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Income Smoothing: An Analysis of Critical Issues

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Abstract

Income smoothing is one of a number of competing theories of the managerial behavior of the firm. To test the theory of smoothing, or income normalization, a number of operational questions must be addressed. Prior research has been inconsistent in its efforts to operationalize and test the smoothing hypothesis, and for the most part research results have been inconclusive. This paper demonstrates empirically that the method of operationalizing the smoothing hypothesis will significantly influence the research results. The study identifies and analyzes a number of critical issues which should be resolved before the theory of smoothing behavior can be meaningfully evaluated.

Income Smoothing: An Analysis of Critical Issues

Income smoothing has been a topic of interest in the literature of accounting and finance for some time. Theoretical discussions concerning the implications for auditing and financial statement analysis date back to Hepworth [1953], with empirical research on the subject starting with Gordon, Horwitz, and Meyers [1966]. This paper considers that aspect of the empirical literature dealing with the definition of income smoothing. The inconsistencies of previously used definitions are discussed, and empirical evidence is presented to suggest that the inconclusive results obtained by previous smoothing researchers are partially attributable to their definitional differences.

The first stage of the paper relates income smoothing to the general problem of information disclosure. Next, a review of previous research leads to the identification of three questions to be addressed in the paper. The three questions regarding the definition of income smoothing are evaluated to determine their impact on smoothing research results in general. Finally, some suggestions are offered for conducting future smoothing research.

Basis of the Issue

The income smoothing controversy turns on the central issue of the adequacy or "fineness" of financial disclosures. In the case where income is smoothed, disclosure may be lacking, in that variables suspected of being manipulated to achieve an artificially smooth earnings stream are not adequately disclosed.

There is some disagreement as to the exact nature of the inadequate disclosure. Some feel that manipulated information is not reported clearly enough to enable users to assess its smoothing effect. This was the implicit assumption in many smoothing studies which examined the effect of observable income

variables on reported net income [i.e., Biedleman, 1973, Copeland, 1968, Dopuch and Drake, 1966, and other]. Alternatively, it has been argued by Copeland [1968] that to effectively smooth income, the smoothing variables cannot be observable components of income. This argument implies that smoothing variables must be aggregated with other variables to facilitate non-disclosure of their smoothing effect. In either case, smoothing suggests that management has made it difficult or impossible for an analysis of public financial statements to reveal their means of achieving a smoothed earnings pattern.

Informational Implications

It may be argued that much of the auditors' contribution to accounting information stems from their independent confirmation of management's financial statements. Although the substance of a firm's financial statements has already been impounded in the market price by the time these annual reports are issued, the reports remain important in the sense that they independently confirm the previously received financial statement disclosures. If the published reports fail to adequately disclose the economic substance of the firm's operations, or contain serious omissions, the market may be reacting to information which is substantially non-economic in nature. Instances of the latter situation are sometimes reported in the financial press (e.g., Equity Funding). The potential failure of published financial data to capture and report the real economic activities of the reporting entity represents a serious problem to financial analysts, auditors, and the investing public.

Income smoothing is a special case of inadequate financial statement disclosure. The smoothing of income implies some deliberate effort to disclose

the financial information in such a way as to convey an artificially reduced variability of the income stream.[1]

This effort to smooth or normalize income might take on any number of forms. Firms might attempt to smooth one of the actual income numbers reported, such as operating income, net income before extraordinary items, net income, or earnings per share. Alternatively, they might try to focus their efforts on the change in one of the income measures from one year to the next. Still others might focus on a ratio of income to some activity base such as sales or total assets. The target of management's smoothing efforts may vary across firms. This study will look at several different smoothing objectives over time. It does not purport to look at an exhaustive list of targets, but simply a number of rather appealing concepts of smoothing. The targets selected exclude the concept of single period smoothing. Also, the methodology will not consider the possibility of changing the target of management's smoothing efforts over the period of observation. The approach here will be to observe the behavior of a number of potential smoothing targets for a group of firms over time, with the underlying assumption that smoothing is represented by stable properties of a target variable for any given smoothing firm.[2]

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[1] It is recognized that the accrual accounting model, calling for numerous allocations, is essentially a smoothing model. Smoothing is considered here to require an overt attempt to dampen earnings variability within the framework of the accrual based model.

[2] Perhaps the most common difference between this concept of smoothing and others which have been used is that it is stated here as a multi-period concept. Other studies have used a two period model to measure smoothing [Archibald, 1967, and Copeland, 1968], which would imply that income smoothing can be a very short range objective. The more common definition considers smoothing to be a multi-period concept as it is considered here. For example see Barefield and Comiskey [1972], Barnea, Ronen, and Sadan [1976], Biedleman [1973], Dascher and Malcolm [1970], Gordon, Horwitz and Meyers [1966], Smith [1976] and Imhoff [1977].

Smoothing, as a special case of misleading or incomplete financial disclosure, represents a potentially serious problem for the production and use of financial statement information. The potential severity of the problem is reflected in the difficulties encountered in researching the subject. If it was fairly easy to identify instances of income smoothing behavior and the means by which management was able to accomplish smoothing, then research problems would be mitigated, financial analysts and investors would not be misled, and the set of financial data, although distorted, would not represent any serious information utilization problems. The potential problem of using information which has been distorted or manipulated to the point where it is no longer representative of economic reality seems inexorably tied to the methodological problems facing smoothing researchers.

Previous Smoothing Research

While there have been a number of research studies which have empirically tested some form of smoothing hypothesis, most studies have failed to develop or contribute to a viable theory which defines and identifies income smoothing behavior. One of the more popular methods of investigating smoothing behavior has been to select certain key variables which are both observable and capable of being influenced in amount through management action, and observing their effect on earnings. Some of the hypothesized smoothing variables which have been investigated include the investment tax credit [Gordon, Horwitz, & Meyers, 1966]; the classification of extraordinary items [Ronen & Sadan, 1975]; dividend income [Copeland & Licastro, 1968, and Copeland, 1968]; gains and losses on securities [Dopuch & Drake, 1966]; pensions, R & D, and sales and advertising expense [Biedleman, 1973, and Dasher & Malcolm, 1970];

choice of the cost or equity method [Barefield & Comiskey, 1972]; and changes from accelerated to straight-line depreciation [Archibald, 1967]. These studies all investigated the impact of the variables mentioned on some form of earnings such as net income, earnings per share, income before extraordinary items, and so on. In some cases the object of smoothing was not clearly identified [e.g. Biedleman, 1973] and in one case two measures of earnings were examined [Barnea, Ronen, & Sadan, 1976]. These studies are all based on the premise that firms will or must disclose variables which were used to achieve smoothed earnings, and that if such variables are observed across firms or within firms across time they will be found to have a smoothing effect on earnings a significant percentage of the time. This premise might suggest that management believes investors, analysts, and smoothing researchers can be easily fooled. There seems to be no conceptually appealing reason to assume, a priori, that the same reported discretionary income statement variable would be used (across firms or across time) to achieve the assumed objective of a smoothed earnings stream. It is not surprising that the findings and conclusions of these studies are limited.

Another potential problem with many of the studies which have been reported rests on the assumption that smoothing behavior will be observed with significant frequency in any sample of firms. In other words, some studies [Biedleman, 1973] simply identify those firms with variables which reduced earnings variability, and label those firms (ex-post) as smoothers rather than identify some subset of firms (ex-ante) as smoothers and then attempt to identify smoothing variables.

The first approach suffers from a number of deficiencies. Not only does it assume that all observed variables which reduce earnings variability have been "managed" or manipulated, it also assumes that the earnings stream

which has been affected is smooth as a result of some slight reduction in variability.

The approach which identifies a smoothing sample ex-ante would seem to be more convincing, provided that an acceptable method of identification could be developed. While this latter approach has been used infrequently [White, 1970], results which observed smoothing behavior within a predefined smoothing sample (and non-smoothing behavior in a non-smoothing sample) would tend to both strengthen the results and support the classification system used. On the other hand, if an incorrect classification system is used, the results from any subsequent analysis are likely to be inconclusive.

The principal thrust of this paper will be to explore several relevant questions regarding the definition of income smoothing and the ex-ante classification of firms into smoothing and non-smoothing samples. The objective will be to determine how sensitive research results are to the classification or definition employed. While a number of definitions will be examined, all possible definitions are not considered. Therefore, it is important to keep in mind that the definitions which are used are not necessarily better or superior to those which are omitted. The focal point will be the impact of changes in the definition of income smoothing firms on the classification of firms as income smoothers.

Three Definitional Questions

In defining income smoothing several operational questions must be resolved. Assume the definition of an income smoothing firm is a firm which has artificially achieved a relatively low degree of variability about some income trend line. To

apply this definition one needs to know: (1) what is the "income" measure being smoothed? (2) what is the model used to detrend the income measure? (3) what is "a relatively low degree" of variance? These questions have been answered inconsistently in previously reported research. Yet to date no one has taken exception with, or pointed out these inconsistencies. Some have argued on an a priori basis that different answers to these operational questions will necessarily yield different results [Ronen, Sadan, & Snow, 1977, p. 21]. Alternatively, one might argue that due to the strong intercorrelation observed among accounting variables, the exact nature of the definition will not have a significant impact on the research results. It would seem important to know if smoothing research results are inconsistent because of differences in their definitions and in the implementation of these definitions. One way to explore this potential problem is to demonstrate that different answers to the three operational questions identified above will produce research results which differ.

Income Measurement Selection

Prior to application of a model and the assessment of the degree of smoothing, it is necessary to identify the object or variable being smoothed. Many different income measures have been assessed, from operating income [Barnea et. al., 1976] to earnings per share [Cushing, 1969]. It is not clear whether net income, or EPS, or some other measure of performance is the object of managements' attempt to smooth. On the one hand, it would seem important to know what users are most interested in as a measure of performance of the firm. Barnea, Ronen, and Sadan have suggested that financial statement users focus on "ordinary income per share" which they feel "...should be the object of smoothing" [1976, p. 110].

On the other hand, it would seem equally important to know what management believes users are observing to evaluate the stability (smoothness) of earnings.

If the firm feels that users are most interested in fully diluted earnings per share, it seems likely that efforts to artificially smooth would be directed at that variable. There is some evidence that top managers are not in agreement about the income measure they perceive outsiders use in evaluating the performance of their firm [Imhoff, 1977]. It is very doubtful that either managers or outside users would be found to be in substantial agreement on any one income measure. The resulting uncertainty presents a potentially serious problem to the operationalization of a smoothing definition if a universal definition of the object of income smoothing is the goal. Alternatively, if different smoothing targets are accepted among firms, the problem becomes one of matching a smoothing target with each smoothing firm.

In addition to knowing which smoothing objects financial statement users are focusing on, and which objects management believes its owners are concerned with, it might also be interesting to know which objects managers are interested in for their own personal welfare. Knowledge of managements' compensation systems might improve the ability of researchers to identify smoothing objects. There has been very little empirical research conducted in this area. While Simon's theory [1957] of profit satisficing behavior seems more consistent with income smoothing than Baumol's [1959] belief that managements' goal is to maximize revenues, either or both may be inconsistent with management's personal wealth maximization objective. If we assume top management is interested in personal wealth maximization, managements whose compensation systems are tied to accounting earnings measures such as net income are less apt to be smoothing net income than managements whose compensation is tied to, say, market share or market value of the firm. It is also possible that the degree of control which management has over the conduct of the firm will influence management's behavior and its likelihood to smooth. For example, studies by Smith [1976], Monsen, Chiu

and Cooley [1968], Larner [1970], and Palmer [1973] suggest that management-controlled firms (firms with widely diffused ownership interests) reported relatively smoother income series and lower systematic market risk than owner-controlled firms. In a study concerning the managerial choice between the purchase vs. pooling of interest accounting alternatives, Gagnon [1967] found management's choice to be more consistent with income maximization than with income normalization. The research results which are available are mixed and are only indirectly related to management's ability to maximize their personal wealth while smoothing income.

To evaluate the importance of having different potential smoothing targets for different firms, an attempt was made to determine whether the relative variability of various "income" measures were significantly different. Four different models were used to evaluate the five different income measures: the coefficient of variation of each income measure for each firm based on (1) gross data for eleven years and (2) first differences for eleven years; and the F statistic from the linear time-series of each income measure for each firm based on (3) gross data for the eleven years and (4) first differences of the same eleven years.

These models may be expressed as follows:

$$GCV_{i\delta} = \frac{\sigma_{G_{i\delta}}}{\overline{X}_{G_{i\delta}}} \qquad (1)$$

Where:

GCV = Coefficient of variation for gross data for firm i and income measure δ,

$\sigma_{G_{i\delta}}$ = Standard deviation for gross data of firm i and income measure δ,

$\overline{X}_{G_{i\delta}}$ = Mean of the gross data of income measure δ for firm i,

i = 1,...,100 firms, and

δ = 1,...,5 income measures.

$$FCV_{i\delta} = \frac{\sigma_{f_{i\delta}}}{\overline{X}_{f_{i\delta}}} \tag{2}$$

Where:

FCV_{ij} = Coefficient of variation for first difference data for firm i and income measure j, and where all terms are as before except they are based on the first differences.

$$G_{i\delta} = \alpha_{gi\delta} + \beta_{gi\delta}t + \mu_{gi\delta_t} \tag{3}$$

Where:

$G_{i\delta}$ = Income measure δ for firm i based on gross data,

$\alpha_{gi\delta}$ = Constant for gross data on measure δ for firm i,

$\beta_{gi\delta}$ = Growth term of gross data for measure δ and firm i,

t = Time variable, t = 1,...,11,

$\mu_{gi\delta_t}$ = Residual of gross data for measure δ, firm i at time t,

δ = 1,...,5 income measures,

i = 1,...,100 firms,

$$F_{i\delta} = \alpha_{fi\delta} + \beta_{fi\delta}t + \mu_{fidt} \tag{4}$$

Where:

$F_{i\delta}$ = Income measure δ for firm i based on first difference data, and where all other terms are as in (3) above.

The five measures of "income" selected were: (δ1) fully diluted EPS; (δ2) net income (NI); (δ3) net income before extraordinary items (NIBEI); (δ4) operating income (OI); and (δ5) gross margin (GM). The four models assessing the variability of the five different income measures were applied to a random sample of 100 Compustat firms. To determine if the relative variability of the

five income measures was significantly different, the four hundred statistics (two coefficients of variation and two F statistics for the beta coefficient of the time series for each of 100 firms) for each income measure were ranked from 1 (least variable firm) to 100 (most volatile firm). A Kendall rank correlation coefficient was computed for each pair of income measures under each model.[3] The following general hypothesis was then examined:

> H_o: Using Model i to measure variability, the relative variability (ranking) of measure j is not significantly different from the relative variability (ranking) of measure k.

Where:

> i = 1-4, the four models described above,
> j = δ1-δ5, the five measures of income defined above,
> k = δ1-δ5, the five measures of income defined above, and
> $j \neq k$.

The resulting Kendall association measures are summarized in the intercorrelation matrices found in Table I. All but two of the rank order comparisons were significantly associated with one another at the .001 confidence level. However, these results do imply a failure to reject the null hypothesis, which questions whether the associations among variables are significantly different from 1.0. All of the correlation coefficients are significantly different from 1.0, with the correlations between net income (NI) and net income before extraordinary items (NIBEI) being the strongest in all four models due to the fact that NI = NIBEI for all firms and all years where no extraordinary items exist. As a result of these tests of association for the overall sample of firms examined, it may be concluded that while all five income measures for each of the four models examined were significantly positively rank order correlated with

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[3]The Kendall τ was selected over the Spearman γ_s statistic because of its superior ability to deal with tied ranks. At the same time, it should be pointed out that the correlations generated with the Kendall τ tend to be lower than the Spearman γ_s statistics (which are similar to Pearson correlations).

Table I

Kendall Correlations

Coefficients of Variation

Gross Data

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.78 (.001)	1.00 (.001)			
δ_3	.79 (.001)	.92 (.001)	1.00 (.001)		
δ_4	.61 (.001)	.71 (.001)	.72 (.001)	1.00 (.001)	
δ_5	.35 (.001)	.47 (.001)	.48 (.001)	.66 (.001)	1.00 (.001)

First Differences

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.38 (.001)	1.00 (.001)			
δ_3	.40 (.001)	.83 (.001)	1.00 (.001)		
δ_4	.21 (.001)	.59 (.001)	.65 (.001)	1.00 (.001)	
δ_5	.13 (.032)	.47 (.001)	.51 (.001)	.62 (.001)	1.00 (.001)

F Statistics

Gross Data

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.38 (.001)	1.00 (.001)			
δ_3	.37 (.001)	.87 (.001)	1.00 (.001)		
δ_4	.26 (.001)	.65 (.001)	.69 (.001)	1.00 (.001)	
δ_5	.08 (.131)	.42 (.001)	.45 (.001)	.58 (.001)	1.00 (.001)

First Differences

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.50 (.001)	1.00 (.001)			
δ_3	.49 (.001)	.83 (.001)	1.00 (.001)		
δ_4	.26 (.001)	.57 (.001)	.59 (.001)	1.00 (.001)	
δ_5	.08 (.001	.33 (.001)	.28 (.001)	.44 (.001)	1.00 (.001)

δ_1 = E.P.S., δ_2 = N.I., δ_3 = N.I.B.E.I., δ_4 = O.I., δ_5 = G.M.

Note: Numbers in parentheses in these (and other) tables are levels of significance.

one another, no two income measures for any of the four models resulted in associations which were not significantly different.

It was noted from Table 1 that as the "distance" from the diagonal increases, the associations become weaker. In other words, as the "distance" (number of items which computationally influence income) between any two income measures (δi & δj) increases, the rank order association between those two measures decreases. This, in turn, is related to the fact that the relative variability of the various income measures tends to increase moving from gross margin to the final residual, EPS. This latter phenomenon is generally supported by the statistical evidence presented in Table II. Going from $\delta 1$ to $\delta 5$, volatility tends to be decreasing, with the major exceptions being volatility measures from models 1 for EPS data ($\delta 1$), which were less volatile overall than net income ($\delta 2$). As a result, smoothing targets such as net income should be expected to be more volatile than operating income.

At this point it would appear that the income target used to evaluate potential smoothing behavior will have a significant effect on the sample identification process. It is possible that these dissimilarities do not apply to all income measures. However, it would seem that the first question identified previously might be relatively important to the identification of smoothing targets for companies included in income smoothing samples.

Model Selection

The model used to assess the smoothness or variability of income has also varied in prior research. In research using a two period model, the target earnings number was assumed to be the same as the previous years earnings [i.e., Archibald, 1967] or slightly higher [Cushing, 1969]. Those studies which evaluated earnings using multi-period tests have employed exponential models [e.g.,

Table II

Means of Statistics From
Models 1-4 for Income
Measures δ_1-δ_5

Income Measure	Coefficients of Variation		F Statistics for β (1)	
	Model 1 (Gross Data)	Model 2 (1st Differ.)	Model 3 (Gross Data)	Model 4 (1st Differ.)
δ_1 (E.P.S.)	1.57	14.53	7.89	18.20
δ_2 (N.I.)	2.98	12.38	26.01	19.45
δ_3 (N.I.B.E.I.)	2.48	16.39(2)	30.41	21.15
δ_4 (Op. Inc.)	1.51	7.77	49.87	20.35
δ_5 (Gross Margin)	.77	7.49	66.53	33.47

(1) F Statistics $\geq$ 4.35 imply that $\beta \neq 0$ at the .05 level of significance.

(2) One outlier, whose mean approached zero, was responsible for this outcome. The average coefficient of variation decreases to 10.74 when this outlier is eliminated.

Dasher and Malcolm, 1970], linear time series models [e.g., Barefield and Comiskey, 1972], semi-logarithmic time trend [Biedleman, 1973], and first difference market income index models [Ronen and Sadan, 1975] to mention a few. Perhaps the variations in models largely reflect the increased sophistication of research methodologies in accounting and finance over the past decade.

Although their study did not specifically involve income smoothing, Dopuch and Watts [1972] suggest that use of the Box-Jenkins methodology might facilitate smoothing research. In their conclusions, they state that Box-Jenkins might provide a time series model which "...best fits a firm's income-generating process that can then be used as a basis for defining a target income" [Dopuch and Watts, 1972, p. 194]. There are several problems with the Box-Jenkins model which limit its use in smoothing research. The model calls for many (about 50) observations on past data, which limits its utility in detrending annual earnings. Also, it is very doubtful that any appreciable number of users (or corporate managers) are actually evaluating earnings properties using some form of ARIMA (auto regressive integrated moving average) process with differencing and seasonal differencing parameters, even though they may be obtaining and using the same information cues. The ability of the methodology to take highly volatile data and model them with very little unexplained variation further limits its utility in assessing the degree of smoothness communicated by the reported earnings numbers.

To resolve the modeling problem, it would again seem necessary to consider both the preparer (management) and the user of earnings data to determine what is being used to evaluate the smoothness of earnings. This is the same sort of problem which was discussed regarding the selection of a smoothing target, and is equally perplexing when applied to model specification. Once again, it is likely that no single model would be appropriate for all firms, and that a firm

by firm approach would present a severe matching problem. However, some argument can be made for the use of a simple model. If management intends to smooth earnings in such a way that a substantial number of users will perceive the earnings stream as being smooth, then it seems necessary that the smoothing model be a relatively simple one which is capable of being readily observed. There is some evidence in the psychology literature which would support the use of a linear model for assessing smoothness. That evidence suggests that individuals "use" information in a linear fashion [Hoffman, 1960 and Green, 1968]. Empirical investigations have revealed that non-linear models of human evaluations have resulted in very marginal improvements over simple linear models.[4] However, Rorer [1973] has suggested that configural or interactive relationships between data elements ("cues") are perceived by data users in making decisions or predictions regarding the data, and the representativeness of the linear model in such cases may be somewhat reduced. It is not clear what the most appropriate model is or what the extent of the interactive effect is in attempting to represent how financial data is used. Slovic's study [1969], and that by Slovic, Fleissner, and Bauman [1972], provide some evidence regarding stock brokers' prediction models. In evaluating brokers' predictions based on data which included interactive attributes, they found that the interactions only accounted for about 5 percent of the total variance. The evidence that is available concerning experiments in accounting and finance [Slovic (1969), Libby (1975), Joyce (1976), and Ashton (1976)] along with other less related experiments, still seems to support the robustness of linear models. Keep in mind that this does not mean that the individuals actually use linear models to

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[4]For a review of these studies, see Goldberg [1968], Slovic and Lichtenstein [1971], and Dawes and Corrigan [1974].

process information. It simply suggests that linear models perform well in representing data utilization for predicting and in decision making. To the extent that the extrapolation of these previous research findings is relevant to the topic of smoothing, it might be argued that a simple linear model is an appropriate means of assessing the communication of earnings variability.

The objective here is not to argue that one model is superior to another but simply to observe whether alternative models produce alternative outcomes. Although there appears to be some evidence in favor or a linear model, it is not necessary that this evidence be accepted by the reader. The two variations of the two models used in the last set of tests were next evaluated for consistency of results between models for any given income target.

It was expected that the model used to assess smoothing would make a difference in the ranking. A Kendall rank correlation test was used to compare the rankings of models 1 and 3 (which used gross data as input) and of models 2 and 4 (which used first differences). For all five income measures, the results summarized in Table III showed that the rankings were all negatively associated between both models 1 and 3, and models 2 and 4. Most (7 of 10) rankings were significantly negatively associated at the .05 level for the comparisons examined.[5] These results support the premise that the model used to assess smoothing will have a significant influence on the outcome of the study. While this result may not be unexpected, it is possible that the models examined could have been very similar in their evaluation of earnings variability. One study suggested that

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[5] These negative correlations seem entirely reasonable. Both sets of model ranking comparisons involve a variability statistic which allows no drift being compared to one that allows a linear drift over time. As the drift defined by the OLS regressions becomes more significant (as F statistics increase), the variability in the coefficient of variation which does not incorporate a drift term should increase.

Table III

Summary of Association Between the Rankings for Selected Models

Gross Data

Comparison of Rankings of Models 1 and 3 for:	Kendall τ	α Level
δ_1 (E.P.S.)	-.0513	.226
δ_2 (N.I.)	-.2371	.001
δ_3 (N.I.B.E.I.)	-.2252	.001
δ_4 (O.I.)	-.2030	.001
δ_5 (G.M.)	-.0258	.353

First Difference Data

Comparison of Rankings of Models 2 and 4 for:	Kendall τ	α Level
δ_1 (E.P.S.)	-.0910	.090
δ_2 (N.I.)	-.2310	.001
δ_3 (N.I.B.E.I.)	-.1933	.002
δ_4 (O.I.)	-.1411	.019
δ_5 (G.M.)	-.2537	.001

management's target or benchmark would be to increase EPS by $.01 each year [Cushing, 1969]. If management was able to achieve such a target, the two models examined might have produced similar results. While the two models examined had some chance of producing similar results, the fact that they actually resulted in different rankings would suggest that other more dissimilar models, such as exponential or moving average models, may also result in different outcomes. Thus, the analysis supports the premise that different models will produce different results in smoothing studies on an a priori basis.

Smoothness Measurement

Some researchers have ignored the issue of what degree of smoothness constitutes smoothing and have simply observed the impact of accounting variables on income. For example, Biedleman [1973] considered firms to be smoothers if the selected income statement variables had a decreasing (dampening) effect on the variability of "earnings." Others have pointed out that these results essentially describe some obvious behavior patterns for income variables [Imhoff, 1975]. Since firms with highly volatile earnings streams might be identified as income smoothers, it is not considered to be a useful approach.

One appealing approach to defining what constitutes smoothing was that used by White [1970], who simply selected the smoothest firms from those included in his sample. Smoothing is a relative concept and it seems desirable to treat it as such. This approach avoids the problem of determining what information preparers and users perceive as being a "smooth" earnings stream. Once an income target and a model for assessing variability or smoothness have been identified, one can simply select from an overall sample those firms with the lowest "relative" degree of income variability.

While selecting firms with low earnings variability seems to work well in the identification of a smoothing sample, it does fail in its ability to capture

managements' intentions. Recall that our definition of smoothing suggested some overt action by management to accomplish the smoothed earnings. While one might logically argue that a relatively stable earnings stream is a necessary condition for identifying smoothing behavior, it is more difficult to demonstrate that it is a sufficient condition. In a study conducted by Imhoff [1977], it was argued that a group of firms identified as smoothers, as in the White study [1970], might include "natural smoothers", hence confounding attempts to identify smoothing behavior within the smoothing sample. The proposition suggested by Imhoff was that firms with smooth earnings stream might also have smooth revenue and expense streams, and might therefore have achieved a smooth income trend from a period of stable business activity or controlled growth. It was argued that smoothing firms which reported earnings streams that were highly correlated with their respective sales data might have accomplished their smoothing naturally or by manipulating sales. This concept of "natural smoothing" seemed to apply to the firms in White's study, as summarized in Table IV. It was pointed out that the high r^2 values between sales and net income for White's smoothing sample were not common to all firms.[6]

If "natural smoothers" are included in smoothing samples, subsequent attempts to identify how smoothing was accomplished might be in vain. At the same time, identifying smoothing intent on the part of management might not be possible, and some inaccuracy in the sample selection process may be unavoidable.

Two other problems with the smoothness measure seem worthy of mention. First, is it necessary for management to be successful in its efforts to smooth in order to be classified as an income smoothing firm? This is one subset of

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[6]The average r^2 value for White's smoothers was .941 while the average for the other 76 firms analyzed by Imhoff was .415 [Imhoff 1977, pp. 85-100.]

Table IV*
Additional Data on Firms
Previously Identified as Smoothers

Firm	R^2 Values from EPS Time-Series White Study 1957-1966	R^2 Values from Association Between Sales and Net Income 1957-1966
National Starch & Chemical Corp.	.949	.973
Armstrong Cork Co.	.909	.941
Celanese Corp.	.919	.975
FMC Corp.	.948	.934
Hercules, Inc.	.952	.941
Monsanto Co.	.927	.948
Pennwalt Chemicals Corp.	.991	.961
Rohm & Hass Co.	.890	.938
Witco Chemicals Co.	.904	.985
Nalco Chemicals Co.	.893	.980
Seagrave Corp.	.835	.955
Corning Glass Works	.943	.899
Texas Industries, Inc.	.770	.907
Vulcan Materials Co.	.772	.943
Trane Co.	.787	.978
Honeywell, Inc.	.806	.831
Minnesota Mining & Mfg. Co.	.965	.988
Coleman Co., Inc.	.850	.867

*Taken from "Income Smoothing--A Case for Doubt," by E. A. Imhoff as reported in The Accounting Journal (Spring, 1977), p. 95.

the definitional problems. If relative smoothness of reported income is the smoothness measure, it would suggest that management must not only intend to smooth but must also be successful in its efforts. This approach views intent as a necessary but not a sufficient condition. If intent were more readily observable, it might be possible to identify smoothers based on intent alone. However, unless management is successful in communicating (and achieving) a smoothed income stream, it would not seem appropriate to identify their company

as an income smoother. The manipulation of income for other purposes, such as income maximization, is a viable alternative for intended adjustments to income targets.

Finally, the time interval of the evaluation period must be considered an important variable. If smoothing is to be considered a multi-period concept, what is the appropriate time period to be observed? If ten years data are evaluated for a firm which has been smoothing income during the last four years, will the smoothing behavior be identified? Copeland [1968] reported that time-series which varied over periods of two, four, six, and eight years resulted in different firms being identified as smoothers, thereby demonstrating empirically the potential importance of the time frame. It is not likely that an optimal time interval could be determined to resolve this problem.

Interaction of Questions

To test for the possible interaction between the three questions, a selection of the 15 firms with the lowest variability for each of the five income measures was made using each of the four models.[7] The original hypothesis was then re-examined using the top 15 firms instead of all 100 firms to see if the income measures influenced the ranking.

The results, presented in Table V, show the Kendall intercorrelation matrices for the four models using each of the five income measures. It appears that the income measure selected to measure variability still makes a difference even within

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[7] There was no particular reason for using the top 15. However, a small sample of comparisons using 10 and 20 was found to be similar to those reported, hence it is doubtful that the specific size of the sub-sample had any major impact on the results obtained here. What remains a problem is the identification of these 15 firms as "smoothers" when no intent to smooth has been demonstrated. This potentially confounding effect is not explored in this study, but simply assumed to have an immaterial effect on the results.

Table V
Kendall Correlations

Top 15 Based on
Coefficients of Variation

Gross Data

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.52 (.001)	1.00 (.001)			
δ_3	.56 (.001)	.86 (.001)	1.00 (.001)		
δ_4	.23 (.048)	.61 (.001)	.59 (.001)	1.00 (.001)	
δ_5	-.37 (.004)	-.09 (.263)	-.08 (.269)	.17 (.106)	1.00 (.001)

Of the 28 firms examined, four were among the top 15 smoothers in all five income measures.

First Differences

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.10 (.200)	1.00 (.001)			
δ_3	.07 (.296)	.76 (.001)	1.00 (.001)		
δ_4	-.12 (.161)	.56 (.001)	.62 (.001)	1.00 (.001)	
δ_5	-.28 (.013)	.23 (.033)	.25 (.022)	.50 (.001)	1.00 (.001)

Of the 32 firms examined, two were among the top 15 smoothers in all five income measures.

Top 15 Based on
F Statistics

Gross Data

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.09 (.212)	1.00 (.001)			
δ_3	.03 (.412)	.74 (.001)	1.00 (.001)		
δ_4	-.10 (.190)	.51 (.001)	.61 (.001)	1.00 (.001)	
δ_5	-.37 (.001)	.10 (.194)	.18 (.050)	.44 (.001)	1.00 (.001)

Of the 37 firms examined, none was among the top 15 smoothers in all five income measures.

First Differences

	δ_1	δ_2	δ_3	δ_4	δ_5
δ_1	1.00 (.001)				
δ_2	.12 (.196)	1.00 (.001)			
δ_3	.13 (.164)	.91 (.001)	1.00 (.001)		
δ_4	.12 (.196)	.37 (.003)	.37 (.004)	1.00 (.004)	
δ_5	-.10 (.226)	.10 (.226)	.05 (.354)	.40 (.002)	1.00 (.001)

Of the 27 firms examined, three were among the top 15 smoothers in all five income measures.

the sub-sample of firms which could be included in a smoothing sample. This is consistent with the results reported earlier. It was noted, however, that only about half of the income measures were significantly positively associated with one another within any given model, whereas nearly all measures were positively associated with one another at the $\alpha \leq .001$ level in Table 1. It does not appear that identifying either the smoothing target or the model to capture smoothing within a smoothing sub-sample will help to solve the problems posed by model and target specification. However, the sub-sample was selected using relative variability in income. It is possible that alternative methods of sub-sample selection could yield different results.

Summary

The results of the tests conducted and reported in this and other studies suggest that the problems of selecting an income smoothing sample will have an important impact on the outcome of smoothing research. A number of issues in the sample selection process have been identified as relevant:

1) Identification of the smoothing object;
2) Identification of the smoothing model;
3) Identification of intent to smooth as opposed to "natural smoothing";
4) Identification of the level of relative stability which constitutes a smoothed income stream;
5) Identification of the relevant time frame over which smoothing should be observed; and
6) Identification of any confounding or statistically significant interaction effects among the first five issues above.

It is not likely that any given smoothing study will address and completely resolve the issues identified in this paper. However some suggestions as to how these issues might be addressed should be considered. A number of possible approaches for identification of the smoothing target are possible. One approach would be to conduct an entire study for each of several measures. Another approach would be to identify that income measure for each firm which is most stable. Still another approach would be to develop a normative selection process. Barnea et. al.

[1976] argued that "ordinary income (before extraordinary items) per share is the focal number of users of financial statements and, therefore, should be the object of smoothing" [Barnea, et. al., 1976, p. 110]. They supported this normative position by stating that "Contacts with Wall Street Analysts confirmed this" position [Barnea, et. al., 1976, p. 110]. Such a naive approach, given the nature of the problem, might prove to be perfectly acceptable for smoothing research. A fourth approach might be to take that income measure which is not related to management's compensation (since management would probably maxmimze this variable), but one which is related to stock price or dividend flows which external users would be interested in following. These possible alternatives are suggestions only, not answers, since no clear answers seem to be available.

Model selection is a problem which may already have an acceptable solution since much of the evidence from the behavioral research literature suggests that linear models are good representations of man's utilization of data in decision making. There does not seem to be any evidence to support any other model as a good representation of how information cues affect decision making. At the same time, the overall explanatory power of such models has not been very strong in any study, and there is some tendency for more complex tasks or decisions to result in a reduction in the strength of the prediction model. It seems likely that non-linear models would remain acceptable alternatives; however, there is no known theory or evidence which convincingly supports non-linear model selection.

Identification of management intent and elimination of the "natural smoothing" phenomenon may present problems which cannot be effectively resolved. In addition to the method suggested for identifying natural smoothers [Imhoff, 1977], it might also be possible to reduce the confounding effects by comparing a smoothing sample (identified without evidence of intent) with a non-smoothing sample. If the apparent smoothing behavior is significantly more frequent in the smoothing sample,

it would lend some credibility to the sample identification process. Still, without measurement of the intent to smooth, the best obtainable classification might be "potential smoothers."

The relative stability necessary in order to communicate smoothing might be handled by simply taking a sub-set of the most stable earnings series from a larger sample of firms. This approach seems to be the most reasonable, but is largely dependent on the way in which the first two issues above (target and model) are resolved. It might be interesting to conduct a behavioral experiment to see how users of financial data preceive or describe various earnings patterns in order to learn more about the nature of effectively communicated income smoothing. Future research might be able to contribute more to this aspect of income smoothing.

The time-frame problem may also have no satisfactory answer. It would seem that information regarding what would motivate management to initiate an income smoothing philosophy would be rather unsystematic and not conducive to building a theory. There might be some reason to believe that a major change-over in top management would be a starting point, but this is more conjecture than logic. In a methodological sense, the longer the series the more powerful the model. However the older the data used for any given firm, the greater the likelihood that the firm has experienced significant changes, to the extent that the firm is essentially not the same entity over the entire period of observation.

While all of these issues seem to require the attention of the smoothing researcher, it is not likely that they can be resolved in a way which will satisfy all interested parties. As a result, smoothing research will probably remain a difficult research area. It is likely that progress regarding the issue identified above will be necessary before the concept of smoothing can be related to the value of the firm, or some other valuation concept which can provide the economic underpinnings of the theory.

Conclusion

This research examined some of the differences in the definitions of income smoothing used by previous researchers, and demonstrated that the definition used will have a significant impact on the research results. Specifically, it was demonstrated that the income measure selected, the model used to evaluate smoothers, and the degree of stability used to define smoothing will have a significant impact on the identification of a smoothing sample. Inconclusive results of previous research studies could be due largely to their failure to meaningfully identify attributes of income smoothing firms. If firms are not accurately classified, tests of their smoothing behavior cannot be expected to provide results which will contribute to our understanding of the subject of income smoothing.

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