

ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILES 8672
2489 SCOM 107: HOUSE SPEC. COMM. ECONOMIC DEVELOPMENT, 1997-98

1998. Under the program, subject to certain conditions, the Company may repurchase from time to time Tesoro Common Stock in the open market and through privately negotiated transactions. Purchases will depend on price, market conditions and other factors and will be made primarily from cash flows. The repurchased Common Stock is accounted for as treasury stock and may be used for employee benefit plan requirements and other corporate purposes. Repurchases of Common Stock are subject to the restricted payments provision of the Credit Facility as described below.

CREDIT ARRANGEMENTS

The Company has financing and credit arrangements with a consortium of nine banks under a corporate revolving credit agreement ("Credit Facility") which provides total commitments of \$150 million. The Credit Facility, which extends through April 2000, provides for cash borrowings up to \$100 million and issuance of letters of credit, subject to a borrowing base (which was approximately \$147 million at September 30, 1997). The Company, at its option, has currently activated total commitments of \$100 million. Outstanding obligations under the Credit Facility are secured by liens on substantially all of the Company's trade accounts receivable and product inventory and by mortgages on the Company's refinery and South Texas natural gas reserves. Under the terms of the Credit Facility, the Company is required to maintain specified levels of consolidated working capital, tangible net worth, cash flow and interest coverage. Among other matters, the Credit Facility contains covenants which limit the incurrence of additional indebtedness and restricted payments. An amendment to the Credit Facility, which was negotiated in September 1997, reduces interest rates and certain fees, increases the Company's borrowing base and makes certain covenants less restrictive. Additionally, the Company is now

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permitted to utilize unsecured letters of credit outside of the Credit Facility up to \$40 million (none outstanding at September 30, 1997). Under the Credit Facility, the Company had letters of credit of \$33.9 million, primarily for royalty crude oil purchases from the State of Alaska, and cash borrowings of \$11.9 million outstanding at September 30, 1997.

The terms of the Credit Facility allow for open market stock repurchases and the payment of cash dividends subject to a cumulative amount available for restricted payments (defined as the difference of (i) the sum since December 31, 1995, of (a) \$5 million and (b) 50% of consolidated net earnings of the Company in any calendar year and (ii) any restricted payments made since June 1996). At September 30, 1997, the cumulative amount available for restricted payments was approximately \$54 million. Annually, however, the aggregate of open market stock repurchases and cash dividends cannot exceed a maximum of \$5 million. In addition, the Credit Facility permits the Company to repurchase a limited amount of Common Stock up to \$10 million annually, specifically for oddlot buyback

programs and employee benefit or compensation plans. While the Board of Directors has no present plans to pay dividends, from time to time the Board of Directors reevaluates the feasibility of declaring future dividends.

In addition to the Credit Facility, a subsidiary of the Company has a three-year line of credit with a bank which provides up to \$10 million for the purchase of real estate and equipment for the Company's Marine Services segment at the bank's prime rate. The loan facility is not guaranteed by the Company and is secured only by such real estate and equipment that are financed. Beginning in March 1998, credit availability is reduced quarterly by 6.667%. At September 30, 1997, \$ 4.8 million was outstanding under the loan facility.

In early October 1997, the Company completed an expansion of the hydrocracker unit at its Alaska refinery. The expansion, together with the addition of a new, high-yield jet fuel catalyst, has an estimated cost of approximately \$19 million and is expected to improve the Company's refinery feedstock and product slate beginning in the fourth quarter of 1997. In October 1997, the National Bank of Alaska ("NBA") and the Alaska Industrial Development and Export Authority ("AIDEA"), under a loan agreement ("Hydrocracker Loan") entered into between the Company and NBA, provided a \$16.2 million loan to the Company towards the cost of the hydrocracker expansion. The Hydrocracker Loan matures on or before April 1, 2005 and is secured by a second lien on the refinery. Under the terms of the Hydrocracker Loan, the Company is required to maintain specified levels of working capital and tangible net worth. See Note 3 of Notes to Condensed Consolidated Financial Statements.

CAPITAL SPENDING

During the first nine months of 1997, the Company's capital expenditures totaled \$95 million which were financed with available cash reserves, internally-generated cash flows from operations and external financing. In addition, the Company has obtained outside financing, as discussed above, for expansion of the refinery hydrocracker unit. Although capital expenditures for the remainder of the year had been projected to reach \$65 million, actual capital spending will be less due to a number of factors, including the extent to which properties are acquired and the timing of capital projects. Capital expenditures for the remainder of the year are expected to be funded by cash flows from operations and external borrowings under the Company's credit arrangements.

The Exploration and Production segment accounts for \$101 million of the projected capital expenditures, with \$71 million planned for U.S. activities and \$30 million in Bolivia. Planned U.S. expenditures include \$22 million for property acquisitions; \$17 million for development drilling (participation in 16 wells), field facilities and workovers; \$13 million for leasehold, geological and geophysical; and \$19 million for exploratory drilling (participation in 14 wells). For the first nine months of 1997, actual U.S. expenditures were \$32 million, principally for participation in the drilling of five development wells

(all completed) and nine exploratory wells (seven completed). In Bolivia, projected capital expenditures of \$30 million for the year included an increase for the purchase of additional contract interests in July 1997 (see Note 2 of Notes to Condensed Consolidated Financial Statements). The projection in Bolivia includes \$3 million for one exploratory well and \$2 million for workovers and field facilities, with the remainder planned for three-dimensional seismic. Capital spending for the first nine months of 1997 totaled \$26 million in Bolivia, primarily for the purchase of additional contract interests, exploratory drilling, seismic activity and workovers. Although the Company continues to pursue exploratory, development and acquisition opportunities, as discussed above, actual capital expenditures for the remainder of the year may vary from projections.

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Capital spending for the Refining and Marketing segment is projected to be \$50 million for the year, including costs for the refinery hydrocracker expansion and a multi-year capital program to improve marketing operations. During the first nine months of 1997, the Refining and Marketing segment had spent approximately \$31 million towards capital projects.

In the Marine Services segment, capital spending for 1997 is currently projected at \$8 million, a \$21 million reduction from the original budget. This projection, of which \$5 million was spent during the first nine months of 1997, is now primarily directed towards expansion and improvement of operations along the Gulf of Mexico rather than acquisitions.

CASH FLOWS

Components of the Company's cash flows are set forth below (in millions):

<TABLE>

<CAPTION>

Nine Months Ended
September 30,

1997 1996

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Cash Flows From (Used In):

Operating Activities	\$	71.1	148.4
Investing Activities		(98.2)	(57.0)
Financing Activities		11.7	(1.8)
		-----	-----
Increase (Decrease) in Cash and Cash Equivalents .	\$	(15.4)	89.6
		=====	=====

</TABLE>

Operating cash flows of \$71 million during the 1997 Period included a \$46 million decrease in receivables due in part to collections related to high product and crude oil sales volumes at 1996 year-end and to a Bolivian receivable representing production sold in prior years, partially offset by income tax and other payments. The 1996 Period operating cash flows of \$148 million included a \$67.5 million receipt from Tennessee Gas and reduced working capital requirements. Net cash used in investing activities of \$98 million during the 1997 Period included capital expenditures of \$58 million for the Company's Exploration and Production activities, \$31 million for Refining and Marketing operations and \$5 million for Marine Services. Net cash from financing activities during the 1997 Period included borrowings of \$16 million under revolving credit facilities partially offset by payments of other long-term debt and purchases of treasury stock. At September 30, 1997, the Company's net working capital totaled \$76 million, which included cash and cash equivalents of \$7 million.

ENVIRONMENTAL

The Company is subject to extensive federal, state and local environmental laws and regulations. These laws, which change frequently, regulate the discharge of materials into the environment and may require the Company to remove or mitigate the environmental effects of the disposal or release of petroleum or chemical substances at various sites or install additional controls or other modifications or changes in use for certain emission sources. The Company is currently involved in remedial responses and has incurred cleanup expenditures associated with environmental matters at a number of sites, including certain of its own properties. At September 30, 1997, the Company's accruals for environmental expenses amounted to \$8.7 million, which included a noncurrent liability of \$3.1 million for remediation of KPL's properties that has been funded by the former owners of KPL through a restricted escrow deposit. Based on currently available information, including the participation of other parties or former owners in remediation actions, the Company believes these accruals are adequate. In addition, to comply with environmental laws and regulations, the Company anticipates that it will make capital improvements of approximately \$3 million in 1997 and \$8 million in 1998. The Company also expects to spend approximately \$6 million by the year 2002 for secondary containment systems for existing storage tanks in Alaska.

Conditions that require additional expenditures may exist for various Company sites, including, but not limited to, the Company's refinery, retail gasoline outlets (current and closed locations) and petroleum product terminals, and for compliance with the Clean Air Act. The amount of such future expenditures cannot currently be determined by the Company. For further information on environmental contingencies, see Note 4 of Notes to Condensed Consolidated Financial Statements.

POLAR MINING INC

4545 Wood River Dr.
Fairbanks, Alaska. 99709
Mine Phone 907-455-4198, Fax 907-455-8245

March 19, 1998

Representative Jerry Sanders
Room 414 State Capitol
Juneau, Alaska. 99811

Dear Sir:

I understand you are conducting a teleconference today to investigate fuel pricing. Though I am unable to attend I would like to have my comments included as part of the testimony received.

I am the President and General Manager of Polar Mining Inc, a family owned and operated mining company operating year round in the Fairbanks area over the past 20 years. We employ up to 40 employees, with seasonal variations, and have been dramatically effected by last years 20% decrease in gold prices. Last season we consumed 800,000 gals of diesel fuel at our mine and this is a significant part of our total operating expenses.

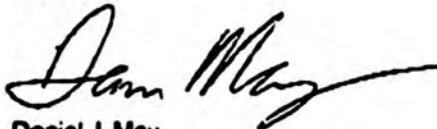
It has come to my attention that there exists a large price difference between fuel refined in North Pole and available for sale to Fairbanks consumers versus the same fuel transported to Anchorage and available to consumers there. In fact recent charting has shown the oil from the north slope can be transported to Washington, refined and sold there for \$0.27 gallon less than the same product sells for in Fairbanks. (based on rack prices of #2 Diesel as of 2/1/98)

It is my understanding that #1 diesel fuel produced @ Mapco's North Pole Refinery can be transported to Anchorage at a cost of approx. \$0.06/ gal, and then sells off the rack in Anchorage @ \$0.53/gal. plus tax. The cost to transport this same fuel back to Fairbanks via independent trucker is \$0.105 that would make this double hauled fuel cost \$0.64 returned to Fairbanks. This is still 12 to 14 cents a gallon less than the current Fairbanks rack price for this product. If this information is correct there is some serious gouging taking place to the local consumer.

I tried to confirm this pricing by calling MAPCO Fairbanks, where I was directed to MAPCO Anchorage. My voice mail message of 3/16/98 to the Anchorage MAPCO marketing office in which I asked for posted rack pricing for #1 Diesel at both Fairbanks and Anchorage has yet to be answered.

I have confined my comments to diesel fuel pricing as that affects me the most. However the same discrepancy exists across the product line and the local consumers appear to be paying extra to line the pockets of this out of state company. I understand that part of the statute that allowed the sale of Alaska's royalty oil to the refinery calls for fair pricing, and I do applaud your investigation into this matter.

Sincerely,



Daniel J. May
President

April 22, 1998

Representative Jerry Sanders
Chairman, Economic Development Committee
State Capitol
Juneau, AK 99811

Dear Representative Sanders:

I applaud your efforts to examine the relationship between crude oil prices and petroleum product prices in Alaska. Bringing down the cost of air, land and water transportation, remote diesel power generation, space heating, and fishing, construction and mining activities will due much to further economic development throughout Alaska.

Please consider the following data:

1. Alaskan refineries experienced increased profit margins in 1997.
 - a. MAPCO'S Fourth Quarter 1997 Earnings Report (attachment 1) states: "The Alaskan refinery experienced a margin increase on processed barrels sold of 45 percent over the prior year."
 - b. TESORO'S 1997 Earnings Report (attachment 2) states "The unit achieved higher margins on refined products through increased sales within its core, Alaska market".
2. At crude costs of \$12.47/bbl and gasoline pump prices of \$1.10/gallon, California refiners operate on a margin of \$0.22/gallon (attachment 3). At the same crude costs and pump prices of \$1.24/gallon, Alaska refiners operate on a gasoline margin of \$0.50-\$0.60/gallon. (attachment 4)
3. Alaska's in-state refiners are moving to capitalize on increased demand in Alaska for jet fuel.
 - a. In the fourth quarter 1997, TESORO completed expansion of their hydrocracker to produce 25% more jet fuel.
 - b. MAPCO is midway through an expansion to increase jet fuel production by 14,000 bbl/day to 35,000 bbl/day.
4. Clearly and justifiably so, these expansion plans reflect the expectation to produce additional jet fuel into the Alaskan market at a profit. With recent Anchorage jet fuel prices in the \$0.50 to \$0.60/gallon range, and with crude costs in the \$0.30/gallon range, the in-state refiners apparently believe they can make a profit at a refinery margin in the range of \$0.20-\$0.30/gallon.

5. In major markets in the U.S., gasoline does not wholesale at significantly higher prices than jet fuel (attachment 5). Yet in Alaska, gasoline wholesales for significantly more than jet fuel.

Are the in-state refiners making a larger margin on local gasoline sales than on jet fuel? If so, why should international air carriers be major beneficiaries of in-state refining when Alaskan's are less so?

Apparently, the proximity of the Anchorage jet fuel market to marine transportation makes for a large volume, competitive environment where in-state refiners must compete with other suppliers. This is not the case in many other markets in Alaska, especially considering the consolidations, vertical integrations, and product swaps that have occurred in the industry in the last few years.

Make no mistake, Alaska's in-state refiners are good for Alaska. They are an excellent example of how value added processing can provide hundreds of millions of dollars of vital economic activity. These companies make major contributions to the communities in which they operate and provide much needed economic diversification.

Indeed, the challenge you face is how to encourage this in-state refining in a manner that also fosters increased in-state competition, thereby complying with the intent of AS 38.05.183(e)(4) to "provide refined products or by-products for distribution and sale in the state with price or supply benefits to the citizens of the state".

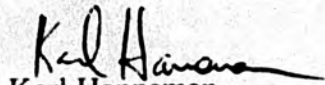
An open dissemination of product price information would help improve the efficiency of the Alaskan markets. Such information is not presently readily available to the citizens of the state, as the refineries are not always able to discuss pricing policies, even with some gasoline retailers. (see testimony to Alaska Royalty Oil & Gas Development Advisory Board, House & Senate Journal Supplement No. 16.)

To encourage more efficient markets and to help fulfill the statutory objective, I suggest that the Department of Revenue add comparative jet fuel and gasoline wholesale prices for Anchorage and Anacortes, Washington to their excellent web site that already tracks crude oil prices (www.revenue.state.ak.us/). This price information is readily available from the Oil Price Information Service (OPIS) for a few thousand dollars per year which, although beyond the reach of the average consumer, is very reasonably priced for a producer state like Alaska. Anacortes is a logical choice because refiners in that area utilize Alaska North Slope crude for feedstock and it is the closest competitive port to Alaska. Anchorage is an acceptable first step, as it is the only Alaskan city that is

currently tracked by the commercial services. An excellent example of how this information could be disseminated is located at the State of California website at www.energy.ca.gov/fuels (attachment 6).

The in-state refiners have pledged to maintain sensitivity and fairness toward the Alaskan consumer. Please assist them in this difficult task by supporting a website that provides an open flow of petroleum product price information for the benefit of all Alaskans.

Respectfully submitted,



Karl Hanneman

626 Second Street, Suite 201
Fairbanks, Alaska 99701

cc: Interior Delegation
Fairbanks North Star Borough Assembly

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quarter operating profit of \$23.9 million in 1997, compared to \$23.0 million for the same period in 1996.

The Alaska refinery experienced a margin increase on processed barrels sold of 45 percent over the prior year and a total sales volume increase of 6 percent, due largely to an increase in jet fuel sales.

At the Memphis Refinery, a lower margin environment during the fourth quarter more than offset record throughput of 118,000 barrels per day. On Jan. 19, 1998, the refinery started production of an incremental 2,000 barrels per day of refinery-grade propylene and will increase production by another 2,000 barrels per day by the end of 1998.

MAPCO'S RETAIL PETROLEUM BUSINESS, MAPCO Express, which markets petroleum products and other merchandise through a network of 252 convenience stores and interstate travel centers, had an operating loss of \$0.5 million for the fourth quarter of 1997 compared to operating profit of \$4.7 million for the same period in 1996.

Fourth quarter results were affected by slightly lower gasoline sales per store, combined with higher per store operating expenses related predominately to implementing strategic growth plans and a \$1.6 million environmental accrual.

MAPCO Express is planning a major growth initiative in its interstate highway presence. The Company expects to open 20 new travel centers during 1998.

OTHER BUSINESSES, which include FleetOne and TouchStar Technologies, are in various stages of development. On a combined basis, these businesses reported a fourth quarter 1997 operating loss of \$4.2 million.

All earnings per share amounts contained herein are reported on a diluted basis in accordance with Statement of Financial Accounting Standards No. 128 "Earnings Per Share."

Statements contained herein, other than matters of historical fact, are forward-looking statements and are made based upon management's expectations and beliefs concerning future developments and their potential effect on the Company. There can be no assurance that future developments will be in accordance with management's expectations or that the effect of future developments on the Company will be those anticipated by management. Among the factors that could cause actual results to differ materially from such forward-looking statements are changes in the regulatory, economic, competitive, or climatic conditions in strategic areas of the Company's operations.

MAPCO press releases are also available on the World Wide Web at <http://www.mapcoinc.com>.

MAPCO INC. OPERATING STATISTICS

	Three Months Ended		Twelve Months Ended	
	December 31,		December 31,	
	1997	1996	1997	1996
NATURAL GAS LIQUIDS				

#2



Quotes & News

Quote, News & Company Digest

Agreement

QUOTES

Quote, News & Digest

Multiple Quotes

Industry Quotes

Quote Bank

Rateboard

Personal Stock Ticker

MODEL PORTFOLIO

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* Please note: both stock and option quotes may be retrieved using stock symbols.

PR NewsWire

Tesoro's Earnings Double From Normalized Prior Year

SAN ANTONIO, Jan. 29 /PRNewswire/ -- Tesoro Petroleum Corporation (NYSE: TSO) today announced net earnings for 1997 had doubled compared with 1996 when excluding certain nonrecurring items from the prior year. Net earnings for 1997 were \$30.7 million, or \$1.16 per share, compared with a normalized \$13.9 million, or 53 cents per share, in 1996.

Reported net earnings in 1996 were \$74.5 million, or \$2.87 per share, which included the effects of an above-market-price natural gas sales contract, which was terminated at the end of 1996.

"Since our earnings were not supported by a high-priced gas contract, these results show significant progress toward our goal of improving the profitability of our assets," said Chairman, President and CEO Bruce Smith. "Our downstream operations doubled in profitability, and the upstream segment increased reserves through a combination of acquisitions and an aggressive exploration program."

Downstream Operations More Than Double Operating Profit

While total downstream profit doubled in 1997, operating profit for Tesoro's Refining and Marketing segment more than tripled from 1996, reaching \$20.5 million. R&M's operating profit in 1996 was \$6.0 million. The unit achieved higher margins on refined products through increased sales within its core, Alaska market and through operating improvements.

Operational modifications implemented during 1997 greatly contributed to the profit improvement. The Company's Kenai, Alaska, refinery had scheduled turnarounds in both 1997 and 1996. The 1997 turnaround expanded the plant's hydrocracker, which allowed increased jet fuel production starting in the fourth quarter.

The Company's Marine Services segment had operating profit of \$6.3 million, up from \$6.1 million in 1996. Operating improvements made in the first half of the year resulted in improved returns in the last six months of 1997. The segment opened two new facilities in its Gulf of Mexico service area at Intracoastal City, Louisiana, and Houston.

Exploration and Production Increases Acreage, Opens New Field

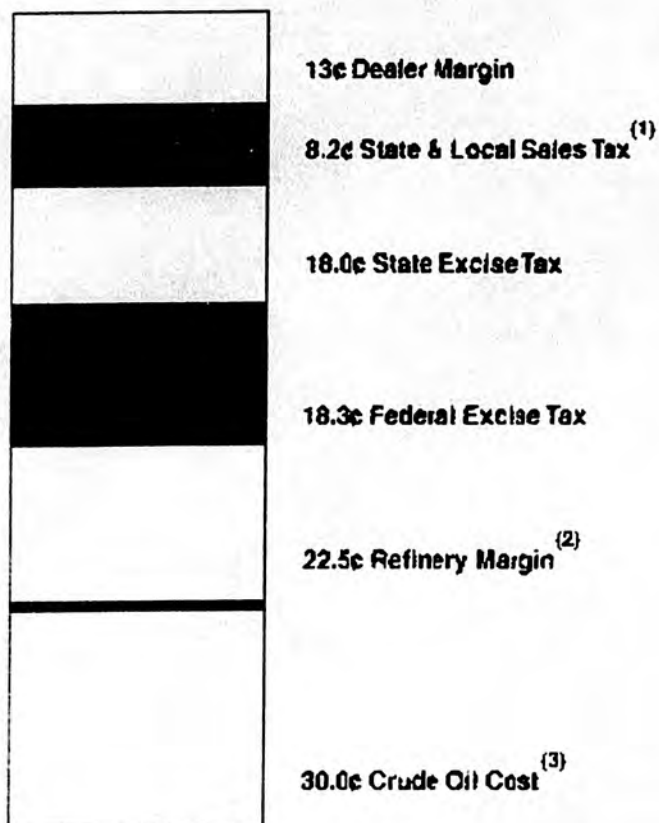
Operating profit for Exploration and Production was \$45.9 million in 1997, compared with \$48.1 million in 1996 after excluding the impact of the above-market-price natural gas sales contract.

California Motor Gasoline Price Breakdown

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Many factors influence the price of gasoline. The figures below are based on a gallon of California reformulated regular unleaded gasoline costing **\$1.10 per gallon**, with Alaska North Slope crude oil costing **\$12.47 per barrel**. Prices will vary depending on geographical location, competition among gasoline stations, local taxes, refiner and dealer margins, transportation costs, etc.

Based on a California Reformulated Unleaded Regular gasoline costing \$1.10 and ANS crude oil costing \$12.47 per barrel.



Notes:

1. Using state and local sales tax totaling 8%. Other localities' sales tax may vary.
2. Refinery margin includes all costs associated with production and distribution of gasoline including refining and terminal operation, crude processing, oxygenate additives, product shipment and storage, oil spill prevention fees, depreciation, brand advertising and profits.
3. Crude oil prices fluctuate daily causing a change of 2.4 cents per gallon in the crude cost for gasoline for every \$1.00 per barrel change in crude oil cost.

Note: Crude oil and wholesale price changes may not be reflected immediately in the retail price of gasoline.

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E-mail us at: energia@energy.ca.gov
 "Energia" means ENERGY in Greek and Latin.

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Based on Unleaded Regular gasoline costing
Alaska North Slope Crude costing

1.24 /gallon and
12.47 /barrel

Typical Fairbanks Scenario

\$	0.12	Dealer Margin
\$	0.08	State Tax
\$	0.18	Federal Tax
\$	0.51	Refinery Margin
\$	0.30	Crude Oil Cost
\$	0.05	Quality Bank Penalty
\$	1.24	

Typical Anchorage Scenario

Nov 1 - Mar 1 (gasahol)

\$	0.12	Dealer Margin
\$	0.02	State Tax
\$	0.18	Federal Tax
\$	0.62	Refinery Margin
\$	0.30	Crude Oil Cost
\$	1.24	

Utility Purchases Another Heating Oil Firm

Providence Energy, the first East Coast utility to enter the heating oil distribution business, has just made another acquisition.

The company just bought a small Providence-based heating oil retailer, Izzy Oil, adding an estimated 500,000 gal of residential heating oil business.

Sources tell OPIS that the company is eyeing a much more substantial acquisition which could be completed this quarter. Future purchases will be focused on residential, rather than commercial/industrial business, we are told.

Providence Energy was the first utility to acquire an oil firm, buying Warwick, R.I.-based Super Service last fall. Super Service had a heavy concentration on the commercial side with 25 million gals of heating oil, diesel, gasoline and lubricants business. Super Service had about 2,600 residential customers. Providence Energy also bought Johnston, R.I.-based Mohawk Oil, which gave it some 1,500 residential heating oil customers in the Providence metro area.

The utility now has about 3,000 residential customers and delivers about 27.5 million gal annually of oil to

commercial customers.

A number of utilities have recently forged alliances with wholesalers who have a niche delivering fuel to industry. But the companies that Providence Energy is targeting are full margin retail companies, particularly in areas like Rhode Island where rack-to-retail differentials have remained substantial. The company will ultimately bundle electricity sales to those customers, but such sales look to be at least a couple of years away, at least in Rhode Island.

The utility also has kept downstream oil sales personnel intact, recognizing that the "high touch personal service can't be replicated" by a large utility, a source told OPIS.

Petroleum asset brokers say that the emergence of utilities as buyers in the retail heating oil business has led some marketers to overvalue their businesses this spring. Last year's \$1.00 gal-plus sales for retail gallons may not be achieved because of the rough winters that some major consolidators have experienced, they add.

One edge for utilities on the buy side: they can structure deals so that retailers can get high yield "safe"

N.Y. Harbor Spot Barge Daily Diary

	FRIDAY (04/03)	MONDAY (04/06)	TUESDAY (04/07)	WEDNESDAY (04/08)	THURSDAY (04/09)	WK AVG.
No.2	43.50-44.50	42.50-43.75	42.00-42.50	41.75-42.75	42.75-43.25	42.925
No.2#	44.75-45.75	44.00-45.00	43.50-44.00	43.25-44.25	44.00-44.65	44.315
Mid.	48.75-49.75	46.75-48.75	46.25-46.75	46.50-47.50	46.25-47.75	47.500
Unl.	46.50-47.50	44.75-46.50	44.25-44.75	44.50-45.50	44.25-45.75	45.425
Pre.	52.25-53.25	49.75-52.25	49.25-49.75	49.50-50.50	49.50-50.75	50.675
Jet 54	44.75-45.75	44.25-45.25	43.75-44.25	43.50-44.25	44.25-44.75	44.475
RFG Unl.	49.00-50.00	47.25-49.00	46.50-47.00	46.75-47.75	46.25-47.50	47.700
RFG Mid.	51.00-52.00	49.00-50.50	48.25-48.75	48.50-49.50	48.25-49.50	49.525
RFG Pre.	53.75-54.75	51.75-53.00	50.75-51.25	51.00-52.00	51.00-52.25	52.150
55Ker/Jet	45.15-46.15	44.50-45.50	44.00-44.50	43.75-44.50	44.75-45.25	44.805

Gulf Coast Spot Pipeline Daily Diary

	(04/03)	(04/06)	(04/07)	(04/08)	(04/09)	
No.2	40.65-41.65	40.15-41.45	40.00-40.50	39.75-40.75	40.75-41.25	40.690
No.2#	41.85-42.85	41.25-42.25	41.00-41.50	41.00-41.75	42.00-42.50	41.795
Mid.	47.25-48.25	44.25-46.50	44.00-44.50	43.50-44.75	44.75-46.25	45.400
Unl.	45.50-46.50	42.50-44.75	42.00-42.75	41.50-42.75	42.75-44.25	43.525
Pre.	50.00-51.00	47.00-49.25	46.75-47.25	46.50-47.75	47.75-49.25	48.250
Jet 54	41.50-42.50	41.35-42.35	41.00-41.50	40.75-41.75	41.75-42.25	41.670
RFG Unl.	50.25-51.25	48.25-50.00	47.50-48.25	44.75-46.00	46.00-47.50	47.975
RFG Mid.	52.00-53.00	50.00-51.75	49.25-50.25	46.75-48.00	48.00-49.50	49.850
RFG Pre.	54.50-55.50	52.75-54.50	51.75-53.00	49.75-51.00	51.00-52.50	52.625
7.8 Unl.	46.50-47.50	44.00-45.75	43.25-43.75	42.50-43.75	44.00-45.50	44.650
7.8 Mid.	51.00-52.00	48.50-50.25	47.75-48.50	47.50-48.75	49.00-51.50	49.475
7.8 Pre.	48.25-49.25	45.75-47.50	45.00-45.75	44.50-45.75	46.00-48.00	46.575
55Ker/Jet	42.25-43.25	41.50-42.50	41.00-41.50	41.00-42.00	42.00-42.50	41.950

Group 3 Spot Pipeline Daily Diary

	(04/03)	(04/06)	(04/07)	(04/08)	(04/09)	
No.2	45.50-46.50	45.00-46.00	45.00-45.50	45.00-46.00	46.15-46.65	45.730
No.2#	46.00-47.00	45.50-46.75	45.25-45.75	45.00-46.00	46.25-46.75	46.025
Unl.	48.25-49.25	46.50-48.25	46.00-46.50	46.00-47.25	46.75-47.45	47.220
Pre.	51.00-52.00	49.25-51.00	48.75-49.25	49.00-50.25	49.75-50.65	50.090

Chicago Spot Pipeline Daily Diary

	(04/03)	(04/06)	(04/07)	(04/08)	(04/09)	
No.2	42.35-43.35	42.00-42.75	42.00-42.60	42.25-43.50	43.75-44.25	42.880
No.2#	44.65-45.65	44.25-45.00	44.00-44.50	44.00-45.00	45.15-45.65	44.785
Mid.	48.25-49.25	47.50-49.00	47.50-48.25	47.50-48.75	48.50-49.25	48.375
Unl.	46.25-47.25	45.25-47.00	45.00-45.75	45.00-46.00	45.75-46.50	45.975
Pre.	51.25-52.25	51.00-52.00	51.25-51.75	51.25-53.00	52.75-53.50	52.000
Jet 54	44.75-45.75	44.35-45.35	43.75-44.25	43.50-44.75	44.50-45.00	44.595
RFG Unl.	49.00-50.00	48.00-49.75	48.00-48.75	48.00-49.00	48.75-49.50	48.875
RFG Mid.	50.50-51.50	49.50-51.25	49.50-50.25	49.75-50.75	50.50-51.25	50.475
RFG Pre.	53.00-54.00	52.00-53.75	52.00-52.75	52.50-53.50	53.25-54.00	53.075

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utility stock as payment for their companies. The utilities can also pay for acquisitions via annuities that are backed by financially sound holding companies.

Other utilities which have purchased or allied themselves with oil firms this winter include AllEnergy (Pal Oil and Dead River) and Connectiv (Petron).

Tom Kloza

Mobil Gives Second Quarter Gasoline Rebate

Mobil Oil is giving Middle Atlantic and Northeastern dealers a gasoline rebate for the months of April, May, and June. The rebate gives dealers the choice of same month 1997 volume or 110 percent of the same month 1996 volume, whichever is lower.

At 97 percent of total gasoline sales and 100 percent of premium sales dealers get back 3cts gal on all grades of gasoline, regardless of how many gallons are purchased. The midgrade and premium payout is contingent upon the dealer reaching 100% of base sales of the premium products.

At 103 percent of total gasoline and 105 percent of premium products, the rebate expands to 4cts gal. The 4cts on regular is paid out regardless of how many gallons are purchased, as long as the customer hits 103%. The 4cts on premium is paid only if the account hits 105 percent of premium product sales. Those in the 100 to 104.9 percent range would get a 3cts rebate on the premium grades.

The final stage of the rebate kicks in at 108 percent of total gas and 110 percent of premium products. The deal goes to 5cts gal on all grades, as long as these two thresholds are met. For purposes of the rebate, Mobil combines Special and Super Unleaded volumes.

Ben Brockwell

Colonial: Complex Model Problem Resolved

Colonial Pipeline confirms that complex model RFG shipments are now meeting new volatile organic compound (VOC) standards set by the pipeline on March 29. A pipeline spokesman tells OPIS "we have not turned down any recent shipments."

The pipeline upped the previous 13.1% standard to 17.1% after realizing that the lower standard was not getting enough VOC reductions.

Shippers had up to 300,000 bbls of complex model RFG rejected prior to the March 29 VOC change, including 125,000 bbls of Mobil's 93 octane gasoline. Citing a discrepancy between Colonial's and Mobil's testing results, Mobil spokeswoman Jeanne Mitchell said the product, shipped on Colonial March 29, had to be reclassified.

Exxon was also said to have some complex model fuel rejected but denied there was a problem. According to unconfirmed reports, the problem was with another grade of gasoline.

Valero said it was "not hurt adversely" in terms of shipments not meeting spec. "We had to change a couple of blends," said a company spokesman.

EPA will allow a 2% VOC test tolerance for the remainder of the year (this is how EPA refers to it in their letter) but aims to discontinue downstream enforcement tolerances altogether next year. In a March 26 letter to NPRA, EPA says tolerances should not be extended for motor fuels - none have been announced for standards in other areas of environmental regulation, such as water toxins.

EPA policy dictates that that enforcement discretion

Los Angeles Spot Pipeline Daily Diary

	FRIDAY (04/03)	MONDAY (04/06)	TUESDAY (04/07)	WEDNESDAY (04/08)	THURSDAY (04/09)	WK AVG.
No.2#	47.00-48.00	46.00-47.00	46.50-47.50	46.00-47.00	46.00-46.50	46.750
Carb	54.50-55.00	53.00-54.00	53.00-54.00	53.00-54.00	52.00-53.00	53.550
UnlCARFG2	58.00-59.00	56.50-58.00	57.00-57.50	56.50-57.50	55.50-56.00	57.150
PreCARFG2	64.00-65.00	62.50-64.00	63.00-63.50	62.50-63.50	61.50-62.00	63.150
Unl.	53.50-54.00	52.00-53.50	52.00-52.50	52.00-53.00	51.00-51.50	52.500
Pre.	60.00-60.50	58.00-59.50	58.00-58.50	58.00-59.00	57.00-57.50	58.600
Jet 54	49.00-50.00	47.50-48.50	46.50-47.50	46.50-47.00	46.00-47.00	47.550
RFG Unl.	57.25-58.00	55.50-57.00	56.00-56.50	55.50-56.50	54.50-55.00	56.175
RFG Pre.	63.25-64.00	61.50-63.00	62.00-62.50	61.50-62.50	60.50-61.00	62.175

San Francisco Spot Pipeline Daily Diary

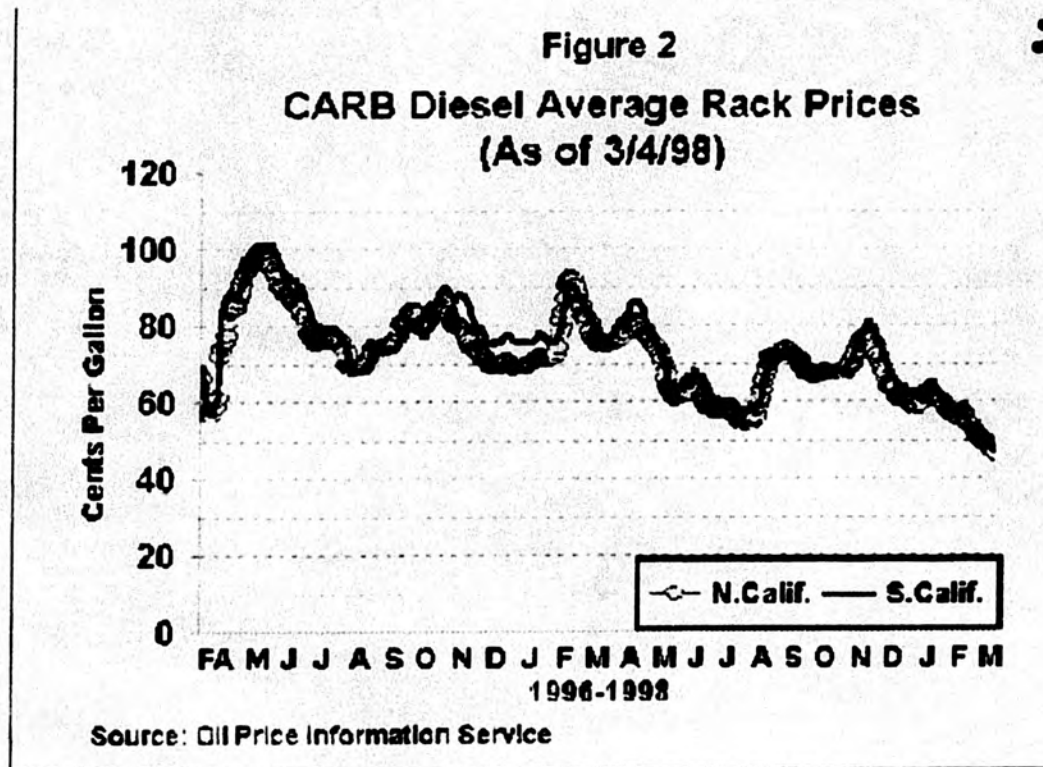
	(04/03)	(04/06)	(04/07)	(04/08)	(04/09)	
No.2#	47.50-48.50	46.50-47.50	46.50-47.50	46.00-47.00	46.00-46.50	46.950
Carb	55.00-55.50	53.50-54.50	53.00-54.00	53.00-54.00	52.00-53.00	53.750
UnlCARFG	58.00-59.00	56.00-58.00	56.50-57.50	56.25-57.25	55.50-56.50	57.050
PreCARFG	64.00-65.00	62.00-64.00	62.50-63.50	62.25-63.25	61.50-62.50	63.050
UnlCARFG2	58.00-59.00	56.00-58.00	56.50-57.50	56.25-57.25	55.50-56.50	57.050
PreCARF2	64.00-65.00	62.00-64.00	62.50-63.50	62.25-63.25	61.50-62.50	63.050
Unl.	53.50-54.00	51.50-53.50	51.50-52.50	51.75-52.75	51.00-52.00	52.400
Pre.	60.00-60.50	57.50-59.50	57.50-58.50	57.75-58.75	57.00-58.00	58.500
Jet 54	46.00-46.50	45.50-46.00	43.50-44.50	43.50-44.00	43.00-43.50	44.600

Pacific Northwest Spot Daily Diary

	(04/03)	(04/06)	(04/07)	(04/08)	(04/09)	
No.2	41.50-42.50	40.50-41.50	41.00-42.00	41.00-42.00	40.50-41.50	41.400
No.2#	48.00-49.00	47.00-48.00	48.00-49.00	47.50-48.50	47.00-48.00	48.000
Unl.	50.50-51.50	50.50-51.50	50.50-51.50	50.50-51.00	51.50-52.00	51.100
Pre.	56.00-57.00	56.00-57.00	56.50-57.50	56.50-57.00	57.50-58.00	56.900
Jet 54	48.50-49.50	47.00-48.00	47.00-48.00	48.00-49.00	47.50-48.50	48.100

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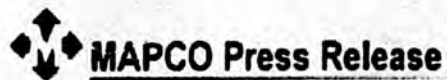
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NC = Northern California Average
SC = Southern California Average

Source: United Communications Group's Oil Price Information Service -- Phone: 1-800-929-4824, ext. 645
Web Site: <http://www.ucg.com/energy/energy.htm>

[Go to Diesel and Gasoline Status Page](#)



March 31, 1998

Merger Closes News Release

Williams announced today it has completed the acquisition of MAPCO Inc., a strategic milestone in enhancing Williams' ability to compete for a greater share of the U.S. energy market and shifting the bulk of the company's assets into an unregulated business environment.

The acquisition is valued at \$3.1 billion based on a fixed exchange ratio of 1.665 shares of Williams stock for each share of MAPCO stock and the \$31.3125 per share price of Williams' common stock at Friday's close of trading.

The completion of the acquisition follows the Federal Trade Commission's announcement on Friday that the combination of the companies may proceed.

"Finally, we can begin delivering on the promise of the merger," said Keith E. Bailey, chairman, president and chief executive officer of Williams. "We believe even more today in the fit between the two businesses and would expect to begin quickly implementing the enhanced opportunities the combination brings. MAPCO operations should immediately add to our ongoing earnings and open new business opportunities throughout Williams."

MAPCO shareholders can expect to receive information about surrendering MAPCO stock certificates for Williams certificates shortly after the closing.

Much of the organizational structure for the combined Williams-MAPCO organization is complete. MAPCO businesses will fall under the direction of Stephen L. Cropper, president and chief executive officer of Williams' energy services group. Williams is evaluating the optimum use of its and MAPCO's headquarters buildings in Tulsa. Williams and MAPCO customers should continue to use their existing contacts unless specifically advised of a change.

The new energy services organization, which will have \$6.2 billion in assets, will include:

- An energy marketing and trading unit that is a top-tier physical and financial trading company. Its market scope is throughout North America, providing natural gas, power and petroleum products marketing at the wholesale and retail level, as well as energy financing. The unit includes MAPCO's Thermogas retail and wholesale propane business, as well as supply, marketing and trading functions from all MAPCO businesses. Jerry Gollnick, senior vice president and general manager of Williams' energy marketing & trading unit, will lead this unit.
- An exploration and production unit that operates 448 wells and has natural gas reserves of 600 billion cubic feet. It owns 1,220 square miles of 3D seismic data and is actively engaged in exploring on- and off-shore in Texas and Louisiana and in the northern and

southern Rocky Mountains. Ralph Hill, senior vice president and general manager of exploration & production for Williams, will lead this unit.

- A midstream gas and liquids unit that provides a full range of natural gas liquids marketing services through an infrastructure of gathering, processing, underground storage and distribution systems, including MAPCO's 10,000-mile Mid-America Pipeline, plus Williams' 11,000 miles of gathering lines, 10 processing plants and eight treating plants. Steve Malcolm, senior vice president and general manager of Williams' field services unit, will lead this segment.

- A petroleum services unit that includes a 9,300-mile pipeline system and 53 product terminals that move an average of 225 million barrels, or nearly 9.5 billion gallons, a year with access to 35 percent of U.S. refining capacity. Also included are MAPCO's MidSouth and Alaska refineries, MAPCO Express retail gasoline and convenience outlets, and FleetOne, MAPCO's fleet fueling and management business. This unit also can produce fuel and industrial ethanol at plants in Pekin, Ill., and Aurora, Neb. **Robert Sachse**, who served as MAPCO executive vice president and chief operating officer, will lead this unit during the transition period until the leader is named.

Williams, through its subsidiaries, is the nation's largest-volume transporter of natural gas and provides a full range of traditional and leading-edge energy and communications services. Its gas pipeline group has \$7.7 billion in assets and the communications group has \$1.3 billion in assets.

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RAND Journal of Economics
Vol. 27, No. 3, Autumn 1996
pp. 429-451

Dynamic pricing in retail gasoline markets

Severin Borenstein*

and

Andrea Shepard**

Supergame models of tacit collusion show that supportable price-cost margins increase with expected future collusive profits, ceteris paribus. As a result, collusive margins will be larger when demand is expected to increase or marginal costs are expected to decline. Using panel data on sales volume and gasoline prices in 43 cities over 72 months, we find behavior consistent with tacit collusion in retail gasoline markets. Controlling for current demand and cost, current margins increase with expected next-month demand and decrease with expected next-month cost. The results are not consistent with intertemporal linkages due to inventory behavior or customer loyalty.

1. Introduction

■ In recent years, economists have developed numerous models to distinguish empirically between collusive and noncollusive pricing behaviors.¹ Generally, these studies have attempted to uncover collusive behavior by estimating relationships among contemporaneous observations of output, cost, and price. In contrast to most of these studies, we present a test for collusion that is based on the relationship between current price and expected future demand and cost conditions. Most prior studies have tested for collusion in industries best characterized as tight oligopolies: the U.S. automobile industry and 19th-century U.S. railroads, for example. We examine behavior in markets with many, differentiated firms.²

Our approach exploits the insights from supergame models in which tacitly collusive outcomes are supported by repeated play. In these models, self-enforcing collusion depends on the current gain from defecting being smaller than the anticipated

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We thank Dennis Carlton, Sam Peltzman, Jim Poterba, Peter Reiss, Mike Riordan, Garth Saloner, two anonymous referees, and seminar participants at the NBER Industrial Organization Summer Institute, U.C. Berkeley, Boston University, University of Chicago, and Stanford University for helpful comments and discussion. Jamie Woods provided excellent research assistance. Any remaining errors are our own.

¹ These include Porter (1983, 1985), Bresnahan (1987), Porter and Zona (1993), and Ellison (1994). Bresnahan (1989) provides a useful review.

² Throughout this article we use "collusion" to mean implicit collusion supported by repeated interaction. Successful collusion of this type does not imply that firms in these markets are earning excess profits or engaging in activities that violate U.S. antitrust laws.

future loss from the punishment triggered by defection. The gain from defecting occurs at the time of the defection and increases in current collusive profits. The punishment loss is realized in the future when other firms respond to the defection. The expected punishment loss increases in the expected difference between the future collusive profits that would have been earned absent defection and the future profit earned when firms are punishing defection. Collusion is more difficult to sustain (i.e., the highest sustainable collusive margin will be lower) when either the gain from defection is greater or the anticipated loss from punishment is lower. Using this general framework, Rotemberg and Saloner (1986) construct a model in which firms anticipate changes in demand. They show that when current demand is higher (lower) than expected future demand, collusion is more (less) difficult to sustain because the gain from cheating increases in current demand while the loss from punishment increases in future demand. Using an analogous argument, collusion is more (less) difficult to sustain when current costs are lower (higher) than expected future costs. Haltiwanger and Harrington (1991) apply this logic to a deterministic demand cycle and show that, holding constant the current level of demand and cost, collusion is more difficult to sustain when demand is declining or cost is increasing.

These models predict that current margins will respond to expected future demand or cost when firms are pricing collusively. In particular, the models predict that current margins will respond positively to expected future demand and negatively to expected future cost. These predictions are inconsistent with standard noncooperative models in which current margins are not a function of expected future conditions. Noncollusive models that could explain a link between today's margins and expected future market conditions usually rely on either consumer loyalty or inventory behavior. We argue below that these alternatives have empirical implications that are not supported by the data.

We test for collusive pricing in retail gasoline markets by examining retail margins (price at the pump minus the wholesale price). In some respects, these markets are a natural setting for the test. The theoretical models rely on predictable changes in demand and marginal cost, and there are predictable changes both in the retail demand for gasoline and in wholesale gasoline prices, which is our proxy for marginal cost.³ Because there is a marked seasonal cycle in the demand for gasoline, some of the movement in demand can be anticipated. Because there are lags in the response of wholesale gasoline prices to crude oil shocks, some of the variation in wholesale prices is also predictable.

The structure of these markets, however, is not typical of those in which collusion is commonly viewed as probable. Collusive behavior in these markets implies at least tacit cooperation over prices at gasoline stations. In the urban areas we study, there are many more gasoline stations than the "few" firms assumed in the theoretical models.⁴ Since collusion is more difficult to sustain as the number of firms increases, the existence of many firms seems incompatible with cooperative pricing. However, gasoline stations sell a product that is differentiated by brand, service, and, most importantly, location. The number of firms operating in a metropolitan area, therefore, may not be a good indicator of the number of effective competitors in any actual retail market. Further, prices at stations need not be set independently: some stations have a common manager who sets prices at all stations he/she owns or manages. In addition, retail prices are posted and can be changed quickly and at low cost, making it easy to detect

³ Wholesale gasoline price constitutes about 85% of the retail price. The other significant contributors to the marginal retail cost are (some) labor costs and the costs of delivering gasoline from the terminal to the retail outlet. Neither of these other components are nearly as volatile as the wholesale price.

⁴ See Borenstein and Gilbert (1993) for information on retail market structures.

from defecting occurs. The punishment is severe. The expected future collusive profits are greater when firms defect. In the Rotemberg framework, Rotemberg (1987) shows that changes in demand, expected future demand, and expected future market power increase the incentive to defect. Using an infinite horizon model, Rotemberg (1991) applies the Rotemberg model to gasoline markets. When demand is de-

creased, expected future demand is lower, and the incentive to defect is reduced. Rotemberg (1991) predicts that current margins are negatively affected by expected future demand. Noncollusive models predict that current margins are positively affected by expected future demand. We argue below that the data support the Rotemberg model.

Rotemberg (1991) shows that in gasoline markets, the magnitude of the effect of expected future demand on current margins is large. Rotemberg (1991) shows that the magnitude of the effect of expected future demand on current margins is large. Rotemberg (1991) shows that the magnitude of the effect of expected future demand on current margins is large.

Rotemberg (1991) shows that the magnitude of the effect of expected future demand on current margins is large. Rotemberg (1991) shows that the magnitude of the effect of expected future demand on current margins is large. Rotemberg (1991) shows that the magnitude of the effect of expected future demand on current margins is large.

Other significant contributors to the literature on gasoline markets include Rotemberg (1987), Rotemberg (1991), and Rotemberg (1991).

defection and respond rapidly. As a result, the gain from defecting will be small, making tacit collusion easier to sustain.

Further, prior research indicates that pricing in retail gasoline markets is not well characterized by standard competitive models. Slade (1986) presents evidence from a single retail market in Vancouver that station-level demand is not perfectly elastic and rejects the hypothesis of competitive pricing. In related work, Slade (1987) concludes that pricing in the Vancouver market is characterized by implicit collusion in which periods of cooperation alternate with price wars triggered by demand shocks. Borenstein (1991) and Shepard (1991) show that U.S. gasoline stations have sufficient local market power to implement price discrimination across gasoline grades or service levels. Although the structure of the market makes it unlikely that the firms come close to achieving the monopoly price in a supgame equilibrium, these results suggest that the possibility of some collusive pricing cannot be rejected *a priori*.

Our work is most closely related to Ellison's (1994) test of the Rotemberg and Saloner model using data on railroad prices and outputs during the era of the Joint Executive Committee cartel. Ellison models the collusive price as a function of the ratio of current to expected future demand. He finds no evidence of an effect on current margins, but notes that the explicit railroad cartel might not be an environment in which the implicit collusion of the Rotemberg-Saloner model is likely to apply. Hajivassiliou (1989) also tests this model in the Joint Executive Committee cartel, but relies on contemporaneous price and quantity data only. He finds little support for the prediction that collusion is less likely when current demand is high.

The results of our analysis are consistent with the predictions of the collusive pricing models. Controlling for current demand and wholesale price, we find that current margins increase with expected next-period demand and decline with expected next-period wholesale price. The magnitudes of these effects are not large in absolute value: increasing expected next-period demand by 10% increases the current margin, which averages about eleven cents, by about .42 cents. Increasing the expected wholesale price of gasoline by ten cents reduces current margins by about .63 cents. The economic importance of these effects is not in the magnitude of their impact on consumer prices, but in what they suggest for the behavior of firms in these markets. They indicate that departure from single-period Nash behavior may be more common than is suggested by studies focusing on tight oligopolies. They also demonstrate that the technique used here to uncover firm behavior might be useful in markets where collusion would have more pronounced welfare effects.

In the following section we describe the models on which the empirical work is based. In Section 3 we discuss the data we use and in Section 4 the estimation procedure. The results are presented in Section 5. We discuss alternative hypotheses in Section 6 and offer concluding comments in Section 7.

2. Models of price dynamics

Bresnahan (1989) and others point out that diagnosing collusive pricing from only contemporaneous price, cost, and demand data is quite difficult. The fact that noncooperative behavior is consistent with a variety of pricing patterns poses a serious problem in these endeavors. For example, noncooperative prices may increase or decrease in response to positive demand shocks, depending on the cost structure and whether the shocks change the composition of demand as well as its level.¹ As a result, efforts to distinguish collusive from noncooperative behavior generally have relied upon restrictive assumptions about the functional forms of demand and cost. Recent models

¹ For this reason, we do not focus on the effect of current demand to diagnose implicit collusion.

of collusion, however, have implications for dynamic pricing that more easily distinguish the behavior consistent with these specific models from noncooperative outcomes.

Rotemberg and Saloner (1986) develop a model in which firms sustain implicit collusion by adjusting current margins in response to anticipated changes in demand. In their model, very-high-demand periods are outlying realizations of an independently and identically distributed demand shock. An individual firm has a relatively large incentive to deviate from the collusive price in these periods because it is able to capture a share of an unusually large market by doing so. Current deviations would be punished by lower prices in future periods. If deviation is to be prevented, the potential loss earned by the firm in the punishment phase must be at least as great as the potential gain from deviating in the current period. The punishment loss anticipated by a deviating firm is the present value of the difference between the profits it expects to earn in the future while colluding and those it expects to earn under the lower, punishment prices. If demand is independently and identically distributed, current demand realizations have no effect on expectations of future demand, and the expected loss is constant. In high-demand periods, then, collusion can be sustained only by reducing the gains to deviating, i.e., by reducing current collusive profits. The highest sustainable collusive margin will therefore be lower in periods after which demand is expected to decline.

Haltiwanger and Harrington (1991) reformulate this model in the context of a deterministic demand cycle. In this environment, it is possible to distinguish the level of demand from the expected change in demand.⁶ To understand their model, it is easier to reverse the thought experiment and hold constant the gain from deviating. Consider a simple model in which firms have constant marginal cost, produce an undifferentiated product, and engage in Bertrand competition during punishment periods. Assume that monopoly (or perfectly collusive) profits would be procyclical (i.e., increase with demand). Notice that the Bertrand assumption and constant marginal costs imply that punishment-period profits are always zero.

Consider two periods, t_1 and t_2 , with equal demand. Because current demand is equal, the gain from deviating is equal. Suppose that demand is increasing at t_1 and declining at t_2 . Near-term, future collusive profits are, therefore, expected to be higher at time t_1 than at t_2 . Because near-term profit is weighted more heavily in evaluating the present value of future profits, the expected collusive profit forgone by deviating is higher at t_1 . With punishment profit constant by assumption, this means that the loss from deviating will be higher at t_1 . The highest sustainable collusive margin will therefore be higher at t_1 than at t_2 . In this formulation, margins respond positively to changes in expected near-term demand, holding constant current demand.

Both the Rotemberg-Saloner and Haltiwanger-Harrington models explicitly hold marginal cost constant over time. If changes in input prices create predictable shifts in marginal cost, however, it is straightforward to show that these models also imply that margins will be affected by expectations about future marginal cost. Suppose demand does not change over time and marginal cost is invariant to output. Then if input prices are expected to rise next period, the expected increase in marginal cost will cause expected collusive profits to decline. This will reduce the potential loss from future punishment. Therefore, holding constant current marginal cost, expected future changes in marginal cost will have a negative effect on current margins.

This discussion suggests three tests for collusive pricing. First, collusive margins will respond to anticipated changes in cost and demand. Second, controlling for current

⁶ In the Rotemberg-Saloner model, the distinction between level and derivative cannot be made. A high demand necessarily implies a negative expected derivative, and a low demand implies a positive expected derivative.

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demand, margins will respond positively to expected increases in near-term demand. Finally, controlling for current input prices, margins will respond negatively to expected increases in the input prices.

Before proceeding to the empirical test of these predictions, it is important to recognize that these stylized game-theoretic models do not precisely comport with conditions in retail gasoline markets. For our application, the most troublesome assumption of these models is that punishment profits are invariant to demand and cost movements. If punishment means a reversion to a noncooperative equilibrium so that "punishment" and "noncollusive" profits are equal, this assumption might be violated in gasoline markets. On the demand side, there is reason to believe that noncollusive margins would be changed with demand.⁷ In this case, the preceding argument about the relationship between expected demand changes and collusive margins relies on the effect of demand changes on collusive profits being larger than the effect of demand changes on noncollusive profits. Similarly, the prediction that margins will respond negatively to expected future input price changes assumes that a change in cost will change collusive profits more than noncollusive profits. While that is the case in many models, it is not general.

What this implies for our empirical work is that the signs of the effects of future demand and input costs on current margins are not unambiguous, as they are in the stylized models. Margins should still respond to expected future cost and demand conditions when firms are colluding. So a finding of any effect of expected future conditions on current margins supports the claim that firms are not in a noncooperative equilibrium. However, we are not certain that the effects will run in the direction predicted by the models.

3. The data

■ The estimation procedure uses data on retail prices, wholesale prices, crude oil prices, and gasoline demand. We describe these data in this section, along with some relevant details on gasoline distribution. Descriptive statistics appear in Table 1.

Retail margin is defined as the retail price (the price paid by consumers at the pump) minus the wholesale price of gasoline. The price at the pump is clearly defined, but selecting the appropriate "wholesale" gasoline price is complicated by the structure of gasoline production and distribution and by observability. Retail gasoline markets are local: consumers typically buy gasoline within a limited geographic area. The relevant price for a given retail market, then, is the wholesale price of gasoline in that geographic area. Wholesale gasoline markets are defined by terminal locations. Most larger cities (and all those in our sample) have a city terminal supplied with gasoline by pipeline or water transport. From the terminal, gasoline is trucked to gasoline stations by refiners or by independent distributors who purchase gasoline at the terminal. Any given station has a single wholesale supplier.

Approximately 55% of the retail gasoline sold in the United States is sold at stations supplied by independent wholesales (called "jobbers" in the gasoline industry; see Temple, Barker, and Sloan, Inc. (1988)). At the terminal, jobbers are charged a posted price set by refiners on a terminal-by-terminal basis. This is called the "terminal price." Jobbers own and operate some of the stations they supply, and for gasoline sold at these stations there is no additional wholesale market transaction. At stations that jobbers supply but do not operate, there is a transaction between the jobber and

⁷ One argument is that high-demand periods have disproportionately more demand from vacation travelers who are buying gasoline in unfamiliar locations and therefore have higher search costs. Higher search costs imply that firm-level elasticities will be higher. For a more complete discussion, see Borenstein and Shepard (1994).

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Table 1 Descriptive Statistics (2,873 observations)

Variable	Mean	Standard Deviation	Minimum	Maximum
Retail price (cents per gallon) <i>RETAIL</i>	72.81	12.56	43.18	126.57
Terminal price (cents per gallon) <i>TERMINAL</i>	61.82	11.94	36.00	111.88
Crude oil price (cents per gallon) <i>CRUDE</i>	46.02	10.90	25.83	87.98
Retail-terminal margin (cents per gallon) <i>MARGIN</i>	10.99	5.41	-8.91	34.90
Gasoline volume (gallons $\times 10^6$ /day) <i>VOLUME</i>	6.56	6.54	.38	38.11
Normalized gasoline volume <i>NVOLUME</i>	1.004	.093	.570	1.617
Expected normalized gasoline volume <i>EXP NVOLUME</i>	1.004	.086	.633	1.402
Expected terminal price (cents per gallon) <i>EXP TERMINAL</i>	62.05	11.09	36.45	112.77

station operator, but the price for this transaction is not publicly available. Similarly, for the gasoline sold at stations supplied directly by a refiner, there is no additional wholesale transaction if the station is owned and operated by the refiner. At the independently operated stations they supply, refiners sell gasoline to the station at the "dealer tankwagon price" (DTW). The DTW price is posted at the terminal. Less than 30% of the gasoline sold in the United States is sold at these refiner-supplied, but independently operated, stations (see U.S. Department of Energy (1988)).

For our purposes, the terminal price is the best proxy for marginal cost. For jobbers, it is the only observable wholesale price. It is also the opportunity cost of gasoline sold through refiner-supplied stations. Finally, unlike the DTW price, the terminal price is less subject to discounting off the posted price, according to people familiar with the industry. Refiners and station operators report that there is widespread discounting off posted DTW prices.⁸ Unobservable, systematic discounts would be particularly troublesome here because their depth and prevalence probably varies with the refiner's perception of profitability in a given market at a particular time.

Because we use terminal price as the input cost, the margin we use for the empirical work is potentially affected by both the supplier (jobber or refiner) and the station operator. At stations operated by the supplier, the margin is set by the supplier alone. At independent stations, the retail price is set by the station operator but may also be affected by the supplier's use of quantity forcing and nonlinear pricing in the delivered price.⁹ Without future information, it is impossible to determine whether the patterns we observe in retail margins reflect primarily the response of refiners and jobbers or of station operators.

⁸ One person employed by a major refiner to set its delivered prices reported that a substantial portion of his division's effort was expended trying to infer rivals' actual delivered prices from their posted DTW prices.

⁹ For a more complete discussion of how retail prices are set, see Shepard (1993) and Borenstein and Gilbert (1993).

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City	Maximum
8	126.57
0	111.88
3	87.98
1	34.90
3	38.11
0	1.617
1	1.402
5	112.77

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For retail prices (*RETAIL*) we use the average price for unleaded, 87 octane, self-service gasoline in each of 43 cities. These averages are reported by Lundberg Survey based on a monthly survey of gasoline stations in each city.¹⁰ Lundberg reports the survey date and the average price in the city for that date. The surveys always occur on a Friday, and the stations sampled change infrequently. The prices have been adjusted to exclude all sales and excise taxes. As is the case for all prices used in the study, retail prices are in nominal dollars.¹¹

The terminal price (*TERMINAL*) is the average of all branded, unleaded, 87 octane terminal prices posted at the city terminal as reported by Lundberg. Because Lundberg reports average terminal prices for each Friday, we can match the average terminal and retail prices by date and city. The retail margin (*MARGIN*) is simply *RETAIL* - *TERMINAL* for a given city at a point in time.

Figure 1 shows the monthly movement in retail, terminal, and crude oil prices for 1986-1991.¹² As is clear in the graph, a large share of the volatility in terminal prices (and therefore in retail prices) is the result of shocks to the price of crude oil. The effect of the Gulf War in 1990-1991, for example, is quite clear in the data, as is the waning effect of the OPEC cartel at the beginning of the sample period. Although this is less clear in the figure, terminal prices respond with a lag to shocks to crude oil. Borenstein and Shepard (1996) estimate that approximately two-thirds of the eventual passthrough of crude price changes occurs in the first two weeks following the shock. The lags imply that future terminal prices will be influenced by both current and past crude price movements. As a result, decisionmakers have information from which to form time-varying expectations about future terminal prices. In the econometric model, we exploit this relationship to estimate expected terminal prices.

The data on gasoline consumption (U.S. Federal Highway Administration) are the total retail volume of gasoline sold in each state in each month. These data are tied to payment of the federal excise tax on gasoline. For each city, we use the volume data for the state in which the city is located. In those states for which Lundberg provides data on more than one city, we have randomly selected a single city to avoid replicating the volume data.¹³ We divide the monthly volume figures by the number of days in the month to get an average daily consumption series for each state.

Movements in the quantity of gasoline consumed per day, as shown in Figure 2, are much more regular than the movements in price.¹⁴ Gasoline demand follows a clear seasonal pattern in the United States: national demand is higher in the summer months, with the annual peak in August and the trough in January. On average, the August peak consumption is 23% above the January trough. There is also long-run movement in consumption—annual volumes rise over the first half of the 1986-1991 period and then decline again—but this is swamped by the seasonal movement.

Because the volume data are cumulative monthly consumption, we have only average daily consumption for each month. The price data, in contrast, record the average price on a single Friday in the month. This raises the issue of how best to match the

¹⁰ This seems to be the best data series on retail prices. Other sources, such as *Oil and Gas Journal*, estimate retail prices from wholesale prices.

¹¹ During our sample period, inflation was fairly stable at about 4%. The results are virtually unchanged if we deflate all prices by the consumer price index.

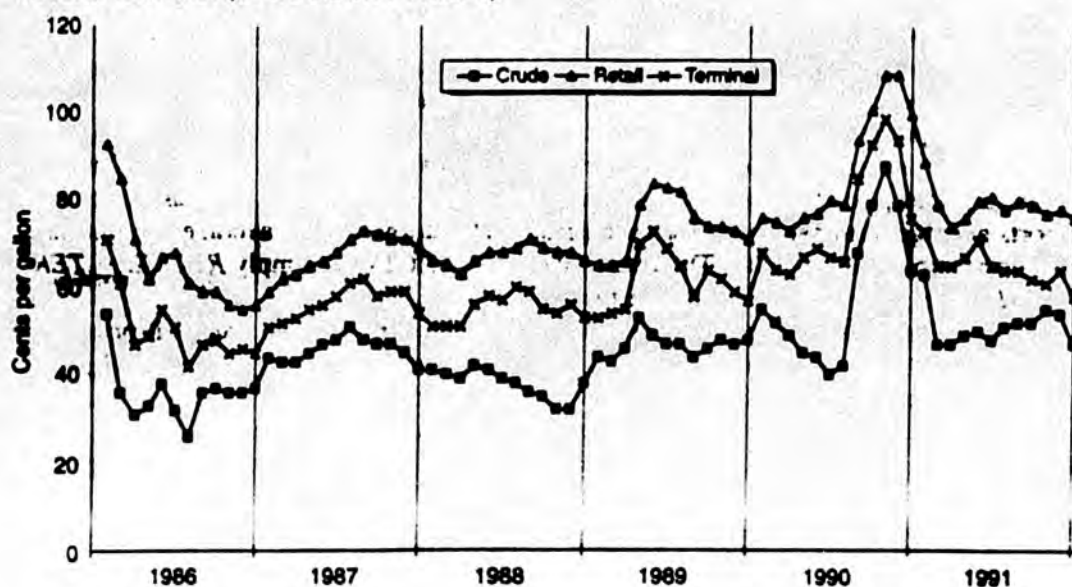
¹² The retail and terminal price series in Figure 1 are average monthly prices for the 43 cities included in our sample. The crude oil price series is the gulf coast spot price for West Texas Intermediate crude oil. The sample period is determined by the available retail gasoline price and volume data. We have gasoline price data for 1986-1992 and volume data for 1982-1991.

¹³ We also estimated the empirical model using data on all (59) cities for which data are available. The results were substantively the same as those reported in Tables 2 and 3.

¹⁴ The data for Figure 2 are average daily consumption for the 43 cities in our sample. They are not the interpolated series described below, but interpolation would have no substantive effect on the figure.

FIGURE 1

PRICES 1986-1991 (AVERAGE CITY PRICES)



price on a given Friday with the average daily volume series. The daily volume for the first Friday in April, for example, is probably best approximated by some combination of the average daily volume in March and in April. We therefore use a linear interpolation approach to construct a weighted average of the daily volumes in adjacent months.¹⁵ The weighting scheme assigns a weight of one to the j th month's average daily volume if the observation happened to record prices on the middle day of that month. The weight on the current month declines linearly with movement away from the middle day. If, for example, prices were recorded for the first day of the month, the weighting scheme would apply a weight of about one-half to the average daily volumes of months j and $j - 1$.¹⁶ The interpolated daily average is reported in Table 1 as *VOLUME*.

Finally, we divide the interpolated daily average in each state by its state mean over the sample period. The resulting normalized volume series (*NVOLUME*) expresses consumption as a proportion of the state's average daily consumption. This normalization removes the cross-sectional variation in daily volume introduced by variations in state populations: over 99% of the variance in *VOLUME* is accounted for by differences between state means. States with higher means also have more variation around the mean in absolute magnitude. If the effect of volume on margin were estimated using absolute deviations from state means in a standard fixed-effects formulation, the estimates would be heavily influenced by differences in state populations. *NVOLUME* removes this variation, leaving us with a series in which the remaining cross-sectional

¹⁵ In unreported estimates, we used a cubic rather than a linear spline. We have also used the reported-month daily volume with no interpolation. The results are robust to the interpolation technique.

¹⁶ More precisely, if v_j is the average daily volume for month j , which has n_j days, and d_y is the day on which retail price is observed, then the interpolated volume on the day price is observed, $\hat{v}_y$, is given by

$$\hat{v}_y = \begin{cases} v_j \left(\frac{1}{2} + \frac{d_y}{n_j} \right) + v_{j-1} \left(\frac{1}{2} - \frac{d_y}{n_j} \right) & \text{if } d_y \leq \frac{n_j}{2}; \\ v_j \left(\frac{3}{2} - \frac{d_y}{n_j} \right) + v_{j-1} \left(\frac{d_y}{n_j} + \frac{1}{2} \right) & \text{if } d_y \geq \frac{n_j}{2}. \end{cases}$$

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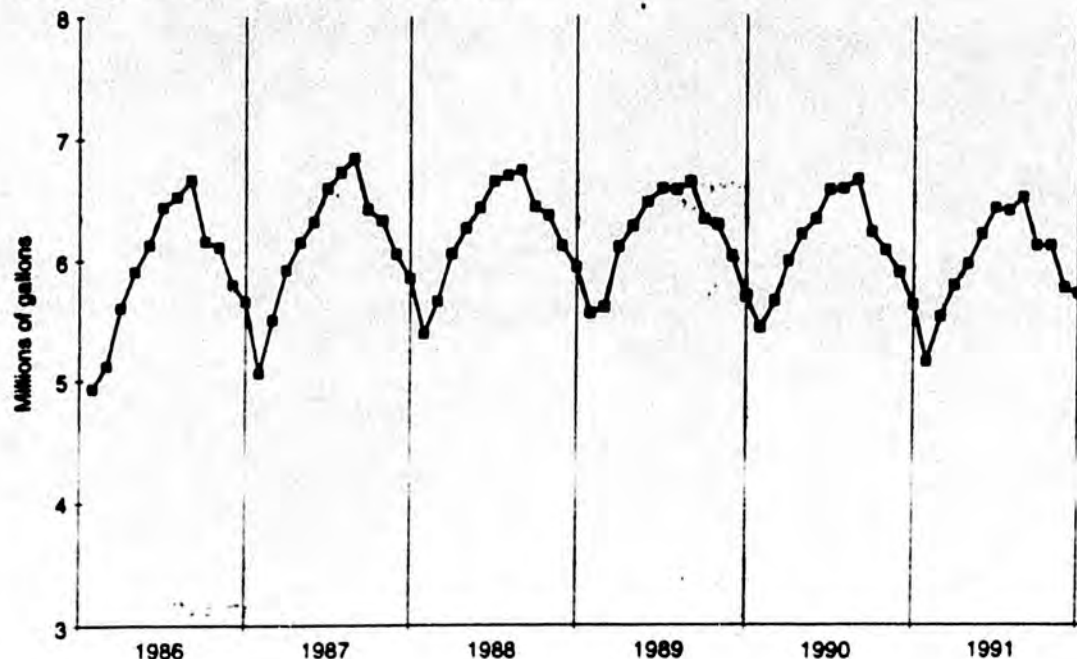
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FIGURE 2

DAILY VOLUME 1986-1991 (STATE AVERAGES)



variation reflects temporal differences in state-level demand patterns. Using *NVOLUME* also provides us with a better variable for station-level demand. A 20% change in California daily volume represents (approximately) a 20% change at the observed California stations. This change is comparable to the change at Vermont stations that is represented by a 20% change in Vermont demand.

4. Estimation Issues

■ A number of estimation issues must be addressed to develop consistent estimates of the effect of expected future demand and cost on current margins. As we argue below, the correct procedure involves estimating expected future demand and cost, allowing for lagged responses of both retail and wholesale prices to crude oil shocks, correcting for heteroskedastic and correlated errors, and instrumenting for endogenous variables. Before addressing all of these issues, however, we take a simple "first cut" at the data to explore the basic relationships. These preliminary estimates (reported in Table 2) should be viewed only as descriptive statistics and as a motivation for the empirical models developed later.

□ **Data exploration.** We begin by running an ordinary least squares regression of margin on current volume, next-period volume, current terminal price, next-period terminal price, and a set of time and city fixed effects. Next-period volume (*NVOLUME_{t+1}*) and terminal price (*TERMINAL_{t+1}*) are included as proxies for the expected future values that the theory predicts will influence current margins. There are two concerns about these proxies. First, it is expected values, not actual values, that should affect current margin decisions. We address this problem in subsequent estimations.

Second, we have chosen to represent the future by only the next period, a simplification retained throughout our analysis. In the theory, the number of empirically relevant future periods depends on the length of the punishment period and the discount

volume for some combination of use a linear regression in adjacent month's average day of that month away from the month, average daily reported in Table

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used the reported- que. and d_{jt} is the day j , d_{jt} is given by

Table 2 Preliminary Regressions
Dependent Variable: *MARGIN*,

	OLS	OLS-ARI	OLS	OLS-ARI
<i>NVOLUME_i</i>	3.777 (1.545)	1.426 (1.031)	3.685 (1.440)	1.277 (1.016)
<i>NVOLUME_{i-1}</i>	1.645 (1.597)	1.844 (1.291)	2.826 (1.436)	2.301 (1.196)
<i>TERMINAL_i</i>	-.262 (.021)	-.431 (.020)	-.093 (.022)	-.134 (.025)
<i>TERMINAL_{i-1}</i>	-.028 (.021)	-.066 (.018)	-.023 (.020)	-.047 (.017)
Δ <i>TERMINAL_i</i>			-.323 (.021)	-.284 (.018)
ρ		.520 (.016)		.558 (.015)
Observations	2,873	2,873	2,873	2,873
R^2	.652	.636	.686	.684

Notes: Fixed time and city effects not reported. White's heteroskedastic-consistent standard errors in parentheses.

rate. The theoretical models of tacit collusion leave open the length of the punishment period. Both the Rotemberg-Saloner and Haltiwanger-Harrington models use infinite punishments to simplify exposition, but their results do not depend on infinite punishments. If punishments are infinite, all future periods are relevant, and discounting makes the near-term periods relatively more important than later periods. If punishments are of finite duration, the relative importance of near-term periods will be greater. In the absence of any information about how long the punishment period might be in these markets, we include only next-period values. If the punishment is longer than one month, we will be measuring the relevant variable with error, and our estimate of the magnitude of the effect is likely to be biased downward.

Because the volume series display correlation over time, we include current volume (*NVOLUME_i*) among the regressors in this simple regression. Omitting current volume would load the effect of both current and future volume on the coefficient on next period's volume. Current terminal price is included to allow margin to respond to the level of the primary input price.¹⁷ We also include a set of 72 monthly and 43 city fixed effects. As is clear from the plot in Figure 1, there are periods in which the price series display unusually large movements. Removing the mean effect for each of the months in the sample ensures that the results are not driven by these events. Approximately 30% of the variance in margin is accounted for by these time fixed effects. An additional 31% of the variance is explained by city fixed effects. All the regressions reported here remove time and city fixed effects.¹⁸

¹⁷ Current terminal price is already in the dependent variable. We include it on the right-hand side to allow an unrestricted response of margins to current terminal prices. Omitting *TERMINAL_i* from the regressors would be equivalent to imposing full (i.e., one-for-one) and immediate passthrough of terminal price changes into retail prices.

¹⁸ The regressions presented here and below rely on the retail, terminal, and crude oil price variables being cointegrated. Carrying out the cointegration test suggested by Greene (1993) yields the following *t*-statistics, each of which strongly rejects the hypothesis that the variables are not cointegrated (using the Dickey-Fuller tables): retail-terminal, -25.31; retail-crude, -19.95; terminal-crude, -22.93.

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The resulting coefficient estimates are presented in the first column of Table 2 and are roughly consistent with the predictions of the theoretical models. Conditional on contemporaneous volume and terminal price, current margins are a declining function of next period's terminal price and an increasing function of next period's volume. The estimated coefficient for the effect of next period's volume is, however, quite noisy.

The residuals from this regression display first-order autocorrelation. Given the evidence from prior studies that retail prices are affected by lagged terminal prices, this is not surprising. Correcting the estimates for an AR1 process (see column 2) does not affect the conclusion about the effect of future values on current margins. It does, however, have a large effect on the coefficient on current terminal. The magnitude of the change in this coefficient is about eight times its standard error.

The effect of the AR1 correction on the *TERMINAL*_{*t*} coefficient suggests that it would be appropriate to include lagged values of terminal prices in the regression. We take the first step in this direction by adding $\Delta \text{TERMINAL}_t = \text{TERMINAL}_t - \text{TERMINAL}_{t-1}$ to the regressors. Including this simple lag structure does not eliminate the AR1 process, but (as reported in the third and fourth columns of Table 2) the coefficient estimates are now more stable. The positive effect of next period's volume and the negative effect of next period's terminal price on current margin persist in this specification.

These descriptive regressions suggest that the estimates from a more careful procedure might uncover effects consistent with the theory of tacit collusion. We begin this effort by describing the procedure we use to construct variables for expected volume and terminal price.

□ **The empirical model.** The results from preliminary regressions suggest that the specification of the lag structure of retail price response might have important effects on the results. We therefore estimate two different models of the lag process. The simpler specification is given by¹⁹

$$\begin{aligned} \text{MARGIN}_{it} = & \alpha_1 \text{NVOLUME}_{it} + \alpha_2 \text{EXP NVOLUME}_{it+1} + \alpha_3 \text{TERMINAL}_{it} \\ & + \alpha_4 \text{EXP TERMINAL}_{it+1} + \alpha_5 \Delta \text{TERMINAL}_{it} + \epsilon_{it} \end{aligned} \quad (1)$$

where *i* indexes cities, *EXP NVOLUME*_{*it+1*} is expected next-period volume, and *EXP TERMINAL*_{*it+1*} is expected next-period terminal price.

While equation (1) is parsimonious, it does not allow for the complex lag structure in the response of gasoline prices that has been found in prior research. (See, for example, Karrenbrock (1991), Bacon (1991), U.S. General Accounting Office (1993), Borenstein, Cameron, and Gilbert (1995), and Borenstein and Shepard (1996).) These studies indicate that the response of retail prices may involve lags longer than one month and may be asymmetric with respect to terminal price increases and decreases. In addition to the lagged response to terminal price changes, retail price changes display persistence. One common effect of persistence is some form of autocorrelation in the error structure of price equations. More generally, retail price changes are a function of lagged changes in retail prices.

A standard approach to estimation in the presence of lagged responses is to model price as a vector autoregression (VAR) process in which the current change in price is a function of past shocks and an error-correction term that takes into account the underlying structure relationship. In our context, this means modelling the change in retail price, and therefore margins, as a function of contemporaneous and lagged

¹⁹ In this and the following estimation equations, we suppress the constant term, which is absorbed by city and time fixed effects.

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changes in terminal prices, lagged changes in retail prices, and an error-correction term involving the one-period lags of retail and terminal prices:

$$\begin{aligned} \text{MARGIN}_{it} = & \alpha_1 \text{NVOLUME}_{it} + \alpha_2 \text{EXP NVOLUME}_{it-1} + \alpha_3 \text{EXP TERMINAL}_{it-1} \\ & + \beta_1 \Delta \text{TERMINAL}_{it}^+ + \beta_2 \Delta \text{TERMINAL}_{it-1}^+ + \beta_3 \Delta \text{TERMINAL}_{it-2}^+ \\ & + \beta_4 \Delta \text{TERMINAL}_{it}^- + \beta_5 \Delta \text{TERMINAL}_{it-1}^- + \beta_6 \Delta \text{TERMINAL}_{it-2}^- \quad (2) \\ & + \beta_7 \Delta \text{RETAIL}_{it-1}^+ + \beta_8 \Delta \text{RETAIL}_{it-2}^+ + \beta_9 \Delta \text{RETAIL}_{it-1}^- \\ & + \beta_{10} \Delta \text{RETAIL}_{it-2}^- + \beta_{11} \text{RETAIL}_{it-1} + \beta_{12} \text{TERMINAL}_{it-1} + \epsilon_{it} \end{aligned}$$

where ΔX_{it} denotes $X_{it} - X_{it-1}$ and the $+$ superscript denotes an increase and the $-$ a decrease. The contemporaneous and lagged changes capture the transmission of shocks, while the error-correction term captures the tendency to revert gradually to the long-term equilibrium relationship between retail and terminal prices. The number of lag periods has been chosen to allow for longer-than-expected lags in response. In the spirit of imposing only a minimal structure on the data, both retail and terminal price changes have been decomposed to allow an asymmetric response to price increases and decreases.²⁰ The details of deriving this estimating equation from the standard VAR treatment of price changes are given in the Appendix.

Estimating either (1) or (2) requires constructing variables representing expected volume and terminal prices. To construct *EXP NVOLUME*, we assume that station operators and suppliers form their expectations of next-period demand based on current and past sales volumes observed in their markets. Volume changes are caused largely by seasonal shifts in consumption patterns and, to a much lesser extent, by variations in retail prices. Demand seasonality varies across geographic locations in both pattern and amplitude. Although the typical state sees its peak demand in August and lowest demand in January, August demand is below the state mean in Florida and January demand is above the state mean in Colorado and Hawaii. The state in our sample with the greatest average annual variation (Maine) has a peak-to-trough difference equal to 57% of mean volume for that state; the state with the smallest variation (Arizona) has a peak-to-trough difference equal to 7% of its mean. The average state has a peak-to-trough difference equal to 23% of its mean. To allow the data to reflect these variations, we predict volume on a state-by-state basis. Accordingly, the predicting equation for state i is

$$\begin{aligned} \text{NVOLUME}_{it} = & a_0 + a_1 \text{NVOLUME}_{it-1} + a_2 \text{RETAIL}_{it-1} \\ & + \sum_{j=2}^{12} \delta_j \text{MONTH}_j + a_3 \text{TIME}_i + a_4 \text{TIME}_i^2 + \epsilon_{it} \quad (3) \end{aligned}$$

where *MONTH_j* is a monthly dummy variable. For nearly all cities, the R^2 of these predicting equations is between .80 and .95. *EXP NVOLUME* is the fitted values from estimating (3).

Our procedure uses future data on volume to estimate the coefficients in the predicting equation (and, similarly, we use future prices in the predicting equations for prices). This is, in principle, incorrect because it uses information the decisionmakers did not have when they formed their coefficient estimates. If, however, the coefficients

²⁰ Including more lags than may be required or allowing for asymmetries unnecessarily will not bias the estimate of other coefficients.

do not characterize them. To characterize them using a rolling station prices based on prices in the lagged and use all information to the VAR.

TERMINAL

We estimate mon crude oil in responses from different 1996).

The crude oil as reported in *Wall Street Journal* (ΔCRUDE_{it}) is the best forecast. The R^2 of the forecasts are seasonal patterns which approach the expected.

Both equations and terminal prices are a function of expected next-period volume. *EXP NVOLUME* is also used in markets for price to influence competitive terminal and cru-

²¹ We use sample period have chosen to use Borenstein using spot price terminal and cru-

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do not change over time, we would get similar results using only data available to them. To check for robustness to the predicting procedure, we also predicted volume using a rolling regression with volume data for 1982-1991. Neither the predicted values nor the coefficients in the final regressions were substantively affected.²¹

Station operators and suppliers form their expectations of next-period terminal prices based on observing the price of crude oil and the time structure of terminal prices in their market. Analogous to retail prices, terminal prices are a function of lagged and current crude oil prices and lagged terminal prices. Because we want to use all information available to decisionmakers, we use the full lag structure analogous to the VAR model in equation (2):

$$\begin{aligned} \text{TERMINAL}_{it} = & b_1 \Delta \text{TERMINAL}_{it-1}^* + b_2 \Delta \text{TERMINAL}_{it-2}^* + b_3 \Delta \text{TERMINAL}_{it-1}^- \\ & + b_4 \Delta \text{TERMINAL}_{it-2}^- + b_5 \Delta \text{CRUDE}_{it-1}^* + b_6 \Delta \text{CRUDE}_{it-2}^* \\ & + b_7 \Delta \text{CRUDE}_{it-1}^- + b_8 \Delta \text{CRUDE}_{it-2}^- + b_9 \text{TERMINAL}_{it-1} \\ & + b_{10} \text{CRUDE}_{it-1} + \sum_{j=1}^{12} \delta_j \text{MONTH}_j + \epsilon_{it} \end{aligned} \quad (4)$$

We estimate this equation city by city because the response of terminal prices to common crude oil shocks displays substantial variation across cities. Some of the difference in responses comes from the distribution system (Spiller and Huang, 1986) and some from differences in the conduct of competitors at the terminal (Borenstein and Shepard, 1996).

The crude oil price we use is the gulf coast spot price for West Texas Intermediate crude as reported by *Dow Jones International Petroleum Report* and published in the *Wall Street Journal*.²² In contrast to equation (2), contemporaneous change in CRUDE (ΔCRUDE_{it}) is not included in (4), because the purpose of this estimation is to generate the best forecast of TERMINAL from information available during the previous period. The R^2 of these regressions varies across cities within the .30 to .60 range. Price forecasts are less accurate than volume forecasts because volume follows a strong seasonal pattern, while terminal prices are very sensitive to current crude oil prices, which approximately follow a random walk. The fitted values from these regressions are the expected terminal prices for the period.

Both equations (1) and (2) include endogenous variables. Contemporaneous volume and terminal price are both reasonably modelled as endogenous. Volume is directly a function of the retail price and, therefore, a function of retail margin. Because expected next-period volume is a function of current volume and retail price, EXP NVOLUME is also endogenous. Terminal price will be a function of retail price if the terminal markets for gasoline are not perfectly competitive so that refiners set the wholesale price to influence the retail price. Terminal prices also will be endogenous if the market is competitive but refiners have an upward-sloping supply curve. Since EXP TERMINAL is a function of current terminal price, it is also endogenous. As a result, OLS

²¹ We use the approach represented in equation (3), because we do not have data on prices for the presample period. Without presample price data we cannot use the rolling regression approach for prices and have chosen to be consistent across predicting equations.

²² Borenstein, Cameron, and Gilbert (1995) report that using futures prices rather than spot prices or using spot prices for other commonly traded crude oils does not affect the estimated relationship between terminal and crude oil prices.

estimates of the margin equations are biased.²³ We provide consistent estimates for these equations using a two-stage least-squares (2SLS) procedure.

We identify the effects of volume and terminal price in 2SLS estimation by recognizing that these variables respond differently across cities to seasons, time, and changes in crude oil prices. As noted previously, seasonal demand patterns differ across cities depending on the weather and the tourist orientation of the area. Over time, these variables have also changed at different rates across areas. The response of terminal prices to changes in crude oil prices differs depending on transportation costs, proximity to a major port, alternative energy sources, and nongasoline uses of oil in the region. Gasoline demand and terminal prices might also be affected by changes in local economic conditions. Thus, besides the included exogenous variables, the instrument set for 2SLS estimation of (1) and (2) includes 11 separate monthly dummy variables for each city ($MONTH_{it}$, $i = 1, 43$, $j = 1, 11$), time and time-squared variables for each city ($TIME_{it}$ and $TIME_{it}^2$, $i = 1, 43$), seven variables for adjustment to current and past crude oil price changes for each city ($\Delta CRUDE_{it}$, $\Delta CRUDE_{it-1}$, $\Delta CRUDE_{it-2}$, $\Delta CRUDE_{it-3}$, $\Delta CRUDE_{it-4}$, $\Delta CRUDE_{it-5}$, and $\Delta CRUDE_{it-6}$, $i = 1, 43$), and the current and lagged unemployment rate for the state.²⁴

The endogeneity problem for equation (1) raises an additional complication because there is serial correlation in the OLS residuals. As a result, the lagged values of terminal in $\Delta TERMINAL_{it}$ are endogenous and the standard AR1 correction procedure is invalid. To correct for the additional endogenous variables, we treat the lagged values as endogenous, add an additional lag to the $CRUDE$ variables in the instrument set and implement an AR1 correction following Greene (1993). Durbin's test for autocorrelation in the presence of lagged dependent variables (Greene, 1993) indicates no serial correlation in equation (2).²⁵

Although we use an appropriate procedure to produce consistent estimates in the presence of endogeneity, we expect that the bias in the OLS estimates would be quite small. The estimated equations are supply relations, and the primary source of bias (directly for volume variables and indirectly for terminal price variables) is from movements along the demand curve rather than shifts of the demand curve. Industry demand for gasoline, however, is quite inelastic in the short run, with estimates ranging from $-.08$ to $-.2$ (Dahl and Sterner, 1991). It is clear, then, that the exogenous shifts in demand account for a much greater variation in consumption than is attributable to price changes. In fact, the 2SLS estimates do not differ substantially from the OLS estimates, as we show below.

Finally, the errors for both equations are heteroskedastic. We expected that the variance of the residuals would be a function of both the average retail margin in a city and the volatility of crude oil prices.²⁶ This suspicion was confirmed by regressing the square of the residuals on the average margin for each city and the sum of the absolute value of the change in crude oil price over the last three months: both variables

²³ In each specification, endogeneity tests reject the exogeneity of some of the current or expected volume and terminal prices and reject the joint exogeneity of all current and expected volume and terminal prices.

²⁴ Along with the city fixed effect for each city, these instruments use 23 degrees of freedom for each city. On average, there are 66 observations per city.

²⁵ The test statistic, distributed asymptotically normal, is below 1.0 for both the OLS and the 2SLS estimates of (2).

²⁶ It is natural to think that larger changes in crude oil prices would be associated with higher variance in the errors. The belief that higher margin observations would have lower variance comes from Borenstein and Shepard (1995), where we show that the adjustment rate of a city's terminal prices to crude oil shocks is a declining function of the city's average retail margin.

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5. Resu

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had *t*-statistics above 4. The heteroskedasticity correction was implemented by weighting the data by the inverse of the predicted values from this regression, as suggested by Greene (1993).²⁷

5. Results

■ The OLS and two-stage least-squares estimates from equations (1) and (2) are reported in Table 3. In all specifications, the coefficient on expected volume is positive, as the Rotemberg-Saloner hypothesis predicts, and significantly different from zero at the 5% significance level or better. Using the coefficients from 2SLS estimation of equation (2), the elasticity of margin with respect to expected next-period volume is about .38 at mean margin and volume. The estimated effect of an expected change in terminal price is also consistent with the Rotemberg-Saloner hypothesis and is statistically significant at the 1% level. The elasticity of margin with respect to expected next-period terminal price is about -.36 at mean margin and terminal price, using the 2SLS results from (2).

In Figure 3 we have graphed the effects of volume changes on margins implied by the estimated two-stage coefficients on current and expected next-period volume from equation (2). The figure shows the national annual pattern for normalized volume (*NVOLUME*) and the estimated margin, normalized by mean margin. Because the changes in margin induced by changes in terminal and crude prices have been removed from the data graphed in Figure 3, it isolates the response of margins to changes in demand.²⁸ Movements in volume are estimated to cause margins to vary from about 95% of average margin in December to about 104% in June and July. The margin pattern in Figure 3 is consistent with the prediction that margins will be higher when near-term volume is increasing, holding current demand constant. For example, national average demand is approximately equal in April and October, but the increase in demand in May compared to the decline in demand in November causes estimated margins to be higher in April than in October. The estimates also imply that changes in the retail margin lead changes in volume over the demand cycle. Margin is positively correlated with volume, but it declines before the August demand peak in anticipation of the September volume decline, and rises before the January trough in anticipation of the February volume increase. This pattern is consistent with simulations conducted by Haltiwanger and Harrington that show a tendency for collusive price to drop (rise) before the demand peak (trough) even if price is generally procyclical.

The estimated effect of volume implies about a 9% variation in margins, or about one cent per gallon, over the seasonal cycle. This effect is not large in absolute magnitude, but its importance to tacitly colluding firms depends on the size of the operating margin. The margin we observe (retail price minus terminal price) averages 10.99 cents in our sample, but this overstates the true margin (retail price minus marginal cost), because true marginal cost is greater than the wholesale cost of gasoline. Delivery cost, for instance, is probably two to three cents per gallon,²⁹ reducing the economic margin to no more than about eight cents. Some of the labor costs are variable on a month-to-month basis for most stations, which would further reduce the economic margin.

²⁷ In unreported regressions, we correct the standard errors using White's procedure. The coefficient pattern is largely unaffected by this change in procedure. However, since White's correction gives consistent estimates of the standard errors, but does not improve the efficiency of the coefficient estimates, we report the results from this direct correction for heteroskedasticity.

²⁸ The pattern evident in Figure 3 is not apparent in a simple graph of margin on volume because a very large share of the variance in margins is the result of movements in crude oil prices. These effects must be removed to uncover the demand effects.

²⁹ DTW prices exceed terminal prices by about this amount.

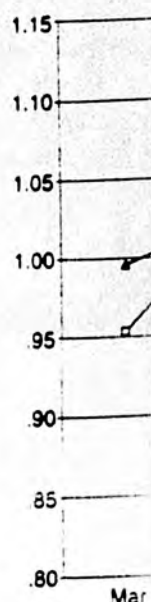
Table 3 Estimation of Equations (1) and (2)
Dependent Variable: *MARGIN*,

	Equation (1)		Equation (2)	
	OLS	2SLS	OLS	2SLS
<i>NVOLUME_t</i>	.952 (1.223)	3.009 (1.600)	-.335 (1.211)	.690 (1.493)
<i>EXP NVOLUME_{t-1}</i>	3.220 (1.560)	3.927 (1.636)	4.314 (1.464)	4.158 (1.533)
<i>TERMINAL_t</i>	-.149 (.023)	-.058 (.035)		
<i>EXP TERMINAL_{t-1}</i>	-.062 (.016)	-.029 (.019)	-.061 (.017)	-.063 (.022)
Δ <i>TERMINAL_t</i>	-.271 (.015)	-.291 (.024)		
Δ <i>TERMINAL_t</i> [*]			-.268 (.025)	-.179 (.043)
Δ <i>TERMINAL_{t-1}</i>			.154 (.029)	.162 (.028)
Δ <i>TERMINAL_{t-2}</i>			.073 (.026)	.078 (.027)
Δ <i>TERMINAL_t</i> [*]			-.532 (.025)	-.553 (.050)
Δ <i>TERMINAL_{t-1}</i>			.174 (.026)	.162 (.028)
Δ <i>TERMINAL_{t-2}</i>			.074 (.025)	.074 (.025)
Δ <i>RETAIL_{t-1}</i>			-.038 (.027)	-.040 (.027)
Δ <i>RETAIL_{t-2}</i>			-.056 (.026)	-.052 (.026)
Δ <i>RETAIL_{t-1}</i>			-.047 (.027)	-.044 (.027)
Δ <i>RETAIL_{t-2}</i>			.023 (.023)	.017 (.024)
<i>RETAIL_{t-1}</i>			.610 (.018)	.606 (.018)
<i>TERMINAL_{t-1}</i>			-.605 (.027)	-.582 (.032)
ρ	.547 (.015)	.564 (.015)		
Observations	2,812	2,812	2,812	2,812
<i>R</i> ²	.634		.799	

Notes: Fixed time and city effects not reported. Heteroskedasticity-corrected asymptotic standard errors in parentheses. Equation (1) corrected for first-order serial correlation.

FIGURE 3

ESTIMATED EFFECT



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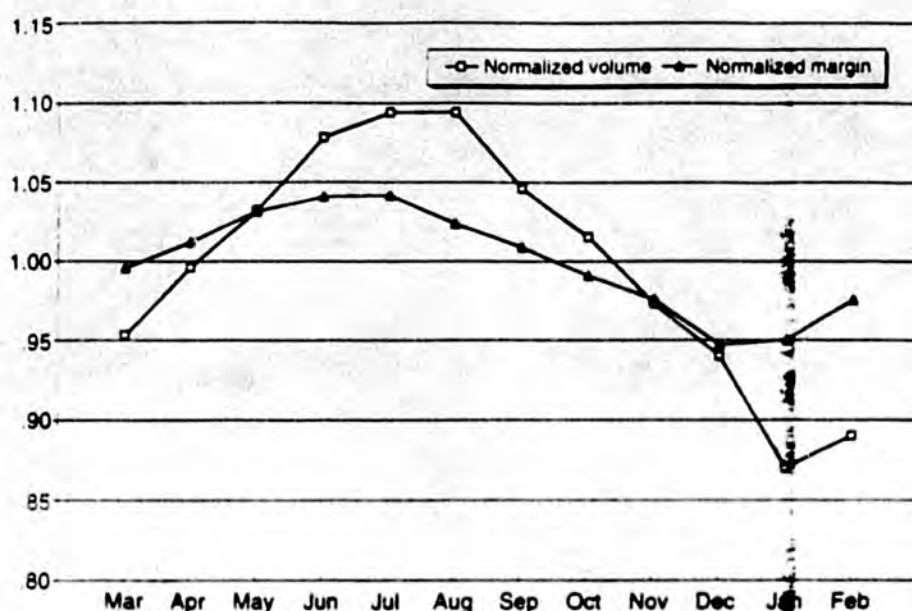
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FIGURE 3

ESTIMATED EFFECT OF VOLUME ON MARGIN



Overall, the proportional effect of volume changes on economic margins is probably at least 15%.

The estimated effect of $EXP_TERMINAL_{t-1}$ is most easily interpreted by considering the magnitudes of expected month-to-month changes in terminal price. The month-to-month expected change in terminal price (i.e., the expected terminal price in period $t + 1$ minus the actual terminal price in period t) in a city has a mean of about zero and a standard deviation of 4.84 cents. If terminal price is expected to increase by an amount equal to one standard deviation of the average expected change, current margin will be reduced by .30 cents compared to an expected change of zero.

The remaining estimates of the effects of lagged changes and levels of terminal and retail prices are consistent with previous research. The cumulative response function implied by these estimates exhibits asymmetric adjustment to terminal price changes: increases are passed through more quickly than decreases. This is consistent with the response found by Karrenbrock (1991), and the size of the asymmetry is very close to that found by Borenstein, Cameron, and Gilbert (1995) using national rather than city-level price data. The estimates also imply a passthrough rate that is not statistically distinguishable from 100%.³⁰

While the estimates in Table 3 allow for fixed city and time effects, we have maintained the assumption that the coefficients in equations (1) and (2) are equal across cities. This is a parsimonious approach, and we have no *a priori* reason to think that these coefficients would differ systematically. Nonetheless, this assumption imposes 210 restrictions on (1) and 630 restrictions on (2). It would not be surprising to find that standard tests reject pooling. Indeed, an *F*-test rejects the pooling in each equation. To investigate whether pooling has affected our results, we now relax these restrictions. Since there is no obvious way of grouping cities to test for meaningful subgroups, we estimated each equation allowing parameter values to differ for each of the 43 cities.

³⁰ See Borenstein, Cameron, and Gilbert (1995) for a description of the method used to construct the cumulative response function and to calculate the passthrough rate.

This approach uses up many degrees of freedom (leaving only about 50 degrees of freedom per city for estimation of (2)), and the estimates will be noisier than the restricted estimates. Nonetheless, removing all the restrictions has the advantage that the estimated coefficients cannot be affected by illegitimate pooling.³¹ The results for the expectation variables from unrestricted estimation of (2) are reported in Table 4 and confirm the pooled estimates reported in Table 3.

The first line of the table reports the means of the 43 OLS and 2SLS estimates of the coefficients on $EXP NVOLUME_{i,t-1}$ and $EXP TERMINAL_{i,t-1}$ parameters and the standard error of those means. The mean estimated effect of future expected volume is of the same sign as the restricted estimate reported in Table 3, but it is substantially larger. Similarly, the mean estimated effect of future expected terminal price is of the same sign as the restricted estimate in Table 3. Despite the loss in degrees of freedom, the means are statistically different from zero, except for the effect of future terminal price in the 2SLS estimation.

Table 4 also reports two additional tests of whether the pattern in the city-by-city parameter estimates is consistent with the restricted estimates in Table 3. The first is the Z-statistic. This statistic is the sum of the 43 *t*-statistics and is distributed asymptotically normal with mean zero and standard deviation of $\sqrt{43}$ under the null hypothesis that the sum of the *t*-statistics equals zero. The Z-statistic, which is commonly used in stock market event studies, is less heavily influenced by individual estimates with large standard errors than is the estimate of the mean. Below each of the Z-statistics, we show the level at which the statistic is significantly different from zero using a two-tailed test.³² The Z-statistics are all of the same sign as the coefficients in Table 3, and all are significantly different from zero at the 10% level or greater.

The final test is a simple binomial distribution: a count of the number of the 43 parameter estimates that have the expected sign. This approach has low power because it ignores considerable available information, but it is least likely to be influenced by individual cities. The counts shown in Table 4 indicate the high noise level in the individual city estimates, though the majority in each case are still of the hypothesized sign. In the 2SLS estimation, 60% of the coefficients for $EXP VOLUME_{i,t-1}$ are of the expected sign and 60% of the coefficients for $EXP TERMINAL_{i,t-1}$ are of the expected sign. Below each count we report the significance level (two-tailed) at which the frequency of "correct" signs is significantly different from the null of .5. Only the results from 2SLS estimation of the $EXP VOLUME_{i,t-1}$ coefficient are distinguishable from $p = .5$ using standard significance levels.³³

These results are consistent with the predictions of the tacit collusion models and inconsistent with standard noncollusive models where current margin is not a function of future expected demand or cost conditions. There are, however, two types of non-collusive models that can produce a linkage: models involving intertemporal switching costs and models of inventory behavior. We discuss these alternatives next.

³¹ For the unrestricted estimation, we continue to remove the common 72 time fixed effects. Thus for each city, every variable is measured as the deviation from its mean over all cities at the same point in time. The heteroskedasticity correction in each case was based on a common estimate of the effect of crude volatility on the variance in all cities. For the unrestricted estimation of (1), we estimated a common parameter of serial correlation ρ .

³² These and all of the significance tests in this table are carried out under the assumption that the city-by-city parameter estimates are uncorrelated across cities. This is valid because the 72 fixed time effects remove common shocks.

³³ The (unreported) results for the unrestricted estimation of equation (1) are similar to those reported in Table 4 for (2). The results for unrestricted estimation of (1) have the expected sign in all cases, are somewhat less significant than for (2) in the mean coefficients, about the same significance for the z-statistics, and more significant in the binomial tests.

Table 4 Summary of
Dependent

Mean parameter estimate
(standard error of mean)

Z-statistic
(P-value vs. $H_0: Z = 0$)

Binomial distribution (of 43)
(P-value vs. $p = .5$)

6. Possible alternative demand and cost

■ Repeat purchases over this period in a model in which consumers demand. Suppose that in the next period at the same time (suppliers) want to attract new industry demand is expected. If this period is higher than the previous period, suppose the terminal period is less profitable and if this-period choices will be lower when the reverse of our empirical findings.

A link between the result of firms' repeat purchases and Inventories play a very important role. It will be reflected in the current margin. For inventory must be held by significant inventory effects, then, must correspond to capacity and are known.

In the standard model, the next period will increase. Pindyck (1994) and today in anticipation be driven up. If they or into the retail price.

³⁴ The switching-cost demand is generated by a significant share of the demand from their usual location.

³⁵ The National Petroleum outlets in the United States, approximately 20,000 gallons per accept delivery more than

Table 4 Summary of Unconstrained Estimation of Equation (2)
Dependent Variable: *MARGIN*,

	<i>EXP NVOLUME_{t,t-1}</i>		<i>EXP TERMINAL_{t,t-1}</i>	
	OLS	2SLS	OLS	2SLS
Mean parameter estimate (standard error of mean)	9.844 (2.623)	10.154 (4.159)	-.053 (.018)	-.048 (.035)
Z-statistic (P-value vs. $H_0: Z = 0$)	17.90 (.01)	11.89 (.07)	-18.62 (.01)	-13.74 (.04)
Binomial distribution (of 43) (P-value vs. $p = .5$)	25 > 0 (.36)	26 > 0 (.22)	28 < 0 (.07)	26 < 0 (.22)

6. Possible alternative explanations for the effect of future demand and cost

Repeat purchases and consumer loyalty can create an incentive for firms to take actions this period in anticipation of future conditions. Klemperer (1987) presents a model in which consumer loyalty leads firms to choose prices to affect their future demand. Suppose that some kind of switching cost causes consumers to prefer buying next period at the station at which they buy this period. Then stations (and their suppliers) want to attract buyers in this period in order to sell to them next period. If industry demand is expected to increase next period, the incentive to attract customers this period is higher than if demand is expected to decline. Or, holding demand constant, suppose the terminal price were expected to rise. This would make a sale tomorrow less profitable and induce higher margins today. Thus, while this model does make this-period choices a function of expected next-period values, it implies that margins will be lower when demand is increasing and higher when cost is increasing. This is the reverse of our empirical findings.¹⁴

A link between current margins and anticipated market conditions could also be the result of firms responding to expected changes by altering their inventory levels. Inventories play a very important role in upstream petroleum markets, but these effects will be reflected in the terminal price and will not affect our analysis of the retail margin. For inventory effects to be important in determining retail margins, inventories must be held by station suppliers or station operators. Station operators do not hold significant inventory; they accept new deliveries every few days.¹⁵ Any inventory effects, then, must come from independent wholesalers. These jobbers have inventory capacity and are known to hold inventory against future demand and cost changes.

In the standard inventory models, a firm that expects demand to increase (decline) next period will increase (reduce) its inventory holdings this period (see, for example, Pindyck (1994) and Thurman (1988)). If, for example, jobbers increase their purchasing today in anticipation of higher demand tomorrow, this period's terminal prices might be driven up. If they do not fully pass this increase into the prices they charge stations or into the retail prices they directly control, then current margin will be reduced. This

¹⁴ The switching-cost explanation assumes that consumers are indeed loyal and that the increase in demand is generated by the same consumers in the same geographic market. If switching costs are low or a significant share of the seasonal increase in demand is generated by leisure travelers buying gasoline away from their usual locations, then there will be no intertemporal response due to consumer loyalty.

¹⁵ The National Petroleum Council estimates that total inventory capacity at the 170,000 retail gasoline outlets in the United States in 1989 was 3.49 billion gallons. This implies an average capacity of approximately 20,000 gallons per station. Stations sell about 200,000 gallons per month on average, so they must accept delivery more than ten times per month on average.

implies that higher demand tomorrow would lead to lower margins today. This prediction has the opposite sign to the one we find for future expected volume.³⁶

Inventory might also link current margins and expected future input prices. If, for example, jobbers believe that terminal prices will increase next period, they have an incentive to increase inventories this period. Holding inventories against expected input price fluctuation will have no effect on current margins, however, because the (opportunity) cost of marginal sales this period is the current terminal price. As long as wholesalers can purchase at the current terminal price, holding inventories may increase profits, but it should have no effect on the optimal retail margin for the current period.

It is possible, however, that transaction costs lead wholesalers to purchase only periodically,³⁷ so that the relevant opportunity cost is the terminal price they expect for the next transaction date. In that case, higher expected terminal prices could cause suppliers to increase the current price they charge to station operators who will, in turn, pass at least some of the increase into the retail price. This would lead to higher observed margins when wholesale prices are expected to increase. The true economic margin would be today's retail price minus the expected future terminal price, but the observed margin would be today's retail price minus today's terminal price. Inventories, then, might lead to a positive estimated effect of expected terminal price changes on current margins, the opposite of the effect that we find.

7. Conclusion

■ Using a panel of data on retail gasoline margins in 43 cities over 6 years, we have found evidence consistent with tacitly collusive pricing. Contrary to the predictions of standard noncooperative models, we find that margins respond to anticipated changes in demand and input prices. Furthermore, margins respond with the signs predicted by the Haltiwanger-Harrington extension of the Rotemberg-Saloner model to markets with deterministic demand cycles. *Ceteris paribus*, we find lower margins when demand is expected to decline next period than when it is expected to increase. The evidence for tacit collusion is particularly strong because we also find that margins respond to input cost changes in the predicted direction—margins are higher when wholesale prices are expected to decline next period than when they are expected to increase next period.

The results are somewhat surprising because the structure of the retail gasoline industry is not the tight oligopoly setting supposed by the formal models or investigated in prior empirical studies of collusion. They are somewhat less surprising when we recognize that evidence supporting tacitly collusive pricing is not evidence that the firms are able to set prices at, or even close to, the monopoly level. Indeed, given the inelastic industry demand for gasoline, it is quite clear that the actual margins fall far short of the monopoly level in this industry. The magnitude of the effect of tacit collusion on margins and the low elasticity of gasoline demand also imply that it will have little effect on welfare. Still, a simple structural analysis of retail gasoline markets might lead one to expect that any price above the one-shot Nash equilibrium level would be unsustainable. The dynamic pattern we observe in retail margins is inconsistent with this conclusion.

The dynamic pattern is consistent with formal models that assume firms are able to make sophisticated calculations to achieve the highest sustainable collusive price. In this

³⁶ Since we control for the lag structure in retail prices, we would uncover this inventory-induced linkage only if we have misspecified the lag structure. The point of the argument in the text is to make clear that the results we do find cannot be explained by inventory effects, not to argue that inventory effects don't exist.

³⁷ This might be the case if, for example, there were a fixed cost to making a purchase.

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Appendix

■ Equation (2) is a straight line price is

$$RETAIL_t = \alpha + \beta_1 \Delta RETAIL_t + \beta_2 \Delta RETAIL_{t-1} + \beta_3 \Delta RETAIL_{t-2} + \beta_4 \Delta RETAIL_{t-3} + \beta_5 \Delta RETAIL_{t-4} + \beta_6 \Delta RETAIL_{t-5} + \beta_7 \Delta RETAIL_{t-6} + \beta_8 \Delta RETAIL_{t-7} + \beta_9 \Delta RETAIL_{t-8} + \beta_{10} \Delta RETAIL_{t-9} + \beta_{11} \Delta RETAIL_{t-10} + \beta_{12} \Delta RETAIL_{t-11} + \beta_{13} \Delta RETAIL_{t-12} + \beta_{14} \Delta RETAIL_{t-13} + \beta_{15} \Delta RETAIL_{t-14} + \beta_{16} \Delta RETAIL_{t-15} + \beta_{17} \Delta RETAIL_{t-16} + \beta_{18} \Delta RETAIL_{t-17} + \beta_{19} \Delta RETAIL_{t-18} + \beta_{20} \Delta RETAIL_{t-19} + \beta_{21} \Delta RETAIL_{t-20} + \beta_{22} \Delta RETAIL_{t-21} + \beta_{23} \Delta RETAIL_{t-22} + \beta_{24} \Delta RETAIL_{t-23} + \beta_{25} \Delta RETAIL_{t-24} + \beta_{26} \Delta RETAIL_{t-25} + \beta_{27} \Delta RETAIL_{t-26} + \beta_{28} \Delta RETAIL_{t-27} + \beta_{29} \Delta RETAIL_{t-28} + \beta_{30} \Delta RETAIL_{t-29} + 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\Delta RETAIL_{t-59} + \beta_{61} \Delta RETAIL_{t-60} + \beta_{62} \Delta RETAIL_{t-61} + \beta_{63} \Delta RETAIL_{t-62} + \beta_{64} \Delta RETAIL_{t-63} + \beta_{65} \Delta RETAIL_{t-64} + \beta_{66} \Delta RETAIL_{t-65} + \beta_{67} \Delta RETAIL_{t-66} + \beta_{68} \Delta RETAIL_{t-67} + \beta_{69} \Delta RETAIL_{t-68} + \beta_{70} \Delta RETAIL_{t-69} + \beta_{71} \Delta RETAIL_{t-70} + \beta_{72} \Delta RETAIL_{t-71} + \beta_{73} \Delta RETAIL_{t-72} + \beta_{74} \Delta RETAIL_{t-73} + \beta_{75} \Delta RETAIL_{t-74} + \beta_{76} \Delta RETAIL_{t-75} + \beta_{77} \Delta RETAIL_{t-76} + \beta_{78} \Delta RETAIL_{t-77} + \beta_{79} \Delta RETAIL_{t-78} + \beta_{80} \Delta RETAIL_{t-79} + \beta_{81} \Delta RETAIL_{t-80} + \beta_{82} \Delta RETAIL_{t-81} + \beta_{83} \Delta RETAIL_{t-82} + \beta_{84} \Delta RETAIL_{t-83} + \beta_{85} \Delta RETAIL_{t-84} + \beta_{86} \Delta RETAIL_{t-85} + \beta_{87} \Delta RETAIL_{t-86} + \beta_{88} \Delta RETAIL_{t-87} + \beta_{89} \Delta 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abstract world, all available information is used, price wars never happen, and the collusive constraint is always binding. This cannot be taken as a serious description of the world of gasoline retailing. It is plausible, however, that station operators, for example, recognize that reducing their own prices induces price cutting at rival stations. They also might reasonably expect that once price cutting begins it will take some time to return to higher margins even without a clearly articulated strategy for the length and severity of the retaliation. Recognizing this, each seller might very well be less willing to cut price if the resulting retaliation will occur when market conditions make it particularly costly. Tacit collusion of this sort can produce the dynamic pricing pattern we find.

Appendix

■ Equation (2) is a straightforward variation on standard VAR models. A VAR model of changes in retail price is

$$\begin{aligned} \text{RETAIL}_t - \text{RETAIL}_{t-1} = & \beta_1 \Delta \text{TERMINAL}_t + \beta_2 \Delta \text{TERMINAL}_{t-1} + \beta_3 \Delta \text{TERMINAL}_{t-2} \\ & + \beta_4 \Delta \text{TERMINAL}_t + \beta_5 \Delta \text{TERMINAL}_{t-1} + \beta_6 \Delta \text{TERMINAL}_{t-2} \\ & + \beta_7 \Delta \text{RETAIL}_{t-1} + \beta_8 \Delta \text{RETAIL}_{t-2} + \beta_9 \Delta \text{RETAIL}_{t-3} \\ & + \beta_{10} \Delta \text{RETAIL}_{t-4} + \beta_{11} \text{RETAIL}_{t-1} + \beta_{12} \text{TERMINAL}_{t-1} + \epsilon_t. \end{aligned} \quad (\text{A1})$$

The terms involving lagged retail and terminal prices in levels are the error-correction term. To understand its role in the regression, take the equilibrium relationship between retail and terminal prices to be

$$\text{RETAIL} = \gamma_0 + \gamma_1 \text{TERMINAL}$$

The extent to which prices deviate from equilibrium in period $t-1$ would be

$$\text{RETAIL}_{t-1} - \gamma_0 - \gamma_1 \text{TERMINAL}_{t-1}$$

If the next-period margin adjusts toward the equilibrium by some factor ρ ($0 > \rho > -1$), the error-correction effect for period t would be $\rho(\text{RETAIL}_{t-1} - \gamma_0 - \gamma_1 \text{TERMINAL}_{t-1})$, which can be rewritten as

$$\rho \text{RETAIL}_{t-1} - \rho \gamma_0 - \rho \gamma_1 \text{TERMINAL}_{t-1}$$

The first term requires including RETAIL_{t-1} , the second term is subsumed in the fixed effects, and the third term requires including TERMINAL_{t-1} .

Because we are interested in retail margins, we rearrange terms in this equation, adding RETAIL_{t-1} and subtracting TERMINAL_{t-1} from both sides to get current retail margin on the left-hand side:

$$\begin{aligned} \text{MARGIN}_t = & (\beta_1 - 1) \Delta \text{TERMINAL}_t + \beta_2 \Delta \text{TERMINAL}_{t-1} + \beta_3 \Delta \text{TERMINAL}_{t-2} \\ & - (\beta_4 - 1) \Delta \text{TERMINAL}_t + \beta_5 \Delta \text{TERMINAL}_{t-1} + \beta_6 \Delta \text{TERMINAL}_{t-2} \\ & - \beta_7 \Delta \text{RETAIL}_{t-1} + \beta_8 \Delta \text{RETAIL}_{t-2} + \beta_9 \Delta \text{RETAIL}_{t-3} + \beta_{10} \Delta \text{RETAIL}_{t-4} \\ & + (\beta_{11} + 1) \text{RETAIL}_{t-1} + (\beta_{12} - 1) \text{TERMINAL}_{t-1} + \epsilon_t. \end{aligned} \quad (\text{A2})$$

Subtracting TERMINAL_t from the right-hand side of (1) requires subtracting one from the coefficients on $\Delta \text{TERMINAL}_t$ and $\Delta \text{TERMINAL}_{t-1}$, each of which contains a positive TERMINAL_t . Because each also contains a negative TERMINAL_{t-1} that has been removed, subtracting one from the coefficient on TERMINAL_{t-1} reintroduces these terms. The equivalence is not exact because the coefficients are allowed to be asymmetric in the adjustment (Δ) terms, but not in the error-correction term (TERMINAL_{t-1}).

Equation (A2) characterizes the autoregressive structure of prices. Augmenting it to take into account the effect of current demand and of expected demand and terminal price produces the basic estimating equation reported in the body of the article as equation (2), where the parameter adjustments to get from (A1) to (A2) are implicit.

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[Investments](#) • [Quote Plus](#) • [Portfolio](#) • [Stocks](#) • [Mutual Funds](#) • [Brokers](#) • [Insights](#)**MAPCO INC (MDA)**[Quote](#)[Charts](#)[News](#)[Snapshot](#)[Analysts](#)[Competitors](#)[Financials](#)[Full Report](#)[Mgt Discussion](#)[SEC Filings](#)[Profile](#)[Discuss MDA](#)Enter ticker symbol(s): [Get Profile](#)[Symbol Lookup](#)**Business Description : MAPCO INC****Location:**1800 S BALTIMORE AVE
TULSA
OK
74119**Ticker:** MDA**Exchange:** NYSE**Telephone:** 918-581-1800**SIC:** 2911 PETROLEUM REFINING**Cusip:** 56509710**Operations**

MAPCO Inc. ("MAPCO" or the "Company") is a diversified energy company which, through separate business units, is engaged in the transportation by pipeline of natural gas liquids ("NGLs"), anhydrous ammonia, crude oil and refined petroleum products; the transportation by truck and rail of NGLs and refined petroleum products; the refining of crude oil; the marketing of NGLs, refined petroleum products and crude oil; the trading of crude oil, refined petroleum products and NGLs; NGL processing; NGL storage; and the marketing of motor fuel and merchandise through convenience store operations. MAPCO was incorporated in Delaware in 1958 and has its principal executive offices in Tulsa, Oklahoma. For convenience of reference and simplification of this report, references herein to MAPCO or the Company include its subsidiaries or affiliates, unless the context requires otherwise.

During 1996, MAPCO sold its Coal segment and reorganized its NGL and Petroleum segments into the following business unit reporting structures:

Annual Figures : MAPCO INC

Balance Sheet Summary

	(Year) FY 1996	(Year) FY 1995
	US\$	US\$1000s
Cash	104,800	33,300
Securities	0	0
Receivables	373,700	239,300
Allowances	1,700	1,500
Inventory	109,600	117,100
Current Assets	619,100	685,800
Property and Equipment, Net	2,154,200	2,209,100
Depreciation	797,300	835,400
Total Assets	2,170,700	2,293,300
Current Liabilities	588,600	417,500
Bonds	608,400	801,000
Preferred Mandatory	0	0
Preferred Stock	0	0
Common Stock	63,000	62,900
Other Stockholders' Equity	540,600	579,400
Total Liabilities and Equity	2,170,700	2,293,300

Income Statement Summary

Total Revenues	3,353,100	3,310,000
Cost of Sales	0	0
Other Expenses	140,200	224,700
Loss Provision	0	0
Interest Expense	56,900	58,300
Income Pre Tax	214,400	114,200
Income Tax	82,800	37,200
Income Continuing	130,200	74,700
Discontinued	-32,700	0
Extraordinary	0	0
Changes	0	0
Net Income	97,500	74,700
EPS Primary	1.7\$	2.51\$
EPS Diluted	1.69\$	2.5\$

Quarterly Figures : MAPCO INC

Balance Sheet Summary

	9 Mos Ending 9/30/97 US\$1000s	6 Mos Ending 6/30/97 US\$1000s	3 Mos Ending 3/31/97 US\$
Cash	44,500	41,700	113,400
Securities	0	0	0
Receivables	325,000	298,300	284,100
Allowances	2,600	2,000	2,000
Inventory	164,900	153,200	120,300
Current Assets	567,500	525,200	542,100
Property and Equipment, Net	2,271,200	2,210,000	2,157,200
Depreciation	824,300	810,500	792,300
Total Assets	2,348,600	2,215,900	2,159,900
Current Liabilities	547,400	459,100	457,600
Bonds	763,000	757,900	698,100
Preferred Mandatory	0	0	0
Preferred Stock	0	0	0
Common Stock	63,200	63,100	63,100
Other Stockholders' Equity	594,200	558,800	558,700
Total Liabilities and Equity	2,348,600	2,215,900	2,159,900

Income Statement Summary

Total Revenues	2,767,600	1,785,500	931,200
Cost of Sales	0	0	0
Other Expenses	-70,300	-72,600	-70,600
Loss Provision	0	0	0
Interest Expense	38,000	26,700	12,100
Income Pre Tax	178,400	139,800	121,700
Income Tax	69,800	54,100	47,800
Income Continuing	105,500	83,400	72,700
Discontinued	0	0	0
Extraordinary	0	0	0
Changes	0	0	0
Net Income	105,500	83,400	72,700
EPS Primary	1.93\$	1.52\$	1.32\$
EPS Diluted	1.91\$	1.5\$	1.3\$

Mgt Discussion : MAPCO INC

Mgt Disc SEP 1997 Mgt Disc JUN 1997 Mgt Disc MAR 1997

[Dated SEP 1997]

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Management's Discussion and Analysis may contain forward-looking statements, including, without limitation, statements relating to the Company's plans, strategies, objectives and expectations and are made pursuant to the "safe harbor" provisions of the Private Securities Litigation Reform Act of 1995. Any such forward-looking statements involve known and unknown risks and uncertainties and the Company's actual results may differ materially from those forward-looking statements. The Company does not undertake to update, revise or correct any of the forward-looking information contained in this document. Readers are cautioned that such forward-looking statements should be read in connection with the Company's disclosures under the heading "CAUTIONARY STATEMENT FOR THE PURPOSES OF THE 'SAFE HARBOR' PROVISIONS OF THE PRIVATE SECURITIES LITIGATION REFORM ACT OF 1995" beginning on page 29.

FINANCIAL CONDITION

Cash Generation

Nine months ended September 30,	1997	1996	Var.
Net cash provided by continuing operations	\$ 66	\$ 101	\$ (35)
Net cash provided by discontinued operations	--	22	(22)
Net cash provided by operating activities	66	123	(57)
Net cash provided by (used in) investing activities	(222)	156	(378)
Net cash provided by (used in) financing activities	96	(253)	349
Cash generation (usage)	\$ (60)	\$ 26	\$ (86)
	=====	=====	=====

The \$35 million decrease in funds provided by continuing operations in 1997 was primarily attributable to a \$28 million decrease in earnings from operations, adjusted for gain on sale of assets and changes in operating assets and liabilities. Decreased earnings in the Propane Marketing business unit were the primary cause of the decreased earnings from operations and were caused by weak market conditions during the first nine months of the year and increased operating costs associated with growth strategies. The net change in accounts payable for the nine months ended September 30, 1997, decreased \$85 million as compared to the change in accounts payable for the same period in 1996 primarily due to higher-cost year-end 1996 crude and propane purchases. The change in accrued taxes was a decrease of \$25 million due to timing differences in making required tax payments. Partially offsetting these uses of cash was a change in accounts receivable which decreased \$106 million, primarily reflecting lower product sales prices in the current year.

Cash provided by discontinued operations was from the operations of the Coal business through July 1996.

Cash flows from investing activities in 1997 included capital expenditures and acquisitions of \$175 million, of which \$50 million was for capital items necessary to maintain existing operations. Capital

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expenditures in 1997 (see the Liquidity and Capital Resources section of this report for additional details regarding the acquisitions discussed below) included \$35 million for the acquisition of various propane marketing businesses, \$18 million for the addition of a propylene splitter, expansion of the alkalization unit, replacement of the fluid catalytic cracker blower and an additional storage tank at the Mid-South Refinery, \$12 million for the acquisition of 19 convenience stores from EZ-Serve Inc., \$11 million for the acquisition of ACS Data LTD., \$7 million for the acquisition of the assets of Gas Supply Inc., \$6 million for a new computer system in the Propane Marketing business unit, \$5 million for a gasoline expansion project and initial costs associated with the addition of a third crude unit for expanded jet fuel production at the Alaska Refinery, and \$5 million for propane tanks. Expenditures for investments in unconsolidated affiliates during the first nine months of 1997 included \$106 million for the Discovery pipeline project, \$4 million for the Rio Grande pipeline project, and \$3 million for the Alliance pipeline project. Cash flows from investing activities in 1997 included proceeds of \$66 million from the sale of MAPCO's interest in the natural gas liquids and condensate in the West Panhandle field. Cash flows from investing activities during the first nine months of 1996 included \$236 million of proceeds from the sale of the Coal segment to Alliance Coal Corporation and \$43 million of proceeds from Retail Propane's sale of its Iowa propane and liquid fertilizer assets to CENEX. These proceeds were partially offset by \$89 million of capital expenditures for continuing operations, of which \$45 million was for capital items necessary to maintain existing operations. Capital expenditures in 1996 also include \$11 million for a saturated gas plant expansion at the Memphis Refinery, \$5 million for the acquisition of a propane company in Colorado, and \$4 million for the expansion of the Hobbs Station in west Texas. Capital expenditures in 1996 associated with the discontinued Coal segment were \$22 million. Investments in unconsolidated affiliates included \$19 million for the Rio Grande pipeline project.

Cash from financing activities in 1997 included the use of \$23 million in cash to reduce variable-rate borrowings, \$50 million to purchase 1.6 million shares of the Company's common stock and \$25 million for cash dividends. In the first quarter of 1997, MAPCO issued \$100 million of senior subordinated notes with a coupon rate of 7.25% that are due in 2009 and \$100 million of senior subordinated debentures with a coupon rate of 7.70% that are due in 2027. Cash used in financing activities for the first nine months of 1996 included the repurchase of 2.2 million shares of MAPCO common stock for \$62 million, the payment of \$22 million of cash dividends and a net decrease in variable rate debt of \$173 million.

Various loan agreements contain restrictive covenants which, among other things, limit the payment of advances or dividends by two of Natural Gas Liquids' ("NGL") subsidiaries to MAPCO. At September 30, 1997, \$190 million of net assets held by such subsidiaries were restricted by such provisions.

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LIQUIDITY AND CAPITAL RESOURCES

MAPCO's primary sources of liquidity are its cash and cash equivalents, internal cash generation, and external financing. At September 30, 1997, MAPCO's cash and cash equivalents were \$45 million compared to \$105 million at

December 31, 1996.

MAPCO's external financing sources include its bank credit agreements, its uncommitted bank credit lines, its ability to issue public or private debt, including commercial paper and its leasing arrangement. MAPCO's bank credit agreements represent a total committed line of credit of \$400 million. The bank credit agreement serves as a back-up for outstanding commercial paper and for borrowings against bank money market lines. As of September 30, 1997, no borrowings were outstanding under the bank credit agreement.

On December 11, 1996, the Company entered into a seven-year operating lease arrangement to accommodate the acquisition and construction of certain assets. Payments under the lease are based on the amounts spent for acquisition or construction of assets and the applicable interest rate. After the lease term, the arrangement may be extended by agreement of the parties or the Company may purchase or arrange for the sale of the assets. As of September 30, 1997, there were no outstanding advances against the lease agreement and the full \$100 million commitment was available. The Company expects to utilize \$15 million of the commitment by December 31, 1997.

As of September 30, 1997, MAPCO had outstanding \$279 million of Medium Term Notes issued pursuant to a 1990 shelf registration statement. The aggregate principal amount of \$47 million remaining on the 1990 shelf registration statement was de-registered on March 4, 1997. On January 31, 1997, MAPCO filed another shelf registration statement with the Securities and Exchange Commission providing for the issuance of up to \$500 million of debt and equity securities. During the first quarter of 1997, the Company issued \$200 million of senior subordinated notes and debentures under this registration statement. The proceeds from this debt issuance were used for general corporate purposes, including funding working capital requirements, capital expenditures, investments in unconsolidated affiliates, share repurchases and reduction of debt.

At December 31, 1996, the Company was a party to various interest rate swap agreements with financial institutions which effectively changed the Company's interest rate exposure from variable rates to fixed rates on \$100 million of debt. In the first quarter of 1997, the Company recognized a \$4.3 million gain upon termination of the interest rate swap agreements, which was done concurrently with the pay-off of the related debt.

As of September 30, 1997, the Company had sold put options on 1.1 million shares of MAPCO common stock with strike prices ranging from \$29.00 to \$32.63 per share. In the first nine months of the year, put options on 500,000 shares expired and options on 600,000 shares were extended. As of September 30, 1997, options on 600,000 shares of MAPCO

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common stock were outstanding with expiration dates ranging from October 1997 to February 1998. MAPCO's Board of Directors has authorized Management to issue put options on up to 1.5 million shares of MAPCO's common stock.

Effective January 1, 1997, MAPCO sold its interest in the natural gas liquids and condensate in the West Panhandle field to Westpan NGL Company, a subsidiary of MESA Operating Company, for \$66 million. The Company recognized

a gain of \$66 million on the transaction in the first quarter of 1997 as the interest sold had no book basis. As part of the sales agreement, MAPCO was released from its liability for its share of prior natural gas liquids over-takes.

Effective January 1, 1997, MAPCO acquired the assets of Gas Supply, Inc., ("Gas Supply") an independent wholesale propane company based in Minneapolis, Minnesota, for approximately \$7 million, plus working capital. The acquisition has been used to expand MAPCO's current wholesale propane marketing activities under the trade name "Gas Supply." Gas Supply marketed approximately 120 million gallons of propane in the Central and Northeastern United States in 1996. MAPCO also acquired Gas Supply's related product sales, a construction company, a 40,000-barrel storage facility and a rail car and truck terminal in Rosemont, Minnesota.

In April 1997, MAPCO acquired ACS Data, Ltd. ("ACS"), a company with headquarters in Manchester, England, at a cost of approximately \$10 million. ACS designs and manufactures hand-held computers and peripherals.

Effective May 21, 1997, MAPCO acquired 19 retail convenience stores located primarily in the Nashville, Tennessee market from EZ-Serve Inc. at a cost of \$12 million.

On April 30, 1997, MAPCO purchased a 5% ownership in the Alliance pipeline project. The Alliance pipeline will construct a 1,900 mile, 36-inch diameter, natural gas pipeline transmission system to carry natural gas and natural gas liquids from western Canada to the Midwest United States for marketing throughout North America. Alliance's delivery points near Chicago include a natural gas liquids extraction facility proposed by Aux Sable Liquids Products LP, which is adjacent to the northern end of MAPCO's 10,000 mile NGL pipeline network. Construction of the pipeline is expected to begin in the second quarter of 1998 with completion anticipated by year-end 1999.

From May through August 1997, MAPCO acquired eleven propane companies at a cost of approximately \$35 million. These companies, with combined sales during 1996 of over 26.5 million gallons of propane and other related products, have market areas in Alabama, Arkansas, Indiana, Minnesota, Missouri, North Carolina, Oklahoma and South Dakota.

MAPCO's existing debt and credit agreements contain covenants which limit the amount of additional indebtedness the Company can incur. Management believes, however, that MAPCO has sufficient capacity to

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fund its anticipated needs.

Capital expenditures in 1997 are currently expected to be about \$315 million and investments in unconsolidated affiliates are projected to be approximately \$140 million. Capital expenditures in 1997 are currently expected to include \$83 million for capital items necessary to maintain existing operations, \$60 million for propane marketing acquisitions and expansions, \$60 million for convenience store construction and acquisitions, \$46 million for refinery expansion projects and \$22 million for pipeline loops and connections. MAPCO expects to utilize cash from operations, short-term funding sources, proceeds from the sale of assets, leasing arrangements and proceeds from additional

borrowings and/or equity securities under the shelf registration statement filed with the SEC in 1997 to meet anticipated 1997 capital expenditures and equity investments. MAPCO anticipates that any future excess internal cash generation will be used primarily for debt reduction and to fund new capital projects.

Other Developments

On July 22, 1997, MAPCO announced plans to construct a splitter at the Mid-South Refinery that will increase the refinery's capacity for propylene production from the current 2,000 barrels per day to 6,000 barrels per day of the high margin product. The project is expected to be completed by the end of the first quarter of 1998 at an anticipated cost of \$20 million.

MAPCO also announced plans to construct a third crude unit at the North Pole Refinery that will produce an additional 17,000 barrels per day of refined products, including 14,000 barrels per day of jet fuel. The project is expected to be completed in the fourth quarter of 1998 at a cost of \$70 million.

On August 1, 1997, MAPCO announced that it had reached an understanding with Enterprise Products Company ("Enterprise") to form a joint venture for the development of a natural gas liquids transportation and distribution system. It is anticipated this system will be capable of distributing product from key NGL sources in southern Louisiana with direct connections to major NGL markets, including the Louisiana river markets, Lake Charles, Louisiana and Mont Belvieu, Texas. The joint venture will be a limited liability company in which MAPCO and Enterprise will each have a 50 percent interest.

On September 5, 1997, MAPCO announced the opening of its new office under the name of Espagas, S.A. de C.V. ("Espagas") in Celaya, Guanajuato, Mexico and future plans to open an additional office in Mexico City. Espagas markets liquefied gas (LPG) technology equipment as a part of MAPCO's TouchStar Technologies LLC.

MAPCO announced on September 10, 1997 that Thermogas Company had launched a new company, Thermogas Energy, LLC, that will form joint ventures with rural electric cooperatives and municipal utilities to market and distribute propane. As of September 30, 1997, Thermogas

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Energy had completed joint ventures with two rural cooperatives in the state of Kentucky.

The gas gathering system for the Discovery project is under construction and gas transportation is expected to begin in December 1997. The project's gas processing plant and fractionator are also under construction and both are expected to be fully operational by July 1998.

In July 1997, MAPCO acquired a 100% ownership interest in LEXAS OIL, L.L.C. which had been an unconsolidated 50% owned entity since January 1, 1995.

The Company is in the process of assessing the expected costs associated with modifying its internal-use software and hardware for the year 2000, and has not yet determined the estimated amount of such costs. MAPCO is also reviewing the potential costs or consequences of incomplete or untimely resolution of the year 2000 issue by the Company or other entities, which could materially impact results of operations, financial position or cash flows.

RESULTS OF OPERATIONS

THIRD QUARTER

Sales and operating revenues were as follows (In millions):

	Three Months Ended September 30,		
	1997	1996	Variance
Natural Gas Liquids	\$ 170.0	\$ 161.6	\$ 8.4
Propane Marketing	66.5	71.7	(5.2)
Petroleum Refining	651.3	466.0	185.3
Retail Petroleum	187.7	186.8	0.9
Other	8.3	--	8.3
Eliminations	(101.7)	(88.6)	(13.1)
	<u>\$ 982.1</u>	<u>\$ 797.5</u>	<u>\$ 184.6</u>
	*****	*****	*****

The \$184.6 million increase in sales and operating revenues primarily reflects increased sales in the Petroleum Refining business unit.

Natural Gas Liquids' sales increased \$8.4 million principally due to increased trading and pipeline revenues. Trading revenues increased \$5.5 million as revenues from the Canadian operations, which just began operations last September, increased \$19.5 million, offset by a \$14.0 million decrease in other trading activities. Other trading revenues decreased as both volumes and prices decreased from last year. Pipeline revenues were at record levels for the third quarter and increased \$4.2 million, primarily due to increased shipments from Rocky Mountain origins, increased production and shipments from the Chaco plant and increased shipments of ethane/propane mix products. The Westpan operations, which were shut down after MAPCO sold its interest in the liquids and condensate in the West Panhandle field on January 1, 1997, generated \$1.9 million of revenues during the third quarter of 1996. Outside storage revenue increased \$0.4 million due to increased storage contracts. Overall, Natural Gas Liquids' \$13.3 million volume increase was partially offset by a \$4.9 million price decrease for a net sales increase of \$8.4 million.

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Propane Marketing sales decreased \$5.2 million as decreased gas supply sales more than offset the impact of increased retail sales. Retail sales increased \$2.3 million as increased retail propane sales more than offset the loss of

revenues from fertilizer and chemical sales. Retail propane sales increased \$4.1 million as volumes increased 5.2 million gallons reflecting the additional plants acquired since last year combined with slightly higher selling prices. Fertilizer and chemical sales decreased \$1.7 million because those operations were phased-out during the third quarter of 1996. Gas supply sales decreased \$7.7 million primarily due to decreased spot supply sales. The decrease in spot supply sales was mainly attributable to decreased sales volumes of 18.9 million gallons combined with a slight decrease in sales prices. Last year's volatile market conditions were favorable for spot supply activities. Overall, a \$12.6 million decrease in prices was partially offset by a \$7.4 million increase in volumes for a net sales decrease of \$5.2 million.

Petroleum Refining sales increased \$185.3 million primarily due to increased sales by the Mid-South Refinery. Sales at the Mid-South Refinery increased \$199.6 million as volumes increased 100,424 barrels per day (73.8%), partially offset by a 7.6% decrease in average sales prices. The sales volume increase was met by increased production, as processed barrels sold increased 19,656 barrels per day, and sales of purchased products increased by 80,768 barrels per day. The increase in sales volume reflects the inclusion of the previously unconsolidated Lexas operations, increased demand for high-octane gasoline, increased jet fuel sales, and aggressive marketing and increased spot sales in the Memphis and Ohio Valley areas. Petroleum Refining's sales decreased \$14.3 million as average sales prices decreased \$0.05 per barrel (5.6%) and sales volumes decreased 1,796 barrels per day (3.3%). The price decrease primarily reflects lower jet fuel and diesel prices and the volume decrease was due to the timing of gasoline blendstock cargo shipments. Overall, Petroleum Refining's \$234.7 million volume increase was offset by a \$49.4 million price decrease for a net sales increase of \$185.3 million.

Retail Petroleum's overall sales increased \$12.9 million due to a \$9.3 million increase in merchandise sales, partially offset by a \$8.4 million decrease in fuel sales. Lower sales prices accounted for \$3.5 million of the \$8.4 million decrease in fuel sales and decreased volumes accounted for the remaining \$4.9 million. Merchandise sales increased \$9.3 million (16.9%) due to the combination of an increase of 20 stores over the prior year quarter and a 7.6% increase in merchandise sales per store. Gasoline revenues increased \$1.0 million reflecting an increase of 2.0 million gallons (2.8%) in sales volumes, partially offset by a \$0.02 per gallon (1.6%) decrease in average sales price per gallon. The increase in gasoline sales volumes was primarily attributable to the increased number of stores. Diesel revenues decreased \$9.5 million as both prices and volumes decreased from last year. Volumes declined 6.7 million gallons (16.9%) because of the absence of volumes from the Rising Fawn travel center which closed due to a fire in the fall of 1996 and the discontinuation of the Fuelman operations. Construction to rebuild the Rising Fawn travel center is

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underway and is expected to be completed by early December 1997. Diesel prices decreased \$0.06 per gallon (5.5%).

Other sales and operating revenues include sales by MAPCO's newly formed companies FleetOne L.L.C. and TouchStar Technologies L.L.C. of \$5.8 million and \$2.5 million, respectively.

Outside purchases and operating expenses increased \$176.9 million in the third quarter of 1997 as compared to 1996. Details by business unit are as follows (In millions):

	1997		Three months ended September 30: 1996		Variance	
	Outside Purchases	Operating Expense	Outside Purchases	Operating Expense	Outside Purchases	Operating Expense
Natural Gas Liquids	\$ 99.4	\$ 27.1	\$ 86.3	\$ 31.4	\$ 13.1	\$ (4.3)
Propane Marketing	13.1	23.0	33.7	17.9	(20.6)	5.1
Petroleum Refining	580.6	27.7	413.9	25.6	166.7	2.1
Retail Petroleum	85.0	26.1	83.3	18.7	1.7	7.4
Other	5.9	(.2)	--	--	5.9	(.2)
	<u>\$ 784.0</u>	<u>\$ 103.7</u>	<u>\$ 617.2</u>	<u>\$ 93.6</u>	<u>\$ 166.8</u>	<u>\$ 10.1</u>

Natural Gas Liquids' outside purchases increased \$13.1 million primarily as a result of increased trading purchases. Canada trading purchases increased \$19.4 million as those operations were in start-up in the 1996 third quarter. Other trading purchases decreased \$6.3 million primarily due to lower market prices. Operating expenses decreased \$4.3 million primarily due to the absence of Westpan expenses as those operations were shut down after MAPCO sold its interest in the liquids and condensate in the West Panhandle field in January of this year.

Propane Marketing's outside purchases decreased \$20.6 million due to reduced wholesale, retail propane and fertilizer purchases. Propane purchases for the wholesale and retail operations decreased \$20.2 million. Lower product prices accounted for \$28.0 million of the variance, partially offset by increased volumes, reflecting the volume increase in both retail and wholesale propane sales. Outside purchases of fertilizer and chemical decreased \$1.3 million due to the divestiture of those product lines in 1996. Appliance and all other purchases increased \$0.9 million. Operating expenses increased \$5.1 million primarily due to increased salary and benefit costs, advertising, supplies and vehicle expenses associated with acquisitions and new development and increased bad debt accruals associated with increased accounts receivable.

Petroleum Refining's outside purchases increased \$166.7 million. The Mid-South Refinery's purchases increased \$183.3 million due to increased purchases of refined products and increased crude throughput volumes, partially offset by a decrease in crude prices. Outside purchases of refined products increased due to the inclusion of the previously unconsolidated Lexus trading operations and an overall increase in sales in the Mid-South Refinery's marketing areas. The

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Alaska Refinery's outside purchases decreased \$16.6 million reflecting a \$2.67 per barrel decrease in West Coast crude prices combined with reduced purchases of refined products as product sales volumes were down for the quarter. Operating expenses increased \$2.1 million primarily due to increased labor and maintenance costs at the

Alaska Refinery. Operating expenses at the Mid-South Refinery were essentially unchanged from last year; however, because of the additional barrels produced, controllable expenses decreased \$0.12 per barrel (6.9%).

Retail Petroleum's outside purchases increased \$1.7 million. Including the more significant amounts of products purchased from the Petroleum Refining business unit, which are not reflected in the above table due to eliminations, total purchases increased \$0.6 million. Gasoline purchases increased \$3.3 million due to an increase in volumes of 4.6 million gallons combined with a \$0.01 per gallon increase in wholesale prices. Merchandise purchases increased \$6.4 million due to increased sales. Total diesel purchases decreased \$9.1 million due to a decrease of 4.7 million gallons purchased, reflecting lower diesel sales volumes, combined with a \$0.07 per gallon decrease in wholesale costs. Operating expenses increased \$7.4 million principally because of general cost increases reflecting the increased number of stores in operation and business development activities.

Other outside purchases of \$5.9 million include purchases of refined petroleum products by FleetOne L.L.C. of \$4.5 million and computer product purchases by TouchStar Technologies L.L.C. in the amount of \$1.4 million.

Selling, general and administrative expenses increased \$4.8 million; however, excluding a \$4.0 million reclassification entry which reduced general and administrative expense (see other income below), selling, general and administrative expense increased \$8.8 million. The increase was primarily due to increased labor and associated costs reflecting increased support personnel, the cost of the Marketing and Business Development department which was established in August 1996 to develop new business opportunities for the Company, and increased outside services, legal and travel expenses.

Depreciation and amortization expense increased \$3.5 million primarily because of increased expense by Alaska Marketing and Refining and Propane Marketing. Alaska Marketing and Refining's increase was due to an adjustment in September 1996 to increase the depreciable life of the refinery which reduced prior year expense by \$3.1 million. Propane Marketing's depreciation expense increased principally because of plant acquisitions since last year.

Interest expense for the current quarter was \$11.3 million compared to \$15.1 million in the 1996 quarter. The \$3.8 million decrease primarily reflects \$3.4 million of interest capitalized in the current quarter which was associated with the Discovery Project.

Other income/expense for the three months ended September 30 decreased

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\$4.3 million principally due to the current quarter reclassification of pension overfunding earnings from other income to general and administrative expense.

The effective income tax rate for the third quarter of 1997 was 40.7% compared to 40.6% in the third quarter of 1996. The difference between the statutory Federal income tax rate of 35% and the effective income tax rate was primarily due to state income taxes.

Operating profit (loss) for the three months ended September 30, 1997 and 1996 is detailed below (in millions):

	1997	1996	Variance
Natural Gas Liquids	\$ 32.2	\$ 32.6	\$ (0.4)
Propane Marketing	(10.0)	(5.1)	(4.9)
Petroleum Refining	33.2	20.4	12.8
Retail Petroleum	3.4	11.3	(7.9)
Other	(1.2)	-	(1.2)
	\$ 57.6	\$ 59.2	\$ (1.6)

Natural Gas Liquids' current quarter operating profit decreased \$0.4 million principally due to the absence of \$3.5 million of operating profit from the Westpan operations. MAPCO sold its interest in the liquids and condensate in the West Panhandle field in January 1997. Excluding Westpan from the 1996 results, operating profit increased \$3.1 million primarily due to increased profits from pipeline operations.

Propane Marketing's operating profit decreased \$4.9 million because increased margins on product sales were more than offset by increased operating, general and administrative and depreciation expenses.

Petroleum Refining's operating profit increased \$12.8 million, reflecting a \$15.2 million increase from the Mid-South Refinery, partially offset by a \$2.4 million decrease from the Alaska Refinery. Profits at the Mid-South Refinery increased primarily due to a 10.8% increase in the gross profit margin on processed barrels sold. The profit margin increase resulted from crude cost decreases which outpaced declines in average product sales prices. The \$2.4 million decrease in the Alaska Refinery's profit was primarily attributable to increased depreciation expenses. The impact of a 13.5% increase in gross profit margin on processed barrels sold was offset by increased operating expenses. The increase in gross profit margin reflects the effect of crude costs declining more than the average product price.

Retail Petroleum's operating profit decreased \$7.9 million primarily due to a \$7.4 million increase in operating expenses. Otherwise, an increase in merchandise profits of \$2.8 million was offset by lower gasoline profits. Diesel profits were essentially unchanged from the 1996 quarter. Merchandise profits increased because of a \$9.2 million

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Increase in sales volumes while gross profit margins remained unchanged from the 1996 quarter. Expenses increased primarily because of general increases in a number of expense categories and the impact of the additional stores from the EZ-Serve acquisition on operating costs. The lower gasoline profits reflect a 4.4 cent per gallon (21.6%) decrease from last year's exceptionally high margins, partially offset by a 2.8% increase in gasoline sales volumes. Diesel profits were essentially unchanged as the impact from a \$0.02 per gallon increase (29.1%) in gross profit margin was offset by a 6.7 million gallon (16.9%) decrease in volumes.

Income from continuing operations was \$22.1 million or \$0.41 per share in the 1997 third quarter compared to \$22.7 million or \$0.40 per share in the 1996 quarter. Average common shares outstanding were 54.4 million in the 1997 quarter and 57.3 million in the 1996 quarter.

YEAR-TO-DATE

Sales and operating revenues were as follows (In millions):

Nine Months Ended September 30,	1997	1996	Variance
Natural Gas Liquids	\$ 552.1	\$ 463.7	\$ 88.4
Propane Marketing	284.3	275.7	8.6
Petroleum Refining	1,645.6	1,285.3	360.3
Retail Petroleum	549.4	532.5	16.9
Other	14.9	-	14.9
Eliminations	(278.7)	(235.5)	(43.2)
	\$ 2,767.6	\$ 2,321.7	\$ 445.9

The \$445.9 million increase in sales and operating revenues was due to increased sales by all of MAPCO's operating units.

Natural Gas Liquids' sales increased \$88.4 million due to increased trading and pipeline revenues. Trading revenues increased \$83.2 million as revenues from MAPCO Canada, which just began operations last September, increased \$51.3 million. Other trading revenues increased \$31.9 million as both volumes and average prices increased over 1996. Pipeline revenues increased \$10.5 million, primarily due to increased ethane shipments from Rocky Mountain and Hobbs origins, increased production and shipments from the Chaco plant and increased shipments of ethane/propane mix products. The Westpan operations, which were shut down after MAPCO sold its interest in the liquids and condensate in the West Panhandle field on January 1, 1997, generated \$5.9 million of revenues during the first nine months of 1996. Overall, \$63.0 million of Natural Gas Liquids' sales increase was due to increased volumes and \$25.4 million was due to higher prices.

Propane Marketing sales increased \$8.6 million; however, excluding the revenues associated with the assets sold in the Cenex transaction, sales increased \$32.3 million as both Gas Supply and Retail Propane sales increased over 1996. The Cenex transaction included the sale of

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all of Propane Marketing's Iowa retail propane plants at the end of the first quarter of 1996 along with phased-out sales of its fertilizer and related products operations through the third quarter of 1996. Gas supply sales increased

\$25.4 million primarily due to increased wholesale propane sales reflecting the acquisition of the assets of Gas Supply Inc. in January 1997. Retail propane sales increased \$6.9 million reflecting a 10.5 cent per gallon increase in average sales prices, partially offset by a 14.0 million gallon decrease in sales volumes. The lower retail propane sales volumes reflect warmer weather patterns in the current year. Overall, \$21.8 million of Propane Marketing's \$32.3 million sales increase was attributable to increased prices and \$10.5 million to increase volumes.

Petroleum Refining sales increased \$360.3 million reflecting increased sales by both the Mid-South and Alaska Refineries. Sales at the Mid-South Refinery increased \$345.8 million (36.6%) as increased volumes more than offset the impact of lower product prices. Volumes increased 52,066 (38.0%) barrels per day reflecting increased demand for high-octane gasoline, increased jet fuel sales, and aggressive marketing and increased spot sales in the Memphis and Ohio Valley areas. The volume increase was met by increased production, as processed barrels sold increased 8,556 barrels per day (8.5%) combined with increased sales of purchased products of 43,510 barrels per day. Average product prices for the period decreased \$0.17 per barrel (0.7%). Sales increased \$14.5 million (1.3%). The increased volumes primarily reflect continued strong demand for jet fuel which more than offset decreased gasoline, diesel and asphalt sales. With this year's construction season almost complete, traditionally high-margin asphalt sales have been reduced by almost 40% due to the entry of new competitors in the Alaska asphalt market. Total processed sales volumes were met through increased sales of purchased products. Barrels sold increased 52,066 barrels per day. Overall, Petroleum Refining's \$364.4 million volume increase was offset by a \$4.1 million price decrease for a net increase of \$360.3 million.

Retail Petroleum's overall sales increased \$16.9 million due to a \$12.6 million increase in merchandise sales and a \$4.3 million increase in fuel sales. The increase in fuel sales was attributable to higher average fuel prices as the impact from volumes was negligible because increased gasoline volumes offset the impact of lower diesel volumes. Merchandise sales increased \$12.6 million (8.0%) due to the combination of an increase of 10 stores over the previous year and a 3.3% increase in merchandise sales per store. Gasoline revenues increased \$13.4 million reflecting an increase in gasoline volumes sold of 8.9 million gallons (4.3%) combined with a \$0.01 per gallon (0.8%) increase in average sales price per gallon. The increase in gasoline sales volumes was primarily attributable to an increase in the number of stores. Diesel revenues decreased \$9.8 million as decreased volumes more than offset the impact of higher sales prices. Volumes declined 10.7 million gallons (9.5%) because of the absence of volumes from the Rising Fawn travel center which closed due to a fire in the fall of

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1996, the discontinuation of the Fuelman operations and the increase in fuel prices. Diesel prices increased \$0.02 per gallon (5.5%) from last year.

Other sales and operating revenues includes sales by MAPCO's newly formed companies FleetOne L.L.C. and TouchStar Technologies L.L.C. of \$9.1 million and \$5.8 million, respectively.

Outside purchases and operating expenses increased \$443.7 million in the first nine months of 1997 as compared to 1996. Details by business unit are as follows (in millions):

	1997		Nine months ended September 30, 1996		Variance	
	Outside Purchases	Operating Expense	Outside Purchases	Operating Expense	Outside Purchases	Operating Expense
Natural Gas Liquids	\$ 337.1	\$ 85.9	\$ 243.7	\$ 85.7	\$ 93.4	\$ 0.2
Propane Marketing	131.2	68.4	141.1	59.8	(9.9)	8.6
Petroleum Refining	1,461.3	79.2	1,146.1	73.5	315.2	5.7
Retail Petroleum	249.6	70.0	241.5	59.6	8.1	10.4
Other	10.9	1.1	-	-	10.9	1.1
	\$ 2,190.1	\$ 304.6	\$ 1,772.4	\$ 278.6	\$ 417.7	\$ 26.0

Natural Gas Liquids' outside purchases increased \$93.4 million primarily as a result of increased trading purchases. Purchases by MAPCO Canada, which was in start-up during the 1996 quarter, increased \$51.3 million and other trading purchases increased \$41.9 million, reflecting both higher market prices and increased trading volumes. Operating expenses were essentially unchanged; however, excluding Westpan expenses from the 1996 amounts, operating expenses increased \$6.9 million. Pipeline expenses increased \$3.8 million due to increased power costs which resulted from both increased volumes and higher natural gas prices, partially offset by decreased property tax expense. Fractionation costs increased \$0.8 million because of increased volumes and higher natural gas prices. Operating expense associated with trading operations increased \$1.4 million.

Propane Marketing's outside purchases decreased \$9.9 million; however, excluding the Cenex transaction, outside purchases increased \$6.8 million. Propane purchases for both the wholesale and retail operations increased \$1.6 million as increased volumes caused purchases to increase \$21.4 million, partially offset by lower product prices which reduced purchases by \$19.8 million. Appliance purchases increased \$2.9 million and all other purchases increased \$2.3 million. Operating expenses increased \$8.6 million; however, excluding the Cenex transaction, operating expenses increased \$11.7 million. The increase was primarily due to increased salary and benefit costs and increased supplies and outside services attributable to acquisitions and retail plant development and accruals associated with contingent liabilities.

Petroleum Refining's outside purchases increased \$315.2 million. The Mid-South Refinery's purchases increased \$305.3 million due primarily

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to additional purchases of refined product to meet sales demand and increased purchases of crude caused by increased crude throughput. Refined product purchases increased 43,509 barrels per day (54.4%) and crude throughput barrels increased 8,992 barrels per day (8.29%). The increase in purchased volumes of refined products and crude was partially offset by lower product and crude prices. Alaska's outside purchases increased \$9.9 million

primarily due to increased purchases of jet fuel. Demand for jet fuel has exceeded the refinery's current production capacity and outside purchases of jet fuel have been required to meet increased sales contracts. Higher product prices also contributed to the overall increase in outside purchases. Operating expenses increased \$5.7 million. Expenses at the Alaska Refinery increased \$4.4 million due to planned increases in maintenance activities, including a mini-turnaround on the Sulfolane unit and maintenance on the crude tank and heat exchangers and increased environmental costs. Expenses at the Mid-South Refinery increased \$1.3 million primarily due to increased benefit costs.

Retail Petroleum's outside purchases increased \$8.1 million. Including the more significant amounts purchased from the Petroleum Refining business unit, which are not reflected in the above table due to eliminations, purchases increased \$16.9 million. Gasoline purchases increased \$17.6 million due to an increase of 11.4 million gallons (5.6%) of gasoline purchased combined with a \$0.04 per gallon (3.9%) increase in product cost. The volume increase primarily reflects increased sales volumes, partially due to the 19 additional stores from the EZ-Serve acquisition in the second quarter of 1997. Diesel purchases decreased \$10.0 million due to a decrease in volumes purchased of 9.7 million gallons (9.0%), which was partially offset by a \$0.01 per gallon (1.0%) increase in wholesale diesel prices. Merchandise purchases increased \$9.3 million (8.5%) as a result of the increased merchandise sales. Operating expenses increased \$10.4 million principally because of additional labor and other cost increases associated with the implementation of strategic growth plans, which include an increased number of stores from the EZ-Serve acquisition and other smaller acquisitions.

Other outside purchases of \$10.9 million reflect \$7.7 million of refined product purchases by FleetOne L.L.C. and \$3.2 million of computer product purchases by TouchStar Technologies L.L.C.

Selling, general and administrative expenses increased \$17.1 million; however, excluding a \$4.0 million reclassification overfunded pension asset income from other income to general and administrative expense, selling, general and administrative expense increased \$21.1 million. The increase was primarily due to increased labor and associated costs reflecting the increased number of employees and establishing, in August 1996, the Marketing and Business Development department to develop new business opportunities for the Company and increased outside services, legal and travel expenses.

Interest expense for the nine months ended September 30, decreased \$6.7 million. Capitalized interest, primarily associated with the Discovery

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Project, increased \$4.1 million over the same period in 1996. Interest expense on commercial paper and the ESOP loan decreased \$8.8 million and \$0.3 million, respectively, but these decreases were mostly offset by a \$2.6 million increase in interest expense on medium term notes and a \$4.4 million increase in interest expense from the 30-year bonds issued in February 1997. The decrease in expense on commercial paper and the ESOP loan reflect reduced average amounts of debt outstanding compared to the same period in 1996. Interest on the medium term notes

increased due to the 12-year bonds which were issued in 1997. The \$66.0 million gain on the sale of net assets held for sale in 1997 reflects the gain on sale of MAPCO's interest in the liquids and condensate in the West Panhandle field in the first quarter. The \$20.8 million gain in 1996 was the gain on sale of the fertilizer and Iowa propane operations.

Other income/expense in the first nine months of 1997 includes a \$4.3 million gain on the termination of interest rate swap agreements and investment income from a portion of the proceeds from the Coal and Westpan sales. Other income/expense in 1997 also includes \$1.0 million of equity income from the Juarez pipeline and \$1.5 million of coal-related pension expense. Other income/expense in 1996 includes \$2.5 million of interest income associated with the sale of the Coal segment and a \$2.5 million gain on the sale of a corporate airplane, partially offset by expenses related to certain coal liabilities which were retained by MAPCO.

The effective income tax rate for the first nine months of 1997 was 39.1% compared to 37.8% for same period in 1996. The difference between the statutory Federal income tax rate of 35% and the effective income tax rate was primarily due to state income taxes.

Operating profit for the nine months ended September 30, 1997 and 1996 is detailed below (in millions):

	1997	1996	Variance
	-----	-----	-----
Natural Gas Liquids	\$ 161.9	\$ 97.6	\$ 64.3
Propane Marketing	(5.5)	41.9	(47.4)
Petroleum Refining	72.9	40.9	32.0
Retail Petroleum	12.3	25.6	(13.3)
Other	(4.7)	-	(4.7)
	-----	-----	-----
	\$ 236.9	\$ 206.0	\$ 30.9
	=====	=====	=====

Natural Gas Liquids' operating profit for the first nine months of 1997 includes a \$66.0 million gain on the sale of MAPCO's interest in the liquids and condensate in the West Panhandle field. Operating profit in 1996 includes \$12.4 million from the Westpan operations. Excluding the gain on sale from 1997 and Westpan's operating income from 1996, operating profit increased \$10.7 million, primarily as a result of increased profits from the pipeline operations. The improvement in pipeline profits reflects strong revenues resulting from favorable ethane recoveries and a full nine months of operations on the Rocky

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Mountain extension compared to last year's first quarter start-up of that line.

Propane Marketing's operating profit in the first nine months of 1996 included a \$20.8 million gain associated with

the Cenex transaction and \$2.7 million of profit from operating the assets included in that sale. Excluding this gain and the income from those divested assets, operating profit decreased \$23.9 million. The decrease in operating profit was attributable to lower margins, decreased retail volumes and increased expenses. The decrease in margins was primarily due to the volatility of propane market prices during the first quarter of 1997. Although margins have subsequently improved, overall margins for the year are still below the exceptional margins experienced during 1996. The decreased retail sales volumes were attributable to the warmer weather conditions in the first nine months compared to record cold temperatures last year.

Petroleum Refining's operating profit increased \$32.0 million as increased profits from the Mid-South Refinery were partially offset by slightly lower profits at the Alaska Refinery. Increased profits at the Mid-South Refinery of \$33.2 million were due to increased sales volumes of 52,066 barrels per day (38.0%) and a \$1.06 per barrel (46.4%) increase in the gross margin on processed barrels sold. Sales volumes increased due to increased demand for high-octane gasoline and jet fuel and increased spot sales in the Ohio Valley market area. Gross margin increased because crude prices decreased more than product prices. Profits at the Alaska Refinery decreased \$1.2 million as increased operating and general and administrative costs more than offset the impact of increased margins. Margins increased \$0.21 per barrel sold (3.4%) primarily because of increased product sales prices.

Retail Petroleum's operating profit decreased \$13.3 million primarily because of increased operating and depreciation expenses. Otherwise, increased merchandise and diesel profits were essentially offset by decreased gasoline profits. Merchandise profits increased \$3.3 million because of increased sales, partially offset by slightly lower margins. Diesel profits increased \$0.9 million as the impact of a 1.7 cent per gallon (23%) increase in diesel margins was largely offset by a 10.7 million gallon (9.5%) decrease in sales volumes. Gasoline profits decreased \$4.7 million as a 2.9 cent per gallon (15.4%) decrease in gasoline margins more than offset the impact of an 8.9 million gallon (4.3%) increase in gasoline sales volumes.

Income from continuing operations was \$105.5 million or \$1.93 per share in the first nine months of 1997 compared to \$87.9 million or \$1.52 per share in the first nine months of 1996. Excluding the impact of the Westpan gain in 1997, the income from the Westpan operations during the first nine months of 1996 and the gain from the Cenex transaction on the first nine months of 1996, income from continuing operations was \$65.6 million or \$1.21 per share in the first nine months of 1997 and \$74.5 million or \$1.29 per share in the first nine months of 1996. Average common shares outstanding for the nine months ended September 30 were 54.7 million in 1997 and 57.7 million in 1996.

CAUTIONARY STATEMENT FOR THE PURPOSES OF THE "SAFE HARBOR" PROVISIONS OF THE PRIVATE SECURITIES LITIGATION REFORM ACT OF 1995

As indicated previously, the Company may have included certain forward-looking statements in this Report and includes this provision pursuant to the "safe harbor" provisions of the Private Securities Reform Act of 1995. Whenever, in this Report, the Company or its management express an expectation or belief as to future results, while made in good faith and with a reasonable basis, there is no assurance that the statement of expectation or belief will be achieved or accomplished. Various risk factors could cause actual results to vary significantly from those expressed in any forward-looking statement. Among those factors which the Company has identified are completion

of construction projects within cost and timing plans, the capacity of constructed assets to function as designed and the availability of financial resources to fund construction projects and other planned capital expenditures.

29 of 30

30

Competitors : MAPCO INC**View By Earnings****PETROLEUM REFINING**

-  **AMERADA HESS CORP**
-  **AMOCO CO**
-  **AMOCO CORP**
-  **ARABIAN SHIELD DEVELOPMENT CO**
-  **ASHLAND INC**
-  **ATLANTIC RICHFIELD CO /DE/**
-  **BP PRUDHOE BAY ROYALTY TRUST**
-  **CASTLE ENERGY CORP**
-  **CHEVRON CORP**
-  **CLARK REFINING & MARKETING INC**
-  **CLARK USA INC /DE/**
-  **CROWN CENTRAL PETROLEUM CORP /MD/**
-  **DIAMOND SHAMROCK INC**
-  **EXXON CORP**
-  **FINA INC**
-  **GIANT INDUSTRIES INC**
-  **HOLLY CORP**
-  **HUNTWAY PARTNERS L P**
-  **LYONDELL PETROCHEMICAL CO**
-  **MAPCO INC**
-  **MOBIL CORP**
-  **MURPHY OIL CORP /DE/**
-  **PENNZOIL CO /DE/**
-  **PHILLIPS PETROLEUM CO**
-  **QUAKER STATE CORP**
-  **SHELL OIL CO**

 [SUN CO INC](#)
 [TESORO PETROLEUM CORP /NEW/](#)
 [TEXACO INC](#)
 [TOSCO CORP](#)
 [TRANSAMERICAN REFINING CORP](#)
 [ULTRAMAR DIAMOND SHAMROCK CORP](#)
 [UNOCAL CORP](#)
 [USX CORP](#)
 [VALERO ENERGY CORP](#)
 [WAINOCO OIL CORP](#)

[| Profile](#) | [| Competitors](#) | [| Financials](#) | [| Full Report](#) | [| Mgt Discussion](#) | [| SEC Filings](#) |



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ACCESSION NUMBER: 0000950134-98-001719

CONFORMED SUBMISSION TYPE: 10-K

PUBLIC DOCUMENT COUNT: 15

CONFORMED PERIOD OF REPORT: 19971231

FILED AS OF DATE: 19980304

SROS: CSX

SROS: NYSE

SROS: PCX

FILER:

COMPANY DATA:

COMPANY CONFORMED NAME:	MAPCO INC
CENTRAL INDEX KEY:	0000062142
STANDARD INDUSTRIAL CLASSIFICATION:	PETROLEUM REFINING [2911]
IRS NUMBER:	730705739
STATE OF INCORPORATION:	DE
FISCAL YEAR END:	1231

FILING VALUES:

FORM TYPE:	10-K
SEC ACT:	
SEC FILE NUMBER:	001-05254
FILE NUMBER:	98557403

BUSINESS ADDRESS:

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CITY:	TULSA
STATE:	OK
ZIP:	74119
BUSINESS PHONE:	9185993712

MAIL ADDRESS:

STREET 1:	P O BOX 645
CITY:	TULSA
STATE:	OK

ZIP: 74101-0645

FORMER COMPANY:

FORMER CONFORMED NAME: MID AMERICA PIPELINE CO
DATE OF NAME CHANGE: 19710923

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<SEQUENCE>1

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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

[X] ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934

FOR THE FISCAL YEAR ENDED DECEMBER 31, 1997

[] TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES
EXCHANGE ACT OF 1934 [NO FEE REQUIRED]

FOR THE TRANSITION PERIOD FROM TO

COMMISSION FILE NUMBER 1-5254

MAPCO INC.
(Exact name of registrant as specified in its charter)

<TABLE>

<S>

<C>

DELAWARE
(State or other Jurisdiction of
Incorporation or Organization)

73-0705739
(I.R.S. Employer
Identification No.)

1800 SOUTH BALTIMORE AVENUE, TULSA, OKLAHOMA

74119

(Address of Principal Executive Offices)
</TABLE>

(Zip Code)

Registrant's telephone number, including area code: (918) 581-1800

Securities registered pursuant to Section 12(b) of the Act:

<TABLE>
<CAPTION>

TITLE OF EACH CLASS -----	NAME OF EACH EXCHANGE ON WHICH REGISTERED -----
<S> Common Stock, \$1.00 Par value	<C> New York Stock Exchange Pacific Exchange Chicago Stock Exchange

</TABLE>

Securities registered pursuant to Section 12(g) of the Act: NONE

INDICATE BY CHECK MARK WHETHER THE REGISTRANT (1) HAS FILED ALL REPORTS REQUIRED TO BE FILED BY SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934 DURING THE PRECEDING 12 MONTHS (OR FOR SUCH SHORTER PERIOD THAT THE REGISTRANT WAS REQUIRED TO FILE SUCH REPORTS), AND (2) HAS BEEN SUBJECT TO SUCH FILING REQUIREMENTS FOR THE PAST 90 DAYS. YES ☒ NO ☐

INDICATE BY CHECK MARK IF DISCLOSURE OF DELINQUENT FILERS PURSUANT TO ITEM 405 OF REGULATION S-K (SEC.229.405 OF THIS CHAPTER) IS NOT CONTAINED HEREIN, AND WILL NOT BE CONTAINED, TO THE BEST OF REGISTRANT'S KNOWLEDGE, IN DEFINITIVE PROXY OR INFORMATION STATEMENTS INCORPORATED BY REFERENCE IN PART III OF THIS FORM 10-K OR ANY AMENDMENT TO THIS FORM 10-K. ☐

The aggregate market value of MAPCO Inc.'s ("MAPCO") voting stock held by non-affiliates of MAPCO, based on the last sale price of MAPCO Common Stock on the New York Stock Exchange on February 20, 1998 was \$3,086,148,513.00. On that date, 55,832,614 shares of MAPCO Common Stock were outstanding, of which 54,801,519 shares were held by non-affiliates.

=====

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(i)

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PART I

ITEM 1. BUSINESS.

BUSINESS OF MAPCO

MAPCO Inc. ("MAPCO" or the "Company") is a diversified energy company which, through separate business units, is engaged in the transportation by pipeline of natural gas liquids ("NGLs"), anhydrous ammonia, crude oil and refined petroleum products; the transportation by truck and rail of NGLs and refined petroleum products; the refining of crude oil; the marketing of NGLs, refined petroleum products and crude oil; the trading of crude oil, refined petroleum products and NGLs; NGL storage; and the marketing of motor fuel and merchandise through convenience store operations. MAPCO was incorporated in Delaware in 1958 and has its principal executive offices in Tulsa, Oklahoma. For convenience of reference and simplification of this report, references herein to MAPCO or the Company include its subsidiaries or affiliates, unless the context requires otherwise.

On November 24, 1997, the Company announced that it had entered into an agreement and plan of merger, as amended as of January 25, 1998 (the "Merger Agreement"), with The Williams Companies, Inc. ("Williams") under which MAPCO will become a wholly-owned subsidiary of Williams (the "Williams Merger"). Under the Merger Agreement, each share of MAPCO common stock and associated preferred stock purchase rights outstanding prior to the Williams Merger will be exchanged for 1.665 shares of Williams common stock and .555 associated preferred stock purchase rights (after giving effect to Williams two-for-one stock split on December 29, 1997) upon consummation of the Williams Merger. The proposed Williams Merger will be completed only if a number of conditions are met or waived, including obtaining (i) the approval of the stockholders of Williams and MAPCO and (ii) receipt of necessary governmental approvals. Consummation of the proposed Williams Merger is expected in the first quarter of 1998. Reference is made to the Joint Proxy Statement/Prospectus of MAPCO and Williams dated January 27, 1998 for a complete description of the Merger Agreement and the transactions contemplated thereby.

In connection with the Williams Merger, also in November 1997, the Company amended its Rights Agreement under which the Company has a one-half Right outstanding for each outstanding share of MAPCO common stock as described in Note 11 to the Consolidated Financial Statements in this Report. This amendment will effectively prevent the Rights from becoming exercisable as a result of the Williams Merger and the consummation of the other transactions contemplated by the Merger Agreement and provides that all outstanding Rights will expire immediately prior to the effective time of the Williams Merger.

CAUTIONARY STATEMENT FOR THE PURPOSES OF THE "SAFE HARBOR" PROVISIONS OF THE PRIVATE SECURITIES LITIGATION REFORM ACT OF 1995

The Company may have included certain forward-looking statements in this Report and includes this provision pursuant to the "safe harbor" provisions of

the Private Securities Reform Act of 1995. Whenever, in this Report, the Company or its management express an expectation or belief as to future results or future events, while made in good faith and with a reasonable basis based on information currently available to the Company's management, there is no assurance that the statement of expectation or belief will be achieved or accomplished. Various risk factors could cause actual results and events to vary significantly from those expressed in any forward-looking statement.

Forward-looking statements are not guarantees of performance. They involve risks, uncertainties and assumptions. The future results and stockholder value of MAPCO may differ materially from those expressed in these forward-looking statements. Many of the factors that will determine these results and values are beyond MAPCO's ability to control or predict. Stockholders are cautioned not to put undue reliance on any forward-looking statements.

Stockholders of the Company should understand that the following important factors, in addition to those discussed elsewhere in this Report, could affect the future results of the Company, and could cause results to differ materially from those expressed in such forward-looking statements: (i) the effect of economic

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conditions and interest rates on a national, regional or international basis; (ii) the financial resources of, and products available to, competitors; (iii) changes in laws and regulations, including changes in accounting standards; (iv) changes in the securities markets; (v) the timing of the implementation of changes in operations to effect cost savings; (vi) opportunities that may be presented to and pursued by Williams following the Merger; (vii) completion of construction projects within cost and timing plans; and (viii) the capacity of constructed assets to function as designed. In addition, future utilization of pipeline capacity will depend on energy prices, competition from other pipelines and alternate fuels, the general level of natural gas and petroleum product demand and weather conditions, among other things. Further, gas prices which directly impact transportation and gathering and processing throughput and operating profits may fluctuate in unpredictable ways.

BUSINESS UNIT INFORMATION

MAPCO's business is divided into the following business unit reporting structures:

<TABLE>

<CAPTION>

BUSINESS UNIT	BUSINESS ACTIVITY INCLUDED WITHIN BUSINESS UNIT
-----	-----
<S>	<C>
Natural Gas Liquids.....	Liquid Petroleum Gas ("LPG") Distribution, NGL Trading, Pipeline Operations, Fractionation and Underground Storage.

Propane Marketing.....	Wholesale and Retail Marketing of Propane and Appliances.
Petroleum Refining.....	Refining, Wholesale Marketing and Crude and Refined Products Trading.
Retail Petroleum.....	Retail Marketing and Convenience Store Operations.
Other.....	Mobile Information Systems and Bundled Services for Commercial Fleets.

</TABLE>

Financial information about MAPCO's continuing business units for each of the three years in the period ended December 31, 1997 is set forth in Note 14 to the consolidated financial statements on page F-22 and Management's Discussion and Analysis of Financial Condition and Results of Operations on page 16.

NATURAL GAS LIQUIDS

GENERAL

The Natural Gas Liquids business unit operations include the transportation and sale of NGLs as well as pipeline transportation of anhydrous ammonia, refined petroleum products and crude oil. The NGL business unit operations also include fractionation and underground storage systems. The 1997 Natural Gas Liquids revenues were \$750.6 million and operating profit was \$183.6 million compared to \$716.4 million of revenues and \$137.1 million of operating profit in 1996. Operating profit in 1997 includes a \$66.0 million gain on the sale of MAPCO's interest in the West Panhandle field.

NGL PROCESSING AND TRADING

MAPCO owns a 50% interest in and operates a 107,000 barrel per day fractionator at Conway, Kansas. This fractionator receives mixed NGLs from the gathering areas in the Overthrust Belt area of Wyoming and Utah, New Mexico, west Texas, western Oklahoma, Colorado and Kansas for separation into ethane-propane mix, propane, normal butane, iso-butane and natural gasoline. After separation, the products are moved principally to markets in the Midwest and on the Texas Gulf Coast through MAPCO's Mid-America and Seminole pipeline systems.

MAPCO buys, sells and exchanges domestic and imported NGLs in the Midwest, Gulf Coast and Rocky Mountain regions. MAPCO purchases all of its NGLs from outside sources and sales are made under both short and long-term arrangements.

NGL sales and purchases for 1997 averaged 77,947 barrels per day compared with 73,696 barrels per day in 1996. The supply of and demand for NGLs can materially affect the volume of product available to MAPCO and also the market for such product.

MID-AMERICA PIPELINE

Mid-America Pipeline Company ("Mid-America"), a wholly-owned subsidiary of MAPCO Natural Gas Liquids Inc., owns and operates 7,668 miles of pipeline and related pumping, metering and storage facilities. The main system consists of 7,636 miles of pipeline; the remaining 32 miles is the portion of the pipeline which runs from near Collierville, Tennessee to MAPCO's Refinery in Memphis, Tennessee.

The Mid-America pipeline system transports NGLs which consist of the following: propane used as fuel and petrochemical feedstock; butane and natural gasoline used as refinery and petrochemical feedstock; ethane-propane mixtures and ethylene used as petrochemical feedstock; and mixed NGLs for further fractionation. The pipeline system consists of 7,636 miles of pipe varying in diameter from two to twelve inches. The main line of this pipeline system runs from the Wyoming-Utah Overthrust Belt area through the northwestern New Mexico portion of the Four Corners area to near Hobbs, New Mexico, and from Hobbs to Conway, Kansas, where it branches into east and west legs. The west leg extends to near Minneapolis, Minnesota, and the east leg leads to near Janesville, Wisconsin. Spurs from these legs extend into southeast Kansas, Iowa and Illinois.

Mid-America also transports crude oil from St. James, Louisiana to Memphis, Tennessee. This crude oil is transported in pipeline space leased by Mid-America in the Capline Pipeline system which extends from St. James to near Collierville, Tennessee. Crude oil is then transported through a 45-mile pipeline, operated and partially owned (32 miles only) by Mid-America to MAPCO Petroleum's Memphis Refinery. In order to increase throughput of crude to the Company's Memphis Refinery, the pipeline was looped in the Fall of 1996. This process increased the length of the line by 13 miles. Effective January 1, 1996, the Mid-America space on the Capline System was leased by the Petroleum Refining business unit.

SEMINOLE PIPELINE

Seminole Pipeline Company ("Seminole") owns 1,311 miles of pipeline, predominantly fourteen inches in diameter, extending from Hobbs Station in west Texas to the Mont Belvieu Terminal on the Texas Gulf Coast, together with related pumping, metering and storage facilities. MAPCO owns 80% of the stock of Seminole and operates and manages the pipeline.

Seminole operates as a batch system moving demethanized mix, ethane-propane mix and specification liquid products. Products are received from gas processing plants and from Mid-America for delivery to various destinations along the pipeline system. The Texas Gulf Coast market served by Seminole is predominantly for petrochemical and refining feedstock.

See "Legal Proceedings" Item 3 beginning on page 12 for information concerning litigation proceedings connected with Seminole.

MAPCO AMMONIA PIPELINE

MAPCO Ammonia Pipeline (the "Ammonia System") transports liquid anhydrous ammonia for use as fertilizer. This system consists of 1,093 miles of pipeline varying from four to eight inches in diameter. It receives ammonia from plants in the Texas Panhandle and near Enid and Tulsa, Oklahoma for delivery to points principally in Kansas, Nebraska, Iowa and southern Minnesota. The Ammonia System is owned by the Company and is operated by Mid-America.

RIO GRANDE PIPELINE

In November 1995, Juarez Pipeline Company (a wholly-owned subsidiary of Mid-America), Amoco Rio Grande Pipeline Company and Navajo Southern Inc. formed a partnership under the name Rio Grande Pipeline Company ("Rio Grande"). Rio Grande transports NGLs from Mid-America's Hobbs Station in Texas and other Mid-America origins to the Pemex Gas y Petroquimica Basica ("Pemex") Mendez terminal in Ciudad Juarez, Mexico through a 244 mile, 8-inch pipeline. The Mexican customer purchasing the NGLs is PMI Trading Company. The partnership pipeline connects with the Mid-America NGL system through an 8-inch line purchased from Navajo Pipeline Company running from west of Odessa, Texas to near El Paso,

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Texas. Construction of a new 8-inch pipeline connecting the 8-inch Navajo line to the Pemex terminal in Ciudad Juarez and additional facilities at the Pemex terminal to efficiently receive incoming shipments was completed in 1997. Rio Grande is operated by Mid-America (under contract with Rio Grande) and first shipments on the new pipeline system began in March 1997.

DISCOVERY PRODUCER SERVICES

In February 1997, MAPCO Energy L.L.C., a Delaware limited liability company wholly-owned by MAPCO ("MAPCO Energy"), formed a joint venture with Texaco Exploration and Production Inc. ("Texaco") under the names Discovery Producer Services, LLC and Discovery Gas Transmission LLC ("Discovery"), which owns and operates the Discovery Project. Discovery has constructed a 150-mile pipeline varying in diameter from 12 inches to 30 inches to transport natural gas from offshore discovery wells in the Gulf of Mexico to gas processing and fractionation facilities in southern Louisiana. First shipments on the new pipeline began in December 1997. The joint venture is also constructing a cryogenic gas processing plant with a capacity of approximately 600 million cubic feet of gas per day near Larose, Louisiana, and will expand a natural gas liquids fractionator in Paradis, Louisiana. The project's gas processing plant and fractionator are both expected to be fully operational by July 1998. MAPCO

Energy and Texaco each own 50% of the joint venture and a Texaco affiliate is the operator. MAPCO Energy's net investment in the Discovery Project in 1997 was \$59.3 million, which included total expenditures of \$126.7 million, net of \$67.4 million of MAPCO Energy's share of the external financing secured by the joint venture. Its investment in 1998 is expected to be \$19.6 million, which will include total expenditures of \$53.5 million, net of \$33.9 million of MAPCO Energy's share of the joint venture's expected external financing.

ALLIANCE PIPELINE

On April 30, 1997, MAPCO purchased a 5% ownership in the Alliance pipeline project. The Alliance pipeline will construct a 1,900 mile, 36-inch diameter, natural gas pipeline transmission system to carry natural gas and natural gas liquids from western Canada to the Midwest United States for marketing throughout North America. Alliance's delivery points near Chicago include a natural gas liquids extraction facility proposed by Aux Sable Liquids Products LP, which is adjacent to the northern end of MAPCO's 10,000 mile NGL pipeline network. Construction of the pipeline is expected to begin in the second quarter of 1998 with completion anticipated by year-end 1999.

OTHER TRANSPORTATION AND DISTRIBUTION ARRANGEMENTS

On August 1, 1997, MAPCO announced that it had reached an understanding with Enterprise Products Company ("Enterprise") to provide a groundwork for the formation of a joint venture for the development of a natural gas liquids transportation and distribution system. It is anticipated that this system will be capable of distributing product from key NGL sources in southern Louisiana with direct connections to major NGL markets, including the Louisiana river markets, Lake Charles, Louisiana and Mont Belvieu, Texas. The parties executed a Memorandum of Understanding ("MOU") setting forth the principal terms being considered with respect to proposed NGL opportunities. The MOU was scheduled to expire of its own terms on December 31, 1997 but has been extended to March 31, 1998.

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LIQUID MOVEMENTS

The following table summarizes the Mid-America, Ammonia and Seminole Systems' total movements of liquids in millions of barrel miles (barrels of liquids times number of miles transported) and revenue per 100 barrel miles for each of the past five years:

<TABLE>
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BARREL MILES (IN MILLIONS)
AND REVENUE PER 100 BARREL MILES

	1997	1996	1995	1994	1993
<S>	<C>	<C>	<C>	<C>	<C>
Natural Gas Liquids.....	140,391	133,122	108,476	109,854	95,568
Anhydrous Ammonia.....	3,777	3,610	3,505	3,851	3,587
Crude Oil and Refined Products.....	771	894*	4,787	5,215	4,971
Total.....	144,939	137,626	116,768	118,920	104,126
Revenue Per 100 Barrel Miles.....	18.3c	19.2c	18.8c	18.7c	19.2c

* Effective January 1, 1996, space previously leased by the NGL business unit on the Capline System was leased by the Petroleum Refining business unit.

The Mid-America, Ammonia and Seminole Systems operate as common carriers. The single largest shipper accounted for 20% of pipeline transportation revenues during 1997. Total pipeline deliveries in 1997 were 289 million barrels, compared with 288 million barrels in 1996.

LIQUIDS SUPPLY

The United States Department of Energy estimates of total proved reserves of NGLs for Mid-America's and Seminole's source of supply areas in Texas, New Mexico, Oklahoma, Kansas, Colorado, Wyoming and Utah are as follows:

<TABLE>
<CAPTION>

	TOTAL INDUSTRY RESERVES IN MILLIONS OF BARRELS
<S>	<C>
December 31, 1993.....	4,172
December 31, 1994.....	4,145
December 31, 1995.....	4,207
December 31, 1996.....	4,421
December 31, 1997.....	not available

Mid-America's and Seminole's supply areas are also served by other pipelines.

NGL PRODUCTION

During 1996, MAPCO Natural Gas Liquids Inc. ("MNGL") owned certain liquefiable hydrocarbons in natural gas in the West Panhandle gas field of Texas. The liquids produced in the field were moved through MNGL's Mid-America and Seminole pipeline systems to Midwestern and Gulf Coast markets. MNGL's West Panhandle field gas supplier had taken more than its percentage ownership share of the field's production. The cumulative effect of this acceleration in gas taken had resulted in the Westpan operations having a 31 billion cubic feet and \$30 million over-take position as of December 31, 1996. MAPCO sold all of its interests in the West Panhandle field to Westpan NGL Co., a subsidiary of Mesa Operating Company ("Mesa") effective January 1, 1997. In connection with the sale, MAPCO was released from liability for its share of prior NGL "over-takes." As part of the transaction, MAPCO has continued to purchase Mesa's liquids produced from the field and will continue to transport the liquids on its Mid-America Pipeline System.

UNDERGROUND STORAGE

Underground storage facilities for NGLs are owned or operated by MAPCO at locations along its pipeline system in the states of Iowa, Kansas, Nebraska, Oklahoma and Texas. The capacity of these facilities

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at December 31, 1997, was approximately 19.3 million barrels. Other storage operations compete with MAPCO for storage leasing in the Conway and Hutchinson, Kansas areas.

COMPETITIVE CONDITIONS

The marketing of NGLs, the underground storage business and the transportation businesses in which MAPCO operates are highly competitive. MAPCO competes with a number of companies engaged in NGL marketing, some of which are larger than MAPCO and may have more significant financial resources. In addition, other pipelines, tank cars, trucks, barges and local sources of supply (refineries, gasoline plants and ammonia plants) and other sources of energy such as natural gas, coal, oil and electricity, all provide competition for pipeline operations.

A portion of the Mid-America System transports propane, which is a seasonal product due to its uses as residential and commercial heating fuel. The Ammonia System is also sensitive to seasonal variations and provides more operating profit to the Company during the spring and summer months when fertilizer use reaches its peak in areas of the country supplied by this system.

REGULATIONS AND ENVIRONMENTAL MATTERS

The Natural Gas Liquids business unit is subject to various federal, state

and local environmental and safety laws and regulations. It is the policy of the Natural Gas Liquids business unit to comply with such laws and regulations. At this time, MAPCO cannot accurately predict the effect which such laws and regulations may have on such activities and future earnings. Pipeline operations are subject to the provisions of the Hazardous Liquid Pipeline Safety Act. In addition, the tariff rates, shipping regulations and other practices of Mid-America and Seminole are regulated by the Federal Energy Regulatory Commission pursuant to the provisions of the Interstate Commerce Act applicable to interstate common carrier petroleum and petroleum products pipelines. The tariff rates and practices of the Ammonia System are regulated by the Surface Transportation Board under the provisions of the Interstate Commerce Commission Termination Act of 1995 applicable to pipeline carriers. Both of these statutes require the filing of reasonable and nondiscriminatory tariff rates and subject MAPCO to certain other regulations concerning its terms and conditions of service.

The United States Department of Transportation has prescribed safety regulations for common carrier pipelines. The pipeline systems are subject to various state laws and regulations concerning safety standards, exercise of eminent domain and similar matters. Mid-America and Seminole also file tariff rates covering intrastate movements with various state commissions.

The Natural Gas Liquids business unit did not incur in 1997 and does not anticipate to incur in 1998 any material capital expenditures for environmental control facilities.

PROPANE MARKETING

The Propane Marketing business unit markets and distributes propane and appliances on the wholesale and retail levels. Propane is used principally as a fuel in various domestic, commercial, industrial, agricultural and vehicle motor fuel applications. Residential customers, who account for the majority of sales, use propane for home heating, cooking and other domestic purposes. The primary agricultural use is crop drying. Commercial and industrial uses include fuel for shopping centers and industrial plants.

Revenues in 1997 for the Propane Marketing business unit were \$413.4 million, compared to \$429.5 million in 1996. Propane Marketing's operating loss in 1997 was \$6.2 million compared to an operating profit of \$65.0 million in 1996, which included a \$20.8 million gain on the sale of propane and fertilizer assets to CENEX, referred to below.

The retail marketing of propane and appliances is carried on under the trade name "Thermogas" through 163 Company-owned and operated retail plants in 18 states in the upper Midwest and the Southeast regions of the United States. Propane is also supplied to dealers operating in the same area, as well as to wholesale outlets and industrial accounts. Wholesale appliances are sold through a distributorship to customers in the

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Midwest. Based upon published industry data, Thermogas is currently the fourth largest retail propane marketer in the United States selling propane to more than 350,000 customers. In 1997, MAPCO sold 297.2 million gallons of retail propane compared to 331.4 million gallons in 1996.

Approximately 60% of the propane sold by MAPCO in 1997 was acquired from outside sources. The largest outside propane supplier accounted for approximately 25% of such outside purchases during 1997. MAPCO's propane supply arrangements are standard for the industry with prices being subject to adjustment in accordance with changes in industry-wide market price levels.

In March 1996, the Propane Marketing business unit sold its Iowa propane and liquid fertilizer assets to CENEX Inc. ("CENEX"). The transaction, which was completed on March 29, 1996, also involved the sale to CENEX of the remaining Thermogas liquid fertilizer assets in Arkansas, Illinois, Indiana, Minnesota, Ohio and Wisconsin. Sales and operating revenues for the assets involved in this transaction were \$24 million and \$69 million in 1996 and 1995, respectively, and operating profit was \$2 million in 1996 and \$7 million in 1995.

Effective January 1, 1997, the Propane Marketing business unit acquired the assets and operations of Gas Supply, Inc., an independent wholesale propane company based in Minneapolis, Minnesota, for approximately \$7 million plus working capital. The acquisition has been used to expand MAPCO's current wholesale propane marketing activities under the name "Gas Supply." In 1997, Gas Supply Inc. marketed approximately 194 million gallons of propane in the Central and Northeastern United States compared to 107 million gallons in 1996. MAPCO also acquired Gas Supply Inc.'s related product sales business, a construction company, a 40,000-barrel storage facility and a rail car and truck terminal in Rosemont, Minnesota.

During 1997, MAPCO acquired 19 propane companies at a cost of approximately \$38.5 million. These companies, with combined sales during 1996 of over 35.8 million gallons of propane and other related products, have market areas in Alabama, Arkansas, Florida, Illinois, Indiana, Minnesota, Missouri, North Carolina, Oklahoma, South Dakota and Wisconsin.

In September 1997, MAPCO launched a new company, Thermogas Energy, LLC, whose purpose is to form joint ventures with rural electric cooperatives and municipal utilities to market and distribute propane. As of December 31, 1997, Thermogas Energy, LLC, had completed joint ventures with two rural cooperatives in the state of Kentucky. Thermogas Energy, LLC is wholly-owned by Thermogas.

COMPETITIVE CONDITIONS

Both the wholesale and retail marketing of propane are highly competitive businesses. Many of the Propane Marketing business unit's competitors are large companies with significant financial resources which may be greater than that of MAPCO. Other energy sources such as natural gas, coal, oil and electricity all compete with propane for home heating, agricultural and commercial applications. Propane competes particularly with natural gas in areas served by natural gas distribution systems. The extension of natural gas service may result in the future loss of existing customers.

The retail propane business is largely seasonal due to its primary uses for home heating and crop drying. Accordingly, sales and operating profits are concentrated in the fall and winter months. The Propane Marketing business unit enjoys certain competitive advantages in its marketing areas due to name recognition and by offering a wide array of competitive products and services.

REGULATIONS AND ENVIRONMENTAL MATTERS

The Propane Marketing business is not highly regulated or environmentally sensitive; however, it is the policy of the Propane Marketing business unit to comply with such laws and regulations as applicable. The Propane Marketing business unit did not incur in 1997 and does not anticipate to incur in 1998 any material capital expenditures for environmental control facilities.

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PETROLEUM REFINING

GENERAL

The Petroleum Refining business unit operates two refining and marketing systems: the Alaska System and the Mid-South System. The Alaska System includes a Company-owned refinery which is situated on land leased from the state of Alaska at North Pole, Alaska, a terminal facility at Anchorage, Alaska, which is situated on land leased from the Alaska Railroad Corporation under two long-term leases, and the wholesale marketing of refined petroleum products. The Mid-South System includes a Company-owned refinery at Memphis, Tennessee and the wholesale and spot marketing of refined petroleum products.

The 1997 Petroleum Refining business unit revenues were \$2,308.4 million and operating profit was \$96.8 million compared to \$1,813.4 million of revenues and \$63.9 million of operating profit in 1996.

ALASKA SYSTEM

MAPCO's refinery, located near Fairbanks at North Pole, Alaska (the "North Pole Refinery"), is the largest refinery in the state. The refinery is owned by MAPCO but is situated on land leased by MAPCO from the state of Alaska under a