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An Analysis of Refiners' Total Barrel Costs and Revenues from the Sale of Petroleum Products: 1976-1979

November 1980

U.S. Department of Energy
Economic Regulatory Administration
Office of Petroleum Operations

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EXECUTIVE SUMMARY

In this report, the Economic Regulatory Administration has evaluated refiners' costs and revenues from the sale of major petroleum products^{1/} from July 1976 through December 1979. This report represents a continuing effort to assess No. 2 heating oil prices and margins in that it updates prior middle distillate studies through March 1980. The analysis examines selling prices and costs associated with each major petroleum product category and a combination of petroleum products ("total barrel") from a sample of nine refiners. The "total barrel" approach was adopted to reduce distortions caused by varying methods of allocation of costs among regulated and unregulated products by refiners. The "total barrel" approach addresses refiners' concerns that it is inappropriate to evaluate one petroleum product's costs and revenues separately from those of other products produced from crude oil.

This report determines the extent to which increased costs were recovered on controlled products and whether refiners obtained greater cost recoupment on decontrolled products than would have been allowed under continued controls (see Chapter III).

The principal methods of measurement used to evaluate product pricing levels for the nine refiners surveyed were cost

^{1/} For purposes of this study, major petroleum products include gasoline, middle distillates, residual fuel oils, aviation fuels, petrochemical feedstocks, and liquefied petroleum gases that are produced in refiners. Combined, these product make up the "total barrel."

recoupment (Chapter III), gross margins (Chapter IV), and net margins (Chapter V). Gross margins were derived by subtracting average crude oil costs from average product selling prices for individual product categories and the "total barrel." Net margins were derived by subtracting average crude oil costs as well as average marketing, manufacturing, and purchased product costs from average selling prices for individual product categories and the "total barrel."

The principal findings of this report are as follows:

1. Petroleum product price increases conformed generally to increases in the Consumer Price Index (CPI) between 1976 and 1978. However, during 1979, the rate of price increases for petroleum products rose faster than the CPI. The upward price trend abated somewhat during the first part of 1980.
2. Without considering the total banks of nearly ^{1/}\$1.4 billion at the end of June 1976, the nine refiners recovered \$642 million more on all products than would have been permitted under

^{1/} "Banks" are defined as accumulated unrecouped costs which are permitted to be carried over for passthrough in subsequent months. Regulations restrict the circumstances, i.e., timing and percentage limitations, under which these "banked" costs may be passed through.

continued price controls. If banks that were available at the end of June 1976 are included in determining refiners' ability to recoup costs, the refiners under-recovered by \$740 million.

3. For No. 2 distillate during the most recent heating season, November 1979 through March 1980, the nine refiners recovered \$657 million more in costs than would have been permitted under continued regulation. When applied to the total volume of distillate sold during that period, the \$657 million would amount to approximately 6 cents per gallon. For the entire period July 1976-March 1980, the nine firms had net revenues ^{1/} of \$1.45 billion, or 1.6 cents per gallon when spread over all sales of distillate for the entire 45 months since the decontrol of distillate in July 1976.

4. For jet fuel sales, during the period August 1979 (when banked costs for jet fuels were depleted) through December 1979, the nine refiners recovered \$267.7 million more in costs than would have been permitted under continued regulations. This translates to 9-cents per gallon on the sales

^{1/} "Net revenues" are defined as the amount of revenues received by refiners in excess of the amount of increased costs that are allowed to be passed through under the regulations.

volume for that time period. When spread over the 10-month period of jet fuel decontrol, March 1979 through December 1979, the net revenues would amount to about 4.7 cents per gallon.

5. In general, increases in "total barrel" gross margins for the nine refiners surveyed remained relatively constant from July 1976 through February 1979. However, beginning in March 1979, a substantial expansion of total barrel gross margins began which continued through December 1979. The products which contributed most significantly to the expansion of total barrel gross margins were motor gasoline, No. 2 distillate, and jet fuels. Gross margin increases for motor gasoline (calculated as a percentage of wholesale prices) remained relatively constant, while those of No. 2 distillate and jet fuel were increasing when compared to their wholesale prices (see Chapter IV).
6. Refiners' ability to recoup costs varied widely among the product categories. For the June 1976-December 1979 period, increases in the nine refiners' net margins for all products over May 1973 levels, amounted to \$642 million. Increases in net margins of \$4.4 billion for motor gasoline (81% of the total increased net revenues), \$595 million for distillate, (11% of the total increased net revenues), \$441 million

for jet fuel (8% of the total increased net revenues) were partially offset by decreases in net margins of \$3.2 billion for residual fuel and \$1.6 billion for "other products" (see Chapter V).

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CHAPTER I

IntroductionBackground

The Department of Energy (DOE) and the Federal Energy Administration (FEA) have been analyzing No. 2 distillate costs and revenues since distillates were deregulated on July 1, 1976. In late 1978, the Office of Fuels Regulation (now the Office of Petroleum Operations) of the Economic Regulatory Administration undertook a detailed study to calculate the costs and revenues of nine leading heating oil refiners for the period since deregulation. The results of that study were contained in a report published in March 1979, Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976 - December 1978. The study has been updated twice; the most recent report covered the period July 1976 through October 1979.

In addition to the refiner-level update, the February report contained an analysis of refiners', resellers', and retailers' gross margins. A comparison of distillate prices to gasoline prices was also included.

This study has evolved as a result of testimony from a number of refiners at hearings on one earlier study that it is inappropriate

1/ Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976 - June 1979, September 1979. Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976 - October 1979, February 1980.

to evaluate their No. 2 distillate costs and revenues separately from those of other crude oil products. Therefore, in addition to updating the No. 2 distillate costs and revenues study to include the most recent heating season which ended in March 1980, the costs and revenues of all major petroleum product categories are considered. The objective of this "total barrel" approach is to reduce distortions caused by the arbitrary allocation of costs among regulated and unregulated products in order to evaluate the reasonableness of refiners' overall selling prices and their resultant margins. Cost data and allocation information were obtained from the same nine refiners surveyed in the previous No. 2 distillate studies. In this way, individual net margins of the various major product lines could be compared and evaluated.

To the extent that available data permits all products refined from crude oil were analyzed in order to determine whether refiners are recovering increased costs on a greater than dollar-for-dollar basis on the entire slate of products and to estimate the proportion of costs refiners are allocating to various products.

This study was designed to determine the extent to which each product contributes to overall profitability, whether selling price and margin changes are consistent with historic trends, and whether deregulated products have become more profitable than

regulated products. The total barrel approach will enable the Office of Petroleum Operations to assess the pricing behavior of refiners on an aggregated basis as well as on an individual basis.

In order to examine both individual and total barrel product prices, three separate analytical approaches were used: (1) cost/revenue (Chapter III), (2) gross margin (Chapter IV), and (3) net margin/profitability (Chapter V). While the study is limited to the nine refiners surveyed in the previous No. 2 distillate reports, a total barrel gross margin comparison is made among the nine refiners' average and the average for all refiners.

The nine refiners included in the survey are Atlantic Richfield (ARCO), Amerada Hess, Exxon, Gulf, Marathon, Phillips, Texaco, Standard of Indiana (Amoco), and Sun. The major product categories included in the analysis, are motor gasoline, No. 2 distillate, residual fuel oil, and jet fuel. Sales of these four products by the nine refiners ranged roughly between 39 and 49 percent of the product supplied by the industry (Table I-1). Although these sales appear to represent a significant market share of product supplied by the petroleum industry, the results of this study with respect to a particular petroleum product may not be representative of the refining industry as a whole.

The data elements involved in the analysis are refiner selling prices, crude oil acquisition costs, non-product (manufacturing

Table I-1. Market Share of Product Supplied by Nine Refiners

	Sales <u>1/</u> by Nine Refiners (MB/D)	Product <u>2/</u> Supplied by Industry (MB/D)	Nine Refiners Market Share (%)
<u>Gasoline</u>			
1977	3,338	7,177	46.5
1978	3,539	7,412	47.8
1979	3,422	7,030	48.7
<u>Distillate</u>			
1977	1,551	3,352	46.1
1978	1,585	3,432	46.3
1979	1,508	3,308	45.6
<u>Jet Fuel</u>			
1977	443	1,039	42.6
1978	435	1,057	41.2
1979	447	1,073	41.7
<u>Residual Fuel</u>			
1977	1,245	3,071	40.5
1978	1,220	3,023	40.4
1979	1,102	2,822	39.1

Sources: 1/ EIA form P-302.

2/ EIA, Monthly Energy Review.

and marketing) costs, purchased product costs, gross margins, and net margins for the July 1976 to December 1979 period.

CHAPTER II

Crude Oil and Petroleum Product Price TrendsIntroduction

Price increases for petroleum products have had a considerable impact on consumers between mid-1976, when the first petroleum products were deregulated, and the end of 1979. According to the Consumer Price Index, increased prices for petroleum products contributed about .5 percent of the 4.8 percent rate of inflation during 1976, .5 percent of the 6.8 percent rate during 1977, .7 percent of the 9.0 percent rate during 1978, and 3.2 percent of the 13.3 percent inflation rate during 1979.

The single largest cost component in these price increases has been the cost of crude oil to refiners as shown in Table II-1.

Table II-1. Refiners' Average Acquisition Costs of Crude Oil, and Wholesale Price Trends for Petroleum Products

(Cents per Gallon, Excluding Taxes)

	<u>Jan.</u> <u>1976</u>	<u>Jan.</u> <u>1977</u>	<u>Jan.</u> <u>1978</u>	<u>Jan.</u> <u>1979</u>	<u>Jan.</u> <u>1980</u>
Crude oil	25.6	27.7	28.9	31.2	59.1
Gasoline - regular	33.4	35.8	37.8	44.6	83.1
Heating oil	31.2	34.8	37.0	40.9	75.9
Diesel fuel	31.7	34.3	36.6	39.7	76.0
Residual fuel oil	25.1	29.6	26.9	30.4	58.3
Jet fuel - kerosene	31.3	33.2	38.5	40.1	77.2
Propane	21.2	22.9	27.0	22.4	42.0

Source: Tables II-2, II-5, II-7, II-9, II-10, and II-11.

The composite price of crude oil and the wholesale prices of refined petroleum products remained reasonably steady between January 1976 and January 1979 (Table II-1). During 1979, significant product price increases occurred when the acquisition cost of crude oil to refiners increased about 90 percent.

Crude Oil

In the three years between January 1976 and January 1979, the composite price of crude oil to refiners, which averages the price of domestic crude oil and imported crude oil (Table II-2), increased only 5.6 cents per gallon. Between January 1979 and January 1980, the price of domestic crude oil increased 20.9 cents per gallon and foreign crude oil imports increased 36.3 cents per gallon. The composite price of both increased 27.9 cents per gallon. This reflects an average price increase of 90 percent during 1979, whereas the previous three years' average cost of crude oil had increased only 20 percent (about the same as the rate of inflation during that period). The price of domestic crude oil increased substantially during 1979, but is still 26.1 cents per gallon (about 35 percent) below the price of imported crude oil.

Motor Gasoline

Motor gasoline is the only major petroleum product that remains under price and allocation controls. Yet, gasoline volumes amount to a significant portion of petroleum products sold in the U.S.;

Table II-2. Refiner Acquisition Cost of Crude Oil
(Cents per Gallon)

	<u>Domestic</u>	<u>Imported</u>	<u>Composite</u>
Jan 1976	21.8	31.6	25.6
Feb	20.6	31.6	25.1
Mar	20.2	32.2	24.9
Apr	20.6	31.9	25.3
May	20.5	31.9	25.4
Jun	20.5	32.1	25.9
Jul	20.8	32.2	26.1
Aug	20.6	32.3	25.7
Sep	21.3	32.1	26.4
Oct	21.7	32.1	26.7
Nov	22.0	32.3	26.8
Dec	22.0	32.6	27.0
Jan 1977	22.0	33.6	27.7
Feb	22.0	34.5	28.1
Mar	22.2	34.6	28.3
Apr	21.9	34.2	28.0
May	21.9	34.8	28.3
Jun	22.2	34.8	28.5
Jul	22.2	34.4	28.3
Aug	22.7	35.0	28.6
Sep	23.2	34.5	28.6
Oct	23.7	37.7	28.9
Nov	24.2	34.8	29.0
Dec	24.2	35.1	29.2
Jan 1978	24.1	34.6	28.9
Feb	24.4	34.3	29.0
Mar	24.9	34.7	29.1
Apr	25.1	34.3	29.0
May	25.2	34.5	29.4
Jun	25.5	34.6	29.7
Jul	25.2	34.5	29.6
Aug	25.4	34.4	29.7
Sep	25.4	34.6	29.9
Oct	25.7	34.8	30.0
Nov	25.9	35.1	30.4
Dec	26.2	35.6	30.8
Jan 1979	26.2	36.9	31.2
Feb	27.0	37.8	32.0
Mar	27.3	39.1	32.6
Apr	28.7	41.9	34.6
May	29.5	45.2	36.7
Jun	31.5	50.1	40.5
Jul	37.8	55.0	44.2
Aug	34.5	57.1	47.0
Sep	38.2	59.7	48.0
Oct	40.3	59.6	49.2
Nov	42.0	64.3	52.5
Dec	44.9	68.8	56.3
Jan 1980	47.1	73.2	59.1

Source: EIA, Monthly Energy Review.

almost half of the crude oil processed in domestic refineries becomes gasoline (see Table II-3). Since 1975, the refinery yield of motor gasoline has declined slightly, while the yield of residual fuel oil has increased, possibly reflecting an industry-wide use of heavier grades of crude oil run in domestic refineries.

Prior to 1979, gasoline prices tended to be seasonal (Table II-4). Prices tended to increase slightly during the summer driving season and then leveled off or declined slightly during the winter, when vacation and recreational travel diminishes. During 1978, gasoline demand was 18 percent higher in June than in January (the highest and lowest demand months)^{1/}. However, during 1979, demand was 5 percent below the 1978 level. This is partly explained by the reduced amount of gasoline supplies available in the spring of 1979 following the curtailment of crude oil exports from Iran, and substantial price increases at both the wholesale and retail levels of distribution. While retail gasoline prices only increased 10.7 cents per gallon between January 1976 and January 1979, these same prices rose by 41.8 cents per gallon through January 1980.

Of this 41.8 cents per gallon increase, 25.5 cents was caused by the increased cost of crude oil and 6.3 cents can be attributed

^{1/} EIA, Monthly Energy Review, August 1980, p. 30.

Table II-3. Percent Refinery Yields of Major Petroleum Products from Crude Oil Runs and Net Reruns of Unfinished Oils in the U.S.

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979*</u>
Gasoline**	46.2	45.6	45.9	46.5	45.5	43.4	44.1	42.5
Jet Fuel	7.2	6.8	6.8	7.0	6.8	6.6	6.6	7.0
Distillate	22.2	22.5	21.8	21.3	21.8	22.4	21.4	21.7
Residual	6.8	7.7	8.7	9.9	10.3	12.0	11.3	11.7
Liquefied Gases	2.8	2.8	2.6	2.4	2.4	2.3	2.3	N.A.

* Projected annual percent yield based on preliminary monthly data.

** Based on total gasoline output minus the input of natural gas liquids and other hydrocarbons.

N.A. = Not available.

Source: DOE form 320.

Table II-4. Industry-Wide Dealer Tankwagon and Retail Gasoline Prices, Leaded and Unleaded (Cents per gallon)

	<u>1/</u>		<u>2/</u>	
	Dealer Tankwagon Leaded (excluding tax)	Unleaded	Retail Leaded (including tax)	Unleaded
Jan 1976	37.5	38.9	57.7	61.2
Feb	36.6	38.1	57.1	60.6
Mar	36.2	37.5	56.6	60.1
Apr	36.3	37.6	56.6	60.4
May	37.6	38.8	57.4	61.1
Jun	39.2	40.3	59.0	62.9
Jul	39.8	41.1	59.6	63.2
Aug	40.2	41.6	60.1	63.9
Sep	40.2	41.6	60.2	64.0
Oct	40.1	41.5	60.2	64.0
Nov	39.7	41.2	60.0	63.9
Dec	39.4	40.9	59.9	63.9
Jan 1977	39.6	41.1	59.9	64.0
Feb	40.3	42.4	60.7	65.0
Mar	40.9	43.1	61.3	65.4
Apr	41.6	43.8	62.2	66.1
May	42.4	44.6	62.9	66.7
Jun	42.7	45.0	63.4	67.2
Jul	42.5	44.9	63.4	67.3
Aug	42.5	44.9	63.4	67.0
Sep	42.1	44.9	63.3	67.0
Oct	41.9	44.7	63.2	67.0
Nov	41.8	44.7	63.1	67.0
Dec	41.8	44.6	63.3	67.2
Jan 1978	41.5	44.4	61.7	65.8
Feb	41.4	44.3	61.6	65.7
Mar	41.6	44.5	61.7	65.8
Apr	42.0	43.8	61.9	66.1
May	42.7	45.8	62.5	66.9
Jun	43.5	46.8	63.4	67.8
Jul	44.4	47.6	64.6	68.8
Aug	45.0	48.2	65.4	69.8
Sep	45.3	48.6	65.8	70.2
Oct	45.0	48.3	65.9	70.2
Nov	45.8	49.1	66.7	71.1
Dec	46.2	49.5	67.4	71.7
Jan 1979	47.0	50.4	68.4	72.9
Feb	48.0	51.6	69.9	74.5
Mar	50.1	53.6	72.6	77.4
Apr	53.1	56.6	76.8	81.6
May	56.4	59.9	81.2	85.8
Jun	60.1	63.9	86.3	90.9
Jul	64.4	67.9	91.3	95.6
Aug	67.9	72.1	95.6	100.1
Sep	70.4	74.9	98.2	103.2
Oct	71.9	76.1	99.5	104.3
Nov	73.1	77.1	100.7	105.4
Dec	76.2	79.9	103.5	108.2
Jan 1980	82.6	86.4	110.2	114.6

Source: 1/ EIA, Monthly Petroleum Product Price Report.

2/ EIA, Monthly Energy Review.

to increased margins at the retail level (which may have included some increases in state and local gasoline and sales taxes). The remaining 10 cent increase comes from price increases at distribution levels between the refinery and a retail gasoline station. This would include increases at the refinery, pipeline, bulk terminal, bulk plant, or jobber levels of distribution, and could reflect increased manufacturing or distribution costs or the expansion of net margins.

Heating Oil

Middle distillates, which comprise about 22 percent of refining output and include heating oil, diesel fuel and kerosene, were decontrolled on July 1, 1976. From the first part of 1976 through December 1978, residential heating oil prices increased an average of 12.4 cents per gallon (Table II-5). This is an increase of 30 percent, or slightly more than the rate of inflation during this period. However, during 1979, the price of heating oil to homeowners increased an average 33.2 cents per gallon; an increase of 63 percent in one year.

The wholesale heating oil price to retailers increased by 33.0 cents per gallon during 1979, the same amount as the residential price. Thus, margins did not increase significantly at the retail level during this period. All but 7.7 cents of the 1979 increase can be attributed to the increase in the price of crude oil to refiners (Table II-2).

Table II-5. Industry-wide No. 2-D Diesel Fuel and No. 2 Heating Oil Wholesale and Retail Prices
(Cents per Gallon, Excluding Tax)

	<u>1/</u> Wholesale		Retail	
	Diesel Fuel	Heating Oil	<u>1/</u> Diesel Fuel	<u>2/</u> Heating Oil
Jan 1976	31.7	31.2	34.8	40.2
Feb	31.7	31.2	34.2	40.2
Mar	31.2	30.5	34.0	39.4
Apr	31.7	30.0	34.4	39.0
May	31.3	30.2	33.8	39.0
Jun	31.7	30.5	34.4	39.3
Jul	31.7	30.8	34.7	39.3
Aug	32.0	31.0	35.0	39.8
Sep	32.1	31.1	35.6	40.2
Oct	32.3	31.8	35.6	40.7
Nov	32.8	32.6	35.5	41.9
Dec	33.5	33.7	35.9	43.0
Jan 1977	34.3	34.8	36.6	44.4
Feb	35.3	35.8	38.2	45.3
Mar	35.9	36.1	39.0	45.8
Apr	36.1	35.9	39.6	45.9
May	36.5	35.8	39.6	45.7
Jun	36.3	35.7	39.6	45.7
Jul	36.2	35.7	39.6	45.8
Aug	36.2	35.6	39.5	46.0
Sep	36.2	35.6	40.2	46.7
Oct	36.5	35.9	40.3	46.7
Nov	36.7	36.4	40.1	47.6
Dec	36.6	36.7	39.9	47.9
Jan 1978	36.6	37.0	39.5	48.5
Feb	36.6	36.5	39.8	48.6
Mar	36.7	36.4	39.7	48.6
Apr	36.5	36.2	39.6	48.6
May	36.6	36.0	39.9	48.3
Jun	36.7	35.8	40.1	48.2
Jul	36.4	35.8	40.0	48.2
Aug	36.6	36.0	40.0	48.2
Sep	37.1	36.9	39.8	49.0
Oct	37.7	38.1	40.9	50.2
Nov	38.6	39.6	41.7	51.5
Dec	39.2	40.2	42.0	52.6
Jan 1979	39.7	40.9	43.0	53.7
Feb	41.8	43.3	46.1	56.3
Mar	44.5	46.0	47.9	58.8
Apr	47.7	49.4	50.6	61.1
May	53.4	55.4	56.1	64.2
Jun	58.7	63.6	65.0	69.1
Jul	62.4	64.3	68.9	73.8
Aug	66.0	67.6	72.1	78.4
Sep	69.0	69.4	72.0	81.0
Oct	69.2	70.1	74.8	82.3
Nov	70.3	70.6	76.1	83.7
Dec	73.0	73.2	80.7	85.8
Jan 1980	76.0	75.9	82.2	90.8

Source: 1/ EIA, Monthly Petroleum Product Price Report.

2/ EIA, Monthly Energy Review.

Diesel Fuel

During 1979, retail No. 2-D diesel fuel prices increased an average of 38.7 cents per gallon, or 92 percent, while the wholesale price increased an average of 33.8 cents per gallon, or about 86 percent (Table II-5). This reflects an average increase in margin at the retail level of 4.9 cents per gallon. In comparison, during the three years between January 1976 and December 1978, the average retail price of diesel fuel increased only 7.2 cents per gallon or about 21 percent. This 21 percent increase in price between January 1976 and December 1978 was the same as the rate of inflation during this period.

Wholesale prices for No. 2 heating oil were compared to No. 2-D diesel fuel prices to determine if heating oil prices have increased more than diesel fuel prices. The two types of prices exhibit a counter-seasonal pattern, with heating oil prices rising in the winter and leveling off during the summer and diesel fuel prices increasing in the summer and leveling off during the winter. Throughout the winter of 1976, the wholesale diesel fuel price averaged about .5 cent per gallon more than the wholesale heating oil price. However, during the winters of 1977 and 1978, the wholesale prices for these two products were about the same. During the colder-than-normal late winter of 1979, wholesale heating oil prices were more than 1 cent per gallon higher than diesel fuel prices. This swing reversed

heating oil and diesel fuel prices again maintaining normal price level.

At the retail level, in December 1976, the average residential price of heating oil was 7.1 cents higher than diesel fuel (excluding all Federal and state road taxes). In December 1979, the difference was slightly less at 5.1 cents per gallon. The minus 2 cent differential occurred even though prices for both diesel fuel and heating oil have doubled since 1976. The 2-cent change may be accounted for by the lower demand for heating oil because of the mild weather during the 1979/1980 heating season along with conservation efforts and fuel switching by consumers.

Gasoline Prices Versus Heating Oil Prices

In order to isolate the effect of seasonality upon the heating oil and gasoline industry, the difference between gasoline wholesale prices (leaded regular) and No. 2 heating oil's wholesale prices is displayed in Figure II-1 with gasoline the higher prices product. The normal range for this difference on the average has been 1 to 6 cents per gallon between 1974 and 1979. Price levels tend to reflect apparent demand for these two product in relation to each other.

These two products reflect a counter-seasonal pattern: gasoline prices rise during the summer driving season and level off in the winter; heating oil prices increase during the winter heating season and level off in the spring and summer.

Figure II-1

The difference in wholesale prices between gasoline and heating oil represents the economic break-even point for converting distillates into gasoline in a refinery catalytic cracking unit. Cracking is the process of breaking down hydrocarbon molecules into simpler and lighter molecules by the application of heat and pressure, and the use of a catalytic agent, thus increasing the gasoline yield from gas oils. (Table II-6 reflects the apparent aim of the U.S. refining industry to enhance its capacity to produce gasoline by adding both catalytic cracking and coking units to its refineries.) If the wholesale price difference is less than about 2 cents per gallon, an economic incentive may exist to take feedstock away from the catalytic cracker and put it into heating oil.^{1/} Conversely, if the difference exceeds 5 cents per gallon, an incentive may exist to take distillate away from heating oil and put it in the catalytic cracker for gasoline, up to the capacity limit of the cracker. In each case, it is assumed that adequate demand exists for the additional product produced.

In the summers of 1975, 1976 and 1978, the price differential exceeded 5 cents per gallon at the wholesale level, suggesting a relatively tight (i.e., high demand) gasoline market and an excess of heating oil (Table II-7). In the winters of 1974/1975, 1976/1977, and 1977/1978, the difference was less than 1 cent

^{1/} Ralph Zaayenga, "Cost Allocation Methods and an Alternate Method to Measure Oil Company Product Pricing Performance," Sun Petroleum Products Company, June 12, 1980.

Table II-6. Catalytic Cracking and Coking Capacity of U.S. Refining Industry at the Beginning of Each Year

	<u>Catalytic Cracking*</u> (MB/D)	<u>Coking</u> (tons/D)
1972	5,831	41,473
1973	5,562	42,723
1974	5,680	43,410
1975	5,611	43,404
1976	5,675	44,217
1977	5,822	49,315
1978	5,854	46,162
1979	5,870	45,160
1980	6,122	48,200

* Charge capacity including fresh and recycled feedstocks in thousands of barrels per stream day.

Source: Oil and Gas Journal Survey.

Table II-7. Average Wholesale Prices for Regular Gasoline and No. 2 Heating Oil
(Cents per Gallon, Excluding Taxes)

	Heating Oil	Regular Gasoline		Heating Oil	Regular Gasoline
Jan 1974	22.1	21.2	Jan 1977	34.8	35.8
Feb	24.1	23.2	Feb	35.8	36.6
Mar	24.6	24.8	Mar	36.1	37.3
Apr	24.6	25.6	Apr	35.9	38.1
May	25.5	27.5	May	35.8	38.7
Jun	26.2	28.6	Jun	35.7	39.1
Jul	26.8	28.8	Jul	35.7	39.1
Aug	26.8	29.0	Aug	35.6	38.8
Sep	27.4	28.4	Sep	35.6	38.4
Oct	27.6	27.0	Oct	35.9	38.3
Nov	27.8	27.2	Nov	36.4	38.2
Dec	27.2	27.4	Dec	36.8	38.2
Jan 1975	27.8	27.8	Jan 1978	37.0	37.8
Feb	27.4	28.1	Feb	36.5	37.5
Mar	27.1	28.6	Mar	36.4	37.6
Apr	28.0	29.7	Apr	36.2	38.1
May	28.7	30.9	May	36.0	39.0
Jun	29.0	32.4	Jun	35.8	39.9
Jul	28.6	34.5	Jul	35.8	40.8
Aug	29.4	35.3	Aug	36.0	41.8
Sep	30.0	35.4	Sep	36.9	42.4
Oct	30.9	34.9	Oct	38.1	42.2
Nov	31.2	34.2	Nov	39.6	43.2
Dec	31.3	33.8	Dec	40.2	43.8
Jan 1976	31.2	33.4	Jan 1979	40.9	44.6
Feb	31.2	32.8	Feb	43.3	46.7
Mar	30.5	32.4	Mar	46.0	49.1
Apr	30.0	32.8	Apr	49.4	53.0
May	30.2	34.3	May	55.4	57.8
Jun	30.5	36.0	Jun	63.6	65.3
Jul	30.8	36.3	Jul	64.3	66.0
Aug	31.0	36.4	Aug	67.6	67.5
Sep	31.1	36.5	Sep	69.4	69.7
Oct	31.8	36.4	Oct	70.1	72.2
Nov	32.6	36.1	Nov	70.6	76.2
Dec	33.7	35.8	Dec	73.2	79.9
			Jan 1980	75.9	83.1
			Feb	77.8	88.5
			Mar	78.8	91.1

Sources: Regular gasoline: July 1975 and forward published in the Monthly Petroleum Product Price Report (MPPPR), EIA. January 1974 through June 1975 published in the Monthly Energy Review, EIA. October 1973 through December 1973 derived from a retail gasoline dealer survey conducted for the Cost of Living Council (CLC) by the Bureau of Labor Statistics. Prior to October 1973, the data source was Platt's Oilgram Price Report.

No. 2 heating oil: July 1975 and forward published in the MPPPR. September 1973 through June 1975 derived from the CLC's CLC-92 survey of heating oil distributors. Prior to September 1973, heating oil prices were derived from a special survey of distributors conducted by CLC.

per gallon, suggesting a tight heating oil market in relation to gasoline. During the winter of 1974/1975, price controls were still on heating oil. The other two winters were both unusually cold, resulting in an increased demand for heating oil supplies.

The differential between gasoline and heating oil wholesale prices increased during 1978, and remained unusually large in early 1979. Gasoline production and demand were continuing at a high level during that period, while the demand for heating oil remained low because of the mild early winter. Later, in February of that year the weather turned colder and the winter lasted longer than normal, and heating oil stocks became depleted. During the spring and summer of 1979, the differential between heating oil and gasoline prices narrowed, indicating a very unusual situation. Foreign crude oil prices were increasing rapidly while primary heating oil stocks were at unusually low levels coming out of the colder-than-normal 1978/1979 winter. The refining industry was also requested to build its inventories to 240 million barrels by the early fall of 1979, so that adequate heating oil would be in storage for the next winter's heating season. By August, wholesale heating oil prices were slightly higher than wholesale gasoline prices. However, with primary heating oil stocks built up to adequate levels and with a mild winter that produced an excess of heating oil upon the marketplace, the differential between wholesale

gasoline and heating oil prices increased to more than 7 cents per gallon by January 1980.

The effects of this can be seen more clearly by reviewing the gross margins for wholesale gasoline and heating oil displayed in Table II-8. These gross margins are calculated by taking the difference between the refiner's acquisition cost of crude oil and the wholesale prices of regular gasoline and of No. 2 heating oil for the entire industry. From 1976 through 1978, the gross margins for heating oil ranged between 4.1 and 9.4 cents per gallon, while gasoline's gross margins ranged between 7.5 and 13.0 cents per gallon.

Since the beginning of 1979, wholesale heating oil's gross margins have been as high 23.1 cents per gallon, while wholesale gasoline's gross margins increased to 24.8 cents per gallon in June 1979 (Table II-8). This was the time of the gasoline lines in some localities and low inventory levels caused by the disruption of normal supply channels of foreign crude oil, precipitated by the revolution in Iran.

Residual Fuel Oil

The average prices of residual fuel oil do not necessarily reflect the true price trends for any particular sulfur grade of this oil because of the large range in prices among grades according to their sulfur contents. However, averages were used for determining both gross and net margins in subsequent chapters; for this reason, selling price averages for residual fuel oils are presented in Table II-9.

Table II-8. Industry-Wide No. 2 Heating Oil and Gasoline Wholesale Prices and Gross Margins
(Cents per Gallon, Excluding Taxes)

	Wholesale Prices		Refiner Crude Oil Acquisition Cost	Margin	
	Heating Oil	Regular Gasoline		Heating Oil	Regular Gasoline
Jan 1976	31.2	33.4	25.6	5.6	7.8
Feb	31.2	32.8	25.1	6.1	7.7
Mar	30.5	32.4	24.9	5.6	7.5
Apr	30.0	32.8	25.3	4.7	7.5
May	30.2	34.3	25.4	4.1	8.9
Jun	30.5	36.0	25.9	4.6	10.1
Jul	30.8	36.3	26.1	4.7	10.2
Aug	31.0	36.4	26.7	4.3	9.7
Sep	31.1	36.5	26.4	4.7	10.1
Oct	31.8	36.4	26.7	5.1	9.7
Nov	32.6	36.1	26.8	5.8	9.3
Dec	33.7	35.8	27.0	6.7	8.8
Jan 1977	34.8	35.8	27.7	7.1	8.1
Feb	35.8	36.6	28.1	7.7	8.5
Mar	36.1	37.3	28.3	7.8	9.0
Apr	35.9	38.1	28.0	7.9	10.1
May	35.8	38.7	28.3	7.5	10.4
Jun	35.7	39.1	28.5	7.2	10.6
Jul	35.7	39.1	28.3	7.4	10.8
Aug	35.6	38.8	28.6	7.0	10.2
Sep	35.6	38.4	28.6	7.0	9.8
Oct	35.9	38.3	28.9	7.0	9.4
Nov	36.4	38.2	29.0	7.4	9.2
Dec	36.8	38.2	29.2	7.6	9.0
Jan 1978	37.0	37.8	28.9	8.1	8.9
Feb	36.5	37.5	29.0	7.5	8.5
Mar	36.4	37.6	29.1	7.3	8.5
Apr	36.2	38.1	29.0	7.2	9.1
May	36.0	39.0	29.4	6.6	9.6
Jun	35.8	39.9	29.7	6.1	10.2
Jul	35.8	40.8	29.6	6.2	11.2
Aug	36.0	41.8	29.7	6.3	12.1
Sep	36.9	42.4	29.9	7.0	12.5
Oct	38.1	42.2	30.0	8.1	12.2
Nov	39.6	43.2	30.4	9.2	12.8
Dec	40.2	43.8	30.8	9.4	13.0
Jan 1979	40.9	44.6	31.2	9.7	13.4
Feb	43.3	46.7	32.0	11.3	14.7
Mar	46.0	49.1	32.6	13.4	16.5
Apr	49.4	53.0	34.6	14.8	21.4
May	55.4	57.8	36.7	18.7	21.1
Jun	63.6	65.3	40.5	23.1	24.8
Jul	64.3	66.0	44.2	20.1	21.8
Aug	67.6	67.5	47.0	20.6	20.5
Sep	64.9	69.7	48.0	21.4	21.7
Oct	71.1	72.2	49.2	21.9	23.0
Nov	70.6	76.2	52.5	18.1	23.7
Dec	73.2	79.9	56.3	16.9	23.6
Jan 1980	75.9	83.1	59.1	16.8	24.0

Source: Tables II-2 and II-7.

Table II-9. Industry-Wide Residual Fuel Oil Wholesale and Retail Prices
(Cents per Gallon)

	<u>Wholesale</u>	<u>Retail</u>
Jan 1976	25.1	27.0
Feb	25.5	27.4
Mar	25.6	27.2
Apr	24.7	27.2
May	24.1	26.1
Jun	24.1	26.3
Jul	24.4	26.3
Aug	24.3	26.7
Sep	24.6	26.9
Oct	25.6	28.1
Nov	26.6	28.4
Dec	28.3	29.6
Jan 1977	29.6	31.7
Feb	30.2	32.6
Mar	30.2	33.0
Apr	28.7	32.4
May	27.7	32.0
Jun	27.9	31.0
Jul	27.7	31.0
Aug	28.7	31.0
Sep	28.6	30.8
Oct	28.8	31.3
Nov	28.0	30.9
Dec	26.9	30.2
Jan 1978	26.9	30.5
Feb	26.8	29.8
Mar	27.0	30.1
Apr	27.5	30.6
May	27.9	30.5
Jun	27.2	29.8
Jul	25.9	29.1
Aug	25.5	29.4
Sep	26.8	29.6
Oct	28.0	31.0
Nov	29.4	31.8
Dec	29.9	32.7
Jan 1979	30.4	33.6
Feb	32.7	35.0
Mar	35.3	38.0
Apr	36.9	39.5
May	37.4	40.9
Jun	42.4	42.8
Jul	45.7	47.4
Aug	45.2	48.4
Sep	47.7	49.8
Oct	49.7	51.4
Nov	52.4	54.4
Dec	56.1	58.2
Jan 1980	58.3	62.5

Source: EIA, Monthly Energy Review.

Selling prices of residual fuel oil increased gradually during the January 1976 through December 1978 period, while exhibiting some seasonal pricing patterns. Prices have normally increased in the winter months and decreased slightly during the following summer months while continuing their overall upward price trend.

However, beginning in January 1979, the selling price for residual fuel oil began to increase rapidly without experiencing a normal seasonal decline in price during the summer months. For example, wholesale and retail residual fuel oil prices increased 25.7 and 24.6 cents per gallon, respectively during 1979. However, the 25 cent per gallon increase during this time period was attributable solely to increased crude oil costs. So generally, it can be said that overall residual fuel oil margins remained constant during the large price increases of 1979.

Jet Fuel

In general, naphtha-based and kerosene-based jet fuels were comparably priced during the January 1976 to December 1978 period. Kerojet fuel is used predominantly by commercial airlines and naphtha jet fuel is used almost exclusively for military aircraft. The demand for total jet fuels remained relatively constant during this period, with annual increases averaging approximately 2.7 percent per year.

Significant price disparities occurred between naphtha-based and kerosene-based fuels during 1979, with kerosene jet fuel normally selling at higher retail prices (Table II-10). In the summer of 1979,

Table II-10. Industry-Wide Retail Naphtha and Kerosene Jet
Fuel Prices
(Cents per Gallon)

	<u>Naphtha</u>	<u>Kerosene</u>
Jan 1976	31.0	31.3
Feb	31.1	31.2
Mar	30.9	30.7
Apr	30.5	30.5
May	30.6	30.2
Jun	31.5	30.3
Jul	31.3	30.8
Aug	31.7	31.1
Sep	32.1	31.4
Oct	32.1	31.9
Nov	32.8	32.4
Dec	32.9	32.2
Jan 1977	33.4	33.2
Feb	34.0	34.1
Mar	34.5	34.6
Apr	34.3	34.9
May	34.3	35.1
Jun	35.1	35.7
Jul	35.6	35.8
Aug	35.5	36.0
Sep	35.6	37.0
Oct	35.7	37.3
Nov	35.8	37.5
Dec	36.2	37.8
Jan 1978	36.9	38.5
Feb	36.5	38.2
Mar	36.9	38.4
Apr	36.8	38.5
May	37.3	38.6
Jun	37.2	38.9
Jul	37.6	38.9
Aug	37.5	39.3
Sep	37.8	39.3
Oct	38.5	39.3
Nov	38.5	39.4
Dec	38.4	39.5
Jan 1979	38.6	40.1
Feb	39.1	40.2
Mar	40.7	41.3
Apr	43.2	45.4
May	44.1	48.4
Jun	49.5	50.9
Jul	50.4	58.2
Aug	55.0	60.8
Sep	60.2	65.9
Oct	64.6	68.4
Nov	66.4	69.7
Dec	73.3	72.3
Jan 1980	76.0	77.2

Source: EIA, Monthly Energy Review.

the kerojet price exceeded the naphtha price by as much as 8 cents per gallon; however, the normal price disparity for previous years was generally in the 1-2 cents per gallon range. The naphtha price for the month of December 1979 was slightly higher than kerojet's average price.

Prices for both jet fuels increased at about the same rate as motor gasoline and No. 2 distillate between July 1976 and the end of 1978 (20 to 30 percent), which was slightly more than the rate of inflation. During 1979, while crude costs rose by 25 cents per gallon, naphtha jet fuel and kerosene jet fuel costs increased by 34.9 and 32.8 cents per gallon, respectively. Comparable data from the nine large refiners will be examined more closely in Chapters IV and V to determine the extent to which the price increases above the price of crude oil were cost-justified.

Propane

The major uses for propane are agricultural crop drying, rural space heating, and some use in internal combustion engines. The cost of delivering propane is higher than for other petroleum products due to both the high cost of the specialized containers required to carry liquefied gases and to the relatively small-quantity deliveries in rural areas. These high delivery costs explain the large differences between wholesale prices and retail prices, which normally range from 16-20 cents per gallon (Table II-11).

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Table II-11. Industry-Wide Wholesale and Retail Propane Prices
(Cents per Gallon)

	<u>Wholesale</u> ^{1/}	<u>Retail</u> ^{2/}
Jan 1976	21.2	37.7
Feb	21.0	38.1
Mar	20.1	38.4
Apr	19.4	39.6
May	19.0	39.7
Jun	19.5	41.3
Jul	19.9	40.4
Aug	20.2	39.8
Sep	20.6	38.6
Oct	20.9	36.6
Nov	21.4	37.1
Dec	22.1	37.1
Jan 1977	22.9	38.3
Feb	24.0	40.7
Mar	23.7	41.6
Apr	23.6	43.7
May	24.5	45.5
Jun	24.5	46.8
Jul	24.9	45.2
Aug	25.5	44.7
Sep	25.9	43.8
Oct	26.8	42.2
Nov	26.5	43.1
Dec	26.7	44.0
Jan 1978	27.0	43.7
Feb	26.5	44.9
Mar	25.6	45.2
Apr	24.4	47.4
May	23.7	46.7
Jun	23.3	47.4
Jul	23.0	46.6
Aug	22.7	44.0
Sep	22.6	41.4
Oct	22.5	39.6
Nov	22.1	40.8
Dec	22.1	40.4
Jan 1979	22.4	40.0
Feb	21.8	39.6
Mar	21.2	40.2
Apr	22.0	42.3
May	24.2	44.3
Jun	27.9	46.0
Jul	29.3	48.2
Aug	30.8	49.4
Sep	33.3	51.3
Oct	35.2	50.3
Nov	37.6	50.7
Dec	40.4	56.6
Jan 1980	42.0	58.8

Source: ^{1/} EIA, Monthly Energy Review.^{2/} EIA, Monthly Petroleum Product Price Report.

During 1979, the average retail price of propane increased by 16.6 cents per gallon, while its average wholesale price increased slightly more, by 18.0 cents per gallon. By the end of 1979, the retail price of propane was about the same as the composite price of crude oil.

While propane has remained under the Department of Energy's price and allocation regulations, its price has risen more slowly than those of motor gasoline and the other major petroleum products remaining under controls. In part, this may be because propane is primarily derived from natural gas (70 percent) which is also governed by price regulations, and due to an increasing availability of natural gas combined with a relatively stable demand for propane.

Product Price Update

As an update to the report, petroleum prices have stabilized since the first quarter of 1980 (Appendix D). Average unleaded gasoline (regular) prices began the year at \$1.11 per gallon and by March averaged \$1.23 per gallon. As of August, this component of the barrel still averaged \$1.243 per gallon or has increased 1.3 cents per gallon within 5 months. The retail gasoline margin (the difference between DTW and retail) has also stabilized at approximately 25 cents per gallon. Heating oil margins remained steady at about 18 cents per gallon between February and July 1980 with retail heating oil prices also stabilizing at just below 98 cents per gallon.

The difference between wholesale gasoline prices and wholesale heating oil prices (Figure 1) has continued to increase to over 13 cents per gallon by June and has been holding steady since March 1980.

CHAPTER III

Refiners' Increased Costs and
Increased Cost RecoupmentIntroduction

This chapter presents the updated data for No. 2 distillate costs and revenues, data regarding other major product categories (gasoline, jet fuel, residual fuel, propane, and "other" products) and the aggregate data of all products. The data are presented as if the price rules currently in effect for gasoline and propane had been maintained for all refined petroleum products over the period of deregulation.

In order to make a general statement concerning price levels under a hypothetically controlled environment, certain assumptions have been made regarding the regulatory scheme.

For example, no attempt has been made to "age" the banks of unrecovered costs, as provided by the Energy Policy and Conservation Act. Neither the 10 percent bank drawdown limitation nor the price maintenance rule for applying 60-day-old banked non-product or purchased product costs at a rate greater than 10 percent per month has been calculated. Also, in calculating cost recoveries, "deemed recoveries" were not calculated when price increases were unequally applied to different classes of purchaser.^{1/} Thus, a greater flexibility for price increases

^{1/} Further details on these regulatory provisions are found in Appendix B.

and cost recoveries is allowed for the nine refiners than the regulations would have provided. However, as pointed out in a previous study,^{1/} these were options available to the refiners to maintain compliance with the regulations. Therefore, it is impossible to determine precisely the amount of costs that a refiner would have been able to pass through, or how different a refiner's marketing strategy might have been if controls had been in effect during the period studied. With these considerations taken into account, the report provides a reasonable estimate of the theoretical impact the price rules would have had if they had been in effect during the period of deregulation.

Data Elements

Tables III-1, 3, 5, 6, 7, and 8 present the nine refiners' data concerning their increased costs and cost recoupments. The ERA allocated increased crude oil and manufacturing costs reported by the refiners by the ratio of production of a given product to total refinery production. The ERA then added to those amounts the increased marketing and purchased product costs attributable to the given product. That total appears in the first column of the above-mentioned tables. The second columns of the tables display the cost recoveries reported by the nine firms from sales of the given product. The third columns present

^{1/} Analysis of Refiners' No. 2 Distillate Costs and Revenues July 1976-June 1979, op. cit., p. 65 and ff.

the differences between the first two columns, which determines the amount by which cost increases exceed price increases. The fourth columns tabulate the cumulative "banks" of unrecovered costs, beginning in June 1976.

No. 2 Distillate

Column 4 of Table III-1 indicates that together, the nine refiners recouped more than \$1.2 billion in excess revenues by the end of March 1980 than would have been permitted under continued regulation. In each of the three previous winters, the nine firms had drawn their banks of unrecovered costs down to below zero, but subsequently increased them to positive amounts during the summer and fall seasons when inventories of distillate are being built. However, during 1979, the banks were only positive in one month, January. Subsequently, cost increases exceeded price increases in only three months of 1979, in contrast to previous years (column 3). The nine refiners began their heavy distillate sales season in November 1979 with a large negative bank; in previous seasons they always had a positive bank going into the winter. In addition, during the succeeding five months, November through March, the nine firms together recovered nearly a billion dollars in net revenues, exceeding the amount of net revenues they accrued during the previous heating season by about 40 percent.^{1/}

^{1/} "Net revenues" here means the amount of revenues received by refiners in excess of the amount of increased costs incurred by refiners during the relevant period that are allowed to be passed through under the regulations. "Net costs" means the amount of cost increases not fully passed through by increasing the selling prices of the product.

Table III-1. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for No. 2 Distillate (Thousands of Dollars)

	Increased ^{1/} Cost Over May 73	Increased Revenues Over May 73	Increased Cost Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				160909
Jul	293957	249299	44658	205567
Aug	294686	256836	37850	243418
Sep	278723	286534	-7810	235607
Oct	348843	318630	30213	265820
Nov	388758	459549	-70791	195029
Dec	411954	628261	-216307	-21278
Jan 1977	582801	684748	-101947	-123225
Feb	561496	606435	-44939	-168164
Mar	534073	482399	51674	-116490
Apr	513398	370096	143302	26812
May	410534	386331	24203	51015
Jun	451280	356491	94788	145804
Jul	404571	334680	69891	215695
Aug	456693	366285	90407	306102
Sep	482690	379369	103321	409423
Oct	454472	460499	-6027	403396
Nov	495492	449049	46443	449839
Dec	492707	643673	-150966	298873
Jan 1978	515476	631170	-115695	183178
Feb	465411	635069	-169659	13519
Mar	428785	600132	-171346	-157827
Apr	436096	388263	47833	-109994
May	414321	415946	-1625	-111619
Jun	469363	377284	92080	-19539
Jul	465825	337028	128797	109258
Aug	400008	418445	61563	170820
Sep	538175	414101	124073	294894
Oct	492479	505213	-12734	282160
Nov	576097	544589	31507	313667
Dec	614932	688730	-73798	239869
Jan 1979	596787	793635	-196848	43021
Feb	558363	792893	-234530	-191509
Mar	524964	768993	-244029	-435538
Apr	625054	635280	-10226	-445764
May	614787	698742	-83955	-529719
Jun	641778	662665	-20887	-550605
Jul	769346	647124	122222	-428383
Aug	840479	792941	47538	-380845
Sep	963758	792371	171388	-209458
Oct	994761	1004410	-9649	-219106
Nov	1077230	1081511	-4282	-223388
Dec	1083634	1294611	-210978	-434366
Jan 1980	1165784	1532418	-366634	-801000
Feb	1110693	1401493	-290798	-1091798
Mar	1068776	1194848	-126072	-1217870

1/ Increased costs are lagged one month to match increased revenues. For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA requests for information.

As the refiners' sales volumes have been about the same as those of previous heating seasons (Table III-2), the excess cost recoveries experienced during the winter of 1979/1980 can be attributed to the higher prices of No. 2 distillate. This is corroborated by data on gross and net margins (see Chapters IV and V).

Motor Gasoline

Table III-3 indicates that if gasoline is allocated only a proportional amount of crude oil cost increases (on the basis of volume of production) the nine refiners would have recovered over \$3.5 billion in net revenues from the manufacture and sale of the product (column 4 for December 1979). Ever since October 1974, however, DOE's predecessor agencies have recognized that gasoline has historically borne a greater share of costs than a volumetric allocation would allow. Therefore, the DOE regulations have permitted refiners to reallocate costs from other products to gasoline. In Table III-4, reallocations were made to gasoline from residual fuel, propane, and other products, since these products had available unrecovered costs. No reallocations were made from No. 2 distillate or jet fuel, since the ending banks of those products were negative, and therefore, they had no costs available to be reallocated. The result of the reallocation (Table III-4) shows that the nine firms' unrecovered cost for gasoline in December 1979 was almost \$1.48 billion. (See page 58 for a further discussion of the reallocations.)

Table III-2. Sales Volumes of No. 2 Distillate
(Millions of Gallons)

	Sales
Jul 1976	1374
Aug	1376
Sep	1526
Oct	1688
Nov	2314
Dec	3004
Jan 1977	3145
Feb	2674
Mar	2186
Apr	1649
May	1677
Jun	1535
Jul	1392
Aug	1558
Sep	1614
Oct	1909
Nov	1807
Dec	2628
Jan 1978	2538
Feb	2585
Mar	2437
Apr	2161
May	1687
Jun	1580
Jul	1410
Aug	1696
Sep	1689
Oct	1939
Nov	2059
Dec	2519
Jan 1979	2860
Feb	2749
Mar	2446
Apr	1661
May	1648
Jun	1526
Jul	1332
Aug	1608
Sep	1488
Oct	1868
Nov	1620
Dec	2302
Jan 1980	2102
Feb	2159
Mar	1525

Source: EIA form P302-M-1.

Table III-3. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for Gasoline (Thousands of Dollars)

	Increased ^{1/} Cost Over May 1973	Increased Revenues Over May 1973	Increased Costs Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				911725
Jul	949774	979637	-29863	881862
Aug	999781	979693	20088	901949
Sep	840106	906358	-66252	835698
Oct	899937	898203	1734	837431
Nov	850278	886678	-36400	801031
Dec	825286	912505	-87219	713812
Jan 1977	922768	829803	92965	806777
Feb	827571	824819	47752	854529
Mar	850443	992204	-141761	712768
Apr	1001973	1001190	783	713552
May	958439	1065122	-106683	606868
Jun	1020789	111938	-91149	515719
Jul	994394	1081609	-87215	428504
Aug	1017577	1140301	-122724	305780
Sep	1044524	1041072	3452	309232
Oct	935286	1043219	-107933	201299
Nov	939512	1015202	-75690	125609
Dec	976234	1042124	-65890	59718
Jan 1978	994181	922905	71276	130994
Feb	974995	889510	85485	216480
Mar	931379	1055068	-123689	92791
Apr	977605	1025665	-48060	44731
May	999533	1170410	-170877	-126146
Jun	1058048	1226465	-168417	-294563
Jul	1148054	1256155	-108101	-402664
Aug	1159493	1382893	-223400	-626064
Sep	1259542	1290436	-30894	-656958
Oct	1184549	1324754	-140205	-797163
Nov	1275379	1317373	-41994	-839156
Dec	1290137	1361437	-71300	-910457
Jan 1979	1363829	1329157	34672	-875785
Feb	1306253	1300105	6148	-869637
Mar	1154534	1548099	-393565	-1263201
Apr	1407887	1584403	-176516	-1439717
May	1412679	1813264	-400585	-1840302
Jun	1631878	1832847	-200969	-2041271
Jul	1892583	2068867	-176284	-2217555
Aug	2066015	2396190	-330175	-2547730
Sep	2086626	2270346	-183720	-2731450
Oct	2127084	2474974	-347890	-3079340
Nov	2165131	2370354	-205223	-3284563
Dec	2249269	2470201	-220932	-3505495

1/ Increased costs are lagged one month to match increased revenues. For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA requests for information.

Table III-4. Ending Gasoline Banks (Excluding Tilt) After Permitting Reallocations to Gasoline from Residual Fuel, Propane, and "Other Products" (Thousands of Dollars)

Jun 1976	1085410
Jul	1170230
Aug	1313305
Sep	1362162
Oct	1549023
Nov	1520274
Dec	1270917
Jan 1977	1365928
Feb	1372501
Mar	1367258
Apr	1655626
May	1661642
Jun	1697534
Jul	1782281
Aug	1814091
Sep	2007172
Oct	2091694
Nov	2235051
Dec	2095591
Jan 1978	2189240
Feb	2326761
Mar	2132470
Apr	2312978
May	2280223
Jun	2306383
Jul	2478581
Aug	2349254
Sep	2538253
Oct	2548322
Nov	2719161
Dec	2713634
Jan 1979	2710590
Feb	2724046
Mar	2138061
Apr	2108256
May	1681228
Jun	1574490
Jul	1606010
Aug	1572445
Sep	1770540
Oct	1617871
Nov	1654304
Dec	1479541

Source: ERA calculation, adding the "unrecovered increased costs, end of month" column from Tables III-3, III-6, III-7, and III-8.

Jet Fuel

Jet fuel costs and revenues maintained a fairly constant pattern until early 1978, when in 8 of 12 months, increased revenues exceeded increased costs (Table III-5). This phenomenon also occurred in 9 months of 1979, and by the end of the year, the nine firms had recovered about \$305 million in net revenues.

Since jet fuel was decontrolled in February 1979, its refiners have consistently recovered more costs than they could have under regulation. The possible factors contributing to jet fuels' price increases are the continuing high level of demand for jet fuel, and the urging by the government to moderate prices on distillate. The latter factor would cause the refiners to seek another distillate product (kerojet fuel) where potential price increases do not have the same visibility, since they may be passed on by the airlines in the form of increased fares.

Propane

Propane costs and revenues have exhibited a cyclical pattern similar to that of No. 2 distillate: unrecovered cost banks are built during the spring and summer and are reduced during the peak agricultural and heating season in the fall and winter (Table III-6). During the three and one-half year period studied, the unrecovered cost bank exhibited the cyclical pattern described above, but grew larger over time. In September 1979, the propane bank reached its highest level, at over \$457 million, partly

Table III-5. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for Jet Fuel
(Thousands of Dollars)

	Increased ^{1/} Cost Over May 1973	Increased Revenues Over May 1973	Increased Costs Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				135427
Jul	111038	101117	9921	145348
Aug	123557	109537	14020	159368
Sep	120182	105751	14431	173799
Oct	104919	94489	10430	184229
Nov	113990	98137	15853	200082
Dec	103283	117273	-13990	186092
Jan 1977	131447	101925	29522	215614
Feb	114190	96369	17821	233435
Mar	115164	128302	-13138	220297
Apr	139834	120351	19483	239780
May	143451	131176	12275	252055
Jun	136822	128146	8676	260732
Jul	121428	129979	-8551	252181
Aug	130553	150303	-19750	232431
Sep	150631	145252	5379	237810
Oct	145015	150149	-5134	232676
Nov	150324	143962	6362	239038
Dec	139410	150253	-10843	228195
Jan 1978	149329	134669	14660	242855
Feb	122824	121667	1157	244012
Mar	133787	152208	-18421	225591
Apr	134230	146594	-12364	213227
May	144780	138193	6587	219814
Jun	145579	146825	-1246	218569
Jul	141806	148028	6222	212347
Aug	129612	163788	-34176	178171
Sep	138411	150465	-12054	166117
Oct	143300	145243	-1943	164174
Nov	142432	150595	-8163	156010
Dec	141500	161409	-19909	136101
Jan 1979	160514	160146	368	136469
Feb	152362	146690	5672	142141
Mar	149108	187430	-38322	103819
Apr	188969	174490	14479	118298
May	184203	197488	-13285	105013
Jun	188823	231478	-42655	62358
Jul	180260	264233	-83973	-21616
Aug	241742	308469	-66727	-88342
Sep	227262	305193	-77931	-166274
Oct	253376	315275	-61899	-228173
Nov	274290	313818	-39528	-267701
Dec	301694	339156	-37462	-305163

^{1/} Increased costs are lagged one month to match increased revenues.
For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA requests for information.

Table III-6. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for Propane (Thousands of Dollars)

	Increased ^{1/} Cost Over May 1973	Increased Revenues Over May 1973	Increased Cost Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				69544
Jul	53539	43025	10514	80058
Aug	53831	46742	7089	87146
Sep	57179	56619	560	87707
Oct	66763	61981	4782	92489
Nov	67446	85477	-18031	74458
Dec	67716	108064	-40348	34110
Jan 1977	115101	110384	4717	38827
Feb	85583	94708	-9125	29702
Mar	86244	82337	3907	33609
Apr	87996	58954	29042	62651
May	69255	58335	10920	73571
Jun	96996	71912	25084	98655
Jul	90551	66847	23704	122359
Aug	89527	88045	1482	123841
Sep	107550	88110	19440	143281
Oct	89948	92333	-2385	140897
Nov	94854	100718	-5864	135032
Dec	94303	139659	-45356	89676
Jan 1978	113481	138955	-25474	64201
Feb	113095	112635	460	64661
Mar	89802	80468	9334	73995
Apr	87612	52048	35564	109559
May	78957	52793	26164	135724
Jun	78556	51146	27410	163134
Jul	80504	49980	30524	193658
Aug	77203	48837	28366	222024
Sep	74442	58725	15717	237741
Oct	76671	67299	9372	247113
Nov	80683	60982	19701	266814
Dec	79761	79211	550	267364
Jan 1979	89480	91493	-2013	265352
Feb	86964	76484	10480	275831
Mar	80111	72115	7996	283828
Apr	82888	61026	21862	305689
May	82816	64488	18328	324018
Jun	114397	79799	34598	358616
Jul	133140	85023	48117	406733
Aug	120149	95774	24375	431108
Sep	138051	111688	26363	457470
Oct	152815	173034	-20219	437252
Nov	154098	175365	-21267	415985
Dec	180544	218672	-38128	377856

^{1/} Increased costs are lagged one month to match increased revenues. For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA request for information.

because propane prices were increasing at a lower rate than were the costs of the raw materials (crude oil and natural gas) from which propane is produced.

Residual Fuel

Residual fuel was the first product to be deregulated; Table III-7 indicates why there has never been a dispute concerning that decision. In only two of the 42 months studied did recoveries exceed increased costs. From the time residual fuel was decontrolled effective June 1, 1976, in 18 months unrecovered cost banks reached \$1 billion. It took only 12 more months for net costs to reach \$2 billion, and only 11 more months to reach \$3 billion. Clearly, it was necessary to reallocate the unrecovered costs for residual fuel to gasoline while both products were controlled, so that refiners would have an opportunity to recover costs volumetrically allocable to residual fuel. Once residual fuel was deregulated, it was necessary to implement a regulation that gave refiners an opportunity to recover the costs they could not otherwise recover on an exempt product. The gasoline "tilt" rule was formulated to accomplish that end. The "tilt" rule will be discussed at the end of this chapter.

Other Products

"Other products" include certain higher-priced products such as No. 1 heating oil and diesel fuel, kerosene, naphtha, petrochemical feedstocks, lubricating oils, benzene, and toluene. They also

Table III-7. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for Residual Fuel (Thousands of Dollars)

	Increased ^{1/} Cost Over May 1973	Increased Revenues Over May 1973	Increased Costs Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				64406
Jul	299489	245651	53838	118244
Aug	281974	241462	40512	158757
Sep	297718	243717	54001	212758
Oct	323129	268625	54504	267262
Nov	353551	352688	862	268125
Dec	405701	437660	-31959	236166
Jan 1977	530481	478176	52305	288471
Feb	488114	468247	19867	308338
Mar	535334	432439	102895	411233
Apr	446512	304908	141604	552836
May	339128	300122	39006	591842
Jun	326816	321739	5076	596919
Jul	382505	340661	41844	638763
Aug	372947	335058	37889	676652
Sep	415458	309188	106270	782922
Oct	436169	320830	115339	898261
Nov	385965	276167	109798	1008059
Dec	365938	362715	3222	1011281
Jan 1978	445374	365870	79504	1090785
Feb	392184	368993	23191	1113977
Mar	445985	399642	46343	1160319
Apr	429609	294282	135327	1295646
May	396949	288820	108129	1403775
Jun	381784	274874	106910	1510685
Jul	373794	259058	114736	1625421
Aug	358993	285342	73651	1699073
Sep	416940	283040	133900	1832973
Oct	400254	297951	102303	1935275
Nov	399644	310807	88837	2024112
Dec	482630	378728	103902	2128014
Jan 1979	511209	435195	76014	2204028
Feb	463878	427188	36690	2240718
Mar	466217	480574	-14357	2226361
Apr	512751	388129	124622	2350984
May	485267	418079	67188	2418172
Jun	514849	422829	92020	2510192
Jul	578966	478082	100884	2611076
Aug	649530	482898	166632	2777708
Sep	615613	491856	123757	2901465
Oct	669218	525498	143720	3045185
Nov	731380	524115	207265	3252450
Dec	710833	679311	31522	3283972

^{1/} Increased costs are lagged one month to match increased revenues. For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA requests for information.

include lower-priced products such as asphalt and petroleum coke. As with residual fuel, these products had large banks of unrecovered costs, reaching their highest level in December 1979 (Table III-8). In 13 of the 42 months studied, cost recoveries exceeded increased costs. Ten of these 13 months were the months of December (three times), January (three times), February (twice), and March (twice). This suggests that of the "other products," heating fuels were the probable cause of the excesses of recoveries over costs in those months, since the rest of the products do not have large seasonal demand patterns.

Total Barrel

Table III-9 combines the last column in each of Tables III-1, 3, 5, 6, 7, and 8, in order to indicate what the combined banks of unrecovered costs for the total product barrel would have been had all products been regulated throughout the 42-month period. With a beginning bank of nearly \$1.4 billion when No. 2 distillate was deregulated at the end of June 1976, the nine firms' total barrel banks fluctuated in essentially the same manner as the No. 2 distillate banks. The banks rose each year until the heating season, were drawn down during the heating season, and then increased again until the next heating season. The exception to that cycle occurred during 1979, when in 10 of the 12 months, banks were lower than in each preceding month, ultimately being drawn down to \$740 million. The factors that contributed to the large bank drawdown in 1979 were the high sales volumes and price increases of gasoline, No. 2 distillate,

Table III-8. Total Increased Costs, Increased Revenues, Unrecovered Costs of Nine Refiners for Other Products
(Thousands of Dollars)

	^{1/} Increased Cost Over May 1973	Increased Revenues Over May 1973	Increased Cost Minus Increased Revenues	Unrecovered Increased Cost End of Month
Jun 1976				39735
Jul	330437	280106	50331	90066
Aug	350150	274763	75387	165453
Sep	347251	286704	60547	226000
Oct	406681	280840	125841	351841
Nov	395454	370634	24820	376661
Dec	361873	451705	-89832	286829
Jan 1977	405963	460939	-54976	231853
Feb	364679	416600	-51921	179933
Mar	380537	350821	29716	209648
Apr	465551	348612	116939	326587
May	437519	374745	62774	389361
Jun	479580	382700	96880	486241
Jul	461696	355282	106414	592656
Aug	523937	408774	115163	707818
Sep	445352	381434	63918	771736
Oct	469081	389580	79501	851238
Nov	482110	366997	115113	966351
Dec	439199	470635	-31436	934915
Jan 1978	410849	462506	-51657	883259
Feb	431760	383375	48385	931644
Mar	380053	506332	-126279	805365
Apr	440768	383091	57677	863042
May	452741	448913	3828	866870
Jun	511051	450794	60257	927127
Jul	535498	400459	135039	1062165
Aug	493430	501375	-7944	1054221
Sep	523950	453674	70276	1124497
Oct	512638	474038	38600	1163097
Nov	602808	498513	104295	1267391
Dec	506648	545327	-38679	1228713
Jan 1979	490771	602489	-111718	1116994
Feb	479451	519313	-39862	1077132
Mar	444984	631043	-186059	891073
Apr	524096	523869	227	891300
May	542626	654585	-111959	779341
Jun	653130	685517	-32387	746953
Jul	796454	737651	58803	805756
Aug	924675	819071	105604	911360
Sep	1031409	799714	231695	1143055
Oct	987188	915469	71719	1214774
Nov	984442	928785	55657	1270432
Dec	1074447	1021671	52776	1323208

^{1/} Increased costs are lagged one month to match increased revenues. For example, increased costs for June 1976 are used for July 1976.

Source: Responses from nine refiners to ERA requests for information.

Table III-9. Unrecovered Increased Costs of the
Total Barrel for Nine Refiners
(Thousands of Dollars)

Jun 1976	1381746
Jul	1521145
Aug	1716091
Sep	1771568
Oct	1999073
Nov	1915385
Dec	1435731
Jan 1977	1458317
Feb	1437772
Mar	1471064
Apr	1922218
May	1964713
Jun	2104069
Jul	2250157
Aug	2352624
Sep	2654404
Oct	2727766
Nov	2923928
Dec	2622658
Jan 1978	2595272
Feb	2584293
Mar	2200234
Apr	2416212
May	2388419
Jun	2505413
Jul	2800190
Aug	2698250
Sep	2999269
Oct	2994661
Nov	3188844
Dec	3089609
Jan 1979	2890085
Feb	2674683
Mar	1806347
Apr	1780795
May	1256527
Jun	1086247
Jul	1156016
Aug	1103262
Sep	1394813
Oct	1170597
Nov	1163220
Dec	140016

Source: Table III-1, III-3, III-5, III-6, III-7,
and III-8.

and jet fuel. (See the tables in Chapter 5 for sales volume data, and the tables in Chapter II for price data.) Without the large beginning bank, the refiners' aggregate total barrel net revenues, as of December 1979, would have been almost \$642 million (see Table V-8).

Margin Expansions

In the previous cost/revenue studies of No. 2 distillate, the ERA calculated margin expansions (so-called "hypothetical refunds") for both individual refiners and the nine refiners in aggregate. In determining whether a refiner experienced a margin expansion, a refiner was permitted to carry a negative bank for 30 days. If the negative bank was not brought back to at least zero by the end of the following month, a margin expansion was identified. If the refiner's bank at the end of the second month were zero or positive (indicating unrecovered costs) no margin expansion was deemed to have occurred. Table III-10 indicates the No. 2 distillate banks for the nine refiners in aggregate, before the margin expansion determination was made, along with the size of the margin expansion. The stated margin expansions differ somewhat from those calculated in previous studies because of changes made by some refiners in the data that was previously filed with ERA.

Margin Expansion by Individual Refiners

In its previous study, Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976-October 1979, the ERA computed

Table III-10. Aggregate No. 2 Distillate Bank of Unrecovered Costs for Nine Refiners Before and After Adjustment for Margin Expansion
(Thousands of Dollars)

Month	End of Month Bank ^{1/}		Identified Margin Expansion
	Before Adjustment	After Adjustment	
Jun 1976	160909		
Jul	205567		
Aug	243418		
Sep	235607		
Oct	265820		
Nov	195029		
Dec	-21278		
Jan 1977	-123225	-101947	21278
Feb	-168164	-44939	101947
Mar	-116490	6735	
Apr	26812	150037	
May	51015	174240	
Jun	145804	269029	
Jul	215695	338920	
Aug	306102	429327	
Sep	409423	532648	
Oct	403396	526691	
Nov	449839	573064	
Dec	298873	422098	
Jan 1978	183178	306403	
Feb	13519	136744	
Mar	-157827	-34602	
Apr	-109994	13241	
May	-111619	11606	
Jun	-19539	103686	
Jul	109258	232483	
Aug	170820	294045	
Sep	294894	418119	
Oct	282160	405385	
Nov	313667	436892	
Dec	239869	363094	
Jan 1979	43021	166246	
Feb	-191509	-68284	
Mar	-435538	-244029	68284
Apr	-445764	-10226	244029
May	-529719	-83955	10226
Jun	-550605	-20886	83955
Jul	-428383	101336	
Aug	-380845	148877	
Sep	-209450	320261	
Oct	-219106	310613	
Nov	-223388	306331	
Dec	-434366	95353	
Jan 1980	-801000	-271281	
Feb	-1091798	-290798	271281
Mar	-1217870	-126072	290798
Total Margin Expansion			1091798

^{1/} The banked costs shown here assume that the bank position for the nine refiners was the sum of the individual refiners' banks.

Source: ERA calculation.

a margin expansion that would not have been allowed under continued regulation. An assumption was made for such calculation that even in a regulated environment each refiner would not have altered its pricing, sales, or product buying behavior in order to make the timing of its increased costs more consistent with the timing of its increased revenues.^{1/} The ERA also computed the extent of the margin expansion on a cents-per-gallon basis. In the computation, the margin expansion was spread over the winter months' sales, when the expansion occurred, assuming that under continued regulation the effects on prices would have been smoothed out over the entire winter.

The present study extends these computations to March 1980, the conclusion of the winter season. The margin expansion by individual refiners appear in Table III-11, and their effect on a cents-per-gallon basis appear in Table III-12.

At the conclusion of the winter season (March 1980) six refiners experienced a margin expansion totalling \$657 million. The largest expansion was \$152 million (Table III-11). The ERA then computed the magnitude of the expansion in terms of cents-per-gallon. In the computation, the expansion was spread over the sales during the period when it occurred, November 1979 through March

^{1/} Under continued regulation, a refiner computed its ceiling price for the month at the beginning of the month. This computation required the use of estimated sales volumes, since actual sales data were not yet available. As a result, refiners had some flexibility in establishing ceiling prices on a monthly basis and could smooth out price changes.

Table III-11. Margin Expansion for Nine Refiners, Attributable to No. 2 Distillate
(Millions of Dollars)

<u>Refiner</u> ^{1/}	<u>Nov 1979- Mar 1980</u>	<u>Jul 1976 Mar 1980</u>
1	94	129
2	0	30
3	45	263
4	152	197
5	0	5
6	0	0
7	131	299
8	85	237
9	<u>150</u>	<u>285</u>
Total	657	1445

^{1/} Individual refiners have not been identified to prevent disclosure of proprietary information.

Source: ERA computation.

Table III-12. Estimated Per Gallon Margin Expansion Attributed to No. 2 Distillate for Nine Refiners 1/ (Cents per Gallon)

<u>Refiners</u> ^{2/}	<u>Nov 1979- Mar 1980</u>
1	0
2	5.59
3	0
4	8.65
5	17.49
6	5.99
7	0
8	7.67
9	6.47
Average	6.13

1/ Amounts were computed by dividing the sum of the estimated monthly margin expansions during the period indicated by refiners' total sales of No. 2 distillate during the period indicated.

2/ Individual refiners' names are not shown to prevent the inadvertent disclosure of company proprietary information.

Source: ERA computation.

1980. It was assumed that under continued regulation, the effects on prices would have evened out over this period.

During the above period, the nine refiners expanded their margins by an average of 6.13 cents per gallon (Table III-12). Individually, six refiners expanded their margins by over 5 cents per gallon and three refiners did not expand their margins during this period. The apparent 17 cents per gallon margin increase on the part of one refiner was due primarily to the delay of its bank drawdown until the winter of 1979-1980, thus causing its entire impact to be felt during that period.

It should be noted that the margin expansion (\$657 million) during the 5-month period, November 1979 through March 1980, was almost as great as the 788 million expansion calculated for the 40 month period, July 1976 through October 1979. When spread over all sales for the entire 45-month period, the margin expansion computes to about 1.6 cents per gallon.

Margin Expansion on Jet Fuel

Table III-13 indicates that the margin expansion on jet fuel sales for the nine refiners taken together during the period August 1979 through December 1979 was about \$267.7 million.

By mid-1979 the refiners in aggregate had drawn down their banks, and began a period of sequentially increasing net revenues.

The margin expansion for jet fuel, when spread among the sales of the product during that period, amounted to 9 cents per gallon,

Table III-13. Aggregate Jet Fuel Banks for Nine Refiners Before and After Adjustment for Margin Expansion ^{1/}
(Thousands of Dollars)

Month	End of Month Banks ^{2/}		Identified Margin Expansion
	Before Adjustment	After Adjustment	
Jul 1979	-21616		
Aug 1979	-88342	-66726	21616
Sep 1979	-166274	-77932	66726
Oct 1979	-228173	-61899	77932
Nov 1979	-267701	-39528	61899
Dec 1979	-305163	-37462	<u>39528</u>
Total Margin Expansion			267701

^{1/} The bank costs shown here assume that the bank position for the nine refiners was the sum of the individual refiners' banks.

^{2/} For end of month banks from June 1976 through June 1979, see Table III-5.

Source: ERA calculation.

or about 4.7 cents per gallon when spread over all sales during the period since deregulation, March through December 1979.

Costs Not Permitted to be Recovered by Price Increases

The nine refiners have cited three general categories of costs they incur but cannot recover in price increases according to DOE's pricing rules:

1. Investment costs since May 1973;
2. Interest costs on working and fixed capital investment; and
3. General overhead costs.

Only one refiner fully quantified the above costs for this study. If the other eight refiners were on an equal par with the refiner who fully quantified these costs, an extrapolation based on refinery capacities would result in costs of approximately \$742 million for the 42-month period that were unavailable for pass-through.

Effect of the Gasoline "Tilt" Rule

As seen in Table III-4, the reallocation provisions of the pricing regulations would have allowed the nine refiners (in aggregate) a gasoline bank of nearly \$1.48 billion at the end of December 1979. (This assumes that the monthly banks were zero for the products from which costs were reallocated, i.e., the residual fuel, propane, and the "other products" categories. Put another way, any costs not recovered for those three products in a given

month were immediately reallocated to gasoline.) Another calculation was then made to determine the effects of the gasoline "tilt" rule on the combined gasoline bank of the nine refiners.

The gasoline "tilt" rule was implemented in March 1979 (with a provision to recapture tilted costs as if the rule had been in effect in January and February 1979). The tilt rule was introduced not only to provide for the recovery of costs which would otherwise be unrecoverable from exempt products' sales, but also to encourage increased investment in refinery capability and capacity. The rule allows refiners to apply additional cost increases to gasoline just as cost increases from the other product categories could be reallocated to gasoline when all petroleum products had been regulated.

According to Table III-14, the nine refiners increased their gasoline banks by \$73.8 million using "tilted" costs during the period January through December 1979. Table III-4, on the other hand, shows how the nine refiners reduced their reallocated gasoline bank by \$1.2 billion over this same period. This difference indicates that the reallocation provisions of the regulations would not have allowed as many costs to be transferred to the gasoline bank as the tilt rule has. Nevertheless, the "soft" (low demand) market for gasoline during this period has inhibited the pass-through of the "tilted" costs to a large extent.

Table III-14. Gasoline Cost Increases Under the Tilt Rule for
Nine Refiners
(Thousands of Dollars)

	<u>Total Gasoline Costs with Tilt</u>	<u>Actual Gasoline Cost Recoveries</u>	<u>Gasoline Bank Increase With Tilt</u>
Jan 1979	1544970	1329157	215813
Feb	1480053	1300105	179948
Mar	1314150	1548099	-233949
Apr	1592236	1584403	7833
May	1609293	1813264	-203971
Jun	1837488	1832847	4641
Jul	2126034	2068867	57167
Aug	2317131	2396190	-79059
Sep	2344559	2270346	74213
Oct	2392105	2474974	-82869
Nov	2438555	2370354	68201
Dec	2536064	2470201	<u>65863</u>
Increase in Bank			73831

Source: Data provided by nine refiners and ERA calculation.

CHAPTER IV

Refiners' Gross MarginsIntroduction

With the rapid increase in petroleum prices during 1979, there has been considerable interest in the markup of petroleum product prices over crude oil costs as a method for evaluating the reasonableness of refiners' selling prices (Figure IV-1). The ERA has used gross margins, which are defined as the markup of the product's selling prices over the costs of crude oil, as an analytical tool in a previous cost/revenue study.^{1/} Gross margin data may be used to assess general marketplace price conditions and changing trends in non-product cost levels or net margin levels.

A number of refiners whose data was analyzed in previous No. 2 distillate studies have testified that it was inappropriate to evaluate their costs and revenues separately from those of other products produced from crude oil. Accordingly, ERA is conducting an analysis of refiners' gross margins for the "total barrel" and other major products in addition to No. 2 distillate. These other major products include motor gasoline, jet fuel (naphtha and kerosene based),

^{1/} See Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976-October 1979, Chapter III.

FIGURE IV-1
COMPARISON OF CRUDE OIL COST AND SELLING
PRICES FOR MAJOR PRODUCT CATEGORIES
FOR NINE REFINERS
(CENTS PER GALLON)

and residual fuel. This approach enables ERA to compare gross margins for individual products to other products as well as to the refiners' overall "total barrel" gross margin. This allows for a better assessment of the behavior of refined product prices. In order to maintain continuity and a consistency of comparison, only data from the nine refiners included in the previous No. 2 distillate studies were used in this analysis. Thus, the results of this study may only be representative of the larger refiners and not of the total refining industry. Nevertheless, a comparison was made to determine the degree to which total barrel gross margins for the nine-refiner sample may be representative of the total barrel gross margins for all refiners.

Methodology for Gross Margin Calculation

Overview

Average gross margins for motor gasoline, No. 2 distillate, jet fuel, residual fuel, and the total refined product barrel were derived by subtracting average crude oil costs from average product selling prices for the period of July 1976 through December 1979. (Table IV-1 presents the data used to calculate the nine refiners' gross margins for major product categories.) Separate gross margins for propane were not calculated because the pricing data appear to include a mixture of propane derived from crude oil and propane produced from natural gas.

Table IV-1. Comparison of Crude Oil Costs and Average Selling Prices for Major Product Categories for Nine Refiners*
(Cents per Gallon)

	Average Crude Oil Cost in Previous Month	Gasoline	Middle Distillates	Jet Fuel	Residual Fuel
Jul 1976	25.4	39.4	31.7	30.2	25.7
Aug	25.6	39.6	32.1	30.6	26.1
Sep	25.5	39.6	32.1	31.0	26.5
Oct	25.8	39.5	32.4	31.6	27.4
Nov	26.6	39.1	33.2	31.9	27.8
Dec	26.2	39.0	34.2	31.7	29.4
Jan 1977	27.4	39.1	35.1	32.5	31.3
Feb	27.3	40.1	35.7	33.8	32.1
Mar	38.0	40.7	36.6	34.2	32.3
Apr	28.5	41.6	36.6	34.5	31.0
May	27.7	42.4	36.7	34.7	30.3
Jun	28.4	42.7	36.5	35.2	30.1
Jul	27.7	42.7	36.5	35.5	29.9
Aug	28.9	42.6	36.4	35.6	30.2
Sep	28.9	42.3	36.4	37.3	30.2
Oct	28.1	42.0	36.7	37.6	30.3
Nov	28.7	42.0	37.1	37.6	29.7
Dec	29.9	42.1	37.3	37.7	28.7
Jan 1978	28.6	41.6	37.8	38.5	29.1
Feb	29.0	41.4	37.4	38.0	28.5
Mar	29.6	41.6	37.2	38.2	29.2
Apr	29.0	42.0	37.2	38.5	29.4
May	30.0	42.8	37.1	38.7	29.4
Jun	29.6	43.8	36.8	38.9	28.6
Jul	30.0	44.6	36.7	39.1	27.7
Aug	29.9	45.0	36.8	39.1	27.5
Sep	30.5	45.4	37.5	39.3	28.2
Oct	30.2	45.4	38.3	39.7	29.7
Nov	31.8	46.4	39.6	39.4	30.4
Dec	30.9	47.1	40.4	39.6	31.3
Jan 1979	31.7	47.9	41.1	40.3	32.3
Feb	32.1	49.0	43.2	40.4	33.4
Mar	32.1	51.0	45.2	42.8	36.8
Apr	34.0	54.2	48.3	45.4	38.3
May	35.3	57.2	51.8	48.7	39.2
Jun	38.3	60.9	55.9	51.7	42.2
Jul	41.3	64.9	59.1	58.6	45.1
Aug	44.9	68.3	62.9	62.0	47.8
Sep	48.2	71.3	66.3	64.2	48.6
Oct	49.0	72.7	66.6	67.5	50.5
Nov	49.6	74.7	66.7	70.0	51.9
Dec	53.2	77.9	69.7	72.1	56.5

* Includes both retail and wholesale refiner sales for each product.

Source: Tables IV-3, IV-5, IV-7, and IV-8.

Weighted average selling prices for products were obtained from the EIA-P302 form for determining selling prices for the nine-refiner average as well as the all-refiner average. Average crude oil costs for the nine-refiner survey were computed by adding the per unit increase in crude oil costs in each month to the average crude oil base costs reported by the nine refiners. Per-unit increased crude oil costs were computed by dividing increased crude oil costs reported by the nine refiners in response to ERA's telegrams, by the volume of crude oil purchased by these refiners, as reported to DOE on form P110 or EIA-14. Post-entitlement crude cost data were used to estimate average gross margins for the average crude cost for all refiners. Crude oil costs were lagged one month, as they would be for the calculation of increased costs under continued regulation. It is also fair to assume that even under total deregulation, the products produced from crude oil may be kept in a refiner's distribution system approximately 30 days before they are sold.

Motor Gasoline

Average selling prices for the motor gasoline gross margin calculation include premium, regular and unleaded grades at the wholesale, dealer tankwagon, and retail distribution levels for those nine refiners included in the survey. It should be noted that wholesale and dealer tankwagon sales accounted for approximately 95 percent of total motor gasoline sales for the nine refiners surveyed.

No. 2 Distillate

Average selling prices for the No. 2 distillate gross margin calculation include No. 2 heating oil and No. 2-D diesel fuel at the wholesale and retail sales levels for the nine refiners surveyed. No. 2 distillate selling prices may vary slightly from prices published in the February 1980 report, Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976-October 1979, due to differing data sources. While No. 1 heating oil and No. 1-D diesel fuel are not included in the distillate category, they are included in the "total barrel" calculation.

Jet Fuel

Average selling prices for the jet fuel gross margin calculation include both naphtha and kerosene-based jet fuel at the wholesale and retail levels for the nine refiners in the survey. The majority of refiners' sales for jet fuel are considered to be retail (sales to ultimate consumers) rather than wholesale (sales to resellers). This is due to large commercial accounts, such as airlines and the military, being defined as retail transactions. Therefore, retail prices reported on the EIA-P302, which include sales to commercial airlines and military installations, are generally priced below the wholesale transactions due to the large volumes purchased.

Residual Fuel

Average selling prices for the residual fuel gross margin calculation include No. 5 and No. 6 residual fuels as well

as all bunker "C" fuel at the wholesale and retail levels for those nine refiners in the survey. While No. 4 residual fuel is not included in the residual category, it is included in the "total barrel" calculation.

Total Barrel

The average selling price for the "total barrel" gross margin calculation is derived by multiplying the selling prices of all refinery products reported on form EIA-P302 by their respective sales volumes for each month to determine the weighted average selling price for all reported refinery output. The weighted average crude oil cost of the nine refiners is then subtracted from the weighted average selling price of their "total barrel" to determine the total barrel gross margin.

The major product categories included in this computation are motor gasoline, middle distillate, residual fuel, aviation fuels, kerosene, petrochemical feedstocks, and liquefied petroleum gases (originating from refineries). Not all petroleum products are reported on the P-302 form; consequently, unreported products are not included in the total barrel gross margin calculation. An example of two products not reported on the P-302 are asphalt and lube oils.

Gross Margin Trends

Gross margins are isolated for individual refined product categories for three basic reasons: (1) to determine whether gross margins

for a particular product category have changed significantly over historic levels, (2) to determine the relationship of the change or lack of change to the present regulatory environment, and (3) to determine how changing individual product's gross margins have affected the overall "total barrel" gross margin trend.

Motor Gasoline

Historically, motor gasoline has enjoyed the largest gross margins of any refined product (Table IV-2). The average gross margin for all grades of motor gasoline has increased by almost 11 cents per gallon between July 1976 and December 1979. Most of this increase occurred as a result of selling prices increasing more rapidly than crude costs since March 1979, which coincides with the implementation of the motor gasoline cost reallocation "tilt" rule (Table IV-3). While the motor gasoline gross margin increased significantly, the gross margin as a percentage of the refiner's selling price has remained relatively constant throughout the July 1976-December 1979 study period (Table IV-4). This suggests that refiners may consider specific gross margin targets in terms of percentages of selling prices. Although gasoline is still a regulated product, a large unrecouped cost bank exists which could allow a significant expansion of gross margins over an extended period of time.^{1/} The

^{1/} See EIA, Monthly Energy Review, August 1980, p. 78.

Table IV-2. Comparison of Gross Margins for Major Product Categories for Nine Refiners
(Cents per Gallon)

	Motor Gasoline Gross Margin	No. 2 Distillate Gross Margin	Jet Fuel Gross Margin	Residual Fuel Gross Margin	Total Barrel Gross Margin
Jul 1976	14.0	6.3	4.8	0.3	8.3
Aug	14.0	6.5	5.0	0.5	8.4
Sep	14.1	6.6	5.5	1.0	8.3
Oct	13.7	6.6	5.8	1.6	8.2
Nov	12.5	6.6	5.3	1.2	6.9
Dec	12.8	8.0	5.5	3.2	7.6
Jan 1977	11.7	7.7	5.1	3.9	7.1
Feb	12.8	8.4	6.5	4.8	8.0
Mar	12.7	8.6	6.2	4.3	8.3
Apr	13.1	8.1	6.0	2.5	8.4
May	14.7	9.0	7.0	2.6	9.5
Jun	14.3	8.1	6.8	1.7	8.9
Jul	15.0	8.8	7.8	2.2	9.6
Aug	13.7	7.5	6.7	1.3	8.4
Sep	13.4	7.5	8.4	1.3	8.2
Oct	13.9	8.6	9.5	2.2	9.1
Nov	13.3	8.4	8.9	1.0	8.5
Dec	12.2	7.4	7.8	-1.2	6.9
Jan 1978	13.0	9.2	9.9	0.5	8.0
Feb	12.4	8.4	9.0	-0.5	7.3
Mar	12.0	7.6	8.6	-0.4	7.1
Apr	13.0	8.2	9.5	0.4	8.3
May	12.8	7.1	8.7	-0.6	8.0
Jun	14.2	7.2	9.3	-1.0	8.8
Jul	14.6	6.7	9.1	-1.3	9.0
Aug	15.1	6.9	9.2	-2.4	8.8
Sep	14.9	7.0	8.8	-2.3	8.4
Oct	15.2	8.1	9.5	-0.5	9.3
Nov	14.6	7.8	7.6	-1.4	8.5
Dec	16.2	9.5	8.7	0.4	9.6
Jan 1979	16.2	9.4	8.6	0.6	9.0
Feb	16.9	11.1	8.3	1.3	9.9
Mar	18.9	13.1	10.7	4.7	12.5
Apr	20.2	14.3	11.4	4.3	13.7
May	21.9	16.5	13.4	3.9	15.2
Jun	22.6	17.6	13.4	3.9	15.7
Jul	23.6	17.8	17.3	3.8	16.7
Aug	23.4	18.0	17.1	2.9	16.4
Sep	23.1	18.1	16.0	0.4	15.3
Oct	23.7	17.6	18.5	1.5	15.5
Nov	25.1	17.1	20.4	2.3	16.2
Dec	24.7	16.5	18.9	3.3	15.0

Source: Tables IV-3, IV-5, IV-7, and IV-8.

Table IV-3. Average Motor Gasoline Selling Prices, Crude Oil Costs, and Average Gross Margins for Nine Refiners* (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	39.4	25.4	14.0
Aug	39.6	25.6	14.0
Sep	39.6	25.5	14.1
Oct	39.5	25.8	13.7
Nov	39.1	26.6	12.5
Dec	39.0	26.2	12.8
Jan 1977	39.1	27.4	11.7
Feb	40.1	27.3	12.8
Mar	40.7	28.0	12.7
Apr	41.6	28.5	13.1
May	42.4	27.7	14.7
Jun	42.7	28.4	14.3
Jul	42.7	27.7	15.0
Aug	42.6	28.9	13.7
Sep	42.3	28.9	13.4
Oct	42.0	28.1	13.9
Nov	42.0	28.7	13.3
Dec	42.1	29.9	12.2
Jan 1978	41.6	28.6	13.0
Feb	41.4	29.0	12.4
Mar	41.6	29.6	12.0
Apr	42.0	29.0	13.0
May	42.8	30.0	12.8
Jun	43.8	29.6	14.2
Jul	44.6	30.0	14.6
Aug	45.0	29.9	15.1
Sep	45.4	30.5	14.9
Oct	45.4	30.2	15.2
Nov	46.4	31.8	14.6
Dec	47.1	30.9	16.2
Jan 1979	47.9	31.7	16.2
Feb	49.0	32.1	16.9
Mar	51.0	32.1	18.9
Apr	54.2	34.0	20.2
May	57.2	35.3	21.9
Jun	60.9	38.3	22.6
Jul	64.9	41.3	23.6
Aug	68.3	44.9	23.4
Sep	71.3	48.2	23.1
Oct	72.7	49.0	23.7
Nov	74.7	49.6	25.1
Dec	77.9	53.2	24.7

* Includes retail DTW and wholesale refiner sales for all grades of motor gasoline.

Source: Average selling prices were derived from EIA form P302. Average crude oil costs were computed by adding to the average crude oil base costs reported by the nine refiners the per unit increase in crude oil costs in each month. Per unit increased crude oil costs were computed by dividing increased crude oil costs reported by the nine refiners in response to ERA's telegrams by the volume of crude oil they purchased, as reported to DOE on form P110 or form EIA-14. Crude oil costs are lagged one month as they would be for the calculation of increased costs under continued regulation.

Table IV-4. Comparison of Major Product Gross Margins as a Percentage of Average Selling Prices for Nine Refiners*

	<u>Motor Gasoline</u>	<u>No. 2 Distillate</u>	<u>Jet Fuels</u>	<u>Residual Fuel</u>	<u>Total Barrel</u>
Jul 1976	35.5	19.9	15.9	1.2	24.6
Aug	35.4	20.2	16.3	1.9	24.7
Sep	35.6	20.6	17.7	3.8	24.6
Oct	34.7	20.4	18.4	5.8	24.1
Nov	32.0	19.9	16.6	4.3	20.6
Dec	32.8	23.4	17.4	10.9	22.5
Jan 1977	29.9	21.9	15.7	12.5	20.6
Feb	31.9	23.5	19.2	15.0	22.7
Mar	31.2	23.5	18.1	13.3	22.9
Apr	31.5	22.1	17.4	8.1	22.8
May	34.7	24.5	20.2	8.6	25.5
Jun	33.5	22.2	19.3	5.6	23.9
Jul	35.1	24.1	22.0	7.4	25.7
Aug	32.2	20.6	18.8	4.3	22.5
Sep	31.7	20.6	22.5	4.3	22.1
Oct	33.1	23.4	25.3	7.3	24.5
Nov	31.7	22.6	23.7	3.4	22.8
Dec	29.0	19.8	20.7	-4.2	18.8
Jan 1978	31.3	24.3	25.7	1.7	21.9
Feb	30.0	22.5	23.7	-1.8	20.1
Mar	28.8	20.4	22.5	-1.4	19.3
Apr	31.0	22.0	24.7	1.4	22.3
May	29.9	19.1	22.5	-2.0	21.1
Jun	32.4	19.6	23.9	-3.5	22.9
Jul	32.7	18.3	23.3	-4.7	23.1
Aug	33.6	18.8	23.5	-8.7	22.7
Sep	32.8	18.7	22.4	-8.2	21.6
Oct	33.5	21.1	23.9	-1.7	23.5
Nov	31.5	19.7	19.3	-4.6	21.1
Dec	34.4	23.5	22.0	1.3	23.7
Jan 1979	33.8	22.9	21.3	1.9	22.1
Feb	34.5	25.7	20.5	3.9	23.6
Mar	37.1	29.0	25.0	12.8	28.0
Apr	37.3	29.6	25.1	11.2	28.7
May	38.3	31.9	27.5	9.9	30.1
Jun	37.1	31.5	25.9	9.2	29.1
Jul	36.4	30.1	29.5	8.4	28.8
Aug	34.3	28.6	27.6	6.1	26.8
Sep	32.4	27.3	24.9	0.8	24.1
Oct	32.6	26.4	27.4	3.0	24.0
Nov	33.6	25.6	29.1	4.4	24.6
Dec	31.7	23.7	26.2	5.8	22.0

* Includes both retail and wholesale refiner sales of No. 2 heating oil and diesel fuel.

Source: Tables IV-3, IV-5, IV-7, IV-8, and IV-9. Average selling prices were derived from EIA form P302. Prices vary slightly from prices published in February 1980 report: Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976-October 1979 due to differing data sources. See Table IV-3 for explanation of sources for crude oil costs.

primary constraint to banked cost passthrough is most likely the soft market conditions resulting from reduced motor gasoline demand and high inventory levels. For some refiners, the guidelines promulgated by the Council on Wage and Price Stability may also be constraining price and gross margin increases.

No. 2 Distillate

The average gross margin for No. 2 distillate expanded by approximately 10 cents per gallon between July 1976 and December 1979 (Table IV-5). Again, the majority of this increase occurred during 1979 when selling prices were increasing more rapidly than crude costs. The actual increases in No. 2 distillate gross margins exceeded the increases in motor gasoline gross margins during the first 10 months of 1979 (Table IV-6). On a percentage of refiner selling price basis, No. 2 distillate gross margins expanded more rapidly and consistently than motor gasoline gross margins (Table IV-4). Nevertheless, since substantial gross margin expansion did not occur immediately following the deregulation of middle distillates in July 1976, it is difficult to make a direct correlation between deregulation and the large gross margin expansions encountered during 1979. For example, there is some evidence, presented in Chapter V, which appears to indicate that during 1977 No. 2 distillate gross margins did not expand sufficiently to cover increased non-product costs. However, refiners, over the longer July 1976 through December 1979 period, more than offset any losses of unrecouped costs through gross margin expansions.

Table IV-5. Average No. 2 Distillate Selling Prices, Crude Oil Costs, and Average Gross Margins for Nine Refiners* (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Oil Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	31.7	25.4	6.3
Aug	32.1	25.6	6.5
Sep	32.1	25.5	6.6
Oct	32.4	25.8	6.6
Nov	33.2	26.6	6.6
Dec	34.2	26.2	8.0
Jan 1977	35.1	27.4	7.7
Feb	35.7	27.3	8.4
Mar	36.6	28.0	8.6
Apr	36.6	28.5	8.1
May	36.7	27.7	9.0
Jun	36.5	28.4	8.1
Jul	36.5	27.7	8.8
Aug	36.4	28.9	7.5
Sep	36.4	28.9	7.5
Oct	36.7	28.1	8.6
Nov	37.1	28.7	8.4
Dec	37.3	29.9	7.4
Jan 1978	37.8	28.6	9.2
Feb	37.4	29.0	8.4
Mar	37.2	29.6	7.6
Apr	37.2	29.0	8.2
May	37.1	30.0	7.1
Jun	36.8	29.6	7.2
Jul	36.7	30.0	6.7
Aug	36.8	29.9	6.9
Sep	37.5	30.5	7.0
Oct	38.3	30.2	8.1
Nov	39.6	31.8	7.8
Dec	40.4	30.9	9.5
Jan 1979	41.1	31.7	9.4
Feb	43.2	32.1	11.1
Mar	45.2	32.1	13.1
Apr	48.3	34.0	14.3
May	51.8	35.3	16.5
Jun	55.9	38.3	17.6
Jul	59.1	41.3	17.8
Aug	62.9	44.9	18.0
Sep	66.3	48.2	18.1
Oct	66.6	49.0	17.6
Nov	66.7	49.6	17.1
Dec	69.7	53.2	16.5

* Includes both retail and wholesale refiner sales of No. 2 heating oil and diesel fuel.

Source: Average selling prices were derived from EIA form P302. Prices vary slightly from prices published in February 1980 report: Analysis of Refiners' No. 2 Distillate Costs and Revenues: July 1976-October 1979 due to differing data sources. See Table IV-2 for explanation of sources for crude oil costs.

Table IV-6. Comparison of Changes in Gross Margins Since July 1976 for Major Product Categories for Nine Refiners (Cents per Gallon)

	<u>Motor Gasoline Change</u>	<u>No. 2 Distillate Change</u>	<u>Jet Fuel Change</u>	<u>Residual Fuel Change</u>	<u>Total Barrel Change</u>
Aug 1976	0.0	0.2	0.2	0.2	0.1
Sep	0.1	0.3	0.7	0.7	0.0
Oct	-0.3	0.3	1.0	1.3	-0.1
Nov	-1.5	0.3	0.5	0.9	-1.4
Dec	-1.2	1.7	0.7	2.9	-0.7
Jan 1977	-2.3	1.4	0.3	3.6	-1.2
Feb	-1.2	2.1	1.7	4.5	-0.3
Mar	-1.3	2.3	1.4	4.0	0.0
Apr	-0.9	1.8	1.2	2.2	0.1
May	0.7	2.7	2.2	2.3	1.7
Jun	0.3	1.8	2.0	1.4	0.6
Jul	1.0	2.5	3.0	1.9	1.3
Aug	-0.3	1.2	1.9	1.0	0.1
Sep	-0.6	1.2	3.6	1.0	-0.1
Oct	-0.1	2.3	4.7	1.9	0.8
Nov	0.7	2.1	4.1	0.7	0.2
Dec	-1.0	1.1	3.0	-1.5	-1.4
Jan 1978	-1.0	2.9	5.1	0.2	-0.3
Feb	-1.6	2.1	4.2	-0.8	-1.0
Mar	-2.0	1.3	3.8	-0.7	-1.2
Apr	-1.0	1.9	4.7	0.1	0.0
May	-1.2	0.8	3.9	-0.9	-0.3
Jun	0.2	0.9	4.5	-1.3	0.5
Jul	0.6	0.4	4.3	-1.6	0.7
Aug	1.1	0.6	4.4	-2.7	0.5
Sep	0.9	0.7	4.0	-2.6	0.1
Oct	1.2	1.8	4.7	-0.8	1.0
Nov	0.6	1.5	2.8	-1.7	0.2
Dec	2.2	3.2	3.9	0.1	1.3
Jan 1979	2.2	3.1	3.8	0.3	0.7
Feb	2.9	4.8	3.5	1.0	1.6
Mar	4.9	6.8	5.9	4.4	4.2
Apr	6.2	8.0	6.6	4.0	5.4
May	7.9	10.2	8.6	3.6	6.9
Jun	8.6	11.3	8.6	3.6	7.4
Jul	9.6	11.5	12.5	3.5	8.4
Aug	9.4	11.7	12.3	2.6	8.1
Sep	9.1	11.8	11.2	0.1	7.0
Oct	9.7	11.3	13.7	1.2	7.2
Nov	11.1	10.8	15.6	2.0	7.9
Dec	10.7	10.2	14.1	3.0	6.7

Source: Tables IV-3, IV-5, IV-7, IV-8, and IV-9.

Jet Fuel

The gross margin for jet fuel exhibited the greatest change of any fuel category examined, with an increase of approximately 14 cents per gallon between July 1976 and December 1979 (Table IV-6). During the last quarter of 1979, refiner selling prices for jet fuel exceeded No. 2 distillate prices by approximately 4 cents per gallon, whereas the No. 2 distillate prices were higher than the jet fuel prices during 1976 (Tables IV-5 and IV-7). While gross margin expansions for jet fuel occurred immediately following DOE price and allocation deregulation in February 1979, its increases did not begin to exceed the rate of increase for other products, in general, until June 1979 (Figure IV-2). These gross margin increases may be attributed, in part, to the relatively strong demand for jet fuels, while other fuels have experienced demand reductions. For example, in March 1979, major oil company suppliers declared a moratorium on supplying new accounts, which is still in effect. As a result, any increase in demand had to be met by products from new refiner/suppliers or from the spot market. Thus, any increase in demand may have enabled refiners to expand jet fuel gross margins.

Residual Fuel

In the past, residual fuels have at best been marginally profitable and in many instances, they were sold at prices well below crude costs (Table IV-8). Generally, residual fuel losses were more than offset by higher light-end products' margins. The deregulation of residual fuel in June 1976 appeared to have no

Table IV-7. Average Jet Fuel Selling Prices, Crude Oil Costs, and average Gross Margins for Nine Refiners* (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	30.2	25.4	4.8
Aug	30.6	25.6	5.0
Sep	31.0	25.5	5.5
Oct	31.6	25.8	5.8
Nov	31.9	26.6	5.3
Dec	31.7	26.2	5.5
Jan 1977	32.5	27.4	5.1
Feb	33.8	27.3	6.5
Mar	34.2	28.0	6.2
Apr	34.5	28.5	6.0
May	34.7	27.7	7.0
Jun	35.2	28.4	6.8
Jul	35.5	27.7	7.8
Aug	35.6	28.9	6.7
Sep	37.3	28.9	8.4
Oct	37.6	28.1	9.5
Nov	37.6	28.7	8.9
Dec	37.7	29.9	7.8
Jan 1978	38.5	28.6	9.9
Feb	38.0	29.0	9.0
Mar	38.2	29.6	8.6
Apr	38.5	29.0	9.5
May	38.7	30.0	8.7
Jun	38.9	29.6	9.3
Jul	39.1	30.0	9.1
Aug	39.1	29.9	9.2
Sep	39.3	30.5	8.8
Oct	39.7	30.2	9.5
Nov	39.4	31.8	7.6
Dec	39.6	30.9	8.7
Jan 1979	40.3	31.7	8.6
Feb	40.4	32.1	8.3
Mar	42.8	32.1	10.7
Apr	45.4	34.0	11.4
May	48.7	35.3	13.4
Jun	51.7	38.3	13.4
Jul	58.6	41.3	17.3
Aug	62.0	44.9	17.1
Sep	64.2	48.2	16.0
Oct	67.5	49.0	18.5
Nov	70.0	49.6	20.4
Dec	72.1	53.2	18.9

* Includes both retail and wholesale refiner sales of naphtha and kerosene-based jet fuels.

Source: Average selling prices were derived from EIA form P302. See Table IV-3 for explanation of sources for crude oil costs.

**FIGURE IV-2
COMPARISON OF GROSS MARGINS FOR
MAJOR PRODUCT CATEGORIES FOR NINE REFINERS
(CENTS PER GALLON)**

Table IV-8. Average Residual Fuel Oil Selling Prices, Crude Oil Costs, and Average Gross Margins for Nine Refiners* (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Oil Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	25.7	25.4	0.3
Aug	26.1	25.6	0.5
Sep	26.5	25.5	1.0
Oct	27.4	25.8	1.6
Nov	27.8	26.6	1.2
Dec	29.4	26.2	3.2
Jan 1977	31.3	27.4	3.9
Feb	32.1	27.3	4.8
Mar	32.3	28.0	4.3
Apr	31.0	28.5	2.5
May	30.3	27.7	2.6
Jun	30.1	28.4	1.7
Jul	29.9	27.7	2.2
Aug	30.2	28.9	1.3
Sep	30.2	28.9	1.3
Oct	30.3	28.1	2.2
Nov	29.7	28.7	1.0
Dec	28.7	29.9	-1.2
Jan 1978	29.1	28.6	0.5
Feb	28.5	29.0	-0.5
Mar	29.2	29.6	-0.4
Apr	29.4	29.0	0.4
May	29.4	30.0	-0.6
Jun	28.6	29.6	-1.0
Jul	27.7	30.0	-1.3
Aug	27.5	29.9	-2.4
Sep	28.2	30.5	-2.3
Oct	29.7	30.2	-0.5
Nov	30.4	31.8	-1.4
Dec	31.3	30.9	0.4
Jan 1979	32.3	31.7	0.6
Feb	33.4	32.1	1.3
Mar	36.8	32.1	4.7
Apr	38.3	34.0	4.3
May	39.2	35.3	3.9
Jun	42.2	38.3	3.9
Jul	45.1	41.3	3.8
Aug	47.8	44.9	2.9
Sep	48.6	48.2	0.4
Oct	50.5	49.0	1.5
Nov	51.9	49.6	2.3
Dec	56.5	53.2	3.3

* Includes both retail and wholesale refiner sales of No. 5, No. 6, and Bunker C residual fuel oils.

Source: Average selling prices were derived from EIA form P302. See Table IV-3 for explanation of sources for crude oil costs.

major impact on selling prices or gross margins. The negative gross margins realized during 1978 were in all probability associated with soft market conditions resulting from excess inventory buildup and decreased demand. It should be noted that the nine large refiners in the study sample would include a greater than industry-wide average of low-sulfur residual fuel, for which gross margins may be higher. For this reason, the gross margins in Table IV-8 may be higher than the industry-wide average. Although 1979 gross margins for residual fuel have improved somewhat over 1978, they are still substantially below all other fuel categories (Table IV-4).

Total Barrel

Average total barrel gross margins for the nine-refiner sample remained virtually constant during the July 1976 to February 1979 period. Beginning in March 1979, total barrel gross margins expanded rapidly and remained at the higher level throughout 1979 (Table IV-9). During the March-December 1979 period, crude costs were escalating rapidly; however, selling prices were increasing at an even more rapid rate, resulting in significantly higher gross margins (Figure IV-3). While increased gross margins for all products were contributing to the increased total barrel margin, increases in jet fuel appeared to be a major contributor from a percentage of selling prices point of view. For example, the jet fuel gross margin as a percentage of selling price rose from 15.9 percent in July 1976 to 29.5 percent in July 1979

Table IV-9. Average Total Barrel Selling Prices, Crude Oil Costs, and Average Gross Margins for Nine Refiners* (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Oil Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	33.7	25.4	8.3
Aug	34.0	25.6	8.4
Sep	33.8	25.5	8.3
Oct	34.0	25.8	8.2
Nov	33.5	26.6	6.9
Dec	33.8	26.2	7.6
Jan 1977	34.5	27.4	7.1
Feb	35.3	27.3	8.0
Mar	36.3	28.0	8.3
Apr	36.9	28.5	8.4
May	37.2	27.7	9.5
Jun	37.3	28.4	8.9
Jul	37.3	27.7	9.6
Aug	37.3	28.9	8.4
Sep	37.1	28.9	8.2
Oct	37.2	28.1	9.1
Nov	37.2	28.7	8.5
Dec	36.8	29.9	6.9
Jan 1978	36.6	28.6	8.0
Feb	36.3	29.0	7.3
Mar	36.7	29.6	7.1
Apr	37.3	29.0	8.3
May	38.0	30.0	8.0
Jun	38.4	29.6	8.8
Jul	39.0	30.0	9.0
Aug	38.7	29.9	8.8
Sep	38.9	30.5	8.4
Oct	39.5	30.2	9.3
Nov	40.3	31.8	8.5
Dec	40.5	30.9	9.6
Jan 1979	40.7	31.7	9.0
Feb	42.0	32.1	9.9
Mar	44.6	32.1	12.5
Apr	47.7	34.0	13.7
May	50.5	35.3	15.2
Jun	54.0	38.3	15.7
Jul	58.0	41.3	16.7
Aug	61.3	44.9	16.4
Sep	63.5	48.2	15.3
Oct	64.5	49.0	15.5
Nov	65.8	49.6	16.2
Dec	68.2	53.2	15.0

* Includes all motor gasoline, all middle distillates, all residual fuel oil, all aviation fuel, all kerosene, all petrochemical feedstocks, all LPG (from refineries) for all sales levels from EIA form P302.

Source: See Table IV-3 for explanation of sources for crude oil costs.

FIGURE IV-3
COMPARISON OF CHANGES IN GROSS MARGINS FOR
MAJOR PRODUCT CATEGORIES FOR NINE REFINERS
(CENTS PER GALLON)

(Table IV-4). Although No. 2 distillate and motor gasoline had somewhat smaller per unit increases in gross margins, they also contributed substantially to the increased total barrel margin due to their large sales volumes.

"Total barrel" gross margins for all refiners were also estimated using P302 selling price data and post-entitlement crude costs. These all-refiner margins were computed in order to determine if the nine-refiner gross margin averages were representative of the overall refining industry (Table IV-10). A comparison of "total barrel" gross margins for all refiners to "total barrel" gross margins for the nine-refiner sample indicates similar trends from 1976 through 1978, with some divergence in 1979 (Table IV-11). Larger "total barrel" gross margins during 1979 for the "all refiners" category may be indicative of the unusually high spot market prices which small refiners were receiving as opposed to lower contract prices charged by the large integrated companies. These larger gross margins for the all-refiner average may also be reflective of the competitive advantage afforded to many small refiners through DOE's Entitlements Program. In this program, a small refiner bias reduced small refiners' crude costs. In June 1979, a change in the amount of the small refiner bias moderated the crude cost advantage held by small refiners.

While gross margins can be indicative of net margin trends, costs other than crude oil should be considered on an individual product category basis in order to determine the

Table IV-10. Average Total Barrel Selling Prices, Crude Oil Costs, and Average Gross Margins for All Refiners (Cents per Gallon)

	<u>Average Selling Price</u>	<u>Average Crude Oil Cost in Previous Month</u>	<u>Average Gross Margin</u>
Jul 1976	34.0	25.8	8.2
Aug	34.1	25.9	8.2
Sep	34.0	25.6	8.4
Oct	34.1	26.4	7.7
Nov	33.9	26.5	7.4
Dec	34.1	26.6	7.5
Jan 1977	34.7	26.8	7.9
Feb	35.5	27.5	8.0
Mar	36.3	27.9	8.4
Apr	37.0	28.0	9.0
May	37.3	28.1	9.2
Jun	37.4	28.3	9.1
Jul	37.4	28.0	9.4
Aug	37.4	28.2	9.2
Sep	37.2	28.4	8.8
Oct	37.3	28.6	8.7
Nov	37.1	29.0	8.1
Dec	36.7	28.9	7.8
Jan 1978	36.7	29.2	7.5
Feb	36.4	28.8	7.6
Mar	36.7	29.1	7.6
Apr	37.2	29.0	8.2
May	38.0	29.0	9.0
Jun	38.4	29.5	8.9
Jul	38.6	29.5	9.1
Aug	39.1	29.7	9.4
Sep	39.0	29.7	9.3
Oct	40.0	30.0	10.0
Nov	40.5	30.1	10.4
Dec	40.6	30.5	10.1
Jan 1979	40.9	30.9	10.0
Feb	42.5	31.3	11.2
Mar	44.9	32.0	12.9
Apr	48.0	32.7	15.3
May	52.2	34.7	17.5
Jun	56.9	36.8	20.1
Jul	59.2	40.6	18.6
Aug	62.6	44.3	18.3
Sep	65.2	47.1	18.1
Oct	66.4	48.1	18.3
Nov	68.0	49.4	18.6
Dec	70.5	52.5	18.0

Source: P302, Post Entitlement Crude Cost Data, OPO, ERA.

Table IV-11. Comparison of Total Barrel Gross Margins for Nine Refiners to Total Barrel Gross Margins for All Refiners (Cents per Gallon)

	<u>Gross Margins for All Refiners</u>	<u>Gross Margins for Nine Refiners</u>	<u>Gross Margin Difference</u>
Jul 1976	8.2	8.3	-0.1
Aug	8.2	8.4	-0.2
Sep	8.4	8.3	0.1
Oct	7.7	8.2	-0.5
Nov	7.4	6.9	-0.5
Dec	7.5	7.6	-0.1
Jan 1977	7.9	7.1	0.8
Feb	8.0	8.0	0
Mar	8.4	8.3	0.1
Apr	9.0	8.4	0.6
May	9.2	9.5	-0.3
Jun	9.1	8.9	0.2
Jul	9.4	9.6	-0.2
Aug	9.2	8.4	0.8
Sep	8.8	8.2	0.6
Oct	8.7	9.1	-0.4
Nov	8.1	8.5	-0.4
Dec	7.8	6.9	-0.9
Jan 1978	7.5	8.0	-0.5
Feb	7.6	7.3	0.3
Mar	7.6	7.1	0.5
Apr	8.2	8.3	-0.1
May	9.0	8.0	1.0
Jun	8.9	8.8	0.1
Jul	9.1	9.0	0.1
Aug	9.4	8.8	0.6
Sep	9.3	8.4	0.9
Oct	10.0	9.3	0.7
Nov	10.4	8.5	1.9
Dec	10.1	9.6	0.5
Jan 1979	10.0	9.0	1.0
Feb	11.2	9.9	1.3
Mar	12.9	12.5	0.4
Apr	15.3	13.7	1.6
May	17.5	15.2	2.3
Jun	20.1	15.7	4.4
Jul	18.6	16.7	1.9
Aug	18.3	16.4	1.9
Sep	18.1	15.3	2.8
Oct	18.3	15.5	2.8
Nov	18.6	16.2	2.4
Dec	18.0	15.0	3.0

Source: Tables IV-9 and IV-10.

reasonableness of selling prices and gross margins. Chapter V will address the issue of increased non-product costs in order to determine if margin expansions are cost-justified and if a direct correlation exists between gross margins and net margins.

CHAPTER V

Refiners' Net MarginsIntroduction

The net margin calculation includes such costs as marketing, manufacturing and purchased product costs which are not included in the gross margin calculation. For this reason, net margins coincide more closely with profit margins than do gross margins. The following discussion presents estimates of the distribution changes in refinery net margins among major petroleum products and the total refined barrel during the June 1976-December 1979 period relative to May 1973.

Increases and decreases in net margins varied widely among the product categories. For the June 1976-December 1979 period, increases in the nine refiners' net margins for all products over May 1973 levels amounted to \$642 million. Increases in the net margins of \$4.4 billion for motor gasoline, \$595 million for No. 2 distillate, and \$441 million for jet fuel were partially offset by decreases in net margins of \$3.2 billion for residual fuels and \$1.6 billion for "other products."

Methodology

In order to estimate the change in profitability with respect to both the total barrel and its component products (motor gasoline, No. 2 distillate, jet fuel, residual fuel oil, and other refined products), monthly data on the increase in revenues and costs

relative to May 1973 were collected from the nine refiners. The theoretical basis for the estimation of the change in refinery profits is presented in Appendix C. The reader should note that when the term "profit" is used with respect to a particular petroleum product or the total barrel, it refers to the change in margin levels since May 1973 (the base month used for DOE's pricing regulations). Changes in petroleum firms' total corporate profitability or their magnitude is not the purpose of this study.

Profit, in short, whether for a refiner or other commercial venture, equals the difference between total revenues and total costs. These totals were divided by the corresponding month's sales volume so as to facilitate the calculation of refiner net margins, which is made on a per-gallon basis. The changes in refiner net margins were estimated by subtracting the increased cost of production and marketing, which includes crude and purchased product costs (weighted by volume) as well as operating and marketing costs, from the increased revenues reported by the companies.

Once the monthly net margins for the respective products and total refinery barrel were calculated, the implied change in refiner profits could be estimated by multiplying the net margins with the corresponding sales volumes. These monthly profits and

losses were in turn summed to estimate the net revenues and net costs experienced by the nine refiners during the period July 1976 through December 1979. The resulting estimates of the refiners' before-tax net margins are discussed in the following section. It is important to note that increased costs are allocated volumetrically, that is, by taking the proportion of a particular product's share of total refinery production. This method simplifies joint-product cost allocation problems, but does not reflect a particular product's historical share of costs or revenues, in relation to the other petroleum products' share.

Motor Gasoline

Motor gasoline accounted for nearly 50 percent of refined petroleum product sales in July 1976, the first of the 42-month period investigated in this study. At the end of the period, December 1979, gasoline held an approximate 40 percent share of the refined product market. Increased profits over May 1973 on the sale of gasoline during the whole period totalled about \$4.4 billion.

Table V-1 presents the increased revenues and increased costs per gallon as well as the associated change in net margins, sales, and implied change in profits over May 1973 from the sale of gasoline by the nine refiners. The most profitable year for gasoline was 1979, when almost \$2.6 billion in increased profits was realized on sales of about 52.5 billion gallons. Profits

Table V-1. Motor Gasoline Increased Revenues, Increased Costs, Associated Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margins (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	21.14	20.50	0.64	4634	29.86
Aug	21.58	22.02	-0.44	4540	-20.09
Sep	21.28	19.73	1.55	4258	66.25
Oct	21.35	21.40	-0.05	4206	-1.73
Nov	21.02	20.15	0.86	4219	36.40
Dec	20.78	18.79	1.99	4392	87.22
Total Jul-Dec 1976				26249	197.91
Jan 1977	21.10	23.46	-2.36	3934	-92.96
Feb	22.22	23.51	-1.29	3712	-47.75
Mar	22.88	19.61	3.27	4336	141.76
Apr	23.68	23.70	-0.02	4228	-0.78
May	24.56	22.10	2.46	4336	106.68
Jun	24.72	22.70	2.02	4498	91.15
Jul	24.59	22.61	1.98	4399	87.22
Aug	24.59	21.94	2.65	4638	122.72
Sep	24.50	24.58	-0.08	4250	-3.45
Oct	24.14	21.64	2.50	4321	107.93
Nov	24.14	22.34	1.80	4206	75.69
Dec	24.12	22.59	1.53	4321	65.89
Total 1977				51179	654.10
Jan 1978	23.66	25.49	-1.83	3900	-71.28
Feb	23.56	25.83	-2.27	3775	-85.48
Mar	23.70	20.92	2.78	4452	123.69
Apr	24.19	23.06	1.13	4240	48.06
May	24.99	21.34	3.65	4684	170.88
Jun	25.97	22.40	3.57	4723	168.42
Jul	26.78	24.48	2.30	4690	108.10
Aug	27.24	22.84	4.40	5078	223.40
Sep	27.71	27.04	0.66	4657	30.89
Oct	27.63	24.71	2.92	4794	140.21
Nov	28.62	27.71	0.91	4603	41.99
Dec	29.24	27.71	1.53	4656	71.30
Total 1978				54252	970.18
Jan 1979	30.19	30.98	-0.79	4403	-34.67
Feb	31.24	31.39	-0.15	4162	-6.15
Mar	33.24	24.79	8.45	4658	393.56
Apr	36.42	32.36	4.06	4350	176.52
May	39.44	30.72	8.71	4598	400.58
Jun	43.23	38.49	4.74	4239	200.97
Jul	47.32	43.28	4.03	4372	176.28
Aug	50.56	43.60	6.96	4739	330.18
Sep	53.66	49.32	4.34	4231	183.72
Oct	55.07	47.33	7.74	4495	347.89
Nov	57.39	52.42	4.97	4130	205.22
Dec	60.45	55.04	5.41	4087	220.93
Total 1979				52464	2595.03
Total 42 Months					4417.22

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

were increasing annually over the whole period, rising from \$198 million in 1976 (July-December), to \$654 million in 1977, and to \$970 million in 1978.

The change in net margins associated with motor gasoline was negative in only 10 of the 42 months between July 1976 and December 1979. As one would expect, these negative months were, for the most part, winter months. According to Table V-1, 1979 sales were over 2 billion gallons below the previous year's sales. The near tripling of profits in 1979 relative to 1978 must therefore be due to substantial increases in the net margin, a reflection of large price increases not attributable to increased costs. The increase in net margins, which averaged about 1.5 cents per gallon prior to 1979, averaged almost 5 cents per gallon in 1979.

No. 2 Distillate

No. 2 distillate accounted for about 15 percent of refined product sales in July 1976. Its share of sales increased to nearly 23 percent in December 1979. Increased profits over May 1973 on the sale of No. 2 distillate totalled about \$595 million for the entire 42-month period.

Table V-2 presents No. 2 distillate increased revenues and increased costs per gallon along with the associated change in net margins, sales, and implied change in profits over May 1973 for the nine refiners from July 1976 to December 1979. Profits increased on

Table V-2. No. 2 Distillate Increased Revenues, Increased Costs, Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margins (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	18.15	21.40	-3.25	1374	-44.66
Aug	18.67	21.42	-2.75	1376	-37.86
Sep	18.78	18.27	0.51	1526	7.81
Oct	18.88	20.67	-1.79	1688	-30.21
Nov	19.86	16.80	3.06	2314	70.79
Dec	20.91	13.71	4.20	3004	216.31
Total Jul-Dec 1976				11282	181.19
Jan 1977	21.77	18.53	3.24	3145	101.95
Feb	22.68	21.00	1.68	2674	44.94
Mar	22.07	24.43	-2.36	2186	-51.67
Apr	22.43	31.12	-8.69	1649	-143.30
May	23.04	24.48	-1.44	1677	-24.20
Jun	23.22	29.40	-6.18	1535	-94.79
Jul	24.05	29.07	-5.02	1392	-69.89
Aug	23.52	29.32	-5.80	1558	-90.41
Sep	23.51	29.91	-6.40	1614	-103.32
Oct	24.12	23.81	0.31	1909	6.03
Nov	24.85	27.42	-2.57	1807	-46.44
Dec	24.49	18.75	5.74	2628	150.97
Total 1977				23774	-320.13
Jan 1978	24.87	20.31	4.56	2538	115.70
Feb	24.57	18.00	6.57	2585	169.66
Mar	24.62	17.59	7.03	2437	171.35
Apr	17.97	20.18	-2.21	2161	-47.83
May	24.66	24.56	0.10	1687	1.62
Jun	23.87	29.70	-5.83	1580	-92.08
Jul	23.91	33.04	-9.13	1410	-128.80
Aug	24.66	28.29	-3.63	1696	-61.56
Sep	24.51	31.86	-7.35	1689	-124.07
Oct	26.06	25.40	0.66	1939	12.73
Nov	26.45	27.98	-1.53	2059	-31.51
Dec	27.34	24.41	2.93	2519	73.80
Total 1978				24300	58.02
Jan 1979	27.75	20.87	6.88	2860	196.85
Feb	28.84	20.31	8.53	2749	234.53
Mar	31.44	21.46	9.98	2446	244.03
Apr	38.18	37.57	0.61	1664	10.23
May	42.39	37.29	5.10	1648	83.95
Jun	43.43	42.06	1.37	1526	20.89
Jul	48.60	57.78	-9.18	1332	-122.22
Aug	49.31	52.26	-2.95	1608	-47.54
Sep	53.25	64.77	-11.52	1488	-171.39
Oct	53.75	53.23	0.52	1868	9.65
Nov	66.75	66.48	0.26	1620	4.28
Dec	56.24	47.07	9.17	2302	210.98
Total 1979				23111	673.25
Total 42 Months					595.30

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

an annual basis over the period except for 1977, when they declined by \$320 million. The largest gains were realized in 1979 when profits advanced by \$673 million.

Like motor gasoline, the 1979 increase in profits from the sale of No. 2 distillate was realized in spite of a decline in sales from 24.3 billion gallons in 1978 to 23.1 billion gallons in 1979. Increased profits were therefore the result of higher net margins, which went from a one cent per gallon average decrease prior to 1979 to a 1.5 cent per gallon increase in 1979. Hence, the distribution of sales in favor of months with an increased net margin accounted for the net increase in profits during 1976 and 1978 when profits showed an increase over May 1973 of \$181 million and \$58 million, respectively.

Jet Fuel

Fuels used in aviation represent a minor part of petroleum production, accounting for only 6 percent of product sales in the 1976-1979 period. Jet fuel, on the other hand, was the third largest source of profit from refinery sales during this period, increasing by about \$440 million over profits realized in May 1973.

Table V-3 lists the increased revenues, increased costs, and associated change in jet fuel net margins over May 1973 during the period July 1976 through December 1979 for the nine refiners. Table V-3 also presents their jet fuel sales and implied change in profits over May 1973. After decreasing in 1976 and 1977 (relative to May 1973), increased profits rebounded to \$92 million

Table V-3. Jet Fuel Increased Revenues, Increased Costs, Associated Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margin (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	17.69	19.43	-1.74	572	-9.92
Aug	18.10	20.42	-2.32	605	-14.02
Sep	19.01	21.61	-2.60	556	-14.45
Oct	17.83	19.80	-1.97	530	-10.43
Nov	18.86	21.91	-3.05	520	-15.85
Dec	21.19	18.67	2.52	553	13.99
Total Jul-Dec 1976				3336	-50.65
Jan 1977	19.49	25.14	-5.65	523	-29.52
Feb	20.70	24.52	-3.82	466	-17.82
Mar	21.87	19.63	2.24	587	13.14
Apr	22.08	25.65	-3.57	545	-19.48
May	22.22	24.29	-2.08	590	-12.28
Jun	22.66	24.20	-1.53	565	-8.68
Jul	22.89	21.39	1.50	568	8.55
Aug	25.01	21.73	3.28	601	19.75
Sep	24.74	25.65	-0.91	587	-5.38
Oct	25.50	24.63	0.87	589	5.13
Nov	25.00	26.10	-1.10	576	-6.36
Dec	25.45	23.62	1.83	590	10.84
Total 1977				6787	-42.11
Jan 1978	25.95	28.78	-2.83	519	-14.66
Feb	25.47	25.72	-0.25	478	-1.16
Mar	25.69	22.58	3.11	592	18.42
Apr	27.38	25.07	2.31	535	12.36
May	25.98	27.21	-1.23	532	-6.59
Jun	25.69	25.47	0.22	572	1.25
Jul	26.72	25.60	1.12	554	6.22
Aug	26.88	21.27	5.61	609	34.18
Sep	25.83	23.76	2.07	583	12.05
Oct	27.14	26.78	0.36	535	1.94
Nov	26.37	24.94	1.43	571	8.16
Dec	27.17	23.82	3.35	594	19.91
Total 1978				6674	92.08
Jan 1979	27.70	27.76	-0.06	578	-0.37
Feb	26.30	27.32	-1.02	558	-5.67
Mar	31.38	24.97	6.42	597	38.32
Apr	33.81	36.61	-2.80	516	-14.48
May	35.77	33.36	2.41	552	13.28
Jun	39.08	31.88	7.20	592	42.66
Jul	45.31	30.91	14.40	583	83.97
Aug	49.26	38.61	10.65	626	66.73
Sep	56.67	42.20	14.47	539	77.93
Oct	53.88	43.30	10.58	585	61.90
Nov	56.55	49.43	7.12	555	39.53
Dec	58.79	52.29	6.50	577	37.46
Total 1979				6858	441.27
Total 42 Months					440.59

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

in 1978 and \$441 million in 1979. The increased 1978 profits were the result of increased net margins, which averaged 1.3 cents more per gallon than in May 1973. Sales of jet fuel in 1978 averaged 10 million gallons a month less than in 1977. The substantial increase in profits during 1979 was the result of both increased sales (which were close to 200 million gallons over the 1978 level of 6.7 billion gallons), and increased profitability of jet fuel (which rose 6.4 cents per gallon over the May 1973 level).

Residual Fuel Oil

About 15 percent of the nine refiners' petroleum product sales from July 1976 to December 1979 was residual fuel oil.

Profits for the nine refiners during this period decreased by \$3.2 billion from the sale of residual fuel, thereby offsetting almost 75 percent of the profits realized on motor gasoline.

Table V-4 presents the increased revenues, increased costs, associated change in net margins, sales, and implied change in profits over May 1973 of the nine refiners for residual fuel oil. Whereas motor gasoline profits increased annually, the reverse trend occurred for residual fuel oil in the 1976-1979 period. Profits declined by \$172 million during the last half of 1976 on sales of 9.6 billion gallons. Profits declined further by \$775 million in 1977 on sales of 19 billion gallons, by \$1.1 billion in 1978 on sales of 18.7 billion gallons, and by

Table V-4. Residual Fuel Increased Revenues, Increased Costs, Associated Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margin (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	16.73	20.40	-3.67	1468	-53.84
Aug	16.99	19.84	-2.85	1421	-40.51
Sep	17.54	21.49	-3.90	1385	-54.00
Oct	19.01	22.87	-3.86	1413	-54.50
Nov	19.22	19.26	-0.04	1835	-0.86
Dec	21.27	19.71	1.55	2058	31.96
Total Jul-Dec 1976				9580	-171.75
Jan 1977	23.16	25.70	-2.53	2064	-52.30
Feb	23.40	24.40	-0.99	2001	-19.87
Mar	24.08	29.81	-5.73	1796	-102.90
Apr	22.71	33.26	-10.55	1343	-141.60
May	21.73	24.56	-2.82	1381	-39.01
Jun	21.41	21.75	-0.34	1503	-5.08
Jul	20.92	23.49	-2.57	1629	-41.84
Aug	21.16	23.56	-2.39	1583	-37.89
Sep	21.69	29.14	-7.45	1426	-106.27
Oct	21.87	29.73	-7.86	1467	-115.34
Nov	21.13	29.52	-8.40	1307	-109.80
Dec	22.96	23.16	-0.20	1580	-3.22
Total 1977				19080	-775.14
Jan 1978	20.67	25.16	-4.49	1770	-79.50
Feb	20.12	21.38	-1.26	1834	-23.19
Mar	20.79	23.20	-2.41	1922	-46.34
Apr	21.06	30.75	-9.68	1397	-135.33
May	20.63	28.36	-7.72	1400	-108.13
Jun	19.50	27.09	-7.58	1409	-106.91
Jul	18.64	26.90	-8.26	1390	-114.74
Aug	18.85	23.72	-4.86	1514	-73.65
Sep	18.97	27.94	-8.97	1492	-133.90
Oct	20.58	27.64	-7.06	1448	-102.30
Nov	21.68	27.87	-6.20	1434	-88.84
Dec	22.48	28.64	-6.17	1685	-103.90
Total 1978				18695	-1116.73
Jan 1979	23.44	27.53	-4.09	1857	-76.01
Feb	24.70	26.82	-2.12	1730	-36.69
Mar	27.87	27.04	0.83	1724	14.36
Apr	29.56	39.06	-9.49	1313	-124.62
May	31.08	36.07	-4.99	1345	-67.19
Jun	33.99	41.39	-7.40	1244	-92.02
Jul	37.67	45.62	-7.95	1269	-100.88
Aug	39.23	52.76	-13.54	1231	-166.63
Sep	41.74	52.25	-10.95	1178	-123.76
Oct	40.04	51.00	-10.50	1312	-143.72
Nov	41.87	58.42	-16.56	1252	-207.26
Dec	47.13	49.32	-2.19	1441	-31.52
Total 1979				16896	-1155.94
Total 42 Months					-3219.56

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

\$1.2 billion in 1979 on sales of 16.9 billion gallons. Net margins during the period declined monthly by 1 cent per gallon on average in 1976, by 4.3 cents per gallon in 1977, by 6.2 cents per gallon in 1978, and by 9 cents per gallon in 1979.

Other Refined Products^{1/}

Together, motor gasoline, No. 2 distillate, jet fuel, and residual fuel oil accounted for 85 percent of refined petroleum product sales in July 1976 and for 83 percent of sales in December 1979. Profits from the remaining sales, categorized herein as "other refined products," declined by \$1.6 billion for the 42-month period. Relative to May 1973, profits on other refined products increased during only 11 months of the period, mostly in the winter.

Table V-5 contains the data for increased revenues, increased costs, associated changes in the net margin, sales, and apparent change in profits over May 1973 for other refined products. During the last half of 1976, profits declined by \$212 million on sales of nearly 8.8 billion gallons. The associated monthly net margin declined, on average, by nearly 1.5 cents per gallon relative to May 1973. The largest decline in profits of other refined products occurred in 1977, when the decrease in profits (or increase in losses)

^{1/} Includes No. 1 and No. 4 distillates, kerosene, petrochemical feedstocks, and LPG as well as aviation gasoline which was excluded from jet fuel.

Table V-5. Other Refined Products Increased Revenues, Increased Costs, Associated Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margin (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	22.81	27.10	-4.29	1417	-60.85
Aug	23.58	29.63	-6.05	1363	-82.48
Sep	25.16	29.64	-4.48	1365	-61.11
Oct	25.17	34.63	-9.55	1367	-130.62
Nov	30.66	31.12	-0.46	1487	-6.79
Dec	31.72	24.34	7.38	1765	130.18
Total Jul-Dec 1976				8764	-211.67
Jan 1977	26.90	24.53	2.37	2124	50.26
Feb	24.69	21.74	2.95	2071	61.05
Mar	24.38	26.28	-1.89	1776	-33.62
Apr	24.24	32.92	-8.68	1682	-145.98
May	30.72	35.95	-5.23	1410	-73.69
Jun	30.92	39.21	-8.29	1470	-121.96
Jul	29.31	38.35	-9.04	1440	-130.12
Aug	36.89	45.55	-8.66	1347	-116.65
Sep	32.39	38.14	-5.75	1450	-83.36
Oct	30.46	35.33	-4.87	1582	-77.12
Nov	30.21	37.26	-7.05	1548	-109.25
Dec	37.43	32.72	4.71	1630	76.79
Total 1977				19530	-703.65
Jan 1978	30.68	26.74	3.93	1961	77.13
Feb	25.13	27.60	-2.47	1974	-48.84
Mar	33.49	26.82	6.67	1752	116.95
Apr	26.59	32.29	-5.70	1637	-93.24
May	37.68	39.93	-2.25	1332	-29.99
Jun	37.02	43.49	-6.47	1356	-87.67
Jul	33.91	46.37	-12.46	1328	-165.56
Aug	47.89	49.67	-1.78	1149	-20.42
Sep	35.27	41.18	-5.92	1453	-85.99
Oct	37.50	40.82	-3.32	1444	-47.97
Nov	38.32	46.81	-8.49	1460	-124.00
Dec	41.16	38.65	2.51	1517	38.13
Total 1978				18363	-471.47
Jan 1979	40.10	33.53	6.57	1731	113.73
Feb	29.86	28.39	1.47	1996	29.38
Mar	40.90	30.54	10.36	1719	178.06
Apr	34.33	35.63	-1.30	1704	-22.09
May	52.33	45.52	6.81	1374	93.63
Jun	52.85	53.01	-0.15	1448	-2.21
Jul	58.35	65.94	-7.58	1410	-106.92
Aug	69.02	78.82	-9.81	1326	-130.00
Sep	65.97	84.65	-18.68	1382	-258.06
Oct	77.95	81.64	-3.69	1396	-51.50
Nov	65.37	67.41	-2.04	1689	-34.39
Dec	74.23	75.11	-0.87	1671	-14.65
Total 1979				18846	-205.01
Total 42 Months					-1591.80

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

totalled \$704 million on sales of almost 20 billion gallons. The associated net margins in 1977 declined monthly by an average 4 cents per gallon.

Further losses, some \$471 million, were realized in 1978 on other refined products' sales, totalling 18.4 billion gallons. The average monthly net margin declined by 3 cents per gallon in 1978. In 1979, profits declined further by \$205 million relative to May 1973. Sales of other refined products totalled 18.8 billion gallons and the monthly net margin declined by 1.6 cents per gallon on average. The largest decrease in the net margin in any month in the period studied occurred in September 1979 when the net margin for other refined products declined by 18.7 cents per gallon over May 1973.

Total Barrel

Profits on the total barrel of refined products sold by the nine refiners increased during the July 1976-December 1979 period by about \$642 million over the May 1973 base month. The increased profit reflects the increase in profits from the sale of motor gasoline, No. 2 distillate, and jet fuel (which totalled nearly \$5.5 billion) and the decline in residual fuel and other refined products' profits of about \$4.8 billion.

Data for increased revenues, increased costs, the associated change in net margins, sales, and implied change in profits of the total refined barrel for the nine companies studied are presented in Table V-6. According to the data, total barrel net

Table V-6. Total Barrel Increased Revenues, Increased Costs, Associated Change in Net Margins, Sales, and Implied Change in Profits Over May 1973 for Nine Refiners

	Increased Revenue (cents/gal)	Increased Costs* (cents/gal)	Associated Change in Net Margin (cents/gal)	Sales (MM gal)	Implied Change in Profits** (MM \$)
Jul 1976	20.06	21.53	-1.47	9465	-139.40
Aug	20.52	22.61	-2.10	9305	-194.95
Sep	20.75	21.36	-0.61	9090	-55.48
Oct	20.89	23.36	-2.47	9204	-227.50
Nov	21.71	20.91	-0.81	10377	83.69
Dec	22.56	18.48	-4.07	11772	479.65
Total Jul-Dec 1976				59213	-53.99
Jan 1977	22.61	22.81	-0.19	11790	-22.59
Feb	22.95	22.77	0.19	10922	20.55
Mar	23.11	23.42	-0.31	10681	-33.29
Apr	23.33	28.11	-4.78	9447	-451.15
May	24.65	25.10	-0.45	9394	-42.50
Jun	24.79	26.25	-1.46	9571	-139.36
Jul	24.49	26.04	-1.55	9427	-146.09
Aug	25.59	26.64	-1.05	9727	-102.47
Sep	25.14	28.37	-3.24	9326	-301.78
Oct	24.89	25.64	-0.74	9868	-73.36
Nov	24.90	26.98	-2.08	9445	-196.16
Dec	26.13	23.33	2.80	10750	301.27
Total 1977				120348	-1186.93
Jan 1978	24.85	24.59	0.26	10688	27.39
Feb	23.59	23.49	0.10	10646	10.98
Mar	25.04	21.60	3.44	11156	384.06
Apr	22.97	25.14	-2.17	9970	-215.98
May	26.11	25.02	0.29	9634	27.79
Jun	26.22	27.43	-1.21	9640	-116.99
Jul	26.15	29.29	-3.15	9372	-294.78
Aug	27.88	26.86	1.01	10046	101.94
Sep	26.84	29.89	-3.05	9874	-301.02
Oct	27.70	27.66	0.05	10159	4.61
Nov	28.47	30.38	-1.92	10127	-194.18
Dec	29.30	28.40	0.90	10972	99.24
Total 1978				122284	-466.94
Jan 1979	29.86	28.11	1.75	11428	199.52
Feb	29.15	27.22	1.92	11194	215.40
Mar	33.09	25.30	7.79	11145	868.34
Apr	35.27	35.00	0.27	9546	25.55
May	40.42	34.91	5.51	9518	524.27
Jun	43.26	41.38	1.88	9050	170.28
Jul	47.75	48.53	-0.78	8966	-69.77
Aug	51.37	50.82	0.55	9530	52.75
Sep	54.11	57.42	-3.31	8817	-291.55
Oct	56.01	53.69	2.32	9657	224.22
Nov	58.34	58.26	0.10	9246	7.38
Dec	59.77	55.57	4.20	10078	423.20
Total 1979				118172	2349.59
Total 42 Months					641.73

* Includes increased manufacturing and marketing costs over May 1973 and purchased product costs. These costs are weighted by their respective share of total increased costs.

** Some totals are slightly inconsistent due to rounding.

Source: Data are derived from company submissions to the Office of Petroleum Operations, Economic Regulatory Administration, DOE, except for sales data which were taken from EIA form P-302.

margins declined monthly during most of 1977 by about 1 cent per gallon on average, compared with declines averaging 1.8 cents per gallon during the latter half of 1976. Total barrel net margins also declined in 1978, but by only .5 cents per gallon on average. In 1979, the net margin increased monthly by an average of 1.8 cents per gallon over May 1973.

During the period studied, profits for the total barrel of refined products examined decreased annually except for 1979. In 1979, profits increased by \$2.35 billion over May 1973 on sales of 118 billion gallons of petroleum products. The largest decline in profits, \$1.2 billion, occurred in 1977 on sales of 120 billion gallons of refined products.

Summary

Table V-7 provides a comparison of the change in net margins over May 1973 associated with the major refined product categories. Relative to the gross margins summarized in Table IV-6 of Chapter IV, net margins for the selected petroleum products and total refinery barrel have been much more variable. Although there was a noticeable increase in both the net and gross margins in 1979 for the products examined, there does not appear to be a significant correlation between the two margins on a month-by-month basis.

The products with the steadiest trend in the change of their net margins during the period covered were residual fuel oil, whose

Table V-7. Comparison of Associated Changes in Net Margins Over May 1973
for Nine Refiners by Major Product Categories
(Cents per Gallon)

	<u>Motor Gasoline</u>	<u>No. 2 Distillate</u>	<u>Jet Fuel</u>	<u>Residual Fuel</u>	<u>Other Products</u>	<u>Total Barrel Weighted</u>
	<u>Change in Net Margin</u>	<u>Change in Net Margin</u>	<u>Change in Net Margin</u>	<u>Change in Net Margin</u>	<u>Change in Net Margin</u>	<u>Change in Net Margin</u>
Jul 1976	0.64	-3.25	-1.74	-3.67	-4.29	-1.47
Aug	-0.44	-2.75	-2.32	-2.85	-6.05	-2.10
Sep	1.55	0.51	-2.60	-3.90	-4.48	-0.61
Oct	-0.05	-1.79	-1.97	-3.86	-9.55	-2.47
Nov	0.86	3.06	-3.05	-0.04	-0.46	0.81
Dec	1.99	7.20	2.52	1.55	7.38	4.07
Jan 1977	-2.36	3.24	-5.65	-2.53	2.37	-0.19
Feb	-1.29	1.68	-3.82	-0.99	2.95	0.19
Mar	3.27	-2.36	2.24	-5.73	-1.89	-0.31
Apr	-0.02	-8.69	-3.57	-10.55	-8.68	-4.70
May	2.46	-1.44	-2.08	-2.82	-5.23	-0.45
Jun	2.02	-6.18	-1.53	-0.34	-8.29	-1.46
Jul	1.98	-5.02	1.50	-2.57	-9.04	-1.55
Aug	2.65	-5.80	3.28	-2.39	-8.66	-1.05
Sep	-0.08	-6.40	-0.91	-7.45	-5.75	-3.24
Oct	2.50	0.31	0.87	-7.86	-4.87	-0.74
Nov	1.80	-2.57	-1.10	-8.40	-7.05	-2.08
Dec	1.53	5.74	1.83	-0.20	4.71	2.80
Jan 1978	-1.83	4.56	-2.83	-4.49	3.93	0.26
Feb	-2.27	6.57	-0.25	-1.26	-2.47	0.10
Mar	2.78	7.03	3.11	-2.41	6.67	3.44
Apr	1.13	-2.21	2.31	-9.68	-5.70	-2.17
May	3.65	0.10	-1.23	-7.72	-2.25	0.29
Jun	3.57	-5.83	0.22	-7.58	-6.47	-1.21
Jul	2.30	-9.13	1.12	-8.26	-12.46	-3.15
Aug	4.40	-3.63	5.61	-4.86	-1.78	1.01
Sep	0.66	-7.35	2.07	-8.97	-5.92	-3.05
Oct	2.92	0.66	0.36	-7.06	-3.32	0.05
Nov	0.91	-1.53	1.43	-6.20	-8.49	-1.92
Dec	1.53	2.93	3.35	-6.17	2.51	0.90
Jan 1979	-0.79	6.88	-0.06	-4.09	6.57	1.75
Feb	-0.15	8.53	-1.02	-2.12	1.47	1.92
Mar	8.45	9.98	6.42	0.83	10.36	7.79
Apr	4.06	0.61	-2.80	-9.49	-1.30	0.27
May	8.71	5.10	2.41	-4.99	6.81	5.51
Jun	4.74	1.37	7.20	-7.40	-0.15	1.88
Jul	4.03	-9.18	14.40	-7.95	-7.58	-0.78
Aug	6.96	-2.95	10.65	-13.54	-9.81	0.55
Sep	4.34	-11.52	14.47	-10.50	-18.68	-3.31
Oct	7.74	0.52	10.58	-10.95	-3.69	2.32
Nov	4.97	0.26	7.12	-16.56	-2.04	0.10
Dec	5.41	9.17	6.50	-2.19	-0.87	4.20

Source: Tables V-1 through V-6.

net margin changes were almost always consistently negative, and motor gasoline, whose net margin changes were almost always positive, with the exception of the months of January and February. Over the July 1976-December 1979 period, the changes in motor gasoline's net margin relative to May 1973 averaged 2.3 cents per gallon per month, compared with -.3 cent per gallon per month for No. 2 distillate, 1.7 cents for jet fuel, -5.4 cents for residual fuel oil, and -2.9 cents for other products. For the total barrel of refined products, the monthly change in the net margin averaged .3 cent per gallon.

Table V-8 and Figure V-1 summarize the implied change in refined petroleum product sales' profits over the May 1973 level that were realized by the nine refiners during the July 1976-December 1979. Figure V-1 shows that on average, profitability rates declined in 1977 relative to May 1973 and then rebounded in 1978. For 1979, substantial gains were recorded for all refined products except residual fuel oil; even the declining profits trend for residual fuel appeared to be leveling off during 1979. The most striking increase in profits was for motor gasoline, which gained \$2.6 billion in 1979.

Over the whole 42-month period, the apparent before-tax change in profits for all nine refiners totalled approximately \$642 million over the level of profits realized in May 1973. This total reflects the substantial gains in profit on the sale of motor

Table V-8. Comparison of Implied Change in Profits Over May 1973 for Nine Refiners by Major Product Categories
(Millions of Dollars)

	Motor Gasoline Change in Profits	No. 2 Distillate Change in Profits	Jet Fuel Change in Profits	Residual Fuel Change in Profits	Other Products Change in Profits	Total Barrel Change in Profits
Jul 1976	29.86	-44.66	-9.92	-53.84	-60.85	-139.40
Aug	-20.09	-37.86	-14.02	-40.51	-82.48	-194.95
Sep	66.25	7.81	-14.45	-54.00	-61.11	-55.48
Oct	-1.73	-30.21	-10.43	-54.50	-130.62	-227.50
Nov	36.40	70.79	-15.85	-0.86	-6.79	83.69
Dec	87.22	216.31	13.99	31.96	130.18	479.65
Total Jul- Dec 1976	197.91	181.19	-50.65	-171.75	-211.67	-53.99
Jan 1977	-92.96	101.95	-29.52	-52.30	50.26	-22.58
Feb	-47.75	49.94	-17.82	-19.87	61.05	20.54
Mar	141.76	-51.67	13.14	-102.90	-33.62	-35.29
Apr	-0.78	-143.30	-19.48	-141.60	-145.98	-451.15
May	106.68	-24.20	-12.28	-39.01	-73.69	-42.50
Jun	91.15	-94.79	-8.68	-5.08	-121.96	-139.36
Jul	87.22	-69.89	8.55	-41.84	-130.12	-146.09
Aug	122.72	-90.41	19.75	-37.89	-116.65	-102.47
Sep	-3.45	-103.32	-5.38	-106.27	-83.36	-301.78
Oct	107.93	6.03	5.13	-115.34	-77.12	-73.36
Nov	75.69	-46.44	-6.36	-109.80	-109.25	-196.16
Dec	65.89	150.97	10.84	-3.22	76.79	301.27
Total 1977	654.10	-320.13	-42.11	-775.14	-703.65	-1186.93
Jan 1978	-71.28	115.70	-14.66	-79.50	77.13	27.39
Feb	-85.48	169.66	-1.16	-23.19	-48.84	10.98
Mar	123.69	171.35	18.42	-46.34	116.95	384.06
Apr	48.06	-47.83	12.36	-135.33	-93.24	-215.98
May	170.88	1.62	-6.59	-108.13	-29.99	27.79
Jun	168.42	-92.08	1.25	-106.91	-87.67	-116.99
Jul	108.10	-128.80	6.22	-114.74	-165.56	-294.78
Aug	223.40	-61.56	34.18	-73.65	-20.42	101.94
Sep	30.89	-124.07	12.05	-133.90	-85.99	-301.02
Oct	140.21	12.73	1.94	-102.30	-47.97	4.61
Nov	41.99	-31.51	8.16	-88.84	-124.00	-194.18
Dec	71.30	73.80	19.91	-103.90	38.13	99.24
Total 1978	970.18	58.02	92.08	-1116.73	-471.47	-466.94
Jan 1979	-34.67	196.85	-0.37	-76.01	113.73	199.52
Feb	-6.15	234.53	-5.67	-36.69	29.38	215.40
Mar	393.56	244.03	38.32	14.36	178.06	868.34
Apr	176.52	10.23	-14.48	-124.62	-22.09	25.55
May	400.58	83.95	13.28	-67.19	93.63	524.27
Jun	200.97	20.89	42.66	-92.02	-2.20	170.28
Jul	176.28	-122.22	83.97	-100.88	-106.92	-69.77
Aug	330.18	-47.54	66.73	-166.63	-130.00	52.75
Sep	183.72	-171.39	77.93	-123.76	-258.06	-291.55
Oct	347.89	9.65	61.90	-143.72	-51.50	224.22
Nov	205.22	4.28	39.53	-207.26	-34.39	7.38
Dec	220.93	210.98	37.46	-31.52	-14.65	423.20
Total 1979	2595.03	673.25	441.27	-1155.94	-205.01	2349.59
Total 42 Months	4417.22	595.30	440.59	-3219.56	-1591.80	641.73

Note: Some totals are slightly inconsistent due to rounding.

Source: Tables V-1 through V-6.

Figure V-1 Change in profits over May 1973 for nine refiners

gasoline, No. 2 distillate, and jet fuel that were largely offset by declining profits for residual fuel oil and other refined products. Together, motor gasoline, No. 2 distillate, and jet fuel accounted for 70 percent of sales and \$5.5 billion in increased profits. The sale of residual fuel oil and other refined products accounted for the remaining 30 percent of sales. Their losses totalled \$4.8 billion, of which \$3.2 billion represents residual fuel oil profit decreases.

The largest positive change in profits listed in Table V-8 occurred in May 1979, when profits from the sale of motor gasoline increased by \$400 million for the nine refiners. The corresponding change in the net margin equalled 8.7 cents per gallon over May 1973, which is the largest monthly increase for gasoline during the period covered. September of 1979, in turn, had the largest decline in profits when \$258 million was lost relative to May 1973 from the sale of other refined products. The corresponding decline in the net margin, -18.7 cents per gallon, was the largest decline for any product covered.

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APPENDIX ADescription of RegulationsPre-Embargo

Price and allocation controls on petroleum products were first established under the Economic Stabilization Program in 1971. Various phases of price controls were implemented on all sectors of the economy between August 1971 and August 1973 including general price freezes, voluntary price standards, and mandatory price controls. On March 6, 1973, Special Rule No. 1 was adopted, which was the first time regulations were adopted specifically for the oil industry. Because Special Rule No. 1 applied only to the 23 largest oil companies, petroleum prices continued to rise as a result of price increases by the uncontrolled portion of the petroleum industry. Phase IV price controls provided a comprehensive system for controlling petroleum prices at all levels of the petroleum industry and are the basis for the Mandatory Petroleum Price Regulations now in effect under the EPAA.

Embargo

The EPAA of 1973 was enacted in November 1973, to deal with the problems created by the reduction in supplies of petroleum products aggravated by the October 1973 oil embargo. Specific temporary authority was granted to the President in order to minimize the adverse impact of any shortages or dislocation of product on the American people and the domestic economy.

The objectives of the EPAA are broad in scope, and include the protection of public health, safety, and welfare; the maintenance of all public services and agricultural operations; the preservation of an economically sound and competitive petroleum industry; and the equitable distribution of crude oil and petroleum products at equitable prices among all regions and areas of the United States and sectors of the petroleum industry. One of the principal responsibilities under the statute is to balance the conflicts inherent in the Nation's need to have adequate production and supplies of petroleum products at reasonable prices.

In specifying prices, the EPAA provided for a dollar-for-dollar passthrough of net increases in the cost of crude oil and petroleum products at all levels of distribution from the producer through the retail level. All costs incurred in the purchase of the product from the crude oil wellhead to the retailer could be passed through to the ultimate consumer. Later provisions in the regulations allowed most nonproduct cost increases, such as increased wages, to also be passed on to consumers. In effect,

the regulations provided ceiling price controls on margins of sellers of crude oil and petroleum products and set maximum permissible selling prices on distributors. A margin is the difference between the purchase cost and the selling price. Sellers could sell for less than their maximum permissible selling price but they could not sell for more and remain in compliance with the regulations.

Post Embargo

In December 1975, the Energy Policy and Conservation Act (EPCA) amended the EPAA and provided a mechanism to deregulate petroleum products while giving the President standby authority to recontrol the product if necessary. Product deregulation would allow a seller to expand his margin above the maximum permissible selling price allowed under price controls.

With a finding that mandatory allocation and price controls were not necessary for a particular product and that exemption of that product from direct controls was consistent with the attainment of the objectives of the EPAA, the Department of Energy could recommend that a product no longer be regulated. These findings, based on analyses of historic and projected supply, demand, and price trends, had to reasonably demonstrate that ample supplies, adequate industry profits, and market competition prevailed which could ensure equitable prices in the absence of direct product price controls. Either House of Congress could disapprove an amendment to decontrol a petroleum product.

Decontrol

Since the enactment of the EPCA, residual fuel oil, aviation jet fuels, and middle distillates which include heating oil, diesel fuel, and kerosene, have been deregulated. Crude oil, motor gasoline, and propane are still under allocation and price controls. Price controls on crude oil are being phased out gradually. Unless the Administration proposes, and Congress approves, the deregulation of motor gasoline and propane, those products will be decontrolled on September 30, 1981, when the EPAA expires.

Refiner Price RuleOverview of Refiner Price Rule

The general provisions of FEA/DOE Mandatory Petroleum Price Regulations (10 CFR 212) limited refiners to their May 1973 net markup over product costs by requiring them to recover increased costs over May 1973 on a dollar-for-dollar basis. Increased costs were computed for three major categories: crude oil, nonproduct, and purchased product cost. Non-product costs were divided into two subcategories, manufacturing expenses and marketing costs, for the purpose of computing increased costs. Increased crude oil and manufacturing costs were computed for the entire refiners' operations and then allocated to six petroleum products, gasoline, middle distillates, residual fuel, jet fuel, propane, and other products according to either percentage of sales, or percentage of production, depending on which method was required at the time. Increased marketing and purchased product costs were computed specifically for each product category. At the time of deregulation of No. 2 distillate on July 1, 1976, the product categories were gasoline, No. 2 distillate oils, aviation jet fuel, and general refinery products. No. 2 distillate and propane were special product categories, which meant that refiners allocated to it a volumetrically proportionate share of costs, and were prohibited from reallocating costs from the other product categories into these product categories.

Eventually, all general refinery products except propane became decontrolled, as well as kerosene-based jet fuels.

Crude Oil Costs

Increased crude oil costs were computed by multiplying the current volume of purchases of crude oil by the increase in the per unit cost of crude oil over May, 1973. For example, if a refiner purchased 100 barrels of crude oil at an average of \$14.00 per barrel this month, and in May 1973, the average per unit cost of crude oil to the refiner was \$4.00 per barrel, the amount of increased crude oil cost available for setting prices this month would be

$$100 \text{ bbls} \times (\$14/\text{bbl} - \$4/\text{bbl}) = \$1000$$

$$\text{or } A^t = Q^t (C^t - C^0)$$

Where Q^t is the volume of crude of purchased in month t , C^t is the weighted average cost of crude oil purchased in month t , and C^0 is the weighted average cost of crude oil purchased in May 1973.

Manufacturing Expenses

Increased manufacturing costs were computed for about ten categories of expense items. Per unit costs for an expense item were computed by dividing the increase in dollar outlays for the item by the total production of petroleum products from refinery operations. Then the increase in per unit cost of refinery production was multiplied by the number of units of all refined products produced in the current month. For example, assuming that in May 1973, the total wage bill for refinery operations was \$1000 and total production of all refined products was 100 barrels, and in the current month the total wage bill was \$2000 and production was 150 barrels, increased cost for wages would be

$$150 \text{ barrels} \times (\$2000/150 \text{ bbls} - \$1000/100 \text{ bbls}) = \$500$$

$$\text{or } N^t = \$500$$

Purchased Product Costs

Increased purchased product cost for the total barrel was computed by multiplying the volume of purchases of six petroleum product categories in the current month by the increase in the average price of these petroleum products purchased in the current month minus the average price of these products purchased by the refiner in May 1973. For example, if a refiner's average cost for No. 2 distillate purchases in May 1973, was 10 cents per gallon and the price in the current month was 30 cents per gallon, increased costs for 100 gallons of No. 2 distillate purchases would be

$$100 \text{ gals} \times (\$.30 - \$.10) = \$20.00$$

$$\text{or } B^t = q^t (P_d^t - P_d^o)$$

Where q^t is the volume of distillate purchased in month t and P_d^t and P_d^o are the weighted average costs of distillate purchased in months t and o .

Marketing Costs

Increased marketing costs were computed specifically for the six petroleum products by subtracting the May 1973 per unit cost from the current per unit cost of marketing six petroleum products and multiplying the difference by the volume of each product sales. However, increased

marketing costs for No. 2 distillate were limited to 2 cents per gallon for retail sales and .75 cents per gallon for wholesale sales. For example, if it cost a refiner one cent per gallon to market No. 2 distillate in May, 1973, and two cents per gallon in the current month, increased marketing costs for sales of 1000 gallons would be

$$1000 \text{ gallons} \times (\$.02 - \$.01) = \$10.00.$$

$$\text{or } F = \$10$$

Crude Oil and Manufacturing Cost Allocation

Up to March 1977, the amount of increased crude oil and manufacturing costs that could be applied to petroleum product prices was primarily equal to the sum of increased crude oil and manufacturing costs multiplied by the percentage of sales of petroleum products.^{1/} After March 1, 1977, the allocation of crude and manufacturing costs for regulated products was based on the percentage of production instead of sales. To illustrate for the period after March, 1977, if No. 2 distillate accounted for twenty percent of production, then the amount of increased crude and manufacturing costs that would be applied to No. 2 distillate would be

$$.2 \times (1000 + 500) = \$300$$

$$\text{or } R^t (A^t + N^t) = \$300$$

Where R^t is No. 2 distillate production as percent of total production.

Total Increased Costs

The total costs that would be available to apply against increased revenues was equal to the sum of increased crude and manufacturing costs allocated to the six petroleum products, plus marketing and purchased product costs directly attributable to each product category.

^{1/} Prior to March 1, 1977, refiners were given the choice of using either percentage of sales or production, but most refiners chose to use percentage of sales.

For example, using the costs computed in the above examples, total increased costs would be

Crude and Manufacturing	\$300
Purchased Product	20
Marketing	10
Total	<u>\$330</u>

$$\text{or } R^t (A^t + N^t) + F^t + B^t = 330$$

Increased Revenues

Increased revenues for the six petroleum products were computed by multiplying the current volume of sales of each product by the increase in prices of each product minus the weighted average price in May, 1973. For example, if a refiner sold 1000 gallons of heating oil this month at 35 cents per gallon and in May 1973, the average price of No. 2 distillate sold by the refiner was 15 cents per gallon, the increased revenues from this sale would be \$200, or

$$1000 \text{ gals} \times (\$.35 - \$.15) = \$200$$

$$\text{or } S^u (P^u - P^o) = 200$$

Where S^u is the volume of No. 2 distillate sales in month u, and month u is the month immediately following month t, P and P are the weighted average selling prices in months u and o.

Cost Recovery Calculation

Under FEA's rules for the recovery of increased costs, a refiner was required to hold his increased costs for one month before passing them through by increasing prices.^{2/} Therefore, in determining if increased revenues were equal to or less than increased costs, a refiner would apply increased revenues in a particular month against increased costs for the previous month, including any previously unrecovered costs (banked cost) available

^{2/} 10 CFR 212.83 placed restrictions on the amount of costs that could be recovered in any particular month. For example, once a refiner had held costs for sixty days, these costs were considered to be in a refiner's limited bank. A refiner could not reduce his limited bank by more than ten percent in any one month by raising prices. This study did not collect sufficient banked costs data to take into consideration these restrictions.

at the end of the previous month. For increased costs to equal increased revenues the following would have to hold:

$$S^u (P^u - P^0) = R^t (A^t + N^t) + F^t + B^t$$

Banked Cost

If a refiner's increased revenues in a particular month did not equal or exceed his increased cost in the previous month, he could "bank" or save the remainder for use in future months. In the above example, this refiner would be able to save the difference between his total increased cost (\$330) in the previous month and his increased revenues (\$200) in the current month, amounting to \$130.00.

$$\text{or } G^u = S^u (P^u - P^0) - R^t (A^t - N^t) + F^t + B^t + G^t$$

Where G^t is the unrecovered costs at the end of month t and G^u is the unrecovered costs at the end of month u .

Reallocated Costs

A refiner was also able to reallocate increased costs from any product to gasoline. As more products were deregulated, refiners lost the availability of those costs for reallocation. Thus, the gasoline "tilt" rule was implemented to provide for costs to be allocated to gasoline in a greater than proportional manner.

Equal Application Rule

Under continued regulation, refiners would have been required to distribute costs allocated to the No. 2 product category evenly for all classes of purchasers in that category. A class of purchaser was defined as a customer, or a particular group of customers, whose price on May 15, 1973, was customarily different from prices charged to other customers, or groups of customers. A base price was computed for each class of purchaser, which was equal to the weighted average price of sales of No. 2 distillate to that class of purchaser on May 15, 1973. Costs were allocated evenly to all classes of purchasers by requiring that refiners compute an average adjustment to No. 2 distillate May 1973 prices, which was equal to increased costs allocated to No. 2 distillate divided by the estimated sales of No. 2 distillate for the current month, and applying the average adjustment to each class of purchaser. For example, using increased costs allocated to No. 2 oils in the previous example, for costs of \$330 and estimated sales of 1000 gallons,

a refiner could raise the price of No. 2 distillate to each class of purchaser by \$330/1000 or 33 cents per gallon over May 15, 1973, prices. If a refiner chose to raise his prices by less than 33 cents, say by 20 cents per gallon, the refiner could bank the 13 cents difference (in which case the total amount banked would be 13 cents x 1000 gallons = \$130).^{3/}

Even if a refiner did not choose to recover all his available costs in a particular month, he was still required to raise prices to each class of purchaser by the same amount in cents per gallon, or suffer a deemed recovery of the costs which he did not in fact recover from the lower-priced or "favored" class. A refiner could choose to raise the price to a particular class of purchaser by less than his average adjustment to base period prices, say by 18 cents per gallon in this example, rather than by the 20 cents which he actually recovered from other classes. But in computing his increased revenues for this "favored" class of purchaser, he was required to assume that he had charged the full price to the class of purchaser. In this example, he would have to compute the increased revenues for the "favored" class of purchaser by using an adjustment to May 1973 prices of 20 cents per gallon, instead of the 18 cents per gallon he actually charged. The additional two cents were deemed to have been recovered.

Effect of 10 Percent Rule

The refiner's pricing regulations required that accumulated cost increases by "aged," that is, cost increases which have been available for recovery for two months and remain unrecovered after that time, were subject to a 10 percent per month recovery limitation.^{4/}

^{3/} Ceiling prices for a particular month were computed at the beginning of the month. Costs data were available to make the calculation since these data were for the previous month. Sales data were not available since sales for the upcoming month were needed in the calculation. Estimated sales were, therefore, used to calculate ceiling prices for the upcoming month. A refiner could make his ceiling prices higher or lower depending on his forecast of sales, but at the end of the month he had to adjust his available costs for excess increased revenues for the computation of ceiling prices the following month.

^{4/} This 10 percent per month "bank draw-down" limitation was mandated by the Energy Policy and Conservation Act.

The applicability of this rule to the total barrel prices has been ignored for the purpose of this study as it is nearly impossible to reconstruct with certainty the effect of the aging requirements. The ERA would have been required to make certain simplifying assumptions concerning the composition of the various banks because the 10 percent limitation was applicable to the aged banks of all covered products taken together, not to the banks of individual product types, such as No. 2 oils, gasoline, etc.

However, it can be said with some degree of certainty that, in at least 11 months during the forty-two month period encompassed by this study, that the 10 percent limitation would have been exceeded on the "total barrel." This would have had the effect of causing more months of sequential net revenues than were calculated in the study, thereby increasing the amounts of hypothetical refunds.

Definitions

Superscript and Subscript References:

o = the month of May 1973.

t = the month of measurement; the month of measurement is the month preceding the current month.

u = the current month.

Definitions of Factors:

A^t = total increased costs of crude oil purchased or landed in total period t for refining.

B^t = total increased costs of a petroleum product category purchased or landed in period t .

C^t = average per unit cost of crude oil purchased in month t .

C^o = average per unit cost of crude oil purchased in month o .

F^t = total marketing cost increases attributable to sales of a petroleum product category in period t .

G^t = total increased costs attributable to a petroleum product that are unrecovered through period t .

G^u = total increased costs attributable to a petroleum product category unrecovered through the current period.

H = reallocation of increased costs.

S^u = total volume of sales of a petroleum product category.

N^t = total increased costs attributable to manufacturing expenses during period t .

P^o = weighted average price of a petroleum product category in May 1973 computed by dividing total revenues from the sales of category in May 1973 by the total sales volume of that product category.

P_t^o = weighted average price of distillate purchased in May 1973.

P_d^t = weighted average price of distillate purchased in month t.

P^u = weighted average price of a petroleum product category in period u computed by dividing total revenues of that category by total sales volume of sales of that category in period u.

Q^t = crude oil volume in period t as reported on DOE forms FEA-P110 and EIA-14.

q^t = volume of a petroleum product category purchased in month t.

R^t = factor for allocation increased crude oil costs in period t to a petroleum product category.

Methodology for Calculations in Chapter VIntroduction

Chapter V contains estimates for the change in profits of nine refiners^{1/} on their petroleum operations over the period July 1976 through December 1979 relative to May 1973. The estimates cover motor gasoline, No. 2 distillate, jet fuel, residual fuel oil, and other products as well as the total product barrel. The theoretical basis and methodology used to derive the estimates are presented in this Appendix.

Gross and Net Margins

A refiner's gross margin equals the spread between the average crude oil cost and the average selling price of products refined from crude oil. Gross margins are considered to be an indication of the trend in profit opportunities for the industry. Although they do not represent the exact dollar amounts refiners receive in any given period, gross margins reflect the timing, direction and fluctuation of the margin a refiner has available to cover his crude transportation costs to the refinery, refinery overhead, operating expenses, and profit.^{2/} A refiner's profitability or net margin per unit of product can thus be derived by subtracting these additional costs of production and marketing from the gross margin. The variability of these costs in recent times, including purchased product costs, precludes the use of gross margins as a reliable indicator of the trend in net margins, especially after-tax unit profits. The net margins estimated in this study are before-tax unit profits relative to May 1973.

Profits

Profits from petroleum refining like the profits of any other commercial enterprise equal the difference between total revenues and total costs of production, inventory, and marketing. A refiner may also profit from the marketing of petroleum products purchased from other refiners or wholesalers. In addition, many refiners have retail outlets for their products which provide further opportunities for profit. The present study of refiner profitability incorporates the refining purchasing for resale, wholesaling, and retailing functions of nine representative energy companies with substantial refining operations. The prices used in this study are

^{1/} Amoco, ARCO, Exxon, Gulf, Hess Marathon, Phillips, Sun, and Texaco.

^{2/} John G. McLean and Robert William Haigh, The Growth of Integrated Oil Companies, Harvard University, Boston, MA, 1954, PP. 119-120.

weighted average prices of wholesale and retail sales; however, retail sales constitute a small portion of total sales of the refiners. In order to estimate increased profits or losses from petroleum refining and the resale of purchased product during the 1976-1979 period, data on increased costs over May 1973 and the change in revenue per unit sold were collected from nine refiners. The change in revenue per gallon of refined product was derived by dividing total revenue in a given month relative to May 1973 with sales for the current month.^{3/}

The increased or decreased net margin was then estimated by subtracting the unit cost of production, purchased product, and marketing from average increased revenue. For this calculation the purchased product cost was weighted by the share of purchased products in total sales. Both purchased product and production costs were also lagged one month in order to account for a delay in intermediate purchases, production, and sales. Marketing costs were not lagged. One might also note that the estimated net margins may be overvalued because inventory charges were not included with the other costs. On the other hand, the one month lag in crude costs and other costs could more than offset the omission of storage costs since the actual lag which varies according to market conditions may average more than one month.

With the data for increased or decreased profitability it is possible to estimate increased profits or losses by multiplying the respective net margins with the associated sales volume. Summing these month-to-month profits and losses provides an estimate of the change in profits for the petroleum products studied and the total refined barrel.

These estimates will differ from realized profits by the amount of profit or loss in May 1973 and the error of the estimate. Thus, the annual and total change in profits and losses presented in Tables V-1 through V-8 are only an approximation of actual profits and losses realized by the nine selected energy companies in their refining and wholesale marketing operations during July 1976 through December 1979. The following equations further illustrate the methodology used to estimate the change in refiner net margins and profits.

Net Margin and Associated Profits Equations

In order to estimate the change in refiner profitability of selected petroleum products and the full barrel of refined products an equation for gross margins (Equation 1) was used

^{3/} Data on revenue and cost were obtained directly from the nine companies whereas sales data were taken from DOE/EIA form P-302.

to derive a formula for the net margin (Equation 2). Equation 2 was then combined with the equation for purchased product profitability (Equation 3) to derive an aggregate product profitability equation (Equation 4). In order to obtain an estimate of the change in refiner profits over May 1973, the change in net margins estimated from Equation 4 were multiplied by the corresponding sales volumes (Equation 5). All the changes () in the equations refer to the difference between the current or lagged month and May 1973.

Legend and Equations

Δ - Change in

π = Profit

C = Cost

Mfg = Manufacturing

Mktg = Marketing

P = Price

ROR = Rate of return (net margin or profitability per gallon)

S = Sales volume

c = Crude oil

np = Nonpurchased product

p = Petroleum product (e.g., motor gasoline, distillate, jet fuel, residual fuel, other)

pp = Purchased product

t = Time (t = current month, t-1 = previous month)

1. Nonpurchased Product Gross Margin:

$$\Delta (P_{np_t} - P_{c_{t-1}}) = \Delta ROR_{np_t} + \Delta (C_{mfg_{t-1}^{np}} + C_{mktg_t^{np}})$$

2. Nonpurchased Product Profitability:

$$\Delta ROR_{np_t} = \Delta P_{np_t} - \Delta P_{c_{t-1}} - \Delta C_{mfg_{t-1}^{np}} - \Delta C_{mktg_t^{np}}$$

3. Purchased Product Profitability:

$$\Delta ROR_{pp_t} = \Delta P_{p_t} - \Delta P_{pp_{t-1}} - \Delta C_{mktg_t^{pp}}$$

4. Aggregate Refiner Product Profitability:

$$\Delta ROR_{p_t} = \Delta ROR_{np_t} + \Delta ROR_{pp_t}$$

Where:

$$\Delta ROR_{p_t} = \Delta P_{p_t} - \Delta P_{c_{t-1}} - \Delta P_{pp_{t-1}} - \Delta C_{mfg_{t-1}^{np}} - \Delta C_{mktg_t^{pp}}$$

5. Apparent Change in Profits:

$$\Delta \pi = \Delta ROR_{p_t} \times S_t$$

The results of these equations are presented in the tables of Chapter V. The increased average revenue and cost data in these tables reflect the relative share of purchased and nonpurchased refined petroleum products in total sales. The associated net margin, obtained by subtracting increased costs over May 1973 from increased revenues over May 1973, was multiplied by the corresponding sales volume to derive the apparent change in profits.

CRUDE OIL AND PETROLEUM PRODUCT PRICES UPDATED

(cents per gallon)

		1980							
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
Crude oil									
Domestic	^{2/}	47.1	50.5	52.5	54.5	56.3	58.3	59.6	
Imported	^{2/}	73.2	77.1	79.6	79.9	81.7	82.1	82.2	
Composite	^{2/}	59.1	62.2	64.0	64.5	66.3	68.6	68.4	
Gasoline, Leaded Regular									
Wholesale	^{1/}	83.1	88.5	91.0	92.8	93.7	93.6	92.2	
DTW	^{1/}	82.6	89.5	93.6	94.8	95.1	95.7	95.8	
Retail	^{3/}	108.6	115.9	120.2	121.2	121.5	121.7	121.6	121.0
Gasoline, Unleaded, Regular									
Wholesale	^{1/}	84.5	90.6	93.7	95.6	95.8	96.1	96.0	
DTW	^{1/}	86.4	93.3	97.5	98.6	98.5	98.9	99.5	
Retail	^{3/}	111.0	118.6	123.0	124.2	124.4	124.6	124.7	124.3
Diesel Fuel									
Wholesale	^{1/}	76.0	78.3	79.8	80.4	80.5	81.7	82.0	
Retail	^{1/}	82.2	85.0	87.8	88.0	87.8	88.6	88.5	
Heating Oil									
Wholesale	^{1/}	75.9	77.8	78.9	78.9	79.8	80.1	79.7	
Retail	^{3/}	90.8	95.3	97.1	97.4	97.2	97.9	97.7	
Residual Fuel									
Wholesale	^{2/}	58.1	55.6	50.3	45.5	48.8	48.7	50.6	
Retail	^{2/}	62.4	63.0	60.3	54.5	56.5	57.4	57.1	
Jet Fuel-Retail									
Naphtha	^{2/}	76.0	80.1	84.1	83.2	89.1	90.0	91.4	
Kerojet	^{2/}	77.0	83.0	86.3	87.4	87.6	88.6	89.7	
Propane									
Wholesale	^{2/}	41.8	42.7	41.0	41.2	41.7	41.2	41.3	
Retail	^{1/}	59.0	62.4	60.0	64.7	64.3	59.9	64.8	

Sources: ^{1/} EIA, Monthly Petroleum Product Price Report, May 1980, updated.
^{2/} EIA, Monthly Energy Review, September 1980, updated.
^{3/} EIA, Weekly Petroleum Status Report, October 17, 1980.