

**ACADEMY OF ACCOUNTING AND
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CONTENTS

LETTER FROM THE EDITORS v

**MANAGERIAL FIRST: REVERSING THE SEQUENCE OF INTRODUCTORY
ACCOUNTING COURSES 1**
Gary P. Schneider, University of San Diego
Carol M. Bruton, University of San Diego
Jeffrey W. Arricale, KPMG Peat Marwick, LLP

**AUDIT REPORT MODIFICATIONS FOR CHANGES IN ACCOUNTING
PRINCIPLES: ARE AUDITORS TOO ENTHUSIASTIC? 7**
Charles E. Jordan, University of Southern Mississippi
Stanley J. Clark, University of Southern Mississippi
W. Robert Smith, University of Southern Mississippi

**APPLYING FUTURES CONTRACT EVALUATIONS TO SMALL BUSINESS
STOCK PORTFOLIOS AND RETIREMENT PLANS:
AN INNOVATIVE APPROACH USING TECHNICAL ANALYSIS 17**
Carroll D. Aby, Jr., Northwestern State University
Marcelline R. Fusilier, Northwestern State University

**ARE ACCOUNTING STUDENTS READY FOR THE INTERNET AGE?
STUDENTS' PERCEPTIONS OF AND IMPLICATIONS FOR THE
ACCOUNTING CURRICULUM 25**
Cheryl A. Cruz, California State University, Los Angeles
Dong-Woo Lee, California State University, Los Angeles
Carol Blaszczynski, California State University, Los Angeles

**STOCK INDEX FUTURES OPTIONS AND THE PREDICTABILITY
OF INTRADAY INDEX PRICE CHANGES 44**
James Stotler, North Carolina Central University

Richard Curcio, Kent State University
Eugene Swinnerton, University of Detroit, Mercy

**THE EFFECTIVENESS OF CORPORATE RESTRUCTURING:
AN ANALYSIS 52**
Vinita M. Ramaswamy, University of St. Thomas
Ramon Fernandez, University of St. Thomas

WOMEN IN THE PUBLIC ACCOUNTING PROFESSION 72
Rodger R. Trigg, Columbus State University
Fabian K Nabangi, Morehouse College
Emmanuel O. Onifade, Morehouse College

DO MANAGERS SMOOTH EARNINGS PATHS? 77
David W. Gibson, Hampden-Sydney College
Mark A. Prell, Hampden-Sydney College

**ESCALATION OF COMMITMENT AND ITS EFFECT ON CAPITAL
BUDGETING: A REVIEW OF THE LITERATURE 96**
Janice L. Klimek, Missouri Western State College

**APPLICATION OF THE SPECIAL CONSTRAINED MULTIPARAMETRIC
LINEAR PROGRAM TO PORTFOLIO SELECTION DECISIONS 116**
Philip Little, Western Carolina University
Michael Shurden, Lander University
Elizabeth Wibker, Louisiana Tech University

LETTER FROM THE EDITORS

Welcome to the second issue of the *Academy of Accounting and Financial Studies Journal*. The Academy of Accounting and Financial Studies is an affiliate of the Allied Academies, Inc., a non profit association of scholars whose purpose is to encourage and support the advancement and exchange of knowledge, understanding and teaching throughout the world. The *AAFSJ* is a principal vehicle for achieving the objectives of the organization. The editorial mission of this journal is to publish empirical and theoretical manuscripts which advance the discipline, and applied, educational and pedagogic papers of practical value to practitioners and educators. We look forward to a long and successful career in publishing articles which will be of value to the many communications scholars around the world.

The articles contained in this volume have been double blind refereed. The acceptance rate for manuscripts in this issue, 25%, conforms to our editorial policies.

As editors, we intend to foster a supportive, mentoring effort on the part of the referees which will result in encouraging and supporting writers. We welcome different viewpoints because in differences we find learning; in differences we develop understanding; in differences we gain knowledge and in differences we develop the discipline into a more comprehensive, less esoteric, and dynamic metier.

The Editorial Policy, background and history of the organization, officer lists and addresses and calls for conferences are published on our web site. In addition, we keep the web site updated with the latest activities of the organization. Please visit our site and know that we welcome hearing from you at any time.

JoAnn and Jim Carland
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ARTICLES

MANAGERIAL FIRST: REVERSING THE SEQUENCE OF INTRODUCTORY ACCOUNTING COURSES

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ABSTRACT

Over the past 75 years, accounting programs have developed a highly consistent sequencing of introductory course topics. In this curriculum model, the financial accounting topics precede the managerial accounting topics. This paper argues that the reverse order may be a more appropriate way to serve today's accounting students and their potential employers. Managers at all levels of organizations use managerial accounting knowledge more frequently than financial accounting knowledge. An ideal sequence of course topics would begin with conceptually easier material and progress to more difficult material. We argue that students in introductory courses understand managerial accounting more easily and find it more interesting than financial accounting. Beginning the sequence with financial accounting ignores this convention. The present sequencing was developed in response to the demands of professional certification examinations that accounting majors face. Many more introductory accounting students are not accounting majors than are. We argue that non-accounting majors would fare much better under a reversed sequencing. For example, the programs of many non-accounting majors require only one accounting course. With the present sequencing, these students take only financial accounting. For many of these students including engineers, health care professionals, and teachers the topics included in the managerial course would be much more useful. In conclusion, we also argue that the needs of accounting majors can be met by this reordering of topic coverage in the introductory accounting courses.

INTRODUCTION

As accounting programs have grown and developed over the past 75 years, they have gradually adopted a very consistent curriculum model for the introductory courses. In this curriculum model, the financial accounting topics invariably precede the managerial accounting topics. In recent years, a number of forces have caused accounting educators to reconsider many of their assumptions about curriculum and its implementation.

The Bedford Committee (AAA, 1986) and the Accounting Education Change Commission (AECC, 1990) have, for example, been the stimuli for many interesting

innovations in accounting education in the past decade. Solomon and DeBerg (1994) have recently supervised the development of a new core competencies model for accounting programs in the State of California. Increasingly, accounting educators are trying new ways to help their students develop critical thinking skills (Doney, et al., 1993; Kimmel, 1995), learn how to learn (Bartholome, 1991; Basu and Cohen, 1994; Geary and Rooney, 1993), learn better in challenging environments (Baldwin, 1993), and deal with technical information overload in accounting courses (Anderson and Boynton, 1992).

The increasing prevalence of outcomes assessment (Herring and Izard, 1992) at many universities is motivating accounting educators to specify desired skill sets more clearly and identify ways to measure student mastery of those skills more accurately. The accounting profession has not been silent about the skills it desires in its new hires. Even the accounting professionals in industry have funded a major study that purports to tell educators what they want to see in the accounting graduates they hire (Siegel and Sorenson, 1994).

These pressures on accounting educators have led to much experimentation and many new ideas. Somewhat surprisingly, experiments that alter the traditional sequencing of introductory course content has been rare.

SEQUENCE MODIFICATION EFFORTS

Ainsworth (1994) and Ainsworth and Plumlee (1993) report the results of an AECC innovation project at Kansas State University. In this curriculum revision, the first introductory course covered how one might use accounting information in making operational decisions. The second course focused on financing and investing decisions. In the first course, therefore, the revised Kansas State curriculum integrated many managerial accounting topics.

Suadagaran (1996) included some managerial topics in a revision of the first introductory course. That revision yielded a first course in which he tried to destroy students assumption that bookkeeping and accounting were synonymous. He accomplished this objective, in part, by including managerial accounting topics which students found to be more interesting and analytical than financial accounting topics in the first course.

Most AECC-sponsored and other curriculum innovations (e.g., Pincus, 1995; Solomon and DeBerg, 1994) have retained the traditional ordering of financial topics first, managerial topics second. One drawback to using blended approaches such as those used by Ainsworth and Plumlee (1993) and Suadagaran (1996) is that book publishers create materials for the more traditional financial/managerial split. Therefore, an instructor using a mixed approach would need to cobble materials together from disparate sources.

Often, faculty that are willing to teach a financial principles introductory course feel ill-prepared to teach managerial topics. The opposite is often true for faculty that feel their teaching strength is in cost and managerial accounting. In many schools, the introductory courses are staffed by adjunct faculty or doctoral students, which can make such course customization extremely difficult.

THE LOGIC OF RESEQUENCING

We believe that a logical argument can be made for introducing student to accounting using predominantly managerial topics. Managers at all levels of organizations use managerial accounting knowledge more frequently than financial accounting knowledge. Ainsworth and Plumlee (1993) argue that an ideal sequence of course topics should begin with easier material that students can master with fewer skills and progress to more difficult material.

We believe that students in introductory courses understand managerial accounting more easily and find it to be more interesting than financial accounting. Beginning the sequence with financial accounting ignores this possibility. The present sequencing of introductory course topics was developed to accommodate the demands of the professional certification examinations for which accounting majors must prepare. Many more introductory accounting students are not accounting majors than are accounting majors.

ADVANTAGES FOR BUSINESS MAJORS

Business schools train their non-accounting majors for careers in management of corporations, government, and not-for-profit organizations. Other than those that choose to be finance majors, most of these students will have careers in which they will use managerial accounting information and the skills taught in traditional managerial accounting courses much more than anything they learn in financial accounting.

All managers are concerned with the pricing of products, the costing of activities, budgeting, and forecasting profitability. Managers actually make buy vs. lease decisions and live or die by the numbers in their responsibility accounting systems. Far more managers will be involved in a transfer pricing issue than will ever be required to calculate accelerated depreciation. Therefore, managerial accounting presents these students with vital knowledge that they can see they will need as they work on the course assignments.

ADVANTAGES FOR NON-BUSINESS MAJORS

A number of non-business majors take an introductory accounting course. Many of these students only take one accounting course, so the need for a careful choice is even more important than for non-accounting business majors, who generally take two introductory accounting courses. The non-business majors that might take an accounting course include students majoring in: engineering, pre-med, pre-law, nursing, education, and a variety of liberal arts and science subjects.

All of these students have some interest in gaining a basic understanding of how businesses operate. When these students take a course in financial accounting, they find the same mind-numbing and confusing double-entry bookkeeping details that bore the business majors to tears. Engineering students are far more interested in cost estimation and budgeting issues than they are in learning about debits and credits. Students heading for health care or

education careers will find their lives ruled by activity measurements, cost allocations, and budgets to a far greater extent than by the correct amortization of discount on a bond.

ADVANTAGES FOR ACCOUNTING MAJORS

Increasingly, accountants are being asked to become business advisors in addition to fulfilling their traditional number-crunching roles (Borthick, 1992; Elliot, 1994; McKinnon and Bruns, 1992). Public accounting firms expect their audit staff members to be vigilant in looking for ways to help clients improve their operations and identifying ways in which the firm may provide audit clients with additional consulting services. Auditors with a firm grasp of managerial accounting principles will be better able to excel at this valued function.

An increasing number of accounting graduates do not enter public accounting and many of those that do enter public accounting ultimately take jobs in managerial accounting areas. Arguably, a solid base of managerial accounting is at least as good for most accountants as a base of financial accounting and it may be markedly better for most. Most accounting programs even the 150-hour programs require students to take twice as much financial accounting as managerial accounting. Giving these students a good start in managerial accounting principles might be a good way to help equalize some of that imbalance.

ADVANTAGES FOR THE ACCOUNTING PROGRAM

Cohen and Hanno (1993) found that one important factor that students use to decide whether to become accounting majors is how well they performed in their introductory courses. The first accounting course is often the first business course of any kind that sophomores take. When this course includes financial accounting topics, topics that lend themselves to dry, mechanistic methods of dissemination, we may be losing bright, creative, potential accounting majors. Adams, et al., (1994); Cohen and Hanno (1993); and Saudagaran (1996) all report findings that brighter students were turned off by the highly-structured mechanical bookkeeping details of introductory financial accounting courses.

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

In this paper, we have presented arguments for reversing the sequence of the introductory financial and managerial accounting courses that are typically taught in U.S. and Canadian accounting programs. We briefly reviewed two reports of topic order revision in introductory courses, however, these program revisions each integrated topics from managerial and financial accounting into both courses. We explained the logic of our arguments and discussed the potential advantages of reversing the order of the topics in the two introductory courses for non-accounting business majors, for non-business majors, and for accounting majors. We noted an advantage to accounting programs an improved ability to recruit the best and brightest students from the introductory courses into the accounting major.

In concluding, we note that the potential advantages we outlined for students would also inure to the benefit of other stakeholders that have an interest in accounting curricula. For example, employers of these students would reap the benefits of having new employees that see the value of accounting as a true business tool. We also believe that a complete reversal of course order may be more effective than selectively exchanging topics between courses because of the textbooks, established pedagogies, and instructional materials available from publishers that support an integrated presentation each financial and managerial component of introductory accounting.

Yet another alternative to the traditional sequencing of financial accounting first would be to have students take both courses in the same term. Such an alternative would provide significant benefits to both accounting majors and the accounting faculty. Accounting majors could move on to upper-division courses in half the time presently required this can be a serious issue for students transferring from community college programs or for those switching majors during their sophomore year. The accounting faculty would benefit from the balanced workload. Since many faculty consider themselves to be either financial or managerial specialists and prefer to teach only in their specialty, this alternative would permit stable year-round staffing loads in each area. Adjunct faculty and doctoral students would also benefit from having one preparation throughout the academic year. Non-accounting majors that are only required to take one course might be permitted to select either the financial or the managerial course to tailor the curriculum to their specific needs. This idea is certainly worthy of further study.

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AUDIT REPORT MODIFICATIONS FOR CHANGES IN ACCOUNTING PRINCIPLES: ARE AUDITORS TOO ENTHUSIASTIC?

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ABSTRACT

Prior research has shown that auditors exhibit strong tendencies to modify reports for changes in accounting principle producing seemingly immaterial effects. However, these studies examined primarily the effect of a change on income. We examined report modification frequencies using several measures of materiality. Our results indicate that, notwithstanding the measure of materiality used, auditors demonstrate a high propensity to modify reports for changes in principle producing effects traditionally considered immaterial.

INTRODUCTION

A change in accounting principle occurs when a company changes from one generally accepted accounting principle (GAAP) to another generally accepted accounting principle. Such changes impact the consistency of financial reporting between years; therefore, Accounting Principles Board (APB) Opinion No. 20 requires financial statement disclosure of the nature of the change, justification for the change, and the cumulative effect of the change on income.

A change in accounting principle may also affect an auditor's report. Under Statement on Auditing Standards (SAS) No. 2, which established audit reporting guidelines prior to 1989, a standard (nonmodified) report referred to a company's consistent application of GAAP. A change in accounting principle producing a material effect on the financial statements required an auditor to qualify the audit opinion for inconsistent application of GAAP. SAS No. 2 did not preclude opinion qualification for changes producing immaterial effects. Thus, report modification under SAS No. 2 did not necessarily mean the auditor deemed the effect of a change material.

SAS No. 58 superseded SAS No. 2 in 1989 and greatly altered the audit reporting requirements for changes in accounting principle. A standard report no longer makes reference to the consistent application of GAAP. A standard report implies that either no change in accounting principle occurred during the period or that a change occurred but that its effect on the financial statements was immaterial. An audit report is modified for a change

producing a material effect, but this report modification no longer represents an opinion qualification as it did under SAS No. 2. Instead, under SAS No. 58, a change producing a material effect results in an explanatory paragraph in the audit report; the paragraph simply identifies the change and refers the reader to an appropriate footnote in the financial statements for more information. SAS No. 58 precludes report modification for a change producing an immaterial effect.

Research (e.g., see Wheeler et al. 1993) on audit reporting of changes in accounting principle prior to SAS No. 58 shows that auditors exhibited a lack of uniformity in their report modification decisions and that auditors demonstrated strong tendencies to modify reports, even for changes producing seemingly immaterial effects. SAS No. 58 might reasonably be expected to produce more uniform modification decisions among auditors. Jordan and Clark (1996), however, showed that SAS No. 58 had little impact on auditors' tendencies to modify reports for immaterial changes in accounting principle.

At first glance, modifying an audit report for a change in accounting principle producing an immaterial effect might be construed simply as unnecessary information resulting in a benign problem. However, this is not the case; modifying a report for an immaterial change sends an erroneous message to the financial statement reader. A modified report signals to the user that the auditor considers the effect of the change material. If the effect is actually immaterial, the user may be misled by the information provided in the audit report.

Why would auditors modify their reports for changes in accounting principle producing seemingly immaterial effects? Perhaps the changes are actually material but appear to be immaterial because of the measures of materiality used in prior research. Previous research evaluating auditors' report modification decisions used a change's effect on income as the measure of materiality. This assumes that the income effect is the only measure of materiality used by auditors. As Pany and Wheeler (1989) noted, however, audit decisions may be impacted by numerous measures of materiality. Because income can fluctuate widely from year to year, more stable measures of materiality (e.g., an item's effect on total assets) may be used. Wheeler et al. (1993) and Jordan and Clark (1996) concluded that auditors modify reports for changes producing seemingly immaterial effects, but both studies acknowledged that their results could have been different if measures of materiality other than income had been used. This article examines post-SAS No. 58 auditor report modification decisions for changes in accounting principle using various measures of materiality to determine whether a propensity to modify reports for immaterial effects exists.

PRIOR RESEARCH

Prior research on report modifications for changes in accounting principle primarily examined the income effects of the changes to draw inferences about auditor materiality decisions. These studies (e.g., Neumann, 1968 and 1969; Frishkoff, 1970; Morris et al., 1984; Morris and Nichols, 1988; Chewing et al., 1989) found that auditors exhibit a great deal of variation in their report modification decisions. For example, Morris et al. (1984) noted that

auditors in their study issued modified reports for changes producing income effects as low as 1 percent and issued nonmodified reports for income effects as high as 38 percent. In addition, the studies indicated that auditors have a tendency to modify reports for changes producing apparently immaterial effects. For example, Neumann (1969) found that a quarter of the audit reports modified in his sample were for changes with income effects less than 3 percent.

Wheeler et al. (1993) and Jordan and Clark (1996) provide the most recent information on auditors' tendencies to modify reports; both projects used the income effect of a change in accounting principle as the measure of materiality. Wheeler et al. examined pre-SAS No. 58 report modification frequencies; Jordan and Clark analyzed post-SAS No. 58 modification rates. To identify their materiality categories, both studies relied on an article by Holstrum and Messier (1982), which is perhaps the most comprehensive review to date of empirical research on factors used in materiality judgments. Holstrum and Messier concluded that, for public companies, an item's effect on income from continuing operations is the most important factor in determining whether that item is material. They also determined that items having a greater-than-10-percent effect on income would be considered material by all parties; items producing income effects less than 4 percent would be considered immaterial by all groups. Items resulting in income effects between 4 percent and 10 percent fall in a "gray" area about which no consensus exists. Table 1 shows the pre-SAS No. 58 and post-SAS No. 58 report modification frequencies for these categories from the Wheeler et al. (1993) and Jordan and Clark (1996) studies.

Effect on income	Number of reports		Percent	
	modified	nonmodified	Total	modified
Pre-SAS No. 58*				
< 4% of income	77	50	127	60.6%
4% - 10% of income	68	8	76	89.5
> 10% of income	<u>79</u>	<u>2</u>	<u>81</u>	97.5
Total	<u>224</u>	<u>60</u>	<u>284</u>	
Post-SAS No. 58**				
< 4% of income	125	26	151	82.8%
4% - 10% of income	166	37	203	81.8
> 10% of income	<u>886</u>	<u>56</u>	<u>942</u>	94.1
Total	<u>1177</u>	<u>119</u>	<u>1296</u>	

* Pre-SAS No. 58 results are from Wheeler et al. (1993).
** Post-SAS No. 58 results are from Jordan and Clark (1996).

The high modification rates for changes producing income effects greater than 10 percent are consistent with Holstrum and Messier's (1982) conclusion that items in this income-effect category are typically considered material. However, the modification rates in

the gray area and the less-than-4-percent income-effect category seem unusually high, especially for the post-SAS No. 58 period since SAS No. 58 clearly states that only changes producing material effects should result in report modification.

Auditors may exhibit a strong propensity to modify reports for apparently immaterial effects because income effects alone are not sufficient for materiality decisions. As mentioned previously, it is unlikely that all auditors make materiality decisions based solely on the income effect of an item. By concentrating on the income effect of a change in principle, prior researchers may have drawn erroneous conclusions concerning auditors' tendencies to modify reports. The remainder of this article examines post-SAS No. 58 report modification decisions using several measures of materiality to determine if evidence exists that this is, indeed, the case.

METHODOLOGY

A data base of companies reporting the cumulative effect of a change in accounting principle was obtained by searching Compact Disclosure footnote text files for the years 1992-1994 using the key words *cumulative effect*. To isolate auditors' modification decisions on individual changes, companies reporting multiple changes during the reporting period were omitted. Changes in accounting principle of all types were included in the sample, although the vast majority were mandatory changes (i.e., changes required because of the adoption of a new FASB standard). Because a dollar amount was needed to evaluate the various measures of materiality, companies that disclosed a change in the footnotes but did not report its cumulative effect were omitted from the sample. This sampling technique resulted in 685 companies that disclosed a cumulative effect of a change in accounting principle.

For all companies, selected financial statement data were obtained to allow the examination of different measures of materiality. As Pany and Wheeler (1989) note, some common non-income measures of materiality are total assets, total revenue, and total equity; these variables were collected as was income from continuing operations. The cumulative effect of the change in accounting principle was computed as a percentage of the four measures of materiality for each company.

RESULTS

To evaluate report modification frequencies for the four measures of materiality, rule-of-thumb materiality cutoff points from prior research were used to divide the companies into two groups: those with cumulative effects above the cutoff percentage and those with cumulative effects below the cutoff percentage. The cutoff for the income measure was 10 percent of income from continuing operations because, as Holstrum and Messier (1982) note, most groups would consider items above this income effect material. In their review of the literature on measures of materiality, Pany and Wheeler (1989) state that a considerable degree of consensus exists in the literature on the following materiality thresholds:

0.5 percent of total assets

1.0 percent of total equity
0.5 percent of total revenue

Table 2 shows the report modification frequencies for the companies above and below these traditional materiality thresholds.

Effect of change on	Reports modified	Reports nonmodified	Percent modified	Chi-square	Prob. > chi-sq.
Income:					
< 10% of income	208	53	79.7%		
> 10% of income	378	46	89.2	11.69	.0006
Assets:					
< .5% of assets	232	52	81.7		
> .5% of assets	354	47	88.3	5.84	.0157
Equity:					
< 1% of equity	198	51	79.5		
> 1% of equity	388	48	89.0	11.50	.0007
Revenue:					
< .5% of revenue	226	51	81.6		
> .5% of revenue	360	48	88.2	5.90	.0152

Table 2 reveals several important points. First, for each of the four materiality measures, the percentage of reports modified is higher for the group of companies with cumulative effects above the rule-of-thumb thresholds than for the group of companies with effects below the thresholds. Chi-square tests showed that these differences within each materiality measure are statistically significant by traditional standards of significance. Second, notice the remarkable consistency in the modification frequencies among the four measures of materiality. Third, and perhaps the most important finding, is the high propensity to modify reports for cumulative effects below the rule-of-thumb materiality thresholds. For each of the four measures of materiality, the modification rate for effects below the materiality threshold is about 80 percent, which is much higher than might be expected given SAS No. 58's clear wording that changes producing immaterial effects should not result in report modification.

USING A BLENDING MODEL

Leslie (1985) suggests that auditors may use blending models to make materiality decisions. This allows auditors to temper the effect of items on the sometimes volatile income measure of materiality with more stable measures (e.g., assets or revenue). Table 2 revealed high modification frequencies for cumulative effects below traditional materiality thresholds, but each materiality measure was viewed in isolation. Perhaps a blending model might demonstrate that auditors are not overly zealous in modifying reports for changes in accounting principle.

A significant portion of the literature indicates that an item's income effect is the most important factor in judging materiality and that an income effect greater than 10 percent would be considered material by most parties (Holstrum and Messier, 1982). Thus, there was no need to use a blending model on the companies with income effects greater than 10 percent; as Table 2 shows, almost 90 percent of the auditors behaved as expected and modified their reports for companies in this category. For the companies in the less-than-10-percent income-effect category, however, a blending model might help explain the auditors' strong tendencies to modify reports.

The blending model used the three non-income measures of materiality to determine the expected modification frequency. The model projected that a report would be modified if the cumulative effect of a change in accounting principle exceeded any of the following materiality thresholds: 1) 0.5 percent of assets, or 2) 1.0 percent of equity, or 3) 0.5 percent of revenue. For the companies with income effects less than 10 percent, Table 3 shows both the expected modification frequency produced by the blending model and the actual modification frequency.

	Reports modified	Reports nonmodified	Percent modified	Chi- square	Prob. > chi-sq.
Actual results	208	53	79.7%		
Expected results*	104	157	39.8	86.17	.0000

* Expected results are from the blending model.

Table 3 provides further evidence on the auditors' strong propensity to modify reports for changes in accounting principle producing immaterial effects. By predicting report modification if a cumulative effect met any of the three non-income materiality thresholds, the blending model projections tended to set an upper limit on the number of report modifications that might have been expected based on the materiality literature. However, the actual modifications occurred at twice the rate projected by the blending model.

ALTERNATIVE MATERIALITY THRESHOLDS

Auditors may appear to be exhibiting strong tendencies to modify reports for seemingly immaterial effects because they are not making their report modification decisions using the traditional materiality thresholds identified in the literature. It is possible that auditors use lower materiality thresholds than those noted in the literature. Evaluating report modification frequencies using the possibly inappropriate traditional materiality thresholds could explain why auditors have always seemed overly zealous in modifying reports for these changes. Perhaps auditors are not overly zealous but are merely being judged by inappropriate standards of materiality. Do generalizable materiality thresholds for reporting changes in accounting principle even exist? Such a threshold would be one below which auditors do not modify the majority of their reports and above which they modify the majority of their reports.

To attempt to identify materiality thresholds, the companies with cumulative effects below the traditional materiality levels suggested in the literature for each of the four measures of materiality were subdivided into ten categories based on 10 percent increments of the traditional thresholds. For example, the first category for the income measure contained companies with income effects between 0 and 1 percent; the second category contained companies with income effects between 1 percent and 2 percent. Table 4 shows the report modification frequencies for the ten categories for each of the four measures of materiality.

The information in Table 4 supports the prior literature in regard to report modification decisions being more closely related to an item's income effect than to other measures of materiality. For the income measure, the propensity to modify reports appears to increase steadily through the first five categories and levels off somewhat after that. For the three non-income materiality measures, there seems to be no connection between the size of the cumulative effect in relation to the materiality base and the report modification frequency; the modification frequencies are high in all categories.

Table 4 also indicates that there seems to be no generalizable materiality threshold for modifying reports for changes in accounting principle. Although the modification rate rises as the income effect increases, the rate is already relatively high at the lowest income-effect category (i.e., there is a 50 percent modification rate for income effects less than 1 percent). There is no meaningful materiality measure below which the majority of reports are not modified and above which the majority are modified. Table 4 shows that auditors do indeed exhibit strong tendencies to modify reports for changes in accounting principle producing seemingly immaterial effects.

Table 4				
Modification Frequencies for Subcategories of Traditional Materiality Thresholds				
Materiality measure:				
Category	Income**	Assets	Equity	Revenue

1	9/18 50.0%	18/22 81.8%	9/12 75.0%	14/18 77.8%
2	23/33 69.7	26/34 76.5	18/27 66.7	25/31 80.6
3	22/30 73.3	29/37 78.4	20/30 66.7	29/37 78.4
4	31/38 81.6	27/34 79.4	20/22 90.9	27/32 84.4
5	36/39 92.3	18/23 78.3	21/27 77.8	24/31 77.4
6	19/22 86.4	25/30 83.3	21/25 84.0	23/28 82.1
7	22/24 91.7	14/22 63.6	27/37 73.0	27/31 87/1
8	16/20 80.0	32/33 97.0	34/36 94.4	22/27 81.5
9	14/15 93.3	20/21 95.2	13/13 100	17/22 77.3
10	17/22 77.3	23/28 82.1	16/20 80.0	19/20 95.0
Effect on:				
Category	Income	Assets	Equity	Revenue
1	0%-1%	0%-.05%	0%-.1%	0%-.05%
2	1%-2%	.05%-.1%	.1%-.2%	.05%-.1%
3	2%-3%	.1%-.15%	.2%-.3%	.1%-.15%
4	3%-4%	.15%-.2%	.3%-.4%	.15%-.2%
5	4%-5%	.2%-.25%	.4%-.5%	.2%-.25%
6	5%-6%	.25%-.3%	.5%-.6%	.25%-.3%
7	6%-7%	.3%-.35%	.6%-.7%	.3%-.35%
8	7%-8%	.35%-.4%	.7%-.8%	.35%-.4%
9	8%-9%	.4%-.45%	.8%-.9%	.4%-.45%
10	9%-10%	.45%-.5%	.9%- 1%	.45%-.5%
** Items in columns are number modified/total & percent modified.				

CONCLUSIONS AND IMPLICATIONS

Prior research suggests that auditors, both before and after SAS No. 58, exhibited strong propensities to modify reports for changes in accounting principle producing immaterial effects. However, these prior studies measured materiality using primarily an item's income effect; some research indicates that auditors' tendencies to modify reports for immaterial effects might appear less dramatic if materiality is evaluated using more stable measures (e.g., assets, equity, or revenue). The present study examined this issue and provides strong evidence for two important conclusions. First, using multiple measures of materiality does not help explain the auditors' zeal for modifying reports for changes producing seemingly immaterial effects. Second, although the income effect of an item does seem to be the most important measure of materiality, there appears to be no generalizable materiality threshold at which point the effect of a change in accounting principle becomes material. Auditors demonstrate a strong propensity to modify reports, even at the lowest income-effect levels.

This propensity to modify reports for apparently immaterial effects can best be exemplified by considering the seminal work by Holstrum and Messier (1982) in which they

concluded, after extensively reviewing the literature on materiality, that all groups would judge items producing income effects less than 4 percent immaterial. Yet, 71.4 percent of the auditors in the present study modified their reports for changes in accounting principle producing income effects less than 4 percent. These reports were modified despite the clear wording in SAS No. 58 that reports should not be modified for changes producing immaterial effects.

This zeal for modifying reports for small income effects could be explained by the changed report format under SAS No. 58. Modifying a report for a change in accounting principle no longer results in a qualified opinion as it did under SAS No. 2. Report modification now simply requires an additional explanatory paragraph highlighting the change. Such a report modification is probably readily accepted by clients and, therefore, presents little negative repercussions to the auditors. These report modifications may provide added comfort to auditors and may be viewed by them as "safe" decisions which do no harm.

There may be little or no harm to auditors, but there is a negative impact in a larger, societal context. Although Mittelstaedt et al. (1992) provide evidence suggesting that report modifications for changes in accounting principle provide no relevant information to investors (i.e., the equity market), Hopwood (1989) and Geiger (1992 and 1994) indicate that these report modifications do provide useful information to users in the non-equity market. By modifying reports for changes producing immaterial effects, auditors are misinforming the financial statement readers about the significance of the changes. This miscommunication at best may result in extraneous and potentially confounding information and at worst may lead to erroneous conclusions. There is also the possibility that such actions by auditors may reduce the public confidence in the accounting profession.

This article examined report modification frequencies only for companies disclosing amounts of cumulative effects. Jordan et al. (1996) examined modification rates for companies with changes producing cumulative effects so clearly immaterial that their amounts were not disclosed and were identified by management in the footnotes to the financial statements as not material. Yet, almost a quarter of the auditors in these cases modified their reports. When auditors in such large numbers, for whatever reason, modify their reports for changes producing apparently immaterial effects despite their own professional standard's requirement to the contrary, one must wonder if the result may eventually be an erosion of the public trust placed in the profession.

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APPLYING FUTURES CONTRACT EVALUATIONS TO SMALL BUSINESS STOCK PORTFOLIOS AND RETIREMENT PLANS: AN INNOVATIVE APPROACH USING TECHNICAL ANALYSIS

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ABSTRACT

The Commodity Channel Index (CCI) is an established tool often used in the selection and valuation of futures contracts. The manuscript challenges traditional interpretation and usage of the CCI with excellent results. Primary applications of the CCI in this study focus on the stock market with the thesis that the CCI has long been directed toward the wrong financial market. The authors develop a contrarian logic and formulate strategies which provide buy signals in areas where conventional logic previously recommended selling. Further, points of liquidation and/or short selling are identified at levels where the generally accepted view indicated purchases.

One of the principal beneficiaries from the concepts herein should be small businesses. Since rewarding large institutional firms and "bigness" in general currently characterizes Wall Street, inequities in advice and overall information flow result. Because enterprising entrepreneurs now have access to a tool which helps in the prediction of key junctures or turning points in stock prices, competitive disadvantages may be eliminated to some extent.

INTRODUCTION

Individual investors and small businesses have been forced to deal with a dilemma for many years in financial markets. Because they face both time and resource constraints, they must accept inequalities from investment firms in terms of both treatment and information flow. Logically, larger entities such as bank trust departments, insurance investment operations, and mutual funds receive preferential treatment, particularly in the areas of security selection, advice, and overall assistance. With trends in the financial community moving toward rewarding "bigness," there now seems to be a total disregard for small firm clients. One of the most critical aspects of this "snub" surrounds the performance of small business retirement plans. While most owners or owner-portfolio managers may be aware of purchasing bonds, the evaluation and selection of common stocks represents a totally different challenge. Making this more pivotal is that equity investments provide better returns on balance than do choices in the fixed-income area. For small firms to enhance investment

returns, a tool or technique which identifies cyclical movements and improves the timing process appears to be a compelling priority.

THE COMMODITY CHANNEL INDEX

The Commodity Channel Index (CCI) was originally developed to identify and capitalize on cyclical price movements in futures contracts. (Lambert, 1980) The emphasis of the CCI focuses on both cycles and momentum associated with these swings. According to Davies (1995), Lambert's ultimate aspirations were to ensure profits while minimizing losses. He felt that if beginnings and endings of cyclical and seasonal price movements in futures contracts were properly identified, traders received a distinct advantage. As with most forecasting tools, a normal range of fluctuation takes place between upper and lower boundaries. In addition to Lambert, others also recognized the need to develop parameters or norms. To do so, boundaries must be formulated to include the greatest concentration of recordings evolved (Murphy, 1986). The CCI does not deal primarily with the normal fluctuation tendencies but with the abnormal. Fluctuations exceeding defined boundaries on either the upside or downside represent opportunities and a departure from the normal course of activity. However, this article challenges the traditional interpretation of extremes or breakouts (i.e., movements outside of generally accepted boundaries).

Lambert's original research efforts are well documented with citations by others (LeBeau & Lucas, 1992; Pring, 1993; Colby & Meyers, 1988; and Davies, 1995) provide some of the better fundamental explanations of Lambert's ideas.

A LITERATURE REVIEW OF BASIC CCI CONCEPTS

According to the original works (Lambert, 1980), the CCI looks at cycles and momentum by determining a mean price for a period (high price + low price + closing price/3). A period could mean a day, a week, or a month. A moving average of the typical price for a period is chosen, thus allowing the computation of the mean deviation of the absolute differences in value between the price and the moving average (Colby & Meyers, 1988). By using a simple moving average, Lambert facilitated a comparison between current prices and the moving average of the series of prices under review at that time. Since most works concerning the CCI are computerized, an elementary overview of the underlying theoretical aspects of this indicator should suffice. It may be stated mathematically as follows:

$$\text{CCI} = \text{Typical price} - \text{moving average} / (0.015) \text{ (mean deviation).}$$

The 0.015 figure is a constant supplied by Lambert from his empirical works and is to be multiplied by the mean deviation. Lambert's assignment of this 0.015 constant results in 70% to 80% of all observations within an established trend falling between +100 and -100, the established upper and lower boundaries, respectively. Lambert believes that CCI readings

were analogous to "standard statistical scores." In other words, the CCI is akin to a standardized statistical measure which considers other readings as a variation. (Colby & Meyers, 1988; Davies, 1995). Movements away from an average or mean figure may be viewed as price excursions. Such departures ultimately result in extreme seasonal or cyclical trend strength culminating in buy or sell signals.

CCI STRATEGIES AND APPLICATIONS

Since the CCI developed primarily as an analytical tool for valuation of futures contracts, short data period lengths such as five days were used initially. Given the volatility of futures prices, most traders seek indicators that are very sensitive and responsive to changes in either directions. The shorter the data length period, the more sensitive the indicator. Conversely, the longer the durations, the less responsive the indicator. Thus, finding a "happy medium" becomes a critical consideration in implementing the CCI as a predictive tool. Short data periods lead to poor performance from "whipsaws", while longer periods prove so insensitive that traders miss a large part of major moves in either direction.

Finally, Lambert decided on a 20-day (period) length. Lambert also advocated buying or long positions on movements above the +100 level and selling or short positions when the CCI dipped below -100. Further, long positions should be closed out on declines from above +100 to below +100. Conversely, short positions should be covered when readings below -100 turn upward and move above the -100 line. Lambert proposed that all positions should be avoided between +100 and -100, an area which he called the "neutral zone." By not participating in the neutral zone, Lambert felt that risks would be greatly reduced. A CCI between +100 and -100 did not display permanent moves and therefore lacked conviction. The thrust of earlier interpretations suggests that speculative action was merited only if enough momentum were present to generate extreme strength in the Index.

METHOD

The CCI and the works of Donald Lambert have drawn some criticism, including comments that signals are received too late to be of value and indictments of Lambert's time frame selections. Numerous other studies attempt to improve upon the original research works associated with the CCI (Davies, 1995; Colby & Meyers, 1988; LeBeau & Lucas, 1992).

However, the authors believe that one major oversight pervades all critical efforts to discredit Lambert's pioneering efforts. In this era of "derivative securities," about 92% of all trades in futures and options lose money. With a losing track record of this magnitude, few if any indicators could stand the test of time. Further, it is the opinion of the authors that the CCI is loosely employed by a number of technical analysts. Also, their efforts may be directed toward the wrong financial market.

This study seeks to accomplish two things, each of which could change the complexion of the CCI. First, the authors focus the application of the CCI on common stocks rather than futures contracts. Secondly, extreme readings of +100 or more are not regarded as buying

opportunities but as overvalued conditions. Abnormal observations of -100 or less will not be viewed as liquidation and/or short selling opportunities but as an oversold market offering the potential to accumulate long positions.

The study utilizes an "anecdotal approach" in which three stocks are analyzed in depth. However, the total research effort embraced the evaluation of a much larger number of stocks, with similar findings supporting the efficacy of this indicator. A 10-week time frame is incorporated for the data length period, because qualified small business retirement plans (primarily stock portfolios) can afford to take advantage of both larger and smaller price swings without tax consequences. Included charts encompass 1992-95 illustration periods because strong advances, declines, and periods of "choppiness" existed. Other evaluation periods examined during the research revealed similar findings.

RESULTS

The authors compared trends in the Sofamor/Danek Group (SDG) stock with the CCI to provide a comparison between respective trends of each. The CCI turned down from extreme readings in excess of +200 in December, 1992, while SDG's common stock remained strong until it reached \$45 in February, 1993. At this juncture or key reversal point, the CCI provided a two-month leading indication of technical deterioration in SDG and the final topping out process. SDG declined in value from \$45 to approximately \$26 rather precipitously. Downturns and upturns from inordinately high or low readings, respectively, appear to suggest the potential for a pronounced change in price.

Sell signals apparently can be received in one of two ways--(1) a downturn in the CCI from high levels, or (2) a crossover below the +100 boundary on the way to lower levels. At the top in early 1993, both interpretations yielded exceptional results. The downturn in the CCI two months before a decline in the common stock prices illustrates "divergence." The CCI and the stock no longer parallel each other in movement, as the CCI "diverges." The divergence indicates a decline in the stock's momentum and warns of impending technical weakness in SDG.

Buy signals surface on an upturn from depressed levels of -100 or less. Lower readings such as -200 or below indicate oversold levels with stocks that have been "hammered" and perhaps ripe for a rally. The more extreme readings in either direction, the stronger buy and sell signals and ultimate price moves should be. A second possible buy signal materializes from an upturn from low levels with a crossover above the -100 lines. Short positions should be closed out in either case.

Some technicians advocate that actual trend changes do not materialize until a crossover below or above "0" occurs. They subscribe to the thought that we gain momentum during rising CCI trends above "0" and lose momentum with CCI "crossovers" below zero. Critics of Lambert suggest that taking action on trends as readings cross zero makes the CCI more timely as opposed to acting on crossovers above +100 or -100. This study objectively seeks to uncover the most timely method of implementing the indicator and thus rejects previous viewpoints advanced by both supporters and detractors.

A buy signal occurred in February, 1993, as the CCI showed an upturn from levels below -200. SDG was extremely oversold and seemed poised for a rally. When the CCI begins to advance in the face of a declining stock price, we receive a leading buy signal from "convergence." In other words, the advancing CCI converges on a falling stock price. The buy signal hinted of strength in SDG, and the advance carried from about \$26 to \$40. Although this phase of SDG's price movement was a rally within the context of an overall bear market downtrend, small business portfolio managers could realize substantial profits by acting on the first CCI upturn from very depressed readings.

A sell signal originated in the June-July period of 1993 with a CCI downturn from +100. The diverging CCI trend preceded a price decline from approximately \$40 to \$27 in SDG. Warnings were received about one month in advance. A September, 1993, buy signal yielded a 10-point profit with a several-week warning preceding the upmove. A February, 1994, CCI downturn advised portfolio strategists of forthcoming weakness in SDG. One month later, SDG's price plunged from the \$37 area to \$10. An April CCI upturn from readings less than -200 preceded a July advance from \$10 to \$22. An August, 1994, sell signal lead a September slide from \$22 back to the \$10 area as a double bottom formed. SDG's 1995 bull market received some impetus from a strong CCI buy signal in December, 1994. Note that the divergence in the CCI in March (a decline from +200 to a current reading on the chart of 80.21) augurs for some form of correction or price decline in SDG, but the newly formed uptrend will probably remain intact.

Throughout the SDG analysis, the ten-period, weekly CCI demonstrated remarkable prognostication abilities. Basic buy signals were received by acknowledging CCI upturns from oversold index levels (e.g., -100 or less), while sell signals emanated from CCI downturns from overbought indicator levels of +100 or higher. The principles of *convergence and divergence* gave early warning signals and allowed portfolio strategists the opportunity to adjust their positions in advance.

The second stock which the authors examined was Copley Pharmaceutical (CPLY). The October, 1993, bull market top was signaled by a late September downturn in the CCI from levels close to +200. CCI declined in valued from about \$55 to \$22 over a three-to-four month period. A diverging CCI would have prevented large losses from unsuspecting investors. A January, 1994, CCI buy signal portended of a rally in CPLY, an advance which carried from \$22 to \$32. In June, 1994, the CCI turned down from near the +200 level and crossed over the +100 boundary rather quickly. After completing a double top in September, CPLY incurred a volatile downmove from \$32 to \$13. An October, 1994, upturn in the CCI from levels below -250 indicates a strengthening in CPLY, but there will be time required for an adjustment to the swift change in price level. The recent CCI downturn more than likely indicates a retesting of the previous bottom at \$13.

The third stock which the authors examined was Apple Computer. Apple reached a bull market top in late December, 1993. However, the CCI presaged this downmove with an earlier downturn forming in late October, 1993. The two months warning from the indicator would have prevented losses in Apple stemming from a 45-point decline (i.e., \$65 to \$20). Multiple buy signals showed strengthening in Apple Computer and the formation of a market

bottom. The final "double bottom" of the buy signal on the CCI developed in June, 1993, while a rally from about \$20 to \$38 followed in September. Multiple or "double top" sell signals in late 1993 and early 1994 both depicted corrections during the building of the bottom. Notice that "double bottoms" on the CCI (i.e., April and June, 1993) and "double tops" often form when the first upturn or downturn lacks the necessary momentum to carry much further than "0" or another close reading within the neutral zone. Thus another top or bottom forms with the second signal attempt finalizing the signal for a more permanent move of greater duration. However, remember that in multiple top or bottom patterns on the CCI, the initial signal attempts indicate a strengthening or a deterioration in the stock that will gain momentum after one or more added attempts from the CCI unfold.

A strong upturn in the CCI appeared in June, 1994, as Apple more than doubled in value. Multiple CCI sell signals from August, 1994, to January, 1995, signaled a weak downturn which represents more of a correction within the newly defined bull market. However, the CCI still assists investors in liquidating or accumulating positions when more than one signal develops. Multiple top and bottom patterns on the indicator also signal a period of consolidation or lateral price movement in the stock. Frequently stock momentum engages in a transitional period from "down to up" or "up to down." Remember that initial downturns or upturns warn of a changing momentum and price trend, even though they may need additional reinforcement in the form of one or more repeat performances. The probable resumption of Apple's bull market received a boost from a CCI buy signal (double bottom) in March, 1995. Apple's price responded immediately with an advance.

DISCUSSION

Findings of the study proved the CCI remarkably effective as a predictor of stock trends, momentum, and changes in cyclical behavior and underlying strength. Most impressive was the early detection of changes in price and momentum. The CCI served as a leading indicator of stock price reversals with advance warnings from several weeks to several months.

A 10-week data length period was utilized as opposed to other tests using from 20 days to 20 months. The selected period was neither too sensitive nor too insensitive. Generally, test periods that are too short are so "fine-tuned" that they lead to "whipsaws" and impulsive decisions. Conversely, a lengthy data series fails to provide enough responsiveness and causes investors to miss most of the early move in either direction. The 10-week test period proved ideal.

Findings also unveiled the value of "divergence" and "convergence." Rather than postulating a series of rules lengthy in number and complex in nature, the authors concluded that decisions should originate from a contrarian philosophy. Buy signals formerly were received only when recordings exceeded +100 or higher. The authors regard readings of +100 or higher as an overbought area rather than a buying opportunity. As a result, long positions should be liquidated and short positions may be established on the first downturn above the upper boundary. Downturns from extreme upper readings warn of a weakening momentum,

something that generally antecedes major turning points in price. Our buying focused on upturns from "-100" and below. An upside reversal from depressed levels in the CCI signifies two things. First, the CCI upturn indicates the price decline is losing momentum. And secondly, the loss of downside momentum suggests that the next major momentum should develop to the upside or in the opposite direction.

Contrarian logic permeates the entire paper because we recommend buying in areas where most previously sold. Selling is encouraged in former buying areas. The CCI lends itself perfectly to common stock evaluation and selection. Futures contracts are perhaps less than ideal, with one explanation stemming from large volatility and another based on the belief that futures contracts show less dependence on sustained or definable trends.

It is not necessary to develop any "crossover rules" (e.g., "zero crossovers," etc.). Some technical analysts argue that long positions may be assumed when the CCI turns up from -100 or less and crosses over zero to "positive or plus readings." Also, liquidations and/or short sales may be initiated when the CCI declines from +100 or higher and crosses over zero on the downside. The "zero crossover" espoused by some is designed to provide timing advantages or earlier points of entry on investment transactions. However, the principal disadvantage continues to be late decisions because proponents of the "zero crossover" still subscribe to the view that long positions should not be accumulated until increasing trends fall between "0" and +100. Shorts should not occur unless levels between "0" and -100 are reached with a declining indicator move.

These findings appear to locate the earliest entry points available. By using upturns from severely depressed levels and downturns from elevated points, long positions and sales or short sales can be better timed. Investors should be patient because these leading indications may require from several weeks to several months to materialize totally. In our opinion, waiting for a "zero crossover" (i.e., the upper or lower half of the neutral zone) delays the decision and results in lost profits. Finally, confine most of your applications from the CCI index to 10-week data period lengths with common stocks as the security of choice.

The enduring nature of price movements following "buy" and "sell" signals identified from the CCI are an outstanding feature of this study. Relatively sustained price moves are in contrast to some predictive tools which lead to meaningless day-to-day fluctuations that create false and misleading signals. The overall performance of the indicator seems totally compatible with the ownership and management of small firms facing time constraints and an incumbent need to earn better investment returns. Given the relative permanence of the identified moves as opposed to day-to-day trading opportunities, small businesses can make allowances for the time required to monitor the indicator. Given the weekly data, an occasional evaluation of the CCI on select stocks is both appropriate and relatively timely. Another general observation from the research may be related to the absolute level of the CCI at the point of the buy or sell signal (i.e., upturn or downturn). The lower the CCI, generally the more undervalued the stock and the greater the upside potential offered. Conversely, the higher the CCI, the more overvalued the stock. Higher potential returns exist on short sales, while greater vulnerability is present on long positions still intact.

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ARE ACCOUNTING STUDENTS READY FOR THE INTERNET AGE? STUDENTS' PERCEPTIONS OF AND IMPLICATIONS FOR THE ACCOUNTING CURRICULUM

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ABSTRACT

Recent developments on the Internet and related technology impose both challenges and opportunities in business education. Wide use of the Internet in the business world creates new demand for skills and knowledge that accounting students are expected to have. Educating accounting students on traditional accounting topics and methods, as we have in the past, may not give them a competitive advantage in the job market. As potential employers demand more experience with the Internet, accounting curriculum needs to be changed to meet such expectations.

This paper examines how students perceive the Internet in their education and career development and analyzes the implications of recent developments in the Internet related technologies on accounting curriculum. A survey of students' perceptions of the Internet was conducted to understand how they feel about the Internet training they have obtained from the current accounting curriculum. Their responses are analyzed to identify whether there are significant differences across different groups of students, i.e., gender, age, number of years in the college, and number of work hours.

The Internet provides not only challenges but also opportunities for accounting education with new tools of instruction which were not available before. New Internet based technologies provide excellent opportunities for accounting educators to help students develop important skills, such as communication skills. This paper provides suggestions on the proposed changes in the accounting curriculum to accommodate new demands and take advantage of new technologies to improve the effectiveness of accounting education in the Internet age.

INTRODUCTION

During the last five years there have been several studies emphasizing the demand for changes in the accounting curriculum. Beaver (1992) stimulated the demand by discussing the challenges in accounting education. Prime among these challenges is to understand the

incentives and environmental factors that influence accounting education and use this understanding to implement improvements in accounting education.

Apparently the Accounting Education Change Commission (AECC) attempted to meet this challenge by offering its position on the objective of the first course in accounting (AECC, 1992). The AECC (1992) stated that the primary objective of this course was to assist students in developing information retrieval and communication skills that would support and enhance their decision-making abilities. To that end, educators must emphasize interaction with students and among students. Such interaction can be promoted by the use of case method, simulation exercises, database research, group projects, and most recently information technology, always keeping in mind that the primary motivation is to teach students to learn on their own.

In light of these challenges and objectives, Ainsworth & Plumlee (1993) described the restructuring of the accounting curriculum at Kansas State University. The restructuring had two curriculum objectives: to provide students with (1) technical and professional knowledge and (2) the necessary skills to implement this knowledge in the professional accounting environment. These objectives required that professors implement new tools of instruction to develop the following skills: communication, analysis, listening, understanding, team building, and negotiation. The ultimate expectation was to teach students how to learn and continually utilize new ideas and information throughout their careers. This development is especially crucial in the age of information technology.

Subsequently, Brigham Young University (BYU) restructured its accounting curriculum to incorporate the new challenges of this century as well as the next. Albrecht et al. (1994) summarized the changes in the curriculum as well as teaching innovations that are transferable to other schools. BYU had three goals: (1) to identify the competencies needed by professional accountants in the next decade, (2) to design a curriculum to develop these competencies in students, and (3) to assess the effectiveness of the new curriculum in achieving these student competencies (Albrecht et al., 1994). One of the many teaching innovations was the integration of expanded competency instruction with technical accounting instruction. The expanded competency instruction included the following areas: written and oral communication, listening skills, group dynamics, conflict resolution, organization and delegation skills, critical thinking, and working under pressure (Albrecht et al., 1994). Within these emerging competencies, understanding the role of information technology in solving business and accounting problems was crucial. Specifically, in the research phase, students were introduced to NAARS, NEXIS and LEXIS databases and given assignments requiring them to use these sources. However, with the expanded information technology base in today's environment, the professors and students face even newer challenges and opportunities in accounting education.

The increasing use of the Internet and related information technologies prompted the International Federation of Accountants (IFAC) to provide a guideline on the use of information technology in the accounting curriculum. The IFAC International Education Guideline No. 11 (Guideline) acknowledges that information technology (IT) is one of the core competencies of professional accountants and thus requires special attention due to its rapid

growth and rate of change. This growth and change has created the following challenges which the accounting profession must address: (1) IT affects the way in which organizations operate, especially the business planning and design processes; and (2) IT changes the nature and economics of accounting activity as well as the competitive environment in which professional accountants participate. IT changes have also created new opportunities in the areas of information development, information systems management, business advisory services, and system evaluation (AICPA, 1996).

Given these challenges and opportunities, the Guideline establishes IT education requirements for professional accountants under five (5) areas: (1) general IT education requirement, (2) accountant as *user* of IT, (3) accountant as *manager* of information systems, (4) accountant as *designer* of business systems, and (5) accountant as *evaluator* of information systems. All professional accountants must obtain knowledge and skills in the IT areas of (1) and (2) and then are expected to concentrate in one of the IT areas (3)-(5). These education requirements anticipate that a professional accountant may operate in one or more of these roles during his or her career. For example, an aspiring tax consultant might be interested in the general IT, user-oriented and evaluator-oriented education requirements. Within these requirements there must be an integration of practical skills and theoretical knowledge. The Guideline is an excellent tool in identifying the IT knowledge and skills required of accounting professionals.

The American Institute of Certified Public Accountants (AICPA) established a task force to review the Guideline and suggest implementation strategies for its use in accounting education as well as the accounting profession. The task force stated that the Guideline provides an excellent blueprint for the IT curriculum of university accounting programs (AICPA, 1996). One of the observations stressed was that although students do not need to understand all the intricacies of each new technology, they must understand the concepts behind the technology. This understanding will assist the students in learning to use, evaluate, and control technology more effectively when making business decisions (AICPA, 1996).

The task force further stated that four issues must be addressed before implementing IT into the accounting curriculum: (1) acknowledge that IT resources are constantly changing and schools must teach students to be responsible for maintaining and updating their knowledge of IT resources; (2) make students aware that IT skills are essential for today's professional; (3) encourage students to study IT based on its usefulness, application and impact on organizations as well as the accounting professional's ability to deliver valuable information; and (4) integrate the study of IT with accounting (AICPA, 1996).

One common thread permeates the contents of the Guideline, the AICPA implementation strategies and the previous studies: use of IT in accounting classes is necessary to meet the demands of an ever changing professional environment.

NEW DIRECTIONS IN ACCOUNTING EDUCATION

In 1990, the AECC promoted a movement away from the lecture format to new instructional methods where students could actively participate in the learning process. The AECC (1992) continued to emphasize this concept when it stated that a priority should be placed on interaction with students and among students in the learning environment. Eventually this concept evolved into what is known today as "cooperative learning".

Cooperative learning has been defined as an instructional technique that requires students to work together in small fixed groups on a structured learning task (Cooper et al., 1990). This instructional technique is based on positive interdependence, individual accountability, heterogeneous teams, group processing, and social skills. It tends to have positive effects on student achievement, multiethnic relationships, self-esteem, student retention and attitudes toward course content (Cottell & Millis, 1993). As such, it is a very effective learning structure that promotes active participation. Such participation fosters the development of communication and professional skills needed for success (Peek et al., 1995).

Cooperative learning can be accomplished through a wide variety of programs, projects, pedagogical techniques and classroom strategies, such as case studies, electronic searches, multimedia presentations, and the like

Another effective method for accomplishing increased student interaction is the case method (Campbell & Lewis 1991; Knechel 1992). One of the main advantages of the case method is that it provides students with the ability to develop analytical and judgmental skills (Campbell & Lewis, 1991). A "case" is usually a fact pattern containing a question or issue requiring a conclusion, where there is more than one possible reasonable conclusion. Thus the case method facilitates active participation and interaction among the students. It allows students to develop oral and written communication skills as well, since there is usually much dialogue during the analysis of the case materials and a written assignment discussing the analysis and conclusion.

The education literature over the years has concluded that computer-based instructional approaches should be integrated into the classroom (Kachelmeier et al., 1992). Kachelmeier, Jones and Keller (1992) developed a comprehensive spreadsheet template for illustrating and computing pension expense. The spreadsheet was designed to capture the benefits of a worked example learning approach. This computer intensive learning aid tremendously assisted the students in the learning process as evidenced by the fact that these students significantly outperformed students who did not use this aid.

In a second study, Maher (1993) required students to develop a portion of a computerized general ledger system with the help of a spreadsheet program and a database manager. The objective of this project was two-fold: (1) improve the students' critical computer skills and knowledge and (2) help students to think about systems design concepts. These objectives were achieved and at the same time students increased their communication skills, one of the most important skills required by potential employers.

One of the effective teaching methods for accomplishing increased student interaction is a simulation game (SG), which is part reality and part contest. There are several advantages to simulation games: (1) they motivate students to participate in educational activities; (2) they enhance cognitive growth, increase recall ability and improve problem-solving skills; (3)

students attribute greater value to accounting information; (4) students receive intensive practice in verbal and written communication; (5) they require flexibility in thinking and adaptive responses on the part of the students; and (6) they benefit students with varying skills and experience (Albrecht, 1996). Based on his financial accounting and investment simulation game, Albrecht (1996) concluded that students became *users and not preparers* of financial accounting information as evidenced by the fact that they used the information to make "real-world" decisions.

Research through electronic databases is yet another tool to assist students in developing information retrieval skills that will keep pace with the ever increasing changes in information technology not to mention the accounting profession in general.

Yancey & Klemm (1996) implemented electronic tax research into the tax courses at Texas Christian University. They first instructed students on the databases by demonstrating the electronic service, allowing students to then complete a self-guided tutorial, followed by a scavenger hunt exercise. After this instruction, research projects were assigned where the students had to analyze a case with ambiguous facts based on the electronic research and prepare three written documents: a legal research memo, a letter to the client, and a bill to the client. Yancey & Klemm (1996) concluded that the electronic tax research developed information retrieval skills as well as analytical, evaluative and critical thinking skills, all of which are crucial for students to remain competitive in the accounting profession. Even though the electronic search was performed on a CD-ROM service, the experience and training the students received were extremely useful for research on the Internet. There is a wealth of tax information on the World Wide Web that can be accessed in similar fashion as specific publishers on-line or in CD-ROM or floppy disk form.

The use of multimedia presentations in the classroom can increase students' enthusiasm for learning. There have been some suggestions that multimedia presentations can also improve students' understanding, class attendance and course satisfaction (Butler & Mautz, 1996). Based on the results of a multimedia presentation experiment, Butler & Mautz (1996) concluded that students who prefer graphic versus verbal presentation of information tended to benefit from multimedia presentations, particularly in the area of "recall". In essence, all students did not benefit. A more interactive multimedia system would probably tend to benefit a larger population of students as the interaction with students and among students facilitates a higher level of learning.

THE INTERNET AS A NEW TECHNOLOGY FOR ACCOUNTING EDUCATION

The Internet provides new tools that were not available in the past, such as the World Wide Web, File Transfer Protocol (FTP), Telnet, and E-mail. Recent Internet technology developments make it possible for accounting educators to apply new teaching methods.

The World Wide Web is the most recently developed technology on the Internet, and it has made the Internet popular among a wide range of users. Before the World Wide Web was introduced, only a few researchers communicated and shared the information on the Internet. However, the introduction of Web browsing programs, such as Mosaic, Netscape Navigator and Internet Explorer, made the use of the Internet so easy that more people are able to access the information on the World Wide Web.

The strengths of the World Wide Web are: (1) it is simple to use without learning special computer languages because it has a graphical user interface; (2) it can be accessed from any operating system; therefore, data on the UNIX computers can be accessed by an IBM compatible personal computer; (3) the use of Hypertext Markup Language (HTML) on the Web pages makes it easy to access related data available in other locations; and (4) locating resources on the World Wide Web has been made easy with the help of search engines.

Because the World Wide Web provides an enormous amount of information and it can be accessed from any computer connected to the Internet, it can be used as an effective tool to gather real world data for cases and student research projects.

The bulletin board system (BBS) can be operated on the World Wide Web site. Faculty can also develop their own web pages through which they can provide course related materials on-line. Students may access the faculty Web pages at any time from either a school computer or a home computer. With the use of Web pages, distributing teaching materials is less costly, and students can benefit more from such materials that were not readily available to them before.

E-mail can be used to improve the communication between the instructor and students and to facilitate interactions among students. Students may be allowed to ask their questions about home work assignments via e-mail, and instructors can answer them by e-mail or discussions in the class. In addition, students can submit their assignments by e-mail and documents can be attached to e-mail messages. However, in such cases, the instructor should detach the document from the e-mail message and decode it, which can be a time consuming process for faculty.

FTP is more efficient way of sending and receiving documents over the Internet. Unlike E-mail, FTP does not convert files into another format so that it is easier to use when files are received by users. Another advantage of FTP over using e-mail as a tool of transmitting files is that it allows multiple users to access files at the same time. FTP is particularly useful in distributing multiple files to many users. Web browsing programs allow users to access FTP sites to download files to their PC.

Users can log onto a remote computer by using the Telnet program. This can be a useful teaching tool when instructors have special software which can be run only on a bigger computer. In such cases, students can log onto the school computer with the Telnet program and run the software that cannot be used on their PCs.

The Internet can be used to incorporate teaching tools, such as the case method, multimedia, and simulation games into the accounting curriculum as well. The use of Internet technologies, such as the World Wide Web, can enhance classroom presentations and student participation. The World Wide Web includes various multimedia components that can be

incorporated into presentations by students and faculty. There is a wealth of tax information on the Internet that students can access for tax research projects.

The databases and other information available on the Internet can assist instructors in the preparation of case studies and the students in the analysis of case studies. Simulation games can be developed on the Internet by instructors and students can play the simulation game through the Internet. The bulletin board system (BBS) is an effective tool that can help students interact with other BBS users. BBSs provide a public place on a computer for senders to post messages or information and for receivers to gather information and comment on it (Flatley & Hunter 1995). This interaction can be helpful in researching information for accounting projects, case studies, and simulation games.

SURVEY OF STUDENTS' PERCEPTIONS OF AND READINESS FOR INTERNET TECHNOLOGY

In February 1997, a researcher-constructed questionnaire was administered to students in School of Business and Economics (SBE) classes at a West Coast State University located in a major metropolitan area. This institution is known to have one of the most multiculturally diverse student bodies in the nation. As a commuter campus, students may not have the benefits of a state-of-the-art home computer loaded with sophisticated software packages.

The classes surveyed were all accounting classes with the exception of two sections of business communication. The specific accounting classes surveyed were auditing, principles of accounting, intermediate accounting, and tax accounting.

As shown in Table 1, female students comprised 59.0 percent of the sample, while males accounted for 39.1 percent of those surveyed.

TABLE 1

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	181	59.0	60.1	60.1
	Male	120	39.1	39.9	100.0
	Total	301	98.0	100.0	
Missing	.00	6	2.0		
	Total	6	2.0		
Total		307	100.0		

Over half of the students, 53.7 percent, spend between 1 and 5 hours each week on a school PC as depicted in Table 2. It is interesting to note that over 30 percent of the respondents DO NOT use a school PC. Thus, over 84 percent of the students spend five hours or less per week on a school PC.

TABLE 2

Number of hours on school PC per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	94	30.6	31.4	31.4
	1-5	165	53.7	55.2	86.6
	6-10	32	10.4	10.7	97.3
	11-15	3	1.0	1.0	98.3
	15+	5	1.6	1.7	100.0
	Total	299	97.4	100.0	
Missing	.00	8	2.6		
	Total	8	2.6		
Total		307	100.0		

The Internet is used by 45 percent of the respondents between 1 and 5 hours each week. Over a third of the respondents *do not* use the Internet. As a result, almost 80 percent of the students use the Internet five hours or less per week as shown in Table 3.

TABLE 3

Number of hours on the Internet per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	106	34.5	35.8	35.8
	1-5	138	45.0	46.6	82.4
	6-10	35	11.4	11.8	94.3
	11-15	7	2.3	2.4	96.6
	15+	10	3.3	3.4	100.0
	Total	296	96.4	100.0	
Missing	.00	11	3.6		
	Total	11	3.6		
Total		307	100.0		

Over a third of the respondents send/receive 1 to 5 e-mail messages per week, while the greatest percentage of students, 43.6, do not send/receive e-mail messages as illustrated in Table 4. A total of 81.7 percent of the respondents send/receive 5 or fewer e-mail messages each week.

TABLE 4

Number of e-mail messages per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	134	43.6	44.7	44.7
	1-5	117	38.1	39.0	83.7
	6-10	26	8.5	8.7	92.3
	11-15	6	2.0	2.0	94.3
	15+	17	5.5	5.7	100.0
	Total	300	97.7	100.0	
Missing	.00	7	2.3		
	Total	7	2.3		
Total		307	100.0		

Over 46 percent of the students are between the ages of 21 and 25, while 25.7 percent are between the ages of 26 and 30. Almost three fourths of the students are between the ages of 21 and 30. These relationships are shown in Table 5.

TABLE 5

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-20	20	6.5	6.7	6.7
	21-25	143	46.6	47.7	54.3
	26-30	79	25.7	26.3	80.7
	31-35	29	9.4	9.7	90.3
	36+	29	9.4	9.7	100.0
	Total	300	97.7	100.0	
Missing	.00	7	2.3		
	Total	7	2.3		
Total		307	100.0		

As Table 6 reveals, 28.3 percent of the students work less than ten hours a week, 21.2 percent work between 11-20 hours per week while 45.9 percent spend over 20 hours a week working.

TABLE 6

Number of hours per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	66	21.5	22.5	22.5
	1-10	21	6.8	7.2	29.7
	11-20	65	21.2	22.2	51.9
	21-30	60	19.5	20.5	72.4
	31-40	81	26.4	27.6	100.0
	Total	293	95.4	100.0	
Missing	.00	14	4.6		
	Total	14	4.6		
Total		307	100.0		

Most students have spent over 3 years in college, with 26.7 percent in their fourth year, while 45.6 percent are in their fourth-plus year of school. When these figures are combined, 72.3 percent have spent more than 3 years in college.

TABLE 7

Number of years in the college					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	1.6	1.7	1.7
	2	22	7.2	7.3	9.0
	3	52	16.9	17.3	26.2
	4	82	26.7	27.2	53.5
	4+	140	45.6	46.5	100.0
	Total	301	98.0	100.0	
Missing	.00	6	2.0		
	Total	6	2.0		
Total		307	100.0		

As depicted in Table 8, over 80 percent of the respondents are undergraduates, while 9.4 percent are graduate students.

TABLE 8

Undergraduate or graduate					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	under	257	83.7	89.9	89.9
	grad	29	9.4	10.1	100.0
	Total	286	93.2	100.0	
Missing	.00	21	6.8		
	Total	21	6.8		
Total		307	100.0		

Over 65 percent of the respondents are Accounting majors, followed by 24.8 percent other business, 4.9 percent CIS, 1.3 percent undeclared, and .7 percent non-business.

TABLE 9

Major					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Accounting	200	65.1	67.3	67.3
	CIS	15	4.9	5.1	72.4
	Other Business	76	24.8	25.6	98.0
	Nonbusiness	2	.7	.7	98.7
	Undeclared	4	1.3	1.3	100.0
	Total	297	96.7	100.0	
Missing	.00	10	3.3		
	Total	10	3.3		
Total		307	100.0		

A quarter of the respondents do not have a computer at home. Just over 28 percent (28.3) have a 486 computer at home, while over 30 percent have a Pentium at home. The majority of students use an IBM platform at home, with 2.9 percent using Macintoshes as Table 10 reveals.

TABLE 10

Your PC at home					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	77	25.1	25.9	25.9
	386	27	8.8	9.1	35.0
	486	87	28.3	29.3	64.3
	Pentium	97	31.6	32.7	97.0
	Mac	9	2.9	3.0	100.0
	Total	297	96.7	100.0	
Missing	.00	10	3.3		
	Total	10	3.3		
Total		307	100.0		

Almost half of the students, 48.2 percent, have no Internet connection at home. As Table 11 illustrates, over 20 percent of the students use the school modem pool, while 24.8 percent use an Internet Provider Service.

TABLE 11

Internet connection from home					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	148	48.2	51.6	51.6
	School modem pool	63	20.5	22.0	73.5
	Commercial service	76	24.8	26.5	100.0
	Total	287	93.5	100.0	
Missing	.00	20	6.5		
	Total	20	6.5		
Total		307	100.0		

Over a fourth of the students, 25.7 percent, do not spend any time on a home PC. Over 40 percent (42.0) use a home PC 1 to 5 hours each week, with 19.2 percent using the PC 6 to 10 hours each week. At the upper end, over 4 percent use the PC for 15 plus hours each week as illustrated in Table 12. It is interesting to note that when the lowest two categories are combined, over two thirds of the students (67.7 percent) use the PC for five hours or less each week.

TABLE 12

Number of hours on home PC per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	79	25.7	26.2	26.2
	1-5	129	42.0	42.9	69.1
	6-10	59	19.2	19.6	88.7
	11-15	20	6.5	6.6	95.3
	15+	14	4.6	4.7	100.0
	Total	301	98.0	100.0	
Missing	.00	6	2.0		
	Total	6	2.0		
Total		307	100.0		

When the strongly agree and agree categories are combined, 73 percent of the students are in agreement that the Internet is essential in learning. Less than 7 percent of the students disagree in any fashion that the Internet is essential in learning as shown in Table 13.

TABLE 13

Essential in learning					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	92	30.0	30.4	30.4
	Agree	132	43.0	43.6	73.9
	Neutral	60	19.5	19.8	93.7
	Disagree	13	4.2	4.3	98.0
	Strongly disagree	6	2.0	2.0	100.0
	Total	303	98.7	100.0	
Missing	.00	4	1.3		
	Total	4	1.3		
Total		307	100.0		

Almost 90 percent, 88.3 percent, of the students agree that the Internet is essential in the future, with over 50 percent strongly agreeing. Only 2.3 percent of the students disagree, when the disagree and strongly disagree categories are lumped together as Table 14 reveals.

TABLE 14

Essential in the future					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	155	50.5	51.0	51.0
	Agree	116	37.8	38.2	89.1
	Neutral	26	8.5	8.6	97.7
	Disagree	4	1.3	1.3	99.0
	Strongly disagree	3	1.0	1.0	100.0
	Total	304	99.0	100.0	
Missing	.00	3	1.0		
	Total	3	1.0		
Total		307	100.0		

Over three fourths of those surveyed, 79.1 percent, agree that the Internet is essential for a job, when the strongly agree and agree categories are combined. Only 15.3 percent are neutral to that statement, while 3.3 percent disagree that the Internet is essential for a job as found in Table 15.

TABLE 15

Internet for a job					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	130	42.3	43.3	43.3
	Agree	113	36.8	37.7	81.0
	Neutral	47	15.3	15.7	96.7
	Disagree	8	2.6	2.7	99.3
	Strongly disagree	2	.7	.7	100.0
	Total	300	97.7	100.0	
Missing	.00	7	2.3		
	Total	7	2.3		
Total		307	100.0		

A total of 82 percent of the respondents agreed that they need more Internet training, while 11.7 percent were neutral. When the disagree and strongly disagree categories were combined, only 5.2 percent of the students surveyed felt they did not need more training on the Internet as shown in Table 16.

TABLE 16

Need more training					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	157	51.1	51.6	51.6
	Agree	95	30.9	31.3	82.9
	Neutral	36	11.7	11.8	94.7
	Disagree	13	4.2	4.3	99.0
	Strongly disagree	3	1.0	1.0	100.0
	Total	304	99.0	100.0	
Missing	.00	3	1.0		
	Total	3	1.0		
Total		307	100.0		

A total of 22.8 percent of the students felt that the classes teach them the Internet, with 38.4 percent being neutral to the statement, and 37.2 percent disagreeing as depicted in Table 17.

TABLE 17

Classes teach Internet					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	30	9.8	9.9	9.9
	Agree	40	13.0	13.2	23.2
	Neutral	118	38.4	39.1	62.3
	Disagree	84	27.4	27.8	90.1
	Strongly disagree	30	9.8	9.9	100.0
	Total	302	98.4	100.0	
Missing	.00	5	1.6		
	Total	5	1.6		
Total		307	100.0		

When asked if instructors use the Internet, 27.0 percent agreed and strongly agreed with the statement, with almost equal numbers responding neutrally and disagreeing, 31.3 and 32.2 percent, respectively. Only 7.2 percent strongly disagreed that the instructors use the Internet as Table 18 shows.

TABLE 18

Instructors use Internet					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	19	6.2	6.3	6.3
	Agree	64	20.8	21.3	27.7
	Neutral	96	31.3	32.0	59.7
	Disagree	99	32.2	33.0	92.7
	Strongly disagree	22	7.2	7.3	100.0
	Total	300	97.7	100.0	
Missing	.00	7	2.3		
	Total	7	2.3		
Total		307	100.0		

The next statement was, “Instructors know the Internet.” Over a third, 35.8 percent of the respondents, agreed with that statement, while 45.3 percent were neutral, and 15.3 percent expressed disagreement in some fashion as shown in Table 19.

TABLE 19

Instructors know Internet					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	33	10.7	11.1	11.1
	Agree	77	25.1	26.0	37.2
	Neutral	139	45.3	47.0	84.1
	Disagree	40	13.0	13.5	97.6
	Strongly disagree	7	2.3	2.4	100.0
	Total	296	96.4	100.0	
Missing	.00	11	3.6		
	Total	11	3.6		
Total		307	100.0		

About 29.3 percent of the respondents felt that the facilities are adequate for Internet usage, with 37.8 percent being neutral, and 30.0 percent expressing disagreement of some sort as illustrated in Table 20.

TABLE 20

Facilities are adequate					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	22	7.2	7.4	7.4
	Agree	68	22.1	22.8	30.2
	Neutral	116	37.8	38.9	69.1
	Disagree	62	20.2	20.8	89.9
	Strongly disagree	30	9.8	10.1	100.0
	Total	298	97.1	100.0	
Missing	.00	9	2.9		
	Total	9	2.9		
Total		307	100.0		

SUMMARY AND CONCLUSIONS

Results of the survey have implications in three areas: implications for faculty, implications for facilities, and implications for the accounting curriculum. As just over a fourth of the students felt that instructors use the Internet and only a third felt that instructors know the Internet, training of faculty should be the first priority. Faculty can and do serve as information technology change agents and therefore should model the behaviors that they wish to see their students exhibit. Workshops for accounting faculty would provide the impetus to grow in Internet knowledge and confidence.

Of course, in order for faculty to use the Internet in classes and in their own research, adequate facilities must be available in departments and in classrooms. Under a third of the students surveyed indicated that the facilities were adequate for the Internet. To that end, careful use of existing classroom resources would be beneficial. Equipping entire labs is expensive and may require pursuing grants; however, to postpone obtaining adequate technology would place students at a competitive disadvantage in the marketplace.

Including the Internet in instruction could be handled in two ways. First of all, a new course taught jointly by faculty in the Accounting and Information Systems departments could be developed. Getting new courses approved on campuses in today's climate can be a difficult task. A more practical solution might be the addition of modules to existing accounting courses to cover the necessary material and skills. In this way, faculty could exert more control over what is taught in their specific discipline and obtain student feedback without intermediaries. Such a solution also circumvents the potential battle that might be fought for the addition of a required class to the curriculum. Furthermore, integrating Internet instruction into existing accounting courses more closely conforms with the recommendations of the Guideline and the AICPA.

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STOCK INDEX FUTURES OPTIONS AND THE PREDICTABILITY OF INTRADAY INDEX PRICE CHANGES

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ABSTRACT

The effect of stock index futures options on the predictability of index price changes is examined using a regression framework. Theoretical futures mispricings, lagged index price changes, and lagged futures price changes are evaluated as predictor variables with and without futures options. The value of lagged index price changes as a predictor variable is the same with or without futures options. The value of lagged futures price changes and theoretical futures mispricings as predictor variables is lower following futures option initiation. This result would be consistent with increased efficiency following stock index futures option initiation.

INTRODUCTION

The Chicago Board Options Exchange began offering standardized call options on equities in 1973. These options were standardized in terms of expiration dates and exercise prices. The popularity of these options, in terms of trading volume, grew quickly. The introduction of these options and the fast growth in their popularity raised the empirical question of how the underlying markets were being affected by option trading. Many studies have examined the impact of equity option introduction on the return variability and trading volume of the underlying equities. Such studies include Bansal, Pruitt and Wei (1989), Whiteside, Dukes and Dunne (1983), and Hayes and Tennenbaum (1979).

More recently, beginning in 1982, standardized option trading was initiated on futures contracts. Currently futures options are traded on many agricultural, financial, currency and stock index futures. Options on futures contracts allow investors and risk managers to define and limit their risk in the form of a premium paid for the right to buy or sell a futures contract at a specified price known as the exercise price.

The impact of futures option introduction on their underlying instruments is not well understood. The case of options on futures is particularly interesting because, for many contracts, the underlying futures contract plays a price discovery role. There are many types of futures contracts and the magnitude of the price discovery role appears to vary by contract type and in some cases even within contract type. Studies such as Figlewski (1987), Kawaller,

Koch and Koch (1987), Finnerty and Park (1987), Swinnerton, Curcio and Bennett (1989), Swinnerton (1988), and Kawaller, Koch and Koch (1993) examine the temporal price relationship between stock index futures and the underlying index and find a significant positive relationship. Theoretical futures mispricings and lagged index price changes have also been utilized by Swinnerton, Curcio and Bennett (1989) to try to predict subsequent intraday index price changes. Irwin (1990) suggests it would be a “particularly interesting question whether the introduction of option trading has a perceptible impact on the efficiency of cash and futures price movements.”

This paper utilized a regression framework to examine the impact of stock index futures option initiation on the predictability of intraday index price changes based on 1) theoretical futures mispricings, 2) lagged index changes and 3) lagged futures price changes.

DATA

The data used in this study consists of tick-by-tick MMI stock index futures price quotes as well as MMI stock index price quotes. In calculating the theoretical futures price, the treasury bill rate was used as a proxy for the risk-free rate of interest and actual dividend payments by firms represented in the MMI were used as a proxy for the expected dividends. The MMI divisors which must be multiplied by the reported index value to convert the index point value to the index dollar value used in computing a theoretical futures price were obtained from the Chicago Board of Trade.

METHODOLOGY

The impact of futures option introduction on the predictability of intraday price changes was examined with respect to three predictor variables using the ordinary least squares regression approach developed by Curcio, Swinnerton and Bennett (1988). The three predictor or independent variables examined are 1) theoretical futures mispricings, 2) lagged spot index price changes and 3) lagged futures price changes. The dependent variable in the regression is the change in the spot price from the j^{th} minute of day t to the $j+n^{\text{th}}$ minute of day t where n ranges from 5 to 30 minutes. The regression model is as follows:

$$[S_{t,j+n} - S_{t,j}] = \alpha + \beta [F_{t,j,T} - F_{t,j}] + \beta [S_{t,j-5} - S_{t,j}] + \beta [F_{t,j} - F_{t,j-5}] +$$

where,

- $S_{t,j}$ = the spot price of the index on the j^{th} minute of day t ,
- $S_{t,j+n}$ = the spot price of the index at the $(j+n)^{\text{th}}$ minute of day t where n is the forecast period in minutes,
- $S_{t,j-5}$ = the spot price of the index on the $(j-5)^{\text{th}}$ minute of day t ,
- $F_{t,j,T}^*$ = the theoretical futures price on the j^{th} minute on day t for a stock index having a cash settlement at T ,

- $F_{tj,T}$ = the actual futures price on the j^{th} minute of day t for a stock index which will have cash settlement at T ,
- $F_{tj-5,T}$ = the actual futures price on the $(j-5)^{\text{th}}$ minute of day t for a stock index with cash settlement at T .

In the above regression β_1 represents the coefficient on the theoretical futures mispricing on the j^{th} minute of day t , β_2 represents the coefficient on the lagged stock index cash price change and β_3 represents the coefficient on the lagged futures price change. α and ϵ represent the intercept and random disturbance coefficient, respectively.

The theoretical futures mispricing is calculated as the difference between the actual and the theoretical futures price at time t . The theoretical futures price is determined using the following cost of carry model:

$$F_{tT} = S_t e^{r(T-t)} + \sum_{j=1}^n D_j e^{-r(t-j)}$$

where,

- F_{tT} = the current price (at time t) of a stock index futures contract for delivery at time T ,
- S_t = the market value of the stock at time t ,
- D_j = the dividend expected to be paid by firm j at time t ,
- r = the riskless rate of interest assumed to be constant over $(T-t)$.

With respect to β_1 , the coefficient on the theoretical futures mispricing variable, relatively fewer significant positive coefficients are expected in the post-futures option period. This would be indicated by a reduction in the ratio of significant positive to significant negative coefficients on the theoretical futures mispricing variable following futures option initiation.

A positive mispricing would indicate that the current futures price is above its theoretical value and the market reaction would be to sell futures and buy the spot index which would tend to drive up the price of the spot index. A negative mispricing would indicate that the current futures price is below its theoretical value and the market reaction would be to buy the futures contract and sell the spot index which would tend to reduce the index price.

The second predictor variable in the regression, lagged index price changes, is expected to be largely unaffected by the introduction of index futures options. The basis of this hypothesis is that, although option introduction may increase the efficiency of the underlying assets, in the case of futures options the asset directly underlying the futures option contract is a futures contract on the stock index and not the index itself. Separate options are traded on the index itself. Therefore, the ratio of significant positive to significant negative β_2 coefficients on the lagged cash index variable is expected to remain relatively constant following stock index futures option initiation.

With respect to β_3 , the coefficient on the lagged futures price change variable, evidence is provided by Kawaller, Koch and Koch (1987), Stoll and Whaley (1990) and Swinnerton, Curcio and Bennett (1989) that the lagged futures price changes are able to predict, to some degree, subsequent stock index price changes. This is known as the price discovery role of futures. The introduction of a futures option should reduce the ability of lagged index futures price changes to predict subsequent intraday index price changes. According to weak form market efficiency past price changes should be of no value in predicting subsequent price changes, therefore to the extent that futures options introduction improves efficiency in the futures market we would expect lagged futures price changes to be a less valuable predictor of intraday index price changes. This would be indicated by a reduction in the number of significant positive to significant negative coefficients on the lagged futures price change variable.

RESULTS

Table 1 shows the change in the ratio of significant positive to significant negative coefficients from the pre- to the post-futures option periods. These ratios are grouped by lag time (ranging from 5 to 30 minutes) and by variable (lagged cash index, lagged futures or futures mispricing). This table shows the value of the ratio with options and without options by lag time.

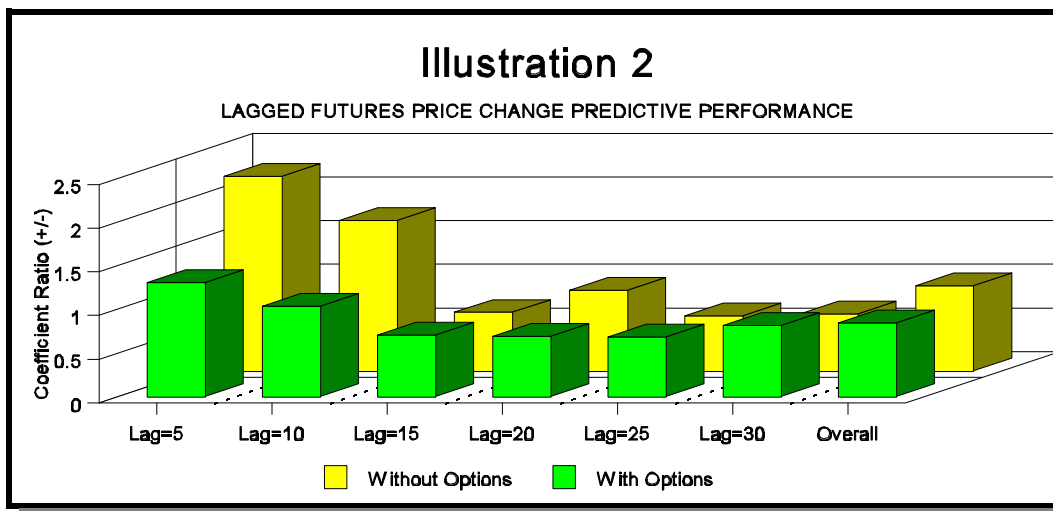
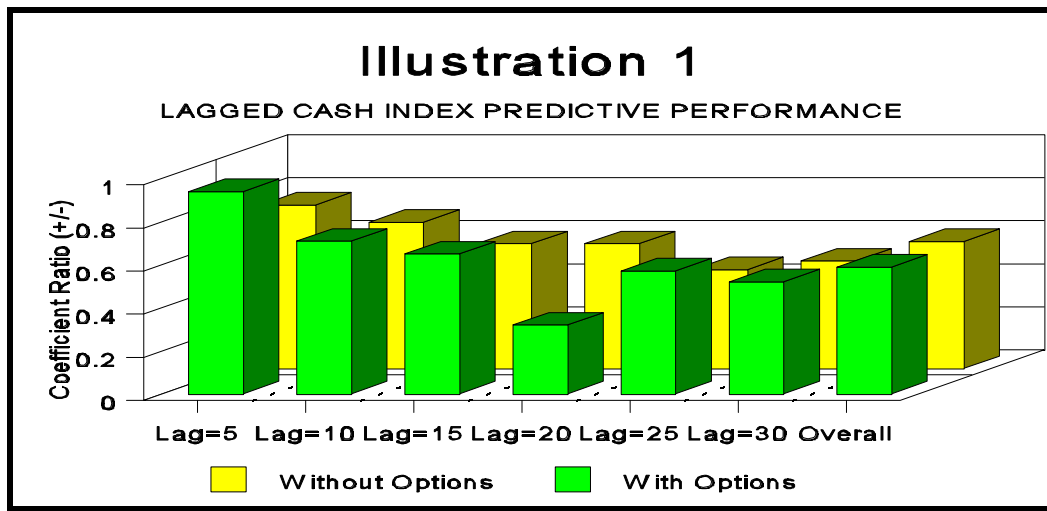
A graphical representation comparing the ratio of significant positive to significant negative coefficients in the pre- and post-futures option periods appears in illustrations 1 through 3. Again, the results are grouped by lag time and variable. It can be seen that the ratio of significant positive to significant negative coefficients for the lagged cash index variable (all lag times) and the lagged futures price change variable (all lag times) are much less than the same ratio for the theoretical futures mispricing variable.

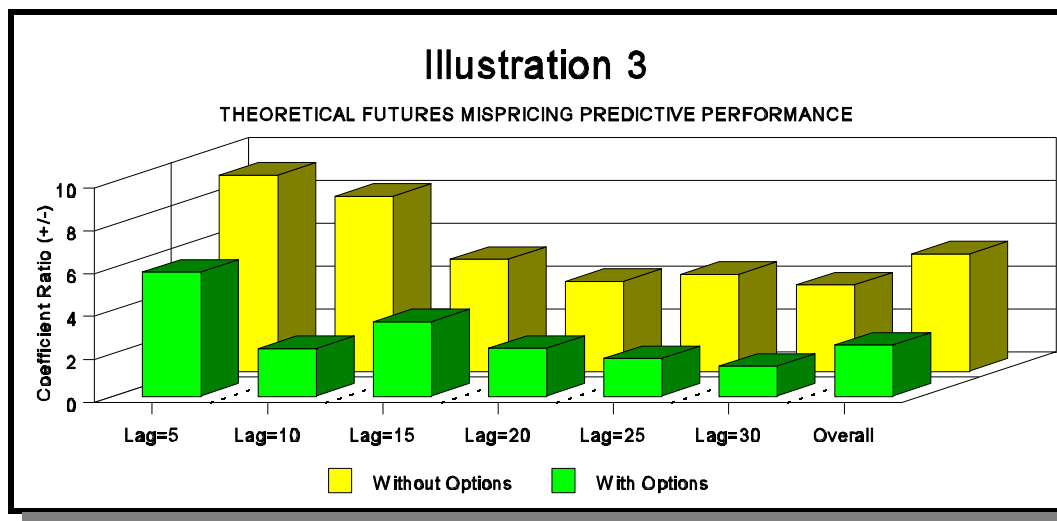
The ratio of significant positive to significant negative coefficients on the lagged index value variable in the regression model was less than one for all lag times in both the pre- and post-futures option periods. This ratio, overall showed no change from the pre- to the post-futures option period.

The number of significant positive coefficients on the lagged index value variable was greater for all lag times except 20 minutes. The number of significant negative coefficients on the lagged index value variable was greater for all lag times in the optioned period. Overall, the ratio of significant positive coefficients (for all lag times) to significant negative coefficients (for all lag times) did not change from the pre- to the post-futures option period.

Table 1: Ratio of Significant Positive to Significant Negative Coefficients

Variable	Option	Lag=5	Lag=10	Lag=15	Lag=20	Lag=25	Lag=30
$S_{tj}-S_{tj-5}$	no	.76	.68	.58	.58	.46	.50
$S_{tj}-S_{tj-5}$	yes	.94	.71	.65	.32	.57	.52
$F_{tj,T}-F_{tj-5,T}$	no	2.23	1.72	.67	.92	.63	.65
$F_{tj,T}-F_{tj-5,T}$	yes	1.30	1.03	.70	.69	.68	.81
$F_{tj,T}-F_{tj,T}^*$	no	9.13	8.14	5.20	4.17	4.50	4.00
$F_{tj,T}-F_{tj,T}^*$	yes	5.78	2.21	3.45	2.22	1.75	1.39





The ratio of significant positive to significant negative coefficients on the lagged futures price variable was 42 percent lower for the 5 minute lag time and 40 percent lower for the 10 minute lag time when options were trading. The ratio remained greater than one for both the 5 and 10 minute lag times. For the longer lag times, the ratio was less than one and remained relatively constant from the pre- to the post-futures option period.

Overall, the ratio of ratio of significant positive to significant negative coefficients on the lagged futures price change variable declined following futures option initiation. While this was especially true for the shorter lag times, the overall results indicate that the price discovery role of the index futures contract is diminished following futures option initiation.

The ratio of significant positive to significant negative coefficients on the theoretical futures mispricing variable was lower in the post-futures option period for all lag times. The reduction in this ratio ranged from a 34 percent reduction for the 15 minute lag time to a 73 percent reduction for the 10 minute lag time. This ratio (over all lag times) fell by 56 percent in the optioned period.

Overall, the reduction in the ratio of significant positive to significant negative coefficients indicates that the value of the index futures mispricings as a predictor variable is reduced following futures option initiation. This could be indicative of more accurate pricing of the index futures contract and would be consistent with greater efficiency in the MMI futures market with the trading of options contracts on MMI futures.

SUMMARY AND CONCLUSIONS

This study examined the impact of index futures options on the predictability of intraday index price changes by examining the MMI futures contract. The predictor variables

examined were 1) lagged cash index values, 2) lagged futures price changes and 3) theoretical futures mispricings.

With regard to the lagged cash index as a predictor variable, the ratio of significant positive to significant negative coefficients in the regression equation remained unchanged following futures option initiation on the MMI. Although the changes in the ratios were not consistent across all lag times, the value of lagged index price changes as a predictor variable appears to be unaffected by MMI futures option initiation.

The impact of futures option initiation on the price discovery role of the futures contract was evaluated through the lagged futures price change variable. The ratio of significant positive to significant negative coefficients on the lagged futures price change variable dropped slightly following futures option initiation. These results indicate that the value of the lagged futures price change variable or the price discovery role of the futures contract appears to have diminished somewhat following initiation of the futures option contract.

With respect to the theoretical futures mispricing variable there was a reduction in the ratio of significant positive to significant negative coefficients in the post-futures option period. This relative decrease in the number of significant positive coefficients indicates that the value of the theoretical futures mispricing variable as a predictor of subsequent intraday index price changes is diminished following futures option initiation.

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THE EFFECTIVENESS OF CORPORATE RESTRUCTURING: AN ANALYSIS

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ABSTRACT

Recently, the fast pace of change in technology and world competitiveness has motivated numerous companies to write-off a charge for "restructuring" on their financial statements. Reaction to such restructuring charges has been mixed. Some analysts are of the opinion that these write-offs signal a more efficient, streamlined corporation, while others criticize them on the grounds that restructuring charges tend to confound a company's earnings picture. This paper examines the financial performance of restructuring companies before and after the restructuring to determine if such measures were truly effective. A study of a sample of restructuring firms, as compared to a control group of non-restructuring firms, using Multiple Discriminant Analysis demonstrates that a majority of restructuring firms showed a slight improvement in the year following the write-off, but deteriorated to its original performance level within four years after the restructuring. As further evidence of financial performance, this paper also examines CEO compensation as compared to the value of investment made in the corporation. An Analysis of Variance discloses that while CEO compensation increased in the years following the restructuring, the value of an investment made in the restructuring companies actually declined during the same time period.

INTRODUCTION

In recent years, restructuring charges have been an increasingly common element on earnings statements. A restructuring charge is a company's estimate of the future costs of a major change in business strategy or operations, such as laying off a large percentage of its workforce, or closing an entire division. The financial press frequently reports a positive market reaction to restructuring, because a company's net income often improves, at least in the short run, in the wake of a non-routine charge against earnings. However, critics complain that such write-offs tend to increase immediate earnings without actual improvement in performance, and that repeated restructurings result in a blurred portrayal of the company's earnings trends. A further consequence of persistent restructuring has been complaints of overworked employees, low morale, dissatisfied customers, and excessive use of expensive contract workers. Such frequent and uncontrolled write-offs provided the impetus for the FASB to take steps to clarify and restrict the use of restructuring charges. During 1995, the FASB issued SFAS 121, "Accounting for the Impairment of Long-Lived Assets to be

Disposed,” and EITF 95-3, “Liability Recognition for Certain Employee Termination Benefits and Other Costs to Exit an Activity (including certain costs incurred in a restructuring).”

Given such conflicting signals from the market and financial analysts, this study examines the financial performance of restructuring firms to determine if restructuring truly resulted in the efficient, streamlined companies that management and shareholders expected. This research has the potential to be of interest to the users of accounting information by providing them with an enhanced awareness of the effectiveness of corporate restructuring. It is also of interest to the promulgators of financial accounting standards (the SEC and the FASB) who have tried to regulate the use of unnecessary restructuring charges.

RESTRUCTURING COSTS DEFINED

What is a restructuring charge? The charge is basically a company’s estimate of the future costs of some drastic change in business strategy or operations, undertaken to improve future profitability, such as laying off a large percentage of its workforce or closing an entire division. Companies took these pretax charges as a signal to investors that prior earnings were overstated and that these charges should be considered a subtraction from shareholders’ equity. Write-offs were usually taken by companies with severe problems. Elliot and Shaw (1988) found that firms making the restructuring charges (1) tended to be larger and carry more debt than the rest of the industry, (2) experienced declining ROA’s and ROCE’s during the three years preceding the write-offs, and (3) experienced lower security returns for three years before, coincident with, and eighteen months after the write-offs. The fast pace of change in technology and world competitiveness also required discretionary write-offs to get rid of unnecessary capitalizations.

<u>NAME</u>	<u>AMOUNT OF CHARGE</u>	<u>REASONS FOR CHARGE</u>	<u>STOCK PRICE MOVEMENT</u>
Unisys	\$ 225 million	Employee layoffs	Up 12.5 cents
1. Westinghouse Electric	\$ 906 million	Sales of business	Down 12.5 cents
Ameritech	\$ 335 million	Write-down of equipment	Down 37.5 cents
Kerr McGee	\$ 5 million	Severance	Down 12.5 cents
1. Eli Lilly	\$ 1.2 million	Streamline operations	Up 12.5 cents
2. Nynex	\$ 1.3 billion	Severance	Up 75 cents
3. Borden	\$ 642 million	Selling off snack business	Down \$ 2.375
K Mart	\$ 535 million	Store closings	Down 50 cents

During the early 1990’s, many companies reported restructuring charges that encompassed several broad categories of cost. These costs included employee termination benefits, costs associated with the elimination and reduction of product lines, costs related to the consolidation or relocation of plant facilities, new systems development or acquisition costs,

and losses on asset impairments and disposal of assets. These pervasive write-offs have also been in response to a variety of changes in the global economic environment, including the NAFTA and the GATT. By reducing asset values or cutting costs, corporate management intended the resultant, streamlined companies to be well situated for future growth in the world market. Table 1 provides a sample list of companies taking restructuring charges, and the reasons for such charges.

PERCEIVED PROBLEMS WITH RESTRUCTURING CHARGES

Some investors and critics are skeptical of such restructuring charges. According to them, write-offs can boost a company's future earnings without an actual improvement in performance. Companies were able to pack all negative charges into one year, leaving the other years free of the charges that actually occurred during the year. A variation of this technique was the use of write-offs to mask an earnings slowdown. A non-recurring write-off during the current year would make reported earnings look good the following year.

Critics also protest that repeated restructurings tend to confound a company's earnings picture. One or maybe even two nonrecurring charges were understandable, because they cleared the books for future earnings gains, but repeated write-offs could neither be non-recurring nor unusual. It is difficult for investors to believe in the face value of reported earnings - such earnings might be in danger of being canceled out by subsequent write-offs.

Another problem with restructuring charges is that the initial charges are, by definition, management's estimates, and the auditors can never be certain how close these estimates will come to the actual expenses involved in selling off assets or retrenchment. When companies took write-offs, they could later reinject some of the reserves into operating income, thus inflating profits. Also, since restructuring charges were liberally defined under APBO 30, firms were charging off costs which would benefit continuing operations, such as expenditure for equipment, costs associated with relocating and training employees, advertising and legal costs, etc. In some cases, restructuring charges even included ordinary operating items such as environmental liabilities, inventory impairments and write-offs of long obsolete, intangible assets. (WSJ, March 1996).

MARKET REACTION TO RESTRUCTURING CHARGES

According to the financial press, initially, investors responded enthusiastically to announcements of restructuring charges. Wall Street's positive response has been attributed to two reasons (Galarza and Ozanian, 1996). First of all, the charges seem to indicate that management is aggressively rectifying past mistakes, thus clearing the way for future earnings growth. Second, reductions in earnings due to these non-recurring charges do not affect the company's ability to pay its bills or dividends since they are simply accounting adjustments that generally do not involve cash outlays.

Table 1 shows that most restructuring announcements have been met with increases in raw stock returns. However, research studies by Elliot and Shaw (1988) and Brickley and

Van Drunen (1990) found that restructuring charges were accompanied by negative stock returns. A recent study by Ramaswamy, Wells, and Loudder (1996) found that the market responded negatively on the day of the restructuring announcement, and positively on the day following the announcement.

MOTIVATION AND EMPIRICAL IMPLICATIONS OF THE STUDY

Amidst these conflicting signals from analysts, researchers, and the securities market, the main purpose of this paper is to focus on the reasons behind restructuring and the effectiveness of such a corporate move. Write-offs are usually taken by companies with severe problems. Studies by Elliot and Shaw (1988) and Brickley and Van Drunen (1990) show that firms facing major problems with cost control and debt management usually take restructuring charges to cut costs and streamline operations, in the expectation that future profitability will improve. Frequently, profits do look good in the year following the restructuring (see Table 6). However, if the downsizing was really effective, the company should show an increasing trend in profitability in the years following the restructuring. If the write-offs were merely temporary, short term measures to reduce immediate costs and boost stock prices, the performance of the company will not improve noticeably in future years. Dechow et. al (1994) studied the effect of restructuring charges on executive's cash compensation and found that compensation committees adjust earnings based incentive compensation for restructuring charges. This implies that executives are not penalized for taking restructuring charges, and are therefore not discouraged from taking write-offs for short term gains. Also, hasty restructurings may cause other problems like strained relations with customers (due to lack of personnel to meet their service requests), demoralized employees, and expensive use of contract workers to fill the void left by the terminated employees. The results of restructuring may not be as efficient as management's expectations.

This paper examines the financial statements of sample companies for three years before the restructurings, the year immediately after the restructuring, and four years after the restructuring. The objective of this analysis is to investigate corporate performance to observe if restructuring de facto contributed to steady long term growth, and was not a hasty decision made in response to low cost foreign competitors, and by the investors' demand for quick returns.

ANALYSIS OF CORPORATE PERFORMANCE

Most financial statement analysis examines some aspect of a firm's profitability or a firm's risk. Assessments of profitability permit the analyst to study a firm's past operating performance and to project expected returns in the future. Assessments of risk permit the analyst to judge a firm's success in coping with the various dimensions of risk in the past, in order to continue operating as a going concern in the future. Described below are some common measures used to evaluate a company's profitability and risk.

Profitability: Profitability is the ability of a firm to generate earnings. Analysis of profit is of vital concern to the stockholders, since they derive revenue in the form of dividends, which is paid from profits. Further, increased profits can cause a rise in market prices, leading to capital gains. Profits are also important to creditors, because profits are a main source of funds for debt coverage. Management has an interest in profits too - it is often used as a performance measure. The following measures are important indicators of profitability.

Earnings: The Statement of Financial Accounting Concepts No. 1 (SFAC) indicates that the primary focus of financial reporting is to provide information about a company's performance with measures of earnings. Income reporting has great value as a measure of future cash flows, as a measure of management efficiency, and as a guide to the accomplishment of managerial objectives (Natarajan, 1996). Numerous studies have documented the market reaction to earnings announcements (see Lev, 1989). One of the most robust findings in financial statement research area is that the release of interim and annual earnings is associated with both increased trading volume and increased security return variability (Bamber, 1986, Bamber and Cheon, 1995). Earnings, therefore, seem to provide significant information to the users of accounting information.

Return on Assets ROA: The rate of return on assets measures a firm's success in using assets to generate earnings independent of the financing of those assets. ROA takes the particular set of environmental factors and strategic choices that a firm makes and focuses on the profitability of its operations relative to the investments (assets) in place. ROA is measured as follows:

$$\frac{\text{Net income before Minority Share of Earnings and Non-recurring Items}}{\text{Average Total Assets}}$$

Return on Common Shareholders' Equity (ROCE): This ratio measures the return to common shareholders after subtracting from revenues, not only operating expenses, but also costs of financing debt and equity securities that are senior to common stock. Thus, ROCE incorporates the results of a firm's operating, investing and financing decisions. The analyst calculates ROCE as follows:

$$\frac{\text{Net Income - Preferred Stock Dividends}}{\text{Average Common Shareholders' Equity}}$$

Research by Walsh (1984) and Bryne (1991) showed that profitability ratios were frequently used by investors, financial analysts, management and creditors, to investigate the performance of a firm.

Risk: A corporation faces numerous and often interrelated types of risk. Such risks could be at the international level (exchange rate fluctuations), at the domestic level (inflation, interest rate changes), at the industry level (changes in technology, competition), and at the firm specific level (lawsuits, management direction). Each of these types of risk ultimately affects net income and cash flows. Risk analysis typically examines (1) the near term ability to generate cash to service working capital needs and debt service requirements, and (2) the longer term ability to generate cash internally or from external sources to satisfy plant capacity and debt repayment needs.

Short Term Risk - the Current Ratio: The ability of an entity to maintain its short-term debt paying ability is important. If the entity cannot maintain a short term debt paying ability, its long term prognosis is apt to be discouraging. An important measure of short term risk is the current ratio, measured as Current Assets/Current liabilities. This ratio indicates the amount of cash available at the balance sheet date, plus the amount of current assets the firm expects to turn into cash within one year of the balance sheet, relative to obligations coming due during that period. Empirical studies of bond default, bankruptcy, and other conditions of financial distress have found the current ratio to have strong predictive power.

Long Term Risk - the Debt/Equity Ratio: Analysts use measures of long-term liquidity to examine a firm's ability to meet interest and principal repayments on long term debt as they come due. The debt equity ratio provides a measure of the proportion of long term debt in financing a firm's capital structure. The higher this proportion, the higher the long term solvency risk. The debt equity ratio is measured as: Long term debt/Shareholders' equity.

Growth: Investors generally use the Price/Earnings (P/E) ratio as a gauge of the future earning power of the firm. It is a measure of the market's assessment of the external economic factors, as well as of the growth prospects, financial strength, capital structure, and other risk factors associated with the enterprise. Companies with high P/E ratios generally have high growth opportunities and vice versa. The P/E ratio is measured as: Market price per share/Earnings per share.

CEO Compensation: An interesting secondary issue in this study was the relationship between CEO compensation and the value added to the firm. Dechow (1994) and Sloan (1994) show that there is a significant statistical association between top-executive cash compensation and reported earnings. If the restructuring positively added value to the firm, it follows that there should be a positive correlation between increase in CEO compensation and increase in the value of the firm. The value of the firm, in this study was measured as the value of \$ 100 invested in the company three years earlier. The increase in investment is measured as the result of share price appreciation and dividends, both of which are related to the earnings of a firm.

QUESTIONS ADDRESSED BY THIS STUDY

On the basis of the above discussion, the paper addresses the following questions to explore corporate performance after a restructuring:

- Have earnings (an overall measure of performance) shown a steady growth trend during the years after the restructuring, as compared to their performance before restructuring?
- Have the restructuring companies improved their profitability (as measured by ROA and ROCE) during the years after the restructurings?
- Have the companies reduced their risk after the restructuring?
- How is the growth potential of the restructuring companies (as measured by the P/E ratio)
- How has CEO compensation changed as compared to the value of the firm during the years following the restructuring?

STATISTICAL ANALYSES USED

To examine the trend of corporate performance in the years surrounding the restructuring, the following types of statistical analyses were used:

T-tests: Simple statistical t-tests were used to compare the profitability, risk and growth measures for three periods: Three years before the restructuring and the year before the restructuring; the years before and after the restructuring; and the year after restructuring and four years after the restructuring. These t-tests were used to determine whether the profitability, risk and growth measures declined or increased during the three periods under study. These three groups of measures were also compared to the industry averages for the three periods under study to ascertain the financial position of the restructuring companies as compared to general industry performance.

Discriminant Analysis: A multiple discriminant analysis and a paired case-control methodology was used to assess the differences in the financial characteristics of restructuring and non-restructuring firms as a further test of economic performance. The six factors listed above (earnings, ROA, ROCE, current ratio, debt/equity ratio, and P/E ratio) were used as the distinguishing variables in the discriminant analysis. The discriminant analysis was performed for each of the three periods under study.

Analysis of Variance (ANOVA): An Analysis of Variance was used to compare the CEO compensation and value of the firm during the restructuring year, and the changes in the two variables after four years for the sample group and the control group selected for the discriminant analysis.

SAMPLE SELECTION

A list of companies engaging in restructuring activities were obtained from the Compact Disclosure archives for the year, 1991. The key search terms used were “restructuring charges” and/or “write-offs” if found in the footnotes to the financial information. This search yielded a list of 787 firms. Out of this list, firms were deleted because:

Restructuring was being done over a period of years. This study was interested in the performance of firms before and after a specific restructuring year. Multi-year restructuring would not provide a clear picture of firm performance prior to or after one year’s restructuring charge. 153 firms were deleted as a result of multi-year restructuring.

The term “restructuring” was used in the footnotes if the firm had taken a charge during the current year, or during any year presented in the financial statements. The sample required firms which had restructured in 1991. Consequently, firms which had restructured during the prior years were deleted from the list. 166 firms were deleted because of prior year restructuring. In some cases, plans of restructuring were discussed in the footnotes, but no actual charges were taken. Such firms were also deleted (47 firms).

The purpose of this study was to examine financial performance to ascertain that restructuring helped companies achieve their objective of cost control and streamlining operations. For that reason, the main criterion of selection was the objective of cost control/increase in efficiency cited as a reason for restructuring. Firms which restructured for reasons other than cost control were deleted from the sample (95 firms). The resultant sample yielded 326 firms (see Table 2).

TABLE 2: SAMPLE OF FIRMS TAKING RESTRUCTURING CHARGES	
DESCRIPTION	NUMBER OF FIRMS
Firms initially selected (with the term “restructuring” in the footnotes)	787
Firms deleted due to:	
Restructuring being done over a period of years	153
Restructuring done within the past three years	166
Plans being announced but no charges taken	47
Cost control or efficiency not stated as the main reason for the restructuring	95
Total firms selected in the sample	326

Earnings and other ratios (ROA, ROCE, current ratio, debt/equity ratio and P/E ratio) were obtained from the Compact Disclosures for the years, 1988 (three years before restructuring), 1990 (the year before restructuring), 1992 (the year after restructuring) and 1995 (four years after the restructuring). Information about CEO salaries and the value of \$ 100 invested was obtained from the Businessweek and Fortune magazines.

For the discriminant analysis, each of the 326 restructuring firms was matched by industry with a control firm (non-restructuring firm). The control firms were also selected by size (as measured by total assets) to match the restructuring firms as closely as possible. The resultant sample had two groups of 326 firms: the test group or the restructuring group and the control group or the non-restructuring group.

DESCRIPTIVE ANALYSIS OF THE SAMPLE

The sample contained 279 firms spread over 10 industries (classified according to their two-digit SIC code), and 47 firms spread over 7 industries, for a total of 326 firms each in the test group and the control group. The maximum number of firms taking restructuring charges were in the Electronic and Other Electrical Equipment industry. This industry contained major computer firms like IBM and Apple - a number of companies in this industry took restructuring charges to keep up with international competition and rapid changes in technology. Banking services came next, with 44 companies. The early 1990's saw major changes in the banking industry after the collapse of the Savings and Loan industry. A number of major mergers and restructurings took place at this time. Communications (with firms like AT&T and Ameritech) came next, once again, in response to rapidly changing technology. (See Table 3)

SIC Code (2 digit)	Industry name	Number of firms
20	Food and Kindred Manufacturing	15
23	Apparel and Other Finished Products	12
28	Chemicals and Allied Products	32
33	Primary Metals	21
35	Industrial Machinery	29
36	Electronic and Other Electrical Equipment	52
38	Measuring and Analyzing Instruments	17
48	Communications	34
67	Banking Services	44
73	Computer Services	23
Others	Miscellaneous	47
	Total	326

Companies in the Banking Services industry were the largest, with mean revenues of \$ 56 million and assets of more than \$ 4 billion. (See Table 4) The Communications industry was a close second, with revenues of \$ 35 million and assets of more than \$ 1 billion. In both these cases, the differences between mean and median revenues was large, because they had one or two companies with extremely high revenues (for example, AT&T in the

Communications industry). The mean/median revenues in the other industries ranged from \$ 1 million to \$ 10 million, with mean/median assets ranging from \$0.2 million to \$ 3 million.

SIC CODE	REVENUES		SENIOR CAPITAL		TOTAL ASSETS	
	MEAN	MEDIAN	MEAN	MEDIAN	MEAN	MEDIAN
20	9,097	6,365	1,477	1,203	1,875	1,985
23	1,021	788	187	206	268	325
28	3,997	8,272	2,727	1,405	3,572	2,895
33	4,261	4,819	568	682	1,279	1,367
35	8,302	10,291	3,982	1,010	5,635	2,983
36	3,238	2,380	462	263	738	432
38	7,699	6,057	673	832	1,010	1,167
48	34,035	13,307	1,569*	237*	1,789*	836*
67	56,355	48,427	3,086*	1,121*	4,036*	2,871*
73	1,027	956	283	731	681	1,039
Others	4,952	3,639	2,995	3,179	4,295	3,327

*figures in billions

The average restructuring charge taken by the companies in the sample was \$ 967 million and the median charge was \$ 118 million. Once again, there was a great disparity between the mean and the median because of a few companies that had taken billions of dollars in restructuring charges. For example, the Communications industry had taken an average restructuring charge of \$ 22 billion, with a median charge of \$ 3 billion. The next highest was Measuring and Instruments, where at least one company took more than \$ 1 billion in restructuring charges.

Out of 326 firms in the sample, 150 (46%) had taken restructuring charges only once during the past five years. An equal number of firms had taken charges twice during the past five years, while 26 firms (8%) had taken write-offs more than twice during that period. In the Communications industry, Banking, and Industrial Machinery industries, more than 70% of the firms had taken restructuring charges twice during the past five years. In fact, 24% of the firms in the Communications industry had taken restructuring charges more than twice during the past five years (See Table 5).

Sic Code	Average Charge		Write-offs Taken		Writeoffs More than Twice No. Of Firms
	(In Millions of \$)		Once in past 5 Yrs No. Of Firms	Twice in past 5 Yrs No. Of Firms	
All	Mean	Median			
	967	118	150 (46%)	150 (46%)	26 (8%)

20	27.1	21.1	11 (73%)	3 (25%)	1 (2%)
23	15.3	7.9	10 (83%)	2 (17%)	0
28	44.2	29.5	17 (53%)	14 (43%)	1 (3%)
33	86	10.7	7 (33%)	11 (52%)	3 (15%)
35	321	120	5 (17%)	21 (72%)	3 (11%)
36	115	149.3	35 (67%)	14 (26%)	3 (7%)
38	786	347	10 (58%)	7 (42%)	0
48	22*	3.57*	2 (6%)	24 (70%)	8 (24%)
Others	44.2	35.7	35 (75%)	9 (19%)	3 (6%)

* figures in billions

RESULTS OF THE ANALYSIS - WITH ONE-TAILED T-TESTS

The financial statements of the sample firms were investigated, based on the questions posed earlier. The variables of interest were Earnings, ROA, ROCE, Debt/Equity ratio, Current ratio, and the P/E ratio. A one-tailed t-test was used to test the following hypotheses:

- H₁: Between 1988 and 1990, the financial performance of the sample group deteriorated significantly.
- H₂: Between 1990 and 1992 (a year after the restructuring) the financial performance of the sample group showed signs of improvement.
- H₃: Between 1992 and 1995, the financial performance of the sample group improved significantly.

The t-tests were used to examine the performance of the sample group, based on the earnings and other ratios specified above.

ANALYSIS OF EARNINGS

A study of earnings behavior of restructuring firms during the period, 1988- 1990 (the years leading to the restructuring) showed that earnings declined for more than 90% of the sample. (See Table 6, Panel A). An industry wise analysis showed that the Communications and Banking Services industry were the worst hit, with more than 95% of firms reporting earnings decline. A small percentage of restructuring firms (less than 10%) did show increasing earnings, but the earnings increases were very small.

A study of average earnings during 1991 (the restructuring year) showed that the average earnings for all the sample firms were less than the industry average (The mean earnings of all firms with a 2 digit SIC code was taken to be the industry average.) (Table 6, Panel B). In some cases, the restructuring firms' average earnings were negative (most of the companies within that industry showed losses for the restructuring year); e.g., restructuring firms in Apparel (SIC No. 23) and Primary Metals (SIC No. 33) showed average negative earnings, while the industry average was positive. Some firms showed wide divergence from their industry averages, especially in the Communications industry (SIC No. 48).

TABLE 6 - PANEL A
EARNINGS PERFORMANCE OF RESTRUCTURING FIRMS

SIC CODE	During 1988 - 1991,		During 1991 -1992		During 1992 - 1995	
	% of firms whose earnings		% of firms whose earnings		% of firms whose earnings	
	Declined	Increased	Declined	Increased	Increased	Declined
All	93	7	7	93	69	31
20	93	7	14	86	59	41
23	93	7	0	100	58	42
28	90	10	9	91	81	19
33	90	10	10	90	71	29
35	93	7	0	100	65	35
36	94	6	4	96	75	25
38	94	6	3	97	70	30
48	96	4	5	95	62	38
67	95	5	6	94	63	37
73	91	9	3	97	60	40
Others	93	7	3	97	53	47

TABLE 6 - PANEL B
EARNINGS PERFORMANCE OF RESTRUCTURING FIRMS

SIC Code	Average	Industry	Avg.	Average	Industry	Avg.	Average
	Industry Avg.	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
	(1991)*	(1991)	(1992)**	(1992)	(1995)***	(1995)	
All	5321.5	6781.5	6236.8	6619.5	5678.9	6521.8	
20	351.6	539.5	521.5	576.2	321.5	589.4	
23	NM	550.8	221.2	599.2	199.3	607.9	
28	311.5	427.6	401.8	456.2	345.2	525.9	
33	NM	1221.3	826.4	1026.5	629.3	1321.2	
35	434.9	636.4	651.2	725.5	399.5	742.5	
36	691.4	821.5	762.5	835.2	534.9	899.6	
38	1125.9	1420.9	1391.2	1455.9	1196.3	1489.2	
48	9097.2	13058.2	11986.2	13051.2	10891.6	13782.1	
67	21087.6	22331.2	23082.5	23149.8	20597.4	23854.7	
73	421.5	546.2	499.2	577.6	435.0	584.3	
Others	2128.1	2322.2	2319.2	2592.6	2198.7	2651.3	

* The restructuring year, 1991

** One year after restructuring, 1992

*** Four years after restructuring, 1995 NM: Not Meaningful, due to numerous negatives in the data for averaging.

During 1992 (the year after the restructuring), 93% of firms showed earnings increases (Table 6, Panel B). In some industries, all the firms in the sample showed earnings increases (for example, Industrial Machinery, SIC No. 35). In most cases, more than 90% of the firms within each industry showed earnings increases, except Food and Kindred Manufacturing

(SIC No. 20) where 86% of the firms in the sample showed earnings increases. As the result of the earnings increases, the average earnings of the sample firms increased in 1992. Within each industry studied in this paper, the sample firms showed increased earnings (See Table 6, Panel A). In the case of Apparel and Primary Materials (SIC No. 23 and 33), the average earnings went from a negative balance in 1991 to a positive mean in 1992. The industry average also rose - but in numerous cases, the average earnings of the restructuring firms were very close to the industry average itself - for example, Measuring and Analyzing Instruments (SIC No. 38) and Banking Services (SIC No. 67).

Were the restructuring firms able to sustain such growth? Table 6, Panel B shows that 69% of the firms showed declining earnings during the period, 1992 - 1995. Only 31% of the firms were able to show increasing earnings. In the Electrical Equipment, Measuring and Analyzing Instruments, and Primary Metals industries (SIC No. 36, 38, and 33) more than 70% of the firms showed declining earnings. Table 6, Panel A also shows that the average earnings of the sample firms declined between 1992 to 1995, in spite of increases in the industry averages.

The above results indicate that the sample firms undertook restructuring in response to declining earnings. These results are consistent with prior research. These firms seem to have shown improved earnings during the following year, but a majority of the firms in the sample were unable to keep up with earnings growth in the years following the restructuring. This suggests that the management of the firms may have resorted to accounting manipulations to increase their earnings in the period following the restructuring to justify the charges against earnings (Ramaswamy and Upneja, 1997). Some of the firms continued to reorganize - about 8% of the sample firms had taken restructuring charges more than twice during the period, 1992 - 1995 (Table 5).

The firm performance for 1988 and 1990 was compared using a one-tailed t-test, the hypothesis being that performance declined during the years leading up to the restructuring. Results of the t-test are in Table 7.

Description	1988 vs. 1990		1990 vs. 1992		1992 vs. 1995	
	t-values	P>t	t-values	P>t	t-values	P>t
Earnings	(5.69)	0.00	1.06	0.15	(1.70)	0.05
ROA	(4.31)	0.00	1.12	0.15	(1.83)	0.05
ROCE	(4.99)	0.00	1.21	0.15	(1.67)	0.05
Debt/Equity	(1.31)	0.10	1.78	0.05	1.59	0.10
Current ratio	(1.11)	0.15	(0.72)	0.20	(0.11)	0.30
P/E ratio	(0.51)	0.25	0.42	0.25	0.61	0.20

Between 1990 and 1992, the one-tailed t-test was positive at the 0.1 level of significance. Earnings increased during this period, but the change was not very significant. Looking at industry averages, the earnings average of the sample group was still less than the industry average, but the level of significance was only 0.1 as compared to 0.001 during 1988 - 1990.

The sample group's earnings therefore showed an improvement during this period, though it was not good enough as compared to the industry average. During 1992 - 1995, earnings declined substantially - the t-test showed a level of significance of 0.05. This was in direct contradiction to the hypothesis posed - the hypothesis stated that firm performance would improve in the years following the restructuring.

Analysis of Profitability: Table 8 provides an analysis of the two ratios that are used to measure the profitability of a company. About 90% of all firms in the sample showed declining ROA's for the period leading up to the restructuring, that is, 1988 - 1990. (Panel A) The Electronic and Other Electrical Equipment (SIC 36) showed the highest number of firms with declining ROA's (94%). Also, 97% of the firms in the sample had ROA's less than the industry average in 1990. In some industries, for example, Banking Services (SIC No. 67) 100% of the firms in the sample had ratios lower than the industry average.

TABLE 8 - PANEL A
ANALYSIS OF PROFITABILITY - ROA

SIC Code	Firms with declining ROA in 1988 vs. 1991	ROA less than industry average	Firms with declining ROA in 1992 vs. 1995	ROA less than industry average
All	296 (90%)	318 (97%)	225 (69%)	233 (72%)
20	13 (86%)	15 (100%)	9 (60%)	10 (67%)
23	11 (97%)	12 (100%)	7 (58%)	9 (75%)
28	30 (93%)	30 (93%)	26 (81%)	23 (90%)
33	19 (90%)	20 (94%)	15 (71%)	17 (81%)
35	26 (89%)	29 (100%)	19 (65%)	23 (79%)
36	49 (94%)	50 (97%)	39 (75%)	42 (80%)
38	15 (88%)	15 (88%)	12 (70%)	11 (67%)
48	31 (87%)	33 (96%)	27 (80%)	25 (73%)
67	39 (88%)	44 (100%)	27 (63%)	30 (68%)
73	22 (95%)	23 (100%)	14 (63%)	14 (63%)
Others	43 (91%)	45 (96%)	25 (53%)	29 (62%)

Performance improved slightly during the years, 1992 - 1995. Only 69% of the firms showed declining ROA's while 72% of the firms still had their ratios below industry average. Electronic and Other Equipment (SIC No. 36) and Banking Services showed good improvement, while Communications (SIC No. 48) and Chemicals (No. 28) showed limited improvement.

ROCE's followed a similar pattern as the ROA's, with 90% of the sample firms showing declining ratios in 1991 and 97% of the firms had ratios lower than the industry averages. During 1992 - 1995, 66% of the firms showed declining ROCE's, a slightly better performance than ROA's (69%), while 69% of the firms still had ROCE's under the industry average (once again, slightly better than the ROA with 72%). The slight improvement in

ROCE could be because of stock buybacks - the 1990's saw tremendous surge in treasury stock purchases.

Looking at the t-tests in Table 7, a similar pattern can be discerned. The period 1988 to 1990 showed a definite decline in ROA and ROCE, with a significance of .001. The profitability ratios were also well below industry average (significant at 0.001 level). During the period, 1990 - 1992, the ROA and ROCE showed a slight improvement - a positive t-value, with significance at the 0.10 level. During the same period, the ROA and ROCE of the sample group were still below industry average, but now the difference was significant only at the 0.10 level. From 1992 - 1995, there was a definite decline in the sample group (not the positive direction expected by the hypothesis posed earlier). Both ROA and ROCE declined significantly (level of significance, 0.05) during this period. The ratios of the sample mean were once again lower than the industry average - the t-test showed a significance of 0.05.

TABLE 9 - PANEL B
ANALYSIS OF PROFITABILITY - ROCE

SIC Code	Firms with declining ROCE in 1989 vs. 1991	ROCE less than industry average	Firms with declining ROCE in 1992 vs. 1995	ROCE less than industry average
All	296 (90%)	318 (97%)	220 (66%)	229 (69%)
20	13 (86%)	15 (100%)	9 (60%)	10 (67%)
23	12 (100%)	12 (100%)	7 (58%)	9 (75%)
28	30 (93%)	30 (93%)	25 (78%)	21 (86%)
33	19 (90%)	20 (94%)	15 (71%)	17 (81%)
35	26 (89%)	29 (100%)	18 (61%)	23 (79%)
36	49 (94%)	50 (97%)	38 (70%)	41 (78%)
38	15 (88%)	15 (88%)	12 (70%)	11 (67%)
48	31 (87%)	33 (96%)	25 (74%)	24 (70%)
67	39 (88%)	44 (100%)	27 (63%)	30 (68%)
73	22 (95%)	23 (100%)	14 (63%)	14 (63%)
Others	43 (91%)	45 (96%)	25 (53%)	29 (62%)

Risk Analysis: The firms in the sample performed reasonably well as far as short term risk (as measured by the current ratio) was concerned. As can be seen from Table 9, Panel A about 55% of the firms in the sample showed declining current ratios during the period, 1988 - 1990. About 57% of the firms had current ratios lower than the industry averages during that period. Measuring and Analyzing Instruments (SIC 38) had only 29% of the firms with declining current ratios. Electronic and Electrical Equipment (SIC 36) and Communications (SIC 48) had the highest number of firms with declining current ratios - more than 65%.

Short term risk showed no noticeable improvement in the years following the restructuring. In fact, during the period, 1992 - 1995, 57% of the firms showed declining current ratios, as compared to 55% of the firms in the earlier period. 57% of the firms still had their ratios below industry average. In some industries, the ratios did improve - for

example, Chemicals and Allied Products (SIC 28) and Industrial Machinery (SIC 35). However, in most industries, short term risk performance remained the same.

TABLE 9 - PANEL A				
ANALYSIS OF RISK - CURRENT RATIO				
SIC Code	Firms with declining Current ratio in 1989 vs. 1991	Current ratio less than industry avg.	Firms with declining Current ratio in 1992 vs. 1995	Current ratio less than industry avg.
All	182 (55%)	187 (57%)	180 (57%)	184 (57%)
20	6 (40%)	7 (43%)	9 (60%)	9 (60%)
23	5 (41%)	5 (41%)	5 (41%)	5 (41%)
28	19 (59%)	21 (67%)	17 (53%)	18 (57%)
33	11 (52%)	11 (52%)	8 (38%)	9 (41%)
35	16 (55%)	16 (55%)	14 (48%)	14 (48%)
36	35 (67%)	35 (67%)	37 (71%)	38 (73%)
38	5 (29%)	5 (29%)	4 (23%)	4 (23%)
48	22 (64%)	24 (70%)	27 (79%)	28 (82%)
67	29 (65%)	29 (65%)	30 (69%)	30 (69%)
73	9 (39%)	9 (39%)	8 (35%)	8 (35%)
Others	25 (53%)	25 (53%)	21 (45%)	21 (45%)

TABLE 9 - PANEL B				
ANALYSIS OF RISK - DEBT/EQUITY RATIO (D/E)				
SIC Code	Firms with declining D/E in 1989 vs. 1991	D/E less than industry avg.	Firms with declining D/E in 1992 vs. 1995	D/E less than industry avg.
All	303 (93%)	305 (95%)	170 (52%)	169 (51%)
20	14 (93%)	14 (93%)	5 (38%)	5 (38%)
23	11 (93%)	11 (93%)	5 (41%)	5 (41%)
28	29 (90%)	29 (90%)	16 (50%)	16 (50%)
33	19 (91%)	19 (91%)	13 (58%)	11 (52%)
35	27 (93%)	27 (93%)	17 (57%)	17 (57%)
36	49 (94%)	50 (97%)	33 (63%)	33 (63%)
38	16 (94%)	16 (94%)	5 (29%)	5 (29%)
48	32 (94%)	33 (97%)	19 (55%)	20 (58%)
67	42 (95%)	42 (95%)	25 (56%)	25 (56%)
73	21 (91%)	21 (91%)	11 (47%)	11 (47%)
Others	43 (93%)	43 (91%)	21 (44%)	21 (44%)

Looking at long term risk, as measured by the debt equity ratio, Table 9 Panel B shows that nearly 93% of the firms in the sample had declining ratios during the period, 1988 - 1990. The decline was essentially uniform through all the industries. All industries had more than 90% of the restructuring firms exhibiting declining debt/equity ratios.

The change in debt/equity ratios after the restructuring was dramatic. Most companies seemed to have used restructuring to pay off their long term debt and improve their long term risk profile. As can be seen from Table 9, Panel B, 52% of the firms showed declining ratios

during the period 1992 - 1995, as compared to 97% during the earlier period. And only 51% of the firms had ratios under the industry average. The improvement was uniformly spread across industries, even the most troubled industries like Electronics (SIC 36) and Communications (SIC 48). As interesting feature noted here was that in the few cases where debt equity ratio had worsened, profit performance improved considerably - there was a negative correlation between debt/equity ratio and profit performance. This seems to imply that companies leveraged themselves to improve profitability.

The current ratio did not provide significant results in the t-test. During 1988 - 1990, the current ratio did decline, but the level of significance was only 0.15. the current ratios of the sample group was not significantly lower than the industry average. During the next two periods, current ratio declined slightly, but the differences were not significant. The ratios of the sample group did not differ materially from the industry average.

The debt/equity ratio showed a decline between 1988 and 1990 (significance at 0.10 level). The ratio of the sample group was also lower than the industry average during this period (significance, 0.10). However, during the period, 1990 - 1992, the debt equity ratio showed a marginally significant increase, and this increase was carried on to the period, 1992 - 1995. During these two periods, the difference between the sample group and the industry average was insignificant.

Price/Earnings Ratio: A study of the P/E ratio showed no significant results. There was no major change in the pattern of P/E ratios of the sample group. About 56% of the firms had P/E ratios less than the industry average during the period, 1988-1990. While earnings declined during the next two time periods, the P/E ratio actually increased for the sample firms, indicating that the market still perceived growth potential in the restructuring firms.

MULTIPLE DISCRIMINANT ANALYSIS (MDA)

To further study the performance of restructuring firms, multiple discriminant analysis (MDA) was used to study the sample, comparing it with a matched sample of control firms. The restructuring firms and the control firms were matched on industry and firm size. MDA is well-suited to many problems where the dependent variable is non-metric. The primary objective of MDA is to classify entries correctly into mutually exclusive groups by maximizing the ratio of inter-group to intra-group variance-covariance from a set of independent variables. In addition, MDA reveals which individual variables have the greatest discriminating power within a multivariate context.

Table 10 summarizes the standardized discriminant function coefficients, and the canonical discriminant function evaluated at the group means. The discriminant analysis was performed for each of the three periods under study. For the years prior to the restructuring, earnings was the most significant factor in the MDA - the earnings of the restructuring firms was materially below the control group. All the other ratios were also significant - the performance of the sample group was clearly inferior to the control group. The results of the MDA for 1988 - 1990 was significant at the 0.001 level. For the year following the

restructuring (1992), the results were still significant, but barely at the 0 .05 level this time. The performance of the sample firms was below par when compared to the control group, but the difference was less obvious as compared to the last period. The price earnings ratio was no longer a significant factor - the average price/earnings ratio for the sample group increased faster than the control group. The final analysis for 1995 showed significance at the 0.01 level. The sample group, once again, performed at a lower level than the control group. Earnings was the most significant factor in this analysis. Debt/equity ratio was no longer significant, while price/earnings ratio showed a definite increase for the sample firm, changing the direction of significance.

TABLE 10: Results of the Discriminant Analysis

Variable	Standard Canonical Discriminant Function Coefficient for		
	1988 vs. 1990	1990 vs. 1992	1992 vs. 1995
Earnings	(0.592)	(0.472)	(0.561)
ROA	(0.337)	(0.246)	(0.298)
ROCE	(0.362)	(0.271)	(0.312)
Current ratio	(0.113)	(0.102)	(0.121)
Debt/Equity	(0.233)	(0.216)	(0.169)
P/E ratio	(0.121)	0.105	0.192
Canonical Correlation	0.6265	0.4972	0.5779
Chi-square	27.82	15.73	18.97
p level	0.001	0.05	0.01

CEO PAY AND INVESTMENT VALUE

Table 11 compares average CEO compensation and the value of \$ 100 invested in the company three years earlier for the test group and the sample group. The data for this analysis was obtained from Fortune and BusinessWeek. Due to lack of available data, the sample size in both the test and control groups were reduced to 96 each.

As can be seen from Table 11, in 1991, the average compensation for CEO's of restructuring firms was \$ 1,358 million. For similar firms without restructuring charges, the average CEO compensation was \$ 1,366 million, a difference of 6%. It should be remembered that management compensation for restructuring firms placed less weight on restructuring charges, thus shielding top management from high restructuring charges (DeChow, et.al, 1994). The value of \$ 100 invested, referred to hereinafter as IV was \$ 155 in 1991 for restructuring firms; for the control group, the average was \$ 177, a difference of 14%.

During 1995, average CEO compensation for restructuring companies was \$ 2,018 million - an increase of 48% from 1991. The average compensation for the control group was \$ 2,498 million, an increase of 82%. The disparity between the two groups was 23% in 1995, as compared to 6% in 1991. If management compensation is an indicator of corporate

performance, obviously the restructuring firms are not doing as well as similar firms in the industry.

TABLE 11: CEO Pay and Value of Money Invested ('000)

Description	1991	1995	% Difference
Average CEO compensation for restructuring companies	1358	2018	48%
Average CEO compensation for similar companies	1366	2498	82%
% Difference	6%	23%	
Value of \$ 100 invested 3 years earlier in restructuring companies	155	125	-19%
Value of \$ 100 invested 3 years earlier in similar companies	177	175	- 1%
% Difference	14%	40%	

This can also be seen by comparing IV in 1995. For the sample group, IV declined from \$ 155 in 1991 to \$ 125 in 1995, a decline of 19%. The control group showed an average IV of \$ 175 - decline of 1% from 1991. The disparity between the two groups also increased - from 14% in 1991 to 40% in 1995. This seems to indicate that restructuring corporations have been performing poorly over the past few years.

An Analysis of Variance performed on the average CEO pay and average IV for the sample group and the control group was significant at the 0.01 level. Pairwise comparisons showed that CEO pay was considerably different for the sample group between 1991 and 1995 (significance, 0.05). There was also considerable difference in CEO pay between the sample group and the control group. IV showed significant differences for the sample group between 1991 and 1995 (significance, 0.05). The control group did not show an extensive difference in IV during the two periods (significance, 0.20). However, IV of the sample group and the IV of the control group showed marginally significant difference in 1991 (at 0.10) and notably increased significance for 1995 (0.01 level). The results of the ANOVA also show that IV decreased considerably for the restructuring firms, while CEO compensation (which is usually tied to performance) increased during this period.

SUMMARY AND CONCLUSIONS

Numerous corporations have taken restructuring charges during the past decade, ostensibly to reduce costs, streamline operations, and therefore to improve profitability. This paper analyzes the financial performance of a sample of restructuring firms to observe the effectiveness of such a strategy. Diverse techniques such as t-tests, discriminant analysis and

ANOVA were used to examine the performance of restructuring firms as compared to a control group of nonrestructuring firms.

The results indicate that restructuring did not contribute extensively to improved financial performance. In fact, earnings and profitability of restructuring firms have shown a declining trend in the years following restructuring for a majority of companies. As a result, companies are now modifying their strategy to “growth” rather than “downsizing” as a approach to increased profitability.

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WOMEN IN THE PUBLIC ACCOUNTING PROFESSION

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ABSTRACT

Even though the number of women that are employed by CPA firms has been increasing over the last twenty years, the number of partners that are women has not gone up proportionally. Some of the reasons why there are fewer women partners are discussed in this paper. Also, what some CPA firms are doing to increase the number of women partners are discussed.

INTRODUCTION

Females entering a traditionally male dominated profession have steadily increased in the last twenty years, with women comprising over 50 percent of all undergraduate accounting majors and about 26 percent of all undergraduate and graduate accounting faculty members (AAA, 1994; AICPA, 1994; Norgaard, 1989). This increased participation by women in accounting has also significantly impacted the public accounting arm of the profession. Today, women make up 50% of all new accountants. However, even with this large number of women entering the profession, CPA firms are having a hard time retaining them. With the high turnover rate for women, there are fewer women to promote to higher levels (Alter, 1991). "Only about 5% of the partners in accounting firms are women" (Burke, 1995). "A study by the American Women's Society of CPAs found that 40% of women CPAs have been in the profession for more than ten years, but only 20% of all management positions in CPA firms are held by women" (Borgia, 1994).

To run a successful CPA firm, one must be able to find and keep top talent. If half of this top talent consists of women, CPA firms need to respond to their needs (Alter, 1991). Time and money will be lost when a firm loses an experienced woman and in her place has to train someone new. Today, more firms are realizing the economic benefit of retaining women (Coolidge, 1994).

UPWARD MOBILITY OBSTACLES

"The AICPA has been addressing the issue of women's upward mobility since 1984" (Borgia, 1994). "The Women and Family Issues Executive Committee of the AICPA has set up a resource clearinghouse on women and family issues in the accounting workplace. It includes articles, reports, policies, and other materials that will help accounting firms and

other employers implement programs addressing women and family issues. It contains information about the "glass ceiling," mentoring, gender awareness, sexual harassment, stress, parental leave, child care, and alternative work schedules" (Williams, 1993). Some upward mobility obstacles that women face in the profession can be very frustrating to women. Some of these obstacles can consist of outdated attitudes about women, extra stress and balancing work and family (Borgia, 1994).

Some upper management still look at women as being less committed to a firm because of maternity leave. They feel that once a woman has children, she will not return to work. Partners have admitted that they invest less time developing female employees, because of this. Firms do not realize that it is all a big misperception. A study showed that 89% of women returned to work after maternity leave (Coolidge, 1994). "An ongoing survey by the new State Society of CPAs estimates that 49% of female CPAs believe that they are less accepted by partners in their firms than are male CPAs" (McKeen, 1994).

Women CPAs have more stress, because they have to deal with the stress that comes along with the profession and the stress that comes along with family pressures. It is a known fact that a woman who has a family is considered to have a disadvantage, but a man with a family is considered to have an asset (Borgia, 1994). The CPA profession has a cyclical nature, and because of this, it is very hard for women to balance it with family (Coolidge, 1994).

THE CHANGING CPA FIRM

To retain female professionals, firms need to make a commitment to find solutions to problems they are facing in the workplace. Some issues that management must deal with concerning their female staff are alternative career paths and child care. Women CPAs are clearly affected by not having these types of formal programs in their work environment. Not only do CPA firms have to implement such programs, but management must believe in them in order for them to work. Plans implemented to retain women CPAs require a lot of planning and time, which could mean a lot of expense. This cost can be considered money well invested. CPA firms that have implemented formal programs have considered their decision to be a sound business decision. Some of the formal programs that can address the upward mobility for women are flexible scheduling, child care and mentoring.

Scheduling for individual needs can be a creative way to keep talented female staff (Alter, 1991). Flexible scheduling can consist of part-time work, work at home or job-sharing (McKeen, 1994). Once flexible work schedules have been put into force, women should still be given challenging assignments and not just "written off" (Higham, 1994). It is much less expensive to adjust current employee's hours than it is to train new employees (Coolidge, 1994). Helping women with day care needs also can be a big plus. Day care that is on site can really help during the busy season, or through the school holidays (Maupin, 1993).

"Mentors are critical to career success. More than three-quarters of public accountants participate in mentoring relationships" (McKeen, 1994). Mentoring can help women steer their careers. Mentors also can give women important opportunities to work with clients and

develop relationships (Baliga, 1994). Women must find mentors who fit their career paths, but most males do not always let women in (Maupin, 1993).

ACTIONS OF CPA FIRMS

Some firms realize that they are in danger of losing these talented professional women. These firms are now looking for solutions. They want to know what other CPA firms are doing to retain these women.

Among the Big Six accounting firms, Deloitte & Touche has the largest number of women employees (Flynn, 1994). Deloitte & Touche implemented formal programs because they were losing a substantial number of women employees. According to their national director of human resources, Jim Walters, the firms were "having a talent drain of capable women. We had to do something about it" (Flynn, 1994). Deloitte & Touche set up a Council for the Advancement of Women. This council was set up to deal with the issues that women face in the firm. As a result, the council made certain recommendations to management. Among these recommendations were (1) the company needed to make career planning more formal (to accomplish this, networking and mentoring were needed), (2) as the company filled leadership positions, it needed to consider women that were qualified, (3) the company was in need of a more flexible work schedule, and (4) any program that the company implements, needed to be supported by the CEO (Institutional Investor, 1994).

Deloitte & Touche started by interviewing women in their firm at all levels, and it also interviewed women who had left their firm. Through these interviews, the firm discovered that most of the women were dissatisfied with the work environment. They felt that they were being left out and their advancement opportunities were limited. The firm knew that this environment that these women were describing did not come about deliberately, but subconsciously. For this reason it would become a great challenge to attempt to change the work environment. The firm started its attempts by having all their 5,000 partners and other high level employees participate in workshops. These workshops addressed the issue of "men and women as colleagues" and cost Deloitte & Touche approximately \$3 million (Flynn, 1994). The workshop program and other such formal programs worked very well for the firm, and showed much improvement. They are retaining more women, and because of this, they are attracting more women to their firm. Today, the firm has the largest number of women employees among the Big Six accounting firms (Flynn, 1994).

The firm of Crowe, Chizek & Co. made some changes when they realized that their turnover rate for women was at a rate twice that of men. Just like Deloitte & Touche, this firm also set up a committee to look at this problem. As a result, they implemented flexible scheduling and set up sessions where women were able to give their input. Women were asked, "level with us. What can we do to make things better?" (Alter, 1991). As a result of these changes, the turnover rate for women has declined (Alter, 1991). Ernst & Young in New York City offers their employees emergency at home day-care for their sick children (Alter, 1991). During tax season the firm provides free Saturday child care.

At Mortenson & Associates, they have a formal counseling program. Within this program, the counseling begins when one is promoted to manager. It informs professional staff members on what is expected of them in becoming a partner. This is a type of mentoring program (Alter, 1991).

Plante & Moran has incorporated a flexible work schedule. They have a pool of computers that employees can use at home. Just like Ernst & Young, these firms also provide free Saturday day care during tax season. This worked extremely well for them (Alter, 1991). The firm has also benefited in another way. For example, when they implemented the free Saturday day care during tax season, the local newspaper wrote an article about the firm. This newspaper article has generated a lot of positive publicity. The firm was "proud to be honored by the state of Michigan for being among the companies judged most responsive to the needs of a changing work force" (Alter, 1991).

Walpert, Smillian & Blumenthal also has a mentoring program. This mentoring program lets employees who have been with the company for at least five years give advice to less experienced professional staff members. Total flexibility, is the reason the firm has been able to keep their top people. Their creative scheduling was implemented eight years ago, and it has really worked for them (Alter, 1991).

Among the firms that are listed above, Deloitte & Touche and Ernst & Young made the list of "the top 100 companies for working mothers." This list is compiled by Working Mother magazine (Clolery, 1994).

LOCAL FIRMS

In a town of about 180,000 that was surveyed by the authors , there were thirty-five CPA firms with eighty partners. Of these eighty partners, only six (8%) were women. These firms had other women working in the firms that were CPAs but they were not partners. A few of these firms are offering flexible schedules and permanent part-time positions as incentives to keep women CPAs.

CONCLUSION

There has been some progress made in dealing with the upward mobility for women in the profession. This can be seen in the changes that have been made in some CPA firms, but there is still a lot more work that needs to be done.

Today, women still have little power in the organizational hierarchy. Personnel is the most important asset for accounting firms, so we must change the perceptions that go on about women in the profession. This can be a challenge for the accounting profession, but we can no longer look at the accounting profession as a man's profession (Maupin, 1993). "The most successful firms in the end will be those that deal early and effectively with women's issues" (McKeen, 1994).

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DO MANAGERS SMOOTH EARNINGS PATHS?

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ABSTRACT

This study reviews a variety of theories of different types of income smoothing that managers of large-scale firms may attempt. Previous empirical studies are considered, and a new methodology is presented that makes use of Cash Flow from Operations (CFO) data that have recently become available for publicly-held firms. By construction, CFO are less subject to manipulation than accrual-based Net Income (NI) figures. The smoothing hypothesis is tested by comparing the volatility of CFO and NI series for 327 Fortune 500 firms for the 1986-1993 period. Two measures of volatility are used. By either measure, NI figures are more volatile than CFO figures for a majority of firms, contrary to the smoothing hypothesis.

INTRODUCTION

The topic of “income smoothing” (or “income normalization”) has received much theoretical and empirical attention. Ronan, Sadan and Snow (1977), Eckel (1981) and Imhoff (1981) provide excellent reviews, and the book by Ronan and Sadan (1981) is thorough. From these works it is clear that there is no standard model of income smoothing, but rather a body of interrelated theories and tests. Articles differ on such fundamental matters as the motivation behind income smoothing, its measurement, and its impact on stockholders. Some of these differences may be attributable in part to multiple definitions of income smoothing. The type of smoothing that we study here “involves the repetitive selection of accounting measurement or reporting rules in a particular pattern, the effect of which is to report a stream of income with a *smaller variation from trend* than would otherwise have appeared.” (Copeland (1968, p. 102), emphasis added).¹

We review theories of (1) management’s alleged motivation for smoothing, (2) measures other than Net Income that may be the object of smoothing, and (3) the means by which smoothing may be achieved. Perhaps the most common theory of motivation is that management tries to induce other parties to believe the firm’s income stream has low volatility in order to maintain personal position and income. Bartov (1993, p. 843) quoted Fortune when writing, “CEOs know that investors hate surprises, so they try to keep net income trending up a nice straight slope.”

We also review several empirical studies of income smoothing in order to contrast our empirical test with previous work. The test we conduct compares Net Income (NI) and Cash Flow from Operations (CFO) for 327 Fortune 500 companies for the 1986-1993 period. The CFO data have recently become available through changes in reporting requirements for

publicly-held firms. We selected a comparison between CFO and NI because, for reasons we discuss below, the definition and construction of CFO makes it less subject than NI to accounting manipulations. We argue that if such manipulations are used to smooth the income stream, then NI data should exhibit less variability than CFO data. For each of the 327 firms in the sample, we compare the variabilities of the NI and CFO series, using two different measures of volatility for each series: (1) the standard deviation of the (index-based) variable around its linear trend, which is equivalent to a coefficient of variation, and (2) the standard deviation of the variable's annual growth rate. In contrast to the smoothing hypothesis, we find that NI variability exceeds CFO variability for either 81% or 74% of the firms, depending on which of the two variability measures is used. We concur with the assessment made by Albrecht and Richardson (1990, p. 713) who wrote that "The [income-smoothing] practice is conjectured to be widespread, but evidence in support of deliberate smoothing is not convincing."

REAL VS. ARTIFICIAL SMOOTHING

Dascher and Malcom (1970, pp. 353-354) made a useful distinction between "real" and "artificial" smoothing: "Real smoothing refers to an actual transaction that is undertaken or not undertaken on the basis of its smoothing effect on income, whereas artificial smoothing refers to accounting procedures which are implemented to shift costs and/or revenues from one period to another . . . Artificial smoothing may be achieved when management has the power to decide which, if any, research projects will be capitalized and the useful life and pattern of allocation for those projects which are capitalized." Similarly, Copeland (1968, p. 102) writes that (among other characteristics) a so-called "perfect" smoothing device "must not require a "real" transaction with second parties, but only a reclassification of internal account balances." He continued,

A smoothing device ought to involve only the accounting interpretation of the event, not the event itself . . . To illustrate, the rejection of a sales order just to lower revenue involves a real event, but delaying revenue recognition until cash is received is only an accounting event; buying equipment in order to increase the depreciation base is a real event, but using an accelerated depreciation method is merely an accounting event" (Copeland (1968, pp. 104-105)). Other examples of artificial smoothing appear throughout the paper. Our empirical work provides a new test for the artificial smoothing of NI.

We do not argue that the income statement is a "distortion" of the "truth" even when smoothing is artificial. Instead, a firm's income statement is a version of the truth constructed according to Generally Accepted Accounting Principles (GAAP). The basis for the smoothing hypothesis is the observation that GAAP permits considerable latitude in financial reporting and practices. Such flexibility pertains to the selection of long-term accounting procedures (or "principles" or "policies") as well as the choices made within each accounting period (year) under a given procedure.² For example, changes in the useful lives of assets and accounting reserves can be selected to "manipulate" earnings regularly, i.e., in each accounting period. At more distant intervals, management can make long-term selections amongst accounting

procedures that will govern future treatments of certain items, e.g., method of depreciation. Indeed, the accounting profession has deliberately framed GAAP in fairly broad terms to allow for firm-specific reporting requirements. It can be argued that this latitude in financial reporting practices is warranted in support of the matching principle and other elements of accounting theory.

MOTIVES FOR SMOOTHING

As in a well-crafted murder mystery, a good theory of smoothing explains how management has both the opportunity and the motive to engage in smoothing. We identify six cases using the labels “stewardship”, “fooling”, “market value”, “cost of borrowing”, “external forecasting” and “internal forecasting”.

A risk-averse sole proprietor, who is both owner and manager, makes operating decisions to avoid high income volatility. The sole proprietor may even trade off some of the income stream’s present value for a sufficiently large reduction in volatility. Thus at least some amount of real income smoothing is done by sole proprietor. Risk-averse stockholders benefit from some real smoothing activities too. As management fulfills its stewardship function of operating the firm on behalf of the stockholders, real smoothing can be expected to some degree.

Real income smoothing need not be so benign, however. The setting for most smoothing theories is the large-scale publicly-held corporation characterized by the separation of management from ownership. The large-scale corporation creates a limited-information environment in which stockholders and other parties rely on financial information provided by management’s accountants. This environment creates the opportunity to mislead or “fool” the stockholders with either artificial smoothing or excessive real smoothing. The fundamental motive for the “fooling” theory follows from combining the propositions that “the happier the stockholders the greater the job security, income, etc. of management” and “[stockholder satisfaction with a corporation increases with . . . the stability of its income” (Gorden, 1964, 261-262). Hepworth (1953) initiated the literature on income smoothing. A classic passage, cited in Lambert (1984, p. 604) and elsewhere, provided the first rationale for smoothing: “Certainly the owners and creditors of an enterprise will feel more confident toward a corporate management which is able to report stable earnings than if considerable fluctuation of reported earnings exists.” Imhoff (1981, p. 24) phrased the “fooling” theory more bluntly when he wrote that “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.” By referring to “inadequate financial statement disclosure”, Imhoff seems to focus on artificial smoothing. Typically the “fooling” theory considers smoothing to be detrimental to stockholders.

The “share value” theory of motivation interprets the effect of smoothing on stockholders more favorably, at least so far as the firm’s current stockholders are concerned; it can be important to distinguish between current and new stockholders to interpret fully the

different effects on the two groups of stockholders. Beidleman (1973, p. 654) argued, “earnings variability is interpreted as an important measure of the overall riskiness of the firm and has a direct effect on investors’ capitalization rates and thus an adverse effect on the value of a firm’s shares . . . Management might be able favorably to influence the value of the firm’s shares by smoothing earnings.” Thus, current stockholders gain from smoothing because it enhances the market value of their shares when they sell to new stockholders. However, if the enhanced value is based on “fooling” rather than the types of real smoothing that a sole proprietor or a full-information environment would support, then current stockholders still gain but at the expense of new stockholders.

In the “cost of borrowing” theory, Trueman and Titman (1988, p. 128) argued, “By smoothing income the manager may be able to reduce the estimate of various claimants of the firm about the volatility of its underlying earnings process, which, in turn, lowers their assessment of the probability of bankruptcy. This is valuable for the firm’s stockholders since it decreases the firm’s cost of borrowing and favorably affects the terms of trade between the firm and its customers, workers and suppliers.” Suppose that the creditor from whom the firm borrows is a commercial bank. Stockholders benefit, as does the bank, when management engages in an appropriate amount of real smoothing. However, as was the case in the “market value” theory, if “fooling” is involved then stockholders can benefit at the expense of another party--in this case, the bank rather than future stockholders.

Another set of motives for smoothing concern forecasting, which may be made by parties either external or internal to the firm. Barnea, Ronen and Sadan (1976, p. 110) provided an “external forecasting” motive when they wrote, ‘If we assume management has some knowledge about the firm’s future earnings, the smoothing of ordinary income with extraordinary items could be undertaken to produce an income number than can be used to predict future earnings efficiently. In this case, smoothing is used as a vehicle for management to convey its expectations within the framework of conventional accounting practices which do not permit direct forecasts.’ Beidleman (1973, pp. 653-654) developed an “internal forecasting” rationale, when he noted that “Reported earnings are used internally . . . If they were highly variable, it would be difficult to establish plans and budgets for future periods.” According to the two forecasting motives, smoothing has favorable effects for stockholders by either (1) enabling them to forecast better, or (2) enabling the firm to develop internal budgets better, which benefits stockholders indirectly. In an interesting variation on the means by which smoothing occurs, Lambert (1984) developed a formal model of how management engages in “real” smoothing in a period by varying (unobserved) managerial effort toward the end of the period.

In summary, there are a variety of theories, not mutually exclusive, which explain why management has both opportunity and motive to make operating decision that result in real smoothing and to make accounting decisions that result in artificial smoothing. The extent of real smoothing may be to the “appropriate” margin that management would choose even if all parties had full information, i.e., the amount consistent with management’s stewardship function, or to an “excessive” margin in the limited-information setting. Our empirical work is not designed to measure the degree or even the presence of real smoothing. Instead, by

comparing Net Income and Cash Flow from Operations, we attempt to detect only the presence of artificial smoothing. Importantly, our neglect of real smoothing is a strength of our methodology rather than a weakness: real and artificial smoothing are distinct phenomenon, and it is advantageous for an empirical test to separate them. In order to identify empirical support for the hypothesis of artificial smoothing, we adopt a ceteris paribus approach that takes as given whatever amount of real smoothing occurs.

PREVIOUS STUDIES OF SMOOTHING

There are a variety of theories about what financial information or variables management allegedly smooths, and about the means or instruments by which the smoothing is done. It is sensible that researchers have considered several financial variables, such as earnings per share (EPS) or Net Income, as the potential objects of smoothing. After all, the objects chosen may be “according to what management perceives investors utilize in making their predictions” (Ronen and Sadan (1981, p. 16)). Studies have also identified different instruments or devices by which management supposedly smooths the object under study.

In an early empirical test Gordon, Horwitz and Meyers (1966) examined whether 21 chemical companies used an investment tax credit to smooth EPS. Cushing (1969) examined the effect on EPS of 325 changes in accounting policies (12 of which were for firms making two or more changes). For the chemical and building materials industries (42 firms and 54 firms, respectively), White (1970) too looked at the effect on EPS changes in accounting procedures, as well as the effects of “nonprocedural” decisions, such as amortization, and “discretionary” decisions such as changes in the amount of a pension plan that is funded. Bartov (1993) recently studied the real-smoothing effect on EPS of selling long-lived assets in a time period chosen by management, for a sample of over 653 firm-year observations for 1987-1989.

For 62 firms in four industries Barnea, Ronen and Sadan (1976) considered whether the use of extraordinary items, such as the sale of a factory, could smooth (on a per share basis) either ordinary income before extraordinary items or operating income before period charges and extraordinary items. Moses (1987) also used ordinary income before extraordinary items to compare for 212 firms whether accounting changes smoothed income, and to determine whether smoothing behavior related to a variety of firm-specific independent variables that measured managerial incentive for smoothing.

Archibald (1967) considered the effect on Net Income (NI) for 53 firms of changing the procedure for calculating depreciation. In their study of 52 chemical firms for six- and eleven-year periods, Dascher and Malcom (1970) identified four distinct instruments by which NI could be smoothed (pensions, dividends from unconsolidated subsidiaries reported by the parent at cost, extraordinary items, and R&D). Beidleman (1973) examined six instruments (pensions, incentive compensation, R&D, remitted earnings from unconsolidated subsidiaries, advertising, and plant retirements) in his study of NI smoothing for 43 firms. Copeland and Licastro (1968) considered the effect on NI of dividends from unconsolidated subsidiaries reported at cost for 20 firms, while Copeland (1968) examined the same effect for 19 firms but added other smoothing instruments (extraordinary items, write-off of assets, pensions, and

changes in accounting procedures or reserves or credit, *inter alia*). Like these previous studies, we will focus on NI as the object of smoothing.

Many studies themselves contain critiques of empirical work. General assessments can be found in Ronen and Sadan (1981), Imhoff (1981) and Eckel (1981). Albrecht and Richardson (1990, p. 714) summarized many of these studies when they wrote, “The classical approach to studying income smoothing involves an examination of the relation between choice of smoothing variable and its effect on reported income.” Ronen and Sadan (1981, p. 35) identified a fundamental problem of the classical approach when they wrote:

The two behaviors [of smoothing instruments and objects] could be systematically interrelated in a way that results in manifestations of smoothing . . . For example, when above-trend operating income (used as a proxy for presmoothed ordinary income) is found to be associated with above-trend discretionary expenses (the smoothing instrument), a form of intertemporal smoothing is inferred. However, this could be attributed also to the fact that an enhanced scale of operations would cause both revenue and expenses to rise.

Of course, the problem that a third variable, Z, could cause changes in both X and Y and create an illusory X-Y correlation is not confined to income-smoothing studies. However, for the income-smoothing literature the limitation might be especially problematic because it is so plausible that the Z variable identified by Ronen and Sadan, scale-of-operations, can create the correlation between NI and the dollars spent in various accounting categories labeled “smoothing instruments”.

Eckel (1981, p. 30) identified another problem of the classical approach: “[T]hese examinations require the specification of an expectancy model for normalized income which is indeed a difficult task.” Ronen and Sadan (1981, p. 35) observed that “Most of the smoothing studies described in this chapter did not make serious attempts to identify the “proper” expectancy models for either the object of smoothing or the instruments of smoothing.”

Yet another problem of most studies is that “In many of the studies described the researchers focused on one smoothing instrument at a time . . . [O]bservation of only one or two smoothing instruments . . . may lead to an inference of nonsmoothing behavior when in fact management smooths by utilizing other instruments (Ronen and Sadan (1981, p. 35)). Eckel noted the same problem.

Ronen and Sadan (1981, p. 36) also observed that “in many of the smoothing studies the period was too short to make inferences with respect to intertemporal smoothing. For example, smoothing manifestations that are observed in the form of changes that occur within a span of two years may not be acceptable as manifestations of intertemporal smoothing.” Eckel (1981, p. 30) too recognized the problems of cross-section data and concluded that “empirical tests of income smoothing behavior should be conducted on time series data.”

Albrecht and Richardson (1990) identify two other approaches that are closely related. In the “income variability” approach introduced in 1977 by Imhoff, and used by Eckel (1981), the volatility of NI--the variable that is allegedly smoothed--is compared with the volatility of some other variable that management cannot smooth (or smooth as easily as NI). For example, Eckel (1981, p. 33) explained, “Gross sales can only be intentionally smoothed by real

smoothing; that is gross sales cannot be artificially smoothed.” Accordingly, comparing the smoothness of NI with another series, such as sales, constitutes a test of artificial smoothing. Albrecht and Richardson (1990) report that Imhoff compared the variability of NI with the variability of Sales for 94 firms. Eckel (1990) used the same 62-firm sample as Barnea, Ronen and Sadan (1976) to compare the variability of NI and Sales, which permitted a comparison of conclusions based on different methodologies. Imhoff (1981) examined five measures of performance, including NI, to see if the relative variabilities of the various measures were different. In an interesting variation on the basic methodology, which they called the “dual economy” approach, Albrecht and Richardson (1990) compared the Sales variability with the variability of NI (and three other measures of performance) for firms they classified into a “core” and “periphery” sector to investigate whether smoothing behavior differs systematically between firms in the two sectors. In our perspective, the ‘dual economy’ approach is a variation on the “income variability” approach and, accordingly, the income-smoothing literature contains the “classical” and “income variability” approaches as the two competing methodologies for empirical work.

Several criticisms of previous studies can be overcome by finding a preferable methodology. Such a methodology could be developed using the classical approach more carefully, shifting to the income-variability approach, or developing a new approach. A preferable methodology would contain at least three elements. First, inasmuch as smoothing is a temporal phenomenon, a preferable methodology would be based on time-series data, as Eckel recommended, and would be longer than a short two-year period, as Ronen and Sadan (1981) recommended. Either the classical or income variability approaches can readily meet that standard. Second, a preferable methodology would either (a) conduct a sensitivity analysis of the extent to which results depend on a particular model of expectations (perhaps by comparing the results of two expectations models), or (b) not require specification of an expectations model. The income variability approach, which simply compares relative volatility of *ex post* data series, satisfies condition (b). The classical approach could satisfy condition (a), but to our knowledge no study has conducted a sensitivity analysis. Finally, a preferable methodology would not be limited to one or another smoothing instruments. Several classical studies contain various smoothing instruments, e.g., Dascher and Malcom (1970) had four variables and Beidleman (1973) had six, but potential smoothing instruments that were omitted could be important too. A useful trait of the income variability approach is that it is exhaustive in its treatment of smoothing instruments: the appropriate combination of instruments need not be identified under the maintained hypothesis that the data series that is allegedly smoothed, e.g. NI, should exhibit less volatility than the unsmoothed series, e.g., Sales.

The methodology that we use is closest to the income variability approach. This approach has its own limitations. For example, Imhoff (1981, p. 27) notes, “It is not clear whether net income, or EPS, or some other measure of performance is the object of managements’ attempt to smooth.” We investigate whether NI is the object of smoothing because: (1) it is plausible that NI matters to stockholders, creditors and others because NI is so often used as a measure of firm performance by these parties, (2) the steps by which NI is

measured provides management an opportunity to smooth the NI figure, and (3) our results can be contrasted with the work of other studies and methodologies which are largely, though not exclusively, based on NI analysis.

CASH FLOW FROM OPERATIONS VS. NET INCOME

Our novel methodology is based on comparing the variabilities of NI and Cash Flows from Operations (CFO). Inasmuch as we examine the relative volatility of two data series, this study belongs in the income variability approach. However, the CFO data that we compare to NI are new and constitute a contribution to the literature.

It must be stressed that CFO are less subject to accounting manipulation than NI. While selection of GAAP can be employed periodically at management's discretion, CFO are more difficult to obscure through reporting practices over time. Mielke and Giacomino (1993, p. 10) assert that "calculating and using cash from operations removes the distortion caused by comparing the earning of companies that use different depreciation methods and different useful lives for assets>" In agreement, Rappaport (1988) argues that changes in accounting method will not alter a firm's CFO and underlying economic value.

Horwitz (1977, p. 27) noted that real smoothing affects cash flow whereas artificial smoothing does not. Because real smoothing--whether to an appropriate or excessive margin--affects cash flows, our study is not designed to measure the presence or extent of real smoothing. Instead, by comparing the behavior of CFO and NI we investigate whether there is empirical support for artificial smoothing, just as previous studies using the income variability approach tried to detect artificial smoothing comparing the behavior of Sales and NI (or some other measure of income).

Table 1 compares steps by which NI and CFO are derived.³ Although the table shows CFO using NI as a starting point, there are many adjustments to NI to obtain CFO. Some of these adjustments are additions or deletions of the very items that could be used to manipulate NI, e.g., amortization. The adjustment made to NI to obtain CFO are so substantial that CFO and NI are best interpreted as separate and distinct measures. Indeed, empirical studies by Gombola and Ketz (1983) and Thode, Drtina, and Largay (1986) confirm that CFO is a distinct measure of firm performance that is not systematically related to other measures such as NI, i.e., neither one predicts the other. By adjusting for entries by which NI may be manipulated, CFO figures are less subject to manipulation than NI.

The stated basis or justification for previous comparisons of Sales and NI is the premise that Sales cannot be artificially smoothed; we noted above that Eckel (1981, p. 33) claimed "gross sales cannot be artificially smoothed." However, a test of the income smoothing hypothesis by comparing Sales and NI volatilities does not require such a strong justification. Such a comparison only requires that Sales be less subject to artificial smoothing than NI--not that it is impossible to manipulate Sales. Accordingly, if data show that NI is more volatile than Sales, then the income-variability approach has identified the incremental or additional artificial smoothing in NI that is in excess of whatever amount of artificial smoothing is reflected in Sales.

TABLE 1	
Net Income	Cash Flow from Operations (CFO)
Net Sales	Net Income
<u>- Cost of Goods Sold</u>	+ Depreciation
Gross Profit	+ Depletion + Amortization
<u>- Operating Expenses</u>	+ Loss on Disposal or
Net Operating Income	Exchange of Long-Lived Assets
+/- Other Revenues	- Gain on Disposal or
<u>+/- Other Expenses</u>	Exchange of Long-Lived Assets
Net Income from Continuing Operations before Tax	+ Decrease in Non-Cash Current Assets
<u>- Income Tax</u>	- Increase in Non-Cash Current Assets
Net Income from Continuing Operations	
+/- Income Gain/(Loss)	+ Increase in Current Liabilities
on Disposal of Segment (Net of Tax)	<u>- Decrease in Current Liabilities</u>
Net Income before Extraordinary Items	Net Cash Flow from Operating Activities
<u>+/- Extraordinary Gain/(Loss) (Net of Tax)</u>	
Net Income before Changes in Accounting Principle	
<u>+/- Income tax Effect of Change in Accounting Principle</u>	
Net Income	

It is important to distinguish between the premise that Sales is not subject to artificial smoothing and the premise that Sales is less subject to artificial smoothing than NI. The reason the distinction is important is because, contrary to Eckel's allegation, there are in fact opportunities to engage in artificial smoothing of accrual accounting sales figures through latitude in revenue recognition principles. According to Pratt, "Users of financial statements must realize that, even within the guidelines of generally accepted accounting principles, managers can use discretion to speed up or slow down the recognition of revenue. This concern is particularly important for transactions that occur near the end of an accounting period" (Pratt (1997, p. 278)). However, Pratt's observation does not ruin the usefulness of previous studies because the premise they require is simply that Sales is less subject to manipulation than NI.

Analogously, the basis for our comparison of CFO and NI volatilities is that the opportunities for artificial smoothing of CFO are much scarcer than for NI. CFO can be manipulated on a very short-term basis, e.g., by withholding payment until the next accounting period or accelerating the collection of receivables. However, there is rarely an incentive to engage in such short-term two-period manipulation: all such manipulations will reverse in the following period when payment must be made or receipt will be foregone (Pratt (1997, pp. 629-93)). CFO does not lend itself to manipulation nearly as much as NI.

At a minimum, we consider our comparison of CFO and NI volatilities to be an important supplement to previous studies that compared Sales and NI volatilities. In fact, our

study may be even more useful than previous ones. Although both Sales and CFO are less subject to manipulation than NI, the opportunities to engage in artificial smoothing of CFO are even scarcer than for Sales. Whereas CFO manipulation of one period is reversed in its successive period, the discretionary timing of revenue recognition can be repeated in a string of periods, i.e., the results of one period's Sales manipulations are not automatically reversed in the successive period. If CFO has less artificial smoothing than Sales, then our comparison of CFO and NI volatilities will be able to detect the (incremental) artificial smoothing of NI better than previous studies, i.e., our comparison is a stronger test for income smoothing.

The Statement on Financial Standards 95 (SFAS 95) became effective in 1988. SFAS 95 requires that firms supplying statements of income and financial position also provide a statement of cash flows. Some firms were already providing such statements a few years prior to 1988, but at that time such disclosure became mandatory. The statement of cash flows is separated into three components: cash flows from operating, investing and financing activities. Thus, only recently has reliable CFO data, prepared in agreement with GAAP, been widely available from publicly-held companies for use in time-series study.

If the smoothing hypothesis is correct, one would expect that a firm's NI (which management is allegedly trying to smooth) should show less volatility than the firm's CFO (which management is unable to influence easily). Our study is similar to other studies in the income variability literature in that the volatility of two series is compared. Our study differs from previous work in that we use the recently-available CFO figures.

Our study does relate to previous empirical work by Belkaoui (1983) who compared the variability of accrual based Earnings Per Share/Price per share (EPSP) with the variability of Cash Flow per share/Price per share (CFP) and found the coefficients of variation for EPSP to be greater than those for CFP. Belkaoui surmised that EPSP numbers are more susceptible to smoothing, and concluded (1983, p. 306) "It may be stated that first the income smoothing is easier and more dramatic with income figures than balance sheet and cash flow data, and second, managers may have a greater incentive in smoothing income figures given the stronger links between accounting income and the firm's reward structure."

Importantly, Belkaoui's finding that EPSP shows greater variability than CFP is at odds with our finding that CFO shows greater variability than NI. It does not seem likely that the difference between findings is due to our use of total dollar figures and Belkaoui's conversion of accrual and cash flow data to a per share basis and then dividing by stock price; after all, Belkaoui makes the same adjustment to both the earnings and cash flow variables. A possible explanation for the difference is that our study is based on actual CFO data reported in each firm's filings and constructed by each firm using a standardized procedure from SFAS 95. In contrast, Belkaoui's study for 66 firms for the 1959-77 period makes use of COMPUSTAT data for a variable that was labeled "Cash Flow" but in fact may be a surrogate due to the unavailability of actual CFO data from these firms for the period under study.

SAMPLE SELECTION AND TESTING

Let NI_{it} represent Net Income for firm i in year t , and CF_{it} represent Cash Flow from Operations for firm i in year t . Our sample selection procedure began with a list of the Fortune 500 companies ranked on the basis of Sales in 1988 (Fortune, April 1989). We attempted to gather NI_{it} and CF_{it} for each company for the eight-year period of 1986-1993. The main source was the Wilson Disk series that contains financial disclosure data for major corporations. Not all data were available for all years for all companies on the Wilson Disks. To the extent possible, we supplemented the Wilson Disk data with data gleaned from firms' Annual Reports.

For 327 Fortune 500 companies we obtained NI_{it} for each year in the 1986-93 period. For 183 of those firms we had CF_{it} data for all eight years as well. For the remaining 144 firms, CF_{it} was available for six years (1988-1993) for 78 firms, and seven years for 66 firms (1987-1993 for 62 firms; 1986-1992 for 4 firms).⁴ Our data set is extremely large. Most studies consider a few dozen firms for relatively short sample periods. To our knowledge, the previous study with the largest data set was done by Belkaoui (1983) who had 1254 firm-year observations for 1959-77. In contrast we gathered 2394 firm-year observations for CF_{it} and 2616 firm-year observations for NI_{it} on 327 firms.

According to the income smoothing hypothesis, NI_{it} should exhibit less volatility than CF_{it} at least "on average" for the "typical" firm (not necessarily for each and every firm in the sample). Testing the hypothesis requires (1) a method for measuring volatility, and (2) a statistical test for whether the null hypothesis of no difference in volatilities can be rejected. We use two different methods for measuring volatility to ensure that our conclusions are robust. We implement the more familiar income variability method, which Section 5 explained is based on coefficients of variation (CVs), after first introducing another method for measuring volatility.

The standard deviation of the growth rate of a time-series is a common way to measure volatility in business cycle analysis, but to our knowledge it has not been used before in studies of income smoothing. By this measure, a series with no volatility will exhibit a constant growth rate for which the standard deviation is zero; such a series follows an *exponential* time trend precisely. In the CV method, a series with no volatility lies along a *linear* time trend.

The annual growth rates for a firm's NI_{it} were computed as

$$(1) G(NI_{it}) = 100 * (NI_{it} - NI_{i,t-1}) / |0.5 * (NI_{it} + NI_{i,t-1})|$$

and the annual growth rates for a firm's CF_{it} were defined analogously.⁵ The percentage differences in (1) were multiplied by 100 to remove decimals from figures reported below.

Next we obtained standard deviations of the annual growth rates for each series.⁶ Let $\sigma_i = SD[G(CF_{it})] - SD[G(NI_{it})]$ for $i = 1, \dots, 317$. The data for a firm are consistent with the income smoothing hypothesis if $\sigma_i > 0$. For illustration, we consider A.O. Smith for the sole reason that it precedes other firms alphabetically. For 1986-93 A.O. Smith had $SD[G(CF_{it})]$ of 62 (the average $G(CF_{it})$ happened to be 18), while the firm's $SD[G(NI_{it})]$ was 383 (with an average $G(NI_{it})$ of -43), making $\sigma_i = -321$.⁷ The negative σ_i for A.O. Smith shows that, in

contrast to the smoothing hypothesis, the volatility of its CF_{it} was less than the volatility of its NI_{it} .

Diff. Of Std. Dev. Growth Rates of CF and NI	Number of Firms
Less than -1000	32
-1000 to -800	4
-800 to -600	8
-600 to -400	16
-400 to -200	33
-200 to 0	149
0 to 200	65
200 to 400	7
400 to 600	5
600 to 800	2
800 to 1000	1
Over 1000	5

Table 2 shows a tabular distribution of δ_i for the 327 firms in the sample. The sign of δ_i is positive for 85 firms, 65 of which had δ_i is between 0 and 200. The data for these 85 firms are consistent with the income smoothing hypothesis. However, these firms constitute only 26% of the sample. For 242 firms there was a negative δ_i , i.e., for 74% of the firms $SD[G(CF_{it})]$ was actually smaller than $SD[G(NI_{it})]$, as in the case of A.O. Smith considered above. The average value of δ_i in the sample is -488.⁸

Because the data on the two variables $SD[G(CF_{it})]$ and $SD[G(NI_{it})]$ pertain to the same set of firms, the data can not be considered two independent samples of 327 observations each. Instead, we have a single sample that consists of 327 paired observations. A Lilliefors test for normality was conducted on the 327 sample values of δ_i (Keller, Warrack and Bartel (1990, pp. 628-631)). The null hypothesis that δ_i is distributed normally was rejected at the 5% confidence level, and the alternative hypothesis that δ_i is not normally distributed was accepted⁹ Due to the lack of normality, we do not conduct a t-test on whether the sample mean of differences of -488 is significantly different from zero. Instead we turn to nonparametric methods which do not require that δ_i be normally distributed: the sign test and the Wilcoxon signed rank sum test for matched pairs of observation (Keller, Warrack and Bartel (1990, pp. 594-613)). The advantage of the sign test is its simplicity of design and interpretation. The

advantage of the Wilcoxon test is that it incorporates the cardinal property of the data. We perform in total four tests: a sign test and a Wilcoxon test for each of the two measures of volatility that we use.

The sign test is straightforward. Under the null hypothesis H_0 the variabilities of CF_{it} and NI_{it} are the same, so that the probability that $\epsilon_i > 0$, given by p , and the probability q that $\epsilon_i < 0$ both equal 0.5. The alternative hypothesis H_A , which is based on the notion that firms engage in income smoothing, is that $\epsilon_i > 0$ for the typical firm, in which case $p > 0.5$. Let x be binomially-distributed variable of the number of firms with a positive ϵ_i . Under H_0 , x will be about $(0.5)(327)$ or 163 firms whereas under H_A x will be larger than $(0.5)(327)$ by a statistically significant amount. Because for 85 firms $\epsilon_i > 0$, the test statistic for the sign test is given by $(85 - (0.5)(327))/[(0.5)(1-0.5)327]^{1/2} = -8.68$. The negative value of the test statistic shows that H_0 can not be rejected in favor of H_A at any level of confidence whatsoever. In other words, before a test can show that x is larger than $(0.5)(327)$ by an amount that is *statistically significant* (at some level of confidence), x must exceed $(0.5)(327)$ in the first place. In contrast, x is only 85. In not one of our four tests are we able to accept H_A that CF_{it} is more volatile than NI_{it} .

The number of firms with a positive ϵ_i is so much smaller than $(0.5)(327)$ that the difference can not be attributed to random chance: at the 95% confidence level the null hypothesis that $p = 0.5$ is easily rejected in favor of the alternative hypothesis $p < 0.5$, i.e., the volatility of CF_{it} is less than the volatility of its NI_{it} for the typical firm. The result that CF_{it} is less volatility than NI_{it} is the converse of what the income smoothing hypothesis predicts.

For the Wilcoxon test, the absolute values of the 327 ϵ_i were calculated and ranked. The sum of the ranks for which $\epsilon_i < 0$ is $T^- = 43,352$ while the sum of the ranks for which $\epsilon_i > 0$ was only $T^+ = 10,276$. We reject the null hypothesis of $\epsilon_i = 0$ and accept the alternative hypothesis that $\epsilon_i > 0$ only if the ranks of the positive differences between $SD[G(CF_{it})]$ and $SD[G(NI_{it})]$ are large, i.e., only if T^- is small. Therefore, our test statistic is T^- at 43,352. Because our sample size of 327 is so large (far above the n of 50), the test statistic is approximately normally distributed with an expected value of $n(n+1)/4$ at 26,814 and a standard deviation of $[n(n+1)(2n+1)/24]^{1/2}$ at 731,799. The usual standardized test statistic is $(43,352 - 26,814)/731,799 = 0.027$ which at the 95% confidence level is not even close to being numerically small enough to reject H_0 in favor of the alternative hypothesis that CF_{it} is more volatile than NI_{it} . (The standardized test statistic must be numerically less than -1.645 for the null hypothesis to be rejected in a one-tailed test at a 95% confidence level.)

Our second method for measuring volatility uses coefficients of variations (CVs) from the income variability approach. We begin by showing why it is important to use CVs rather than the standard error of residuals.

A simple model that contains a linear time trend is:

$$(2A) \quad CF_{it} = A_{0i} + A_{1i}(\text{TIME}) + u_{it}, \quad u_{it} \sim N(0, \sigma_{ui}^2)$$

$$(2B) \quad NI_{it} = B_{0i} + B_{1i}(\text{TIME}) + v_{it}, \quad v_{it} \sim N(0, \sigma_{vi}^2)$$

where both the intercept and the time-slope (for each series) is firm-specific. One might hypothesize that a firm's data are consistent with the income smoothing hypothesis if $u_i - v_i > 0$ for the firm, i.e., if the OLS residuals (around trend) of the allegedly smoothed NI_{it} series have a smaller standard error than the residuals (around trend) of the CF_{it} series. However, the model specified in (2A) and (2B) ignores an important difference between the magnitudes of the two series, a difference that invalidates the simple comparison of standard errors.¹⁰

Let the average over time of a firm's NI_{it} be given by NI_i and the average across firms of NI_i be given by $E[NI_i]$; CF_i and $E[CF_i]$ are defined analogously. A major feature that distinguishes the two series is that CF_{it} tends to be much larger than NI_{it} . For the sample, CF_i ranges from a low of -44 (for Zenith) to 11,376 (for General Motors), with a sample average $E[CF_i]$ of 561.¹¹ Meanwhile, NI_i ranges from -1,487 (for General Motors) to 4,954 (for Exxon), with a sample average $E[NI_i]$ of 197. The firm-by-firm difference between CF_i and NI_i ranges from -64 (for Tosco) to 12,863 (for General Motors), with the average across firms of $E[CF_i - NI_i]$ at 364. Because averages are linear combinations of data, $E[CF_i - NI_i] = E[CF_i] - E[NI_i]$. Thus, the $E[CF_i]$ of 561 far exceeds $E[NI_i]$ of 197 by 364. In relative terms, the percentage difference is 184% or, stated another way, $E[CF_i]$ is nearly triple $E[NI_i]$.¹²

The CV is a measure of relative dispersion that is typically defined as the ratio of a variable's standard deviation to the mean of the variable (Mason, p. 176). The CV ratio is defined in order to make comparable the dispersions of two variables whose magnitudes differ substantially, e.g., the weights of elephants and mice. However, in contrast to comparing animals' weights, it is important for our time-series study to recognize that a firm's CF_{it} and NI_{it} each vary around (firm-specific) trends. Therefore we define the CV as the standard error of the trend-based OLS residuals--taken from (2A) and (2B)--relative to the mean of the series, in absolute value.¹³ The CVs for CF_{it} and NI_{it} are:

$$(3A) CV_i^{CF} = 100 * u_i / |CF_i|$$

$$(3B) CV_i^{NI} = 100 * v_i / |NI_i|$$

where u_i and v_i are obtained from the regressions specified in (2A) and (2B). We adjusted the usual definition of CV by using absolute values because the CV has a denominator to correct for the differences in magnitudes; the sign is not of interest. For 3 firms CF_i were negative and NI_i were negative for 38 firms (3 of which also had the 3 negative CF_i). The absolute values in (3A) and (3B) parallels their use in the growth rates in (1).¹⁴

Again we consider A.O. Smith for illustration. For the 1986-93 period, v_i was 22 (million dollars) and NI_i was 14 (million dollars), making CV_i^{NI} 150, i.e., the dispersion of the data around the trend were 150% of the series average. In contrast, u_i was 26 (million dollars) and CF_i was 68 (million dollars) making CV_i^{CF} 38. The CF_{it} data for A.O. Smith exhibit less variability than the firm's NI_{it} data when measured in terms of relative dispersion by the CV. Therefore, it does not matter whether variability is measured for A.O. Smith using standard deviations of growth rates or using CVs: by either measure, its CF_{it} show less variability than its NI_{it} . It turns out that the same conclusion holds for the sample as a whole.

Let the differences in CVs for a firm be given by

$$(4) D_i = CV_i^{CF} - CV_i^{NI}, I = 1, \dots, 327$$

The data for any one firm are consistent with the smoothing hypotheses when $D_i > 0$.

Diff. Of C.V.s of CF and NI	Number of Firms
Less than -1000	13
-1000 to -800	6
-800 to -600	2
-600 to -400	13
-400 to -200	35
-200 to 0	197
0 to 200	58
200 to 400	1
400 to 600	0
600 to 800	0
800 to 1000	1
Over 1000	1

Table 3 shows a tabular distribution of D_i . The number of firms for which $D_i > 0$ is only 61, which is even lower than the 85 firms for which the difference in the standard deviations in growth rates, σ_i , was positive. Fewer than 19% of the firms have a positive D_i consistent with the income smoothing hypothesis. The average value of D_i in the sample is -302.

A Lilliefors test for normality rejects the null hypothesis that D_i is distributed normally, a result that parallels the same result described earlier for the distribution σ_i .¹⁵ The results of sign tests for D_i are also similar: the test statistic of $(61 - (0.5)(327)) / [(0.5)(1-0.5)327]^{1/2} = -11.34$ has a negative sign, which precludes rejecting H_0 (at any level of confidence) and accepting the alternative that CF_{it} is more volatile than NI_{it} . As before, the null hypothesis that there is no difference in volatilities can easily be rejected in favor of the hypothesis that CF_{it} is less volatile than NI_{it} , the converse of the income smoothing hypothesis. The Wilcoxon test signed rank sum test on D_i also reaches similar conclusions. The sum of the ranks for which $D_i < 0$ is $T^- = 48,260$, which is even larger than the 43,352 found for $\sigma_i < 0$ case, while the sum of the ranks for which $D_i > 0$ was $T^+ = 5368$, which is even smaller than the 10,276 found for the $\sigma_i > 0$ case. Again, we reject the null hypothesis of $D_i = 0$ and accept the alternative hypothesis that $D_i > 0$ only if the test statistic T^- at 48,260 is sufficiently small. The standardized test statistic is now $(48,260 - 26,814) / 731,799 = 0.0293$ which again fails to reject the null hypothesis.

All four of our statistical tests lead confirm that NI_{it} is not larger than CF_{it} by an amount that is statistically significant. In fact, in contrast to the income smoothing hypothesis, CF_{it} shows greater volatility than NI_{it} by an amount that is statistically significant.

CONCLUSION

We reviewed the theories that allege managers have both the opportunity and the motive to engage in artificial smoothing. We used data for 327 firms for Net Income and Cash Flow from Operations to calculate the volatility of each series for each firm. We measured volatility using the standard deviation of annual growth rates and the coefficient of variation of deviations from trend. The use of alternative measures of volatility means that our conclusions are not sensitive to which measure is used. We conducted sign tests, which ignore cardinal properties of the data because the sign tests simply counted the number of firms for which one series is more volatile than the other. We conducted Wilcoxon signed rank sum test for matched pairs of observation, which is a test that does incorporate the cardinal properties of the data. Regardless of which measure of volatility measure or which test we used, we could not reject the null hypothesis of no difference in volatility in favor of the alternative hypothesis that Cash Flow from Operations is more volatile than Net Income. In fact, the hypothesis that Net Income is more volatile was found to have statistically significant support from the data.

We were surprised by the outcome of our tests. We had thought that the Net Income series, which so many researchers allege is “smoothed” by management, would at least be more volatile than Cash Flows because the latter are so much more difficult to manipulate, and because of the empirical work by Belkaoui (1983). Prior to our empirical work we did not know whether the difference would be statistically significant or not, but we had thought that the difference would at least be consistent with the income smoothing hypothesis. The converse result--that Net Income is more volatile than Cash Flows--calls for further research to develop a model of the firm that is consistent with these findings.

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ENDNOTES

1. Similarly, Beidleman (1973, p. 653) writes that "Smoothing of reported earning may be defined as the intentional dampening of fluctuations about some level of earnings that is currently considered to be normal for a firm." However, the term "normal" earnings easily lends itself to the interpretation that "normal" earnings are a constant. If, on average, a firm's earnings rise over time, would not stockholders and other parties consider a rising level of earnings to be "normal"? Accordingly, we adopt Copeland's definition and its phrase "variation from trend." In empirical testing we use variation around trend as one of our measures of volatility.
2. Gordon (1964, p. 253) wrote that a principle "is a basis of valuation (a rule for assigning a money figure to an asset, equity, and/or income statement category) which may be used to govern the analysis of a class of transactions. Illustrations are current cost, declining charge depreciation, capitalization of long-term leases, and the expensing of research and development outlays."
3. There are direct and indirect methods for measuring CFO that yield identically equivalent figures. FASB recommended the direct method through the cash account. The indirect method, which is the method shown in Table 1, is in common use due to its greater ease.
4. Estimated CF_{it} volatilities for the 144-firm subgroup are measured with less precision than for the 183-firm subgroup because for the former only six or seven of CF_{it} are available. However, their estimated CF_{it} volatilities are still unbiased, and the precision with which CF_{it} volatility is measured does not directly enter our methodology. Our simple comparisons of NI_{it} and CF_{it} volatility are therefore unhindered by the paucity of CF_{it} data for some firms.
5. One aspect of (1) requires a more extended discussion. Note that the average of the successive NI_{it} and NI_{i-1} figures was converted to an absolute value. Such a practice is unnecessary in most business cycle applications for which output figures or indexes can not be negative. In our study data can be negative. If, for example, NI_{it} were to be negative in two successive years but to increase, drawing closer to zero, the growth rate would of course be positive. If absolute values were not used then the denominator in (1) would be negative and incorrectly calculate a negative growth rate. To avoid that problem we made use of absolute values for the base.
6. It must be kept in mind that we are not examining whether CF_{it} grows more quickly than NI_{it} , but instead whether the annual growth rates of CF_{it} -- whatever their values--show relatively greater volatility as measured by the standard deviation.
7. Inasmuch as standard deviations are measured in the same units as the data, which here are annual growth rates, the standard deviations and their differences are in percentages.
8. The sample's average \bar{g}_i of -488 is mathematically identical to the difference between the sample's average values for $SD[G(CF_{it})]$ of 191 and $SD[G(NI_{it})]$ of 679.

9. The Lilliefors for normality is similar to the better-known Kolmogorov-Smirnov test, although the latter can be applied to any hypothesized distribution. The Lilliefors test compares for each i the sample cumulative distribution functions $S(i)$ to the hypothesized normal $F(i)$. The test statistic is the largest difference between $F(i)$ and $S(i)$ in absolute value. For the sample the test statistic is 0.356 while the critical value for rejection of the null hypothesis at the 95% confidence level is $0.886/\text{SQRT}(327) = 0.049$.
10. Across firms in the sample the average difference of $\ln u_i - \ln v_i$ happens be -65, which we report only for completeness.
11. In our data, NI_{it} and CF_{it} and are measured in thousands of dollars. However, we report figures here in millions of dollars; the precision of six figures is given up for the clarity of three.
12. Because percentage differences and ratios are nonlinear in the data, the percentage difference between $E[\text{CF}]$ and $E[\text{NI}]$ differs from the average of the firm-by-firm percentage differences. While the former is 184%, the latter is 372%. The 372% figure is far larger than even the 184% figure in part because for some firms NI_i is close to zero, making the percentage difference extremely large and raising the sample average to 372%. However, the 372% figure is in its own way artificially low, because for those firms with $\text{NI}_i > \text{CF}_i$ the percentage difference would be negative: the sample average of the absolute values of the percentage differences is a remarkable 553%.
13. If the trend were to be ignored, the CV as it is usually defined would use the standard error of OLS residuals obtained from regressing the series on a constant alone; naturally, exclusion of the trend would result in different OLS residuals with a different standard error than what our procedure uses.
14. One might imagine that a third approach for measuring volatility would be to convert each series from its "natural" units to an index, thereby correcting for the magnitude-effect, and then simply compare the standard errors of the OLS residuals from regressing the two index-based series on time trends. A proof is omitted, but it is straightforward to show that the index-based approach and the CV approach in fact yield identically equivalent figures so long as the denominator of the CV is the denominator of the index (rather than having different bases, e.g., using some given "base year" for the index while the uses the mean for the CV). Accordingly, we have implemented only two approaches for measuring volatility.
15. The test statistic was 0.412 which exceeds the critical value of 0.049.

ESCALATION OF COMMITMENT AND ITS EFFECT ON CAPITAL BUDGETING: A REVIEW OF THE LITERATURE

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ABSTRACT

This paper reviews past research on escalation of commitment and its effect on capital budgeting decisions made by managers. The study of escalation behaviors exhibited by managers is important to the field of accounting accountants design information systems that provide information useful to managers in their decision making activities. Accountants are also involved in establishing and enforcing the investment monitoring activities within organizations. Developing an awareness of escalation and how it affects managerial decision making is necessary in order for management accountants to effectively perform their roles as providers and monitors of information.

INTRODUCTION

It is commonly accepted among capital investors that "projects be selected, continued or terminated based on their net present values (NPV)" (Statman and Caldwell, 1987). Investment decisions are typically future focused. In other words, decision makers exhibit prospective rationality. Often, however, when a financial setback occurs individuals become focused on past events; they exhibit retrospective rationality. They attempt to recoup losses or sunk costs by allocating additional funds to a failing project when NPV rules suggest withdrawal from the project (Conlon and Leatherwood, 1989). This increased commitment of resources to projects performing below expectations is termed escalation (Staw, 1976).

Escalation of commitment to a course of action, often called entrapment, has been the topic of many studies in the fields of psychology, social psychology and organizational behavior during the past two decades. More recently, other disciplines such as accounting, economics and finance have attempted to explain why individuals seem to "throw good money after bad" (Staw, 1976) by emphasizing economically rational explanations for the phenomenon. The purpose of this article is to review past research on escalation of commitment. The review of escalation will focus on the following areas: (1) psychological explanations for escalation (2) economically rational explanations for escalation (3) prospect theory, information framing and escalation (4) monitoring and escalation (5) effect of individual differences on escalation (6) effect of group decision making on escalation and (7) contradictory research. The article concludes with a summary and some directions for future research. A summary of the sources for empirical results included in this review is provided in Table 1.

Table 1

SUMMARY OF SOURCES OF EMPIRICAL EVIDENCE (Referenced to parts of the paper)**Introduction**

Staw, 1976

Statman and Caldwell, 1987

Conlon and Leatherwood, 1989

Psychological Explanations for Escalation

Festinger, 1957

Aronson, 1968

Gerard, 1968

Cooper, 1971

Staw, 1976

Wicklund and Brehm, 1976

Leatherwood and Conlon, 1987

Staw and Fox, 1977

Staw and Ross, 1978

Fox and Staw, 1979

Staw, 1980

Staw and Ross, 1980

Staw, 1981

Bazerman, Beckun, and Schoorman, 1982

Caldwell and O'Reilly, 1982

McCain, 1986

Staw and Ross, 1987

Barton, Duchon and Dunegon, 1989

Walsh and Henderson, 1989

Ruchala, Hill and Dalton, 1993

Economically Rational Explanations for Escalation

Fox and Staw, 1979

Staw and Ross, 1980

Ross and Staw, 1986

Kanodia, Bushman and Dickhaut, 1989

Harrison and Harrell, 1993

Harrell and Harrison, 1994

Klimek, 1996

Prospect Theory, Information Framing and Escalation

Arkes and Blumer, 1985

Whyte, 1986

Bateman and Zeithaml, 1989

Conlon and Leatherwood, 1989

Table 1 (Continued)

Prospect Theory, Information Framing and Escalation (continued)**Kahneman and Tversky, 1979****Thaler, 1980****Staw, 1976****Rutledge and Harrell, 1993****Schaubroeck and Davis, 1994****Monitoring and Escalation****Statman and Caldwell, 1987****Kanodia, Bushman and Dickhaut, 1989****Gordon and Myers, 1991****Smith, 1993****Klimek, 1996****Effect of Individual Differences on Escalation****Aronson, 1968****Staw and Ross, 1978****Caldwell and O'Reilly, 1982****Eaton and Rosen, 1983****Bateman, 1986****Schaubroeck and Williams, 1993a****Schaubroeck and Williams, 1993b****Effect of Group Decision Making on Escalation****Bazerman, Giuliano and Appelman, 1984****Whyte, 1991****Whyte, 1993****Rutledge, 1994****Rutledge and Harrell, 1994****Contradictory Research****Bowen, 1976****Staw, 1976****Conlon and Wolf, 1980****Singer and Singer, 1985****Bateman, 1986****McCain, 1986****Kernan and Lord, 1989****Brody and Lowe, 1995****Heath, 1995****Klimek, 1996****Summary****Ross and Staw, 1986****Staw and Ross, 1987****PSYCHOLOGICAL EXPLANATIONS FOR ESCALATION**

Research on escalation of commitment developed from the seminal work of Festinger (1957) who suggested that cognitive dissonance motivates behavior. Staw (1976) began the current stream of research on escalation by applying Festinger's theories in an organizational context. The paper's title, "Knee Deep in the Big Muddy", has become a phrase often used to describe actions by individuals who feel trapped in a course of action. Festinger (1957) developed the theory of cognitive dissonance which is based on the premise that individuals strive toward consistency of beliefs. Individuals tend to rationalize away occurrences that may not be consistent with prior beliefs. It is the unsuccessful rationalization attempt that is interesting to psychological theorists. Individuals not successful in maintaining consistency, referred to as consonance, may experience "psychological discomfort". This inconsistency, which leads to discomfort, is termed dissonance. The following are Festinger's basic hypotheses (1957, p. 3):

1. The existence of dissonance, being psychologically uncomfortable, will motivate the person to try to reduce the dissonance and achieve consonance.
2. When dissonance is present, besides trying to reduce it, the person will actively avoid situations and information which would likely increase the dissonance.

The term cognition refers to "any knowledge, opinion, or belief about the environment, about oneself, or about one's behavior" (Festinger, 1957, p.3). Cognitive dissonance, then, is a condition that leads to dissonance reduction.

Gerard (1968) pointed out that a choice must be difficult and important for the psychological discomfort that leads to the need for dissonance reduction to occur. Wicklund and Brehm (1976) also expanded dissonance theory by describing two components of dissonance: commitment and responsibility for the commitment. Cooper (1971) hypothesized that for responsibility to occur, an individual must be able to choose between opposing options and negative consequence associated with each option must be foreseeable. If either condition is not met, dissonance should not be aroused. The more difficult and the more important the choice is, the more committed an individual may become. Commitment exists when an individual is unable to reverse a decision, when the psychological costs of doing so are great, or when there are future reward/punishment implications inherent in the decision.

Aronson (1968) stressed that dissonance theory does not view man as a rational animal but as a rationalizing animal who attempts to appear rational to both himself and others. The psychological need to justify actions to oneself, called self-justification, is summarized as follows:

Individuals are motivated by a competence drive. They seek to predict and control their immediate environments and to attain particular goals they have set for themselves. The more subject to a competence motive, the more susceptible one

is to forces that run counter to rationality. It is a need to demonstrate rationality that leads to justification processes (Staw, 1980, p.55).

Staw (1976) was one of the first to relate escalation of commitment to an organizational setting. He drew from the psychology literature on cognitive dissonance in his attempts to test the hypothesis that both level of responsibility and type of outcome are related to self-justification. A financial decision case was administered to 240 undergraduates randomly assigned to either high or low responsibility and positive or negative outcome conditions. Each subject was asked to make a decision to continue to fund a particular product division or to use the funds elsewhere. Results indicated that there were significant main effects for both responsibility and outcome condition as well as an interaction effect. High responsibility groups allocated more to the initial project than to alternate projects. Negative outcome groups also allocated more to the original project, and those in the high responsibility/negative outcome condition allocated the most funds to the original project. For low responsibility, there was no significant difference between amounts allocated to the initial project versus an alternative. Staw concluded that in a failing course of action, those personally responsible for the original decision will escalate commitment to the project via additional funding because of the need to justify to oneself that a prior decision was rational. The decision maker's hope is that with further funding, the project will turn itself around and again yield profitable returns. Several other researchers have reported similar findings regarding the importance of escalation (Staw, 1981; Caldwell and O'Reilly, 1982; Staw and Ross, 1987).

Ruchala, Hill and Dalton (1993) theorized that responsibility is important to the escalation cycle, but they purported that this variable was not operationalized appropriately in previous studies. In most studies, the "responsible" subject makes the original choice and also decides whether to continue the project in the face of negative results. In contrast, the "not responsible" subject only enters the experiment for the second decision. A different subject makes the original choice. Per Ruchala, Hill and Dalton (1993), the fact that some subjects enter the decision context mid-stream could cause confounding due to task framing and differences in belief revision between the two types of subjects. They used a more specific variable called personal identification, where a loan officer advocates initiating a loan relationship. To remove confounding concerns, all subjects made the initial decision to loan funds. After receiving additional information suggesting that the loan was a mistake, those same subjects were asked to make a subsequent decision regarding whether to continue the loan relationship. Those personally responsible did escalate to a greater degree. Greatest escalation occurred when personal identification existed and blame for a failing loan relationship could be diffused (i.e., loan committee concurred with officer's view). If personal identification was present with no avenues to diffuse blame (i.e., sole responsibility for initial loan approval) escalation diminished. These results may be institution specific as the banking industry has in place a detailed loan monitoring system.

Many studies have addressed issues compatible with those of Ruchala, Hill and Dalton (1993). Staw and Ross (1978) found that managers who attribute the cause of failure to exogenous factors tend to escalate commitment. Barton, Duchon and Dunegon (1989) reported

that responsible subjects given positive feedback (exogenous cause of failure) chose to escalate more often than those given negative feedback (endogenous cause of failure). However, a predicted interaction between feedback type and level of commitment was not supported in a laboratory experiment conducted by Walsh and Henderson (1989). In a case scenario where a strike by union members caused failure of a project (Leatherwood and Conlon, 1987), responsible subjects who could diffuse blame (strike deemed unforeseeable) chose to withdraw. Those who were responsible for the initial decision to fund the project and should have foreseen the possibility of a strike tended to escalate. This contradicts Ruchala, Hill and Dalton's (1993) findings.

Staw and Fox (1977) expanded the Staw (1976) study by testing whether escalation continues to occur over time. Results were consistent with Staw (1976) in that those who were responsible did commit significantly more funds. Those subjects in the high efficacy condition also committed more funds while those labeled less effective did not escalate. Overall, escalation did decrease over time, but the pattern found was not linear over the three-year period. McCain's (1986) empirical results also suggested that escalation occurs earlier in the investment cycle, but a process of de-escalation begins later.

Fox and Staw (1979) continued the stream of research that seems to support a self-justification theory for escalation tendencies, but they found evidence of an additional motivation to continue committing funds. Individuals are motivated to externally justify actions. The data gathered suggest that "trapped" administrators are most likely to escalate commitment rather than change behavior due to both job insecurity and policy resistance. Those experiencing job insecurity or resistance to policy invested the most funds in apparently losing courses of action. The authors concluded that when worried about political vulnerability, administrators are less flexible in decision making. It seems that more funds were committed when need for external justification was high. The need to justify actions to oneself was apparently secondary.

An attempt to explain why external justification plays such a vital role in administrative decision making was made in a study that examined reactions of observers to decision successes and failures (Staw and Ross, 1980). Administrators, business students and psychology students were used as subjects to test the importance of both consistency and success in decision making. Administrators who were both consistent and eventually successful were rated highest regarding leadership effectiveness. Although all subjects viewed consistency as important, administrator subjects placed more value on consistency than student subjects did.

Escalation has been found in settings other than the typical laboratory study where decisions focus on allocation of funds. Bazerman, Beckun, and Schoorman (1982) applied the self-justification theory in a performance evaluation context. When responsible for promoting a "failing" employee, managers were more likely to escalate commitment toward that employee by giving a more positive review and a more optimistic projection of future performance. Three reasons were cited for such responses:

1. Perceptual processes may be biased because negative cues are not fully acquired.
2. Negative cues may be acquired but weighted differently due to biased judgmental processes.
3. Negative cues may be acquired and weighted properly but the decision maker may simply not be willing to publicly contradict a prior decision.

Bazerman, Beckun, and Schoorman (1982) concluded that the need to justify to themselves or others that prior decisions were rational may induce individuals to distort their mental processing in an effort to appear rational (points 1 and 2 above). Distorting information to others is also suggested as a consequence of the need to justify ones actions (point 3 above). Caldwell and O'Reilly (1982) recorded evidence that supports this view. They found that the selective use of information may be a conscious effort to manipulate signals sent to others in an effort to manage others' interpretations of the failure. Justification attempts are thought to include management of communication as well as simple persistence of behavior. Distortion of information has accounting and agency theory implications that will be discussed later in this chapter.

In summary, a psychological explanation for escalation of commitment stresses that justification processes are invoked when an individual takes responsibility for making a difficult choice that proves to be failing. That the individual is responsible implies an opportunity to choose between alternatives and that consequences of actions are foreseeable. The stronger the commitment, which is a function of choice and foreseeability, the greater the resistance to change or the greater the tendency to escalate. Escalation by a decision maker leaves open the possibility for future success from a now failing course of action. Such a success would serve to justify one's actions to himself and thus reduce psychological dissonance. The need to justify past decisions may also stem from pressure by external sources (e.g., public surveillance and sanctions by others). Like self-justification, external justification may promote escalation behaviors. Continued funding of failing projects may give others a more positive impression of the decision maker if eventual success occurs than if that decision maker admitted failure early without trying to rectify the bad situation. From a psychological viewpoint, a model explaining an individual's tendency to escalate should include the decision maker's need for self-justification and for external justification.

ECONOMICALLY RATIONAL EXPLANATIONS FOR ESCALATION

Kanodia, Bushman and Dickhaut (1989) [referred to as KBD throughout the remainder of the paper] presented an alternate explanation for escalation behavior. Although they do not deny the importance of psychological factors, KBD designed a model that explains escalation behavior based on economic rationality alone. Their model, based on assumptions from agency theory, explains escalation behavior as "part of a larger phenomenon of hiding private information on human capital" (1989, p.60). The main elements of their explanation are: (1) information on the desirability of switching is private to the decision maker; (2) this

information is also related to the unobservable talents of the decision maker; (3) these talents are inferred by others in society from observation of the decision maker's actions; (4) these inferences affect the future opportunities of the decision maker; (5) managers have limited liability; and (6) manager and firm are risk neutral (although not a key assumption, per KBD).

KBD's model suggests that responsibility is important. Only those managers who are responsible for decision-making should suffer reputation effects if a project fails. Their model further suggests that only if there exists potential reputation effects will escalation occur. A manager may be shielded from negative reputation effects because of his employment contract or because it is almost certain that he is talented. In this case, there should be no need to justify past decisions in an effort to "look good" and thus no cause for escalation.

A manager's private information regarding future events has the potential to reveal to the labor market whether that manager is talented or untalented. Per KBD, if the information can be concealed through escalation, the negative effects on future expected wages will be reduced. They theorize that switching projects in stage 2 has the greatest negative effect on a manager's future expected wage because the switch reveals without question that the manager made an incorrect decision in stage 1. Those managers who escalate and subsequently exhibit low performance receive higher current-period expected income and higher future expected wages than those managers that chose to switch immediately. Therefore, escalation should be unambiguously preferred to switching.

As with no reputation effects, with no private information, escalation should not occur. KBD's theory suggests that when information is publicly accessible, there is no benefit derived from escalation. Information regarding a manager's stage 1 decision is already available to the labor market so negative reputation effects associated with a suboptimal decision have supposedly already affected the manager's future expected wages. Several findings of previous studies indirectly support the model developed by KBD. Effects of job insecurity on commitment to a course of action were measured by Fox and Staw (1979). Their results revealed that those who were insecure in their positions tended to escalate more than other less insecure subjects. According to KBD, if reputation for talent is not certain, switching signals an untalented manager; those who are insecure should choose to escalate. Staw and Ross (1980) found that managers who were consistent (did not switch) were rated higher than those who switched courses of action by both student and executive raters. Those who were consistent and were eventually successful were rated highest. This pattern is the same pattern described by KBD in their escalation model. Although these results originated in a laboratory setting, KBD postulates that employers (or potential employers) generate comparable rankings. Events surrounding British Columbia's decision to host a world's fair have also been described using an escalation framework (Ross and Staw, 1986). Here, political costs to the Premier was one variable used to explain why the fair was not canceled even after initial estimates of a \$78 million cost skyrocketed to \$1.5 billion. Again, KBD suggest that termination of the project would have led unambiguously to negative reputation effects on the part of the Premier; while escalation postponed such negative effects.

Two recent studies (Harrison & Harrell, 1993; Harrell & Harrison, 1994) tested the theory developed by KBD. The first analysis compared an experimental group with a control

group. Experimental group cases provided both private information and an incentive to shirk. Control group cases provided no private information and no incentive to shirk. The experimental group exhibited significantly greater escalation than the control group although it was reported that the more negative the results of prior decisions, the less escalation occurred.

Harrell and Harrison refined their design in the 1994 study. A 2 X 2 between groups factorial design was employed using two levels of private information and two levels of incentive to shirk. Main effects for privately held information and interaction effects for incentive and information were significant and in the direction predicted by KBD. Contrary to the results of Harrell and Harrison, a study by Klimek (1996) showed no significant escalation of commitment even when both private information and personal reputation effects were present. Klimek concluded that use of a more complete and realistic task resulted in better decision making by subjects and thus little tendency to escalate commitment.

PROSPECT THEORY, INFORMATION FRAMING AND ESCALATION

Prospect theory has been used by several researchers to explain the actions of decision makers faced with negative feedback on investment choices (Arkes and Blumer, 1985; Whyte, 1986; Bateman and Zeithaml, 1989; Conlon and Leatherwood, 1989). The major consideration of prospect theory is the way that the decision maker edits or frames the situation (Kahneman and Tversky, 1979). The decision maker either frames a current situation as positive (gain) or negative (loss). Bateman and Zeithaml (1989) summarized the prospect theory explanation of escalation as follows:

Decision makers who receive negative feedback on an earlier decision are at a loss position, and will view the upcoming decision as a choice between the sure loss that has already occurred (i.e., choosing not to continue that course of action with additional investment) and a future loss that is less certain (i.e., risking additional funds in the hope of some positive return). Under this circumstance, decision-makers tend to be risk-seeking, choosing the uncertain loss that offers some hope for improvement (commitment of more funds) over the certain loss (the status quo) (p. 64).

One example of research that supports a prospect theory explanation for escalation is Arkes and Blumer (1985). They presented two problems to a group of college students. Both problems were similar in all respects except that problem 1 included sunk costs. The experiment tested whether the presence of sunk costs affects choice. Problems presented to subjects are replicated below:

Problem 1: (Sunk cost frame)

As president of an aircraft company, you have earmarked \$10 million of the company's money to build a plane that cannot be detected by conventional radar.

When the project is 90 percent complete, another firm begins marketing a plane that is also not radar detectable and that is faster and more economical than your company's product. Should you invest the last 10 percent (\$1 million) to finish your plane?

(41 of 48 respondents chose to complete project)

Problem 2: (No sunk costs frame)

As the president of an aircraft company, you have received a suggestion from one of your employees to use the last \$1 million of your research and development (R & D) funds to produce a plane that cannot be detected by conventional radar. However, another firm has just begun marketing such a plane. It is also apparent that their plane is much faster and economical than the plane your company could build. Should you invest the last million dollars of your research funds to build the plane proposed by your employee?

(10 of 60 respondents chose to complete project)

As predicted by prospect theory, those who were given a scenario that included sunk costs framed the situation as a loss and thus became risk seeking in their choice. Most subjects escalated commitment to the project even in light of negative feedback. Those who were not presented with sunk costs viewed the situation from a neutral position that resulted in significantly fewer subjects choosing to invest in the aircraft. These results represent the "sunk cost effect" (Thaler, 1980).

Whyte (1986) makes a distinction between the prospect theory based explanation for escalation and self-justification approach proposed by Staw (1976). In Staw's theory, responsibility for prior decisions plays an important role in determining whether escalation will occur. Those personally responsible for prior failures are thought to escalate while those not responsible act rationally based on the financial information available. Whyte's prospect theory explanation of escalation suggests that escalation occurs "whenever future choices can reasonably be framed as choices between losses, as after a series of failures" (1986, p. 319). These predictions were partially supported by Rutledge and Harrell (1993) whose laboratory results showed that while both responsibility and frame variables significantly affected decisions, framing of the performance information dominated.

Schaubroeck and Davis (1994) also interpreted their results to support prospect theory. However, level of responsibility did affect outcomes. They found that responsible individuals, when faced with highly risky alternatives, chose reinvestment in the original project in stage 2. Those in the not responsible, high risk condition avoided stage 2 reinvestment.

In summary, it seems that current research supports a prospect theory explanation of escalation. Negatively framed situations induce risk seeking behaviors consistent with escalation of commitment. This temptation is stronger for those responsible for the initial decision to invest in a now failing project.

MONITORING AND ESCALATION

Monitoring includes auditing, budget restrictions, incentive compensation systems and formal control systems. The control phase of an organizations's capital budgeting process, called postauditing, often involves an investment monitoring system, a subset of the broader management accounting system. The purpose of postauditing and the investment monitoring system (IMS) is "to provide ex post information on capital assets and to reduce incentives for inappropriate abandonment decisions" (Smith, 1993). The four primary objectives of investment monitoring include: (1) serving as a financial control mechanism (2) providing information for future capital expenditure decisions (3) removing certain psychological and/or political impediments usually associated with asset control and abandonment and (4) having a psychological impact on those proposing capital investments (Gordon and Myers, 1991, p. 39). Of these four objectives, objective 1 and 3 directly relate to escalation of commitment. The control aspect of postauditing, objective 1, includes gathering information on projects in process to determine whether original projections are being met. As agency theory suggests, the greater information symmetry between principal and agent, the less likelihood that agency problems such as moral hazard will be encountered. From a capital budgeting perspective, the more information gathered by upper level management or outside consultants on how a project is proceeding, the less opportunity a lower level manager has to conceal project failures. In other words, there is less opportunity to escalate commitment to failing projects.

The objective of removing psychological impediments associated with asset control and abandonment is also related to escalation of commitment. As previously noted, individuals who are responsible for making decisions may hesitate to abandon those projects. Having a formal postauditing system in place may reduce psychological barriers if someone other than the original decision maker reviews current project information and is involved with the subsequent decision to abandon the project (Gordon and Myers, 1991).

A formal investment monitoring system is expected to help control conflicts of interest discussed by Kanodia, Bushman and Dickhaut (1989) by providing information about the true state of the project. KBD's model implies that use of groups in stage 2 decision making may eliminate the escalation errors made in individual decision-making settings. If information regarding appropriateness of the stage 1 choice were made available to a group whose mission was to decide whether to terminate a project, then the incentive to escalate by the original responsible individual should be eliminated. When information on the true conditions of a project is publicly available, the probability of abandonment of that project, as opposed to escalation of commitment, is increased (Statman and Caldwell, 1987; Smith, 1993). Smith (1993) found that firms with IMS experienced better market performance associated with abandonment decisions.

Klimek (1996) investigated whether monitoring of individual capital budgeting decisions affects escalation. One-half of the subjects were monitored by another subject whose role was to determine if the manager's actions were appropriate. The other half were not monitored. Choices between the two groups were not significantly different which suggests that reactions to monitoring at the individual level are not congruent with agency theory.

EFFECT OF INDIVIDUAL DIFFERENCES ON ESCALATION

Aronson (1968) noted that a positive self-concept is an important boundary for dissonance theory effects. Dissonance is aroused when an individual who has a positive self-concept is faced with situations that suggest otherwise. If an individual feels incompetent, dissonance is not aroused in failure situations.

Staw and Ross (1978) included three personality scales in their escalation study. Individual levels of dogmatism, ambiguity tolerance and self-esteem were assessed with no significant results. Caldwell and O'Reilly (1982) found that individual differences in personality, specifically self-monitoring, affected whether escalation behaviors were exhibited. Schaubroeck and Williams (1993a, 1993b) also tested personality characteristics in an escalation context. They found that causality orientation (autonomy, control or impersonal) affected the level of reinvestment in failing projects. Of the three orientations, two relate specifically to escalation. Control orientation, where "people seek out, select or interpret events as controlling" (1993a, p. 1305), was positively associated with reinvestment. Impersonal orientation, where people believe "their behavior is beyond their intentional control" (1993a, p. 1305), was negatively associated with reinvestment. Evidently, this personality trait affects the individual's perceived responsibility for the making the original decision to fund a now failing project. In their second study, Schaubroeck and Williams (1993b) tested whether the Type A behavior pattern is related to escalation. They found that individuals displaying Type A behavior characteristics such as impatience, persistence, achievement-striving and high arousal levels had a greater desire to escalate commitment to failing courses of action. Type A people were more prone to justify previous behaviors through escalation.

Age may also indirectly affect the extent to which individuals will escalate. Eaton and Rosen (1983) found that risk aversion of executives decreased with age. Those who continue to invest in failing projects most likely choose the riskier action. It seems then that older executives will have a greater tendency to escalate due to a risk-seeking disposition. Bateman (1986) found significant gender differences in escalation behaviors. Females seemed to de-escalate when causes of failure were endogenous while males' reactions were opposite.

In summary, various personality traits and other individual differences such as age and gender have been associated with escalation in laboratory studies. However, few of the results have been consistently replicated in escalation studies. Effects of these subject-specific factors on escalation should be controlled for as necessary in the design phase of escalation studies.

EFFECT OF GROUP DECISION MAKING ON ESCALATION

Several studies have examined whether escalation occurs in group decision making contexts as well as in individual circumstances. Bazerman, Giuliano and Appelman (1984) examined commitment in group and individual decisions in a role-playing exercise. They found that when groups of four were responsible for initial investment decisions and were later

faced with negative feedback, escalation through allocation of additional funds to the failing investment occurred just as it did for individuals.

Whyte's (1991) results somewhat contradict the findings of Bazerman, Giuliano and Appelman (1984). Group decision making in the stage 1 of the decision making process reduced escalation tendencies in stage 2. Whyte concluded that these laboratory results were achieved due to a diffusion of responsibility for initiating the failing project. Although results showed that escalation was reduced, group responsibility did not eliminate feelings of personal responsibility for the stage 1 decision. Unlike his 1991 study, Whyte's 1993 laboratory experiment used prospect theory to test escalation tendencies. It showed that group decisions reflected similar but intensified trends apparent at the individual level for both frequency and severity of escalation. Rutledge (1994) found that 3-person groups responsible for stage 1 decisions escalate commitment to a greater extent than those groups not responsible for stage 1 choices among investments. In another study, Rutledge and Harrell (1994) found that type of decision maker, group versus individual, was not a significant determinant of escalation behavior. The interaction between both type level of responsibility and situation frame accounted for the results. Specifically, those not responsible for the stage 1 decision who were given positively framed cases escalated the least. On the other hand, those responsible for the stage 1 choice who were given negatively framed cases escalated the most.

In summary, results do not consistently indicate that groups act differently than individuals when making 2-stage investment decisions. Some research suggests that groups perform consistent with individuals (Bazerman, Giuliano and Appelman, 1984; Rutledge, 1994; Rutledge and Harrell, 1994). Other research suggests that groups may react more extremely than individuals (Whyte, 1993). Yet another study presents data supporting the contention that group decision making diffuses responsibility and thus reduces escalation tendencies. Future research will determine which hypothesis best describes escalation of commitment among groups.

CONTRADICTORY RESEARCH

Several studies have been published which seem to suggest that significant escalation results may simply be a product of how the research was conducted. For example, Conlon and Wolf (1980) added opportunity costs to the typical case to present subjects with a more realistic decision environment. This study also incorporated heuristics that may be employed by decision makers in arriving at a particular decision. The authors felt that earlier studies by Staw and his colleagues used ill-structured problems which did not give subjects an opportunity to calculate a solution. It was hypothesized that given a well-structured problem, one that provides the data necessary to calculate a solution, the tendency to escalate would be mitigated. Results indicated that the strategy used, calculating versus non-calculating, significantly affected outcomes. Because of these results, Conlon and Wolf concluded that it was impossible to test for self-justification in those prior studies due to their use of ill-structured problems. Klimek (1996) used a well-structured problem to test for escalation in

a capital budgeting setting. Results indicated that when information necessary to calculate a solution was provided and used, escalation was significantly less likely.

McCain (1986) incorporated specifically defined opportunity costs as part of the escalation case by making available alternative actions. Having other alternatives available reduced escalation; and where escalation did occur, it was limited to early stages of investment. One of the most important conclusions of this study was that uncertainty plays a major role in escalation. As uncertainties are resolved, escalation of commitment seems to decline. A study by Brody and Lowe (1995) tends to support this contention. Actual tax professionals who were well aware of the tax laws and issues surrounding the case, a low uncertainty level, were used in the study on tax related decision making. Even when the professionals were heavily involved with the client, they chose not to escalate commitment. Bateman (1986) stressed that the "fundamental indicator of a person's prospective rationality (or lack thereof) is how information regarding the probability of future outcomes, including information pertaining to decision alternatives, is used" (p. 34). He criticized previous research because of the ambiguity associated with decision alternatives. Subjects were told only that funds not invested would be reserved for future uses. In his study, the success/failure main effect was due mainly to type of probability. Significantly more individuals escalated when the probability of success was high versus low. These results suggest that escalation biases are not at work and that prospective rationality does dominate the decision making process if specific information regarding opportunity costs and probabilities of occurrence are available for use in making an allocation decision.

Singer and Singer (1985) also replicated Staw's (1976) study but found no significant results. The authors concluded that the prior study's small sample, lack of assessment of personality differences and lack of control over the subject's initial feelings regarding allocation may have contributed to misleading results.

Bowen's (1987) paper stands out as the most critical assessment of escalation research to date. He outlines several omissions in Staw's previous studies:

1. reasons for failure
2. future prospects for ongoing research and development efforts
3. size of investment not sufficient to produce results
4. competitor's performance
5. other factors leading to failure such as sales or marketing problems
6. the firm's definition of what constitutes failure of research and development investments
7. other financial data

Because of these omissions, feedback assumed to be negative may not be perceived as negative by subjects. Two criteria are necessary for feedback to be properly classified as negative. Some credible criteria must exist against which to compare raw feedback data. This feedback must predictably indicate that future performance will not meet outcome criteria in the future. Bowen concluded:

Since no definite negative feedback was given about effects of their decisions, one might easily conclude that prior research on escalation makes it difficult to detect whether subjects reinvested in their experimental courses of action because of the psychological manipulation or because they felt that they were making the economically prudent decision under equivocal circumstances (1987, p. 56).

The previous escalation results may be based on what Bowen called "very difficult decision dilemmas" due to uncertainty surrounding decisions where definite feedback was not available. Bowen felt that such findings should not be attributed to errors or biases without further testing. One study that combined specific feedback and explicit goals, together hypothesized to generate the greatest amount of effort by individuals, did not produce the results expected by Bowen (1987). Kernan and Lord (1989) found that specific failure feedback led to escalation only when the perceived effort necessary to achieve goals was not too large. When a failure rate was low, escalation occurred as predicted in previous studies; but when failure rate was high, individuals did not escalate. As indicated by Bateman above, individuals may escalate only when the perceived probability of success is large enough to be economically feasible.

Another study by Heath (1995) provided evidence that people are only likely to escalate commitment when they fail to set budgets or when expenses are difficult to track. Heath contends that previous escalation research dealt with "incidental" investments that are difficult to track. When individuals were given explicit information on total income and total costs, errors of de-escalation occurred. Subjects used "mental" accounting and were reluctant to continue investing when total costs exceeded total benefits, even when such choice was optimal. Previous studies suggested that escalation should have occurred. Heath concluded that escalating commitment is not a universal reaction to sunk costs.

Apparently, the methods employed in laboratory experiments affect results. The inconsistencies documented above suggest that researchers must use caution when developing cases intended to mimic real decision making settings. Administering cases where pieces of information are missing, information usually present in typical decision making situations, may cause subjects to respond in a manner not consistent with reality.

SUMMARY

The large quantity of competing research on escalation of commitment suggests that less is known about escalation of commitment than is commonly thought. Some researchers have attempted to determine whether escalation is due to a psychological need to rationalize past behaviors to oneself or others. Some have tried to explain escalation from the viewpoint of decision framing. Others believe that escalation does not necessarily suggest a decision "error" but may be justified based on pure economic rationality. Yet another group of researchers contends that the decision contexts in many studies represented decisions dilemmas where no "right" answer was obtainable due to ambiguous or unavailable information. Also, the level of uncertainty associated with outcomes and individual personality differences could potentially be mediators of escalation. No theorist has produced a clearly superior model of escalation. This suggests that possibilities for future research in the area of escalation of commitment are quite promising.

Staw and Ross (1987) proposed that a more viable approach to development of a model that represents the causes of escalation involves an integration of theories. Their escalation prototype begins with an initial decision made by an individual. That decision was presumably made using concepts closely related to expected utility or economic rationality. If failure feedback is received, the theory suggests that psychological factors (e.g., the need to justify to oneself that prior decisions were rational) induce errors in the calculation of gains and losses associated with future outcomes. These calculation errors lead to escalation of commitment to a previously chosen project. Social forces (e.g., external pressures and sanctions) may also lead an individual to persist in a course of action if socially induced personal costs of withdrawal are perceived to outweigh the costs of escalation. This latter perception is associated with agency theory. Lastly, structural forces may eventually cause continued escalation. Structural forces enter the model at a macro level and relate to other outside parties who may be indirectly affected by escalation. Staw and Ross (1987) theorize that individuals eventually find themselves trapped due to the possibility of negative effects on others if withdrawal occurs. Ross and Staw (1986) used actual events surrounding the 1986 World's Fair to illustrate the applicability of their four-step model of escalation in a real administrative setting.

Although the above model clearly does not incorporate all the reservations mentioned by researchers in the area of escalation, it seems to provide a good basis for continuing the pursuit for an integrated escalation model. Of particular interest is the role agency theory plays in decisions where escalation of commitment is a possible alternative.

DIRECTIONS FOR FUTURE RESEARCH

The area of escalation of commitment to a failing course of action is of concern to the accounting profession for at least two reasons: (1) the profession is responsible for providing useful information to decision makers and (2) the accounting professionals are involved in establishing and enforcing the investment monitoring activities within firms. Therefore, the results of all studies in the area must be carefully evaluated and expanded upon so that a better understanding of the escalation process is obtained. Results discussed earlier reflect

contradictory findings. For example, while some studies support agency theory as an explanation for escalation, others indicate that the presence of reputation effects and private information do not significantly affect a manager's tendency to escalate commitment to a previously chosen project. More research using agency theory is called for. Comparisons should also continue to be made between economically rational explanations for escalation, such as agency theory, and psychology-based explanations for this behavior.

Another area that needs attention in the future deals with the decision making process or the way people make decisions. Research should be directed at determining which methods individuals choose to use in making decisions and why some choose calculating methods and others choose non-calculating methods to reach their conclusions. Naturally, the accountant's role in persuading managers to use more economically rational approaches to decision making should be emphasized in the future research. Also, future studies should utilize subjects who are well equipped to use net present value techniques in decision making. This control is necessary to reduce noise created when subjects use intuition or "gut instincts" to make their abandonment decisions instead of financially sound methods such as net present value.

The area of escalation of commitment is important to the accounting profession. Accountants act as providers of useful information to business organizations as well as monitors of the use of that information by organization members through their roles as financial analysts, internal auditors and controllers. Therefore, it is essential that the profession continues to conduct research to determine how the providing of information and the monitoring of that information can be used to reduce escalation tendencies by decision makers within the organization.

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APPLICATION OF THE SPECIAL CONSTRAINED MULTIPARAMETRIC LINEAR PROGRAM TO PORTFOLIO SELECTION DECISIONS

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ABSTRACT

The need exists for a "tool" which will permit the investor to combine the different types of investments in such a way as to minimize investment risk and maximize investment returns while satisfying individual preferences. This research suggests that the Special Constrained Multiparametric Linear Program (SCMLP) is superior to other approaches to the portfolio selection process when the individual preferences of investors extend beyond the dimple risk to total return tradeoff. The unique feature of the SCMLP model that allows for a single ranking of individual preferences versus the necessity of assigning absolute weights is highlighted.

INTRODUCTION

Individual investors who are faced with portfolio selection decisions may choose from diversification techniques which range from the most simple and naive forms to more highly complex schemes requiring quadratic programming. Regardless of the technique employed, it is widely recognized that the foremost goal of most investors is a common one: to achieve the maximum rate of return at the level of risk considered appropriate for the individual investor's portfolio.

While the risk to total return tradeoff is important, investors do exhibit individual references for other investment features as well. This is evident when one considers the many types of investments available from which to choose. Some investments offer maximum growth potential in capital appreciation; some periodic income distributions; some liquidity; and still others some combination of all the above.

Given the myriad of investment opportunities available to the individual investor, the need exists for a "tool" which will permit the investor to combine the different types of investments in such a way as to minimize investment risk and maximize investment returns while satisfying individual preferences. The purpose of this research is to demonstrate how the Special Constrained Multiparametric Linear Program (SCMLP) model can facilitate this complex decision process in such a manner as no other method can.

The next section of this research explores some of the widely accepted theoretical and practical means that have been devised to make portfolio selection decisions. The third section presents the SCMLP and related theory. The fourth section demonstrates how the SCMLP may be employed in the portfolio selection decision process. Finally, the last section provides a summary and the conclusions of this research.

THEORETICAL BACKGROUND: PORTFOLIO SELECTION TECHNIQUES

The classical model for portfolio analysis was developed by Markowitz (1952). The theoretical substance of the Markowitz model is brilliant and is rightfully accepted in finance literature. However, its practical usage is limited by the following factors:

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| <ol style="list-style-type: none"> (1) (2) (3) | <p>The quadratic programming solution procedure requires a considerable amount of computer time and space.</p> <p>The complexity of the model makes it difficult to explain to an individual user.</p> <p>The Markowitz model focuses only on risk and total returns and does not consider other individual preferences.</p> |
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Various attempts have been made to overcome the practical problems posed by the Markowitz model. For instance, Sharpe's single index model greatly simplifies the solution procedure and the time and cost of obtaining a solution. However, this approach may not lead to the optimal mean - variance portfolio and does not take into consideration other preferences of individual investors (Sharpe, 1963).

A variation of Sharpe's single index model, developed by Elton, Gruber, and Padberg (1976), uses the risk measure from Sharpe's model (BETA) in a returns to risk ratio which is then used to determine the proportion of the portfolio to be invested in each asset. In fact, Burgess and Bey (1988) demonstrate that the Elton, Gruber, and Padberg procedure is effective in estimating the Markowitz efficient portfolio and can be an effective screening procedure for large number of securities. Again, however, regardless of the simplification and effectiveness of the Elton, Gruber, and Padberg approach, individual references for investment factors other than risk and total returns are not taken into consideration in the portfolio selection process.

The literature is also replete with articles on linear programming approaches to portfolio selection and optimization which do take into consideration the individual preferences of investors (e.g., Lee & Lerro, 1973; Beazer, 1976; Mitchell & Rosebery, 1977; Courtney, 1979; Avery; Hodges & Schaefer, 1977). One major drawback of the linear programming procedure in portfolio selection is that the individual investor must place weights on his preferences.

Though not a linear programming approach, Smith presents an arithmetic algorithm as a suggested approach to a quantitative solution of the problem of individual preferences in portfolio selection. As an example, he suggests that an individual investor first weight four

attributes (liquidity, income, capital appreciation, and safety) according to his preferences. Then the investor examines four asset types (savings account, corporate bonds, common stock, and real estate) as to their suitability with respect to each attribute. The final step is to weight the suitability measures for each asset with the preferences of the individual, attribute by attribute, in order to get an overall measure for that asset type. Each of the four attributes is desirable to the individual, hence, the weighted-suitability measure for each asset is an overall index of suitability based on the unique set of preferences. However, by the author's own admission, many individuals may not feel comfortable with a precise set of relative weights reflecting their preferences (Smith, 1974).

A more workable approach for making multiasset portfolio decisions based on individual preferences can be derived using the SCMLP model. In contrast to the absolute numerical weights necessary in the approach used by Smith, the SCMLP formulation requires only that the investor order his preferences with respect to the attributes and that he define a ranking as to the suitability of each asset type with respect to each attribute. The manner in which the SCMLP model works after these individual preferences have been ranked is dealt with in the following sections of this research. The next section presents the theoretical development of the SCMLP followed by a demonstration of how the SCMLP could be applied to the portfolio selection problem.

THE SPECIAL CONSTRAINED MULTIPARAMETRIC LINEAR PROGRAM

A major task in the development of realistic linear programming models is determining and stating the exact numerical value of the objective function coefficients. Obviously, many situations exist where the interdependencies in an economic model as described by a linear programming problem are not fixed or known with certainty. In practice, the available data is often too vague or unreliable to be applicable in a strict delineation of the model. The inexactitude of information concerning the objective function coefficients necessitates deriving some method to handle the more general and realistic situation. This formulation will be termed the Special Constrained Multiparametric Linear Program (SCMLP).

In this model, the objective function coefficients in a linear program are constrained in a manner similar to the decision variables. These constraints may be such that they bound the coefficients in some fashion, or they may simply be an ordering of the values. Thus, the model of interest can be expressed as

$$\begin{array}{ll}
 \text{Maximize: } & c^T X \\
 \text{subject to: } & Ax \leq b \\
 & x \geq 0 \\
 & Gc \leq d \\
 & c \geq 0
 \end{array}$$

The unknown column vectors c and x are of dimension n . The matrix A of constant coefficients is of order (m,n) , and G is an (s,n) matrix of known constants. The vectors b and d are assumed to have nonnegative constant elements of which at least one is non-zero with b having dimension m and d being an s -component vector.

It should be noted that the SCMLP can be formulated as a quadratic programming problem. Letting $t^T = (x^T, c^T)$ the model can be expressed as follows:

Maximize:	$\frac{1}{2}$	t^T	O	I	t
subject to:	A	O	I	O	b
	O	G	$t \leq$	d	
	$t \geq 0$				

where I is an (n, n) identity matrix.

This particular formulation seems to present a viable solution method. Unfortunately, the SCMLP is not a convex programming problem. Thus, any quadratic programming solution procedure will be very complicated and time-consuming to employ and will not guarantee convergence to the global optimum. Consequently, an alternate procedure for solving the problem shall be derived that employs the far simpler and relatively efficient simplex method.

The purpose of the algorithm is to simultaneously determine the optimal objective function coefficients and decision variables that solve the SCMLP. The process begins by determining an initial feasible vector of coefficients c_i . A vector of decision variables, (x_i) is then derived such that it maximizes the objective function with the set (c_i) . If the function is not at the global maximum, a new (c) can be found that increases the value of the objective function at (x_i) . The procedure continues in this manner until the point is reached where there no longer exists any other vector of objective function coefficients that will increase the value of the objective function with the associated decision variables and vice-versa and simultaneously satisfy the constraint set.

In the next section, the SCMLP model is demonstrated in the portfolio selection process. A more detailed exemplification of the solution method is presented there.

A DEMONSTRATION OF THE PORTFOLIO SELECTION PROCESS USING THE SCMLP MODEL

Earlier in this research, the Smith (1974) model for investment selection was discussed. In that discussion it was claimed that the SCMLP model could best achieve the desired objectives of the Smith model and applications of linear programming procedures to the portfolio selection process without the necessity of having the individual investor place absolute

weights on his investment preferences. The following example demonstrates how the SCMLP model would work using the same individual preferences (liquidity, periodic income, capital appreciation, and safety) and asset types (savings accounts, corporate bonds, common stock, and real estate) used by Smith in his research.

The process begins by questioning the individual as to his relative preferences concerning the four attributes. Define $c^T = (c_1, c_2, c_3, c_4)$ to be a vector of weights or rankings on the attributes liquidity, income, appreciation, and safety respectively such that the sum of the (c_i) is one. The weights may be of the form $c_1 \leq 2c_2$, or $c_1 \geq .1$, or $c_3 + c_4 \leq .3$, or they may be some simple ordering such as $c_1 \leq c_2 \leq c_3 \leq c_4$, which implies that the investor prefers safety to appreciation, appreciation to income, and income to liquidity. These relationships form a set of constraints of the form $Gc \leq d$.

Next the investor must examine the four asset types as to their suitability with respect to each attribute. These variables are defined as follows:

Liquidity	Income	Appreciation	Safety	Asset
w_1	x_1	y_1	z_1	Savings Account
w_2	x_2	y_2	z_2	Corporate Bonds
w_3	x_3	y_3	z_3	Common Stock
w_4	x_4	y_4	z_4	Real Estate

where $w_i = 1$, $x_i = 1$, $y_i = 1$, and $z_i = 1$.

As before, the individual may use some simple ordering of his preferences or concepts with respect to some attribute and how the four asset types correspond. For example, an individual may feel that a savings account is more liquid than corporate bonds implying that $w_1 \geq w_2$. Proceeding in this manner defines a set of constraints of the form $At \leq b$, with the inclusion of the norming restrictions, where $t^T = (w^T, x^T, y^T, z^T)$.

Since the preference orderings are independent, the portion of the investor's nonconsumed wealth that he will want to hold in each asset type will be as follows:

Savings account:	$w_1c_1 + x_1c_2 + y_1c_3 + z_1c_4 = SA$
Corporate bonds:	$w_2c_1 + x_2c_2 + y_2c_3 + z_2c_4 = CB$
Common Stock:	$w_3c_1 + x_3c_2 + y_3c_3 + z_3c_4 = CS$
Real Estate:	$w_4c_1 + x_4c_2 + y_4c_3 + z_4c_4 = RE$

Thus, SA is the percentage of one's nonconsumed wealth that should be invested in a savings account given the individual's preference for the four attributes and his perception of how a savings account corresponds with respect to these attributes. The quantities CB, CS, and RE can be defined similarly.

Next, an initial set of values are derived for c_1, c_2, c_3 and c_4 which satisfies the $Gc \leq d$ constraints. The values chosen for c_1, c_2, c_3 , and c_4 serve only as a starting point to derive an initial set of coefficients for the objective function. The summation of these values must equal one. The w 's, x 's, y 's and z 's ($w_1, w_2, w_3, w_4, x_1, x_2, x_3, x_4, y_1, y_2, y_3, y_4, z_1, z_2, z_3, z_4$) are the sixteen decision variables presented in the initial formulation of the linear programming models. The initial set of coefficients (c_{0i}) for the decision variables is derived by multiplying c_1, c_2, c_3 , and c_4 by each of the expected returns associated with the four investment categories as follows:

$c_1r_1 = c_{01}$	$c_2r_1 = c_{05}$	$c_3r_1 = c_{09}$	$c_4r_1 = c_{013}$
$c_1r_2 = c_{02}$	$c_2r_2 = c_{06}$	$c_3r_2 = c_{010}$	$c_4r_2 = c_{014}$
$c_1r_3 = c_{03}$	$c_2r_3 = c_{07}$	$c_3r_3 = c_{011}$	$c_4r_3 = c_{015}$
$c_1r_4 = c_{04}$	$c_2r_4 = c_{08}$	$c_3r_4 = c_{012}$	$c_4r_4 = c_{016}$

where: r_1 = expected return on a savings account
 r_2 = expected return on corporate bonds
 r_3 = expected return on common stock
 r_4 = expected return on real estate holdings

Next, the original $Gc \leq d$ constraints must be reformulated in terms of c_0 by substituting c_0/r in place of c . Accordingly, the $Gc \leq d$ constraints are redefined by $Wc_0 \leq h$. The $Wc_0 \leq h$ relationships constrain the coefficients (c_{0i}) in the objective function. The $At \leq b$ relationships constrain the decision variables (w_1, x_1, y_1, z_1). The formulation of the SCMLP is presented:

Maximize	$c_{01}w_1 + c_{02}w_2 + c_{03}w_3 + c_{04}w_4 + c_{05}x_1 + c_{06}x_2 + c_{07}x_3 + c_{08}x_4 + c_{09}y_1 + c_{010}y_2 + c_{011}y_3 + c_{012}y_4 + c_{013}z_1 + c_{014}z_2 + c_{015}z_3 + c_{016}z_4$
subject to	$At \leq b$
	$t \geq 0$
	$Wc_0 \leq h$
	$c_0 \geq 0$

The simplex method is used to solve the SCMLP problem. Initially, the optimal w_i, x_i, y_i , and z_i values are derived that satisfy the constraints at $At \leq b$. Next, the optimal w_i, x_i, y_i , and z_i values are used as the objective function coefficients to find the optimal (c) values that satisfy the constraints $Gc \leq d$. The next (c) values are then used to find the optimal w_i, x_i, y_i , and z_i values subject to the original $At \leq b$ constraints. This process will continue back and forth until the solution to the simplex method yields the (c) values and w_i, x_i, y_i , and z_i values that will maximize total portfolio returns. These values are then substituted in the formula

(shown earlier in this section) to solve for the portion of the individual's nonconsumer wealth to hold in each asset type (for example: $SA = w_1c_1 + x_1c_2 + y_1c_3 + z_1c_4$).

SUMMARY AND CONCLUSION

This research suggests that the SCMLP model is superior to other approaches to the portfolio selection process when the individual preferences of investors extend beyond the simple risk to total return tradeoff. Additionally, the unique feature of the SCMLP model that allows for a simple ranking of individual preferences versus the necessity of assigning absolute weights is highlighted. Problems associated with applying portfolio selection techniques ranging from the Markowitz Quadratic Programming Technique to the Smith Simple Arithmetic Algorithm are discussed. This research shows how the problems of the other approaches are mostly overcome by the SCMLP model.

The other approaches that are used in the portfolio selection process are wrought with one or more of the following four problems:

- (1) Costly to implement.
- (2) Complex and difficult to explain.
- (3) Do not take into consideration the individuals preferences of investors.
- (4) Required absolute weights to places on individual preferences.

The SCMLP model, which is explained in this research in a portfolio selection environment, certainly overcomes the problems associated with individual preferences, is not costly to implement, and is not as complex and difficult to explain (as the Markowitz Quadratic Approach).

Finally, the question remains: How can the SCMLP model be applied to the "real world" of portfolio selection? As an example; a retail investment broker, trained in the use of the SCMLP, could interview a client with respect to the client's investment objectives and preferences for various investment features plus empirical data for various types of investments, a portfolio could be designed. This portfolio design could be the general framework from which the client's available funds would be allocated. As conditions in the market or the client's individual preferences change, the SCMLP model could be reformulated to determine if adjustments need be made in the portfolio makeup. The decision process would certainly be enhanced by the use of the SCMLP model.

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