UNIVERSITY OF ILLINOIS LIBRARY AT URBANA-CHAMPAIGN BOOKSTACKS
STOCK MARKET REACTION TO CHANGES IN INVENTORY VALUATION METHODS

Frank K. Reilly
Ralph E. Smith
Ron Hurt

#280

College of Commerce and Business Administration
University of Illinois at Urbana-Champaign
STOCK MARKET REACTION TO CHANGES IN INVENTORY VALUATION METHODS

Frank K. Reilly
Ralph E. Smith
Ron Hurt

#280
STOCK MARKET REACTION TO

CHANGES IN INVENTORY VALUATION METHODS*

Frank K. Reilly
Professor of Finance
University of Illinois at Urbana-Champaign

Ralph E Smith
Associate Professor of Accounting
Arizona State University

Ron Hurt
Graduate Student
University of Wyoming

*The authors acknowledge the extensive use of the computer facilities at the University of Wyoming and comments of participants in the Finance Workshop at the University of Wyoming, especially Edward Dyl.
STOCK MARKET REACTION TO
CHANGES IN INVENTORY VALUATION METHODS

INTRODUCTION

During the last several years a number of studies have examined the
effect of accounting changes on corporate financial statements. Other
studies have considered the further effect of accounting changes on stock
price movements. This paper is concerned with the latter area of analysis-
specifically with the effect of a change from the FIFO method of accounting
for inventories to the LIFO valuation technique on stock price movements.
Based upon a belief in efficient capital markets, we hypothesize that,
even though reported earnings generally decline as a result of the change,
there should be no significant change in stock price movements surrounding
the announcement of the changes. In fact, because of the lower reported
earnings, firms pay lower taxes and, therefore, one might hypothesize an
increase in value for the company and an increase in stock prices.

The initial section of the paper contains a discussion of previous
studies on accounting changes. The second section considers the possible
alternative hypotheses concerning the effect of the inventory valuation
change on stock price movements. Section three discusses the technique
employed to adjust reported stock price changes for aggregate market
movements. Section four considers the sample and tests of the hypothesis.
In section five the results are presented and discussed. The final
section contains a summary, the conclusions of the study, and a discussion
of the implications of the results for accounting changes and the efficient
market hypothesis.
I. PRIOR STUDIES ON ACCOUNTING CHANGES AND STOCK PRICE MOVEMENTS

Introduction

All of the studies that will be discussed in this section implicitly assume that the ultimate effect of an accounting change can best be examined through an analysis of stock price changes surrounding the announcement of the change. This "positive" approach to the evaluation of accounting data or the analysis of changes in accounting techniques is in contrast to the traditional normative approach which attempts to evaluate changes on the basis of their consistency with existing "generally accepted accounting practices." For an extended discussion of normative vs. positive economics the reader is referred to Friedman.\(^1\) The use of this positive approach as a criterion for evaluating accounting data and techniques is discussed in a paper by Beaver, Kennelly and Voss.\(^2\) A further justification of this approach with explicit consideration of efficient capital markets is presented by Gonedes.\(^3\) It is initially contended that the purpose of the accounting process is to produce numbers that possess informational content. Subsequently it is asserted that observations of market reactions to such accounting numbers should govern evaluation of the informational


content of these numbers, and also should be used to evaluate alternative sets of accounting procedures. At the same time it is noted that, because there are competing sources of information one should expect the price movements to anticipate the accounting numbers unless the accounting numbers reflect inside information.

To summarize the reasoning behind the use of market tests of the usefulness of accounting information, one begins with a belief in the existence of relatively efficient capital markets which implies that security prices adjust rapidly to new information and, therefore, security prices at any point in time are an unbiased estimate of the true underlying value of the security.\(^4\) Further, if accounting numbers contain important new information, or a change in accounting technique is an important event, the announcement of the accounting number or the announcement of the accounting change should cause an abnormal change in security prices. Therefore, a preferable test of the information value of accounting numbers or the importance of an accounting change is to examine the abnormal stock price changes surrounding the release of the accounting number or the announcement of the accounting change. Finally, because there are competing sources of important new information, it is very likely that in most instances (where the accounting announcement is not inside information), the abnormal price changes will precede the release of the accounting information. An extended discussion of the alternative means

of evaluating accounting techniques...including a consideration of the theory and evidence is contained in an article by Gonedes and Dopuch. 5

Stock Prices and Income Numbers

One of the first studies to employ the market test to determine the value of accounting information was by Ball and Brown. 6 They examined the relationship between accounting income numbers and stock prices. Consistent with the hypotheses that accounting income numbers have information value, there was a significant relationship between abnormal earning (earnings above or below expectations based upon aggregate economic earnings) and abnormal returns on the common stock. The results were also consistent with the notion of competing information sources because it was shown that the bulk of the abnormal price changes occurred by the time the final income number was released.

Stock Prices and Changes in Accounting Techniques

Several studies have employed the market test to determine the importance of alternative accounting changes and the specific impact of the changes. Archibald examined the market reaction to a change in the depreciation accounting method from a form of accelerated depreciation to a


form of straight-line depreciation for financial statement purposes.\textsuperscript{7} Because of the change for reporting purposes, all of the 65 firms in the sample experienced an increase in their reported profits from what they otherwise would have reported. Notably, such a change has no true economic impact. Based upon these changes an advocate of an efficient market would hypothesize no abnormal price changes surrounding the announcement. In contrast, one who believes that investors are naive regarding income numbers would hypothesize positive abnormal price changes consistent with higher reported earnings. The results indicated that the majority of pre-change abnormal returns were negative, while the 24 post-change months were evenly divided with 12 negative values and 12 positives. The preponderance of negative abnormal returns prior to the announcement indicates that these switch-back firms were generally performing poorly prior to the switch which is probably why they considered the changes. The mixed results after the announcement could be used to support the naive hypothesis because they are better than the very consistent negative results prior to the announcement. Archibald prefers to interpret them as indicating no immediate conversion of the positive effect of the change especially because the first five abnormal returns after the announcement were negative.

A study by Baskin investigated the difference in stock market behavior of a group of companies that changed accounting techniques compared to a

group that employed consistent practices. There were three groups of companies considered. First were firms that changed accounting practices and announced the change when they announced their earnings. The second group were companies that changed accounting practices but announced the change in the annual report rather than at the time of the earnings announcement. The third group was a control group of companies that did not change accounting principles. Weekly price changes surrounding the announcement were examined to determine the information content of the announcements. It was hypothesized that there would be a difference in the price changes for firms that divulged the change with the earnings announcement and those that revealed the change in the annual report. Specifically, there should be a difference in the price change pattern surrounding the release of the annual report for these two groups of firms.
A test of homogeneity of the abnormal stock price changes surrounding the annual earnings announcement for the three sample groups indicated that the sample differences were not statistically different--i.e., the samples were initially homogenous. Baskin then examined the three samples for homogeneity in price response at the annual report date. Again, the conclusion was that there is no statistical difference in average price response among the three samples. This implies that the "new" information provided by the companies in the sample II group does not cause any significant stock price response. By inference, the consistency exception possesses no information content for most investors.

---

In addition, Baskin carried out a test to determine whether investors had a materiality function based upon size of change. The evidence did not support the existence of such a function. Finally, there was an analysis to determine whether investors respond differently to various types of accounting changes. Again, the results indicated that the response to different types of accounting change was not different which implies investors do not have materiality functions based on the type of accounting change.

Stock Prices, the Investment Credit and Depreciation Changes

Kaplan and Roll examined investor reaction to two accounting changes. First was the switch in 1964 to the flow-through method of reporting the investment credit; the second change studied was the switch back from reporting accelerated depreciation to reporting straight-line depreciation. It is noted that both changes affected only the financial statements and had no affect on taxes, cash, or any real economic asset or liability.

In the analysis of the effect of a switch in the accounting for the investment tax credit the final sample included 275 companies that switched their accounting treatment and 57 companies that did not change. The announcement date was assumed to be when the full year earnings were announced. They used the market model to adjust for market movements and examined abnormal weekly prices for the 30 weeks on both sides of the announcement week. The results indicated that the securities of firms that

increased reported earnings by adopting the flow-through method of accounting for the investment credit experienced abnormally good price movements during the ten weeks surrounding their earnings announcement. Unfortunately for stockholders market prices did not remain high—during the period from ten weeks after the announcement to 24 weeks after the announcement these securities experienced abnormally bad stock price movements. Alternatively, firms that did not switch and take the opportunity to increase reported earnings likewise experienced favorable stock price movements around the time of the earnings announcement, but in contrast to the switching firms, the abnormal gains remained—i.e., it was a permanent gain.

For the analysis of stock price movements surrounding a switch from accelerated to straight-line depreciation, the final sample was 71 companies. Again, the earning announcement date was used as the relevant time for examining price movements although it was recognized that the specific announcement could have been made earlier. The abnormal price change results for the 60 weeks surrounding the announcement showed generally poor stock price performance except for a short period near the announcement week. It is felt by the authors that these results indicate that the firms that elect to change their depreciation method are typically firms that are performing poorly as shown by the negative abnormal price changes many weeks prior to the announcement. Again, there apparently is some temporary benefit to the switch and higher reported earnings and this shows up for a few weeks around the announcement. Again though, the benefit is only temporary and the average negative price changes begin again shortly and continue to the end of the test period. In conclusion, it is felt that such practices are unsuccessful in permanently affecting stock prices.
Different Accounting Changes and Stock Prices

An extensive analysis of the effect of several different accounting changes on stock price changes was conducted by Ray Ball. Specifically, the major conclusions of the study were based upon 267 accounting changes made by 197 firms. The accounting changes included were varied and included changes in inventory valuation, changes in depreciation accounting, the treatment of other expenses, and the revenue recognition alternative used when accounting for subsidiaries. An alternative breakdown is between firms that disclosed the effect of the changes on income versus those that did not.

Prior to the actual analysis of the effect on stock price movements there is an extended analysis of the basic market model used to adjust for aggregate market movements. First there is consideration of using a model that takes into account a second market factor as suggested by Fischer Black and by Black, Jensen, and Scholes. The cumulative abnormal returns for all the firms are examined with the straight market model, then with an adjusted market that adjusts for nonrandom residuals around the time of the announcement, and finally abnormal returns are examined using the two factor model.

---


The results with the straight market model indicate the presence of negative market behavior before the accounting change (beginning with month-100) and positive market behavior after the accounting change. It is contended by Ball that these results indicate that the data violate the assumptions of the OLS model. The elimination of further observations from the period surrounding the announcement results in a model that does not have the positive market behavior after the announcement.

The two factor model is derived using a cross-sectional sample to get an estimate of the return on a zero Beta portfolio for each period and an estimate of the risk premium for each period. The cumulative average errors from the two factor model shows negative values before the announcement and positive changes after the announcement toward zero. It is felt that the cross-sectional model is superior because its intercept is estimated using returns from all firms rather than only one firm.

In addition to the adjustment in the model itself, Ball feels it is very possible that over the long estimating period employed that the risk of the firms change. There is no theoretical reason given as to why the risk should change and in what direction it will change--only that it is possible it could change. To test whether it did change, a moving beta was computed using 101 monthly observations. The results indicated secularly increasing beta from about .909 at month-109 to 1.028 at month+49.

Using the cross-sectional model with risk changes he examined the cumulative average errors for all the firms that announced the accounting changes. For the total period from nine years before the change to
19 months after there is no significant abnormal price movement (there is a decline in the average error shortly before the announcement but it is statistically insignificant). It is concluded that changes in accounting techniques do not appear to be associated with any consistent market adjustments.

There was a further analysis of results by type of change--i.e., inventory, depreciation, subsidiary accounting, etc. Following an analysis that examines the effect of changes that affect income it is concluded:

In general, the results support both the semi-strong and strong forms of the efficient market hypothesis. The market appears to ignore the effect on income of a change in accounting technique.\(^{13}\) In addition, there was no relationship between the sign of income change for a firm and the sign of its abnormal market behavior.

The study concludes that the belief that the market cannot distinguish between real and accounting effects on income is not supported. Specifically, while a prior study by Ball and Brown\(^ {14}\) indicated that stock prices do react to changes in real income, the current study indicates no significant reaction to changes in reported income caused by accounting changes.

Stock Prices and Inventory Changes

A study directly related to the current study was recently reported by Shyam Sunder.\(^ {15}\) Specifically, he examined the abnormal stock price

\(^{13}\)Op. Cit., p. 27.


changes surrounding a change in inventory valuation technique. A unique aspect of the study was that the model that takes account of market movements for changes in risk by estimating the time path of relative risk for the stocks during the months surrounding the accounting change. Two alternative hypotheses were suggested regarding what should happen to stock prices surrounding the announcement of the accounting changes. The naive investor view would hypothesize that investors rely on reported earnings and because a change to LIFO will result in a decrease in earnings, then stock prices should decline. In contrast, if one believes that investors rely on the economic value of the firm stock prices will increase because such a change causes an increase in cash flow. The expectations were the opposite for firms that changed to the FIFO method of inventory valuation.

The study sample included 126 firms that changed to LIFO and 29 firms that changed to FIFO during the 21 year period 1946-1966. The relative risk for each stock was estimated for each of the 24 months surrounding the time of the accounting change by using an adaptive regression model that adjusted for changes in the risk of the stocks involved. Because of data limitations, only 133 companies were in the final sample.

The results indicated that the risk for the firms did change from the pre-change months to the post-change months--it increased an average of about 5 percent and most of the change occurred during the 12 months before the accounting change. In contrast, the relative risk for firms that changed from LIFO to FIFO decreased during a comparable period. The average
abnormal price changes adjusted for relative risk and changes in relative risk was 4.7 percent during the 12 months before the change, and was 2.9 percent for the full 24 month period—i.e., there was a slight price decrease after the change. The 4.7 percent pre-change result compared to an average 5.3 percent increase with the constant risk assumption. The abnormal price changes for only the steel firms was a larger positive value before the change and also a larger negative value after the change. Finally, the results for firms that changed from LIFO to FIFO were very close to zero.

The author felt that these results, which were very similar to those derived from an analysis that did not adjust for changing risk, support the hypothesis that the changes in the market price of stocks are associated with the changes in the economic value of the firms rather than with the changes in reported earnings.

II. ALTERNATIVE HYPOTHESES REGARDING EFFECT ON STOCK MOVEMENTS

One might derive two alternative hypotheses regarding the expected effect of a change in the inventory valuation methods from FIFO to LIFO on stock price movements surrounding the accounting change. The first and most obvious can be described as the "reported income" effect. It is well-known that during a period of rising prices a change in inventory valuation methods from FIFO to LIFO results in an increase in the firm's cost of goods sold and a reduction in reported income. If one assumes naive investors who
react to changes in reported earnings, one would hypothesize that the stock prices of firms who make such inventory valuation changes would experience adverse price movements surrounding the announcement of the accounting change.

The second hypothesis can be described as an efficient market effect. As noted above, the change in inventory valuation technique causes a reduction in reported earnings which likewise causes a reduction in taxable earnings and taxes payable to the government. The effect of lower taxes is an increase in cash flow to the firm and a consequent increase in the economic value of the firm. Those who recognize such a chain of events and believe in efficient capital markets would expect investors to take account of the increased economic value and, therefore, would hypothesize an increase in positive price movements around the announcement of the accounting change. Specifically, in an efficient capital market security prices adjust rapidly to any new information. Therefore, security prices at any point in time reflect all currently available information and hence reflect the prevailing estimate of true value for the firm. In such a market, one would expect investors to recognize the true economic consequence of the accounting change (i.e., an increase in cash flow and economic value) and to adjust stock prices accordingly.

In summary, there are two alternative hypotheses available regarding the effect of the accounting change on stock price movements. Those who

---

hypothesize a "reported income effect" would expect negative abnormal price movements to surround the announcement of the change because the change from FIFO to LIFO will almost certainly cause a reduction in reported earnings. Advocates of an efficient market would expect positive abnormal price movements surrounding the announcements because of the expected increase in economic value due to the increase in cash flow.

III. ADJUSTMENT OF STOCK PRICE MOVEMENTS FOR AGGREGATE MARKET EFFECTS

The aim of this study is to examine the effect of a change in inventory valuation methods on the stock price movements. Obviously during any such periods there are general economic changes and aggregate market movements that must be considered and eliminated if one wants to observe "unique" or "abnormal" price movements in individual securities. Numerous past studies have made such adjustments by simply subtracting the aggregate market movement from the individual stock price change. The implicit assumption of such an adjustment technique is that all individual stocks are equally influenced by the aggregate market. A study by King indicated not only the substantial influence of the aggregate market on individual stocks, but also indicated that the market influence varied substantially between stocks. Such an idea was also implied by Sharpe's market model which contended that there

should be a relationship between an individual stock and the aggregate market portfolio, but also implied that the relationship should differ between securities and this relationship is the major risk variable.\(^{18}\)

The existence of this "unique" relationship between a stock and the market was recognized by Fama, Fisher, Jensen and Roll (FFJR) in their important study on the effects of stock splits on stock price movements.\(^{19}\) Specifically, in contrast to the "general" market adjustment they employed the market model and adjusted each stock for its unique relationship to the market as follows:

\[
R_{jt} = \alpha_j + \beta_j R_{mt} + \mu_{jt}
\]

where:

- \(R_{jt}\) = rate of return on stock \(j\) during period \(t\).
- \(R_{mt}\) = rate of return for the aggregate market portfolio during period \(t\).
- \(\alpha_j, \beta_j\) = estimated constants for firm \(j\) reflecting their unique relationship to the aggregate market.
- \(\mu_{jt}\) = random error term for firm \(j\). It is assumed that \(\mu_{jt}\) satisfies the usual assumptions of the linear regression model--i.e., it has zero expected value, variance independent of \(t\), and serially independent.

Given such assumptions one can examine the residuals of the model around the time of an unusual company event (such as a stock split or a change in some accounting technique), and determine the effect on the stock price movements after adjusting for market movements. As stated previously,


it is felt that the use of the market model allows the investigator
to derive a more precise indication of abnormal stock price movements because
the adjustments for market movements is more precise using the stock's
unique $a_j$ and $b_j$. In the context of the model, the residuals from the market
model constitute abnormal price movements and will be the focal point of
the analysis for the period surrounding the announcement of the inventory
valuation change. The model will be discussed further in the subsequent
section.

IV. SAMPLE AND TESTS

Sample
The initial sample was derived from a list of 39 companies contained
in a recent article by Anna Merjos. Subsequently this list of 39
companies was expanded by adding companies that announced such changes
in the Wall Street Journal. To get the exact announcement dates, letters
were written to the treasurer or financial vice-president of each firm
requesting the announcement date, the effective date of the change, and the
effect of the change on reported net income. Fifteen replies were received
from the initial request. A subsequent letter was written to those companies
that did not reply to the initial request and further replies were received.
Unfortunately several companies could not be included because of insufficient
past stock price data. The final list of 32 companies is contained in
Table 1.

20Anna Merjos, "FIFO to LIFO," Barron's (October 21, 1974), pp. 5,
14, 15.
This sample differs from Sunder's in size and also in the time period. The Sunder sample involved companies that made the change during a 21 year period (1946-1966) while all the companies in this study except one announced the change during 1974. Also, these recent changes have received substantial general publicity through articles like the Merjios study as well as individual publicity. The general articles on the changes have probably resulted in more informed investors regarding the reporting effect and the economic effect.

Test

As mentioned, the test is concerned with the examination of abnormal stock price movements surrounding the announcement of a change from FIFO to LIFO inventory valuation methods. Abnormal stock price movements are indicated by observing residual price movements from those expected based upon the market model. The specific model used to adjust for market movements was:

\[ PC_{jt} = \alpha_j + \beta_j PC_{mt} + \nu_{jt} \]

where:

- \( PC_{jt} \) = percent change in stock \( j \) during month \( t \) using end of month price
- \( PC_{mt} \) = percent change in the aggregate market during month \( t \) using end of month prices. The market indicator series used was the Standard & Poor's Index of 500 stocks listed on the New York Stock Exchange.
- \( \alpha_j, \beta_j \) = constants for each firm in the sample.
- \( \nu_{jt} \) = random error term assumed to have an expected value of zero, a variance independent of \( t \) and to be serially independent.
This model differs from the market model set forth in section III that used total rates of return that included dividends. Based upon results contained in the Sharpe-Cooper study, this difference is not considered of any consequence. Specifically, Sharpe and Cooper found that the correlation between the beta values derived from models that used total returns and the beta values from models employing just price changes was .996.

A least squares regression was used to estimate the parameters $\alpha_j$ and $\beta_j$ which we would expect to vary between securities. It is also assumed that the two parameters are constant during the period of analysis. This obviously differs from the assumption made by Sunder in his Accounting Review study. Although the Sunder results indicate some changes in the risk parameters during the time period of his analysis, it is notable that after an extensive adjustment process he acknowledges that the results obtained after making an adjustment for risk were substantially similar to the results when no adjustment was made. This lack of difference is over a 24 month period compared to a 13 month period used in the current study which means any difference should be less. In any case, the results will be analyzed in the light of a potential change in risk.

The base parameters $\alpha_j$ and $\beta_j$ for each security were derived from a regression that employed monthly price changes for the five year period that started six months prior to the announcement with prices adjusted for stock splits and stock dividends.

---


Because the model is intended to take account of market movements as they influence the individual securities, it is possible to focus attention on the residuals that should reflect the effect of any "new information" provided by the announcement of the accounting change. The residual or "abnormal" price change for each month is defined as:

\[ \mu_{j,t} = PC_{j,t} - a_j \cdot PC_{t-6} - j \cdot PC_{t+6} \]

These "abnormal price changes," \((\mu_{j,t})\) were averaged cross-sectionally to obtain

\[ \bar{\mu}_t = \frac{1}{N} \sum_{j=1}^{N} \mu_{j,t} \]

The cross-sectional average provides a useful composite figure for the total sample. In addition, such an averaging process is carried out to dampen any unique company effect that is not taken care of by the market model adjustment.

The abnormal price changes were computed for the period beginning six months prior to the month of the announcement (period \(t-6\)), and extending to six months after the month of the announcement (period \(t+6\)). The month of the announcement is \(t = 0\). The reader should recognize that \(t\) is the measure of time relative to the announcement of the change in inventory valuation technique and is not the same chronological date for different firms. The relatively short test period is felt to be adequate because of a belief in a semi-strong efficient market where prices adjust rapidly to significant public announcements.
V. PRESENTATION AND DISCUSSION OF RESULTS

Parameter Estimates

The individual parameter estimates for the 32 companies in the sample are contained in Table 2 with a summary of the results in Table 3. An obvious observation from the two tables is that the $\alpha$ and $\beta$ parameters for alternative companies differ significantly. Besides being of interest by itself, this difference indicates that the use of the market model which derives a "unique" relationship for each company is justified and necessary if one wants to derive a precise measure of "abnormal" stock price movements surrounding an important announcement. The statistically significant t-values for all the beta coefficients except one also indicates the importance of the market influence. Finally, the Von-Neumann ratios indicated that only four of the models exhibited significant serial correlation in the residuals which indicates that the regression model is generally correctly specified.

Analysis of Abnormal Price Changes

The relevant data for the analysis of the market performance of firms that changed their inventory valuation methods are displayed in Table 4. The average of the cross-sectional abnormal price changes for each individual month are contained in the second column of Table 4 and plotted in Figure 1. The cumulative average abnormal price changes are contained in the third column and plotted in Figure 2.

The average of the abnormal price changes for each month during the period prior to the announcements were always positive. These average
price change results were confirmed by the fact that the majority of the individual company abnormal price changes were always positive (i.e., from 53 percent up to 72 percent).

The average of the abnormal price changes during the month of the announcement were likewise positive with a small majority of the companies (56 percent) reporting positive changes.

The abnormal price changes for the period after the announcement were mixed. Specifically, during the first two months after the announcement a small majority of companies had positive abnormal price changes and the average of these price changes was positive. During month +3 there was an even split between individual company results and the average price change was negative. During months four and five the majority of companies experienced negative abnormal price changes and the average was negative. During the final month there was again an even split for individual companies, but the average of the price changes was positive.

The cumulative abnormal price change series began positive in month t-6 and continuously became larger with slight dips during months +3, +4, and +5. Such results would indicate that an investor who purchased such stocks prior to the announcement and held them for six months after the announcement would have experienced positive abnormal returns on average during ten of the 13 months and for the total period.

Implication of Results for Alternative Hypotheses

As discussed, the "reported income" hypothesis would imply negative abnormal stock price changes surrounding the announcement because the change in inventory valuation method always results in a lower level of reported income than would be reported without the change. In contrast, the
The efficient market hypothesis would imply positive abnormal stock price changes surrounding the month of the announcement because of the positive effect on the economic value of the firm.

In summary, the results provide definite support for the efficient market hypothesis and almost no support for the reported income hypothesis. Specifically, one could explain the strong positive price changes prior to the announcement on the basis of better than average operating results for these companies during this period or because of leaks that the companies were going to make such a change which would lead to expectations of increases in value. The positive price changes during the month of the announcement and the two subsequent months indicates further support for the hypothesis that investors recognize the true effect of the change. It is notable that, although this proportion of companies that experienced positive price changes during months plus one and two was not very large, the average of the price changes was a fairly large positive value. This indicates that some of the companies experienced very substantial positive price changes.

In contrast, there was almost no support for the reported income hypothesis because negative price changes did not prevail until the third month after the announcement, and did not dominate the price change pattern until the fourth and fifth month after the announcement of the change and the announcement of lower earnings than otherwise would have been reported.
Earnings Effect and Price Changes

An alternative test of the effect of the change can be provided by an analysis of the relationship between the size of the earnings change caused by the switch in inventory valuation method and the size of the abnormal stock price change. The reported income hypothesis would imply a positive relationship between the two variables--i.e., a large decline in earnings from what would have been reported without the change should cause a large negative abnormal price change. In contrast, the efficient market hypothesis would imply a negative relationship because the larger the decline in reported income caused by the change, the larger the saving in taxes and the greater the increase in economic value.

The rank correlation test related the size of the earnings change (in percent)* to the size of the stock price residual during each of the months minus one, zero, and plus one. The test involved 76 companies that reported the effect of the change. The results supported the efficient market hypothesis because all correlations were negative as follows:

minus one: -.335; zero: -.216; plus one: -.312. Apparently the larger the decline in earnings caused by the inventory change, the better the stock price performance.

Risk Changes and Stock Price Changes

As noted earlier, the model used to adjust stock price changes for market movements assumed that the individual company parameters were constant

* Earnings without Change - Earnings with Change
Earnings without change
during the test period surrounding the announcement. It was acknowledged that such an assumption implies that the risk of the firm is constant during this period which may not be true in general (even without special announcements the risk can change), and almost certainly is not true for firms that change their inventory valuation techniques. As pointed out by Sunder, one should expect the risk for firms changing from FIFO to LIFO to experience an increase in their level of risk and this was confirmed in his study.23

The abnormal stock price changes following the announcement are consistent with this change in risk and such a change actually helps to explain some of the abnormal price changes within the context of the efficient market hypothesis. Specifically, one might speculate that in an efficient market two factors were at work and they had opposite effects. On the one hand, there was an increase in cash flow that ceteris paribus would cause an increase in value. Alternatively, one would expect an increase in risk that would tend to reduce the value of the firm all else the same.

The results after the announcement were consistent with the conflicting forces. The average of the abnormal price changes continued to be positive but the proportion of companies with positive changes declined and during the third and fourth month the average of the price changes was negative. One might even reason that the positive price changes during months zero, plus one and plus two in the face of the increased risk is even stronger support for the efficient market hypothesis and against the reported income hypothesis.

VI. SUMMARY AND CONCLUSION

Summary

The accounting process is intended to provide relevant information for decision-makers. Because a major group of decision-makers are common stock investors, it has been suggested that the usefulness of accounting numbers and any changes in accounting methods be examined in the light of their effect on stock price movements. This "positive" approach to the evaluation of alternative accounting techniques has prompted several studies that examined abnormal stock price movements surrounding an accounting change in order to evaluate the importance of the change to the ultimate consumer of accounting information—the investor. The consensus tended to indicate that most accounting changes have a minor effect on stock price movements or the stock price movements were consistent with an efficient market which would indicate that most investors have the ability to break through the "veil" of accounting. Put another way, the capital markets tend toward the strong form efficient market hypothesis wherein there is not a substantial amount of inside information unknown to the majority of investors.

The current study examined stock price movements surrounding a change in inventory valuation techniques from FIFO to LIFO. If one believes that investors determine value on the basis of reported income he would hypothesize negative abnormal price changes surrounding such an announcement because the changes consistently caused a decline in reported earnings from what they would have been. In contrast, those who hypothesize efficient capital
markets would expect price changes to reflect an increase in value because the change in inventory valuation method reduces reported earnings, reduces taxes payable and thereby increases cash flow.

In order to derive a precise measure of abnormal price movements distinct from aggregate market movements, we employed the FFJR technique which used the market model to adjust for market movements. Specifically, for each stock we derived a unique $\alpha$ and $\beta$ from a regression of monthly stock price changes relative to percent price changes in the S&P 500 Index. The diverse results for these parameters indicated the apparent value of this technique.

The results for the average abnormal price movements for the months surrounding the announcement of the accounting change tended to support the efficient markets hypothesis because the average of the abnormal price changes was positive for all the months before the announcement, the month of the announcement, and the two months following the announcement. The only two months that obviously supported the reported income hypothesis were the months four and five months after the announcement.

In addition we examined the relationship between the change in earnings caused by the accounting change and price movements. Again the results supported the efficient markets hypothesis because there was a negative relationship between the variables--i.e., the greater the decline in earnings, the greater the tax savings and the larger increase in cash flow which should result in a larger positive abnormal price change. Finally, we discussed the effect of a change in risk and concluded that if such a change occurred that the results would even be more
supportive of the efficient markets hypothesis because the change in risk would tend to bias results in favor of the reported income hypothesis.

Conclusion

The results support the efficient market hypothesis which implies that investors are aware of accounting changes and react to their effect on economic value. These study results are consistent with the results from several prior studies that indicate that corporate managers cannot manipulate stock prices by changing accounting numbers that do not affect economic value. On a more positive note, corporate managers can benefit the value of the firm by making accounting changes that increase the economic value of the firm even though they adversely affect reported earnings.
<table>
<thead>
<tr>
<th>Company</th>
<th>Ticker Symbol</th>
<th>Ann. Date (Mo./Yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegheny</td>
<td>AG</td>
<td>12/74</td>
</tr>
<tr>
<td>American Standard</td>
<td>AST</td>
<td>11/74</td>
</tr>
<tr>
<td>Apache Corp.</td>
<td>APA</td>
<td>7/74</td>
</tr>
<tr>
<td>Anaconda</td>
<td>A</td>
<td>4/74</td>
</tr>
<tr>
<td>Bearings</td>
<td>BER</td>
<td>8/74</td>
</tr>
<tr>
<td>Borg-Warner</td>
<td>BOR</td>
<td>10/74</td>
</tr>
<tr>
<td>Celanese</td>
<td>CZ</td>
<td>7/74</td>
</tr>
<tr>
<td>CPC</td>
<td>CFG</td>
<td>2/74</td>
</tr>
<tr>
<td>Duplex Prod.</td>
<td>DPLX</td>
<td>5/74</td>
</tr>
<tr>
<td>duPont</td>
<td>DD</td>
<td>8/74</td>
</tr>
<tr>
<td>Eastman Kodak</td>
<td>EK</td>
<td>9/74</td>
</tr>
<tr>
<td>Ennis Bus. Forms</td>
<td>EBF</td>
<td>9/74</td>
</tr>
<tr>
<td>Federal Mogul</td>
<td>FMO</td>
<td>7/74</td>
</tr>
<tr>
<td>Firestone</td>
<td>FIR</td>
<td>8/74</td>
</tr>
<tr>
<td>Florida Steel</td>
<td>FLS</td>
<td>11/73</td>
</tr>
<tr>
<td>General Tire</td>
<td>CY</td>
<td>6/74</td>
</tr>
<tr>
<td>Hoover Ball &amp; Bear.</td>
<td>HL</td>
<td>3/74</td>
</tr>
<tr>
<td>Ingersol-Rand</td>
<td>IF</td>
<td>12/74</td>
</tr>
<tr>
<td>Marathon Oil</td>
<td>MRO</td>
<td>1/74</td>
</tr>
<tr>
<td>Monsanto Chem.</td>
<td>MTC</td>
<td>10/74</td>
</tr>
<tr>
<td>Owens-Corning</td>
<td>OGF</td>
<td>1/74</td>
</tr>
<tr>
<td>PPG Industries</td>
<td>PPG</td>
<td>1/74</td>
</tr>
<tr>
<td>Proler Steel</td>
<td>PS</td>
<td>11/74</td>
</tr>
<tr>
<td>Smith (A.O.)</td>
<td>SMC</td>
<td>12/74</td>
</tr>
<tr>
<td>Standard Oil (Ohio)</td>
<td>SOH</td>
<td>1/74</td>
</tr>
<tr>
<td>Stepan Chemical</td>
<td>SCL</td>
<td>6/74</td>
</tr>
<tr>
<td>Stokely-Van Camp</td>
<td>SBC</td>
<td>7/74</td>
</tr>
<tr>
<td>Texaco</td>
<td>TX</td>
<td>12/74</td>
</tr>
<tr>
<td>Unarco Industries</td>
<td>UNR</td>
<td>6/74</td>
</tr>
<tr>
<td>Vulcan Materials</td>
<td>VMC</td>
<td>12/74</td>
</tr>
<tr>
<td>Wallace Bus. Forms</td>
<td>WF</td>
<td>7/74</td>
</tr>
<tr>
<td>Yates</td>
<td>YES</td>
<td>3/74</td>
</tr>
</tbody>
</table>
TABLE 2

BASE TIME PERIOD REGRESSION STATISTICS

FOR SAMPLE COMPANIES

<table>
<thead>
<tr>
<th>Bond</th>
<th>Const.</th>
<th>Beta Coeff.</th>
<th>T-Value</th>
<th>$R^2$</th>
<th>S.E.</th>
<th>V.N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG</td>
<td>-0.3645</td>
<td>1.3095</td>
<td>5.1959</td>
<td>0.3176</td>
<td>7.7673</td>
<td>2.0753</td>
</tr>
<tr>
<td>AST</td>
<td>-0.9329</td>
<td>1.0654</td>
<td>3.3452</td>
<td>0.1617</td>
<td>9.9562</td>
<td>2.0979</td>
</tr>
<tr>
<td>A</td>
<td>-0.7032</td>
<td>1.1872</td>
<td>3.9071</td>
<td>0.2084</td>
<td>9.0791</td>
<td>1.8436</td>
</tr>
<tr>
<td>BER</td>
<td>1.4136</td>
<td>0.9458</td>
<td>3.3149</td>
<td>0.1593</td>
<td>8.9594</td>
<td>1.8615</td>
</tr>
<tr>
<td>BOR</td>
<td>-0.3659</td>
<td>1.3694</td>
<td>7.0157</td>
<td>0.4591</td>
<td>6.0700</td>
<td>2.7250</td>
</tr>
<tr>
<td>CFG</td>
<td>-0.6112</td>
<td>0.7441</td>
<td>5.7931</td>
<td>0.3665</td>
<td>3.8359</td>
<td>2.4551</td>
</tr>
<tr>
<td>CZ</td>
<td>-0.8991</td>
<td>1.2871</td>
<td>5.5381</td>
<td>0.3459</td>
<td>7.2995</td>
<td>1.7783</td>
</tr>
<tr>
<td>DFX</td>
<td>-0.1567</td>
<td>0.9112</td>
<td>2.5637</td>
<td>0.1018</td>
<td>10.6200</td>
<td>2.1331</td>
</tr>
<tr>
<td>DD</td>
<td>0.1952</td>
<td>0.6716</td>
<td>4.3988</td>
<td>0.2502</td>
<td>4.7407</td>
<td>1.6138</td>
</tr>
<tr>
<td>EK</td>
<td>0.8490</td>
<td>0.7572</td>
<td>5.3923</td>
<td>0.3339</td>
<td>4.3155</td>
<td>2.2762</td>
</tr>
<tr>
<td>EBF</td>
<td>0.1102</td>
<td>1.2989</td>
<td>2.6745</td>
<td>0.1098</td>
<td>15.2544</td>
<td>1.7552</td>
</tr>
<tr>
<td>FMO</td>
<td>-0.6636</td>
<td>0.9253</td>
<td>4.7768</td>
<td>0.2823</td>
<td>6.0847</td>
<td>2.2332</td>
</tr>
<tr>
<td>FIR</td>
<td>-0.9621</td>
<td>1.1351</td>
<td>6.5162</td>
<td>0.4227</td>
<td>5.4701</td>
<td>1.6908</td>
</tr>
<tr>
<td>FLS</td>
<td>0.6656</td>
<td>0.8686</td>
<td>3.1146</td>
<td>0.1433</td>
<td>8.4013</td>
<td>2.2575</td>
</tr>
<tr>
<td>GY</td>
<td>0.8310</td>
<td>0.7418</td>
<td>5.4299</td>
<td>0.3370</td>
<td>4.2908</td>
<td>2.3616</td>
</tr>
<tr>
<td>HBB</td>
<td>-0.8746</td>
<td>1.5284</td>
<td>5.7360</td>
<td>0.3619</td>
<td>8.3692</td>
<td>2.2934</td>
</tr>
<tr>
<td>IR</td>
<td>1.4834</td>
<td>0.9112</td>
<td>4.4772</td>
<td>0.2568</td>
<td>6.3238</td>
<td>2.0579</td>
</tr>
<tr>
<td>LPR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRO</td>
<td>-0.7077</td>
<td>1.4174</td>
<td>6.3628</td>
<td>0.4111</td>
<td>6.5663</td>
<td>2.2032</td>
</tr>
<tr>
<td>MOH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 2
(Continued)

<table>
<thead>
<tr>
<th>Bond</th>
<th>Cnst.</th>
<th>Beta Coeff.</th>
<th>T-Value Coeff.</th>
<th>R²</th>
<th>S.E.</th>
<th>V.N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTC</td>
<td>.5197</td>
<td>1.1691</td>
<td>6.2614</td>
<td>.4033</td>
<td>5.8324</td>
<td>1.9420</td>
</tr>
<tr>
<td>OCF</td>
<td>.3114</td>
<td>1.1326</td>
<td>5.1152</td>
<td>.3109</td>
<td>6.5269</td>
<td>2.0156</td>
</tr>
<tr>
<td>FPG</td>
<td>-.5819</td>
<td>1.3016</td>
<td>6.6663</td>
<td>.4338</td>
<td>5.6309</td>
<td>2.3340</td>
</tr>
<tr>
<td>FS</td>
<td>.5115</td>
<td>1.0711</td>
<td>3.1095</td>
<td>.1429</td>
<td>10.1529</td>
<td>1.9151</td>
</tr>
<tr>
<td>SMC</td>
<td>.5159</td>
<td>1.4578</td>
<td>5.4110</td>
<td>.3355</td>
<td>8.3028</td>
<td>2.2868</td>
</tr>
<tr>
<td>SBC</td>
<td>-.6652</td>
<td>.9568</td>
<td>2.6793</td>
<td>.1101</td>
<td>11.2920</td>
<td>2.4891*</td>
</tr>
<tr>
<td>SOH</td>
<td>1.0861</td>
<td>.6110</td>
<td>1.5286</td>
<td>.0387</td>
<td>11.7578</td>
<td>1.7341</td>
</tr>
<tr>
<td>VMC</td>
<td>.9774</td>
<td>1.1646</td>
<td>5.2900</td>
<td>.3255</td>
<td>6.7848</td>
<td>2.5852</td>
</tr>
<tr>
<td>TX</td>
<td>-.3185</td>
<td>1.0474</td>
<td>6.2348</td>
<td>.4013</td>
<td>5.1773</td>
<td>2.2538</td>
</tr>
<tr>
<td>SCL</td>
<td>.8504</td>
<td>2.2774</td>
<td>8.2494</td>
<td>.5399</td>
<td>8.6695</td>
<td>2.4929*</td>
</tr>
<tr>
<td>WF</td>
<td>.6658</td>
<td>.7905</td>
<td>3.0277</td>
<td>.1365</td>
<td>8.1999</td>
<td>2.0168</td>
</tr>
<tr>
<td>YES</td>
<td>.5542</td>
<td>2.2494</td>
<td>5.5025</td>
<td>.3430</td>
<td>12.3001</td>
<td>2.3644</td>
</tr>
<tr>
<td>APA</td>
<td>-.8425</td>
<td>1.8234</td>
<td>6.8270</td>
<td>.4506</td>
<td>8.3601</td>
<td>2.0341</td>
</tr>
<tr>
<td>UNR</td>
<td>-.2495</td>
<td>1.3892</td>
<td>4.1229</td>
<td>.2266</td>
<td>10.0674</td>
<td>2.5226*</td>
</tr>
</tbody>
</table>

* Indicates significant serial correlation in residuals.
<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant (α)</td>
<td>.020</td>
<td>-.9621 to +1.483</td>
</tr>
<tr>
<td>Beta Coefficient</td>
<td>1.173</td>
<td>+.6110 to +2.277</td>
</tr>
<tr>
<td>Coefficient T-Value</td>
<td>4.864</td>
<td>+1.529 to +8.249</td>
</tr>
<tr>
<td>Coefficient of Determination ($r^2$)</td>
<td>.283</td>
<td>.039 - .540</td>
</tr>
<tr>
<td>Standard Error (S.E.)</td>
<td>7.897</td>
<td>3.836 - 15.254</td>
</tr>
<tr>
<td>Von-Neumann Ratio (V.N.)</td>
<td>2.148</td>
<td>1.614 - 2.725</td>
</tr>
</tbody>
</table>
TABLE 4
MONTHLY CROSS-SECTIONAL
AVERAGE ABNORMAL PRICE CHANGES FOR
INVENTORY CHANGE FIRMS CENTERED ON THE ANNOUNCEMENT MONTH

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>1</td>
</tr>
<tr>
<td>-6</td>
<td>3.230</td>
<td>3.230</td>
<td>32</td>
</tr>
<tr>
<td>-5</td>
<td>1.903</td>
<td>5.133</td>
<td>32</td>
</tr>
<tr>
<td>-4</td>
<td>4.564</td>
<td>9.697</td>
<td>32</td>
</tr>
<tr>
<td>-3</td>
<td>2.447</td>
<td>12.144</td>
<td>32</td>
</tr>
<tr>
<td>-2</td>
<td>0.469</td>
<td>12.613</td>
<td>32</td>
</tr>
<tr>
<td>-1</td>
<td>3.320</td>
<td>15.943</td>
<td>32</td>
</tr>
<tr>
<td>0</td>
<td>0.972</td>
<td>16.915</td>
<td>32</td>
</tr>
<tr>
<td>1</td>
<td>4.988</td>
<td>21.903</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>4.272</td>
<td>26.175</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>-1.260</td>
<td>24.915</td>
<td>32</td>
</tr>
<tr>
<td>4</td>
<td>-2.922</td>
<td>21.993</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>-1.852</td>
<td>20.141</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>1.770</td>
<td>21.911</td>
<td>32</td>
</tr>
</tbody>
</table>
Exhibit 1

Average of Monthly Abnormal Price Changes
Surrounding Inventory Valuation Change