WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

SOME PROBLEMS AND PROSPECTS FOR MARINE TRANSPORTATION OF OIL IN THE 1970s

By

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March 1973 649-73

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N73-30464

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Presentation made at the Energy: Demand, Conservation and Institutional Problems 1973 February Conference at the Massachusetts Institute of Technology, February 12-14, 1973. The underlying research was partly supported by NASA Contract No. NGL-22-009-309, Integrated Planning and Control Systems.

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Introduction

One of the most neglected and also misunderstood elements of the whole energy supply system is that of ocean transportation. At a time when outcries of impending and existing energy crises abound, not sufficiently serious thought is given as to how the energy sources which are bound with geography can be brought effectively to the potential market place. In the final analysis the oil companies may find - if they continue their present policies - that the production problems of oil supply during the 70s may be less thorny than those of transportation. The latter which at present is at best viewed as an ancillary evil, deserving contempt and neglect, does now and will continue in the 1970s to provide one of the best opportunities for profit enhancement in the oil industry. I use the term profit enhancement in its broad sense. Later on I will point out that effective management in the transportation area also provides profit protection.

Because of the structure of the petroleum industry, the organization of the international oil companies, and the accounting systems of the latter, the impact of transportation on profitability is for the most part indirect. As a result, unless one looks carefully for these profit-making and profit protection opportunities they tend to go unnoticed.

Another and more important reason for the relative neglect of transportation can be found in the lack of clear understanding by the oil industry as to what makes tanker rates fluctuate so wildly. And what one cannot understand he

naturally tends to ignore, because he does not know how to control through planning.

The amount of capital required for transportation and the conditions determining the availability of such funds cannot provide logical support to the attitude of the oil producers toward transportation. Unlike some commonly held beliefs, it is much easier for the integrated producers to find external capital for transportation than for exploration and production. As I have pointed out elsewhere (25) the oil companies provide either directly or indirectly almost all the credit support behind the capital which flows into the tanker markets. Furthermore, the amount of financial resources required for exploration and production activities is orders of magnitude greater than that required for transportation.

In trying to understand why the major oil producers have tended to ignore marine transportation, one cannot help but wonder as to how much those who are in charge of marine operations, for the oil industry, have contributed to the present state of affairs. A close look will show mainly two major classes of people at the helm. One group is transient, placed in transportation temporarily for training before reassignment to other "down-stream" operations. By the time these managers have learned something about transportation they are moved to "greener pastures". The other group is more permanent, it is hard working and in the final analysis more influential in guiding the activities of the transportation departments. These are the people who normally collect statistics, are reactive and tend to be exclusively intuitive operators. So in an industry where scientific talent has indelibly left its mark on exploration, production and refining, most transportation departments succeeded in the main to coexist with their "brethren" unaffected by management science techniques.

The end result of the above is that transportation has been dominated by other operations. The planning and anticipatory actions taken by the oil

industry have been almost exclusively in the areas of exploration, production, refining and distribution. Ocean transportation has been for years relegated to the status of a second class citizen, and allocated resources either because of budgetary surpluses or because of crises.

The point that should not be lost is that this relative neglect of transportation by the integrated producers and their reactive behavior are not benign, if I am to use a now famous expression. In fact, herein lies the greatest cause of the wild fluctuations in both tanker rates and shipbuilding costs.

The purpose of my presentation is to look at the problems associated with, and the financial resources required for ocean transportation of petroleum in the 1970s. In the process I will also attempt to explain why I believe that in the future the oil industry and the producing countries cannot afford to ignore ocean transportation as much as they did in the past.

I. Some Background

A. Spot Rate Fluctuations

If we look at the time-series of spot rates for tankers (that is to say over time the current round trip cost for delivering one ton of oil for a given route),[1] we will find that the rates fluctuate over a wide range. Forgetting the 1967 disturbance, in the post 1967 period the Persian Gulf/U.K. Continent rates reached a peak of Worldscale 297 in October 1970 and a low of Worldscale 25 in April-May 1972. (See Graph II). This represents

[1] Spot rates refer to the cost of transporting oil for a given run, and are expressed in monetary terms per ton of oil delivered. They are to be distinguished from time-charter rates which refer to the cost of renting a vessel to carry oil for a certain specified time period. The time-charter rate is usually quoted in monetary terms per deadweight ton of carrying capacity per month. We can convert, of course, time-charter rates to spot-rate equivalents. For convenience spot rates are quoted in terms of percentages of a standard, the latter now being "World Scale."

a fluctuation of 12 times from low to high. As Table I shows, if we take the Kharg Island/Philadelphia run, Worldscale 297 results in a transportation cost of $3.80 per barrel of crude oil delivered and the low of Worldscale 25 in a transportation cost of only 32 cents per barrel of oil. Looking at it in another way, at the high rate the spot rate cost of transportation alone was greater than the total value of the oil delivered during periods of low rates.

I hasten to warn at this point that the spot market does not handle much carrying capacity. Over 80%[2] of all the oil shipped is transported in vessels which are either owned by the oil companies or chartered by the latter on a long-term basis. Although the long-term rates do fluctuate sympathetically with the short-term (spot) rates, the fluctuations of the former are more tempered. From the economic point of view, however, the spot rate is very important because it represents the short-run opportunity cost of transportation. It also affects the expectations of those in the industry (23), and brings about an overall impact which far transcends the percentage of tonnage involved in spot market activities.

In addition to affecting the long-term or time-charter rates, spot rates also influence the investment patterns in ocean transportation capacity. In the latter case not only the shipbuilding costs are affected by the level of spot rates in transportation, but so is the amount of orders placed for new tonnage.

The relationships between spot rates for transportation and orders for new vessels create a complex network of dynamic interdependencies which can cause cyclical patterns and the "feast and famine" situations that we have been observing over the years in the price of ocean transportation. (See

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[2] During prolonged periods of low spot rates the spot market handles approximately 20% of the total tonnage. During periods of high rates, however, the amount drops to about 6%.

Graph I). One significant consequence of these observations is that we do not necessarily have to have cyclical demand for transportation in order to observe cyclical price patterns. The forces operating on the supply side are sufficient to generate them without any aid from the factors affecting the demand for transportation. In practice of course both types of impacts are manifested.

Another important conclusion that we can draw is that the vital interrelationships among the various time periods (in terms of the spot rates, construction costs, orders placed for new tankers, deliveries of tankers and eventual retirement of such) although complex, provide those in the industry with enough information on which to make rational plans regarding chartering and building of tankers and reduce the price fluctuations of transportation capacity. Such a reduction with its concomitant consequences will result in significant cost savings for the industry.[3] Ironically, these observations are not new. They were first expounded in their general form by Jan Tinbergen back in the 30s (20) later on by Tjalling Koopmans, whose work in the area of freight rates published in 1939 is now classic (7) and more recently by myself in the late 50s and early 60s (23, 24). And here I am, feeling the necessity to talk about these conclusions, once again, because they are still valid and as yet have not extensively influenced the oil industry.

B. Who Absorbs the Rate Fluctuations?

I see compelling reasons for change within the tankship markets, however. What the industry failed to do voluntarily through planning and rational

[3] We assume here that "enough" users of transportation will rationalize their policies and operations by using the information and thus affect the industry. If not, those few who apply this knowledge will benefit at the expense of the rest.

anticipatory action in the past, it will be forced to do in the future as a matter of necessity. As the margins on production operations are reduced by the ever increasing demands of the producing countries and the elimination of some of the special taxation benefits which are presently enjoyed by most internation oil companies, it will be relatively more difficult for the latter to guarantee delivered prices and absorb large fluctuations in transportation costs. Transportation will now come to merit consideration as a profit center, not as a cost center. It will, therefore, be rationalized to the point where it is as efficient an operation as can be. The profits and losses from transportation will no longer be burried in other upstream and downstream operations. In short, I foresee that ocean transportation will come to maturity. In the future it will neither be able to hide its inefficiencies under the average profitability of other operations, nor will it subsidize others.[4] It will have to "stand on its own two feet."

Admittedly, the integrated oil companies may choose other alternatives such as:

1. Pass along the increasing "costs" (including the transportation inefficiencies) to the consumer as they have done in the past. This, however, will bring increasing resentment from the consuming countries with deleterious long-run effects. The larger the price increases the more vocal the complaints will tend to be. If we look very carefully we will find out that this policy has never <u>fully</u> worked consistently. The existence of discounts from posted prices and the absorption of transportation fluctuations adds credence to the arguments of those people who try to convince us that in reality there is no shortage of oil <u>in the extended short</u>

[4] In the past we have been witnessing more of the former rather than the latter. The policies of the international oil companies have resulted in other departments having to absorb costs resulting from inefficient transportation decisions.

run, at least not in the sense and to the degree that we are led to believe.[5]

2. Sell oil on an F.O.B. basis. This will imply a complete reversal of past practices of selling oil on a delivered basis,[6] and abandonment of a very powerful instrument for control of long-term contracts. Under a strict F.O.B. pricing scheme and an independent (more or less perfectly competitive) market for transportation, crude oil will be reaching the refineries at different prices because of the fluctuations in transportation costs. Similarly the landed cost of crudes which have different distances to travel to the same market will be fluctuating with transportation and upsetting the delicate balance between the F.O.B. prices of the various producing centers. There will be no way of equalizing crude prices. For example, my calculations show that the posted prices at Kharg Island, Iran, and Aruba for 34° API crude will result in the same C.I.F. cost (adjusted for refinery values) if transportation is around World-scale 75. (See Table II). At a lower rate the advantages shift in favor of the Persian Gulf crude and vice versa. Such shifts in the comparative advantages upset both the producing countries and the international oil companies. If the spot rates are on the high side then little pressure is exerted on the producers for two reasons. First of all the new agreements provide for automatic escalation in the posted prices of producing countries nearer to the consumption centers, and second the producers whose

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[5] We have also seen recently another supporting evidence. Iran is demanding that the Consortium increases the output from the present rate of 5 million barrels per day to 8 million. Saudi Arabia is also attempting to increase its output. If we continue on the same consumption course, however, I foresee long-run shortages.

[6] Although hard data are not available, it appears that over 95% of all oil is sold by the international oil companies on a delivered basis.

oil is more transportation intensive have an option as to whether they wish to revise upward their C.I.F. price to reflect the higher spot rates. In most cases they choose not to, so that they do not upset the goodwill of their customers and the long-term contracts. Failure to take advantage of an opportunity to raise C.I.F. prices allows the producers, furthermore, to appear magnanimous and socially responsible. When the spot rate is very low, however, the pressure for discounts is really on, and cannot be ignored.

It has not escaped some producing countries that transportation differentials will be putting pressures on the F.O.B. prices. As we have already mentioned the 1971 agreements provide for adjusting the posted prices, upwards with spot rates, in countries such as Venezuela, Libya and Algeria which are closer to the major consuming centers.

The conclusion that we reach, therefore, is that it will be to the advantage of both the producing countries and the international oil companies if they were to control delivered prices so as to equalize in the market place the cost of the oil flowing from different geographic areas. In order to achieve this equalization they must either fully control transportation or absorb freight differentials. Small fluctuations can be condoned. Wild fluctuations cannot, however, because these put pressure on the C.I.F. system which in turn strains the F.O.B. price structure. Of these pressures, of course, those which tend to raise prices are not very damaging because they afford the producers a choice. In fact they allow the producers to appear generous. It is the downward pressure which is most disturbing to the oil companies and the producing countries. They dislike downward pressures on posted prices because every decrease affects their net revenues. The oil companies in addition have some reasons of their own to dislike pressures for reduction in the posted prices. First of all because they "guarantee" the latter to the producing countries as a base for calculating royalties

and income taxes, and second because they are concerned lest their customers abrogate long run commitments or refuse to renew them. For all these reasons it appears unwise for them to relinquish the instrument (i.e., transportation) which enables them to preserve the existing delicate structure.

The history of the railroads in the United States during the second half of the 19th century provides us with a lesson which has some bearing here. It was not so much for the profits of the railroads that people fought to control them but because they wanted the right to control delivered prices and the markets of the transported commodities. There is one major difference between railroads and tankship transportation, however, which needs to be brought out. No matter how hard the oil companies and the producing countries try to control transportation, they will not succeed in completely eliminating the fluctuations in the spot rates, short of paying dearly for such control.[7] At best they can control the amplitude of the fluctuations through efficient planning and execution of plans. Unlike the railroad beds which fix railroad investments geographically (like pipelines) and create natural monopolies, tankers are flexible and many. So the competitive nature of the tanker markets should prevail,[8] but it can be made more efficient.[9]

Note also that the greatest potential control of the fluctuations exists on the high side (upswings) which as we have pointed out is the least damaging as far as the oil companies and the producing countries are concerned. But what is the choice that the producers have, one may ask. If they withdraw

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[7] One way of gaining such control is for each one to have enough capacity to satisfy 100% of his requirements. This solution, however, will increase the cost of transportation for the industry as a whole (25).

[8] These arguments are based on some theoretical factors which favor more-or-less perfectly competitive markets in ocean transportation (23) and an independent fleet (25).

[9] In an overall cost sense. Opportunities for speculative profits and arbitrage will then be reduced.

completely or do not step into the market to acquire ownership control of a substantial part of the necessary transportation capacity, the independents will. This will place the producers at the mercy of the independent tanker owners which is the worst possible solution for them, especially if the producers completely abdicate. So logic tells me that we should see some changes in the ownership of tanker capacity in the future, with greater representation of the oil companies and the producing countries.[10] The latter ought to be particularly concerned since they do not control refining and distribution.[11]

To summarize this part of our discussion, the C.I.F. approach to selling oil does not appear to be under test or disgrace as far as the producers are concerned. The oil companies, therefore, may attempt, in their effort to exercise tighter control over rate fluctuations, to get more heavily involved in ocean transportation, and so should the exporting countries. My only hope is that any such efforts are accompanied by a thorough study of the dynamics of the tanker markets so that they do not add fuel to future transportation crises which their past actions have already set in motion.

II. Financial Requirements for Ocean Transportation

No year passes by without statements from responsible analysts of ocean transportation that the prospects for tankers "are not bright" (6). Even in the face of success, gloominess accentuates at the anticipation of the impending doom which follows so-called "abnormal market behavior". While

[10] In addition to benefiting from greater control of the C.I.F. pricing structure, the oil companies and the producing countries, if they make efficient management decisions, will reap some additional profits from transportation through increased ownership.

[11] This does not necessarily imply that the producing countries should proceed and invest in refining and distribution facilities in the consuming countries.

this diagnosis goes on, the independents plod along becoming wealthy and the oil companies react mostly to crises.

A careful analysis will show that ocean transportation can be a very profitable business, and a growing one. In 1955 the total fleet of ocean-going tankers was less than 40 million deadweight tons (DWT). By December 31, 1972, it grew to over 190 million DWT. The average growth over this period has been 10.2% annually compounded. During the last ten years the growth rate has been approximately 10.7% annually. The size of the largest new buildings grew during this period (1955 to 1972) from 45,000 DWT to 530,000 DWT.

A recent publication of the Chase Manhattan Bank (18) estimates that during the period of 1970 through 1985 there will be a need for 247.2 million DWT of new tankers, and a total fleet of 450,000,000 DWT. This increase represents approximately 137% of the tonnage as of December 31, 1972, and an annual compounded growth rate of slightly over six percent over the period studied.

No matter how impressive, I do not believe that the above forecast is realistic. In the past ten years, for every one percent growth rate in oil consumption we have required 1.4% increase in transportation to satisfy it. It appears to me that during the 1970s the tanker fleet will increase at an average rate of close to 11% per year. This means a fleet of about 450,000,000 DWT by the end of 1980, and close to 600,000,000 DWT for the period studied by Chase.

The main reasons behind my projection are as follows:

1. Scheduled deliveries of vessels in backlog at this time will add over 100,000,000 DWT over the next four years. And even if there is a spill-over or stretching this is not expected to be greater than six months. Furthermore, deliveries of vessels not in backlog now are to be expected during these years.

2. The United States which was importing only 600,000 barrels per day from the Middle East in 1970, is expected to increase this dependence by tenfold by 1980. The Middle East oil is very intensive in transportation.
3. The rate of growth of petroleum consumption in the free world is estimated at 8% annually over this period, and that of the United States at about 5%.
4. The Alaskan North Slope according to the experts will not contribute more than 2 million barrels per day. This will most probably flow to the West U.S. Coast, and this not before 1975-1976.
5. Canada will only be able to provide about 2 million b/d and South America about 4 million barrels per day.
6. The North Sea finds will not become important before the late 1970s. And even if the output from these fields reaches the impressive figure of 4 million barrels per day, it will not satisfy the increase in the European demand.

In addition to the newbuildings of 260,000,000 DWT by the end of 1980, we have the replacement of 52 million DWT which will be over 20 years old by that time. This total of 312 million DWT will require an investment of about $47 billion at current construction costs. If I am correct in my projections that shipbuilding cost should be coming down, the total investment may not exceed $40 billion, inflation included.

The amount of $40-47 billion over the next eight year period is rather insignificant when compared with the present capital expenditures of the oil industry which ran about $24 billion annually in 1972. The problem is that:

(a) Ocean transportation never ranked high in terms of the budgetary priorities of the oil industry.[12] Over the period of 1960 to 1970

[12] For some of the reasons behind the behavior of the oil companies see (25).

all expenditures for Marine operations in all facets, were less than ten percent of the total capital budget.

(b) The oil industry cannot generate enough capital internally to support the anticipated investment for expansion of production capacity during the 70s. According to a long-time oil economist John Winger, Vice President of the Chase Manhattan Bank and head of the Energy Economics Division, the oil industry will need $1 trillion for the period of 1970 to 1985 (12, October 1972, p. 364).

Unfortunately, we do not have the back up data to analyze Mr. Winger's capital expenditure projections which indicate a compounded growth rate of 13% annually. But if we were to accept them, one may ask where would all this money come from. His answer is, partly from operations and the rest from borrowing. In his estimation operations are not expected to contribute more than $600 billion, leaving a deficit of $400 billion which "is equal to seven times the demand on capital markets by petroleum companies during the past 15 years". (12, October 1972, p. 364).

I am rather pessimistic that such a deficit can be satisfied through the normal capital market operations. During the past seven years the oil industry has been raising 30% of its needs by borrowing and the rest through the internal cash flow (13, 14). In order to be able to sustain a Debt to Equity ratio of 1/2 which today the financial community considers magical for the oil industry, the internal cash flow of the oil industry must increase at a rate of over 10% compounded annually. This is a task of no mean proportions. Of course one may try the equity route. The international part of the oil industry, however, has been also experiencing difficulties in raising equity capital. The opinion of the financial community is partly reflected in the price earnings (P/E) ratios of the stock of international U.S. oil companies versus those which are

primarily domestic.[13] As of December 1972 the average P/E ratios stood at 11.2 for the international versus 20.5 for the domestic U.S. corporations. So when it comes to priorities I am led to believe that history will repeat itself.

I am of the opinion that a large part of the needed capital for transportation must come from the petroleum exporting countries. The royalties and taxes of the Middle Eastern countries alone are now running at about $25 million per day or over $9 billion a year and increasing. As I have already mentioned it would seem logical for them to be interested in investing in transportation, but would, for obvious reasons, prefer that others put (fix) money in exploration and production.[14]

To conclude then, I feel that the $40 to $47 billion needed for transportation over the next eight year period will be found not because of the initiative of the oil companies but rather because of their apathy and lack of appreciation of the role and contribution of transportation. I am not as optimistic, however, about the ability of the oil companies to raise $1 trillion over the next fifteen years for exploration and production, if indeed this much is needed, especially since $400 billion of the total must be found from outside sources.

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[13] Whether this is due to an overreaction to the political situation in the Middle East is rather immaterial as long as it affects the behavior of capital markets.

[14] Nor would it be to the advantage of the producing countries to fix their investments in refining and distribution facilities in foreign countries. There are many other strategy possibilities which merit priority before the latter is attempted in my estimation.

TABLE I

Cost of Transportation

	Worldscale 297		Worldscale 25	
	Per ton	Per Barrel	Per ton	Per Barrel
(1) Kharg Island/Philadelphia	$28.51	$3.80	$2.40	$0.32
(2) Kharg Island/Rotterdam	27.65	3.70	2.33	0.31
(3) Kharg Island/Yokohama	15.21	2.03	1.43	0.19
(4) Aruba/Philadelphia	5.44	0.73	0.46	0.06
(5) Aruba/Rotterdam	11.46	1.54	0.97	0.13

References: Conrad Boe Ltd. A/S Shipbrokers, Estimated Tanker Market Rates Single Voyages 1947-1972, Oslo, Norway, 1972.
John I. Jacobs & Co., Ltd. World Tanker Fleet Review, 30th June 1972, London, England.
Worldwide Tanker Nominal Freight Scale Applying to Tankers Carrying Oil in Bulk (for Flat Rates).

Notes:

(a) Flat Rate:

Kharg Island/Philadelphia	$9.01 + .59 = $9.60
Kharg Island/Rotterdam	8.72 + .59 = 9.31
Kharg Island/Yokohama	5.13 + .59 = 5.72
Aruba/Philadelphia	1.83
Aruba/Rotterdam	3.86

(b) The spot rate of Worldscale 297 was reached most recently in October 1970 and the low of Worldscale 25 in May 1972. Both rates were recorded for the Persian Gulf/U.K. Continent.

(c) We assume that there are 7.5 barrels to a long ton of crude oil of 34 API degrees.

TABLE II

Impact of Distance on C.I.F. Prices

	Dec. 1972 F.O.B. Price/b	Transp. Cost	C.I.F.	Adjust-ments*	Equiv. Cost**
A. Iranian, Light 34° API ex. Kharg Island	$2.467				
Transportation to Phila.					
W-297		$3.80	$6.267		$6.267
W-75		0.96	3.427		3.427
W-25		0.32	2.787		2.787
B. Venezuelan 34° API	$3.3138				
Transportation to Phila.					
W-297		0.73	4.044	(.07)	3.974
W-75		0.18	3.494	(.07)	3.424
W-25		0.06	3.374	(.07)	3.304

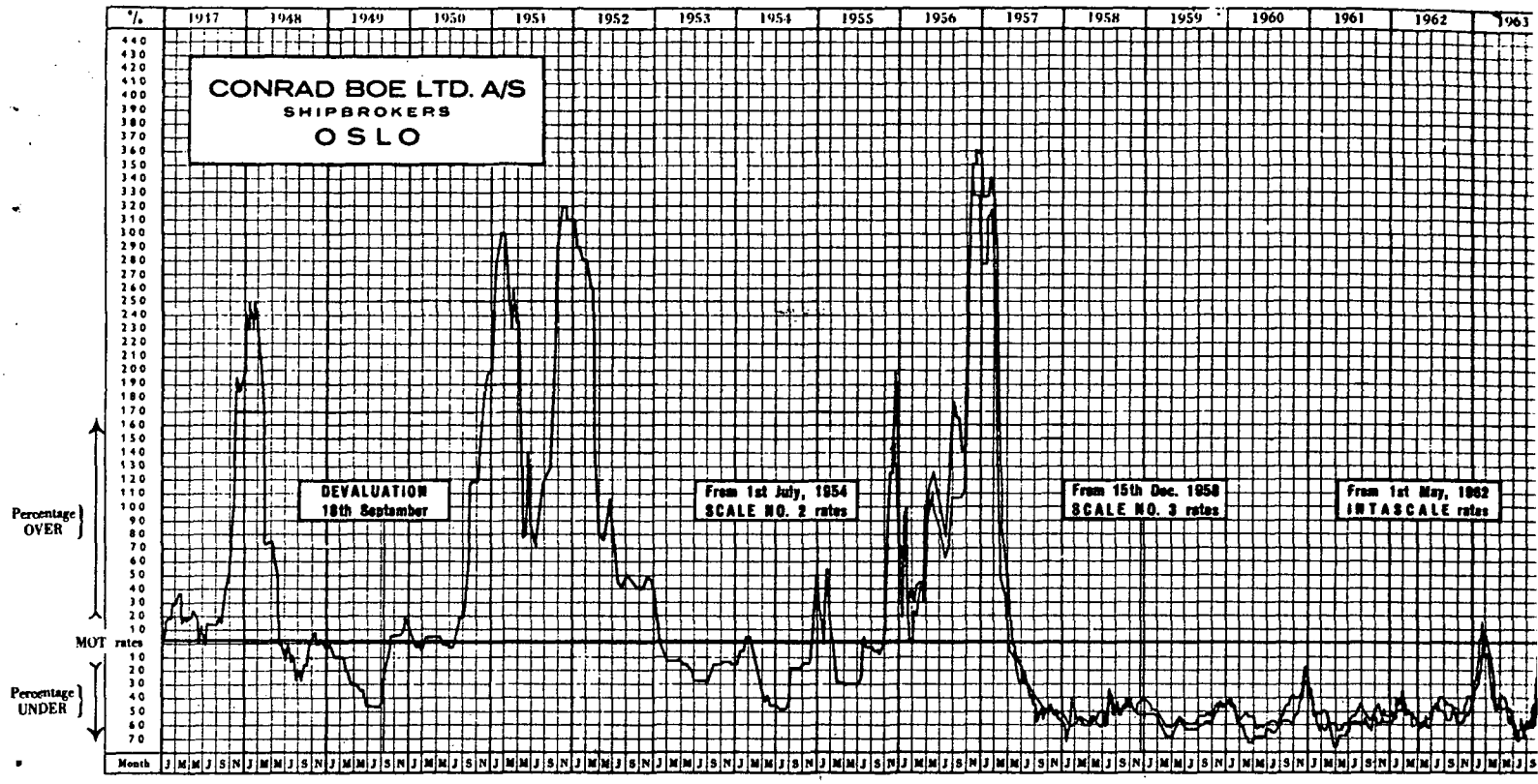
*For quality of crude. If we exclude it, equalization occurs at Worldscale 81.

**Excluding 10¢/b duty.

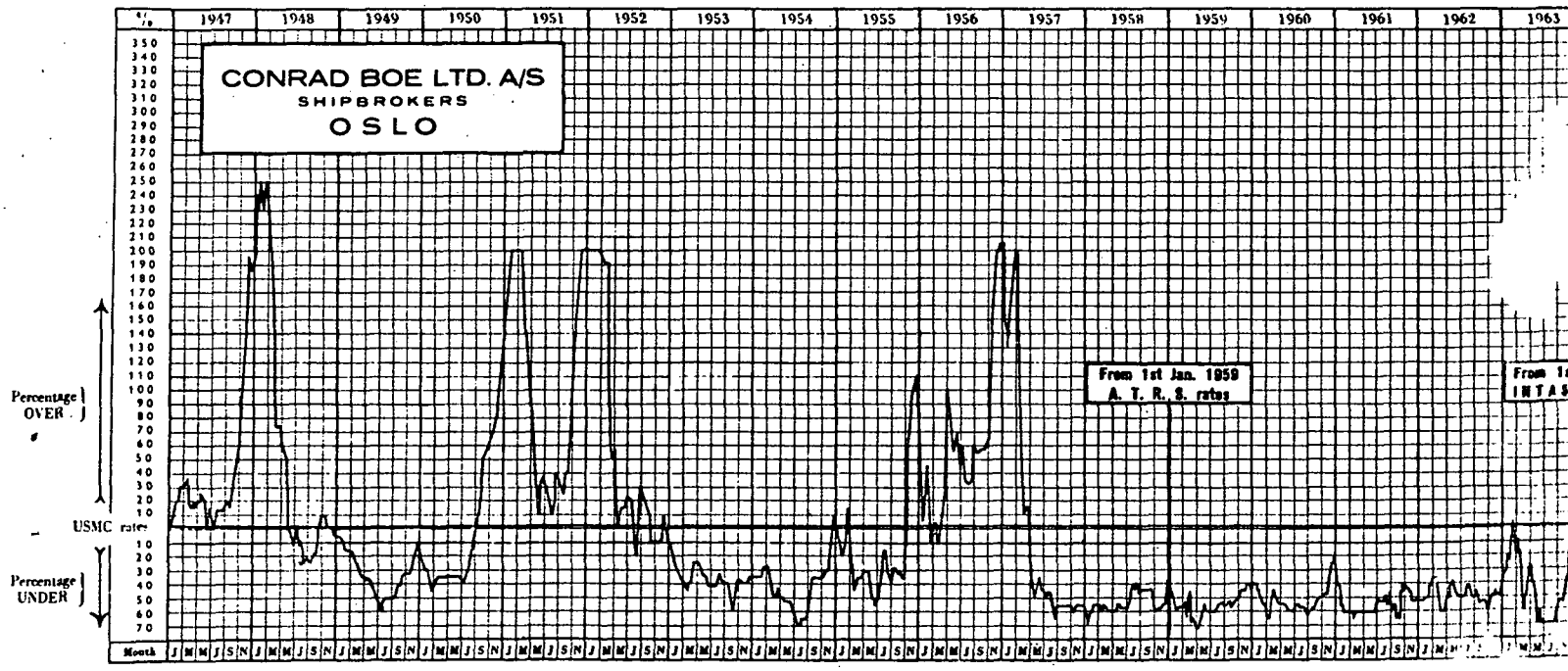
GRAPH I

Estimated Tanker Market Rates
Single Voyages

— PERSIAN GULF
— TRANSATLANTIC



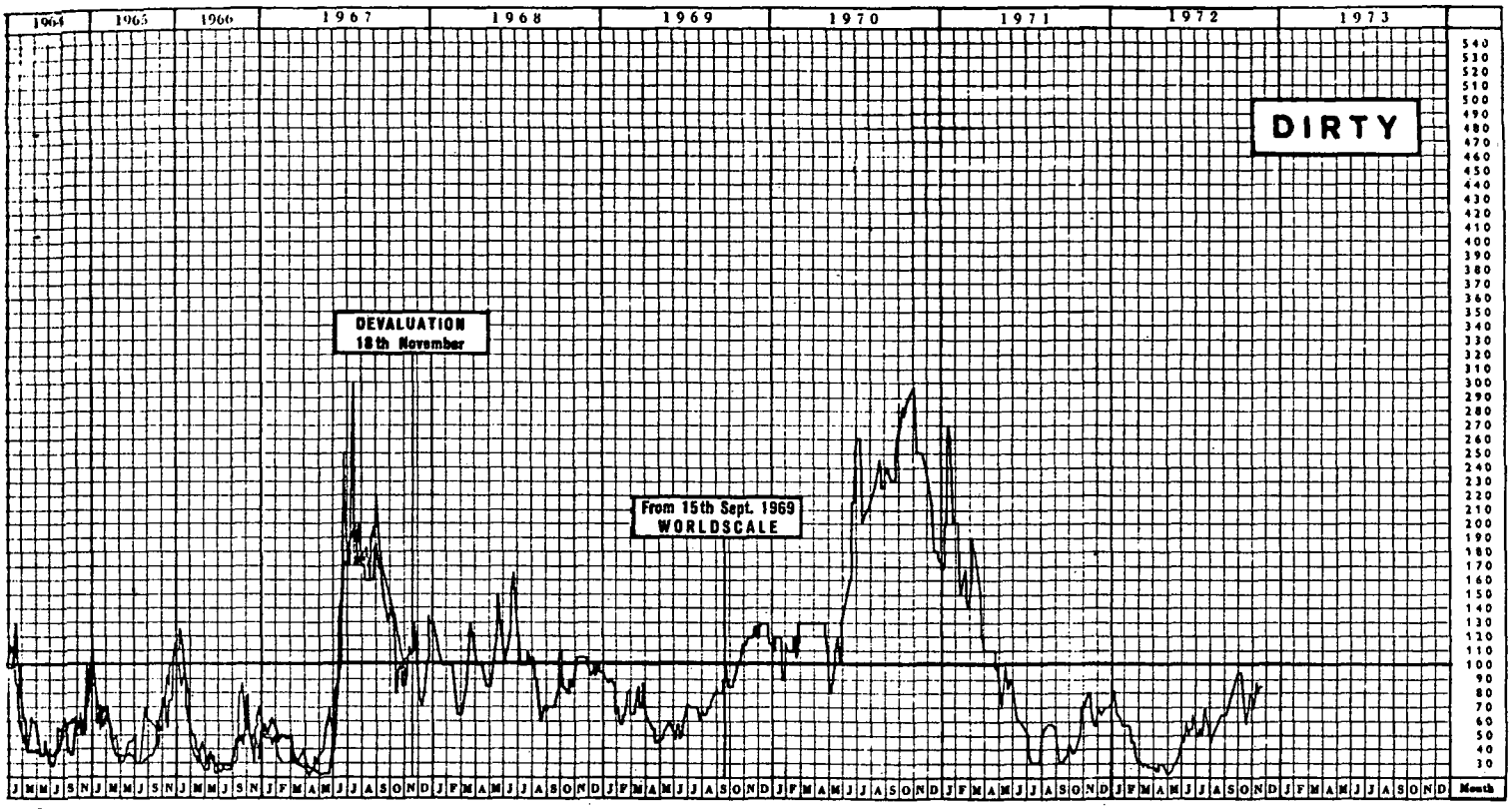
— WESTERN HEMISPHERE



GRAPH II

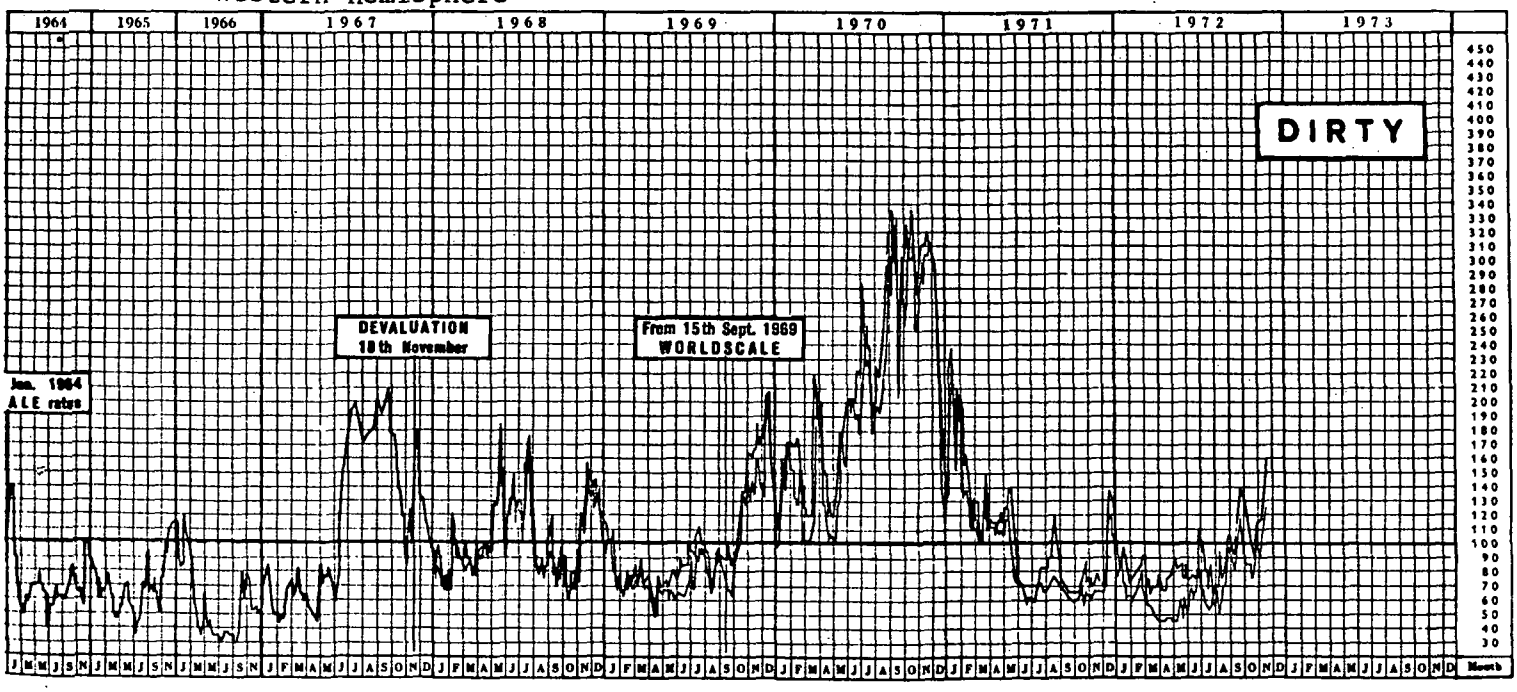
Estimated Tanker Market Rates
Single Voyages

Persian Gulf



HANDY SIZE TONNAGE
TONNAGE ABOVE 30 000 TONS

Western Hemisphere



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