

An Empirical Test Of Politically-Motivated Income Smoothing In The Oil Refining Industry

Dr. Richard H. Fern, Accounting, Eastern Kentucky University
Dr. Betty C. Brown, Accounting, University of Louisville
Dr. Steven W. Dickey, Accounting, Eastern Kentucky University

Abstract

This paper reports the results of a study of income smoothing in the oil refining industry for years 1971 through 1989. Evidence of a political motivation to practice such smoothing behavior is also reported. The methodology follows closely that of Ronen and Sadan (1981) which found strong smoothing behavior for oil firms in the 1953 to 1972 period. Two types of smoothing behavior were examined -- classificatory and intertemporal. Based on the analysis, oil firms were found to have a strong political motivation to "manage" reported earnings. There was no evidence of significant classificatory smoothing behavior by the 26 firms in the study. However, there was significant intertemporal smoothing behavior suggested, although to a lesser degree than that suggested by Ronen and Sadan. This reduction in smoothing behavior seems to indicate that over the past 20 years standard setters have been somewhat successful in reducing purely arbitrary accounting choices.

Introduction

The process of choosing financial accounting and reporting principles has traditionally been one of selecting from among various acceptable alternatives. Firms are encouraged to choose principles and applications that most nearly reflect their particular reporting needs. Thus, reported earnings and financial position are somewhat at the discretion of which accounting principles are chosen.

Accounting researchers have long had an interest in management use of these discretionary accounting choices to manipulate income streams. Various motivations for income-smoothing behavior have been proposed including attempts to affect a firm's stock prices and risk, to manipulate management compensation, to escape restrictive debt covenants or to avoid political costs.

Much of the previous research has attempted to align one or more of these motivations with ex-post observations of smoothing behavior by targeted firms. Many of these studies, however, suffered from weak identifications of smoothing behavior, inability to separate "natural" versus "artificial" smoothing and lack of effort or success in linking observed smoothed behavior to assumed, specific motivations (Moses, 1987; Ball and Foster, 1982). The proper test for smoothing should include situations where there is relatively

greater incentive for it to exist (Lambert, 1984). In an attempt to overcome these limitations, this study specifically identifies smoothing behavior, controls for the effects of "natural" smoothing, links smoothing attempts to a specific motivation and focuses on an industry with strong smoothing incentives.

The oil refining industry's profits are highly dependent on crude oil prices. In light of a long history of political costs, such firms have reason to attempt to manage abnormal fluctuations in reported earnings (Lambert, 1984). Integrated oil companies have previously been found to have exhibited strong income smoothing behavior during the years 1953 through 1972 (Ronen and Sadan, 1981). This study updates the Ronen and Sadan research by examining income smoothing behavior in the petroleum industry since 1971.

Previous Research

One area of smoothing research has been directed at identifying attempts to minimize or maximize earnings (e.g. Kelly, 1983). Another perspective is that management artificially manipulates earnings to achieve some preconceived notion of the firm's "expected" earnings (e.g. analyst forecasts, management's prior estimates or continuation of some earning's trend). For this study, income smoothing is defined as attempts to

reduce earnings variability, especially behavior designed to dampen abnormal increases in reported earnings.

Smoothing Motivations

Early smoothing studies hypothesized that management was motivated to reduce earnings and cash flow variability in an attempt to reduce stock ownership risk (Cushing, 1969; Ronen and Sadan, 1975; Beidleman, 1973). Later research suggested that capital markets were "efficient" and that investors would not be fooled by mere accounting gimmicks (Imhoff, 1975 and 1981; Copeland, 1968; Beaver and Dukes, 1973). In light of follow-up research suggesting the existence of at least a weak form of market efficiency, other smoothing motivations have been pursued.

Management has been accused of acting in its own best interest and selecting reporting alternatives that maximize earnings-related compensation (Watts and Zimmerman, 1978; Ronen and Sadan, 1981). Several studies of the agency orientation to income smoothing have found positive relationships between the degree of management control of the firm (versus owner control) and variability of firm earnings (Smith, 1976). Others have concluded that a positive relationship does exist between incentive compensation schemes, accounting choices in general and earnings (Hagerman and Zmizewski, 1979; Morse and Richardson, 1983).

The focus of this study, however, is yet a third type of motivation. Firms will lobby for or adopt accounting policies that reduce income if the firm is politically visible and subject to publicly-imposed costs such as increased taxation or regulation (Watts and Zimmerman, 1978; Lillien and Pastena, 1982). Larger firms, those in capital-intensive industries and firms with highly visible earnings have more incentive to reduce income via accounting alternatives (Bowen, Lacey and Noreen, 1981; Hagerman and Zmizewski, 1979).

The Oil Refining Industry

Most large oil refiners are vertically integrated and, to a varying degree, have substantial investments in both upstream (exploration and production) and downstream (refining) operations (Au, 1991). Earnings from upstream operations stem from sale of excess production at current market prices while costs are based on historical contract and/or production costs. Earnings from downstream operations are based on the "crack" spread between production and/or acquisition costs and the market prices for refined products. Both markets are directly and immediately dependent on crude oil prices.

The oil and gas industry has several unique attributes such as an enormous amount of capital investment,

substantially high investment risk and extended production cycles. Petroleum refiners are highly visible to the public and regulators due to their size, continuous consumer interaction and public attention to political actions in the Middle East over the past 15 years. Based on 1990 sales, there were 9 oil refiners among the 25 largest U. S. corporations (Dun's, 1990). Oil firms fit the profile of companies likely to engage in income smoothing practices -- large and capital intensive.

Rapid increases in crude oil and gasoline prices in the late 1970's resulted in the windfall profits tax on oil earnings, loss of the oil depletion allowance, increased regulation by Department of Energy and criticism from Congress about non-uniform accounting systems (Lillien and Pastena, 1982). Recent headlines such as "Big Oil With Huge Profits in the Offing, Struggles to Pump Up Its Public Image" (Solomon and Sullivan, 1991) and "Oil Firms, Expecting to Post Profit Surge, Fear Public Demand for a Windfall Tax" (Solomon, 1991) demonstrate that, even today, oil refiners still have an acute sensitivity to the political costs arising from abnormal profits.

As crude oil prices increase, management has a strong incentive to dampen large profit increases. On the upside, management is predicted to weigh potential political costs more heavily than bookkeeping and agency costs (e.g. shareholder dissatisfaction) and engage in negative smoothing behavior (Bowen, Lacey and Noreen, 1981). During the 1950's and 1960's, oil firms were found to have demonstrated significant smoothing behavior; more so than other highly-visible industries (Ronen and Sadan, 1981).

Smoothing Methods and Vehicles

In previous smoothing research net income, earnings per share or operating income have been used as management's presumed primary smoothing vehicle. However, management will more likely attempt to affect ordinary income (generally, income before extraordinary items) which is the reporting figure most used by statement readers (Andrews, 1972) and is a better predictor of future earnings than net income (Ronen and Sadan, 1975).

Under generally accepted accounting standards (GAAP) there are innumerable ways to manage earnings and still get auditor and regulatory approval. Revenue and expense allocations are often arbitrary and estimates can be made that support desired financial outcomes.

Accounting standard-setting bodies have attempted to reduce the number of accounting alternatives available under GAAP. The Accounting Principles Board (APB) felt that accounting principles should not change when

the nature of a transaction has not essentially changed and disclosure of justification for the change is required (Opinions, 1971). During its 20-year existence, the Financial Accounting Standards Board (FASB) has attempted to limit reporting alternatives that reflect no underlying change in expected cash flows. For example, the FASB has directly limited choices related to accounting for contingencies and marketable securities (Statement No. 5 and No. 12, 1975).

However, while trying to achieve reporting uniformity, standard setters have adhered to the premise that financial transactions are so diverse that one all-encompassing accounting method is insufficient to capture the unique attributes of all. Additionally, accounting estimates are a necessary part of any accrual-based reporting system. Thus, in many ways, accounting choices and changes are not just tolerated, but encouraged.

Ronen and Sadan (1981) classified smoothing methods as either classificatory or intertemporal. In general, all approaches to smoothing involve either timing of item recognition (intertemporal) or classification of recorded amounts (classificatory). Specific methods include: discretionary acceleration or deferral of certain types of expenses (e.g. advertising, R&D, retirement benefits); use of "aggressive" or conservative estimates in matching revenues and expenses (e.g. depreciation methods and lives, bad debt percentages, inventory methods and applications); and classification of borderline expense items between the ordinary and extraordinary categories to affect the reported amounts of ordinary income. Several types of typical operating expenses do not readily lend themselves to smoothing behavior and can be viewed as relatively non-discretionary expenses. These costs, which are largely driven by level of operations, include cost of production, interest expense and many types of selling, general and administrative costs other than those mentioned above.

Since the early 1970's, avenues available for smoothing have gradually been limited by both the APB and FASB. APB Opinion No. 20 defined strict reporting guidelines for changes in accounting estimates, principles and entities (Opinions, 1971). APB No. 30, which required extraordinary items to be both "unusual" and occur "infrequently", considerably reduced management's discretion in classifying items as extraordinary (Opinions, 1973). AICPA studies show an average of 27.5% of sample firms reporting extraordinary items in the 5 years immediately prior to APB No. 30, while an average of only 12% of sample firms reported such items in the following 10 years (Accounting Trends and Techniques, 1970 - 1990).

The FASB was organized in 1973 to standardize,

streamline and conceptualize accounting standards while opening the standard-setting process to wider influences. In accomplishing their mission, the FASB has issued 110 Statements of Accounting Standards, 38 Interpretations, 49 technical bulletins and 6 Statements of Financial Accounting Concepts since 1973. These additional standards have served to restrict the discretion available in financial accounting and reporting.

Recent Studies

The most recent, extensive smoothing study is that of Ronen and Sadan (1981). R&S developed a statistical approach to approximating the intertemporal and classificatory smoothing efforts of firms in 12 different industries (see Appendix III for details of their methodology). R&S used ordinary income as their targeted smoothing vehicle. They expected intertemporal smoothing when firms demonstrated positive co-movements of discretionary expenses and operating income. In other words, firms will "adjust" amounts and timing of discretionary expenses in an effort to counteract changes in operating income (sales less non-discretionary expenses).

R&S expected classificatory smoothing when changes in reported discretionary expense amounts moved in the opposite direction of changes in extraordinary item amounts *and* discretionary expenses showed positive co-movements with operating income. Thus, another method of countering unwelcome changes in ordinary income amounts is by arbitrarily reclassifying expense items between the discretionary expense category (i.e. part of ordinary income) and the extraordinary category (reported after ordinary income). Significant smoothing activity was found in the oil, drug and steel industries.

Research Methodology

This study is similar in design to that used by R&S (1981) in their study of oil company earnings for years 1953-1972. However, there are several significant differences. The current study attempts to link smoothing behavior to a specified motivation (i.e. avoidance of political costs) by concentrating on only one of the most politically-visible industries. A more recent period of Compustat data was analyzed (1971-1989) than previously studied by R&S and a larger sample of oil firms was examined. Specification of some of the regression variables were also changed based on an improved Compustat data base over that used by R&S.

Crude oil prices (a highly visible and widely-quoted oil price statistic) were used as a measure of potential political costs faced by oil refiners. Although this linkage is difficult to prove empirically, substantial anecdotal evidence exists to make this connection on a

conceptual level (see Lillien and Pastena, 1982; Solomon and Sullivan, 1991; Solomon, 1991). The producer price index for crude petroleum (Appendix I) was used.

The smoothing vehicle used in this study was ordinary income, which is generally income before extraordinary items (IBXI). All income items in the study were obtained from Compustat II Primary Industrial Tapes. The income reporting scheme was structured as follows:

- Sales (S)
- Non-discretionary Expenses (NDX)
- Non-discretionary Income (NDI)
- Discretionary Expenses (DX)
- Ordinary Income (OdI)
- +/- Extraordinary Items (XI)
- Net Income

(See Appendix II for definitions of Compustat variables included in these items.)

The R&S variable, operating income, was redefined here as Non- discretionary Income (NDI) and computed as Sales Revenue less Non-discretionary Expenses (NDX). NDX was defined such that opportunities for management to arbitrarily reclassify items between NDX and DX would be minimized.

Following the R&S methodology, Sales was initially regressed on Time to achieve a de-trended measure of firm revenues (this served to remove firm size as a confounding variable in subsequent analyses). A first-order correction of the estimate was made for R²s with unacceptable Durbin-Watson statistics. For firms with R²s greater than .5, regression residuals were used in subsequent estimations rather than the de-trended Sales amounts (DTS is used hereafter to refer to the de-trended Sales variable regardless of whether the actual values or the residuals were used).

Similar procedures were followed for the regression of NDI on DTS and Time and the regression of XI on DTS and Time. First-order Cochrane-Orcutt corrections were made where applicable and residuals were carried forward for estimates with R²s greater than .5. (NDI and XI terms are used hereafter regardless of whether the actual values or residuals were used.) These procedures were designed to minimize serial correlation and achieve minimally correlated independent variables.

Finally, from these derived independent variables 3 equations were developed from which the regression estimates could be used to assess the existence of smoothing behavior. Although arbitrary reclassification of items between DX and NDX was considered unlikely, the possibility of such movement still existed. The resulting contamination of the regression estimates from this possibility was controlled by including estimates of

co-movements between these parameters (R&S, 1981). This is the basis for equation 3. The 3 estimation equations were:

- 1) $DX = b_1T + b_2DTS + b_3XI + b_4NDI$
- 2) $NDX = c_1T + c_2DTS + c_3XI$
- 3) $TotX = d_1T + d_2DTS + d_3XI$

Classificatory smoothing behavior was inferred for any firm with simultaneous occurrences of $b_4 > 0$, $b_3 < 0$ and $c_3 < 0$ which had an expected frequency of .125 ($1/2 \times 1/2 \times 1/2$). Intertemporal smoothing behavior was inferred for any firm where $b_4 > 0$ and $d_3 < 0$ (expected frequency of .25).

The sample of firms used in this study were those in the Petroleum Refining Industry (SIC Code 2911). Of the original 36 firms in SIC Code 2911, only 26 could be included in this analysis. Seven firms were excluded from the study because complete Compustat data for years 1971 - 1989 was not available, corresponding 10-Ks or annual reports could not be obtained for 2 firms, and one firm's merger activity since 1980 prevented separate analysis of its oil refining activities.

Results

Over the past 20 years, media coverage, public reaction and resulting legislative action demonstrate that there is a strong relation, at least in the public's perception, that oil company profit levels are tied to the spot price of crude oil. As a measure of that perceived linkage (i.e. potential political costs) crude oil prices were correlated with the oil refiners' gross revenues for the 19-year period of the study. The resulting R values and significance levels are reported in Table I. As expected, all 26 oil refiners' revenues bore a significantly strong relationship to changes in oil prices over this period. A strong political motivation to smooth income was inferred from these results.

Recall from the methodology discussion that classificatory smoothing depended on the simultaneous occurrence of 3 events, positive DX and NDI relationship, a negative DX and XI relationship and a negative NDX and XI relationship. These events are reported in Table II. The expected frequency of this joint event was .125 ($1/2 \times 1/2 \times 1/2$).

For those firms with no extraordinary items reported over the study period, the second 2 events in Table II show "**". Without this reporting option, classificatory smoothing was not considered an option for those firms. The observed frequency of 5 (out of a possible 22 remaining firms) for the joint event in Table II is not significantly different than the expected frequency of 2.75 ($.125 \times 22$).

Table I
Relationship Between Crude Oil Prices and Sales (1971-1980)
Correlation Coefficients and Significance Levels

Firm	R	%	Firm	R	%
Amerada-Hess	.97	.0001	MAPCO	.89	.0001
American-Petrofina	.77	.0001	Mobil	.91	.0001
Amoco	.95	.0001	Murphy	.98	.0001
Ashland	.90	.0001	Pennzoil	.91	.0001
ARCO	.98	.0001	Philips	.96	.0001
British-Petroleum	.86	.0001	Quaker-State	.86	.0001
Chevron	.87	.0001	Royal-Dutch	.85	.0001
Crown Central	.94	.0001	Sun	.97	.0001
Exxon	.91	.0001	Tesoro	.89	.0001
Holly	.90	.0001	Texaco	.94	.0001
Hondo	.74	.0001	Tosco	.93	.0001
Imperial	.80	.0001	Total-Petroleum	.89	.0001
Kerr-McGee	.94	.0001	Unocal	.92	.0001

Table III shows the 2 events indicating intertemporal smoothing (i.e. positive co-movements between DX and NDI accompanied by negative co-movements between TotX and XI). (Recall that the latter event controls for contamination of OpI measures caused by possible reclassification of items between DX and NDX.)

There are 11 firms in Table III with both positive DX and NDI signs as well as negative TotX and XI signs which suggests intertemporal smoothing behavior. This includes 4 firms with no reported XI (denoted "**") between 1971 and 1989. Without XI there is no chance for removing items from the computation of ordinary income. The observed frequency of 11 out of 26 firms is significantly greater than the expected frequency of 6.5 (.25 x 26) at a .03 level.

Discussion

As R&S (1981) and others have indicated, firms open to substantial public scrutiny and government regulation have strong incentive to report a relatively stable earnings stream. Especially on the upside, oil firms fit this profile. R&S found the oil refining industry to be one of 3 industries exhibiting significant smoothing behavior over the period 1952 - 1972.

Beginning with APB Opinion No. 30, classificatory smoothing options have been limited. This standard greatly restricted management discretion in reporting items as extraordinary and excluding them from ordinary income. Based on the annual AT&T sample of corporate reports, the number of extraordinary items reported since 1972 has averaged less than 45% of those

reported prior to 1972. Even in an industry as volatile as oil refining, several firms reported no extraordinary items over the 19-year period of this study. The effect on classificatory smoothing behavior by oil firms has been significant. R&S found evidence of smoothing behavior by 6 of 15 oil firms (a significantly-large 40%) from 1952-1972 which was the highest percentage of any industry included in their twelve-industry study. In this study, only 5 of 22 firms showed classificatory smoothing behavior. Despite the strong incentive to do so, it appears that oil refiners generally found classificatory smoothing opportunities more limited during this nineteen-year period than in the immediately preceding 20 years.

With limited discretion in classifying extraordinary items, oil refiners might logically turn to the other smoothing option available to them. Despite disclosure restrictions imposed by standards such as APB Opinion No. 20, a statistically-significant number of firms in this study (11 of 26) exhibited intertemporal smoothing behavior. However, the proportion of firms (42%) is smaller than the 53% reported by R&S in 1981. Despite the rise and fall of crude oil prices over the past 20 years, evidence examined in this study suggests that oil refiners have engaged in less smoothing behavior than in the prior 20 years.

Conclusion

Many critics have long faulted financial accounting standards for allowing too much managerial discretion related to when and how items are to be included in annual earnings numbers. The results of this study give

Table II
Classificatory Smoothing Events -
Regression Coefficients and Signs

Firm	DX and NDI	DX and XI	NDX and XI
Amerada-Hess	+ .61	+ .80	- 1.03
American-Petrofina	- 4.79	+ 2.28	+ 2.10
Amoco	+ 2.99	*	*
Ashland	- 2.20	+ .01	- .34
Atlantic-Richfield	- 4.77	- .70	- .10
+British-Petroleum	+ .23	- .64	- .62
Chevron	+ 1.01	*	*
Crown Central	+ .23	- .15	+ .42
Exxon	+ 2.69	- 3.56	+ .62
Holly	- .07	+ .37	- .61
+Hondo	+ .47	- .10	- 1.23
+Imperial	+ .99	- 1.52	- 1.17
Kerr-Mcgee	+ 2.77	- 1.29	+ .01
MAPCO	+ .22	+ .14	+ .18
Mobil	+ .63	+ .24	+ .64
Murphy	- .81	+ 1.11	+ .06
Pennzoil	+ 2.11	+ 6.61	+ .67
Philips Petroleum	- .14	+ .14	+ 1.36
Quaker-State	+ 3.55	*	*
+Royal Dutch	+ 1.32	- 1.12	- 1.28
Sun Co.	+ 1.45	*	*
Tesoro Petroleum	- 1.22	+ .55	- .58
Texaco	- 3.63	+ 1.00	+ .47
Tosco	+ 2.05	+ 1.23	- .19
Total Petroleum	- .46	+ .74	+ .98
+Unocal	+ 1.96	- 6.79	- .60

+ = classificatory smoothing

some indication of the long-term, general effects of standard setting over the past 20 years. Beginning with the APB's restrictions on reporting of changes in accounting estimates and extraordinary items and continuing through the FASB's prolific twenty-year history of standard setting, financial reporting alternatives have been reduced. Even in the volatile oil-refining industry where income-smoothing techniques would be most appropriate, there appear to be increasing limits on accounting and reporting discretion.

Suggestions for Future Research

R&S found strong smoothing behavior in the oil, drug and steel industries between 1953 and 1972 (Ronen and Sadan, 1981). Replication of their study for the drug and steel industries since 1970 would be a logical extension of this study related to the oil industry. Findings similar to the ones reported here would give more conclusive evidence of the effect our standard-setting process is having on reporting of discretionary accounting items.

Research support for this study was provided by the Kentucky EPSCoR Regional Universities Visiting Scholars

Program.

References

1. *Accounting Trends and Techniques* (1970-1990). (New York: American Institute of Certified Public Accountants).
2. Andrews, Frederick. "Accounting Panel Seen Curbing Use of Special Items" *The Wall Street Journal* (March 5, 1972).
3. Au, Thomas P. "Analysis of Petroleum Industry" *Value Line* (January 4, 1991 and April 5, 1991).
4. Ball, R. and G. Foster. "Corporate Financial Reporting: A Methodological Review of Empirical Research" *Supplement to Journal of Accounting Research* (1982) p. 161-234,
5. Beaver, W. H. and R. E. Dukes. "Delta Depreciation Methods: Some Empirical Results" *Accounting Review* (July, 1973) p. 549-559.
6. Beidleman, C. R. "Income smoothing: The Role of Management" *Accounting Review* (October, 1973).
7. Bowen, R., J. Lacey and E. Noreen. "Determinants of the Corporate Decision to Capitalize Interest" *Journal of Accounting and Economics* (August, 1981) p. 151-179.

Table III
Intertemporal Smoothing Events -
Regression Coefficients and Signs

Firm	Intertemporal			
	DX and NDI		TotX and XI	
	Sign	t	Sign	t
+Amerada-Hess	+	.61	-	.80
American-Petrofina	-	4.79	+	2.36
+Amoco	+	2.99	*	
Ashland	-	2.20	-	.57
Atlantic-Richfield	-	4.77	-	.24
+British-Petroleum	+	.23	-	.67
+Chevron	+	1.01	*	
Crown Central	+	.23	+	.37
Exxon	+	2.69	+	.15
Holly	-	.07	-	.57
+Hondo	+	.47	-	1.10
+Imperial	+	.99	-	1.28
+Kerr-Mcgee	+	2.77	-	.96
MAPCO	+	.22	+	.17
Mobil	+	.63	+	.69
Murphy	-	.81	+	.51
Pennzoil	+	2.11	+	3.62
Philips Petroleum	-	.14	+	1.26
+Quaker-State	+	3.55	*	
+Royal Dutch	+	1.32	-	1.38
+Sun Co.	+	1.45	*	
Tesoro Petroleum	-	1.22	-	.53
Texaco	-	3.63	+	.45
Tosco	+	2.05	+	.06
Total Petroleum	-	.46	+	1.10
+Unocal	+	1.96	-	2.34

+ = intertemporal smoothing

8. Standard & Poor's Compustat Services, Inc. Compustat Industrial Tapes.
9. Copeland, Ronald M. "Income Smoothing" *Empirical Research in Accounting - Selected Studies* (1968) p. 101-116.
10. Cushing, Barry E. "An Empirical Study of changes in Accounting Policy" *Journal of Accounting Research* (1969) p. 196-203.
11. *Dun's Business Rankings - 1990* (Parsippany, NJ: Dun's Marketing Services).
12. Hagerman, Robert L. and Mark E. Zmizewski. "Some Economic Determinants of Accounting Policy Choice" *Journal of Accounting and Economics* (1979) p. 141-161.
13. Imhoff, Eugene A., Jr. "Income Smoothing: An Analysis of Critical Issues" *Quarterly Review of Economics and Business* (Autumn, 1981) p. 23-42.
14. -----, "Income Smoothing: The Role of Management: A Comment" *Accounting Review* (January, 1975) p. 118-121.
15. Kelly, L. "The Development of a Positive Theory of Corporate Management's Role in External Financial Reporting" *Journal of Accounting Literature* (Spring, 1983) p. 111-150.
16. Lambert, R. "Income Smoothing as Rational Equilibrium Behavior" *Accounting Review* (October, 1984) p. 604-618.
17. Lilien, Steven and Victor Pastena. "Determinants of Intramethod Choice in the Oil and Gas Industry" *Journal of Accounting and Economics* (1982) p. 145-170.
18. Morse, Dale and Gordon Richardson. "The LIFO-FIFO Decision" *Journal of Accounting Research* (Spring, 1983) p. 106-127.
19. Moses, Doug. "Income Smoothing and Incentives: Empirical Tests Using Accounting Changes" *Accounting Review* (April, 1987) p. 358-377.
20. *Opinions of the Accounting Principles Board, No. 20, "Accounting Changes"* (New York: American Institute of Certified Public Accountants, 1971).
21. *Opinions of the Accounting Principles Board, No. 30, "Reporting the Results of Operations"* (New York: AICPA, 1973).
22. Ronen, Joshua and Simcha Sadan. "Do Corporations Use Their Discretion in Classifying Accounting Items to Smooth Reported Income?" *Financial Analysts Journal* (September-October, 1975) p. 62-68.
23. -----, *Smoothing Income Numbers - Objectives, Means and Implications* (Reading, MA: Addison-

Appendix I
Crude Petroleum Producer Price Index,
1971 - 1989 (1982 = 100)

Year	Index
1971	15.6
1972	15.5
1973	17.2
1974	28.9
1975	33.5
1976	34.6
1977	37.4
1978	40.9
1979	51.3
1980	79.8
1981	109.6
1982	100.0
1983	92.9
1984	91.3
1985	84.5
1986	46.9
1987	55.5
1988	46.2
1989	56.3

(Source: Business Statistics 1961-1988, U.S. Department of Commerce; Supplement to Producer Price Indexes - 1989, U.S. Department of Labor)

Appendix II
Definition of Income and Expense Variables
(Data from Compustat II Industrial Tapes)

Non-discretionary Expenses = CGS + SG&A (less R&D,
Pension & Retirement, Advertising) + Interest
Expense - Interest Income - Minority Interest
Non-discretionary Income = (Sales - Non-discretionary
Expenses) x (1 - Tax Rate)
Tax Rate = Income Taxes/Pre-tax Income
Discretionary Expenses = Depreciation + Nonoperating Expense -
Nonoperating Revenue + Special Items + R&D +
Pension & Retirement + Advertising
Ordinary Income = (Non-discretionary Income -
Discretionary Expenses)/(1 - Tax Rate)

- Wesley, 1981).
24. Smith, E. "The Effect of the Separation of Ownership from Control on Accounting Policy Decisions" *Accounting Review* (October, 1976) p. 707-723.
 25. Solomon, Caleb. "Oil Firms, Expecting to Post Profit Surge, Fear Public Demand for A Windfall Tax" *The Wall Street Journal* (November 11, 1991) p. A2.
 26. ----- and Allanna Sullivan. "Big Oil, With Huge Profits in the Offing, Struggles to Pump Up Its Public Image" *The Wall Street Journal* (November 18, 1991) p. B1, B4.
 27. Spurr, William A. and Charles P. Bonini. *Statistical Analysis for Business Decision Making* (Homewood, IL: Richard D. Irwin, 1973).
 28. *Statement of Accounting Standards No. 5*, "Accounting for Contingencies" (Stamford, CT: Financial Accounting Standards Board, 1975).
 29. *Statement of Accounting Standards No. 12*, "Accounting for Certain Marketable Securities" (Stamford, CT: Financial Accounting Standards Board, 1975).
 30. U. S. Department of Commerce. *Business Statistics (1961-1988)*.
 31. U. S. Department of Labor. *Supplement to Producer Price Indexes - Data for 1989*.
 32. Watts, Ross L. and Jerold L. Zimmerman. "Towards a Positive Theory of the Determination of Accounting Standards" *The Accounting Review* (January, 1978) p. 112-134.

Appendix III Development of Regression Equations (Ronen and Sadan, 1981)

In examining 12 different industries, Ronen and Sadan (R&S) developed 3 regression equations designed with minimal correlation among the independent variables time (T), sales (S), extraordinary items (XI) and operating income (OpI). The dependent variables for these 3 equations were discretionary expenses (DX), operating expenses (OpX) and the total of these 2 expenses (TotX).

R&S hypothesized that firms could practice smoothing by classifying unusual borderline items in either the "extraordinary" or "operating" category depending on whether a larger or smaller operating income was desired. However, this must be accompanied by positive co-movements between operating income and discretionary expenses or else anti-smoothing results are achieved.

R&S felt that since firms also have some ability to classify items as either DX and OpX, a third required condition is a negative relationship between TotX and XI. Thus, classificatory smoothing requires the simultaneous occurrence of a positive correlation between DX and OpI, a negative correlation between DX and XI and a negative correlation between TotX and XI.

Additionally, firms could practice intertemporal smoothing by including discretionary items in the current period's OpI or deferring them to later periods. This would be evidenced by positive co-movements between OpI and DX. Since reclassification from OpX to DX would affect measures of OpI, a simultaneous negative co-movement between TotX and XI should also be observed. Intertemporal smoothing would thus be indicated by simultaneous occurrences of a positive correlation between OpI and XI and a negative correlation between XI and TotX.

Due to the inability to separate the effects, R&S tested for classificatory and intertemporal smoothing simultaneously. The relative frequencies of the occurrences of these joint events compared to that expected by chance (binomial distribution) led to R&S's conclusions regarding evidence of income-smoothing behavior. R&S found 40% of oil firms exhibited classificatory income smoothing behavior while 53% exhibited intertemporal smoothing behavior.

To achieve the statistical objectives of removing a firm size factor, correcting serial correlation of parameter estimates and minimizing multi-collinearity among independent variables, R&S used the following statistical procedures.

- 1) Sales (S) was regressed on time (T).
 - a) If the resulting Durbin-Watson statistic (DW) was too low, the Cochrane-Orcutt procedure was used to correct for serial correlation.
 - b) If the original or Cochrane-Orcutt corrected R^2 was greater than .5, regression residuals were used in subsequent procedures. If the R^2 was less than .5, the actual variable was used.
- 2) OpI was regressed on S and T.
 - a) Similar correction and R^2 choice procedures used in 1 above were applied.
- 3) XI was regressed on S and T.
 - a) Similar correction and R^2 choice procedures used in 1 above were applied.
- 4) The result was 4 minimally correlated independent variables S, OpI, T and XI. These were used as follows to develop 3 regression equations to which the Cochrane-Orcutt correction procedures were applied:
 - 1) $X = b + b_1T + b_2S + b_3XI + b_4OpI + e$
 - 2) $OpX = c + c_1T + c_2S + c_3XI + e$
 - 3) $TotX = d + d_1T + d_2S + d_3XI + e$

The positive or negative signs of b_4 , b_3 , c_3 and d_3 determined the existence of smoothing behavior as discussed in the text.