the formation of an organization to promote the interests of the producing countries would not have been forthcoming anyway. Danielson (1982, p. 126) described it as a natural --though not inevitable-- event. For a long period of time the oil companies and the industrialized countries have enjoyed the benefits of energy at negligible costs. It is always mentioned that the oil price increase of the 1970s have led to a massive transfer of wealth from developed to developing countries, whereas the former process of massive wealth transfer in the opposite direction is rarely mentioned.

At any rate, the formation of OPEC and the shift of control over the petroleum industry from the companies to the producing countries, represents the biggest structural change in any industry in history. OPEC decided to set the price of crude oil unilaterally in 1973, which marked the end of the concession system. Even so, the companies still dominated the market because of their ownership of refineries, information channels and accumulated expertise in handling the oil business.

Since its inception, OPEC has been constantly struggling to set the proper price for its crude as a depletable resource, which, in effect, means determining the scarcity rent or user cost of oil. The basic pricing structure used by OPEC until recently was very similar to the basing-point system. A marker crude, which was Saudi Arabia's Arabian Light, is chosen, then each country sets the prices of its own crudes in relation to the price of the marker, after adjusting for differences in location, gravity and sulfur content of the particular crude.

This structure, which has never really worked quite well, has resulted in what is known as the "differentials problem," i.e., the price differentials