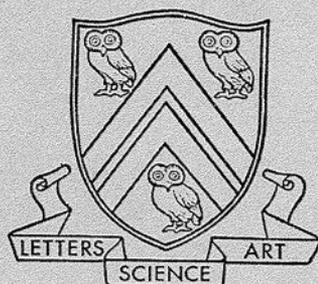


RICE UNIVERSITY STUDIES



MONOGRAPH IN ECONOMICS

**INDEX NUMBERS AND COST ANALYSIS:
AN APPLICATION TO THE PETROLEUM INDUSTRY**

HENRY B. STEELE

VOL. 49, NO. 2

SPRING 1963

RICE UNIVERSITY STUDIES

JOURNAL OF WILLIAM MARSH RICE UNIVERSITY

RICE UNIVERSITY STUDIES, successor to the RICE INSTITUTE PAMPHLET, is a quarterly journal of writings in all scholarly disciplines by staff members and other persons associated with Rice University.

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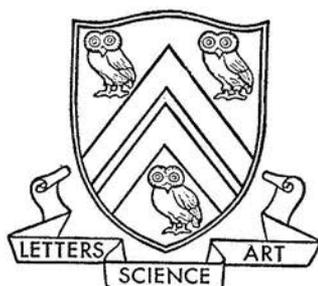
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PUBLISHED BY
WILLIAM MARSH RICE UNIVERSITY
HOUSTON 1, TEXAS

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PREFACE

THIS monograph is a logical extension of an earlier study which I published in collaboration with Mr. John E. Hodges, under the title, "An Investigation of the Problems of Cost Determination for the Discovery, Development, and Production of Liquid Hydrocarbon and Natural Gas Resources," as the October, 1959, issue of *The Rice Institute Pamphlet*. In the 1959 monograph we attempted first to explore the purely theoretical problems of cost determination in the extractive phase of the petroleum industry, and second to apply certain theoretical techniques to a study of the apparent trends in the "real" costs of finding oil and gas reserves in the United States. In this context, the term "real" costs has reference to the actual physical outlays necessary to discover a given volume of oil, of gas, or of oil and gas together. For example, how many feet of new field exploratory wells must be drilled in order to add one barrel of new discoveries of liquid hydrocarbons to total cumulative discoveries of liquid hydrocarbons? A more convenient way of handling the problem would have been to use money costs in terms of dollars spent in discovery efforts per barrel of liquid hydrocarbons found; however, the limitations of the data available at that time prevented the computation of any sort of money costs that would have been comparable in value to the real cost measures then devised.

It has now become possible to construct a more nearly adequate index of the costs of drilling and completing oil and gas wells in the petroleum industry, using price indexes for major component items of cost, weighted by the use of certain data, supplied by a survey on a random sampling basis, of the operations of forty-two companies in the industry. These companies responded to a continuing cost study and cost survey program carried on by the Independent Petroleum Association of America. I have had access to these actual cost data, which permit the construction of a money cost index supplementing, and in many ways superior to, the real cost indexes developed in the 1959 monograph.

Part I attempts to explain the need for adequate statistical data concerning trends in the cost of drilling and completing oil and gas wells. The magnitude of the problem of assuring future supplies of petroleum resources at reasonable levels of cost is described; the usefulness of adequate cost data to academic students of the petroleum industry, to business firms engaged in oil and gas exploration and drilling, and to government agencies responsible for policies affecting the use of energy resources is briefly indicated.

Part II deals with the historical evolution of the cost indexes developed by the Independent Petroleum Association of America. It

is felt that a better appreciation for and understanding of the problems involved in measuring the complex of costs that go into oil and gas well drilling and completion activities in terms of index numbers can be gained by following the development of the final indexes through their earlier, and more tentative, versions.

Part III is devoted to a descriptive analysis of the current indexes of total drilling and completion costs per well and per foot, as developed by the Independent Petroleum Association of America. Here is a detailed description and analysis of the sources of the data used for the computation of the component parts of the various indexes, and an explanation of the methods employed to combine disparate individual series and indexes into the final composite cost indexes.

Part IV describes some of the possible uses of the indexes of drilling and completion costs. The uses of the individual series as well as of the final composite indexes are discussed. Part IV concludes with an attempt to estimate total expenditures for drilling and completing oil and gas wells in the United States during the period 1947-1961, by use of the relevant cost indexes. In so doing, efforts are made independently to confirm the accuracy of the cost indexes by comparing the total costs obtained by their use with other estimates of total industry costs.

Part V is a commentary on the limitations of the cost indexes. General limitations applicable to all the indexes are first set forth. Certain cautions which should be observed in the use of individual indexes, or in the interpretation of the results of such use in particular instances, are then introduced by way of further qualification.

The author is indebted to his colleagues, Professor John E. Hodges and Mr. I. C. Kerridge, Jr., for their invaluable suggestions and assistance in editing the manuscript. Acknowledgments are also due to Mr. Radford L. Schantz and to the other members of the Cost Study Committee of the Independent Petroleum Association of America. The views expressed are, however, wholly my own; none of the gentlemen mentioned above necessarily agrees with all my conclusions.

HENRY B. STEELE

Assistant Professor of Economics
Rice University
Houston, Texas
April 1, 1962