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ACADEMY OF ACCOUNTING AND FINANCIAL STUDIES JOURNAL

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LETTER FROM THE EDITORS

Welcome to the *Academy of Accounting and Financial Studies Journal,* an official journal 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 disciplines of accounting and finance.

Dr. Michael Grayson, Jackson State University, is the Accountancy Editor and Dr. Denise Woodbury, Southern Utah University, is the Finance Editor. Their joint mission is to make the *AAFSJ* better known and more widely read.

As has been the case with the previous issues of the *AAFSJ*, 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.

The Editors work to foster a supportive, mentoring effort on the part of the referees which will result in encouraging and supporting writers. They will continue to 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.

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Michael Grayson, Jackson State University

Denise Woodbury, Southern Utah University

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AN ASSOCIATION BETWEEN THE REVISION COEFFICIENT AND THE PREDICTIVE VALUE OF QUARTERLY EARNINGS IN FINANCIAL ANALYSTS' EARNINGS FORECASTS

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ABSTRACT

This study provides further evidence regarding the predictive value of quarterly earnings in improving the forecasts of annual earnings. It is hypothesized that the revision coefficient is positively related to the predictive value of quarterly earnings information. The revision coefficient is a magnitude of earnings forecast revision in response to actual quarterly earnings information releases, which is measured by a regression coefficient of forecast errors over forecast revisions. The predictive value is a measure of quarterly earning information's impact on the accuracy of annual earnings forecasts, which is measured by total improvement (TI) in the accuracy of annual earnings forecasts for one year and by relative improvement (RI) in the accuracy of annual earnings forecasts for each quarter.

Empirical tests on this hypothesis are conducted using the Value Line analysts' earnings forecast data about 235 sample firms over a five-year period. The test results show the followings. First, the accuracy of annual earnings forecasts increases as additional quarterly reports become available, which is consistent with many previous studies on this issue (see Lorek [1979], Collins and Hopwood [1980], Brown and Rozeff [1979b],and Hopwood, McKeown and Newbold [1982]). Second, the revision coefficient is positively related to both of TI & RI, which supports the hypothesis. These results are robust across different forecast error metrics, and statistical methods.

INTRODUCTION

Ever since Green and Segall [1966,1967] did pioneering works, numerous researchers in accounting have examined the predictive value of quarterly earnings in forecasting annual earnings (E.G., Abdel-Khalik and Espejo [1978] and Brown, Hughes, Rozeff and Vanderweide [1980], Lorek [1979], Collins and Hopwood [1980], and Brown and Rozeff [1979b] and Hopwood, McKeown and Newbold [1982]). Using various time-series models and data, these studies found that the accuracy of analysts' annual earnings forecasts improves with the release of quarterly earnings information,

which is intuitively appealing because annual earnings are temporal aggregation of four quarterly earnings. Previous studies also identified systematic and time persistent differences in analysts' earnings forecast accuracy, but have not explained why the differences exist. In other words, how quarterly earnings affect the forecast accuracy was not well documented in the previous research (E.G., Clement [1999], Hope [2003], Clement et. al. [2003], Gleason & Lee [2003]).

Thus, the objective of this study is to examine this issue of how quarterly earnings affect the accuracy of analysts forecasts. To be specific, it is to investigate the impact of the revision coefficient on the predictive value of quarterly earnings. The revision coefficient is a magnitude of earnings forecast revision in response to actual quarterly earnings information releases, which is measured by a regression coefficient of earnings forecast errors over earnings forecast revisions. This coefficient may vary with the quality and quantity of new information revealed through the quarterly earnings announcement. The predictive value is a measure of quarterly earning information's impact on the accuracy of annual earnings forecasts, which is measured by total improvement (TI) in the accuracy of annual earnings forecasts for one year and by relative improvement (RI) in the accuracy of annual earnings forecasts for each quarter.

It is hypothesized that the revision coefficient be positively related to the predictive value of quarterly earnings information.

Empirical tests on this hypothesis are conducted using the Value Line analysts' earnings forecast data about 235 sample firms over a five-year period. The test results are consistent with the hypothetical prediction that the revision coefficient is positively related to the predictive value of quarterly earnings (i. e., positive relationships with both of TI & RI). Besides it, the results show that the accuracy of annual earnings forecasts increases as additional quarterly reports become available, which is consistent with many previous studies on this issue (see Lorek [1979], Collins and Hopwood [1980], Brown and Rozeff [1979b], Hopwood, McKeown and Newbold [1982]). These results are robust across different forecast error metrics, and statistical methods.

The remainder of this paper is organized as follows. Chapter 2 describes hypotheses development, which is followed by a discussion on sample selection and methodology for testing the hypotheses in Chapter 3. Empirical results from the hypotheses tests are presented in Chapter 4, while some concluding remarks appear in Chapter 5.

HYPOTHESES DEVELOPMENT

Financial analysts revise their annual earnings forecasts as new quarterly earnings information is released, because earnings forecasts for a reporting quarter, an integral part of annual earnings forecasts, are replaced by the actual earnings for the same quarter. This revision may vary with the quality and quantity of new information revealed through the actual quarterly earnings announced.

The quantity of new information in the actual quarterly earnings can be measured by the difference between the projected earnings for the reporting quarter and its corresponding actual earnings

(i.e., quarterly earnings forecast error), because more news in the actual quarterly earnings causes the bigger difference. The bigger the quarterly earnings forecast error, the bigger the revision on annual earnings forecasts. In other words, an association between the quarterly earnings forecasts error and the revision on annual earnings forecasts (i.e., the revision coefficient) should be positive.

The quality of new information in the actual quarterly earnings may be reflected on the sensitivity of annual earnings forecast revisions with respect to a given magnitude of quarterly earnings forecast error. Financial analysts place heavier weights on the high quality information than on low quality information when they revise their forecasts on the annual earnings. Thus, the higher the quality of new information in the actual quarterly earnings, the bigger the revision on the annual earnings forecasts. In other words, the revision coefficient should be positively related to the quality of quarterly earnings information.

With the revision, the accuracy of annual earnings forecasts improves, because uncertainties in the annual earnings forecasts decrease as the predicted quarterly earnings in annual earnings forecasts is replaced by the corresponding actual quarterly earnings. And the higher the revision coefficient due to higher quality of quarterly earnings information, bigger the revision on annual earnings forecasts which, in turn, leads to higher accuracy of annual earnings forecasts.

In sum, the predictive value of quarterly earnings, a measure of quarterly earnings' impact on the accuracy of annual earnings forecasts, is positively related with the revision coefficient. This predictive value can be measured either by total improvement in the accuracy of annual earnings forecasts due to all four quarterly earnings (i.e., annual earnings) information (TI) or by relative improvement in the accuracy of annual earnings forecasts due to an individual quarterly earnings information (RI). Since TI is a temporal aggregation of four quarterly RI's, both TI and RI should be positively related to the revision coefficient. Therefore, testable hypotheses herefrom would be

H1: The total improvement (TI) is positively related to the revision coefficient of quarterly earnings.

H2: The relative improvement (RI) is positively related to the revision coefficient of quarterly earnings

METHODOLOGY

This chapter describes sample selection, empirical measures of predictive values and time-series parameters, and statistical methodology used to test the hypotheses.

Sample Selection

Each firm included in this study should satisfy the following selection criteria. (1) Quarterly earnings per share (EPS) data are available in the *Value Line Investment Survey* over the entire estimation and testing period (10 years for estimation and 5 years for testing). (2) Quarterly earnings

forecasts are available in the *Value Line* during the estimation and testing period. (3) Sufficient daily return data are available on the CRSP tape. (4) Each firm's financial information must be included in the COMPUSTAT tapes. (5) Each firm has a fiscal year ending on December throughout the estimation and testing period. And (6) each firm must be in the manufacturing industry with two-digit SIC code between 10 and 39.

The first criterion is used to have enough EPS data for estimating the time-series models. The second criterion to estimate revision coefficients of the time-series model implied by analysts' forecasts. The criteria (3) and (4) are required to ensure the availability of necessary financial and market data. The fifth and sixth criteria are imposed to ensure the comparability of earnings series across firms. The firms in the regulated industries such as Banking, Utilities and Transportation are excluded because they may have earnings processes quite different from the manufacturing firms. As is typical with time-series research in accounting, the familiar 'survivorship bias' applies to the sample because it includes only those firms that have existed for at least 18 years.

The above selection criteria yielded a sample of 235 firms. Table 1 shows the breakdown of the sample firms by industry (two-digit SIC code). Twenty-three industries are represented in the sample. There is clustering in particular industries, notably Chemicals (SIC=28) and Electric Machinery (SIC=36), which account for 15.7% and 13.6% respectively, of the sample firms.

Table 1: Industry Classifications of Sample Firms

Two-Digit SIC Code	Industry Description	Number of Firms
10	Metal Mining	9
12	Coal Mining	3
13	Oil and Gas Extraction	5
14	Nonmetal Mineral	1
16	Heavy Construction	2
20	Food and Kindred	10
21	Tobacco	3
22	Textile Mill	3
24	Lumber and Wood	2
25	Furniture and Fixtures	2
26	Paper	11
27	Printing and Publishing	7
28	Chemicals	37
29	Petroleum Refining	18
30	Rubber	7
32	Stone, Clay and Glass	11

Table 1: Industry Classifications of Sample Firms		
Two-Digit SIC Code	Industry Description	Number of Firms
33	Primary Metal	15
34	Fabricated Metal	9
35	Industrial Machinery	21
36	Electric Machinery	32
37	Transportation Equipment	19
38	Instruments	7
39	Miscellaneous Goods	1
Total		235

Measuring Predictive Values of Quarterly Earnings

The term 'predictive value' is defined here as the improvement in the accuracy of annual earnings forecasts with the release of actual quarterly earnings information. The improvement in the forecasts is measured by the reduction in forecast errors. Two forecast error metrics are used; absolute forecast error (AFE) and squared forecast error (SFE) which are specified as:

$$AFE(Q_\tau)_{iy} = \left| A_{iy} - E(A|Q_\tau)_{iy} \right|$$

$$SFE(Q_\tau)_{iy} = \left(A_{iy} - E(A|Q_\tau)_{iy} \right)^2$$

where A_{iy} = actual annual earnings for firm i and year y, and

$E(A|Q_\tau)_{iy}$ = forecasted annual earnings conditional on τ quarter's earnings for firm i and year y, $\tau = 0,1,2,3$.

These two forecast error metrics are used in this study (i) to examine the sensitivity of the results to different measures of forecast error, and (ii) to be comparable with previous studies which employed this measure. Hereafter, $SFE(Q_\tau)$ will be used for exposition purposes.

The total improvement (TI) in the accuracy of annual earnings forecasts during a year relative to the beginning of the year due to the release of actual quarterly earnings is measured by:

$$TI_{iy} = [SFE(Q_0)_{iy} - SFE(Q_3)_{iy}]/SFE(Q_0)_{iy}$$

Similarly, the relative improvement (RI) in the accuracy of annual earnings forecasts due to an individual quarterly earnings is measured by:

$$RI(Q_\tau)_{iy} = \frac{SFE(Q_{\tau-1})_{iy} - SFE(Q_\tau)_{iy}}{SFE(Q_0)_{iy} - SFE(Q_3)_{iy}}, \tau = 1,2,3$$

The forecasts of annual earnings at the end of each quarter $E(A|Q_\tau)$ are obtained by summing the remaining quarterly earnings forecasts of the year with the actual quarterly earnings of current and previous quarters.

Measuring Revision Coefficient

Recent studies have provided empirical evidence suggesting the superiority of financial analysts over the three 'premier' time-series models in forecasting future earnings (e.g., Collins and Hopwood [1980] and Brown, Hagerman, Griffin and Zmijewski [1987]). Therefore, it would be appropriate to use analysts' earnings forecasts data to measure the revision coefficient and examine the association between the revision coefficient and the predictive value of quarterly earnings. Analysts' forecast data from the *Value Line Investment Survey* were used in this study.

To obtain the revision coefficient, the following regression model was estimated:

$$REV_\tau(t) = \acute{a} + \hat{a}(t)FE_\tau + e \qquad (1)$$

where $REV_\tau(t)$ = the revision of t-quarter ahead *Value Line* forecast at quarter τ,

FE_τ = the forecast error for quarter τ; actual earnings minus the most recent *Value Line* Earnings forecast for quarter τ.

$\hat{a}(t)$ = the revision coefficient.

This adaptive expectation model was used for the following reasons. First, the process by which analysts form their forecasts has not been established in the literature. The model has been used in previous studies to investigate analysts' revision process of annual earnings forecasts (Givoly [1985]) as well as quarterly earnings forecasts (Abdel-Khalik and Espejo [1978] and Brown and Rozeff [1979c]).

Equation (1) was estimated for each firm using immediately preceding 10 years' forecast data to obtain the revision coefficient for each testing year. Both one-quarter and two-quarters ahead forecast revisions were used as dependent variables for all sample firm over five-testing years, which results in total of 2,350 estimates for the dependent variable (2x235x5).

Table 2 presents summary statistics on the estimation results of equation (1) using initial 10 years' forecast data. Panel A reports the mean, standard deviation, and quartile distributions of intercept and slope coefficients, their t-statistics, and R^2s using one-quarter ahead forecast revisions as the dependent variable. The results suggest that in most of the sample firms, the adaptive expectation model adequately represents the analysts' forecast revision process. First, the mean R^2 value of 0.221 indicates that a significant portion of forecast revision is explained by the most recent one-quarter ahead forecast error. Second, the estimated intercepts are small and insignificantly different from zero. Third, the average slope coefficient is 0.329 and it is significant in 190 of the 235 regressions. Furthermore, except for nine firms, the revision coefficients are positive and most of them lie between zero and one.

Panel B of Table 2 shows the summary statistics on the estimates of equation (1) using two-quarter ahead forecast revisions. As expected, there is a decrease in R^2 (an average value of 0.101). Although the descriptive statistics on the revision coefficients using two-quarter ahead forecasts are less informative, they can be used to draw an inference as to which time-series model is most concordant with analysts' forecast revision process.

Table 2: Descriptive Statistics of Adaptive Expectations Model
Estimates Using Analysts' Forecasts [a]
$REV_t(t) = á + â(t)FE_t + å$ [b]

Panel A. One-Quarter Ahead Forecast Revisions

Estimates	Mean	Standard Deviation	Quartiles		
			0.25	0.50	0.75
á	-0.015	0.049	-0.021	-0.006	0.003
t(á)	-0.478	1.243	-1.352	-0.652	0.328
â	0.329	0.257	0.171	0.326	0.465
t(â)	2.926	2.850	1.539	2.782	4.421
R^2	0.221	0.186	0.068	0.177	0.359

Panel B. Two-Quarter Ahead Forecast Revisions

Estimates	Mean	Standard Deviation	Quartiles		
			0.25	0.50	0.75
á	0.001	0.039	-0.006	0.003	0.014
t(á)	0.291	1.308	-0.599	0.409	1.235
â	0.148	0.246	0.011	0.116	0.236
t(â)	1.194	1.509	0.124	1.177	2.118
R^2	0.101	0.121	0.009	0.055	0.146

[a] The summary statistics are based on 235 sample firms.
[b] $REV_t(t)$ = the revision of t-quarter ahead *Value Line* forecast at quarter t.
FE_t = the forecast error for quarter t; actual EPS minus the most recent *Value Line* forecast for quarter t.

Testing Hypotheses

It was hypothesized that both total (H1) and relative (H2) predictive value of quarterly earnings are positively related to the revision coefficient of quarterly earnings. To test these hypotheses, the following pooled cross-sectional and time-series regression models are estimated:

$$TI_{iy} = a_0 + a_1 PARA_{iy} + a_2 \ln(SIZE)_{iy} + \mathring{a}_{iy} \quad (2)$$

$$RI(Q_j)_{iy} = b_0 + b_1 PARA_{iy} + b_2 \ln(SIZE)_{iy} + \mathring{a}_{iy} \quad (3)$$

where TI = total improvement in the accuracy of annual earnings forecasts from incorporating all four actual quarterly earnings,
PARA = revision coefficient of a given quarterly earnings time-series model,
ln(SIZE) = natural logarithm of firm size measured by the market value of equity,
$RI(Q_j)$ = relative improvement in the accuracy of annual earnings forecasts by the Quarter j's actual earnings,
i, y = firm and year index, respectively.

Under these regression models, the hypotheses can be stated as follows:

H1: $H_0: a_1 = 0, \quad H_a: a_1 > 0$
H2: $H_0: b_1 = 0, \quad H_a: b_1 > 0$

Firm size is used as a controlling variable for the following reasons. First, the superiority of financial analysts' forecasts over those by univariate time-series models suggests that information other than publicly available earnings data is useful for forecasting earnings. In fact, several studies have used firm size as a proxy for the availability of other information sources and found that firm size is positively related to the accuracy of earnings forecasts (e.g., Brown, Richardson and Schwager [1987] and Collins, Kothari and Rayburn [1987] among others). Second, evidence by Bathke, Lorek and Willinger [1989] suggests that firm size is positively related to both revision coefficients and the accuracy of one-quarter-ahead earnings forecasts. Thus, the firm size effect should be controlled for to examine the net effect of the revision coefficient on the predictive value of quarterly earnings. The controlling variable, SIZE, is measured by the market value of equity.

As an additional test on H1 and H2, two-way analysis of variance (ANOVA) design was also employed by dichotomizing sample firms according to the magnitude of revision coefficient (high(H) versus low(L) revision coefficient firms), and the firm size (small(S) versus big(B) firms). Under this 2x2 factorial design, H1 and H2 can be stated in null form as follows:

$$\text{H1:} \quad \begin{vmatrix} TI_H \\ TI_S \end{vmatrix} = \begin{vmatrix} TI_L \\ TI_B \end{vmatrix}$$

and

$$\text{H2:} \quad \begin{vmatrix} RI(Q_1)_H \\ RI(Q_1)_S \end{vmatrix} = \begin{vmatrix} RI(Q_1)_L \\ RI(Q_1)_B \end{vmatrix}$$

EMPIRICAL RESULTS

Table 3 presents descriptive statistics of annual earnings forecast errors, which are reported for each conditioning quarter and for both absolute forecast error (AFE) (Panel A) and squared forecast error (SFE) (Panel B). Mean values of AFE and SFE decrease every quarter, which implies that the accuracy of annual earnings forecasts improves, as additional quarterly reports become available. The F-values are 70.562 and 55.499 for the AFE and SFE, respectively. The corresponding χ^2 statistics from the Kruskal-Wallis tests are 455.50 and 454.94, which is statistically significant. Standard deviation of forecast errors decreases as the year-end approaches, which means that analysts converge to a consensus on annual earnings forecasts as more quarterly earnings become available. All these results are robust with respect to the choice of forecast error metric. In sum, the results presented in Table 3 are consistent with the previous studies that the accuracy of annual earnings forecasts increases, as additional quarterly earnings become available.

One-way ANOVA was conducted using analysts' forecasts to test H1 and H2, and the results are reported in Table 4. Panel A provides evidence about the effect of revision on the predictive values of quarterly earnings. The result shows that firms with higher revision coefficients have larger TI's as well as $RI(Q_j)$'s than the firms with lower revision coefficients. The differences are statistically significant ($\alpha<0.10$) using either the F-tests or the Wilcoxon tests. Also, the result is not sensitive to the choice of forecast error metric. Panel B of Table 4 shows the relationship between firm size and predictive values of quarterly earnings. Large firms exhibit consistently larger predictive values (both TI and $RI(Q_j)$) than smaller firms. However, the differences are statistically significant ($\alpha<0.10$) only when AFE was used.

Table 3: Descriptive Statistics of Annual Earnings Forecast Errors Using Analysts' Forecasts [a]

Panel A. Absolute Percentage Error [b]

Quarters Reported	Mean	Standard Deviation	Quartiles		
			0.25	0.50	0.75
0	0.543	0.803	0.060	0.177	0.624
1	0.430	0.712	0.042	0.127	0.413
2	0.310	0.599	0.029	0.084	0.266
3	0.173	0.419	0.013	0.038	0.130

Panel B. Squared Percentage Error [c]

Quarters Reported	Mean	Standard Deviation	Quartiles		
			0.25	0.50	0.75
0	0.517	0.962	0.004	0.031	0.390
1	0.390	0.848	0.002	0.016	0.171
2	0.258	0.693	0.001	0.007	0.071
3	0.129	0.498	0.000	0.001	0.017

[a] The summary statistics are based on 235 sample firms over 5 year testing period.
[b] The absolute percentage error (APE) is defined as APE=|(A-E(A))/A|, where A and E(A) are actual and forecasted annual earnings, respectively. APE greater than 3.00 were truncated to 3.00.
[c] The squared percentage error (SPE) is defined as SPE=((A-E(A))/A)^2. SPE > 3.00 were also truncated to 3.00.

Table 5 presents the results from 2x2 ANOVA to test the effect of revision coefficients on the total predictive value (Panel A) and the relative predictive value (Panel B) after controlling for firm size. Consistent with the univariate results, revision coefficient has a significantly positive effect on both TI and RI(Q_j). Although the significance level is somewhat low (α<0.10), this result lends support to H1 and H2 even after controlling for the effect of firm size.

Table 4: Effect of Revision coefficient and Firm Size on the Predictive Values of Quarterly Earnings: One-Way ANOVA Using Analysts' Forecasts [a, b]

Panel A. The Effect of Revision coefficient

	Absolute Forecast Error		Squared Forecast Error	
Parameter	TI	$RI(Q_1)$	TI	$RI(Q_1)$
Small	0.622(0.407)	0.408(0.286)	0.793(0.386)	0.556(0.300)
Large	0.782(0.304)	0.526(0.235)	0.908(0.259)	0.667(0.237)
F-value	5.82*	6.31*	5.84*	8.07**
Wilcoxon Z	2.24*	2.12*	1.62[i]	2.69**

Panel B. The Effect of Firm Size

	Absolute Forecast Error		Squared Forecast Error	
Firm Size	TI	$RI(Q_1)$	TI	$RI(Q_1)$
Small	0.649(0.393)	0.426(0.278)	0.805(0.379)	0.568(0.299)
Large	0.764(0.337)	0.515(0.259)	0.883(0.291)	0.644(0.251)
F-value	2.91[x]	3.24[x]	2.51	3.63[x]
Wilcoxon Z	2.03*	1.71[x]	0.99	1.57

[a] Analyses are based on pooling data across 235 sample firms and over 5 year testing period. Observations in middle parameter group are excluded.

[b] The numbers reported are mean values with the standard deviation in parentheses. Revision coefficients are the slope coefficients of the regression model (7) and firm size is measured by the market value of equity.

** Significant at a<0.01; * Significant at a<0.05; [x] Significant at a<0.10.

Results from estimating regression model (2) and (3) are presented in Panel A of Table 6. The regression coefficients of the revision coefficient variable, a_1 and b_1, have the expected positive signs and are statistically significant at the α level of 0.05 for AFE and 0.01 for SFE. The regression coefficients of the firm size variable, a_2 and b_2, also have the predicted positive sign but are not statistically significant except for the $RI(Q_1)$ when SFE was used. Regressions models (2) and (3) were again estimated using rank data, and the results are reported in Panel B of Table 6. The general tenor of conclusion remains the same; significantly positive relation of revision coefficient to both total and relative predictive values, which supports H1 and H2. Diagnostic tests for multicollinearity and heteroskedasticity were also conducted using the procedure introduced by Belsley, Kuh and Welsch

[1980] and White [1980], respectively. Test results indicate that neither of these problems presents in our data.

Table 5: Effect of Revision coefficient and Firm Size on the

Predictive Values of Quarterly Earnings:

Two-Way ANOVA Using Analysts' Forecasts

Panel A. Total Predictive Value

	Absolute Forecast Error			Squared Forecast Error		
Source	SS	F-value	p-value	SS	F-value	p-value
Parameter	0.400	3.57	0.0625	0.356	3.69	0.0570
Size	0.247	2.20	0.1420	0.258	2.67	0.1046
Error	8.509			12.258		
R-square	0.071			0.047		

Panel B. Relative Predictive Value

	Absolute Forecast Error			Squared Forecast Error		
Source	SS	F-value	p-value	SS	F-value	p-value
Parameter	0.224	3.61	0.0611	0.234	3.44	0.0660
Size	0.233	3.76	0.0561	0.347	5.09	0.0258
Error	4.703			8.650		
R-square	0.088			0.061		

In sum, results show that annual earnings forecasts become more accurate as additional quarterly reports become available and revision coefficients of quarterly earnings are positively related with both total and relative predictive values of quarterly earnings (TI and RI). These results are robust with respect to the choice of forecast error metric, statistical methodology, forecast data and revision coefficients used.

Table 6: Effect of Revision coefficient and Firm Size on the

Predictive Values of Quarterly Earnings [a]:

$$TI_{iy} = a_0 + a_1 PARA_{iy} + a_2 ln(SIZE)_{iy} + å_{iy} \quad (2)$$

$$RI(Q_j)_{iy} = b_0 + b_1 PARA_{iy} + b_2 ln(SIZE)_{iy} + å_{iy} \quad (3)$$

Panel A. Ordinary Regression Analysis

	Absolute Forecast Error		Squared Forecast Error	
Variables	TI	$RI(Q_1)$	TI	$RI(Q_1)$
Intercept	0.77 (6.298)**	0.54 (6.076)**	0.90 (10.404)**	0.69 (9.856)**
PARA	0.22 (2.511)*	0.15 (2.402)*	0.17 (2.723)**	0.17 (3.262)**
ln(SIZE)	0.024 (1.323)	0.021 (1.544)	0.019 (1.444)	0.022 (2.094)*
R^2 (%)	3.42	4.58	3.22	4.99
F-value	4.135*	4.195*	4.702**	7.432**

Panel B. Rank Regression Analysis [c]

	Absolute Forecast Error		Squared Forecast Error	
Variables	TI	$RI(Q_1)$	TI	$RI(Q_1)$
Intercept	84 (8.264)**	85 (8.351)**	139 (10.764)**	135 (9.856)**
PARA	0.19 (2.589)**	0.18 (2.408)*	0.10 (1.732) $^{\xi}$	0.18 (3.037)**
ln(SIZE)	0.13 (1.752) $^{\xi}$	0.13 (1.752) $^{\xi}$	0.07 (1.197)	0.12 (2.072)*
R^2 (%)	5.49	5.00	1.54	4.56
F-value	5.086**	4.602**	2.220$^{\xi}$	6.767**

[a] Analyses are based on pooling 235 sample firms and over 5 years.

[b] TI = total improvement in the accuracy of annual earnings forecasts from incorporating all four actual quarterly earnings,

PARA = revision coefficient of a given quarterly earnings time-series model,

ln(SIZE) = natural logarithm of firm size measured by the market value of equity,

$RI(Q_j)$ = relative improvement in the accuracy of annual earnings forecasts by the Quarter j's actual earnings,

i, y = firm and year index, respectively.

[c] Ranks of both dependent and independent variables are used.

** Significant at $\alpha<0.01$; * Significant at $\alpha<0.05$; $^{\xi}$ Significant at $\alpha<0.10$.

CONCLUSIONS

This study examines the effect of quarterly earnings and their revision coefficients on their predictive value. It is hypothesized that the revision coefficient is positively related to the predictive value of quarterly earnings information. The revision coefficient is a magnitude of earnings forecast revision in response to actual quarterly earnings information releases, which is measured by a regression coefficient of forecast errors over forecast revisions. The predictive value is a measure of quarterly earning information's impact on the accuracy of annual earnings forecasts, which is measured by total improvement (TI) in the accuracy of annual earnings forecasts for one year and by relative improvement (RI) in the accuracy of annual earnings forecasts for each quarter.

This hypothetical relationship was empirically tested using the Value Line analysts' forecast data about 235 sample firms over the five-year period. Empirical results are consistent with the hypothetical relationship between the revision coefficients and the predictive value of quarterly earnings. First, annual earnings forecasts become more accurate as additional quarterly reports become available, suggesting that quarterly earnings are useful for improving the accuracy of annual earnings forecasts. Second, revision coefficients of quarterly earnings are positively related with both total and relative predictive values of quarterly earnings (TI and RI). These results are robust with respect to different forecast error metrics and statistical methods.

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AN ANALYSIS OF CFO COMMENTS REGARDING COMPREHENSIVE INCOME

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ABSTRACT

The Financial Accounting Standards Board (FASB) issued Statement on Financial Accounting Standards No. 130 (FAS No. 130) in June of 1997, which requires companies to report comprehensive income. Comprehensive income is defined as a company's net income plus other comprehensive income items. Per FAS No. 130 companies are allowed to choose among three possible alternative formats to report comprehensive income. At the time FAS No. 130 was issued, many argued that the construct of comprehensive income provided no useful information and in fact had the possibility to mislead the users of the financial statements.

A survey was mailed to approximately 2,500 Chief Financial Officers (CFO) of large companies in the United States to ask their perception of comprehensive income. As part of this survey project, space was left on the survey for the CFOs to comment on comprehensive income. This paper provides an analysis of the many comments received regarding CFOs' perception of this new accounting construct.

COMPREHENSIVE INCOME

Comprehensive Income is defined as:

> . . . the change in equity of a business enterprise during a period from transactions and other events and circumstances form nonowner sources. It includes all changes in equity except those resulting from investments by owners and distributions to owners (FASB 1985, para. 70).

In discussing the concepts of earnings and comprehensive income, the Financial Accounting Standards Board (FASB), in Statement of Financial Accounting Concepts (SFAC) No.5, declared:

> Earnings and comprehensive income have the same broad components -- revenues, expenses, gains, and losses -- but are not the same because certain classes of gains and losses are included in comprehensive income but are excluded from earnings (FASB 1984, para. 42).

FAS No. 130 allows companies to select from three alternative formats for reporting comprehensive income:

> . . .[*I*] the components of other comprehensive income and total comprehensive income being reported below the total for net income in a statement that reports results of operations, [*ii*] in a separate statement of comprehensive income that begins with net income, and [*iii*] in a statement of changes in equity (FASB 1997, para. 22).

While FAS No. 130 does not specify a single financial statement presentation, it does encourage the use of either the first or second alternative and thereby assigns a lesser level of acceptability to the third alternative (para. 23).

In the exposure draft, the FASB called for comprehensive income to be reported in either one or two statements of financial performance (FASB 1996, para. 14). Comprehensive earnings per share (EPS) was also proposed for display in the statement of financial performance used to report comprehensive income (para. 23). Reporting comprehensive income only in a statement of changes in stockholders' equity was not an available alternative in the proposal. However, when SFAS No. 130 was issued, the acceptable presentation alternatives were expanded beyond a statement of financial performance to include reporting comprehensive income only in a statement of changes in equity. Additionally, the presentation of a comprehensive EPS figure was not part of the final standard.

Nothing in FAS No. 130 detracts from net income as an important measure of performance and as an important element of comprehensive income. The standard requires that, regardless of the financial statement format selected, an enterprise display net income as a component of comprehensive income (para. 22). The Board indicated that responses to uncertainty and perceptions regarding realizability and volatility help to explain the differences between items included in earnings and those excluded from earnings but included in comprehensive income (para. 50). Although the specific elements of other comprehensive income are not identified by FAS No. 130 because they may change over time, the major items currently included are (1) unrealized gains and losses on available-for-sale securities, (2) foreign currency translation adjustments, and (3) minimum pension liability adjustments.

A single focus on the aggregate amount of comprehensive income is likely to result in a limited understanding of an enterprise's performance. Information about the components of comprehensive income often may be more important than the amount of comprehensive income (para. 13).

STUDY DESIGN

Financial executives from publicly owned corporations were surveyed to test financial statement preparers' reactions to the alternative reporting formats available for the reporting of

comprehensive income. A survey instrument was sent to approximately 1,200 CFOs. The survey instrument (see Appendix A) presented a set of comprehensive income items and asked the CFO to select one of the three alternative reporting formats for presenting the comprehensive income information. The nature (positive/negative) of the comprehensive income items presented to the CFOs was randomized to control for any possible directional effects. Responses were received from 234 CFOs, representing a 19.5% response rate. This survey was sent in early 1998 before companies actually had to report comprehensive income (see King, et al. for a detailed description of the results of the survey).

In addition to asking which of the three acceptable reporting formats the CFO would use, the survey also asked the CFO to characterize the usefulness of the information conveyed by reporting comprehensive income reported to the users of financial statements (see Appendix A for a copy of the survey). The CFOs were asked to characterize the usefulness of the information on a 5-point scale, with 1 indicating that the comprehensive income information is misleading and 5 indicating that the comprehensive income information is extremely useful. Finally, the survey also had a place for the CFOs to make comments. Due to the controversial nature of comprehensive income, many of the CFOs made comments on the survey instrument. This paper provides an analysis of those comments.

DATA ANALYSIS

Table 1 shows that a total of 38.46% of the CFOs that responded to the survey felt that comprehensive income was either misleading (11.54%) or somewhat misleading (26.92%). Additionally, 35.90% felt that comprehensive income was neither useful nor misleading and 25.21% felt that comprehensive income was somewhat useful.

Table 1: CFO's Perception of Comprehensive Income

Comment	Number	
Misleading	27	11.54
Somewhat Misleading	63	26.92
Neither Useful nor Misleading	84	35.9
Somewhat Useful	59	25.21
Extremely Useful	1	0.43

Table 2 shows that 67.09% of the respondents reported that they anticipated reporting comprehensive income in the Statement of Changes in Stockholder's equity with 19.66% selecting a separate statement of comprehensive income and 13.25% selecting a combined statement of income and comprehensive income reporting format.

Table 2: CFO's Preferred Reporting Format		
Format	Number	Percent
Combined Statement of Income and Comprehensive Income	31	13.25
Separate Statement of Comprehensive Income	46	19.66
Statement of Changes in Stockholder's Equity	157	67.09
Total	234	100%

Table 3 reports a summary of the comments received from the CFOs. A review of the comments resulted in the following categories for grouping the CFO comments:

1. Two measures of "income" is confusing to users of the financial statements.
2. Reporting comprehensive income is not needed since the information is already disclosed in the financial statements.
3. The concept of reporting comprehensive income is acceptable but the identified elements of other comprehensive income do not represent economic income.
4. The FASB cost/benefit constraint is not met.
5. Comprehensive income is not really comprehensive
6. Comprehensive income is too volatile and therefore misleading
7. Other

Table 3: Analysis of CFO Comments		
Comment	Number	%
Two measures of income are confusing	21	20.6
CI not needed since information is already disclosed	24	23.5
The concept of CI is acceptable but the individual components do not make economic sense	10	9.8
Cost/Benefit threshold not met	16	15.7
Not really comprehensive	9	8.8
Amounts are too volatile and therefore misleading	6	5.9
Other	16	15.7
Total	102	100

A total of 88 of the 234 CFOs that responded to the survey made comments regarding comprehensive income. Some of the CFOs made multiple comments resulting in 102 comments that were classified into the seven categories listed above. The remainder of the paper gives examples of comments in each of the categories listed above. Additionally, any FASB consideration given to the concerns exhibited by the CFOs is discussed.

Of the 102 comments received, 21 (20.6%) revealed the CFO's belief that two measures of income would be confusing to the financial statement users. These comments are exemplified by a comment from the CFO of Sports Authority:

> There should be only a single net income figure. Showing both net income and comprehensive income in the income statement will confuse investors.

The potential problem of using two measures of income was addressed by the FASB in its exposure draft on comprehensive income. As noted by the FASB in paragraph 60 of FAS No. 130:

> ....Much of that confusion would stem from reporting two financial performance measures (net income and comprehensive income) and users' inability to determine which measure was the appropriate one for investment decisions, credit decisions, or capital resource allocation.

After considering these concerns the Board decided to allow reporting comprehensive income in a statement of shareholder's equity rather than a performance statement.

Of the 102 comments received 24 (23.5%) felt that comprehensive income was not needed since the information was already disclosed. The CFO of AMR Corp. indicated that:

> In my view there is nothing of substance in this pronouncement. The users of the financial statements already had this information.

The FASB's thoughts are summarized in paragraph 63 of FAS No. 130:

> The Board also agreed that only disclosure of comprehensive income and its components was inconsistent with one of the objectives of the project, which was to take a first step toward the implementation of the concept of comprehensive income by requiring that its components be displayed in a financial statement.

Ten of the CFO comments reflected the belief that the items contained in other comprehensive income are not really income items. The CFO Dana Corp. stated: "The FASB should have addressed whether the items are income or not." FAS No. 130, paragraph 54 indicates that:

> Although the scope of the project was limited to issues of reporting and display, the Board recognizes that other more conceptual issues are involved in reporting comprehensive income. Such issues include questions about when components of comprehensive income should be recognized in financial statements and how those components should be measured. In addition, there are conceptual questions about the characteristics of items that generally accepted accounting principles require to be included in net income versus the characteristics of items that this Statement identifies as items that are to be included in comprehensive income outside net income. Furthermore, there are several items that generally accepted accounting principles require to be recognized as direct adjustments to paid-in

> capital or other equity accounts that this Statement does not identify as being part of comprehensive income. The Board expects to consider those types of issues in one or more broader-scope projects related to reporting comprehensive income.

Sixteen of the 102 comments related to concerns that given the low level of benefit expected for the users of the financial statements, that the FASB Cost/Benefit criteria is not met. An example of this belief is expressed by the CFO of CMS Energy, "Accomplishes very little except add additional weight to the financials."

The FASB addressed the Cost/Benefit criteria in paragraphs 51 and 52 of FAS No. 130

> In accomplishing its mission, the Board follows certain precepts, including the precept to promulgate standards only when the expected benefits of the information exceed the perceived costs. The Board endeavors to determine that a standard will fill a significant need and that the costs imposed to meet that standard, as compared to other alternatives, are justified in relation to the overall benefits of the resulting information.....
>
> ....Because enterprises already accumulate information about components of what this Statement identifies as other comprehensive income and report that information in a statement of financial position or in notes accompanying it, the Board determined that there would be little incremental cost associated with the requirements of this Statement beyond the cost of understanding its requirements and deciding how to apply them.

Nine of the 102 CFO comments (8.8%) expressed concern that comprehensive income is not really comprehensive and, therefore, can be somewhat misleading. Comments by the CFOs of Heritage Financial Services and JP Morgan conclude that:

> The statement does not capture the complete economic value changes of the balance sheet. Only piecemeal.
>
> "Comprehensive Income" is misleading because it does not represent total economic return. Important sources of income (return) are not included, including changes in the fair value of non-marketable securities. As a result, "comprehensive income" is not all inclusive - comprehensive.

The FASB addresses thee concerns in paragraph 71:

> ...The Board acknowledged that comprehensive income will never be completely "comprehensive" because there always will be some assets that cannot be measured with sufficient reliability. Therefore, those assets and liabilities as well as the changes in them will not be recognized in the financial statements. For example, the internally generated intangible asset often referred to as intellectual capital is not presently measured and recognized in financial statements. The Board agreed that comprehensive income is "comprehensive" to the extent that it includes all recognized changes in equity during a period from transactions and other events and circumstances from

> nonowner sources. The Board acknowledged that there are certain changes in equity that have characteristics of comprehensive income but that are not presently included in it.

Some respondents to the survey thought that comprehensive income would be too volatile to be useful. This comment was expressed by 6 of the 102 comments received (5.9%). The CFO from Aetna stated that:

> As a large financial services company our investment portfolio can exhibit significant swings due to interest rate changes that has no bearing on our core operating performance or stock valuation.

These concerns were addressed by the FASB in paragraphs 60 - 63 of FAS No. 130.

> ....some respondents indicated that comprehensive income would be volatile from period to period and that volatility would be related to market forces beyond the control of management. In their view, therefore, it would be inappropriate to highlight that volatility in a statement of financial performance.
>
> ....In response to constituents' concerns about the requirement in the Exposure Draft to report comprehensive income and its components in a statement of financial performance, the Board considered three additional approaches. The first approach would require disclosure of comprehensive income and its components in a note to the financial statements.
>
> ....The Board agreed that only disclosure of comprehensive income and its components was inconsistent with one of the objectives of the project, which was to take a first step toward the implementation of the concept of comprehensive income by requiring that its components be displayed in a financial statement.

CONCLUSION

This results of this study seem to indicate that CFOs do not believe that comprehensive income is a useful financial statement item. The reasons for the negative perceptions of CFOs regarding comprehensive income are revealed in the comments provided by the CFOs. An analysis of the FASB's basis for its conclusions contained in FAS No. 130 finds that the FASB considered the concerns presented in the comments by the CFOs and decided that companies should report comprehensive income not withstanding the concerns of the preparers of the financial statements.

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APPENDIX A
COMPREHENSIVE INCOME SURVEY -- CFOs

Assume you are the CFO of a company with the following comprehensive income items:

Net Income	$ 164
Other Comprehensive Income, Net of Tax:	
Foreign Currency Translation Adjustments	$ 28
Unrealized Losses on Investments	(19)
Minimum Pension Liability Adjustment	15
Total Other Comprehensive Income	$ 24
Comprehensive Income	$ 188

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. Which of the three acceptable reporting alternatives would you choose for reporting Comprehensive Income?

   a. Include in a combined Statement of Income and Comprehensive Income.
   b. Include in a separate Statement of Comprehensive Income
   c. Include in the Statement of Changes in Stockholder=s Equity.

2. How would you characterize the additional information conveyed by reporting Comprehensive Income to users of financial statements? Please circle a number from 1 to 5.

1	2	3	4	5
Misleading	Somewhat Misleading	Neither Useful nor Misleading	Somewhat Useful	Extremely Useful

Comments:

THE EFFECTS OF LEGAL ENVIRONMENT ON VOLUNTARY EARNINGS FORECASTS IN THE U.S. VERSUS CANADA

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ABSTRACT

Past research documents managers' reluctance to issue voluntary earnings forecasts in part due to legal considerations. Since Canadian laws create a less litigious environment than those of the U.S., this study finds that when the two environments are compared, Canadian managers issue voluntary earnings forecasts more frequently across the board. In addition, the Canadian forecasts tend to be more precise than those of their American counterparts.

INTRODUCTION

Prior research in the study of voluntary earnings disclosures finds that managers release information that is unbiased relative to subsequently revealed earnings and that tends to contain more bad news than good news [Baginski et al.(1994), and Frankel (1995)]. Such releases are also found to contain information content [Patell (1976), Waymire (1984), and Pownell and Waymire (1989)]. Although forecast release is costly, credible disclosure will occur if sufficient incentives exist. These incentives include bringing investor/manager expectations in line [Ajinkya and Gift (1984)], removing the need for expensive sources of additional information [Diamond (1985)], reducing the cost of capital to the firm [Diamond and Verrechia (1987)], and reducing potential lawsuits [Lees (1981)].

More recently, studies show that managers are more likely to issue voluntary forecasts in a less litigious environment [Frost (2001)], [Johnson et al, (2002], while another [Baginski et al. (2002)] indicates that there are legal environment differences between the U.S. and Canada in issuing earnings forecasts when smaller size firms are evaluated. My research extends the aforementioned studies by evaluating U.S. and Canadian firms of all sizes and over a more extended period. The research question becomes: Do Canadian firms issue voluntary earnings forecasts with greater regularity than U.S. firms and which forecasts exhibit greater accuracy?

Clarkson and Simunic (1994) note that unlike the U.S., courts in Canada generally require unsuccessful plaintiffs to pay the costs of a successful defendant. Also, because plaintiffs have no absolute right to a jury trial in Canada, judges hear technical cases and are less likely to award large settlements. In addition, Canadian provinces do not permit trial lawyers to work on a contingency basis. Also, it is much more difficult to bring a class action suit in Canada. All of these differences

in the legal systems create a natural environment in which voluntary earnings releases may be perceived differently.

HYPOTHESIS DEVELOPMENT

Three hypotheses are tested. First, King et al (1990) finds that forward-looking information disclosure in the U.S. increases the firm's exposure to legal liability. It is, in part, for this reason that many U.S. firms have exhibited a reluctance to issue voluntary forecasts on a consistent and on-going basis. The first hypothesis, stated in the alternative form is:

H1:	Canadian firms, faced with a less-litigious legal environment, engage in more voluntary earnings forecasts relative to U.S. firms.

The second hypothesis, also stated in the alternative form, relates to previous studies that indicate U.S. firms are less likely to issue voluntary forecasts during good news periods for fear of litigation:

H2:	Canadian firms, faced with a less-litigious legal environment, engage in voluntary forecast releases that are less-related to earnings than U.S. firms.

The third hypothesis, stated in the alternative form, centers around the notion that as voluntary forecast are made with greater frequency, they also tend to exhibit greater accuracy over the long term:

H3:	Canadian firms engage in more precise forecasting of earnings information.

RESEARCH DESIGN

The sample consists of all quarterly and annual estimates made during the period 1983-2003 meeting the following criteria: 1) The voluntary earnings forecast was recorded by the Dow Jones News Retrieval Service (DJNRS). The Canadian exchanges list the Dow Jones as a preferred means of disclosure. 2) Earnings data was obtained from Compustat. The overall sample consists of firms which made at least one management earnings forecast during the period 1983-2003. All American exchanges (NYSE, NASDAQ, OTC, ASE) and all Canadian exchanges (Toronto, Vancouver,

Montreal, Regional, Nonlisted Canadian) were included in the sample Table 1 provides the summary of the sample used in the study.

Table 1
Study Sample Summary

	U.S.	Canadian	Total
Firm-years available on Compustat	227,170	24,364	251,534
Firm-quarters available on Compustat	579,127	87,271	666,398
Total firm-years/quarters sample	806,297	111,635	917,932
Forecasts identified by DJNRS	8,940	2,960	11,900
Loss due to Compustat requirement	-881	-342	-1,223
Final forecast sample	8,059	2,618	10,677
Distributed by firms	842	250	1,092

TEST OF HYPOTHESIS 1

Table 1 reports that 251,534 firm-years and 666,398 firm-quarters are available on Compustat for the sample total of potential voluntary forecast periods from 1983-2003. A total of 8,059 U.S. forecasts are made by 842 firms (9.58 per firm over 21 years) while 2,618 Canadian forecasts are made by 250 Canadian firms (10.48 per firm over 21 years).

Forecast Frequency and Good Versus Bad News Forecasts

To test H1 and H2, a logistic regression model is used similar to the one employed in Baginski et al (2002). It employs a combined sample of Canadian and U.S. firms across all potential forecasting periods (n = 917,932):

$$FORECAST_{it} = a_0 + a_1 \Delta ESIGN_{it} + a_2 CANADA_{it} + a_3 CANADA_{it} \times \Delta ESIGN_{it} \quad (1)$$

Where:

$FORECAST_{it}$ = 1 if the firm issued a voluntary earnings forecast during the period and 0 otherwise.
$\Delta ESIGN_{it}$ = the sign of the earnings change[1], 1 if ≥ 0 (good news), and 0 if < 0 (bad news).
$CANADA_{it}$ = 1 if the potential forecasting period relates to a Canadian firm, 0 otherwise.

Figure 1 maps the coefficients in Equation (1) to H1 and H2. Column (1) lists the coefficient sums in earnings increase periods (i.e., good news, $\Delta ESIGN_{it}=1$) for Canadian firms in row 1 and for U.S firms in row 2. Column (2) provides analogous coefficients for earnings decrease periods

(i.e., bad news, $\Delta ESIGN_{it}=0$). The last row indicates the difference *between countries* in the propensity to issue forecasts in periods of good news ($a_2 + a_3$), and bad news (a_2). Hypothesis 1 predicts that Canadian firms issue more forecasts, thus, both sets of coefficients are expected to be positive ($a_2 + a_3 >0$, $a_2 >0$).

Column (3) in Figure 1 provides coefficients associated with differences between good and bad news periods (i.e., "sign-related" forecast behavior) in Canada (row 1) and the U.S. (row 2). The last row in the column shows that the coefficient a_3 measures the difference *between countries* in sign-related forecasting behavior. If legal-liability-created asymmetric forecast disclosure incentives in the U.S. lead to more forecasts in bad news periods, then the expectation is that $a_1 < 0$. Hypothesis 2 predicts $a_3 > 0$, indicating that Canadian managers are less likely to skew forecast disclosures toward bad news periods.

Figure 1: Mapping Equation (1) into Hypothesis Tests

	Column 1 Good News Period $\Delta ESIGN_{it}=1$	Column 2 Bad News Period $\Delta ESIGN_{it}=0$	Column 3 Difference Across Sign (column 1 – column 2)
Canadian (CANADA = 1)	$a_0 + a_1 + a_2 + a_3$	$a_0 + a_2$	$a_1 + a_3$
U.S. (CANADA = 0)	$a_0 + a_1$	a_0	a_1
Difference Between countries (row 1 – row 2)	(H1 test during good news periods): $a_2 + a_3 > 0$	(H1 test during bad news periods): $a_2 > 0$	Difference between countries in sign-related behavior (H2): $a_3 > 0$

Forecast Precision

King et al (1990) argue that U.S. managers are concerned about potential litigation if a forecast turns out to be inaccurate. Accordingly, researchers have argued that, when faced with perceived higher expected litigation costs, U.S. managers will issue less precise forecasts (i.e., range, minimum, maximum or general impression forecasts instead of point forecasts). Empirical evidence shows that this is consistent among U.S. firms [Skinner (1994), Baginski and Hassell (1997), Bamber and Cheon (1998)].

The Canadian legal system exacts lower legal penalties for inaccuracy than does the U.S. system. Canadian managers are therefore likely to issue more precise management forecasts (H3)

and to make forecast precision choices that are less likely to depend on whether the firm is performing poorly during the period (H2). To test these hypotheses, the following ordered logistic regression model is used for a pooled sample of all forecasts issued by U.S. and Canadian firms (n = 10,677).

$$PRECISE_i = b_0 + b_1\ \Delta ESIGN_i + b_2\ CANADA_i + b_3\ CANADA_i\ x\ \Delta ESIGN_i \quad (2)$$

Management forecast precision is measured using an ordinal coding scheme that assigns the highest value to the most precise forecasts. PRECISE equals 3,2,1, and 0 for point, closed interval, open interval, and general impression forecasts, respectively. Hypothesis 3 predicts that Canadian firms will issue more precise forecasts because the legal penalties for inaccuracy are smaller. For earnings decreases, this suggests that $b_2 > 0$, and for earnings increases, it suggests that $b_2 + b_3 > 0$. If fear of legal liability leads U.S. firms to issue less precise forecasts when the firm is performing poorly, then $b_1 > 0$. Hypothesis 2 predicts that Canadian forecast precision is less skewed toward poor performance than is U.S. forecast precision ($b_3 < 0$).

RESULTS

Forecast Frequency and Good Versus Bad News Forecasts

Table 2 describes variable distributions for the sample of 917,932 potential forecasting periods and 10,677 voluntary earnings forecasts. This table shows that forecast frequency is only .9995% for U.S. firms and 2.3452% for Canadian firms. Table 2 also indicates that Canadian firms release voluntary management earnings forecasts 58% of the time when the earnings information is good news compared with 38% of the time for their U.S. counterparts. With respect to precision of the forecast, Table 2 shows that Canadian firms are more likely to issue point forecasts (most precise) 54% of the time versus 23% for U.S. firms.

Table 3 presents the Equation (1) logistic regression tests of H1 and H2. Coefficient a2 is significantly positive (p = 0.002), so Canadian firms are more likely to issue voluntary earnings forecasts during bad news periods relative to U.S. firms. The sum of coefficients a2 + a3 is also significant (p = .001), indicating that Canadian firms are also more likely to issue voluntary earnings forecasts during good news periods. These results support H1's prediction that lower legal liability in Canada leads to more forecast disclosures during both good and bad news periods. These results are also consistent with findings in Table 2.

With respect to H2, the results are also consistent with expectations. U.S. firm behavior is as expected, coefficient a1 is significantly negative (p = 0.007). This indicates more forecast disclosure in bad news periods relative to good news periods. Coefficient a3, which measures the difference between U.S. and Canadian sign-related behavior, is significantly positive (p = 0.001)

indicating that Canadian forecasts occur more often in good news periods. These results are also consistent with findings in Table 2.

Table 2
Variable Distributions for 1983-2003 Sample of 917,932 Potential Forecasting Periods (n= 111,635 Canadian and n= 806,297 U.S.); and 1983-2003 Sample of 10,677 Management Earnings Forecasts (n= 2,618 Canadian and n= 8,059 U.S.)

	Good News Periods ($\Delta ESIGN_{it}$ =1)	Bad News Periods ($\Delta ESIGN_{it}$ =0)	Total
Potential Forecasting Periods:			
U.S Firms	330,582 (41%)	475,715 (59%)	806,297
Canadian Firms	63,632 (57%)	48,003 (43%)	111,635
Total	394,214	523,718	917,932
Management Earnings Forecasts:			
U.S. Firms	3, 021 (38%)	5,038 (63%)	8,059
Canadian Firms	1,514 (58%)	1,104 (42%)	2,618
Total	4,535	6,142	10,677
Forecast Frequency Rates in Potential Forecast Periods:			
U.S. Firms	.9139%	1.0591%	.9995%
Canadian Firms	2.3793%	2.2999%	2.3452%
Management Forecast Type:			
	U.S. Firms	Canadian Firms	Total
Point	1,854 (23%)	1,426 (54%)	3,280 (31%)
Range	2,176 (27%)	445 (17%)	2,621 (25%)
Minimum	2,015 (25%)	524 (20%)	2,539 (24%)
Maximum	1,113 (14%)	131 (5%)	1,244 (12%)
General Impression	901 (11%)	92 (4%)	993 (8%)
Total	8,059 (100%)	2,618 (100%)	10,677 (100%)

Forecast Precision

Table 4 presents results of Equation (2). As H3 predicts, the b2 coefficient is significantly positive ($p = 0.001$), indicating that Canadian firms issue more precise forecasts in bad news periods than do U.S. firms. Also the sum of coefficients b2 + b3 are significantly positive ($p = 0.001$), indicating that Canadian firms issue more precise forecasts in good news periods than do U.S. firms. Coefficient b1 is significantly positive ($p = 0.033$) indicating that U.S. firms issue less precise

forecast when earnings are declining. In summary, results reported in Table 4 support H3, indicating that Canadian firms issue more precise voluntary earnings forecasts than do U.S. firms.

Table 3: Management Earnings Forecast Frequency in the U.S. and Canada

$$FORECAST_{it} = a_0 + a_1 \Delta ESIGN_{it} + a_2 CANADA_{it} + a_3 CANADA_{it} \times \Delta ESIGN_{it}$$

Independent Variable (Coefficient)	Expected Sign	Coefficient Estimate (p-value)
Intercept (a_0)	None predicted	-6.210 (0.001)
ΔESIGN (a_1)	negative	-0.129 (0.007)
CANADA (a_2)	positive (H1 for bad news)	0.491 (0.002)
CANADA x ΔESIGN (a_3)	positive (H2)	0.639 (0.001)
Coefficients $a_2 + a_3$	positive (H1 for good news)	0.882 (0.001)

Table 4

$$PRECISE_i = b_0 + b_1 \Delta ESIGN_i + b_2 CANADA_i + b_3 CANADA_i \times \Delta ESIGN_i$$

Independent Variable (Coefficient)	Expected Sign	Coefficient Estimate (p-value)
ΔESIGN (b_1)	positive	0.293 (0.033)
CANADA (b_2)	positive (H3 for bad news)	1.209 (0.001)
CANADA x ΔESIGN (b_3)	negative (H2)	-0.207 (0.291)
Coefficients $b_2 + b_3$	positive (H3 for good news)	0.821 (0.001)

SUMMARY

This paper uses the largest sample of voluntary earnings forecasts to date, covering a 21 year period, to show that characteristics of forecast disclosures vary when comparing two countries with differing legal systems. Canadian managers, faced with a less litigious environment than U.S. managers disclose more earnings forecasts (in both good news and bad news periods) and are more precise in their forecasts. An implication is that substantial differences in legal systems across countries might provide a key for stockholders, with respect to disclosure issues, which in turn may affect investment decisions of investors who are exposed to varying protections under different legal systems.

ENDNOTES

1 The change in earnings is defined as (EPSit - EPSit-k)/PRICEit-k, where EPSit equals earnings per share for firm i in period t, EPSit-k = earnings per share for firm i in period t-1 for annual and t-4 for quarterly period; and PRICEit-k equals security price for firm i at the end of period t-1 for annual and t-4 for quarterly periods…all obtained from Comnpustat.

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DAY-OF-THE-WEEK AND MONTH-OF-THE YEAR IN CHINA'S STOCK MARKETS

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ABSTRACT

The Chinese stock markets experienced abnormally negative July returns for most of the years and the mean July return is the most negative. The abnormally poor July return is more apparent during years of high real GDP growth, low inflation, and bearish and volatile stock markets. The nonexistence of January effect in the markets may support the tax-loss selling hypothesis for the U.S. January effect. In the "A" share markets, mean Friday returns are the highest and mean Tuesday returns are the lowest, which may indicate the day-of-the-week effect. The phenomenon is diminishing in the Shanghai "A" share market while strengthening in the Shenzhen "A" share market over the decade.

INTRODUCTION

The stock market in Mainland China is the largest among emerging markets and may offer the greatest potential to investors. Whether the well-known month-of-the-year effect and the day-of-the-week effect in developed markets also exists in the Chinese markets is of considerable interest to international investors.

The Shanghai Stock Exchange (SHSE) officially opened on December 19, 1990 with four listed "A" shares. The trading of "B" shares started in February 1992. The Shenzhen Stock Exchange (SZSE) officially opened trading of both the "A" and "B" shares on October 4, 1992. The "A" shares were available only to domestic investors and are priced/traded in the Chinese currency, the yuan. "B" shares were issued only to foreign investors (available to domestic investors since February 20, 2001) and are priced/traded in U.S. dollars on the SHSE and in Hong Kong dollars on the SZSE. Both "A" and "B" shares carry the same voting rights and dividends, with "A" share dividends paid in Chinese yuan and "B" share dividends paid in either U.S. or Hong Kong dollars, adjusted for exchange rates. As of the end of 2002, there are about 702 "A" shares and 54 "B" shares traded on the SHSE with market capitalization of 2,807 billion Chinese yuan ($1 = Y8.27), and about 519 "A" shares and 60 "B" shares are traded on the SZSE with market capitalization of 1,462 billion yuan (SHSE and SZSE).[1]

Return anomalies in the U.S. stock market, such as the January effect--or the abnormally large returns on common stocks in most months of January--has been one of the most intriguing

issues in financial economics since 1976. Wachtel (1942) provided the first academic reference to a January seasonal in stock returns. 34 years later, Rozeff and Kinney (1976) pointed out that common stock returns in January are significantly larger than those in other months, and that the anomaly is related to small firms. Reinganum (1981), Keim (1983), and Roll (1983) reaffirm that the January effect is more pronounced in small firms.

Researchers have also found that there is a day-of-the-week or weekend effect on stock returns in both the most developed markets and in some emerging markets. For example, many studies have revealed abnormally positive mean Friday returns and abnormally negative mean Monday returns in the U. S. and other equity markets. Pioneer research on the so called "weekend effect" can be found in Cross (1973), French (1980), Gibbons and Hess (1981), Hindmarch (1984), Keim and Stambaugh (1984), and Jaffe and Westerfield (1985). Major studies for the anomaly in international equity markets include articles by Gultekin and Gultekin (1983), Theobald and Price (1984), Jaffe and Westerfield (1985), Jaffe, Westerfield and Ma (1989) and Dubois and Louvet (1996), and Tong (2000).

Some researchers report different findings. Cornell (1985) and Najand and Yung (1994) see no weekend effect in the S&P 500 index futures: the effect seems to exist, they argue, because the returns are affected by conditional heteroskedasticity. Connolly (1989) points out that the effect disappears for some years and then reappears for others. Wang, Li, and Erickson (1997) find that the Monday effect occurs primarily in the last two weeks (the fourth and fifth weeks) of the month. For the UK stock market, Board and Sutcliffe (1988) see the significance of the anomaly decreasing over time, and Steeley (2001) notes that the weekend effect disappeared in the 1990s. Sullivan, Timmermann and White (2001) assert that calendar effects, including day of the week effect, no longer remain significant in the context of 100 years of data as the full universe. Brusa, Liu, and Schulman (2000) find reverse weekend effect in recent data for major stock indices: Monday returns are positive and significantly greater than the preceding Friday's. They also report that the reverse weekend effect is strong and significant in large-company stocks. Seyed and Perry (2001) report evidence of reversal of the Monday effect in major US equity markets.

Research on the anomaly in the emerging markets includes works of Wong, Hui and Chan (1992), and Tong (2000). Wong, Hui, and Chan (1992) find day-of-the-week effect in Singapore, Malaysia, Hong Kong, Thailand but not in Taiwan. They also reveal that the weekly seasonal patterns are period specific.

Study on the possible existence of anomalies in Chinese equity markets is not found. This study examines the daily, weekly, and monthly data of the "A" and "B" share indexes on the Shanghai and Shenzhen Stock Exchanges from the opening through the end of year 2001, in order to reveal whether the month-of-the-year or the day-of-the-week effect exists and whether the strength of the weekend effect changes over time. The Shanghai "A" index started from 1991, the Shanghai "B" index from 1992, the Shenzhen "A" and "B" indices started from November 1992. The data are from Shanghai Pudong Development Bank.

THE MONTH-OF-THE-YEAR IN CHINA'S STOCK MARKETS

First, an examination of each month's performance in the year reveals some pattern of the monthly returns, the summary statistics are presented in Table 1. In Penal A of the table, for the month of May, the number of years in which May return is positive is shown next to the month; for other months, the number of years in which the month's return is negative is shown next to the month. For example, seven of the 11 years for the SHSE "A" share index, seven of the 10 years for the SHSE "B" share index, five and six of the nine years for the SZSE "A" and "B" share indices show negative July returns. Eight, nine and seven years for the SHSE "A" share, SZSE "A" and "B" share indices, respectively, experienced negative December returns.

July looks to be the worst month of the year, as shown in Table 1, Penal A, for most of the years July experienced negative return and mean July return is negative for all the four indices, and the returns are statistically significantly negative for all but the Shenzhen "A" share index. Results of t-tests for comparing July return with each of the other month's return are reported in Table 1, Penal B. In the penal, the t-statistics in the columns of the months other than July indicate the pairwise comparison of that month's return with July return. The test is one tailed, the null hypothesis is that July return is at least as much as that month's return, and the alternative hypothesis is that July return is less than that month's return. As shown in the penal, 25 out of the 48, or 52 percent of the t-statistics are statistically significant. If all months had an equal likelihood of being the worst performing month of the year over the sample period, July would be the worst about one-twelfth of the time, or 8.3 percent of the time. Notice that the number of significant t-statistics is larger for the "B" shares than that for the "A" shares.

December looks to be the next worst month, as shown in Table 1 Penal A, the number of years in which the month experienced negative return is the largest, and the negative return is statistically significant for the "A" share indices.

The month of May looks to be a good month for the Shanghai Stock markets as May mean return is the highest for both the Shanghai "A" and "B" share indices, and the number of years that experienced positive May return is the largest among the years with positive return for a particular month. As shown in Table 1 Penal A, seven of the 11 years for the SHSE "A" share index, six of the 10 years for the SHSE "B" share index show positive May return. February return is statistically significantly positive for the Shanghai indices. Finally, spring looks to be a good season for the stock markets, the mean returns in February, March, April and May are all positive for the four indices.

There is no particular week whose return in July, December, or May consistently contribute to the abnormal returns of the months. In the U.S. stock markets, researchers have pointed out some particular timing of the anomalies. Reinganum (1983) and Keim (1983) report that the January effect is stellar mostly during the first five days of the month. Wang, Erickson and Li (1997) show that the Monday effect occurs primarily in the fourth and fifth weeks of the month.

Table 1: Descriptive Statistics

A) Except for May, the numbers to the right of each month indicate the number of years in which the month has negative return.

Month	SHSE A	SHSE B	SZSE A	SZSE B	**Month**	SHSE A	SHSE B	SZSE A	SZSE B
January	5	6	5	5	September	7	7	6	5
Mean	0.0405	-0.0415	0.0069	-0.0172	Mean	-0.0198	-0.0284	-0.0194	-0.0102
t -statistic	(0.93)	(-0.79)	(0.17)	(-0.6)	*t* -statistic	(-0.94)	(-0.82)	(-0.81)	(-0.31)
February	4	2	3	5	October	7	7	6	6
Mean	0.0322	0.0449	0.0313	0.0120	Mean	-0.0337	-0.0272	-0.0024	-0.0206
t -statistic	(1.56*)	(1.57*)	(1.13)	(0.27)	*t* -statistic	(-0.73)	(-1.13)	(-0.05)	(-0.93)
March	3	5	3	4	November	3	5	5	5
Mean	0.0049	0.0217	0.0158	0.0837	Mean	0.0703	-0.0111	0.0084	0.0257
t -statistic	(0.11)	(0.32)	(0.44)	(0.81)	*t* -statistic	(1.72*)	(-0.30)	(0.45)	(0.42)
April	5	4	4	5	December	8	6	9	7
Mean	0.0558	0.0303	0.0311	0.0125	Mean	-0.0417	0.0491	-0.0539	-0.0275
t -statistic	(1.14)	(0.98)	(0.54)	(0.38)	*t* -statistic	(-1.44*)	(1.30)	(-1.90**)	(-0.85)
May (#positive)	7	6	5	6	**Annual Return**	SHSE A	SHSE B	SZSE A	SZSE B
Mean	0.0839	0.0849	0.0217	0.0199	1991	0.8303			
t -statistic	(0.78)	(1.49*)	(0.71)	(0.35)	1992	1.0249	-0.5562		
June	5	7	4	4	1993	0.0384	0.4432	-0.0445	-0.0947
Mean	0.0357	-0.0163	0.0195	0.0354	1994	-0.2386	-0.4962	-0.5604	-0.6034
t -statistic	(0.84)	(-0.31)	(0.36)	(0.70)	1995	-0.1492	-0.2752	-0.2400	-0.3753
July	7	7	5	6	1996	0.5070	0.3404	1.2050	0.8520
Mean	-0.0599	-0.1053	-0.0396	-0.1261	1997	0.2760	-0.1818	0.2979	-0.5298
t -statistic	(-1.54*)	(-2.14**)	(-0.91)	(-2.02**)	1998	-0.0314	-0.6660	-0.3400	-0.5528
August	5	4	4	4	1999	0.1743	0.2780	0.1418	0.2765
Mean	0.0681	0.0353	0.0608	0.0133	2000	0.4121	0.8596	0.4579	0.4863
t -statistic	(0.76)	(0.91)	(1.01)	(0.36)	2001	-0.1846	0.6130	-0.2467	0.6533

* Significant at the 10 percent level. ** Significant at the 5 percent level.

FACTORS RELATED TO JULY RETURN

This study also tries to identify the factors that are related to the poor July return. In the literature, there are several explanations for the January effect. Stoll and Whaley (1983) attribute the anomaly to transaction costs. Chang and Pinegar (1989, 1990) and Kramer (1994) suggest seasonality in risk premium or expected returns. Ritter (1988) hypothesizes tax-loss selling effects. Haugen and Lakonishok (1988) suggest window dressing. Ogden (1990) relates the January effect to year-end transactions of cash or liquidity. Kohers and Kohli (1992) and Kramer (1994) connect the anomaly to business cycle, and Ligon (1997) reports that higher January returns relate to higher January trading volume and lower real interest rates.

A regression analysis is undertaken to reveal the relation between the inferior July return and five explanatory variables. The inferior July return -- the power ratio -- of the indices is the dependent variable. The first two explanatory variables, real GDP growth and inflation capture the market's exposure to macroeconomic forces. The third explanatory variable, annual return of the year relates the strength of inferior July return to the annual performance of the index. The last two explanatory variables, standard deviation and variance of daily returns, indicate the connection between inferior July return and return volatility. Using daily return volatility is better than using

monthly return volatility because an abnormally low July return can obviously increase monthly volatility. The estimation results are reported in Table 2.

Table 2. The Estimation Results

	GDP		Annual	Standard[1]		R	F-value
Intercept	Growth	Inflation	Return	Deviation	Variance1	Square	(signif.)
3.704	-0.2812	0.151	1.3413	-0.5184	2.0235	0.416	4.7015
-2.439	(-2.044)**	(4.000)***	(3.151)***	0.872	-0.215		-0.002

1. Divided by 100
t-value in parentheses
*Significant at the 10 percent level.
**Significant at the 5 percent level.

The coefficients of the variable real GDP growth are negative and significant, showing that the abnormally low July returns (smaller power ratios) are more apparent during years of high GDP growth. For the U.S. equity market, Kohers and Kohli (1992) examine the S&P Composite Index from 1948 through 1988 and report that high January return existed in the expansionary phases but does not preset during recession phases for the period; Gu (2002) have reported negative relation between the January return and GDP growth. It may be the case that, while an abnormal month's return may have some connection with GDP growth, that connection is not static, the connection may change directions over time and vary across markets, because expectations about the (different sectors of) economy, and the actual movement of the (different sectors of) economy, do not change as regularly as the calendar month. Expected changes in the economy do impact the stock markets, but it is not clear yet how business cycles affect an abnormal month's return.

Financial economists generally believe that inflation affects risk premium and expected return of equity. Inflation should affect the July return as other months in the year. The coefficient for the variable inflation is positive and significant, which indicates that abnormally low July returns tend to occur during the years of low inflation, or July returns are better (larger power ratio) during years of high inflation. The years 1994 and 1996 experienced partial inferior July return, and 1995 experienced a stellar July return, the inflation in theses years are the highest, i.e., 24.1 percent, 17.1 percent and 8.3 percent, respectively. This finding is similar to that suggested by Kramer (1994) for the high January returns and inflation. The connection between annual return of the year and inferior July return is positive and significant, which indicates better July returns during years of good market performance, and worse July returns during years of poor market performance.

Abnormally lower July returns tend to occur during years of volatile markets. The relation may not be linear, which is captured by using both standard deviation and variance, but the relation is insignificant. Investors may sell more and buy less in July during a year of volatile markets, and hold or sell less in July during a year of relatively stable markets.

THE DAY-OF-THE-WEEK IN CHINA'S STOCK MARKETS

An examination of the return behavior of each trading day in the week reveals abnormal days in the week. Summary statistics of each trading day's return is reported in Table 3. For both the Shanghai and Shenzhen A share markets, Friday return is significantly positive and Friday mean return is the highest, followed by Wednesday return, which is statistically significant for the Shanghai A Share Index, and Tuesday return is significantly negative, and Tuesday mean return is the lowest, followed by Monday mean return. The returns are not significantly different from zero for other days in the week.

Table 3. Summary Statistics for the Returns

A)	Monday	Tuesday	Wednesday	Thursday	Friday
SHSE A	-0.0006	-0.0021	0.0018	0.0015	0.0041
	(0.0015)	(0.0013)	(0.0007***)	(0.0020)	(0.0015***)
SHSE B	0.0007	-0.0016	-0.0001	-0.0006	0.0023
	(0.0011)	(0.0014)	(0.0011)	(0.0014)	(0.2323)
SZSE A	-0.0014	-0.0021	0.0011	0.0006	0.0024
	(0.0023)	(0.0009***)	(0.0012)	(0.0010)	(0.0007***)
SZSE B	0.0007	-0.0017	-0.0012	-0.0007	0.0019
	(0.0014)	(0.0015)	(0.0007)	(0.0017)	(0.0011)

B) *t*-statistics for comparing Friday return with each of the other days' return.					
SHSE A	2.72 ***	4.07 ***	1.42 ***	1.25	na
SHSE B	1.04	2.64 ***	1.63 *	1.92 **	na
SZSE A	1.66 **	2.98 ***	1.00	1.43 *	na
SZSE B	0.64	2.52 ***	2.03	1.53 *	na
C) *t*-statistics for comparing Tuesday return with each of the other days' return.					
SHSE A	-0.80	na	-2.37 ***	-1.72 **	-4.07 ***
SHSE B	-1.40 *	na	-0.98	-0.65	-2.64 ***
SZSE A	-0.89	na	-2.00 **	-1.35 *	-2.98 ***
SZSE B	-1.55 *	na	-0.46	-0.93	-2.52 ***

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

For the B share indices, none of the day's return is significantly different from zero. In Panel A of the table, the asterisks in the parentheses of standard error show the result of comparing each day's return with 0. The test is one-tailed, the null hypothesis is that the day's return is equal to zero, and the alternative hypothesis is that the day's return is greater or less than zero. In Panel B of the table, the t-statistics in the columns of the days other than Friday and Tuesday indicate the pairwise comparison of that day's return with Friday and Tuesday return. The test is one tailed, the null hypotheses are that Friday return is below that day's return and Tuesday return is at least as much as that day's return, and the alternative hypotheses are that Friday return is greater than that day's return and Tuesday return is less than that day's return.

The highest Friday mean return is consistent to the empirical evidences in developed and other emerging markets and the lowest Tuesday mean return is coincident with what Jaffe and Westerfield (1985) have found in the Japanese and Australian stock markets.

It might be too early to conclude the abnormally high Friday mean return and the abnormally negative Tuesday mean return as anomaly with only 9 to 11 years history of the markets. As one may have noticed, the Chinese stock markets are extremely volatile, which is common among emerging markets. The pattern found in this study would help investors in the markets if the pattern repeats itself in the future.

To reveal possible trend of the anomaly, one needs to measure the return of the day in the week relative to the return in the remaining trading days of the week for each individual year. It would be difficult to measure the anomaly when the day's return and return of the week have opposite signs or when returns of both Friday (Tuesday) and the week are negative. For example, when a Friday (Tuesday) is positive, but the week is negative, or when Friday (Tuesday) is negative and the week is positive. A method is developed to give a consistent measurement of the contribution of the day's return to the return of the week. The returns are calculated as the natural logarithm differentials of the index values. Now define

$$R^*_F = (1+ \text{mean Friday return})^5 \qquad (1)$$

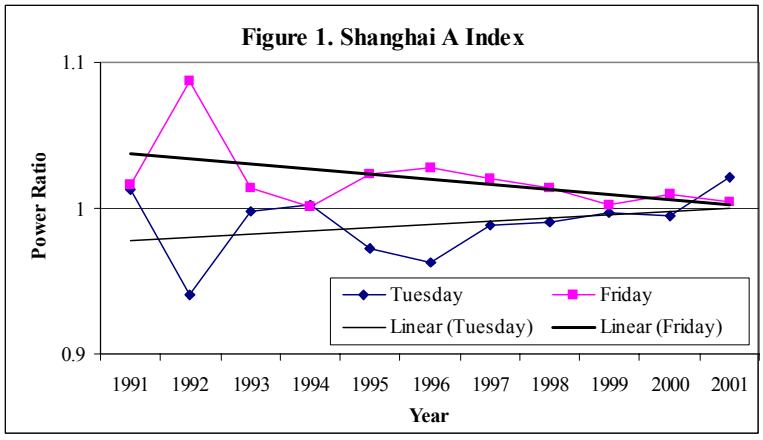
Where F represents Friday, the power 5 is used because there are 5 trading days in a week, except holidays. Obviously R^*_F is always greater than zero. And

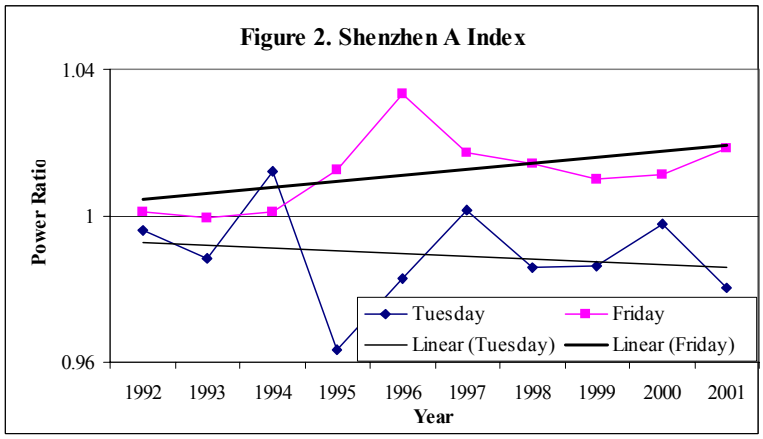
$$Rw = (1+ \text{mean weekly return}) \qquad (2)$$

Rw is always greater than zero. Then, compose a ratio

$$\frac{R^*_F}{Rw} \qquad (3)$$

which may be called "power ratio" since R^*_F is a factor of power. Now it should be clear that when $R^*_F/Rw > 1$, then Friday return is higher than the average of other days of the week. When $R^*_F/Rw = 1$, then Friday return is as good as the average of other days of the week; and when $R^*_F/Rw < 1$, then Friday return is below the average of other days of the week. The same power ratios are calculated for Tuesday returns for each year.





Figures 1 and 2 display the trend of the abnormal Tuesday and Friday mean returns on the "A" share indices over the decade. For the Shanghai "A" share market, the Friday mean returns exhibit a downward trend while the Tuesday mean returns display an upward trend. This phenomenon is similar to the recent evidences of diminishing day-of-the-week effect in the developed markets (Brusa, Liu, and Schulman, 2000, Steeley 2001, Seyed and Perry 2001). On the contrary, for the Shenzhen "A" share market, the abnormally high Friday mean returns exhibit an upward trend while the abnormally negative Tuesday mean returns display a downward trend over

the decade. The strengthening Friday and Tuesday effects in the Shenzhen “A” share market show the opposite to the recently reported evidences of diminishing day-of-the-week effect in the developed markets.

CONCLUSION

Most of the July returns in the Chinese stock markets are negative, and the mean July return is the most negative. The abnormally low July return is more apparent during years of high GDP growth, low inflation, and bearish and volatile stock markets. The mean December return is also negative for all but one of the four indices, and the number of years with a negative December return is the largest. On the other hand, most of the May returns on the SHSE "A" and "B" share indices are high, and the mean May return is the highest. In addition, spring seems to be a bullish season for all the markets.

The suggestions that tax and window-dressing be related to the January effect in the U.S. equity markets cannot explain the negative July returns in the Chinese stock markets. However, the nonexistence of January effect in China may support the tax-loss selling hypothesis (Ritter, 1988) because in china, losses from equity investment is not deductible from taxable income as income from equity investment is not taxable.

This study also reveals abnormally high Friday mean return and abnormally low Tuesday mean return on the "A" share indices of the Shanghai and Shenzhen Stock Exchanges in China. The Friday and Tuesday effects in the Shanghai "A" share market exhibit a diminishing trend, which is similar to the trend of weekend effect in the major developed markets. However, the strengthening Friday and Tuesday effects in the Shenzhen "A" share market are unique in the literature, it is the opposite to the recently reported evidences of diminishing day-of-the-week effect in the developed markets.

It may be too early to conclude the negative July return an anomaly with only 9 to 11 years of history of the markets. As one may have noticed, the stock markets are extremely volatile, which is common among emerging markets. The pattern found in this study would help investors in the markets if the pattern repeats itself in the future.

Further study is needed to uncover the factors that are related to the poor performance of the markets in the months of July and December, and the excellent performance of the SHSE "A" and "B" share indices in the month of May. It would be informative to examine if January effect would occur after China starts to tax on income from equity investment for evidence for the tax-loss selling hypothesis. Further research is also needed to identify the factors that are related to the high Friday returns and low Tuesday returns, and the opposite trends of the effects on the two markets in the same country.

ENDNOTES

1 As of the end of June 2003, China has 1,250 listed stocks with a total market value of 4,163 billion yuan or 520 billion U.S. dollars.

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THE CONTEXT-SPECIFIC BENEFIT OF USE OF ACTIVITY-BASED COSTING WITH SUPPLY CHAIN MANAGEMENT AND TECHNOLOGY INTEGRATION

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ABSTRACT

This paper examines whether a context-specific benefit is obtained from the use of Activity-based Costing (ABC) with the business initiatives Supply Chain Management (SCM), Technology Integration (TI) Context-specific benefit is operationalized by a composite measure of financial performance, Return on Assets (ROA) Top executives of 305 firms operating in the motor carrier industry furnished information regarding use of the initiatives. Dependent variable information is obtained from financial statement data filed with the U.S. government. Multiple regression analysis is used to identify the improvement in ROA associated with 1) use of each initiative and 2) concurrent use of two initiatives.

A direct effect for use of SCM and TI is confirmed. Context-specific benefits obtained from concurrent use of ABC with SCM and TI are identified. It is likely that ABC functions as an enabler of other improvement initiatives, providing the information necessary to optimize the effectiveness of SCM and TI. The positive findings regarding ABC are of particular interest to practicing and academic accountants because they are often the primary proponents and administrators of ABC and most previous evidence of ABC efficacy has been theoretical or anecdotal.

INTRODUCTION

The focus on cost, quality and time has generated many management changes with significant accounting implications (Smith, 1998). These changes increasingly include the implementation of strategic business initiatives such as Supply Chain Management (SCM), Technology Integration (TI), and Activity-Based Costing (ABC).[1] Profit-maximizing firms would not implement strategic business initiatives if they did not expect a net financial benefit from their use. However, there has been little empirical evidence that demonstrates that SCM, TI, or ABC improves financial performance in any industry.

In addition, researchers have often suggested that ABC and other strategic business initiatives complement and enhance each other, rather than being individually necessary and

sufficient conditions for improvement (e. g. Cagwin and Bouwman, 2002; Shields et. al,. 2000; Anderson, 1995; Swenson, 1998). There has been little empirical investigation of context-specific benefits obtained from using ABC to enhance the benefits of other initiatives or of a context-specific benefit obtained from concurrent use of SCM and TI.

The purpose of this study is to investigate the improvement in financial performance associated with the single and concurrent use of the strategic business initiatives SCM, TI, and ABC. Data is obtained through a cross-sectional mail survey of 305 motor carrier industry top executives and from a database containing financial statement information reported to the U.S. government. Multiple regression analysis is used to investigate the association between use of initiatives and improvement in financial performance (proxied by ROA) and to identify positive context-specific effects from the use of SCM with TI and of ABC with SCM and also with TI.

This research adds to the limited body of empirical strategic business initiative research in four ways. The first contribution is to provide empirical evidence that the benefits claimed by initiative advocates are net benefits. Second, the existence of context-specific benefit from concurrent use of ABC with SCM and with TI is confirmed. Third, the study focuses on the motor carrier industry, an important member of the service sector, which has become the dominant sector of the economy. Researchers have often postulated, but not tested, the efficacy of initiatives in a service setting. Finally, limitations of previous research (i.e., the lack of control for simultaneous use of multiple initiatives and prior level of performance) are addressed.

The remainder of the paper is organized as follows: Section II defines and describes strategic business initiatives, situates this study in the context of past research and provides hypothesis development. Section III describes sample selection and the survey instrument. Section IV describes the methodology used, including variable selection and specification. Results are presented in Section V, and a Summary and Discussion in Section VI.

BACKGROUND

A strategic business initiative is an innovative business technique, strategy or technology that is purported to increase business success. All initiatives broadly advocate change through continuous improvement, but each accomplishes continuous improvement somewhat differently. In recent years, strategic business initiatives such as SCM. TI, and ABC have been subjects of intense interest for practicing accountants, consultants, and academicians, motivating their selection for the current study. Each initiative is discussed below.

Technology Integration (TI)

TI takes place when the technology applied to a business process becomes indistinguishable from the process itself (Haag, 2005). Examples include using technology (bar coding, electronic data

interchange) for fast order entry, automatic pricing and discounting, printing pick tickets for a specific route or delivery, and purchase orders (Sheth & Sisodia, 1995). Fleisch (2004) discusses opportunities and risks involved in such highly integrated information systems. Specific goals in using technology include reducing the cost of personnel and operations, as well as changes in the organizational structure. For sustained competitive advantage, companies need an IT platform that uniquely blends core marketing competencies with seamless technology. Over time IT becomes less of a driving force and more of a requisite infrastructure. This leads to the development of technology-based core competencies that are not readily duplicated by others (Sheth & Sisodia, 1995).

Supply Chain Management (SCM)

Russell and Taylor (2003) define a supply chain as the "facilities functions, and activities involved in producing and delivering a product or service from suppliers .. to customers.." SCM is an advanced management discipline that uses structured planning techniques to optimize the performance of supply chains to increase value to the shareholders of the trading partners that comprise the supply chain. SCM has the potential to improve financial performance in three key areas: (1) revenue growth (e.g. through improved forecasting results), (2) profitability (e.g., through reduced costs), and (3) capacity utilization (Timme & Williams-Timme, 2000). For all its potential benefits, however, Dani et al. (2004), in their discussion of opportunistic behavior and gamesmanship in the supply chain context, point out that SCM is not a panacea.

Activity-Based Costing (ABC)

The arguments in support of Activity-Based Costing (ABC) are generally based on the superiority of information that can be generated in comparison with that generated by traditional cost management systems. According to the theory of information economics, better information leads to better decision-making, and better decision-making enhances firm value. For example, in their discussion of optimal factory design La Trobe-Bateman and Wild (2003) include ABC in their model of product manufacturability because it provides improved information quality. However, several reservations have been expressed regarding the efficacy of ABC (Innes & Sinclair, 2000), particularly that it is not suited for all business environments.

Association between Initiative Use and Improvement in Financial Performance

The theories of diffusion of innovations (Kwon & Zmud, 1987), transaction cost economics (Roberts & Sylvester, 1996), and information technology (Dixon, 1996) suggest that organizations adopt an innovation to obtain benefits that directly or indirectly impact financial performance

measures. There have been numerous claims and counterclaims, rarely supported by objective and rigorous empirical evidence, regarding whether programs have yielded net financial gains. Evidence of the benefits of these systems is largely restricted to theoretical models and anecdotal information obtained from case studies that depend on anecdotal information related by practitioners.[2]

Hard empirical evidence of the benefits from innovation has been slow in coming. Consultants may have been active, and successful, in 'selling' the benefits of change, but accounting academics and the academic publications industry must shoulder the blame for not bringing relevant research findings to the attention of practitioners in a timely manner (Smith, 2000). Results from the limited empirical research examining the link between SCM, TI, and ABC and financial performance are mixed (Wouters et. al., 1999). With the exception of Giunipero et al. (2001), who used correlation analysis to find partial evidence of an association between use of Quick Response (SCM as applied to retailing) and financial performance, we are aware of no studies that have identified an association between improvement in net financial performance and use of SCM or TI.

Recently, researchers have been successful in detecting a link between use of ABC and improvement in financial performance in specific business environments. Kennedy and Afleck-Graves (2001) were successful in linking the implementation of ABC with a net improvement in financial performance in manufacturers. However, Ittner et al. (2002), and Cagwin and Bouwman (2002) found that ABC's contribution was an indirect, rather than direct effect on improvement in financial performance.

HYPOTHESIS DEVELOPMENT

Firms adopt initiatives in attempts to gain or maintain cost and market advantages (Kinney & Wempe, 1998). These advantages should in turn lead to improvement (or to maintenance of favorable values) in composite financial indicators, in the face of competitive pressures. The first hypothesis is in three parts and is consistent with hypotheses contained in prior research, suggesting that initiatives individually contribute toward an improvement in financial performance.

H1: There is a positive association between use of a) SCM, b) TI, c) ABC and improvement in financial performance relative to the improvement in financial performance of non-users.

Context-specific Benefits Obtained from Concurrent Use of Initiatives

There may be context-specific benefits (positive or negative) leading to various optimal combinations of factor inputs, e.g., initiatives and management systems (Capon et al., 1988). If

firms are rationally maximizing value they would choose initiative combinations that they believe lead to this objective.

There has been considerable academic and practitioner interest in investigating possible context-specific benefits of initiatives with management information systems and management techniques.

Context-specific Benefits Obtained from Concurrent Use of TI with SCM

Information technology by itself will do very little to lower the cost of receiving, inventory control, shipping or transportation. Reducing costs requires process and management improvements to take advantage of what technology can do (Dawe, 1994). The challenge in SCM today is matching material or service flow with the flow of information associated with it (Andel, 1998). For example, when materials show up at the receiving dock, how long does it take to get the information associated with that delivery into the system that houses customer order management? Many researchers have argued the efficacy of combining SCM and TI in specific circumstances (e.g., Larson and Lush, 1990 in retailing; Lewis, 2000 at McCormick & Co.; Lin et al., 2000 at IBM; and Palaniswamy and Frank, 2002 at Oracle), leading to the second hypothesis:

H2: The financial performance of firms that use SCM with TI has improved more than the sum of the improvements directly associated with each initiative.

Use of ABC with SCM

The development of the supply chain concept poses a significant challenge for the cost accounting system. Porter (1985) and Drucker (1995) argue a firm must look beyond its internal actions to reduce costs and explore the linkages between suppliers' value chains and a firm's value chain to identify opportunities for competitive advantage. According to Pohlen and La Londe (1994), success of these efforts will largely depend on the ability of the firm's cost accounting system to trace costs to specific products, customers, supply channels, or logistics activities. Partridge and Perren (1994), Johnson and Kaplan (1987), Roth and Borthick (1991), and Pohlen and La Londe (1994) argue that with their inherent cost distortions, traditional cost systems are ill equipped to provide relevant information for analysis of supply chain costs; and that ABC, with its focus on activity analysis, is a natural choice for supply chain analysis. Noncontributing time can be identified and eliminated using information in the supply chain to avoid redundancies, compress the supply chain cycle, and synchronize lead times and capacities in the supply chain (Borthick & Roth, 1993; Partridge & Perren, 1994).

Use of ABC with TI

According to Drucker (1995), advances in information technology and the declining costs of computerized information have facilitated the development and maintenance of ABC and put ABC data at the fingertips of all management levels. Researchers and practitioners have often noted the natural relationship between ABC and TI. For example, Reeve (1995) suggests that an integrated ABC system presupposes a relatively high level of IT sophistication with extensive and flexible information stratification and real-time activity driver information; and Cooper (1988) and Koltai et al. (2000) suggest that ABC becomes more beneficial as the costs of measurement are reduced. That this connection is appreciated by the practitioner community is evidenced by a survey of software users where two-thirds said the full value of ABC would not be realized until improvements are made in data collection systems (Geishecker, 1996).

Context-specific Benefits Obtained from Concurrent Use of ABC with SCM or TI

Theory and anecdotal reports support the proposition that the improved costing information and intensive analysis of business activities provided by ABC lead to improved decision-making, and therefore should be associated with improved performance. However, Ittner et al. (2002) and Shields et al. (2000) argued that ABC has an indirect effect on financial performance by enhancing improvements contributed by other process improvement initiatives. Krumwiede (1998) provided additional weight to this argument by reporting that all fifteen "best practice" firms had linked ABC to another improvement initiative.

Although, as Shaw (1998) notes, ABC is now recognized as a fundamental business methodology for enabling business improvement, no empirical research has specifically targeted the combination of ABC with either SCM or TI and their combined association with improvement in financial performance, leading to the following hypothesis:

H3: The financial performance of firms that use ABC with SCM or TI has improved more than the sum of the improvements directly associated with each initiative.

SAMPLE SELECTION AND SURVEY INSTRUMENT

Selection of Industry

Most research regarding strategic business initiatives has focused on the manufacturing segment of the economy. However, the major changes that manufacturing companies have experienced in recent years have also occurred in virtually all types of service organizations

(Atkinson et al., 1995). Consequently, strategic business initiatives can be applied in all types of organizations (Rotch, 1990; Tanju & Helmi, 1991; Jarrar & Aspinwall, 1999). Since non-manufacturing activities represent the majority of the North American economy, there clearly is opportunity for research to focus on non-manufacturing settings, including transportation (Shields, 1997).

This study focuses on a single service industry: the motor carrier industry (SIC 4213). Restricting to a single industry reduces noise, thereby increasing statistical power, and consequently provides a higher likelihood of identifying valid relationships. The motor carrier industry is selected because of 1) the importance of the motor carrier industry to the nation's economy, 2) interest of the members of the industry in use of business initiatives that can potentially improve their competitive positions[3], and 3) the availability of detailed financial statement data for members of the industry.

Although it can be argued that the focus on a single industry tends to make results less generalizable than a study that crosses industries, the findings of this study have a wide appeal. The motor carrier industry generates about five percent of the gross domestic product and hauls approximately 55 percent of all domestic freight volume. It has an impact on virtually every organization in every industry and governmental agency in the U.S. economy. Furthermore, transportation is a major component of business logistics and is usually the single largest cost element in the logistics function. Companies not only contract with for-hire carriers but very often maintain private fleets of long-haul vehicles.

Survey Instrument and Procedures

The independent variable data used in this study (other than LEVEL) are extracted from an instrument that was used to collect data intended for use both in this study and also for other in-depth analyses of the trucking industry. The instrument is based on a thorough review of prescriptive, conceptual, practitioner, and empirical motor carrier industry literature. Content validity is addressed by asking representatives of the trucking industry, industry experts, and a group of faculty experienced in management innovation and survey research to review the instrument for clarity and meaning. Modifications were made as appropriate.

Most of the questions are close-ended and ask the respondent to rate or assess the item on a seven-point Likert balanced scale, anchored by 1 = "Almost Always Avoid" and 7 = "Almost Always Use." Some items ask for specific numerical information (e.g., "Truckload percent of total freight revenue").

Procedures prescribed by Dillman (1999) are followed to maximize response rates. Specific steps taken to strengthen this study include 1) pre-calling to obtain name of the CEO and to verify the mailing address, 2) sending a preliminary letter and brief summary of the project, 3) pre-calling to ask if the CEO had any questions, 4) including a personalized cover letter, 5) promising to send a summary of results and a Technical Report, 6) promising confidentiality, 7) including a stamped,

self-addressed envelope for reply, 8) mailing a reminder letter at three weeks past initial mailing, and 9) mailing a reminder post card after seven weeks.

Population and Sample

The initial population for this study consisted of the 2,002 firms that reported to the Interstate Commerce Commission and were included in the 1998 TTS Blue Book of Trucking Companies. In order to focus on companies of sufficient size to have an established set of practices for conducting business, the population is limited to those companies that have at least thirty employees or $5 million in gross revenues. This constraint reduced the population by 383. From the remaining 1,619 companies, 1,100 were randomly selected for inclusion in the study. Of these, six were eliminated because they are Canadian companies, two were unable to be contacted by telephone or letter, nine had gone out of business, and 14 withdrew or refused to cooperate upon initial contact. The remaining 1,069 firms comprise the final sample. A total of 332 responses were received, a response rate of 31.1 percent.[4] Because of their larger size, the 332 sample firms represent 16.5 percent of the firms in the TTS database but contribute 23.1 percent (equity) to 41 percent (ton-miles) of the aggregated totals.

Financial data is available for 305 of the responses for both 1999 and 1998. Sample selection and response are summarized in Table 1.

Table 1: Summary of Sample

Initial Population			2,002	
Less: Firms with Less than Thirty Employees or $5 million in Revenues			383	
Population of Interest			1,619	
Random Selection			1,100	
Less: Canadian Companies		6		
	Undeliverable	2		
	Out of Business	9		
	Withdrew or Refused to Cooperate Upon Initial Contact	14	31	
Net Responses Possible			1,069	
Responses Received			332	
Response Rate				31.1%
Less: Data from 1999 Unavailable			27	
Final Sample			305	

The median industry, company, and position experience of the respondents is 25, 17, and nine years, respectively and 96 percent are of the rank of controller or officer (70 percent are President, Owner, or CEO). The extensive experience and high rank of the respondents lend considerable credibility to the survey responses.

METHODOLOGY

The impact of strategic business initiatives on a firm's improvement in financial performance is examined using the following model:

$$\Delta(PERFORMANCE = f(Initiative\ Use, Initiative\ Use\ Interactions, Control\ Variables)$$

where ΔPERFORMANCE is the change in ROA, measured for year t+1 minus year t. The Initiative Use variables are the set of binary measures of use of SCM, TI and ABC and are used to identify simple effects (H1). Interaction terms are created for concurrent use of SCM with TI (H2) and of ABC with SCM and with TI (H3). The dependent variables, variables of interest and control variables are discussed below.

Change in Return on Assets (ΔROA)

ROA, defined as after-tax net income scaled by total assets is generally accepted as a composite financial performance variable in empirical research. Many researchers, e.g., Ittner et al. (2002), Cagwin and Bouwman (2002); Kennedy and Affleck-Graves (2001) have used ROA as a dependent variable in their studies of ABC and financial performance. Furthermore, previous research shows a high correlation between ROA and other profitability measures (Prescott et al., 1986). For these reasons ROA is selected as the primary dependent variable.

Testing improvement in financial performance poses significant measurement problems. As Roberts and Silvester (1996) observe, numerous complications arise, including: (1) Modeling a company's "expected" profitability against which to compare realized profitability achieved after use of an initiative, (2) Controlling for concurrent changes in the organization, and (3) Controlling the breadth of implementation and integration of initiatives throughout the firm.

In general, comparison of "expected profitability" requires either specification of control variables which describe the industry in which the firm operates or the use of "industry mean-adjusted" measures. In the current study, expected profitability is addressed through restricting the study to a single industry, by using a fixed period of time (the change from 1998 to 1999) which provides control for macroeconomic and industry-specific factors that affect all firms equally, and by controlling for differences in the three segments of the industry. These restrictions allow

comparison of the profitability of initiative users against that expected without use, proxied by the performance of equivalent non-users.

Concurrent changes in the organization are addressed through identifying and controlling for use of other initiatives and for prior performance. Control for use of other initiatives separates the effects of individual initiatives and allows comparison of users of an individual initiative to non-users of that initiative. Controlling for the moderating effects of length and breadth of implementation is addressed by inclusion of variables measuring extent of use derived from survey responses.

Archival dependent variable information is obtained from the TTS database. The TTS Blue Book of Trucking Companies is published by Transportation Technical Services, Inc., New York (TTS, 1998). The majority of Blue Book data is extracted from annual reports (Form M) that carriers file with the Interstate Commerce Commission. Form M requires use of standardized accounts defined in the Uniform System of Accounts for Motor Carriers of Property published by the American Trucking Associations, Inc.

Variables of Interest (ABC, SCM, and TI)

The simple variables of interest measure use of the initiatives SCM, TI, and ABC. These initiatives are established initiatives of significant interest to the motor carrier industry. ABC is of particular interest to the accounting profession.

Cross-sectional survey data are collected regarding the extent of use (diffusion) of initiatives at the survey date (mid-1999). The variables of interest are developed from 7-point Likert balanced scale (Dillman, 1999) responses to survey items introduced as "How much do you avoid or use the following competitive tactics to realize your competitive strategies?" Possible responses are: (1) "Almost Always Avoid," (2) "Mostly Avoid," (3) "Sometimes Avoid," (4) "Neither Avoid or Use," (5) "Sometimes Use," (6) "Mostly Use," and (7) "Almost Always Use."

ABC is measured by a single survey item. SCM is an additive measure comprised of three survey items: "Alliances with Competitors," "Partnership with Suppliers, " and "Inter-modal." TI is comprised of "Electronic Data Interchange," "Satellite Tracking Systems," "On-board Computers."

In addition, respondents furnished the year that they began use of each initiative. Responding firms are classified as significant users if their response averaged at least 5.5 to the questions regarding ABC, SCM or TI, and, because strategic initiatives are inherently multi-year projects, their year of beginning use was not 1999. As in Ittner et al. (2002), to avoid measurement problems with companies that are just beginning to implement initiatives, or that have not achieved full commitment to the systems, binary variables (SCM, TI and ABC) differentiate significant users from the remainder of the sample. These variables are the variables of interest for testing Hypothesis 1, which tests for a positive simple effect from use of the individual initiatives.

Control Variables

The implications of three control variables- two variables denoting type of company, TL and LTL (with specialized carrier the default), and beginning mean-adjusted LEVEL of performance are discussed in the following section.

Type of Company (TL, LTL)

The motor carrier industry is not entirely homogenous, but can be partitioned into three segments. One important distinction is between less-than-truckload (LTL) and truckload (TL) carriers. LTL carriers provide service to shippers who tender shipments lower than the minimum truckload quantities (i.e., 500 to 15,000 pounds). Consequently, the LTL carrier must consolidate the numerous smaller shipments into truckload quantities for inter-city movement and break down full truckloads at the destination city for delivery in smaller quantities. In contrast, the truckload carrier picks up a truckload and delivers the same truckload at destination.

Carriers may also be classified by the type of commodity they haul, general or specialized commodities. Specialized equipment carriers are carriers of goods requiring special handling (e.g., liquefied gases, frozen products, automobiles, or household goods). A specialized carrier is not permitted to transport other specialized commodities, or general commodities.

Industry type has been demonstrated as important in previous work (e.g., Capon et al. 1988) explaining cross-sectional variation in financial performance. The characteristics of the three types of service offered by carriers (TL, LTL, and specialized) in effect reflect three mini-industries. The impact of industry type is appropriately addressed through use of control variables. Because firms often offer more than one type of service, participating in more than a single mini-industry, self-reported continuous variables measuring the percentage of total freight revenues attributable to each classification (TL and LTL, with specialized carrier the default) are created. These variables provide control for differences in competitive environments, accounting practices, and other classification specific attributes that may impact performance. It is expected that LTL will be negatively signed because that segment of the industry has been under-performing the other segments during this decade.

Level of Performance (LEVEL)

As Balakrishnan et al. (1996) noted in their discussion of JIT, a firm's pre-adoption operating efficiency will influence its ROA response to the increased efficiency of initiative use. Because it appears that there are continuing pressures that tend to pull the performance of firms towards the average[5] (Bernard, 1994), higher performing companies may implement business initiatives to retain their comparative advantage, rather than to show improvement. In addition, firms are

generally unable to sustain extremely poor performance for an extended period of time. They must either improve their performance towards the mean, or go out of business and thus would be not included in a cross-sectional study. These conditions may effectively create a "collar" around the performance of a sample firm, a ceiling limiting the improvement of the top performers and a floor limiting the deterioration of the already poor performers, resulting in a phenomenon with the statistical characteristics of mean reversion.

Significance of the variable of interest could result from lack of control for the effects of this "collar." If below average performers tend to implement initiatives more than successful firms, an upward change in performance may be due to the pressures noted above that tend to pull the performance of firms towards the average rather than efficacy of the initiatives. To control for the effects of mean reversion, beginning of test period (t) mean-adjusted level of performance (ROA) is included as an independent variable. It is expected that the sign of the regression coefficient associated with this variable will be negative (i.e., performance will be drawn toward the mean).

Regression Model

Testing of the three hypotheses is accomplished through estimation of the following OLS multiple regression:

$$\Delta ROA = \alpha + \beta_1 SCM + \beta_2 TI + \beta_3 ABC + \beta_4 TL + \beta_5 LTL + \beta_6 ROA + \beta_7 SCM*TI + \beta_8 SCM*ABC + \beta_9 TI*ABC + \epsilon$$

The expected signs of the coefficients are: β_1 through β_3, and β_7 through $\beta_9 > 0$, and $\beta_6, < 0$; β_4 is not predicted.

RESULTS

Descriptive Statistics

Statistics relating to the use of SCM, TI and ABC are reported in panel A of Table 2. Over thirty percent (23 percent) of the respondents indicated that their firm "mostly" or "almost always" use ABC (TI), with 59 (19.3%) making heavy use of both. As might be expected given the recency of its widespread acceptance as a viable management strategy, fewer respondents (18.4%) use SCM heavily. However, in contrast to Morton (1997) who states that ABC has not been readily accepted by those in SCM, almost 2/3 of the SCM users also use ABC. There appears to be an adequate balance of users and non-users (control firms) to provide the contrast necessary to obtain adequate statistical testing power.

Table 2: Descriptive Statistics					
PANEL A Characteristics of Responding Firms Use of Initiatives (n=305)					
		# Responses			
		Nonusers		Users	
		#	%	#	%
Initiative					
	Activity-Based Costing (ABC)	211	69.2	94	30.8
	Technology Integration (TI)	233	76.4	72	23.7
	Supply Chain Management (SCM)	249	81.6	56	18.4
Interactions					
	TI*SCM			36	11.8
	TI*ABC			59	19.3
	SCM*ABC			41	13.4

Use of ABC, SCM, and IT had an average response of 5.5 to 7 with the implementation date completed and before 1998. Firms are partitioned into High and Low performance at the median.

Table 2: Descriptive Statistics					
PANEL B Sample Partitioned into Low and High Performing Firms Based on LEVEL of Prior ROA					
		# Nonusers		# Users	
		LEVEL		LEVEL	
		Low	High	Low	High
Initiative					
	Activity-Based Costing (ABC)	102	109	51	43
	Technology Integration (TI)	113	120	40	32
	Supply Chain Management (SCM)	127	122	26	30
Interactions					
	TI*SCM			21	15
	TI*ABC			31	28
	SCM*ABC			20	21

Descriptive statistics relating to the dependent and control variables used in statistical testing are presented in Table 3. The median (mean) change in ROA is a slightly negative (0.6) percent (positive 0.1 percent) from 1998 to 1999, reflecting the recent decline in profitability of the industry. The median level of performance for 1998 was a 3.7 percent ROA. Because the sample includes somewhat larger and less TL oriented firms than the industry population, this performance could indicate reduced profitability for the LTL segment of the industry.

Table 3: Descriptive Statistics

Panel A
Characteristics of Tested Firms

		Mean	Median	Std. Dev.
Financial Performance				
	1999 ROA	0.040	0.036	0.096
	1999 Net Income (000s)	487.7	419.0	3210.0
Type (%)				
	TL	48.360	35.0	44.207
	LTL	15.016	0.0	31.499
	Specialized	36.524	0.0	35.907
Size (000s)				
	Revenue	53,171	29,087	107,992
	Assets	27,627	12,415	86,486

Panel B
Dependent and Control Variables

		Mean	Median	Std. Dev.
Performance				
	ROA	0.001	(0.006)	0.101
	% INC (% Change in Income)	0.087	0.046	0.088
	Level (ROA), (t) before mean adjustment	0.039	0.037	0.098
Type (%)				
	Truckload (TL)	48.360	35.0	44.207
	Less-than-Truckload (LTL)	15.016	0.0	31.499

The correlation matrix of the simple effect and control variables is shown in Table 4. As expected, use of initiatives is moderately positively correlated, with individual correlations ranging from 0.21 for ABC with SCM to 0.30 for SCM with TI. Initiative users also are more likely to be

less-than-truckload (LTL) companies than truckload carriers (TL). Consistent with these pair-wise correlations, regressions of individual variables on the remaining independent variables show that the initiative variables have a moderate multivariate relationship with significance levels in the $\alpha = 0.10$ range. All three initiatives are also moderately correlated with LTL. In no cases does the R^2 exceed 0.18 for these regressions. The extent of these correlations does not suggest that correlation among variables is a serious econometric issue.

There are statistically significant negative correlations between prior level of performance and SCM (-0.20) and ABC (-0.12), an indication of possible endogeneity. Lower performing firms tend to use SCM and ABC more often than high performers. A regression of initiative use on year t level of ROA (not presented) confirms that heavy users of initiatives tended to be slightly below mean in level of performance. If the form of the LEVEL variable does not adequately model mean-reversion (e.g., due to non-linearity), then performance improvement from lower performing SCM or ABC users cannot be specifically attributed to the initiative. This potential problem is addressed by performing an alternate test where the sample is partitioned into two groups based on prior performance, as shown in panel B of Table 2. As discussed later in the paper, consistent results for both groups indicate that results for the lower performing firms are not biased by improper modeling of mean reversion.

Table 4: Spearman Correlation Matrix of the Independent Variables
(N= 305)

	ABC	TI	SCM	TL	LTL	ROA
LEVEL						
Activity-Based Costing (ABC)	1					
Technology Integration (TI)	.26	1				
Supply Chain Management (SCM)	.21	.30	1			
Truckload % (TL)	-.09	-10	-.15	1		
Less-than-Truckload % (LTL)	.20	.15	.17	-.12	1	
LEVEL of year t (ROA)	-.12	-.08	-.20	.01	-.02	1

In Table 4, the use of ABC, TI, and SCM had a response of 5.5 to 7 with implementation date completed and before 1998; LTL and LTL equal the percentage of truckload and less-than-truckload carriage; and LEVEL equals the industry-adjusted level of the prior year's ROA.

Tests of Association are between Initiative Use and Financial Performance.

Results of the formal hypothesis tests are reported in Table 5[6]. The model is highly significant with an F-statistic of 24.71 and an R-square of .5501. SCM and TI have positive simple

effects at the $\alpha = 0.05$ level. Hypothesis 1 is confirmed for SCM (H1a) and TI (H1b). Although ABC (H1c) is positively signed, it does not attain statistical significance at conventional levels ($p<0.157$).

The interaction of ABC with TI is positively significant at $\alpha = 0.05$, while that of ABC with SCM is significant at $\alpha = 0.059$. Significance of a positively signed interaction term confirms that there is a positive effect created from concurrent use of the two tested initiatives (i.e., there is an association with improvement in financial performance over and above that of the sum of the effects of the initiatives used in isolation). Therefore, it appears there is a positive context-specific benefit created from concurrent use of these pairs of initiatives. Hypothesis 3 is therefore confirmed.

However, although the coefficient is positive, there is no statistical evidence that concurrent use of SCM and TI creates a positive context-specific benefit. Hypothesis 2 is not confirmed.

Table 5: Regression of 1-Year Change in ROA on Initiatives including Interactions of SCM with TI and ABC with SCM and TI

$$\Delta ROA = \alpha + \beta_1 SCM + \beta_2 TI + \beta_3 ABC + \beta_4 TL + \beta_5 LTL + \beta_6 ROA + \beta_7 SCM*TI + \beta_8 SCM*ABC + \beta_9 TI*ABC + \epsilon$$

F			24.71		
P-Value			0.001		
R^2			.5501		
Adjusted R^2			.5212		
		Expected Sign	Coefficient	-Stat	p-value
Intercept			-0.005	2.078	0.026
Initiative Simple Effect					
	Activity-Based Costing (ABC)	+	0.004	1.004	0.157
	Technology Integration (TI)	+	0.007	1.594	0.049
	Supply Chain Management (SCM)	+	0.009	1.787	0.015
Interactions					
	TI*SCM	+	0.005	0.906	0.183
	TI*ABC	+	0.014	2.147	0.020
	SCM*ABC	+	0.009	1.694	0.059
Control Variables					
	Truckload (TL)	?	-0.000	-0.720	0.458
	Less-than-Truckload (LTL)	-	-0.000	-1.502	0.098
	LEVEL	-	-0.107	4.201	0.001

In Table 5, the use of ABC, TI, and SCM had an average response of 5.5 to 7 with implementation date completed and before 1998; LTL and LTL equal the percentage of truckload and less-than-truckload carriage; and LEVEL equals the industry-adjusted level of the prior year's ROA. Bold indicates significant at the $\alpha = 0.05$ level; Italicized indicates significant at the $\alpha = 0.10$ level. Tests on the coefficients are one-tailed for variables with an expected sign, and two tailed for remaining variables.

Results are consistent when each initiative's set of three variables (one simple and two interaction terms) is dropped from the model. In all cases, the adjusted R^2 decreases. Inclusion of each initiative adds to the explanatory power of the model. Also, the SCM-ABC and TI-ABC combinations individually contribute a positive adjusted R^2. SCM-TI does not add to explanatory power.

Of the control variables, LTL is negatively signed and significant at $\alpha = 0.10$, and LEVEL is negatively signed and highly significant at 0.001. The negative significance of LTL confirms that, as discussed in the motor carrier and transportation literatures, LTL and large companies did not perform as well as specialized carriers or TL companies during this period. The negative significance of LEVEL confirms the mean-reversion of earnings in the motor carrier industry.[7]

SUMMARY & DISCUSSION

This study investigates the use of SCM, TI and ABC in the motor carrier industry and the association of those initiatives with improvement in financial performance. Knowledge of the efficacy and context-specific benefit of business initiatives is of significant interest to three communities: 1) the practitioner community (including accountants, managerial decision-makers, potential project leaders, professional associations, and consultants) using, promoting, instructing in the use of, or contemplating the implementation of SCM, TI, or ABC, 2) researchers interested in the theoretical and empirical literature regarding these initiatives, and 3) educators who communicate the commonly believed benefits and instruct in their use.

Archival financial information obtained for 305 motor carriers is used to regress 1-year change in financial performance against initiative use. The first finding is that, consistent with the literature and after control for previous level of performance and for use of other initiatives, use of SCM and TI are significantly associated with ROA improvement. The second finding is that, although there was not a statistically significant simple effect obtained from use of ABC, there is empirical evidence that, consistent with the management accounting, SCM, and TI literatures, context-specific benefits are obtained from concurrent use of ABC with SCM and TI. These results are robust to the partitioning the sample into high and low performing groups. It is likely that ABC functions as an enabler of other improvement initiatives, providing the information necessary to optimize the effectiveness of SCM and TI. The positive findings regarding ABC are of particular

interest to practicing and academic accountants because they are often the primary proponents and administrators of ABC and previous evidence of ABC efficacy has been theoretical or anecdotal.

However, more research is needed to explain how this effect occurs. It is possible that improvement in performance results more from the introspection and internal and external communication that occurs whenever the initiative is implemented rather than results achieved from its mechanical application. Research that investigates the conditions under which improvement occurs and that identifies the components of financial performance that are impacted by initiative use would be of benefit.

A third significant finding of this study is that there is a pronounced mean reversion of earnings, at least in the motor carrier industry. Since deregulation in the 1970s, the industry has become highly competitive, largely because of 1) low entry costs in the TL and specialized carrier segments, and 2) increased competition with other modes of transport. Overall the industry lacks the capital investment requirements, proprietary processes, technology, and territory and patent protection typical of many other industries. Therefore, trucking firms are not able to maintain their competitive position over extended periods of time without continuing improvements in efficiency and service (Coyle et al., 1994). To maintain their position, the best performing firms must implement solutions to counter the "collar" effect that pulls their performance towards the mean. Although cause cannot be directly inferred from this study, there is evidence that the use of initiatives can help to offset this effect, thereby facilitating top performers in maintaining their relative position.

As with all studies, there are several important limitations to the analyses. It is assumed that respondents know the extent of initiative use and have responded honestly. Although respondents were generally top executives who should be knowledgeable about major initiatives, the possibility exists that the responses do not represent actual company practices. Secondly, although this study is restricted to a single industry, level of use may not capture the effectiveness of an individual firm's implementation of an initiative. As argued by previous researchers (e.g., Cooper 1988, Cooper and Kaplan 1991), firm-specific factors such as complexity and diversity and information technology may limit or enhance this effectiveness. Further research testing the arguments of prior researchers would be of value.

Restriction to a single industry yields significant advantages in empirical testing. Although the motor carrier industry affects virtually all firms, there is no assurance that results are generalizable to firms in other industries. Research investigating other industries would complement the findings of this study.

This study does not control for varying risk among sample firms. It is possible that high risk firms would have a higher (lower) expected change in ROA change than low (high) risk firms. Moreover, high (low) risk firms might be more likely to adopt ABC or other measures than other firms.

Finally, significant interaction terms precludes interpretation of the individual coefficients of the initiative variables, and prevents the determination of the individual economic effect of TI, SCM, and ABC. A study that utilizes a different methodology but maintaining control for concurrent use, possibly through matched sample control groups, would be welcome.

NOTE

Data Availability: Dependent and control variable data are available from Transportation Technical Services, Inc. Initiative use data was obtained under promise of confidentiality.

END NOTES

1 The terms activity-based costing (ABC) and activity-based management (ABM) are sometimes used interchangeably. Strictly speaking, ABC refers only to the actual techniques for determining the costs of activities and outputs that those activities produce. Some researchers and practitioners prefer to use the term activity-based management (ABM) when they describe how the activity information is used to support operating decisions. As in Swenson (1995) and Krumwiede (1998), this study defines ABC very broadly to include activity-based costing and activity-based management

2 For examples, Barnes (1991), Brimson (1991), Bruns and Kaplan (1987), and Harris (1990).

3 As a confirmation, of 332 total responses, 80 firms use TI, 97 use ABC, and 60 use SCM.

4 The median response time was fifteen days. Non-response bias is tested by comparing the median responses of the early responders to those of late responders for statistical difference in responses. The tests reveal slightly more significant differences ($p<.05$) than would be expected by chance. Later respondents tend to be older, to have more industry experience and to be associated with smaller companies. These firms also exhibit a slightly higher use of TI.

It is not surprising that the non-response bias tests reveal some differences. For example, a possible explanation for the slower responses by older and more experienced respondents representing smaller companies is that the range of their responsibilities precludes a fast response.

5 Previous research (DeBondt and Thaler 1987; Penman 1991; Penman 1992; Lieber et al. 1983) has documented the mean reversion of earnings. ARIMA (p,d,q) models with mean-reverting characteristics have been shown to be descriptive of annual earnings series (Halsey 1996; see Finger, 1994 and Foster, 1986 for a discussion). Halsey (1996) successfully tested a model of earnings consisting of three components: 1) an underlying trend to capture the permanent component of earnings, 2) a transitory component to reflect irregular shocks, and 3) a mean-reverting component. It is contended that use of initiatives provides a positive adjustment to the trend component.

6 Regression diagnostics reveal no serious problems with multicollinearity. For a model without initiative interaction terms the condition index is 6, with no variance inflation factors above 2, well within the guidelines established by Belsley (1980). Addition of interaction terms increased the condition index to 24, still within

acceptable limits. However, the addition of interaction terms tends to bias against finding simple effects and prevents interpretation of the individual initiative coefficients.

White's (1980) heteroskedasticity adjusted t-statistics are reported. Analysis of the Durbin-Watson statistics indicates no misspecification of variables.

Influential data points, generally outliers with extreme values of the dependent variable, are identified through analysis of the R-student residuals. Outliers are expected because extreme observations of ratios (e.g., ROA) occur frequently relative to typical level variables. Influential data points are addressed through an iterative process whereby a regression is run, the observation with the largest r-student residual (exceeding '3') is identified, investigated and eliminated, and the regression re-run. This process results in the elimination of eight observations (2.6 percent), well within normal limits. As discussed later in the paper, sensitivity testing is performed whereby the values of the dependent variables are transformed to eliminate the need for eliminating observations. Results are robust to these specifications.

7 Several sensitivity tests are performed including alternative modeling of prior level of performance, and a search for missing variables i.e., controlling for level of equity and firm size (revenues, log of revenues, total assets and log of total assets). In addition, several alternative specifications of the dependent variable and variables of interest were tested including logarithmic transformation of ROA and winsorizing rather than deleting of outliers. Also, return on equity (ROE) and percentage change in income were substituted for ROA. Finally, the original 7-point likert responses and a three-point (heavy, light and non-users) specification of initiative use were substituted for binary measures. Results are generally robust to these specifications of the model.

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AN ANALYSIS OF RELATIVE RETURN BEHAVIOR: REITs VS. STOCKS

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ABSTRACT

Given the ongoing changes in the REIT industry, we have analyzed the return behavior of the equity REIT, mortgage REIT, and S&P 500 indices using monthly data for the period of 1972-2001, to see if previously identified return patterns still hold for REITs relative to stocks. Following a large monthly gain, investors can benefit by adopting a momentum buying strategy for stocks or mortgage REITs, but not for equity REITs. Investors can also profitably employ a mean reversion strategy for any of the three indices. Indications for the existence of exploitable calendar effects were found all three markets indices. While the general pattern of seasonality effects differs across indices, a positive January effect, negative August and October effect were found in all index return series for several subperiods. Our findings also suggest that both equity REITS and mortgage REITS can enhance the risk/return relationship of a general stock portfolio. However, equity REITs clearly dominate mortgage REITs on a risk-return basis and compare favorably with stocks. The correlation coefficients between all three asset classes are similar, but the relationship between stocks and equity REITs has lessened over time.

INTRODUCTION

A sizeable body of literature has developed that examines the behavior of real estate investment trust (REIT) returns relative to those of common stocks. In this paper, we analyze the return behavior of REITs and stocks using monthly data for the period of 1972-2001 to determine whether investors should consider adding REITs to traditional stock and bond portfolios. We examine returns for equity and mortgage REIT indices and for the Standard and Poor's 500 stock index (S&P 500) to address three issues that have been subject to controversy in the literature.

First, there has been some debate over whether stocks and REITs exhibit momentum, mean reversion, or both types of behavior. To investigate this issue, we identify the twenty-four largest monthly increases and decreases for the equity REIT, mortgage REIT, and S&P 500 indices - similar to the selection procedure employed by Seligman (2001). Then, we apply the event study methodology to measure the subsequent response to these events to determine whether momentum or mean reversion is prevalent for each index and whether REITs behave differently than stocks

during these periods. Our findings suggest a buy and hold strategy after a large decline for all three indices and a momentum buying strategy for stocks and mortgage REITs only.

A second area of focus is to investigate calendar effects across our three asset classes. As seasonalities for each asset class are documented and become widely known, they are subject to short-term trading activities designed to exploit inefficiencies. Thus, testing for the persistence of monthly calendar effects is also a test of market efficiency for each type of financial asset. We find calendar effects in several subperiods across all three indices. Positive January and negative October effects are most pronounced in the REITs indices, weak complementing evidence is also found in the S&P 500 stock index. The time varying nature suggests that investors may have already incorporated this knowledge into their trading strategies as would be consistent with the Efficient Market Hypothesis.

The third objective of this paper is to identify the degree of correlation between equity REITs, mortgage REITs and stock returns. If REITs are not highly correlated with stocks, or if this correlation has been declining over time, REITs can enhance the risk/return relationship of a general stock portfolio. With the structural changes initiated in January 1993, more institutional investors entered and more analysts covered the REITs market (Chan, Leung, and Wang 1998). To further investigate this issue, we examine correlations between the three asset classes for the pre-1993 period, the years 1993-1999, and for 2000-2001, which represents the recent bear market for stocks. We find diversification benefits from the inclusion of real estate related securities into a general stock portfolio to have increased over time and that equity REITs, based on a superior risk/return relationship, are to be preferred over mortgage REITs.

LITERATURE REVIEW

An important theme in many studies has been whether REITs are sufficiently different from stocks to provide diversification benefits or enhance portfolio returns. While Chen, Hsieh, and Jordan (1997) find superior financial performance for equity REITs during the period 1980 - 1985, Chen and Peiser (1999) show that REITs, as a separate asset class, under perform both bonds and stocks on a risk-return basis over the 1987-2000 period, and conclude that real estate has "no role in a very highly risk-tolerant portfolio". Yet, Ibbotson Associates (2002) indicate that inclusion of REITs into a well-diversified stock and bond portfolio could have enhanced returns by up to 0.8% annually over the period 1972-2001 and by 1.3% annually for the years 1992-2001. The methodology varies between these three studies, but the apparently conflicting results may arise primarily from differences in time periods considered.

Liao and Mei (1998) find the risk premiums of real estate related securities to vary significantly over time and stress the importance of market timing. Using monthly return data for the S&P 500 index, Seligman (2000) explains that only a few extraordinarily good months account for a large portion of the entire holding period's return. The biggest gains were concentrated in

months following large declines, directly supporting the mean reversion argument. Jegadeesh and Titman (1993, 2001) have documented the success of momentum strategies using portfolios of individual stocks for time horizons of generally three to six months. Similarly, Chui, Titman, and Wei (2001) find momentum effects in REIT portfolios over six-month holding periods that are even stronger than the momentum effects for stocks. And while Glascock (2004) reveals that REITs momentum return are less during bear markets, Chui and Titman (2003) finds momentum effects to be positive related to REIT size.

The tests conducted by Chui, Titman, and Wei (2001) can serve as a framework to determine whether monthly effects contribute to either momentum profits or mean reversion. Evidence of a January effect in equity securities is abundant and not limited to the US [see e.g., Rozeff and Kinney (1976), Reinganum (1983), and Keim (1983)]. Also, Ma and Goebel (1991) observe the January effect in securitized mortgage markets, while Colwell and Park (1990) and McIntosh, Liang, and Tompkins (1991) document calendar effects in REIT returns.

The combination of the look through provision, which allowed pension funds to invest in REITs (January 1, 1993) and the liquidity crisis and recapitalization of commercial real estate, led to the REIT boom of 1993-1997. While Mull and Soenen (1997) reveal the existence of large temporal differences in REIT efficiency as a stock portfolio component, Clayton and MacKinnon (2001) discuss the time-varying nature of the link between REIT, stock, and bond returns and point out that return relationships underwent a structural change, leaving REITs to be a different type of investment than they were in earlier years. Given the recent changes in the REIT industry, it may be useful to revisit the risk-return characteristics of REITs to see if previously identified return patterns still hold for REITs relative to stocks. While Paladino and Mayo (1998) and Capozza and Seguin (1999) conclude that REITs do not provide diversification benefits to a stock portfolio, Hudson-Wilson (2001) suggests that a declining correlation of REITs and stocks can enhance the risk/return relationship of a general stock portfolio. As more institutional investors entered and more analysts covered the REITs market subsequent to the structural changes initiated in January 1993 (Chan, Leung, and Wang 1998), REITs could become more like stocks. However, recent work by Clayton and MacKinnon (2001) and Chui, Titman, and Wei (2001) suggests that the opposite may have happened in recent years and Lee and Stevenson (2005) conclude that the attractiveness of REITs as a diversification asset increases as the holding period increases. To further investigate this issue, we examine correlations between the three asset classes for the pre-1993 period, the years 1993-1999, and for 2000-2001, which represents the recent bear market for stocks.

DATA AND METHODOLOGY

The data set of monthly REIT returns for January 1972 to December 2001 is calculated from monthly index prices of equity REITs (ERI) and mortgage REITs (MRI) available on the National Association of Real Estate Investment Trusts website. Monthly returns for the S&P 500 index and

returns on Treasury bills are obtained from Pinnacle Data Corporation. These data are used to analyze the return behavior of REITs relative to stocks (S&P 500), and as discussed earlier, the empirical analysis focuses on three major issues.

MEAN REVERSION OR MOMENTUM?

METHODOLOGY

Monthly returns on the ERI, MRI, and S&P 500 index are ranked in order of decreasing (increasing) abnormal returns. This formulation modifies and extends ideas presented in Seligman (2001), who looks at the 41 largest return months for the S&P 500 and discovers that they occur primarily after the months of largest declines for the S&P 500. Two samples are formed for each index, consisting of the 24 best and 24 worst months. These 48 top or bottom performing months are labeled "event month". Event study methodology was used to determine abnormal returns subsequent to a significant up or down move. Abnormal index returns are measured over a ten month event window that includes the three months prior to the event, t_{-3} to t_{-1}, the event day $t = 0$, and the subsequent six months of returns t_{+1} to t_{+6}. Abnormal returns are calculated as the difference between actual return and expected return, the monthly return average for the previous 12 months (t_{-15} to t_{-4}):

$$AR_{it} = R_{it} - E(R_{it}), \qquad \textit{Formula (1)}$$

where:
R_{it} = the actual rate of return on index i for the event month t,
$E(R_{it})$ = the expected rate of return on event month t.

For a sample of N events (24 in our analysis), an average abnormal return (AAR_t) for each event month is computed as:

$$AAR_t = (1/N)\ Sum\ (AR_{it}) \qquad \textit{Formula (2)}$$

The cumulative average abnormal return ($CAAR_t$) for any event month j within the 10-month window from t_{-3} to t_{+6} is computed as:

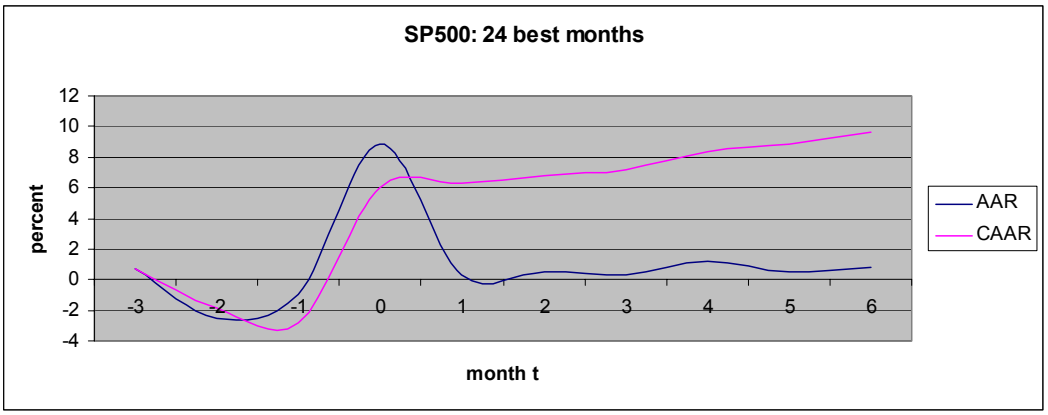
$$CAAR_t = Sum\ (AAR_t) \qquad \textit{Formula (3)}$$

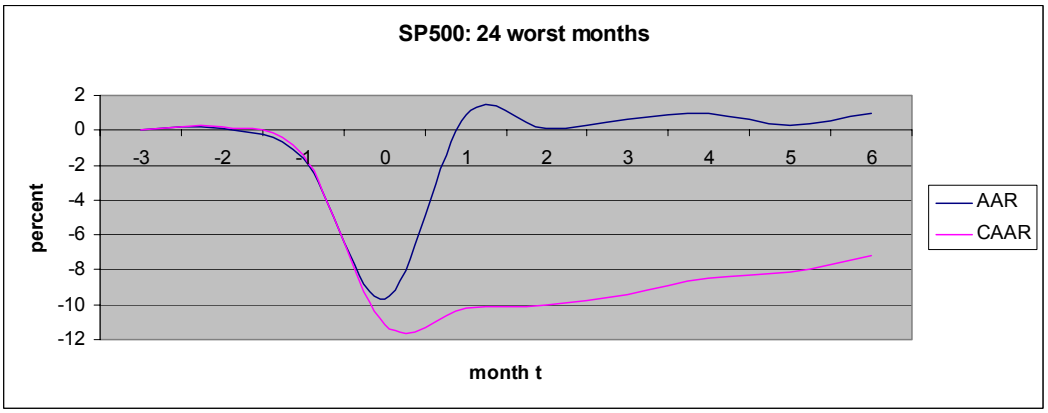
EMPIRICAL RESULTS

As shown in Exhibit 1, the S&P 500's best 24 months are preceded by two months of negative returns with a *CAAR* of -3.53%. The average abnormal return of the event month t_0 is 8.85%. With *AAR*s for the following six months t_{+1} to t_{+6} all being positive (ranging from 0.32%

to 1.23%), the S&P 500 index clearly displays momentum behavior following large gains. An investor, who benefited from the high returns of an event month, would not have to suffer from the negative consequences of a severe market reaction, due to the lack of a mean reverting tendency. Even more interesting is the finding that an investor could have earned a modest abnormal return simply by investing in the S&P 500 immediately after a significant upturn. The result would have been a positive *CAAR* of 3.91% for the period of t_{+1} to t_{+6}.

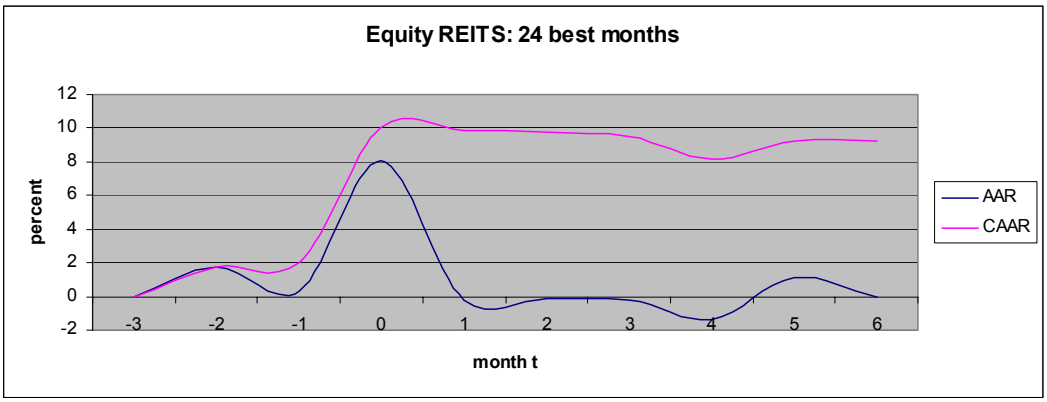
Exhibit 1

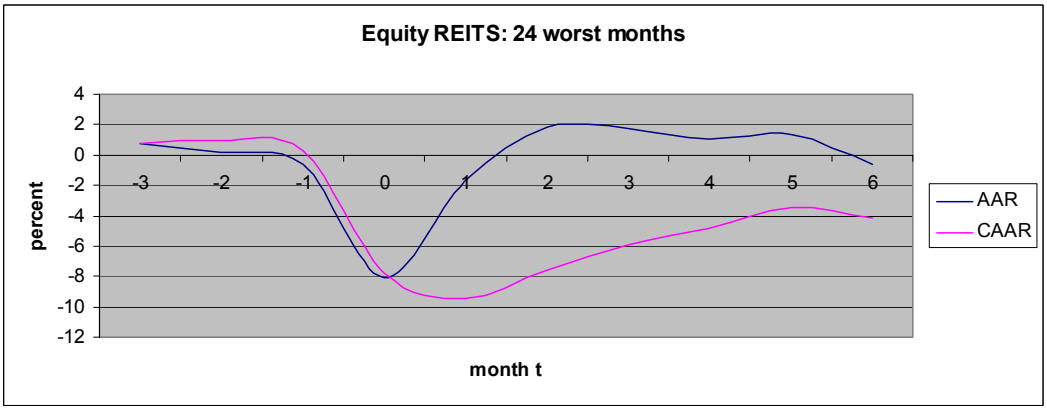




The S&P 500's worst 24 months generated an *AAR* of - 9.72%. As shown in Exhibit 1, monthly *AAR*s range from 0.15 to 0.99% for the subsequent 6-months period and *CAAR* = 3.96%, indicating that it is beneficial to invest in the S&P 500 index right after a huge downturn to capture the subsequent impact of mean reversion.

Exhibit 2





The return analysis of the ERI reveals a picture somewhat different from that of the S&P 500 index (Exhibit 2). Both the upswings and especially the downswings of the ERI are less pronounced. The 24 best (worst) months produce average abnormal returns of 8.03% (-8.15%). Following the best months, the *AAR*s for t_{+1} to t_{+4} are negative, indicating some profit taking and minor evidence of mean reversion. Consequently, following a major up move, investors should retire from the equity REITs markets for a period of four to six months to avoid the negative impact of what technical analysts would describe as a market reaction. Following months with unusually high negative returns, the ERI recovers less quickly than the S&P 500 index. While the S&P 500 index generates positive *AAR* in the month immediately following a large downturn, *AAR* for t_{+1} is still negative (-1.69%) for the ERI and becomes positive only in the months t_{+2} to t_{+5}, with averages ranging from 1.10% to 1.86% for the former. The ERI displays continued negative momentum in the month following a large decline and then finally mean reversion sets in and *CAAR* increases by 5.38% from periods t_{+1} to t_{+6}.

Table 1: Descriptive statistics

The table presents descriptive statistics for the 360 monthly return observations (in%) for the period of 1972-2001, and each of the six 5-year subperiods for the ERI, MRI, and SP500 index. CV is the coefficient of variation, showing risk per unit of return. Low CV values are preferred to higher values.

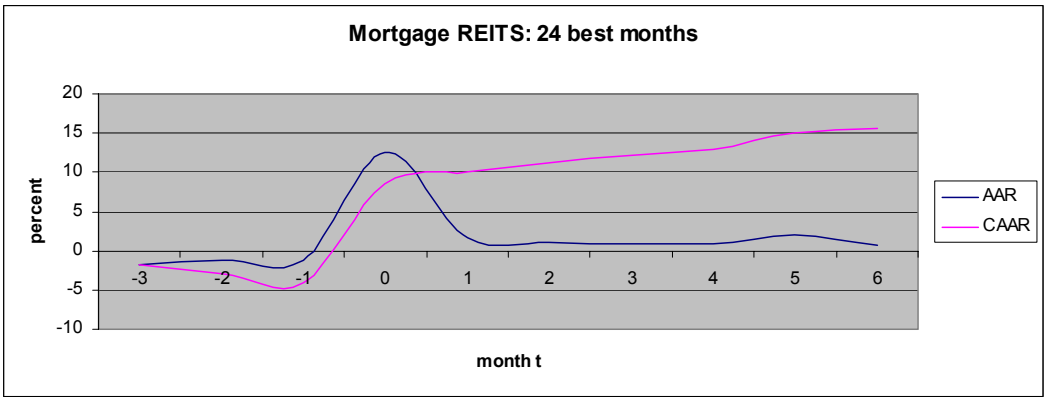
Period: 1972 - 2001	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-16.53	13.17	0.98	3.91	3.99
Mortgage REITS	-24.58	32.49	0.44	5.77	13.11
SP500 Index	-24.23	15.51	0.95	4.49	4.73
Period: 1997 - 2001	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-9.91	9.07	0.06	3.74	62.33
Mortgage REITS	-23.14	13.25	1.04	7.38	7.10
SP500 Index	-15.59	9.33	1.08	5.21	4.82
Period: 1992 - 1996	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-5.58	9.89	1.32	3.10	2.35
Mortgage REITS	-8.09	11.82	1.30	2.98	2.29
SP500 Index	-4.50	7.24	1.18	2.81	2.38
Period: 1987 - 1991	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-16.53	10.38	0.52	3.89	7.48
Mortgage REITS	-10.84	8.96	-0.33	3.83	-11.61
SP500 Index	-24.23	12.63	1.19	5.49	4.61
Period: 1982 - 1986	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-3.84	9.64	1.67	2.82	1.69
Mortgage REITS	-11.08	13.41	1.24	3.87	3.12
SP500 Index	-8.64	11.44	1.50	4.13	2.75
Period: 1977 - 1981	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-12.96	11.87	1.47	4.41	3.00
Mortgage REITS	-12.69	15.86	0.73	5.18	7.10
SP500 Index	-10.24	10.12	0.64	4.20	6.56
Period: 1972 - 1976	Minimum	Maximum	Mean	Std. Dev.	CV
Equity REITS	-15.09	13.18	0.39	5.08	13.03
Mortgage REITS	-24.58	32.49	-0.30	8.51	-28.37
SP500 Index	-12.23	15.51	0.39	4.92	12.62

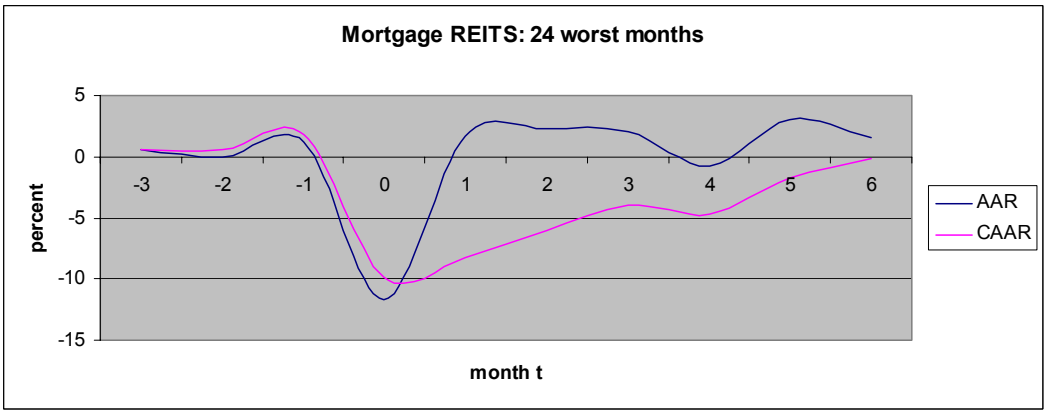
As shown in Table 1, the MRI is more volatile than both the ERI and the S&P 500 index. Its standard deviation is 5.77% per month over the period 1972-2001, versus 3.92% and 4.50% for ERI and S&P 500, respectively. In addition, the mean monthly return of .44% per month is noticeably smaller than the .98% and .95% monthly returns for ERI and the S&P 500. On a pure risk-return basis, mortgage REITs may not make sense for inclusion in investment portfolios. The best (worst) 24 months *AAR* for the MRI on event days is 12.57% (-11.69%). This compares with

8.03% (-8.10%) and 8.85% (-9.72%) for the ERI and the S&P 500 index (Exhibit 3). Surprisingly, the MRI behaves more like the S&P 500 index than like the ERI. *CAAR* for the three months preceding the event month is -4.13%, compared to -3.53% for the S&P 500 index. Beginning with the event month rather than month t_{-3}, *CAAR* cumulates to 19.72% by month t_{+6} and *CAAR* for months t_{+1} to t_{+6} is 7.15%. Both the S&P 500 and mortgage REITs display continuation of momentum in the months following a large gain, but the momentum effect is considerably more pronounced for mortgage REITs.

The mean reverting tendency of the MRI following the 24 worst months is also more pronounced than that of the ERI and the S&P 500 index. The ERI displayed positive *AAR*s prior to the event month, *AAR* = -11.69% for $t = 0$, and CAAR of 9.80% over months t_{+1} to t_{+6}. This compares to values of 5.38% and 3.91% for mean reversion on the ERI and S&P 500 indices over the same period.

Exhibit 3





CALENDAR EFFECTS

METHODOLOGY

To assess possible calendar effects, each of the three market indices (ERI, MRI, and S&P 500) is regressed on a set of 12 monthly dummy variables:

$$R_i = a_i + Sum\ (b_{im}TD_m),\ with\ Sum\ (b_{im}) = 0 \qquad Formula\ (4)$$

where:

R_i	=	the monthly return on the market index *i*
a_i	=	the intercept term
b_{im}	=	the slope coefficient associated with the time dummy variables
Tdm	=	the time dummy variable, equal to one if the index return was generated in month *m*; zero otherwise

Instead of regressing the index return on a set of eleven time dummy variables, leaving an arbitrarily chosen month, e.g., January, to become the intercept term, with the b_{im} coefficients measuring the pairwise difference between the average return in January and each of the other months (see for example Friday and Peterson (1997) or Redman, Manakyan, and Liano (1997)), the b_{im} coefficients in equation (4) represent the pair-wise difference between the average monthly across all 12 months and the average return in each of the months - January through December. Since the average month's effect is zero, a set of unique values of the coefficients can be obtained.[1] The least squares estimate of the intercept term, a_i, is equal to the average monthly return on the market index *i*, since the average residual is zero in every month.[2] Thus, the calendar effects are estimated net of the average monthly index returns for any given period.

EMPIRICAL RESULTS

We found significant, non-stationary calendar effects for all three indices. The pattern of these effects differs somewhat across the indices. For the entire 30-year period, the most significant calendar effects experienced by the ERI were positive in January and negative in October. While the positive January effect was mirrored in the MRI, the negative October effect was replaced by a negative August effect. In contrast, the only evidence of a full period calendar effect in the S&P 500 index was found in September (negative at the 10%-level).

For all three indices, Tables 2-4 provide a detailed account of the time varying pattern of the calendar effects by 5-year subperiods. For example, some of the calendar effects displayed by the ERI and MRI can also be found in the returns of the S&P 500 index: the positive January effect during 1972-1976 and the negative effects in August and October during 1997 – 2001 and 1987-1991, respectively. Similar to the MRI, a negative effect was found during 1977-1981 for the month

of October. Resembling the ERI, a negative effect was found during 1982-1986 for the month of July. Other calendar effects significant only to the S&P 500 index were found for August (positive during 1982-1986), September (negative during 1982-1986), October (positive during 1972-1976), and November (positive during 1977-1981). Contrary to the ERI and MRI, no significant calendar effects were found for stocks for the subperiod of 1992-1996.

Table 2: Calendar Effects, Equity REITs Index

Calendar effects are measured by regressing monthly returns on the market index i over the period 1972 - 2001 on a complete set of 12 time dummy variables. The results are reported for the full 30-year period and each of the six 5-year subperiods. The least squares estimate of the intercept is equal to the subperiod's average monthly return.

Ri = ai + Sum (bimTDm), with Sum (bim) = 0

Month	*1972- 2001*	*1972- 1976*	*1977- 1981*	*1982- 1986*	*1987- 1991*	*1992- 1996*	*1997- 2001*
January	2.25***	6.01***	1.81	1.58	3.30**	1.34	-0.55
February	-0.03	1.10	-0.17	-1.10	1.09	0.82	-1.94
March	0.28	0.22	-1.11	1.44	1.57	-0.97	0.55
April	-0.06	-0.82	-0.17	0.56	0.08	-1.86	1.85
May	-1.10	-5.23**	-1.28	-1.55	-0.58	1.00	1.03
June	1.34*	4.24**	2.78	-0.69	0.87	-0.78	1.62
July	-0.07	0.03	1.42	-2.14*	0.63	0.27	-0.62
August	-1.05	-2.77	1.61	-0.03	-2.49	0.30	-2.91*
September	-0.57	0.42	-3.50*	-0.21	-1.74	0.35	1.26
October	-1.86***	-0.10	-2.37	2.33*	-5.35***	-2.28*	-3.40**
November	-0.47	-3.78*	1.06	-0.35	0.71	-1.64	1.20
December	1.33*	0.68	-0.10	0.16	1.89	3.46**	1.91
Mean	0.98	0.31	1.47	1.67	0.52	1.32	0.52

where:
Ri = the monthly return on the market index i
ai = the intercept term
bim = the slope coefficient associated with the time dummy variables
TDm = the time dummy variable, equal to one if the index return was generated in month m; zero otherwise
*, **, and *** indicate statistical significance at the 10%, 5%, and 1%-level, respectively.

Our results provide evidence for the existence of calendar effects across all three asset classes. These effects may play some role in momentum (positive Decembers and Januaries), but seasonality does not seem to explain the differential behavior of equity REITs relative to mortgage REITs and stocks after a large up move in the index. Also, given the time varying nature of the monthly effects, seasonality does not seem to explain either momentum or mean reversion in index

returns. The non-stationarity of monthly effects itself, however, could be explained by the Efficient Market Hypothesis, that is, as investors incorporate the anticipation of these calendar effects into their trading strategies, they cause them to disappear.

Table 3: Calendar Effects, Mortgage REITs Index

Calendar effects are measured by regressing monthly returns on the market index i over the period 1972 - 2001 on a complete set of 12 time dummy variables. The results are reported for the full 30-year period and each of the six 5-year subperiods. The least squares estimate of the intercept is equal to the subperiod's average monthly return.

Ri = ai + Sum (bimTDm), with Sum (bim) = 0

Month	*1972- 2001*	*1972- 1976*	*1977- 1981*	*1982- 1986*	*1987- 1991*	*1992- 1996*	*1997- 2001*
January	4.26***	10.28***	2.00	1.62	3.12*	4.78***	3.75
February	-0.91	-0.47	-2.27	-1.05	-0.53	-0.46	-0.67
March	-0.37	0.94	-1.55	-0.57	0.75	-1.57	-0.22
April	0.16	-5.54	4.09*	0.94	-0.89	-2.15	4.49
May	0.29	-1.94	-0.26	-1.55	1.75	1.15	2.61
June	0.69	-0.85	3.58	-1.50	0.61	-0.73	3.05
July	0.45	2.28	1.55	-0.71	0.79	0.20	-1.38
August	-2.37**	-6.30*	0.82	0.56	-0.42	0.75	-9.66***
September	0.05	3.40	-3.37	-0.74	-2.06	-0.04	3.13
October	-0.82	3.54	-4.38**	4.09**	-3.47**	-0.77	-3.96
November	-0.60	-4.40	3.04	-0.17	0.50	-1.34	-1.21
December	-0.83	-0.93	-3.25	-0.92	-0.14	0.18	0.06
Mean	0.44	-0.30	0.73	1.24	-0.33	1.30	0.02

where:
Ri = the monthly return on the market index i
ai = the intercept term
bim = the slope coefficient associated with the time dummy variables
TDm = the time dummy variable, equal to one if the index return was generated in month m; zero otherwise
*, **, and *** indicate statistical significance at the 10%, 5%, and 1%-level, respectively.

The fact that calendar effects differ across the three market indices suggests differences in market return behavior and may indicate potential benefits from diversifying across asset classes. Several authors have focused on these return differences. Hudson-Wilson (2001) points out that a partial investment in REITs can enhance the risk/return relationship of the portfolio. Booth, Cashdan and Graff (1989) conclude that investors should differentiate between equity REITs and mortgage REITs, as the former behave more similar to equity while the latter is closer related to fixed-income debt securities. However, the poor risk-return results for mortgage REITs may not make them

suitable replacements for bonds, or as desirable as equity REITs. Subsequently, we will analyze the return correlation between the three market indices in search for possible changes in the relationship that occurred over time.

Table 4: Calendar Effects, SP 500 Index

Calendar effects are measured by regressing monthly returns on the market index i over the period 1972 - 2001 on a complete set of 12 time dummy variables. The results are reported for the full 30-year period and each of the six 5-year subperiods. The least squares estimate of the intercept is equal to the subperiod's average monthly return.

Ri = ai + Sum (bimTDm), with Sum (bim) = 0

Month	*1972- 2001*	*1972- 1976*	*1977- 1981*	*1982- 1986*	*1987- 1991*	*1992- 1996*	*1997- 2001*
January	1.25	4.27*	-1.41	0.47	3.13	0.55	0.51
February	-0.17	0.50	-1.89	-1.24	1.52	-0.32	0.38
March	-0.03	0.55	-0.37	0.56	0.26	-1.26	0.06
April	0.11	-0.94	1.80	0.83	-0.51	0.13	-0.61
May	0.35	-0.24	-0.28	-1.36	2.48	0.92	0.58
June	0.47	0.70	1.39	0.02	-0.45	-1.37	2.54
July	-0.50	-2.48	1.88	-3.90**	2.38	0.02	-0.94
August	-0.76	-2.56	-0.27	4.43**	-2.30	0.34	-4.21*
September	-1.46*	-2.17	-1.02	-3.35*	-2.19	0.32	-0.34
October	-0.61	3.85*	-3.16*	2.54	-5.70**	0.29	-1.51
November	0.55	-2.36	4.15**	1.28	-2.46	0.79	1.94
December	0.80	0.88	-0.83	-0.28	3.83	-0.41	1.59
Mean	0.95	0.39	0.64	1.50	1.19	1.18	0.83

where:
Ri = the monthly return on the market index i
ai = the intercept term
bim = the slope coefficient associated with the time dummy variables
TDm = the time dummy variable, equal to one if the index return was generated in month m; zero otherwise
*, **, and *** indicate statistical significance at the 10%, 5%, and 1%-level, respectively.

MARKET CORRELATIONS

METHODOLOGY

The correlation coefficients are computed pairwise for the ERI, MRI, and the S&P 500 index on a 24-month rolling basis. The resulting correlation coefficients are regressed on constant, a trend

variable that increases by one with each monthly observation, and two dummy variables that indicate how the trend changes between time periods. The intercept shows the estimated general correlation coefficient at the beginning of 1972 and the b_1 coefficient shows the monthly trend over the 1972-1992 period (the trend dummy is one for all years, but when additional trend subperiod dummies are added, it then captures the trend in the first subperiod). The dummy variables TD_2 and TD_3 for the years 1993-2001 and 2000-2001 reflect the period after the elimination of the pension fund barrier for investing in REITs, and the recent bear market in stock returns. The b_2 coefficient actually measure trend changes for 1993-1999 relative to 1972-1992, while the b_3 coefficient to capture any additional trend changes for 2000-2001 relative to the second subperiod. The regression equation is:

$$rho_{ij,t} = a_t + b_{1t}Trend_{ij} + b_{2t}Trend_{ij} * TD_1 + b_{3t}Trend_{ij} * TD_2 + e_{ij} \qquad \textit{Formula (5)}$$

where:

$rho_{ij,t}$	=	the correlation coefficient between market index *i* and *j* at time *t*
a_t	=	the intercept term
b_{1t-3t}	=	the slope coefficient associated with each independent variable
$Trend_{ij}$	=	trend variable, indicating the change in the correlation coefficient over the entire 1972-2001 period.
TD_1	=	the time dummy variables equal to one starting January 1993; zero otherwise.
TD_2	=	the time dummy variables equal to one starting January 2000; zero otherwise.
e_{ij}	=	the random error term

EMPIRICAL RESULTS

The time trend analysis of the market index correlation coefficients reveals that ERI and MRI behave quite similarly (Table 5 shows a = .75, or a high initial degree of correlation starting in 1972). The negative coefficients b_1 and b_2 associated with the variables Trend and TD_2, respectively, indicate a slight reduction of *rho* over time in general and after January 1993 in particular (at the 5% and 10%-level, respectively). This finding is surprising in light of the notion that equity REITs behave more like stocks and mortgage REITs behave more like bonds, e.g., see Hudson-Wilson (2001), but confirms Clayton and MacKinnon (2001) who found the sensitivity of REIT returns to large cap stock returns declining over time and updates He (1998) who found stable long-run linear relationship between the equity and mortgage REITs.

The base correlation coefficient (the *a* portion of rho) is .66 between the ERI and the S&P 500 and .68 between the MRI and the S&P 500. Although Peterson and Hsieh (1997) already hinted on mortgage REIT returns being related to three stock market factors, it is surprisingly that mortgage REITs and stock returns are more closely related than are equity REITs and stock returns, though the level is decreasing over time, especially in the recent bear market, as indicated by the negative

b_1 and b_3 coefficients (significant at the 5% and 10%-level, respectively). The negative b_2 coefficient indicates an increasing level of "disconnect" between ERI and the S&P 500 index after 1993 (significant at the 1%-level). Our findings suggest that (1) equity investors can reduce portfolio risk by including REITs in the portfolio, (2) the diversification effect of including REITs in the portfolio has increased over time, and (3) since mortgage REITs are actually more correlated with the S&P 500 than are equity REITs and provide lower returns at higher risk, there is little reason to include mortgage REITs in an equity portfolio.[3] In light of the findings of Howe and Jain (2004), who document a significant decline in the systematic risk of REITs subsequent to the REIT Modernization Act of 1999 (RMA), it seems reasonable to assume that the introduction of the RMA was a contributing factor to the decline in REITs and stock market correlation in the latest subperiod.

Table 5: Market Correlations

The correlation coefficients are computed pairwise for the equity Reits index (ERI), the mortgage Reits index (MRI), and the SP500 index on a 24-month rolling basis. Subsequently, the correlation coefficients are regressed on a "trend" variable, which increases by one with every monthly observation, and two time dummy variables. The intercept shows the estimated general correlation at the 1972-2001 period. The trend varible indicates the change in the correlation coefficient over the entire 1972-1992 period. The time dummy variables TD2 and TD3 indicate additional trend changes between periods. TD2 is equal to one starting January 1993, TD3 is equal to one staring January 2000; zero otherwise. The covariance estimator is consistent in the presence of both heteroscedasticity and autocorrelation of unknown form, according to Newey and West (1987).

Market Correlation between	Intercept	*t-stat.*	b1 Trend 1976-2001	*t-stat.*	b2 Trend *TD2 1993-2001	*t-stat.*	b3 Trend *TD3 2000-2001	*t-stat.*
ERI and MRI	0.7517	23.89***	-0.0005	-1.98**	-0.0004	-1.93*	0.0002	0.85
ERI and SP500	0.6627	18.18***	0.0001	0.19	-0.0011	-5.44***	-0.0005	-1.51
MRI and SP500	0.6831	13.50***	-0.0008	-2.35**	0.0001	0.15	-0.0005	-1.93*
ERI and SP mid-cap 4001	0.5703	5.18***	0.0024	2.91***	n/a	n/a	-0.0027	-5.41***
MRI and SP mid-cap 4001	0.6661	11.82***	-0.0037	-4.12***	n/a	n/a	0.0007	0.13

1 The SP mid-cap 400 data range is limited to 1992 - 2001 but, for comparison purposes, was included in the analysis as a stock index alternative to the SP500.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1%-level, respectively.

Equity REITs can enhance the risk/return relationship of a general stock portfolio and long-term investors, aiming for a well balanced portfolio, should monitor any changes in the relative return behavior of asset classes and, from time to time, adjust the portfolio weights if necessary.

CONCLUSIONS

We have analyzed the return behavior of the equity REIT, mortgage REIT, and S&P 500 indices using monthly data for the period 1972-2001. A major goal was to identify recurring return patterns in each index that could be exploited by either momentum or mean reversion trading strategies. Our results differ across markets. Investors can obtain positive abnormal returns from a momentum strategy that buys either the mortgage REIT or the S&P 500 index immediately after the index has experienced a significant up move. The equity REITs market should be avoided for about four months after a large monthly gain due to its mean reversion tendencies. For all three assets classes, investors can earn above average returns from buying and holding the index for the six month period immediately following a large monthly decline. Both stocks and REITs display mean reversion after large declines, confirming the often repeated investment advice to avoid selling immediately after a large decline in asset value.

Significant calendar effects were found for both REIT and stock indices, although the general pattern for monthly effects differs across asset classes. While the positive January and negative October effects were most pronounced in the REITs indices, weak complementing evidence was also found in the S&P 500 stock index. The non-stationarity of these effects suggests that investors may have already incorporated this knowledge into their trading strategies as would be consistent with the Efficient Market Hypothesis. We also examined correlation and changes in correlation between asset classes over the period 1972-2001. Both mortgage and equity REITs have become less correlated with the S&P 500 index from 1972 to 2001, but the difference has become greater for equity REITs than for mortgage REITs. Equity REITs also provide a more favorable risk-return ratio than mortgage REITs. Our findings suggest that equity REITs can enhance the risk-return relationship of a general stock portfolio and probably should be added to many investors' stock and bond portfolios. Mortgage REITs may be useful for diversification, but greater benefits are obtained by adding equity REITs to a portfolio.

ENDNOTES

1 See also Suits (1984) and Kennedy (1986) for a detailed discussion

2 By construction, in OLS estimation of a regression the estimated disturbances are orthogonal to all months.

3 "Some authors, e.g., Liang and McIntosh (1998) and Chen and Peiser (1999), have suggested using the S&P mid-cap 400 index as a stock market proxy. This index was introduced in September 1991. Given the 30-year data window of this study, the inclusion of the mid-cap index would be of limited use for the first and second part of the analysis. However, the inclusion of the S&P mid-cap 400 index in our market correlation analysis confirms our findings for the S&P 500 index. In fact, the lower correlation coefficient of the S&P mid-cap 400 index with equity REITs indicates an even greater potential for diversification benefits from the inclusion of equity REITs in a stock portfolio than suggested by the S&P 500 index."

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ENVIRONMENTAL DISCLOSURES AND RELEVANCE

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ABSTRACT

Environmental disclosure is a type of social reporting that provides information to help users assess environmental risk. Environmental risk is the probability and amount of future expenditures for environmental liabilities. The SEC issued Staff Accounting Bulletin No. 92 (SAB 92) presenting detailed suggestions for environmental disclosures that integrated the current FASB standards and the SEC requirements. With specific guidance on environment reporting, and considering the SEC's enforcement power, SAB 92 should have had a significant impact on the amounts and types of environmental disclosure provided by firms. In addition, if the objectives of SAB 92 are fulfilled, the information provided should correlate with reporting firms' environmental risk.

This study investigated the expected correlation. First content analysis was used to compute environmental disclosure scores using the annual reports of firms of fourteen industries that are likely to have environmental information to report. Next, information content of the disclosure scores for the sample companies was investigated using regression with number of Superfund potential responsible party (PRP) citations as the dependent variable. PRPs are companies that the Environmental Protection Agency (EPA) designates as responsible for hazardous site cleanup costs. When the EPA becomes of aware of a hazardous site it conducts a study to: 1) determine the extent of the potential hazard; 2) estimate the clean up costs; and 3) identify the current and former owners of the area that are responsible for creating the environmental problem (i.e., the PRPs). Sites that meet the EPA's threshold level of potential hazard are included in the National Priority List (NPL) database Site Enforcement Tracking System (SETS) along with the names of the PRPs. Clean up activities for sites that are shown on the NPL are guided by the Comprehensive Environmental Responses, Compensation and Liability Act (CERCLA) (1980), also known as the Superfund, and the PRPs are jointly and severally liable for cleanup costs. The number of times that a company is designated as a PRP should be a good surrogate measure of environmental risk because the hazardous sites and the PRPs are not included on the NPL unless the responsibility for cleanup is certain and cost of cleanup has been estimated.

Analysis of the data shows positive significant associations between the variables suggesting that environmental reporting post issue of SAB 92 provides relevant information about environmental risk. The empirical evidence suggests that the overall disclosure practices have improved in that more information is provided as compared to previous studies conducted pre-SAB 92 and that it correlates with a measure of environmental risk.

INTRODUCTION

Environmental disclosure is a type of social reporting that provides information to help users assess environmental risk. Environmental risk is the probability and amount of future expenditures for environmental liabilities. Prior to 1993, the authoritative support for environmental disclosure was the Statement of Financial Accounting Standards No. 5, "Accounting for Contingencies." Firms recognize a liability when a loss is probable and its amount is reasonably estimable. Compliance with this rule required significant management judgment. Studies, such as Beaver (1991), and Reimers (1992), and Amer, Hackenbrack and Nelson (1994) have shown that financial statement preparers and auditors show inconsistent interpretations of the term "probable," which seems to support findings of inconsistency among firms' environmental reporting (i.e.,Krueze, Newell and Newell (1996), Mitchell (1995), and Gamble, Hsu, Kite, and Radtke (1995)). However, Barth and McNichols (1994) did show a correlation between firm value, which is influenced by environmental contingent liabilities and environmental risk, which they measured using number of times the firm was listed as a responsible party in Superfund cleanup sites.

In mid 1993, the FASB issued EITF 93-5 Accounting for Environmental Liabilities requiring that an environmental liability should be evaluated independently from any potential claim for recovery. In support of the EITF issue, on June 8 1993, the SEC issued Staff Accounting Bulletin No. 92 (SAB 92) presenting detailed suggestions for environmental disclosures that integrated the current FASB standards and the SEC requirements.

With specific guidance on environmental reporting, and considering the SEC's enforcement power, SAB 92 should have had a significant impact on the amounts and types of environmental disclosure provided by firms. In addition, if the objectives of SAB 92 are fulfilled, the information provided should correlate with reporting firms' environmental risk. This study investigated the expected correlation. First content analysis was used to compute environmental disclosure scores using the annual reports of firms of fourteen industries that are likely to have environmental information to report. Next, information content of the disclosure scores was investigated using regression with a measure of environmental risk, the number of times each firm was named as a Potentially Responsible Party (PRP) of a Superfund site, as the dependent variable. PRPs are companies that the Environmental Protection Agency (EPA) designates as responsible for hazardous site cleanup costs. When the EPA becomes of aware of a hazardous site it conducts a study to: 1) determine the extent of the potential hazard; 2) estimate the clean up costs; and 3) identify the current and former owners of the area that are responsible for creating the environmental problem and cleanup costs (i.e., PRPs). Sites that meet the EPA's threshold level of potential hazard are included in the National Priority List (NPL) database Site Enforcement Tracking System (SETS). NPL citations also include the names of the PRPs. Cleanup activities for sites shown on the NPL are guided by the Comprehensive Environmental Responses, Compensation and Liability Act (CERCLA) (1980), which is more popularly known as the Superfund, and individual PRPs are

jointly and severally liable for clean up, remediation and monitoring costs. The number of times a company is listed as a PRP should be a good surrogate measure of environmental risk because a site and the PRPs are not listed on the NPL unless the responsibility for cleanup is certain and the cost of cleanup has been estimated.

Analysis of the data indicates positive significant associations between the variables suggesting that environmental reporting post issue of SAB 92 provides relevant information about environmental risk.

The remainder of the paper is organized as follows. The second section provides a review of the environmental disclosure literature. The guidelines of SAB 92 and the research program are presented in the third section. The fourth section discusses sample selection and the variables. The fifth section presents the results of the study and the sixth section provides the summary and conclusion.

REVIEW OF THE LITERATURE

Based on the objective of this study, the environmental accounting literature can be divided into three groups: environmental reporting studies, social reporting, and the adequacy of environmental disclosure for assessing environmental risk.

Environmental Reporting

Three recent studies have examined the extent of environmental disclosure practices. Krueze, Newell and Newell (1996) surveyed the environmental disclosure of 1991 annual reports of 645 Forbes 500 firms. The survey showed that seventy-four percent of the firms had no environmental information disclosed in either the letter to stockholders or in annual reports and only nine percent of the firms disclosed environmental related information. For companies in energy, steel, chemicals, pulp and paper, and utilities where one would expect more environmental disclosures, only fifty percent of the firms in those industries provided environmental related information.

To assess uniformity in environmental disclosures among firms, Mitchell (1995) examined associations between environmental disclosures and environmental liabilities of 287 Fortune 500 industrial firms. Environmental disclosures were environmental liability accruals and footnote disclosures found in the 1991 annual reports and 10Ks. Four surrogate measures for environmental liabilities were 1) number of PRP citations; 2) total cleanup costs for each site where the firm was listed as a PRP; 3) proportional cleanup costs for each site where the firm was listed as a PRP; and 4) the maximum liability shown in the Record of Decision (ROD), provided by the Environmental Protection Agency. The firms were divided into four groups -- no exposure, low exposure, medium exposure and high exposure -- by magnitude of size of environmental liability related to total firm

equity. The results indicated scant uniformity among firms, only 36% of firms that had environmental liabilities to report provided accruals and/or footnote disclosures. However, the result did show that high exposure firms were more likely to accrue and disclose than low exposure firms.

Moneva and Llena (2000) investigated increases in environmental reporting over time (1992-1994) by Spanish firms. They used content analysis to examine the annual reports, including the presidents' letters, pictures, charts and graphs, and the notes to the financial statements. At the time of the study, Spain had no statement comparable to SAB 92. The analysis found some increases in information provided over time; however, the increases were not significantly different from year to year.

The results suggest that firms use considerable discretion when there is no specific authoritative support. This study investigates environmental disclosure when authoritative support exists.

Social Reporting

Social reporting deals with providing information about firms as corporate citizens and includes information about employees, contributions to worthy causes and environmental responsibility. The two theories used to explain why firms make social disclosures are user utility and political economy (Hughes, Reier, and Sander (1996)). Both theories predict that large firms will find it in their best interest to provide social disclosures.

User utility theory focuses on social disclosure's usefulness for decision making for firms' dominant user group, stockholders. Under user utility, there would be no relevant indicator that explained social reporting -- all stockholders have the same needs for information and if firms believe that stockholders require the information they will provide it.

On the other hand, political economy theory suggests possible differences in social disclosure among firms. Under political economy, firms will use social disclosures to improve their image as corporate citizens. For instance, firms are more likely to report good news (Jaggi and Zhao (1996)). For reporting bad news, firms seem to provide information to show that they are doing the right things to correct problems (Jaggi and Zhao (1996); Gamble, Hsu, Kite, and Radtke (1995), and Freedman and Jaggi, (1996)). Much of environmental disclosure is bad news (i.e., lawsuits, expenditures that do not generate revenue, etc.), and political economy would predict that firms would provide information about their environmental activities to show that they are aware of problems and are fixing them.

Political economy theory is supported by studies that provide evidence that social disclosure is closely related to public pressure variables. Cowen, Ferreri, and Parker (1987) suggests that "larger companies tend to receive more attention from the general public and therefore, [are] under greater pressure to exhibit social responsibility, [in fact and in reporting]." This study investigated larger firms, many with considerable environmental exposure.

Environmental Risk Assessment

To help accountants and auditors, Zuber and Berry (1992) described the potential sources of financial risk and the environmental accounting reporting requirements. Specific firm examples were provided to explain the significance of environmental liabilities. Sources of financial risk discussed were: substantial funds required for environmental compliance, toxic tort liability for personal injury or property damages, fines for knowing violations of environmental laws and regulations and remediation and cleanup costs.

Gamble, Hsu, Kite and Radtke (1995) examined 1986-1991 annual reports and 10Ks of 234 firms within 12 industries (e.g., chemical, oil and gas, petroleum refining, steel, motor vehicles and hazardous waste management) that have the potential to incur extensive environmental liabilities. The purpose of the study was to determine whether the existing environmental disclosures meet the needs of stakeholders. First, the quality of environmental information was assessed by the authors as to its usefulness in evaluating the long- and short-term risks and current and prospective cash flow requirements of a company. Based on the quality scores assigned to the disclosure items in the annual reports and 10Ks, the study then compared cross-sectional and longitudinal differences. The analysis indicated that petroleum refining, hazardous waste management, and steel works and blast furnaces provided the highest quality of disclosures. In addition, the quality of disclosures improved over time with the highest quality experienced in the end of the sample periods (e.g., 1989-1991). However, the study concluded that disclosures found in the annual reports and 10Ks did not adequately cover the informational needs of stakeholders because they did not provide detailed and aggregated information regarding future environmental plans and the dollar amount necessary to fulfill the plans.

The results of the pre- SAB 92 literature suggests that the environmental information provided in the financial statements provided little or no value to the users. However, a study using data post issue of SAB 92 provides empirical evidence that the market does impute to some extent the dollar value of reported environmental liabilities (Bewley, 2000). The empirical study suggested a negative relationship between dollar values of environmental liabilities and market value, which implies that environmental disclosures post issue of SAB 92 do provide users with insight into firms' risk. This study adds to this stream of research by including yes/no reports of dollar values of environmental liabilities plus other environmental information items in the investigation of the relationship between environmental disclosures and firms' environmental risks.

SAB 92 AND RESEARCH PROGRAM

Staff Accounting Bulletin No. 92 sets forth the most recent guidelines for the disclosure of environmental contingent liabilities. The SEC states that disclosures should be "sufficiently specific to enable the reader to understand the scope of the contingencies affecting the registrant." [SAB 92]

Similarly, disaggregated disclosure that describes accrued and reasonably likely losses with respect to particular environmental sites that are individually material may be necessary for a full understanding of these contingencies. The guidelines of SAB 92 are follows:

> The Emerging Issues Tasks Force (EITF) of Financial Accounting Standards Board reached a consensus on EITF Issue 93-5, "Accounting for Environmental Liabilities," that an environmental liability should be evaluated independently from any potential claim for recovery. The EITF also reached a consensus that discounting an environmental liability for a specific clean-up site to reflect the time value of money is appropriate only if the aggregate amount of the obligation and the amount and timing of the cash payments are fixed or reliably determinable for that site.
>
> The staff believes that separate presentation of gross liability and related claims for recovery in the balance sheet most fairly presents the potential consequences of the contingent claim on company's resources and is the preferable method of display.
>
> If the discount rate is not readily determinable, the discount rate used to discount the cash payments should not exceed the interest rate on monetary assets that are essentially risk free.
>
> If there is a reasonable basis for apportionment of costs among responsible parties, a registrant must not recognize a liability with respect to costs apportioned to other responsible parties. However, if it is probable that other responsible parties will not fully pay costs apportioned to them, the liability that is recognized by the registrant should include the registrant's best estimate, before consideration of potential recoveries from other parties, of the additional costs that the registrant expects to pay.
>
> The measurement of the liability should be based on currently available facts, existing technology, and presently enacted laws and regulations, and should take into consideration the likely effects of inflation and other societal and economic factors. Notwithstanding significant uncertainties, management may not delay recognition of a contingent liability until only a single amount can be reasonably estimated. If the amount of the liability is likely to fall within a range and no amount within that range can be determined to be the better estimate, the registrant should recognize the minimum amount of the range pursuant to Financial Accounting Standards Board Interpretation No. 14.
>
> The staff believes that product and environmental liabilities typically are of such significance that detailed disclosures regarding the judgments and assumptions underlying the recognition and measurement of the liabilities are necessary to prevent the financial statements from being misleading and to inform readers fully regarding the range of reasonably possible outcomes that could have a material effect on the registrant's financial condition, results of operations, or liquidity. [Staff Accounting Bulletin No. 92]

SAB 92 attempts to clarify some of the issues that have caused the non-uniformity in environmental reporting. It provides guidance on the estimation of future cleanup costs. It suggests that the process of determining the amount of the liability should include the consideration of all currently known information about the environmental problem, current technology, the effects of current laws and inflation, and other societal and economic factors. In addition, and most important to the users of the financial statements, SAB 92 suggests that the possibility that an estimate of an

environmental liability may be different from the actual liability is no reason for a reporting firm to delay reporting on the contingency until its amount is absolutely certain. SAB 92 also provides suggestions about additional disclosures that are useful for understanding the reliability of the estimates that are provided. The suggestions include: (1) the major assumptions that were used to make the estimate of the contingent liability; (2) the terms of cost sharing agreements with other firms; and (3) any expectations of third party (insurance carriers) contributions. Finally, SAB 92 recommends that firms provide information about future capital expenditures for the purpose of limiting or mediating previously contaminated sites and the recurring costs that are associated with managing hazardous substances and pollution caused by ongoing operations.

With the disclosure requirements of SAB 92, there should be an increase in the extent of environmental information provided for firms that have environmental risk and this information should be associated with firms' environmental risk. To investigate this expectation a measure of environmental disclosure, a disclosure score, was constructed using the disclosure recommendations of SAB 92. The disclosure scores were then investigated for information content. Associations between disclosure scores and a variable associated with environmental risk, number of PRPs (i.e., the number of times a firm is listed as a potentially responsible party of a Superfund site), are investigated.

DATA COLLECTION AND METHODS

The Sample

For the pre-SAB 92 periods, lack of guidelines showed limited environmental disclosure for relatively larger firms in industries with perceived high environmental exposure. For instance, Krueze, et al. (1996) showed only nine percent of surveyed Forbes 500 firms disclosed environmental related information and environmental disclosures were presented in only a few industries. The population of firms that was sampled for this study was the Fortune list of 417 "America's Most Admired Companies" (Fisher, 1996). The reason for using the Fortune list is that these companies are more likely to comply with the requirements of SAB 92 given their "most admired" reputation.

For each of the companies on the list, the National Priority List (NPL) and the Record of Decisions (ROD) were searched using Lexis/NAARS for the number of times each of these companies were cited as Potential Responsibility Party (PRP). The 417 firms were grouped by their industries and the average number of PRPs was computed for each industry. The averages were calculated by adding the observations for each firm within an industry and dividing by the number of firms in the industry group. Using the average number of 4.22 PRPs as the cutoff, fourteen industries were selected. These fourteen industries consist of a total of 132 firms that have 1995 annual reports and 10K text files available on the Compact Disclosure and the EDGAR systems.

The Environmental Disclosure Variables

Following the SAB 92 disclosure requirements, the environmental disclosure variables are identified and organized into three categories: 1) General disclosures about the environmental risk; 2) Disclosures about the contingent environmental liability; and 3) Estimates of the costs of remediation and abatement - current and future. After examining the annual reports and 10Ks of the 132 sample companies, the identified environmental disclosure variables were coded. With the exception of some variables that are expressed in dollar amounts, most of these variables were coded as categorical variables, or dummy variables based on whether the information was provided. A code of '1' was assigned to the variable if the particular information was provided, a '0' otherwise for no information. A total score was computed for each sample firm with a higher score representing more extensive environmental disclosures.

Table 1
Frequency of Disclosure Items (1995)

Item	Description	Number Firms	Percent Firms
1 General Disclosure about Environmental Risk			
1-1	Is PRP status mentioned?	92	69.70%
1-2	Is a number of PRPs provided?	49	37.12%
1-3	If 1-2 is yes, what is the number of PRPS?	49	37.12%
1-4	Is the nature of the problem revealed?	37	28.03%
1-5	Is the cause of the problem revealed?	64	48.48%
1-6	Is a specific incident described?	23	17.42%
2 Contingent Liability Disclosures			
2-1	Are pending liabilities mentioned?	103	78.03%
2-2	Is the accrual mentioned?	80	60.61%
2-3	Is the total accrued cost to date provided?	52	39.39%
2-4	Is the current year's accrual provided?	35	26.52%
2-5	Is the balance sheet classification accrued liability provided?	27	20.45%
2-6	Is an estimate of future cost (not accrued) provided?	15	11.36%
2-7	Are any circumstances that may affect the reliability of the estimate discussed?	74	56.06%
2-8	Are cost sharing agreements discussed?	14	10.61%

Table 1
Frequency of Disclosure Items (1995)

Item	Description	Number Firms	Percent Firms
2-9	Are possible insurance claims discussed?	25	18.94%
2-10	Is yes to 2-9, are the uncertainties that surround the legal sufficiency of insurance claims discussed?	4	3.03%
2-11	Is an amount for contested recoveries provided?	16	12.12%
2-12	Are the reasons for concluding that the recovery amounts are probable given?	1	0.76%
2-13	Is the time frame for the insurance payouts provided?	2	1.52%
2-14	Are the material components of the insurance recovery accruals (sites, problems, etc.) discussed?	4	3.03%
3 Disclosures of Estimates for Remediation and Abatement			
3-1	Are recurring costs that are associated with managing hazardous substances and pollution disclosed?	83	62.88%
3-2	If 3-1 is yes, what is the estimate?	46	34.85%
3-3	Are other infrequent clean-up expenditures mentioned?	7	5.30%
3-4	If 3-3 is yes, what is the estimate?	2	1.52%
3-5	Does the firm provide an estimate of the mandated expenditures needed to remediate previously contaminated sites?	62	46.97%
3-6	If 3-5 is yes, what is the estimate?	47	35.61%
3-7	Are capital expenditures for limiting or mediating previously contaminated sites disclosed?	57	43.18%
3-8	If 3-7 is yes, what is the estimate?	41	31.06%
3-9	How is the estimate of 3-8 described? (range, minimum, maximum, best estimate)	46	34.85%
3-10	Are future environmental expenditures disclosed?	51	38.64%
3-11	If 3-10 is yes, what is the estimate?	50	37.88%
3-12	How is the estimate of item 3-11 described? (range, minimum, best estimate)	47	35.61%
3-13	Is the time frame of payout for item 3-10 provided?	40	30.30%

Table 1 summarizes the disclosure items and the frequency of reporting among the items. For the General Disclosure items, about 70% (92) of the 132 sample firms revealed their Potentially Responsible Party (PRP) status, but only 37.12% (49) firms reported the number of PRPs. Only 28% and 48% of the firms provided some disclosures on the nature and causes of the environmental problems. With respect to the Contingent Liability Disclosures, a majority (78%) of the sample firms did mention their pending liabilities in their financial reports. They also provided information on whether the liability had been accrued and the circumstances affecting the reliability of estimated contingent legal liability. Unfortunately, only 40% of these companies provided the amount of total accrued environmental costs to date. As for the current year accrued amount and future costs estimation, very few firms provided this important accounting information. Furthermore, there were limited disclosures on items 2-8 to 2-14 on insurance recovery information. Finally, on the Disclosures of Estimates for Remediation and Abatement, 83 sample companies (63%) disclosed recurring cost information that was associated with managing hazardous substances and pollution, and only 46 of them provided estimates. However, less than 50% of the sample companies provided information on estimated mandated expenditures, current and future capital expenditures (items 3-3 to 3-13) relating to remediation and abatement.

The Environmental Risk Variable

Environmental risk is the probability and amount of future expenditures for environmental liabilities. This study uses the number of times that the company is listed as a Potentially Responsible Party (PRP) of a Superfund cleanup site on the National Priority List (NPL) database Site Enforcement Tracking System (SETS) as the measure of environmental risk.

PRP listings represent environmental risk because the companies listed as PRPs of individual Superfund sites are joint and severally responsible for cleanup, remediation and monitoring costs of the sites. In addition, using pre- SAB 92 data, Barth and McNichols (1994) found number of PRP listings to be significant indicator of firm value, while other cost-based measures of environmental disclosures (e.g., estimates of capital costs for abatement and Superfund cleanup cost estimates) were not. Consequently, the number of PRPs should be a good surrogate measure for environmental exposure and risk.

DATA ANALYSIS AND RESULTS

Table 2 summarizes the average disclosure scores and average number of PRPs by the fourteen industry groups. There is variation among the industry groups for these two measures. As expected, the Chemical and the Petroleum Refining industry groups have the highest disclosure scores as they have the greatest environmental risk exposure.

Table 2
Summary of Average Disclosure Scores and Number of PRPs by Industry Group (1995)

Column 1	Column 2	Column 3	Column 4
Industry Group	Number of Firms	Average Number of PRPs*	Average Disclosure Score*
Chemical	8	35.50	21.13
Petroleum Refining	10	32.20	20.50
Electronics, Elec. Equipment	9	24.67	5.11
Motor Vehicles & Parts	9	24.22	8.67
Aerospace	10	14.70	8.70
Forest & Paper Products	10	12.00	11.80
Industrial & Farm Equipment	10	11.50	8.20
Railroad	8	10.50	13.88
Metals	10	8.90	14.30
Pharmaceuticals	10	7.70	6.10
Scientific, Photography & Control Equipment	10	5.60	4.90
Metal Products	10	5.50	4.40
Rubber & Plastic Products	9	4.33	5.89
Mining & Crude Oil	9	4.22	11.00
Total Firms	132		

* The averages were calculated by adding the PRP occurrences for each firm within an industry and dividing by the number of firms in the industry group.

Environmental Risk Issue

To evaluate the relationship between the environmental risk measure and the environmental disclosure scores, a univariate regression was run using the number of PRPs as the dependent variable and the disclosure scores as the independent variable. Table 3 shows the regression results. The coefficient of the independent variable (i.e., disclosure score) is significant and the adjusted R2 of 15.8% is also significant. The regression results suggest that the disclosure score is positively related to the PRP measure and it has good explanatory power over the cross-sectional variation in the environmental risk measure. The result provides support to the notion that environmental disclosure post SAB 92 reveals firms' environmental exposure.

Table 3
Regression Results
Number of PRPs = Disclosure Score

Column 1	Column 2
F	24.442
(p-value)	(0.000)
Adjusted R2	0.1518
Intercept coefficient	5.0122
(p-value)	(.0272)
Disclosure Score coefficient	0.8865
(p-value)	(0.0000)
n	132

SUMMARY AND CONCLUSION

As there was a lack of comprehensive guidance on environmental disclosure practices prior to SAB 92, previous studies have shown that very limited environmental information was provided in the annual reports and 10Ks and the information is generally not supportive of firms' environmental exposure. SAB 92 was issued in 1993 with the objective of improving the environmental disclosure practices. The purpose of this paper was to examine the SAB 92 environmental disclosure practices of fourteen environmentally sensitive industry groups to determine if the quantity and quality of the information have improved.

The empirical evidence provided in this study suggests that the overall disclosure practices have improved in that more information is provided as compared to studies conducted pre-SAB 92 and that the information given correlates with a measure of environmental risk. However, limited empirical research exists regarding this topic and more research, such as, longitudinal analyses, is needed.

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AN INFORMATION SYSTEMS APPROACH TO THE ORIGINS OF ACCOUNTING: PRE-HUMANS TO THE GREEKS

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ABSTRACT

Accounting is viewed here as an information system designed to measure specific economic transactions in terms of obligations and resources and to communicate these measurements to decision makers. Using this broad, information systems definition, this paper reviews the development of accounting over a 2.5 million year period, from pre-humans to the decline of Greek civilization. Accounting systems evolved from cave art and marks on antlers used by Paleolithic peoples, to the geometric tokens of the Sumerians, cuneiform writing adopted by the Akkadians, Minoan Linear A and then to Greek Linear B script. When Greek city-states instituted public building projects and paid for them with taxes, the citizenry demanded an accounting of the monies spent. In response, public officials developed a formal social accounting responsibility system. But within 500 years, Greek culture declined and the Romans borrowed their predecessors' methods for keeping track of goods.

INTRODUCTION

Because today's accountants use information collected by bookkeepers to make decisions regarding economic resources, we begin with the bookkeeping function to examine the origins of accounting. Initially, bookkeeping consisted of methods for remembering the rights and obligations of parties involved in economic resource transactions. For example, Eli owns 50 pregnant sheep and Masouk 50 bushels of grain. The sheep and grain are resources and the lambs a potential resource. After the fall harvest, Eli promises to pay Masouk five spring lambs in exchange for five bushels of grain delivered immediately. The promise comprises an economic resource transaction. The five lambs become Eli's obligation and Masouk's right. Shall Eli and Masouk trust their bargain to their memories? They have reasons not to and with a bookkeeping system they need not.

As societies became more complex, the demands on their bookkeeping systems grew. The requirements evolved from recording transactions to much more, and a broad, inclusive conceptualization of accounting became necessary. Accounting developed from bookkeeping into an information system designed to measure specific economic transactions in terms of obligations

and resources and to communicate these measurements to decision makers. As an information system, it consists of a collection of methods and techniques for collecting and disseminating information. It measures economic transactions such as buying and selling goods, services, and promises of goods and services for delivery in the future. The obligations derive from transactional promises and the resources include the goods and services. In the end, the information is delivered to decision makers for immediate or future action.

Why examine the origins of accounting using an inclusive conceptualization? First, because accounting systems collect information about resources and obligations, accounting techniques are employed to implement control over an entity's resources and assign responsibility to individuals charged with efficient and effective utilization of these resources. Indeed, in many countries the accounting function also holds entities, individuals and organizations socially responsible for resource allocation (Pomeranz, 1979). Therefore, as we investigate the pre-historical foundations of accounting it makes sense to view the concept broadly and inclusively.

Second, an inclusive interpretation is necessary to understand how a culture defines its resources and from the definition constructs its particular accounting system. A culture's definition of its resources is predicated on its unique set of normative and existential postulates. Normative postulates form the foundation for its valuation system and existential postulates determine how it perceives existence. Combined, these postulate bases form the customs of a culture. Moreover, because customs vary across time and from one culture to another, resources themselves may be defined and employed differently. Hence, a resource may be valuable in one culture and of no value in another. For example, uranium is essential to a technically sophisticated nation employing nuclear power but of inconsequential value to a rainforest tribe in Brazil. In sum, using an inclusive conceptualization of "resource" allows us to identify those things the culture under consideration considers resources rather than using some a priori and, perhaps, useless definition.

In the same way, using a broad and inclusive conceptualization of accounting permits us to consider accounting systems from the perspective of the culture under study. Thus, we are not likely to dismiss a particular custom as being a non-accounting function simply because our traditional notions of accounting created an ethnocentric perspective that, for example, accounting equals recording. More importantly, we are less likely to miss a culture's unique use of accounting as a tool in making resource decisions. With this understanding, and considering the inclusive conceptualization of accounting, we can begin our search for the origins of accounting. To assist the search, Table 1 below links societies with a time line. The dates are only approximate and can vary by source. See Brandt (2000) for an example.

EARLY HUMANS

Bookkeeping and accounting practices began long before recorded history. Most likely, they started more than 2.5 million years ago with the early toolmakers at the dawn of the human genus.

As pre-humans became aware of their need to control resources, and developed their cognitive abilities to do so, they created systems for keeping track of their resources and for using accumulated information to make decisions about these resources. That is, early hominids evolved into Homo sapiens and their accounting systems kept pace with their cognitive development and need for such systems.

Table 1: Period Time Line
(expressed in years from present)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Lower Paleolithic	Middle Paleolithic	Upper Paleolithic	Mesolithic	Neolithic	Copper/Bronze	Iron	Greek	Roman
1.5 million to 125,000	125,000 to 30,000	30,000 to 12,000	12,000 to 10,000	10,000 to 8,000	8,000 to 3,000	3,000 to 2,500	3,500 to 2,500	2,500 to 1,500

Neanderthals developed from early Homo sapiens about 80,000 to 100,000 years ago. Archaeological evidence indicates that they used stone and bone tools and fire, and conducted ritualistic ceremonies (Gowlett, 1984). Neanderthal culture consisted of nomadic peoples practicing hunting and gathering techniques in close association with their environment. Did these people possess the cognitive skills necessary to create and develop a system of accounting and, if so, did they? Fossil records don't provide definitive answers, but at some point over the 80-millennium span it seems apparent that men and women attempted to control their resources and environment. And through their efforts to control came accounting systems.

For example, imagine living in a small clan of Middle Paleolithic mammoth hunters. A successful mammoth hunt requires more than a single hunter with every hunter in the group carrying at least one spear in each hand. If the clan defines a potentially successful hunt in terms of these two cultural assumptions, then each mammoth hunter has the responsibility of making and maintaining a spear for each hand in order to participate in the hunt. Each hunter would necessarily maintain control of his spears and the clan would charge him with the obligation to present himself at the proper time with a spear in each hand ready for the hunt.

Does an accounting system exist here that would communicate information on resource availability and utilization? If we limit accounting only to a bookkeeping function, probably not. However, conceptualizing accounting in terms of an information system that measures economic transactions in terms of obligations and resources and communicates these to decision makers, an accounting system exists. The individual mammoth hunter has the obligation to present himself with a spear–a resource–in each hand. All the hunters in the group check to insure that each one caries two spears and they communicate their knowledge to each other, leveling sanctions when necessary. Where are the accounting records? They do exist, though not in the traditional written form used

by modern cultures. The records are the resources themselves, the spears. Their availability, qualities and functional traits are integrated into the resource and are communicated to the individual and clan through observation and experience. Thus, we have the basic concept of accounting control and responsibility and we might conclude that very early people took the first steps in developing accounting systems. Obviously, we can only speculate when hominids developed the cognitive ability to take the first steps to develop accounting systems. Not only is archaeological evidence insufficient to delineate the time, but also cognitive skills necessary to accomplish the step probably evolved over millennia. However, a formal recording system based on simple notations existed by the Upper Paleolithic Period, approximately 40,000 B.C.E. to 12,000 B.C.E. (Marshack, 1972).

UPPER PALEOLITHIC PERIOD

Upper Paleolithic peoples left behind material evidence of their existence in the form of what 21st century Homo sapiens call art. On cave walls, for example, they created representations of animals and people and of symbols. They also produced portable art on antlers, bone, stones, and wood that was more than decorative. For example, an analysis of Paleolithic portable art has revealed lunar notation systems for recording moon phases and for determining seasonal changes. People inscribed pieces of bone, antler, stone and wood with notches and marks representing the passage of time and seasons. It seems that Paleolithic people were keeping a record of the lunar cycle. This is not surprising because an early culture that relied on hunting would need to keep track of time in order to predict the periodic migrations of food animals and when a hunter's moon would illuminate nocturnal expeditions. Later, societies would need to predict calving seasons of domestic animals and when to expect naturally growing fruits and vegetables to ripen. Note that this and the discussion below follow Marshack (1972).

The portable notation systems also depicted different animals juxtaposed with the markings recording lunar cycles and changing seasons. We don't know the exact relationship between the animals and notations about time. However, perhaps a salmon etched into a bone or antler alongside the lunar cycle represented the amount of time before the salmon migration or the lunar phases before a ritual needed to be performed commemorating the salmon. In any event, use of this system would greatly enhance a clan's control over a specific animal resource.

The term, "notation" refers to the method of recording time using inscriptions on bones and antlers. By examining how the societies viewed resources, we can see that this notational system comprised a form of accounting. For example, modern accounting practice assumes that resources are owned by an entity with ownership defining and determining accountability. However, early hunters did not own resources in the modern, western sense. The game that they followed was not owned by a clan yet did comprise resources of the clan. These early hunter–gatherers were nomadic people, moving with herd animals or awaiting migrations of fish and fowl. These natural resources served as accounting resources of the individual clans. Therefore, it was the clan's responsibility

to exert control over these resources to ensure the clan's survival. Knowing when herds moved, calved, migrated and which species could be harvested in bountiful numbers would have been critically important to ensure survival. But exerting control over these animal resources required understanding time. The ability to predict an animal's availability is directly correlated to passage of time from month to month, lunar cycle to lunar cycle, and season-to-season. The need to know the exact time of the lunar cycle and the precise moment within a season would likely have been essential to the successful harvest of herd animals, salmon, fowl and plant life. The notation system used by Upper-Paleolithic people undoubtedly comprised the first attempts to control the environment through a formal recording, or accounting, system. By controlling time as a resource, individuals controlled their biological resources.

Cave art probably also incorporated accounting functions of recording and control, though it most likely did not include the more complex notation system found on portable art. On the other hand, portable notational systems and cave art may not have been separate, discrete systems but one system, one form of communication. For example, a hunter would examine his buffalo baton–a piece of bone etched with a buffalo–and see that it has been notched for twelve lunar cycles with one cycle remaining since the last harvesting of this animal. He knows that one lunar cycle remains before a buffalo herd migration will begin and the clan must prepare for it. If the migration route lies some distance away, the clan will need to stop at several temporary shelters or caves along the trip. While spending a night in the cave, hunters will draw pictures of buffalo on cave walls to record the number harvested last season and the techniques utilized in the harvest. Young clan members would study the hunting techniques portrayed and increase their knowledge of the process. At some point clan elders would conduct a spiritual or ritualistic ceremony in the cave in accordance with the clan's customs and taboos. For a more complete discussion, see Bahn and Vertut (1988.)

While our example depicts plausible events, we do not fully understand the meaning of portable and cave art. Also, Marshack's analysis is but one interpretation of marks on portable art, though probably the most credible interpretation because of the correlation between marks and lunar phases. However, other scholars have concluded that some portable art objects are simply tallies of animals harvested during a hunt (Bahn & Vertut, 1988, pp. 203-4). On the other hand, portable and cave art were probably interrelated and, when combined, might have represented records and the accounting system employed by early humans in attempting to control and record their resources. If this interpretation is correct, these pieces of bone, antler, and stone and cave art would help substantiate Upper Paleolithic humans' first attempts at record keeping and controlling resources and, possibly, their first attempts at game management.

MESOLITHIC PERIOD

Beginning about 12,000 B.C.E., descendants of Paleolithic peoples spread throughout what is now Africa, Europe, Britain, and the Far East. In Europe and other areas, they founded

pre-agricultural villages and developed mixed food–collecting economies. Their Mesolithic culture soon spread into the area we know today as the Fertile Crescent–the valley and delta of the Nile River at the western end, the lower courses and estuary of the Tigris and Euphrates rivers at the eastern, and circling around the Syrian Desert. As people migrated, they carried with them their cognitive ability to factor and record time.

However, the herds of reindeer, mammoth and other animals began to diminish. As these resources available to Paleolithic cultures declined, Mesolithic cultures developed or discovered new resources and new ways to cope with them. For instance, people learned how to plant and harvest crops and to domesticate animals. But changes in these animal and plant resources created pressures on old notational methods. Mesolithic cultures found that a system for controlling time and resources remained essential to their survival and the notation system of recording flourished. Thus, the early notational forms of the Paleolithic period became more abstract and symbolic in the Mesolithic in order to predict planting and harvesting times and to account for quantities of foodstuffs and animals exchanged and promised.

The development of agriculture and animal husbandry radically impacted human societies. Hunting-gathering cultures, no longer dependent upon the availability and migration of game animals, could exert more control over their environments and better ensure survival. With domesticated agriculture, societies could produce more food and store the excess. The abundance of food led to the collection of permanent shelters into villages, an increase in the populations, and more free time to devise new solutions to problems. Further, villages could trade their abundant surpluses of agricultural products for items not produced locally. With trade came wealth for the community and with wealth the need to protect the village from invasions by outsiders. The need for protection gave rise to standing armies, city-states, and kings. Eventually the abundance of resources, more complex economic transactions, and a greater need by decision makers for information required ever more elaborate accounting systems and the evolution of accounting systems continued.

PRE-SUMERIAN CULTURES

As agriculture and animal husbandry developed, Mesolithic hunting-gathering cultures settled into villages and produced meat and grain for their growing populations. By the fifth millennium B.C.E., people had established settlements in the marshy lands between the Tigris and Euphrates rivers in Southern Mesopotamia. The area did not possess such necessary resources as metals, timber, and stone nor did it receive much rain. However, it contained an abundance of wildlife, a fertile alluvial plain for agriculture, and a dependable supply of water from rivers and streams that villagers could use to irrigate thirsty crops. Over time, with an excess supply of food and a lack of needed resources, trade began with other cultures possessing the required materials but

lacking food. A stable economy based upon agriculture, animal husbandry, and trade, however, eventually led to problems.

As Kent (1989) notes, village life creates potentials for interpersonal conflicts. People with restricted mobility cannot easily move to a different area when disputes arise. And internal conflicts undoubtedly arose over, among other issues, land and water rights. Over time, the resolution of intragroup disagreements may have evolved into a form of mediation with mediators helping disputing parties resolve their differences. Eventually society granted special powers to these mediators to assist them resolve disputes. The mediators thus evolved into arbitrators with the authority to force compliance. Citizens held their arbitrators in high esteem and came to attribute divine characteristics to them, features that could only have been awarded by a deity. Arbitrators evolved into priests with their temples and councils of elders. Then as city-states grew strong, kings and emperors assumed power. They possessed divine rights but also were saddled with the obligation of insuring that the society prospered.

Intergroup trade also created the potential for disputes since memories of trading partners sometimes differed as to the quantity, quality, and timing of stuffs exchanged. To reduce the potential for debilitating intergroup conflict, rulers of city-states needed written records to aid failing memories. Sumerian scribes responded by developing formal accounting systems to record judicial decisions and economic transactions.

THE ACCOUNTING PROBLEM

To develop an accounting system, a society must overcome several problems. First, its people must develop a set of cognitions complex enough to be able to represent a resource with an abstract symbol: a clay cone to represent a jar of olive oil, for example. Second, people must conceptualize an abstract symbol, a numeric symbol that utilizes a one-to-one correspondence with the resource it represents: five dots to represent five jars of olive oil. Third, individuals must understand that an abstract numeric symbol can represent more than one resource: five dots to represent five jars of oil or five bushels of grain or five cows. Fourth, the abstract numeric system must facilitate the application of mathematics such as addition, subtraction, multiplication, and division: try dividing with Roman numerals. The Sumerian city-states overcame the four problems and developed accounting systems to provide economic information on resources for trade and to facilitate the efficient operation of the government.

THE SUMERIAN SYMBOLIC RECORDING SYSTEM

Once settled into villages, Sumerian communities grew and traded surpluses of grain and animal fiber and protein. The Sumerians also manufactured for use and trade a number of

commodities including oil, beer, pottery, and metal goods. They found that the old notational system of notches on antlers and bones could not account for the variety and quantity of goods.

Scribes developed a new recording system using clay counters or tokens. (This section based on Schmandt-Besserat, 1992.) A one-to-one correspondence existed between the good and the token with each good represented by a different shaped token: sphere, cone, disk, etc. That is, one type of token stood for a specific measure of a resource. For example, workmen store five jars of oil in the temple warehouses. A court scribe shapes five spheres representing the five jars of oil and fires the clay spheres for permanence. The scribe places the five spheres into a clay envelope, closes it, and stamps it with a clay seal or bullae bearing the king's mark. The envelope is then stored in a secure room.

When an accounting of the commodities in storage was ordered, rather than make a count of the physical goods the envelopes could be retrieved, opened, and the tokens counted. Eventually the tokens would be taken to the warehouse and the jars of oil recovered for use or trade. The Sumerians, then, were one of the first societies to create internal control and responsibility accounting systems. Internal control came from the token count while responsibility for secure storage and correct counts rested with government bureaucrats.

Court scribes eventually found it easier to mark the clay envelopes with the number and type of tokens inside. By pressing the token into the wet clay five times, the court administrator need not break open the envelope to learn that five jars of oil were stored. This mutation of three-dimensional objects to two-dimensional symbols represented an early step in the development of a system of writing.

About 3500 B.C.E. Bronze Age scribes began to replace the token and envelope system with clay tablets. Rather than inscribe five circular images on an envelope, they impressed them onto a clay tablet then secured the tablet in the royal archives. The physical impressing of a figure onto a clay tablet evolved into a geometric, pictographic system produced by a writing instrument. Sumerian accountants used a wedge-shaped section of a chopped-off reed that could produce many shapes representing a variety of resources. The wedge-shaped impressions–in Latin, cuneus–led to cuneiform writing.

WRITING AND NUMBERS

From tokens, to tokens in clay envelopes, to geometric shapes impressed on envelopes, to shapes impressed on clay tablets, to wedge-shaped impressions on tablets, to cuneiform writing, the Sumerians invented a system that not only recorded the number of units of a particular commodity but other information surrounding the commodity (see Schmandt-Besserat, 1992).

The information communicated where goods were stored and under whose authority they fell–the basic requirements for a social responsibility accounting system.

The number of units began with a system based on a one-to-one correspondence. First, one geometric symbol on an envelope represented one unit of a particular commodity. Then lines on a clay tablet next to a symbol stood for the number of units of the commodity. By 3100 B.C.E., Sumerian accountants realized that one sign could stand for a group of symbols. For example, they initially found they could inscribe a circle to represent ten jars of oil rather than use ten lines. Then they realized that the circle could represent ten units of anything. They developed the idea that a symbol, a number, could represent a quantity, a quantity of anything or, in the abstract, of nothing. The Sumerians had evolved the beginnings of mathematics. And in order to manipulate their numbers, they invented the abacus.

AKKADIANS

As the marshy lands between the southern Euphrates and Tigris rivers silted in and became inhabitable, small Sumerian villages of Caucasian peoples developed into city-states such as Ur, Eridu, Ururk, Nippur, Kish, Lagash, and Babylon. Each consisted of an independent city, ruled by priests, which dominated farms and villages for several miles around (see Roberts, 1976). By the third millennium, strong kings began to replace priestly rulers and to establish their influence over neighboring city-states. However, about 2400 B.C.E. Sargon I, the king of Semitic Akkad situated just north of Sumer, conquered Sumer and united the city-states into an empire. Under Sargon and his successors, trade flourished throughout Mesopotamia and further, into the Levant and Indus valley. Sumer peoples accumulated immense wealth and undertook great building projects.

To facilitate trade, the Akkadians adopted much of the Sumerian culture, including cuneiform writing. However, though Akkadian dominance lasted less than 500 years, the Semitic Akkadian language replaced Sumerian.

Enemies abounded on the frontiers of Sumer and about 2000 B.C.E. Ur fell to the Elamites. Thereafter the Guti, Elamites, Amorites and other cultures dominated parts of what had been Sumer. The invasion by these outsiders combined with salinization of the soil, silt accumulation in the irrigation canals, destructive floods, political upheaval, and administrative collapse contributed to Sumer's decline (Adams, 1965). By the middle of the second millennium, the sun had set on the Sumerian civilization. But "Her people left their successors writing, monumental building, an idea of justice, and the roots of a great religious tradition. Their era is possibly the most important in early history, because it was the seedbed of so much that followed (Roberts, 1976, p. 46)."

MINOANS

At least by 8000 years ago, Neolithic villages in Macedonia, Sumeria, Anatolia, the Indus Valley, and the Levant were trading with each other. Obsidian, for example, prized for its ease of manufacture and razor-like edge, was produced on the Greek island of Melos and traded over a wide

area (Vermeule, 1972). By 3000 B.C.E. metal workers found that a mixture of copper and tin resulted in a substance that was stronger and more rigid than copper alone and held a sharp edge. Produced from materials mined on Cyclades, this bronze metal found its way into Greece by 2400 B.C.E. Because trading of obsidian, bronze, and other goods requires an accounting system to track and document the goods bought and sold, the Greeks imported an idea: using markings on clay seals to designate the quantity and type of goods in a container. Though rudimentary, it easily fit the definition of and served as an accounting system.

Trade facilitated the founding of cities. Maritime trade expedited the movement of such bulky goods as wine and wheat between growing coastal communities. Caravans moved low bulk, high value items inland between population centers. As a result of the commerce, existing cities expanded and new ones developed in strategic locations, often where trade routes crossed. Needing to protect their growing riches from invasion, city leaders created armies and built strong walls. But to support their armies and growing populations, they developed an agricultural system and re-distributive economy that subsequently created even greater wealth for the cities and their people. By 1300 B.C.E. the Minoan culture on Crete, for example, flourished; its people grew quite affluent and constructed great palaces (Dickinson, 1994).

To assist trade and preserve the wealth, the Minoans used an accounting language termed Linear A. And though linguists haven't deciphered all of Linear A, it was, at least in part, created and developed for trade and the redistribution of goods (see Martin, 1996). Indeed, we understand it well enough to know that it performed a record keeping function. With it, the Minoans kept track of inventories, personnel, receipts and disbursements, and other transactions. Gordon (1964, pp. 183-186) noted that the Minoans kept records of everything from chariots to perfumes. The receipts found by archeologists record payments owed and note any deficits in the amount paid. In addition, Linear A made possible a responsibility accounting system where individuals were held accountable for variations in quantity or quality.

GREEKS

In addition to agricultural and manufactured goods, the Minoans apparently exported Linear A to their trading partners. By 1500 B.C.E. the Greeks had adapted Linear A to their own language in order to track the increasing trade and account for the resulting wealth accumulated by such Greek cities as Mycenae, Pylos, Tiryns, and Ochomenos. The adaptation produced Linear B script, which then replaced Linear A on Crete as the Mycenaean Greeks came to dominate their trading partners.

Tablets in the Linear B script have been deciphered. They tell of a new affluence in Greece combined with a heavily armed military. Splendid Mycenaean cities, strategically built on trade routes, possessed massive walls and a military class to protect them and to extract tribute from merchants. Archeological evidence from palace graves demonstrates the vast riches accumulated by Mycenaean princes (Vermeule, 1972) in these cities, wealth earned from trade. But with

extensive trade and wealth came a need for internal control over assets, receipts, and disbursements. Mycenaean palaces required an accounting system capable of inventorying vast quantities of palace assets for redistribution. Linear B provided the basis for their inventory and control needs. For example, tablets listed flocks down to the last ewe and ram, the names of individual shepherds and tax inspectors, minute enumerations of equipment and war material, and individual thrones and chariots listed with their accouterments and defects (Wood, 1985). In sum, these detailed accounting records indicate a thirst for opulence and the development of a powerful military necessary to achieve it (Vermeule, 1972).

To assure prosperity for an increasing population, the Greeks continued to expand their focus by raiding neighboring kingdoms. Looking to the Near East, Mycenaean Greeks found Troy blocking their trade movements. For this and probably other reasons, they sent a fleet of war ships to sack and plunder the coasts and islands of Northwest Anatolia. A list of the ships' stores, written in Linear B, accounted for the goods carried forth and then obtained in the raids. One list noted that among the booty were women, carried back to work on the estates around Mycenae and Pylos (Wood, 1985).

DARK AGE

By the 12th century B.C.E., however, several events combined to end the extensive Greek influence. Famine in the Near East and the depletion of natural resources by palatial estates contributed. But most likely, the continual raiding by the Sea-People hastened the decline. Though their origins are not altogether understood, the Sea-People might have included displaced refugees from Mycenae and Troy and Hittite, Phoenician, Assyrian and other peoples. These raiders destroyed the palatial estates in the coastal cities and Greece entered a dark age.

During this Dark Age, trade all but ceased. Without trade, the need for an accounting system disappeared. Further, written language temporarily faded away and Greece reverted to an oral tradition. With no need for it, the Linear B script was lost for centuries.

RECOVERY

By the ninth century, Greece began a recovery but with Greek society ruled by city-states rather than palaces. Writing reappeared. Trade between city-states and with outsiders increased. And the improving economic environment and stable political system encouraged an expansion of knowledge in medicine, philosophy, mathematics, and the arts. With the escalating exchange of goods demanding an accounting system and the means for it available, the Greeks resurrected their old accounting methodologies.

The new city-states discovered the benefits of democracy. They relied heavily on public funds to function. Public funds came from taxes and tribute, and records of who paid what became

necessary. Further, rather than a Mycenaean palace king, public officials were responsible to the citizens of the city-state, citizens who wanted to know how and where their money was being spent. And project contractors had to delineate the origins of their funds and account for the disbursements of these funds. In sum, democracy and the increasing prosperity of the city-states necessitated an accounting system that assigned social responsibility. In response, the Greeks created a formal social accounting responsibility system.

By the fifth century, the influence of the city-states began to decline as Macedonia under Philip and then Alexander over-ran the Greek city-states. Democracy was replaced by oligarchy and when Alexander died, his empire was divided. Alexander had spread the Greek culture into the countries he conquered, though, and it lived on. As their influence spread the Romans became heirs to the Greek culture, including the accounting systems developed by the Greeks.

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A STUDY OF STOCK MARKET SECTORS DURING THE NINETIES

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ABSTRACT

This study examined the performance of the U.S. stock market during the nineties, concentrating on the performance of the various industry sectors. The study examined the quarterly rates of return earned by stocks in various industry groups and the performance of the stock market as measured by the Standard and Poor's 500 index. The data used for this study covered a period beginning the first quarter of 1990 through the second quarter of 2001. The study focused on both the returns and the risk provided by the various industry sectors of the stock market. The profitability of various sector rotation strategies was also examined in this study. The optimal strategy was a rebalancing of the portfolio every quarter with stocks in industries that outperformed the market in the prior quarter. This strategy provided a very attractive risk-return portfolio characteristic and was also able to hold on to the gains when the market turned at the start of the new millennium.

INTRODUCTION

In recent years, with the advent of index stocks traded on the AMEX and other exchanges, a strategy of sector switching combined with momentum investing suddenly has become more cost effective as a whole basket of stocks can be purchased and sold with minimal transactions costs. This study examined the possibility of earning excess rates of return based on a momentum identification strategy over the decade of the nineties. The switching strategy was based on measuring the momentum of the stock market rates of return of various industry sectors in the United States. On the other hand, the contrarian approach to investing suggests that over the long term, all investment returns tend to regress toward their normal risk adjusted rate of return, in which case an industry that has under-performed in a given period will likely outperform the market during the next period.

LITERATURE REVIEW

A number of studies in the past have found both positive and negative serial correlation of returns over different time periods based on different rebalancing strategies. Chan, Jegadeesh and

Lakonishok found that strategies based on past returns provided significant returns over a horizon from six months to one year. They believe "The source of these momentum profits may be the tendency of at least some investors to chase past trends. These investors may rush to buy past winners and dump past losers, resulting in temporary price drifts for these stocks." Swinkels conducted a similar study in the international context. His study examined the momentum effect for Europe and Japan. His findings were that there was a significant momentum effect for Europe whereas it was nonexistent for stocks in Japan. Schiereck, De Bondt and Weber examined the contrarian and momentum strategies in Germany. Their study examined the returns and earnings of all major German companies over a period 1961-1991. They found that "--what is perhaps most surprising is how closely the results for Germany match the findings for the United States---Maybe general traits in human behavior and psychology overcame these differences---in the social, cultural, and economic environment." Rouwenhorst found that international momentum returns are correlated with those of the United States. His study covered 12 countries and found an internationally diversified portfolio of past winners outperformed past losers by about one percent per month. He believes that "the exposure to a common factor may drive the profitability of momentum strategies."

METHODOLOGY

This study used the United States stock market price data to test the following hypotheses:

H0a:	It is not possible to earn an excess risk-adjusted rate of return on stocks with a sector rotation strategy based on industry momentum.
H1a:	It is possible to earn an excess risk-adjusted rate of return on stocks with a sector rotation strategy based on industry momentum.
H0b:	It is not possible to earn an excess risk-adjusted rate of return on stocks with a sector rotation strategy based on a contrarian approach to industry momentum.
H1b:	It is possible to earn an excess risk-adjusted rate of return on stocks with a sector rotation strategy based on a contrarian approach to industry momentum.

Given the results of past studies cited in the literature review, a momentum strategy should provide a superior portfolio performance while a contrarian approach might not provide any benefits. Hence, it is expected that this study should reject the null hypothesis H0a while at the same time accepting the null hypothesis H0b.

The study used the United States stock market price data covering the first quarter of 1990 through the second quarter of 2001. The stocks were categorized according to thirty-one industrial groups as shown in Exhibit 1. The study used quarterly portfolio rebalancing initially, and later the

study was replicated using semi-annual portfolio rebalancing. For testing hypotheses H0a and H1a, the performance (rate of return) of each industry was measured and the best performing industry was identified. All the portfolio funds were then invested in the stocks of this industry for the following quarter. This procedure was then repeated every quarter and the portfolio rebalanced accordingly.

For the sake of convenience, the time span for both the identification period and the investment period was the same. Similarly, to test hypotheses H0b and H1b with regards the contrarian investment approach, the worst performing sector (industry) was identified for a particular quarter and the total portfolio funds were invested in this sector for the following quarter. This portfolio too was rebalanced every quarter over the same time period. Both these were then replicated with semi-annual rebalancing.

RESULTS

The sector inclusion results are shown in Exhibit 1. There were nine sectors that were never in either the best or the worst performing sectors over the eleven-year time span. Sixteen sectors were never included in the best performing group and twelve sectors were never included in the worst performing group. There were a total of twelve sectors that were included in both the best and worst performing sectors which suggests that to a certain extent, reversal of fortunes for these sectors was at work.

EXHIBIT 1: SECTOR INCLUSION

SECTOR	INDUSTRY	High Sectors	Low Sectors
MG110	Chemicals	1	
MG120	Energy	2	3
MG130	Metals and mining	3	1
MG210	Conglomerates		
MG310	Consumer Durables		1
MG320	Consumer Nondurables		
MG330	Automotive		1
MG340	Food and Beverages		
MG350	Tobacco	4	5
MG410	Banking		
MG420	Financial Services		1
MG430	Insurance	3	
MG440	Real Estate		1
MG510	Drugs	2	2
MG520	Health Services	2	2
MG610	Aerospace & Defence	2	

EXHIBIT 1: SECTOR INCLUSION			
SECTOR	INDUSTRY	High Sectors	Low Sectors
MG620	Manufacturing		
MG630	Materials & Construction	3	3
MG710	Leisure		
MG720	Media	1	2
MG730	Retail		
MG740	Specialty Retail	4	1
MG750	Wholesale		2
MG760	Diversified Services		
MG770	Transportation		1
MG810	Computer hardware	1	2
MG820	Computer Software	1	1
MG830	Electronics	6	3
MG840	Telecommunications		
MG850	Internet	11	11
MG910	Utilities		3

The summary results of each portfolio strategy compared to the performance of the S&P 500 over the time span under study is as shown in Exhibit 2. It can be noticed that the annualized rate of return for the high return portfolio at 29.76 percent was much greater than the return on the low return portfolio at –5.83 percent. Both portfolios provided their returns with an equal amount of risk. Obviously, over the decade, the contrarian approach did no work.

EXHIBIT 2: SUMMARY STATISTICS			
	High returns	Low Returns	S&P 500
Mean	6.73	-1.49	2.87
Std. Dev	18.77	18.79	7.44
Ann. Return	29.76	-5.83	11.98
Correlation Coefficients 1990-2001			
	S&P500	High	Low
S&P500	1.00	0.38	0.69
High		1.00	0.19
Low			1.00

A contrarian approach of portfolio management would have led to losses over the decade and severely under-performed both the momentum approach and the overall market as represented by the S&P 500 index. In fact, the contrarian portfolio is dominated by both of the other two portfolios. On the other hand, the momentum portfolio provided a significantly superior rate of return as compared to the stock market. However, the momentum portfolio does not dominate the market portfolio since the momentum portfolio has achieved the higher returns with higher risk. It is interesting to note that the momentum portfolio has a fairly low correlation with the stock market and an even lower correlation with the contrarian portfolio. The contrarian portfolio, on the other hand, has a relatively high correlation with the stock market.

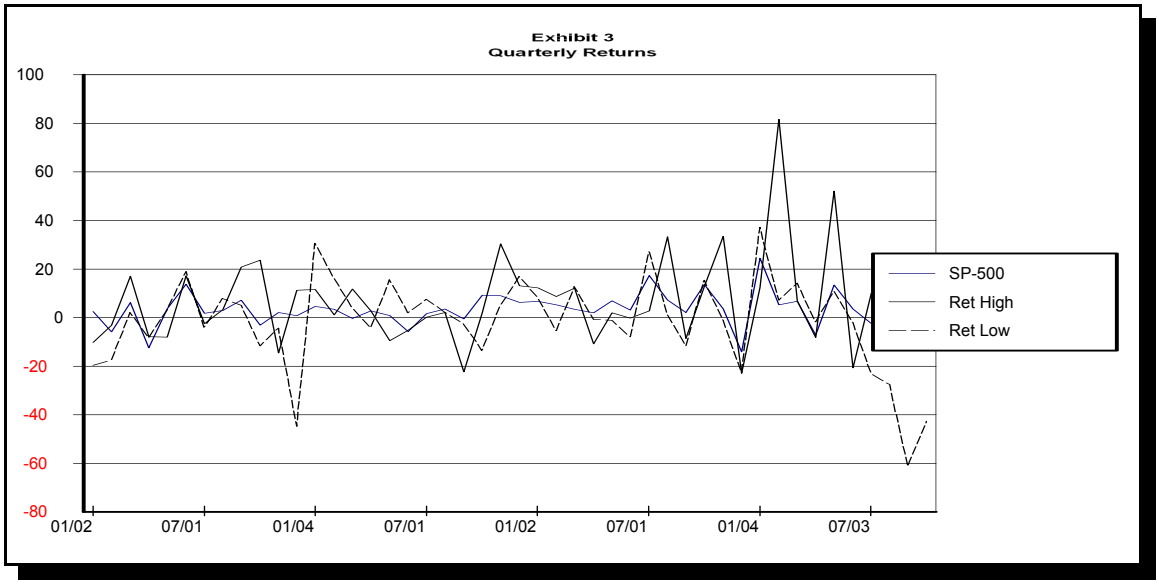
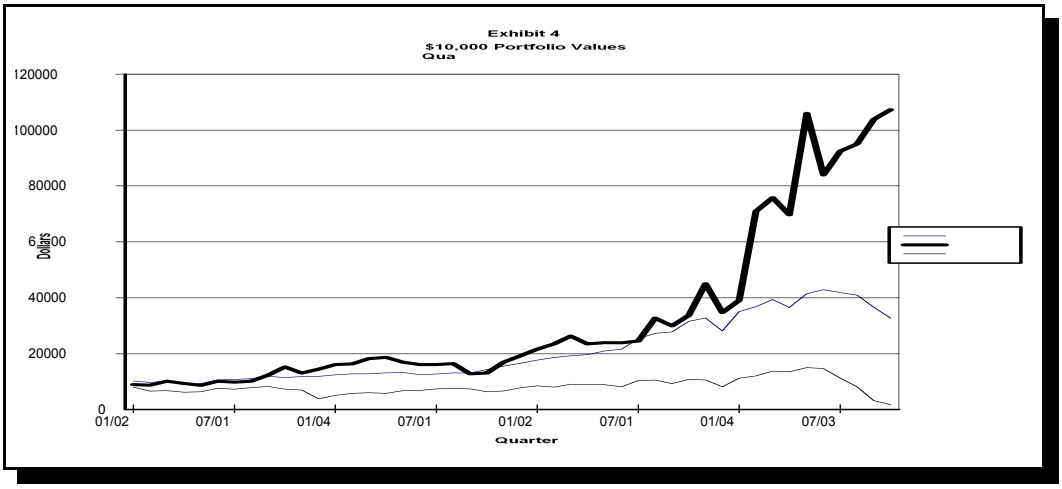


Exhibit 3 shows the quarterly returns of the three investments. The volatility of all three portfolios, especially the momentum portfolio, was significantly higher beginning in early 1999. It can also be seen that beginning in the middle of the year two thousand, even as the market and the contrarian portfolios were producing negative rates of return, the momentum portfolio has provided positive returns.

Finally, it should be noted that the rates of return of all three portfolios are positively related, as seen earlier, especially when the rates of return are abnormally high or low.

Exhibit 4 shows the growth of a $10,000 investment in January 1990 in the three portfolios. The momentum portfolio and the S&P 500 clearly are superior to the contrarian portfolio over the whole time span. The S&P 500 and the momentum portfolio were providing very comparable results till early 1999 at which point the momentum portfolio clearly outperformed the market. This is also true after the stock market turned down in early 2000. Except for a sharp drop for one quarter, the momentum portfolio has continued to gain value even in a dropping market.



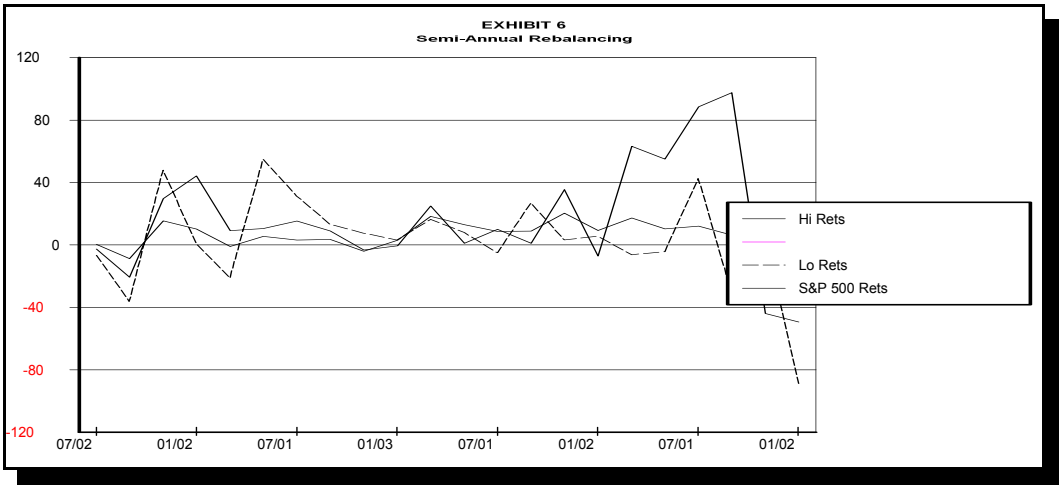
The study was then replicated using semi-annual rebalancing with the performance over the previous six months determining the portfolio construction for the following six months. Here too, a high return and a low return portfolio were constructed. The results are as shown in Exhibit 5.

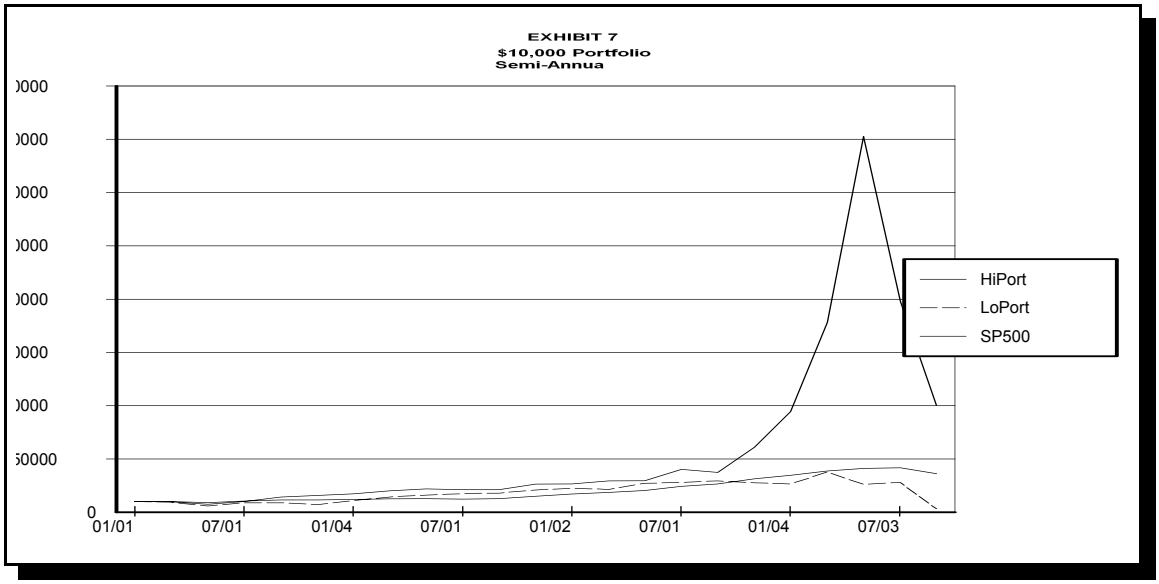
EXHIBIT 5: Statistics
Semi-Annual Rebalancing

Date	Hi Rets	Lo Rets	S&P 500 Rets
07/02	-2.54	-6.63	0.32
01/02	-20.67	-36.04	-8.75
07/01	29.72	47.97	15.52
01/02	44.26	0.85	10.19
07/01	9.19	-21.24	-0.98
01/04	10.4	54.85	5.41
07/01	15.3	31.32	3.14
01/03	9.04	13.2	3.63
07/01	-3.12	7.61	-4.04
01/03	-0.49	3.11	2.91
07/03	24.95	16.3	18.32
01/02	1.13	8.01	13.04
07/01	10.03	-5.05	8.7
01/02	1.13	26.89	8.91
07/01	35.44	3.14	20.37
01/02	-7.12	5.48	9.28
07/01	63.21	-6.28	17.3
01/04	55.01	-4.4	10.38

EXHIBIT 5: Statistics Semi-Annual Rebalancing			
Date	Hi Rets	Lo Rets	S&P 500 Rets
07/01	88.53	42.48	12.09
01/03	97.64	-30.6	6.33
07/03	-43.81	6.91	1.05
01/02	-49.37	-88.83	-12.9
Mean	16.72	3.14	6.37
Std. Dev	36.79	30.84	8.53
Annualized Mean	36.24	6.38	13.15
Correlation Coefficients			
	SP500	Ret Hi	Ret Lo
SP500	1	0.62	0.56
Ret Hi		1	0.28
Ret Lo			1

As in the earlier case, the rate of return for the Hi-Return portfolio is substantially greater than the Lo-Return portfolio, or for that matter, the S&P 500 index. However, the standard deviation of returns of the Hi-Return portfolio is somewhat greater than for the Lo-Return portfolio and substantially greater than the S&P 500 index. Hence, in the six-month rebalancing, none of the three portfolios are dominant. The correlation coefficients between all three portfolios are also greater compared to quarterly rebalancing, but is relatively low between the Hi-Return and Lo-Return portfolios.





The portfolio returns for the six-month rebalanced portfolios (both Hi-Return and Lo-Return) fluctuate much more than with the quarterly rebalancing, and this is most apparent over the last one and a half years. The semi-annual rebalanced portfolio was too slow to react to the market downturn that started early in year 2000 and gave up most of the gains of the latter part of the decade.

CONCLUSIONS

This study found that a quarterly rebalancing going with industry sectors that were surging using a momentum strategy would have produced an attractive rate of return on a risk adjusted basis over the time period studied. This strategy also kept most of its value when the market took a downturn. On the other hand, a contrarian approach would have produced inferior results. Though semi-annual rebalancing using a momentum strategy provided an attractive rate of return that was fairly comparable to quarterly compounding, it was unable to hold on to these returns when the stock market went down. In both the rebalancing methods (quarterly and semi-annual), the contrarian approach did not work. This study thus rejects the null hypothesis H0a in favor of the alternative hypothesis H1a while it finds that the second null hypothesis H0b cannot be rejected. This study thus finds that the momentum strategy works and provides an attractive rate of return on a risk adjusted basis. The results of this study are in line with the results of other studies cited in the literature review and meet the a priori expectations of this study. The contrarian approach though, combined with a momentum portfolio, might be an attractive option for a portfolio hedging strategy where a portfolio is constructed by investing in a momentum portfolio while at the same time selling short the portfolios constructed using the contrarian portfolio strategy.

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REAL OPTION TECHNOLOGY IN APPLIANCE EXTENDED WARRANTY VALUATION

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ABSTRACT

Since the extended warranty can be expressed as a contingent insurance policy, in this study the extended warranty is valued as a put option. Real option technology is applied in order to determine if the observed extended warranty prices coincide with the theoretic extended warranty prices of three types of durable goods. Our findings suggest that the prices of the extended warranties should be negative. Because the premiums of these extended warranties do have positive values, it is, however, implied that other variables are involved that generate a positive premium price.

INTRODUCTION

Economically defined and aggregated, a decline in the gross domestic product for at least two consecutive quarters is recognized as a recession. A recession, however, is very personal at the individual level. Either individually or as a family, each purchasing unit faces similar circumstances; rising prices, interest rates, and news of job layoffs. Facing the uncertainty of such an environment, the wise household adopts a policy of parsimony. Occurring within this parsimonious state, the breakdown of a major household appliance is akin to rubbing salt into an economic wound. The consumer must now replace the nonfunctioning major appliance.

Many appliance retailers offer product lines from multiple manufacturers at comparable prices. The rational consumer researches several replacement appliances produced by one or more manufacturers. Finally, the selection process and purchase decision is complete. As the sales representative is completing the appropriate sales documentation, the consumer is asked "Would you like to purchase an extended warranty for your product?" The economic issue conjectured is the benefit/cost relationship: "Is the extended warranty really worth the price?"

The extended warranty is specifically a contingent insurance policy that provides the certainty of coverage for a specified risk. The risk is narrowly identified as 'the purchased machine becomes inoperative within a certain time period'. The principal risk addressed by the extended warranty is the repair cost of nonfunctioning appliance faced by the purchaser. The extended warranty payoff state occurs when the insured appliance becomes nonfunctioning: the extended

warranty compensates the repair agency for the cost of returning the appliance to an operational status.

The extended warranty also provides several non-economic benefits in excess of the consumer's repair costs. When the appliance becomes nonfunctional, the retailer is informed and dispatches a service technician to repair the nonfunctional appliance. Thus, the consumer's convenience factor is seen as a psychological payoff from the extended warranty. The extended warranty may also preclude the occurrence of some future costs; the driving costs and waiting time expended at a self-service laundry; the frustration of locating a reputable service technician from the phone book; sustaining a greater loss of perishable goods from a nonfunctioning refrigerator. In the event that a repaired appliance again becomes nonfunctioning shortly after repair, the extended warranty offers a degree of conflict resolution between the retailer and consumer.

The extended warranty is also a hedge against an information asymmetry. The manufacturer has built and tested millions of these appliances. The manufacturers, therefore, have a priori information concerning the probability of failure within a specified time. Because the information is proprietary, the consumer does not know what the manufacturers know.

Finally, there is the occurrence of a utility loss when the appliance becomes inoperable. The utility loss is exacerbated as the time of inoperability increases while the purchaser searches for and secures an appointment with a qualified repair technician.

The general population views the extended warranty as an insurance policy. Economically the extended warranty is viewed as a real option. Buxbaum defines a real option as a systematic and integrated decision analysis process that centers on real assets (Buxbaum, 2002). While this definition is accurate, it may also be confusing to the lay person. Rephrased, an option allows you the right, but not the obligation, to take some action in the future (Dixit and Pindyck, 1995). In order to exercise the option, the extended warranty purchaser needs only to call and report the product inoperative.

The economic consideration maps the extended warranty value relative its purchase price. If the extended warranty value is greater than or equal to its purchase price, then the extended warranty is economically feasible. The obverse is also true. Only the relevant economic factors are considered in this analysis: the price of individually purchased goods, product price, warranty expiration, time and a riskless rate of return from an appropriate Treasury security.

HISTORY

Real options have a rich history. Some of the earliest real option references are Biblical: dating to approximately 1728 BCE. Joseph recommended to Pharaoh that he invest heavily in grain after learning that Pharaoh was having dreams of an impending drought. Pharaoh, believing that investment in grain was the best path for the future, accepted Joseph's counsel. He purchased all available grain and all the grain that became available for the next seven years. Because he

exercised his option to buy grain, Pharaoh survived the seven years of famine. The risk that Joseph and others faced was death by starvation. The real option hedged death by starvation by acquiring grain: the exercise price was the cost of creating some storage containers wherein to store the grain (Brach, 2003).

During the mid-620's BCE, the ancient philosopher Thales became wealthy by buying call options on olive presses nine months prior to harvest season. The risk Thales faced was the uncertainty of the next harvest; if the harvest was bad, then there would be little need for olive presses, and Thales would receive no income from renting the presses to the olive farmers. Fortunately, the harvest season was plentiful. Thales exercised his call option, renting the presses at a below-market price during a period of high demand. The high demand allowed him to charge above market-rate rentals; rentals that provided Thales an above average return (Brach, 2003).

In May 1973, Fischer Black and Myron Scholes published their Nobel Prize winning option pricing equation. Their equation provided a solution for the equilibrium price of a call option on shares of stock. Since that time, the Black-Scholes model has helped foster the growth of the options market by providing a basis for option valuation and pricing. Variations of the model have provided broader applications within the financial market (Brach, 2003).

Petroleum engineers use real option technology to determine whether the returns from oil exploration and extraction exceed the venture costs; integrating the geological uncertainty with the uncertainty of oil prices (Amram and Kulatilaka, 1999). In other applications, the strategy of a real option was used by Portes, a Boston-based software company. Portes used real option technology to measure the risk and return relative to entering the realm of the business-to-business world on the Internet (Copeland and Antikarov, 2001). We now apply the real option approach to ascertain a fair market price of the extended warranties on the lowest and highest priced washing machines, dryers, and refrigerators.

DATA AND METHODOLOGY

There are four major manufacturers for all of the product lines in this 2003 study. Table 1 lists the manufacturers of refrigerators and the brand names under which they are sold. Table 1 also lists the most economical price to obtain a basic product and the premier price after the amenities are added to the product[1].

Table 2 lists the manufacturers of clothes washing machines and the brand names under which they are sold. Table 2 also lists the most economical price to obtain a basic product and the premier price for the amenities that could be added to the product.

Table 3 lists the clothes dryer manufacturers and the brand names under which they are sold. Table 3 also lists the most economical price to obtain a basic product and the premier price once the amenities are added to the product.

Table 1: Refrigerator Manufacturers and the Brand Names			
Manufacturers	Brand Name	Economical Price	Premier Price
General Electric	GE Profile	$758.00	$3,201.30
	Hot Point	$488.31	$910.39
Whirlpool	Whirlpool	$ 470.13	$1,897.00
	KitchenAid	$662.34	$2,301.30
	Kenmore	$349.99	$3,049.99
	Roper	$412.99	$441.56
AB Electrolux	Frigidaire	$497.00	$1,197.00
Maytag	Maytag	$783.12	$1,819.00
	Jenn-air	$1,514.29	$2,047.00
	Amana	$536.36	$1,927.27

Table 2: Washing Machine Manufacturers and the Brand Names			
Manufacturers	Brand Name	Economical Price	Premier Price
General Electric	GE	$257.00	$397.00
	Hot Point	$257.00	$329.49
	GE Profile	$497.00	$799.00
Whirlpool	Whirlpool	$237.00	$897.44
	Kenmore	$299.99	$969.99
	Roper	$227.00	$527.00
	KitchenAid	$460.53	$543.42
AB Electrolux	Frigidaire	$277.00	$641.00
Maytag	Maytag	$357.00	$297.00
	Amana	$377.00	$580.77

Table 3: Clothes Dryer Manufacturers and the Brand Names			
Manufacturers	Brand Name	Economical Price	Premier Price
General Electric	GE	$217.00	$448.68
	Hot Point	$218.00	$305.26
	GE Profile	$486.84	$649.00
Whirlpool	Whirlpool	$247.00	$797.00
	Kenmore	$299.99	$969.99
	Roper	$197.00	$447.00
	KitchenAid	$403.95	$494.74
AB Electrolux	Frigidaire	$219.77	$434.21
Maytag	Maytag	$327.00	$819.00
	Amana	$377.63	$475.00

The price for each machine plays a part in determining the value of the extended warranty, given that each product is purchased separately, each with a 3-year extended warranty.

To calculate the value of the extended warranty, the Black-Scholes model and the Put-Call Parity equation are used. The Black-Scholes equation is used to determine the theoretic value of a call option.

$$C = S \bullet N(d1) - X(e^{-rT}) \bullet N(d2) \qquad \text{Equation (1)}$$

$$d1 = (\ln(S/X) + [r + (\sigma 2 / 2)]\, T) / (\sigma\sqrt{T}) \qquad \text{Equation (1a)}$$

$$d2 = d1 - \sigma\sqrt{T} \qquad \text{Equation (1b)}$$

Where: C = call option theoretic value

d1, d2 = standard normal random variable; also called a z-statistic

N = the value of the cumulative function of a normal distribution

N(x) = the cumulative probability distribution function of observing a value drawn from a standardized normal distribution with a mean of zero and a standard deviation of one.

N(d1) = the call option delta: the partial derivative of the call value with respect to the appliance price. The delta can be interpreted as the price change in the call value per dollar change in appliance value.

N(d2) = the probability that the option is exercised in a risk-neutral environment.

S = market value of underlying asset (cost of the appliance)

X = strike price ($125)

r = risk-free rate of a 3 year Treasury bill

T = time to expiration; $\left(\frac{(1095\text{-actual days remaining prior to warranty expiration})}{1095}\right)$

σ = Standard Deviation of the product prices about the mean price.

The Put-Call Parity equation is described as:

$$P = C + X - S \qquad \text{Equation (2)}$$

Where: P = extended warranty theoretic value

C = call option theoretic value

X = strike price ($125)

S = the current price of the underlying asset (appliance)

The market value of the extended warranty as a put option is established through the use of Put/Call Parity. In the Put/Call Parity equation, the strike price is the cost incurred by the retailer for a service call to repair the product based on the total cost of the service call. Total costs include all direct and indirect costs involved with the notification, scheduling, transporting, and repairing the nonfunctioning appliance. Based upon the total dollars constituting a service call, an amount of $125 is assigned as the strike price. The current market price of each underlying appliance is stated in Tables 1, 2, and 3. The next step in the process is to determine the market value of the call option.

Equation 1 states the call option price equation. On the right-hand side of equation 1 is the untaxed retail price of each appliance from the most economical product to the premier product in each category. The next term, N, is the value of the cumulative function of a normal distribution for (d1) and (d2), with the mean and standard deviation calculated from each sample[2]. The three year Treasury bill risk-free rate is 1.74%. The time variable for this study is three years, expressed as days because the extended warranty period is 3 years: [(3 years)*(365 days per year) = 1,095 days].

The distribution means, standard deviations and variances were deterministically applied from the economical and the premier model's retail product prices and applied in equation 1(a) and 1(b). The first z-statistic is estimated by first taking the natural logarithm of the quotient created when the appliance's retail price is divided by the strike price. The natural logarithm is summed to the outcome of the risk-free rate plus one-half of the variance and multiplied by the time remaining before the extended warranty expires. The second z-statistic is determined by subtracting the results of the first z-statistic from the product of the standard deviation and the square root of the time remaining until expiration.

Once the call price is determined, the put valuation is deterministic. The put is valued by summing the call, the strike price, and the appliance price.

RESULTS

According to the analysis, each appliance's extended warranty theoretic value is different from each appliance's extended warranty observed value. Table 4 reports the 3-year extended warranty theoretic value for each model of refrigerator.

Table 4: Extended Warranty Theoretic Values Calculated using BSOPM

Refrigerator Mfgr	Brand Name	Economic Model	Premier Model
		Ext. Warranty Theoretic Value	Ext. Warranty Theoretic Value
General Electric	GE Profile	($634.97)	($3,066.24)
	Hot Point	($367.96)	($787.11)
Whirlpool	Whirlpool	($349.96)	($1,768.66)
	KitchenAid	($540.26)	($2,170.87)
	Kenmore	($231.01)	($2,915.71)
	Roper	($293.40)	($320.68)
AB Electrolux	Frigidaire	($376.57)	($1,072.25)
Maytag	Maytag	($659.84)	($1,691.06)
	Jenn-air	($1,383.68)	($1,917.88)
	Amana	($415.54)	($1,798.77)

The 3-year extended warranty theoretic value for each of the washing machines was also different from the 3-year extended warranty observed value. Table 5 reports the 3-year extended warranty theoretic value for each model of washing machine.

The 3-year extended warranty theoretic value for each dryer was also different from the 3-year extended warranty observed value. Table 6 reports the 3-year extended warranty theoretic value for each dryer model.

Table 5: Extended Warranty Theoretical Values Calculated using the BSOPM

Washer Mfgrs.	Brand Name	Economy Model	Premier Model
		Ext. Warr. Theoretic Value	Ext. Warr. Theoretic Value
General Electric	GE	($133.60)	($274.73)
	Hot Point	($133.60)	($207.32)
	GE Profile	($373.58)	($676.17)
Whirlpool	Whirlpool	($113.60)	($774.47)
	Kenmore	($176.58)	($846.92)
	Roper	($103.60)	($404.55)
	KitchenAid	($337.11)	($420.95)
AB Electrolux	Frigidaire	($153.59)	($518.40)
Maytag	Maytag	($233.59)	($174.87)
	Amana	($253.59)	($458.25)

Table 6: Extended Warranty Theoretic Values Calculated using the BSOPM

Dryer Manufacturers	Brand Name	Econ. Model	Premier Model
		Ext. Warranty Theoretic Value	Ext. Warranty Theoretic Value
General Electric	GE	($93.89)	($326.00)
	Hot Point	($94.89)	($182.70)
	GE Profile	($363.66)	($526.15)
Whirlpool	Whirlpool	($123.88)	($674.03)
	Kenmore	($176.86)	($846.87)
	Roper	($73.89)	($324.32)
	KitchenAid	($280.79)	($372.02)
AB Electrolux	Frigidaire	($96.66)	($311.54)
Maytag	Maytag	($203.86)	($696.01)
	Amana	($254.48)	($352.30)

SUMMARY AND CONCLUSION

The objective of this study is to determine if the observed extended warranty prices coincide with the theoretic extended warranty prices of three types of durable goods, based upon the prices of the economical and premier product line in each class of products listed in this study. The Black-Scholes option pricing model and put-call parity provided the valuation framework.

The results were computed and compared to the observed price of each class of appliance's three-year warranty. The results show that for all members of each class, the observed price of the extended warranty is greater than its theoretic price.

Since, for all classes of appliances, the three year extended warranty theoretic price is greater than the observed price, it is highly probable that other factors dominate the theoretic pricing factor such that consumers are willing to pay a positive insurance premium to purchase an extended warranty. We acknowledge that the Black-Scholes Option Pricing Model casts no illumination upon a utility value, a psychological value, a convenience value, or an asymmetric information hedging value.

ENDNOTES

1 The Economical and Premier prices of the products in Tables 1, 2, and 3 were established from retail stores that offer to the public the appliances listed in this study and that have outlets in the United States, Canada, and Mexico: Lowe's, Sear's, Conn's, Circuit City, Home Depot, Sam's Club, J.C. Penney, Best Buy, Fry's Electronics, and Wal-Mart. The prices obtained were found to be the same nationally for each individual retailer.

2 There are only four manufacturers that produce all ten of the brand name appliances in this study. While we recognize that thirty observations are generally accepted as a minimum sample size in order to obtain a normal distribution, only twenty observations are available for our study. Because there are only twenty observations available, we recognize that some generalities are lost.

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