

The efficient market hypothesis and a change to LIFO: An empirical study on the JSE

1 INTRODUCTION

LIFO refers to the last-in-first-out cost flow assumption of inventory valuation whereby it is assumed that the costs of the most recent purchases of merchandise should be charged to the most recent sales of such, thus depressing the value of end-period inventory and understating earnings in inflationary times. This is the converse of the FIFO approach which refers to the first-in-first-out cost flow assumption of inventory valuation whereby end-period inventory is valued at the most recent purchase price and the estimate of earnings in inflationary times is, consequently, greater.

LIFO is given an economic significance by virtue of the fact that if applied to tax reporting a reduced liability for tax is incurred. Thus the present value of future cash flows is increased because the present value of future tax payments decreases. The result is an increase in economic well being, in times of rising prices.

With the increase in price levels witnessed in recent years, this characteristic has enticed a number of South African companies to change to LIFO to improve their inflated squeezed cash positions. There are certain immediate implications of a switch to LIFO. The more important are listed below:

- (i) Section 22(5) of the Income Tax Act, No. 58 of 1962, requires that if a company uses the LIFO system for tax purposes it must use LIFO for financial reporting purposes. However, this section does not prohibit the simultaneous footnote disclosure of FIFO information.
- (ii) The reported book value of the firm diminishes as inventory is valued at older prices.
- (iii) The equity of the company reduces and based on book value the firm may seem more highly geared.
- (iv) If there is a reversal of current trends and the price level falls, earnings will be inflated above the FIFO figures and an increased tax will become payable.
- (v) LIFO removes the unrealised holding gains reported on a FIFO system and thus the difference between the two earnings figures (LIFO and FIFO) may measure, to a degree, the firm's exposure to inflation.

It is noted that it is, of course, possible for a firm to report LIFO and not take it for tax purposes, in which case a change to LIFO would have no economic significance whatsoever. However, no such case has been encountered on the JSE (Knight (1981)).

Thus, a change in accounting method from FIFO to LIFO may be classified in terms of accounting theory, as a translatable change which has an economic impact and a negative impact on earnings. Moreover, this negative impact on earnings is counter-directional to the economic impact which is positive.

Hence a study of the effect of such a change should be of great interest as it should indicate which impact (earnings or economic) has the dominant influence on the share price.

In addition, by examining the length of time it takes the

JSE to adjust to the informational content implied by the change, the efficiency of the market can be tested. More specifically a test of the semi-strong form of the Efficient Market Hypothesis (EMH) can be made.

The purpose of the study will therefore be to:

- (i) indicate to both the management and the investing public what impact a change to LIFO has had on share prices;
- (ii) provide investors with some information on the likely impact of future changes to LIFO;
- (iii) provide the management (report preparers) of companies considering a change with information on the likely impact on their share price; and
- (iv) test the efficiency of the JSE in the semi-strong form.

2 RESEARCH METHODOLOGY

The effect on a company's share price of a change to LIFO is examined using the two-stage time series methodology. This approach was first employed by Fama, Fisher, Jensen and Roll (1969) in the first direct test of the semi-strong form of the EMH. This method has now become firmly established in the finance literature and is briefly summarised below in the context of the LIFO problem.

Consider a company which decides to change from FIFO to LIFO. The raw data required comprise the weekly returns on the share price which are defined in terms of the following formula:-

$$R_t = \frac{P_t + D_t - P_{t-1}}{P_{t-1}}$$

where R_t is the return on the share in period t ;

P_t is the price of the security at the end of period t ; and

D_t is the dividend paid during period t .

The first stage of the methodology involves the removal of those movements in share prices which are attributable to market-wide or common factors. Such factors are common to all shares and King (1966) has shown that for the NYSE approximately 50% of the variability in share prices is due to such common factors. The effect of these market-wide influences must be removed so that the effects of a change to LIFO can be clearly observed and not obscured or confounded with broad market movements.

The market related return can be removed as follows:

Estimate the α and β coefficients in the well-known market model:

$$R_t = \alpha + \beta R_{M,t} + e_t$$

where R_t is the return on the security in period t ;

$R_{M,t}$ is the return on the market in period t ;

e_t is the residual or non-market related return in period t ;

α and β are the regression parameters estimated using ordinary least squares.

*The authors wish to acknowledge the financial support given by the CSIR and the University of Cape Town's Staff Research Fund.

Figure 4

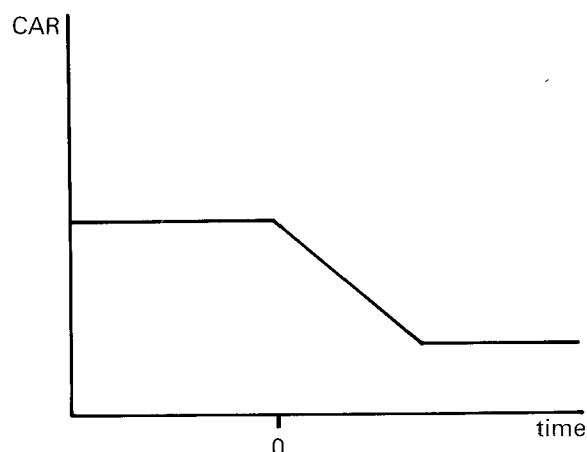


Figure 5



Figure 1 would occur if the market was efficient and there was positive informational value in the announcement. This follows since the CAR's are constant before the announcement and after the announcement they remain constant but at a higher level than previously. The market is clearly efficient because it adjusts to the informational content immediately and the informational content of the announcement is positive because the jump is upwards. Figure 2 has an identical interpretation except that the informational content is negative.

Figure 3 indicates a situation in which the informational content is positive (the CAR's rise after the announcement) but the market is inefficient. This follows since there is a gradual adjustment over several periods to the new equilibrium level resulting from the announcement. Thus the market is inefficient. Figure 4 displays the identical situation except that the informational content is negative.

Finally, Figure 5 indicates the situation where the informational content of the announcement is zero. This is the only case in which nothing can be said about the efficiency of the market.

It must be noted that Figures 1 to 5 indicate theoretical behaviour. In practice the plots of the CAR's will have some random variation around the straight lines. However, the informational content of the announcement and the efficiency of the JSE can be ascertained from the general shape of the CAR's.

3 THE DATA

A survey was undertaken to establish all the firms quoted on the JSE which employed LIFO at 14 November 1980. This resulted in the selection of some 32 firms (see Appendix A and B). However, only those firms meeting the following criteria were retained in the study:

- (i) All shares must have been quoted continuously from 18 July 1969 to 14 November 1980 (590 weeks).
- (ii) The firms must not have undergone substantial changes at any one particular time.
- (iii) The firm must not only have announced a switch to LIFO but the effect must have been quantified. Any reversals on consolidation of LIFO effects would disqualify a firm.
- (iv) Because the RDM 100 index was employed as a surrogate for the market, non-industrial firms were ignored.
- (v) The announcement must have been made at least thirty-five weeks after 18 July 1969, i.e. since 20 March 1970 and before thirty-five weeks prior to 14 November 1980, i.e. before 14 March 1980.

These criteria resulted in a reduction of the population to twenty-one shares (see Appendix A).

Even firms making only partial changes to LIFO were considered, for it is the first change to LIFO that is of interest in this study of the accounting change. For example, a firm which converts 50% of its stocks from FIFO to LIFO in one year and the rest in the following year can be viewed as having had an accounting change in the first year only. The change of method in the second year is merely an application of a method already in use. This is further justified when it is considered that the initial change reflects management's partiality to the method.

The timing of the announcement

Unlike Sunder (1973) and Brown (1980) who used an arbitrary date of announcement in their studies of the NYSE, an attempt was made in the current study to establish unequivocally the exact timing of the release. This was achieved by direct contact with the board of directors of each company in the study. The date supplied by the company official was the date on which the firm had released an announcement of the change to the public. This varied from the date the interim results were released to Reuters (press) to the date of posting the annual financial statements. This date was then verified by reference to the source as claimed by the company and the date of the announcement (zero week in this study) was deemed to be the following Friday. Appendix A lists the firms in the study and the date of the announcement. Although it is acknowledged that all market participants will not have received the information simultaneously, by allowing a lag until the following Friday, it is considered reasonable that the information can then be deemed to be publicly available. Clearly, the problem of leakages should be borne in mind but unfortunately this factor could not be controlled in the current study.

In estimating α and β it is customary to omit several periods around the date of the announcement of a change to LIFO so that any unusual price behaviour in this period will not obscure the long-term relationship between R_t and $R_{M,t}$.

The difference between the actual return on the security and the return expected if relationship (1) holds can then be determined for each of the omitted periods around the date of announcement. This difference is called the abnormal return:

i.e.

$$\hat{e}_t = R_t - \hat{R}_t$$

where R_t is the actual return observed in period t ;
 \hat{R}_t is the return predicted for period t by equation 1 (i.e. $\hat{R}_t = \alpha + \beta R_{M,t}$); and
 \hat{e}_t is the residual return in period t ;

Note that \hat{e}_t is often referred to as the abnormal return on the share because it is the return over and above the market return.

The second stage in the methodology seeks to examine the residual returns which may be attributable to the event being examined. To further reduce the effect of any price changes not caused by the announcement of a change to LIFO, an average residual is established for each time interval as follows:

$$\bar{u}_t = \frac{1}{N_j} \sum_{i=1}^N \hat{e}_{it} \quad t = -(x-1), \dots, 0, \dots, x.$$

where N is the number of securities examined;
 $(x-1)$ is the number of periods before the announcement of a change to LIFO which were omitted in the estimation of α and β ;
 x is similarly the number of periods after the announcement which were omitted; and
 \hat{e}_{it} is the estimated residual of the j^{th} company in period t

Thus, for example, \bar{u}_{-4} is the average, over all the securities examined in the study, of the residuals in the 4th week before their announcement of a change to LIFO. This helps further remove any market or industry effects because, for example, $\hat{e}_{1,-4}$ (the residual of the first company 4 weeks before its announcement of a change to LIFO) and $\hat{e}_{2,-4}$ (the residual of the second company 4 weeks before its announcement) are calculated at completely different calendar dates.

Finally, the average residuals are cumulated as follows:

$$Z_k = \sum_{t=-(x-1)}^k \bar{u}_t \quad \text{for } t = x-1; \dots; 0; \dots, x.$$

\bar{u}_t and Z_k both have expected value of zero and hence any movements away from zero in a plot of Z_k can be attributed to the announcement of a change to LIFO. It is important to note, however, that some random variation around zero is to be expected and it is only persistent or very marked deviations from zero that should be further examined.

The product of such an analysis is therefore $2x$ values of cumulative average residuals (CAR's) which are plotted graphically. If the event being studied (in this case the announcement of a change to LIFO) has any informational value, a movement away from zero would be expected at period 0 (the actual date of announcement). Hence, the plot of the CAR's can be used to test both the efficiency of the JSE and the informational content of the accounting change. This is best illustrated by reference to Figures 1 to 5.

Figure 1

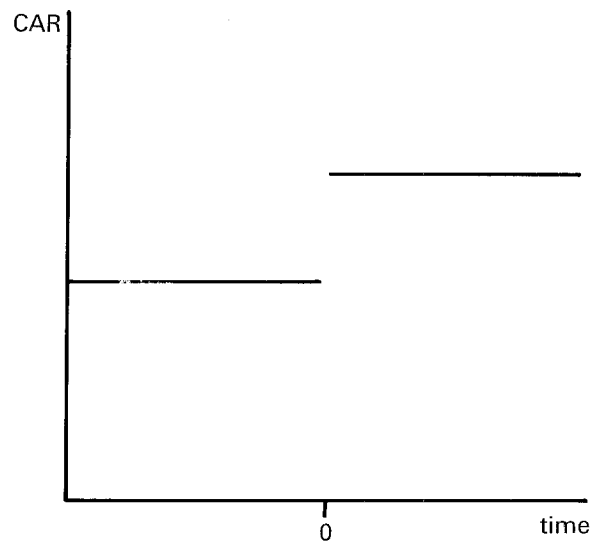


Figure 2

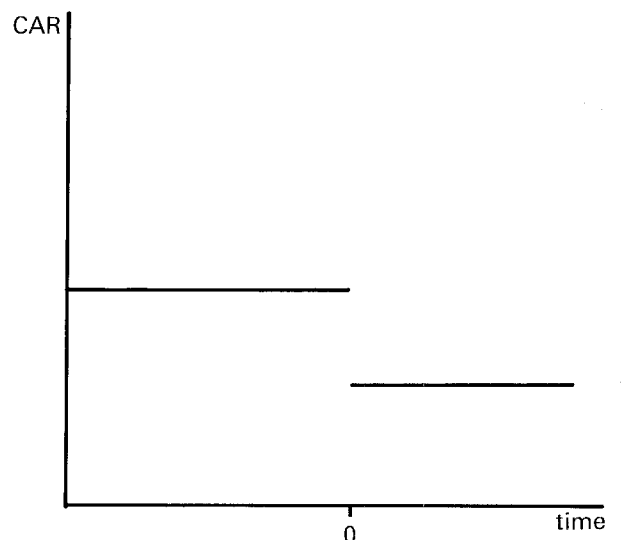
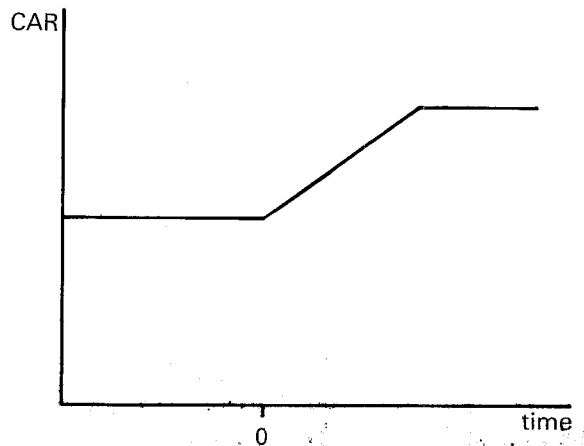


Figure 3



In order to ensure that the CAR configuration of the study group is peculiar to that group, a number of earlier studies have constructed a control group of firms which were not exposed to the event under observation. The objective of such control groups is to establish the randomness of the residuals in periods of non-occurrence of any particular event.

In order to overcome the problems of a non-equivalent control design the current study presents what it refers to as a quasi-equivalent control design. Acknowledging the difficulty in matching firms directly, the design addresses the problem of implicit matching. Thus the control group of non-changers were selected by matching each change firm with a non-change firm according to the following:

- (i) The selection of a shadow firm from the same industry; and
- (ii) Employing the selection method of choosing the firm in the industry with the closest valuation of inventories at the date of the change firm's switch to LIFO.

This procedure does not purport to suggest that an equivalent level of inventory holding will result in a similar impact of a change to LIFO if the shadow firm made the change. The implications of a change to LIFO depend on a number of factors including the extent of the change, the stock mix, the rate of price increase for various combinations of stock, etc. Thus no attempt is made to match equivalent firms and the level of inventory holding is really a random selection technique. Thus, the selection procedure must be emphasised as being random within the industry. Nevertheless, this approach should eliminate some of the inconsistencies of a non-equivalent control design.

A group of non-change firms was selected (see Appendix C) and the data collected in the same way as in the case of the study group. The shadow group was subject to the same procedures as the study group and the cumulative residuals were derived. The deletion period for each shadow firm was determined by the deletion period used for each partner in the study group.

Thus, the data used in the study consisted of the weekly closing price of the 42 selected shares (21 which changed to LIFO and 21 control group securities) from 18 July 1969 to 14 November 1980. Because only industrial shares were considered in the study the RDM industrial index was used as a surrogate for the market.

4 INITIAL RESULTS

Having selected the firms and constructed the data file, the method of ordinary least squares was used to estimate the parameters α and β in the market model

$$R_{jt} = \alpha_j + \beta_j R_{M,t} + e_{jt}$$

where R_{jt} is the return on the j^{th} security in period t ;

$R_{M,t}$ is the return on the RDM industrial index in period t ; and

α_j and β_j are the regression parameters for the j^{th} security.

The data used in the study comprised all weekly returns between 18 July 1969 and 14 November 1980 (590 observations) less 70 weeks around the announcement date which were deleted. The deletion period of 70 weeks consisted of 34 weeks before the announcement, the week of the announcement and 35 weeks after the announcement. These 70 weeks are omitted from the estimation data lest any unusual price behaviour in the weeks surrounding the announcement obscures the long-term relationship between R_t and $R_{M,t}$.

The actual weekly returns observed in the deletion period were then used to derive 70 residuals for each firm as follows:

$$\hat{e}_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{M,t}) \quad t = -34, \dots, 0, \dots, 35$$

where $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the OLS regression estimates of α_j and β_j for share j . These residuals were aggregated and averaged cross-sectionally throughout the sample so that 70 average residuals denoted by \bar{u}_t were derived for the entire group of 21 LIFO companies:

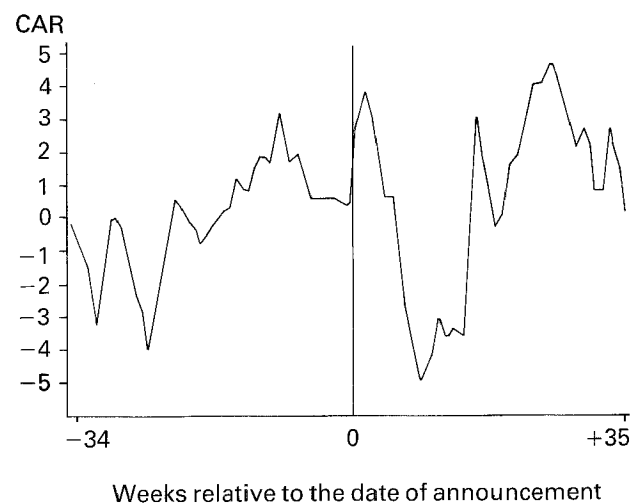
$$\bar{u}_t = \frac{1}{21} \sum_{j=1}^{21} \hat{e}_{jt} \quad t = -34, \dots, -1, 0, 1, 2, \dots, 35.$$

Finally, 70 cumulative average residuals (CAR's) defined by Z_t were derived for the group:

$$Z_t = \sum_{i=-34}^t \bar{u}_i \quad t = -34, \dots, -1, 0, 1, 2, \dots, 35.$$

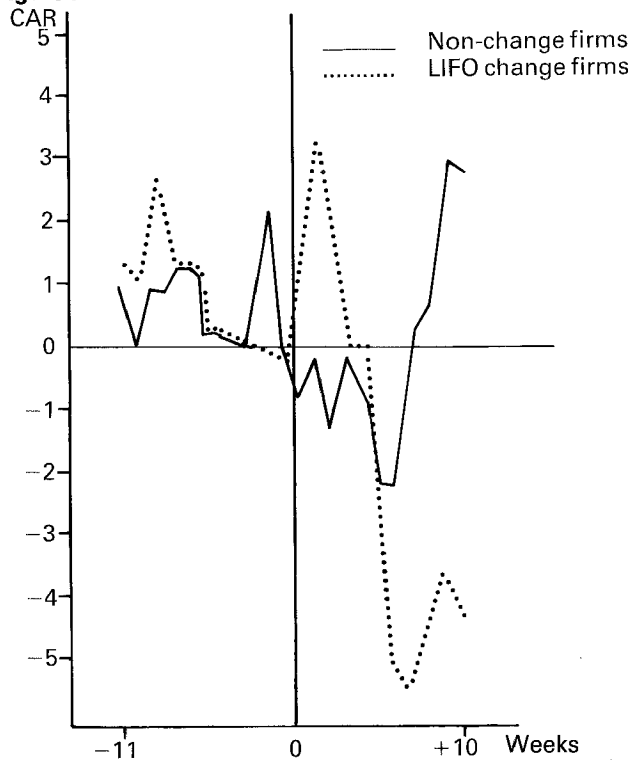
The CAR's were plotted and are presented in Figure 6 below.

Figure 6



The interpretation of the cumulative graph is not easy and the approach adopted in this analysis is set out below. The model employed and the aggregation of CAR's should distil confounding events so that the final CAR graph is likely to represent the impact of LIFO only. However, the assumption of the methodology may not be a complete description of reality and thus some of the CAR movement may be due to various other non-random effects albeit diluted on aggregation. In view of this possibility, although the full deletion period will be presented and analysed, the detailed interpretation and conclusion will concentrate on the twenty-one weeks surrounding the announcement of the change. Thus the graph will be reproduced with only twenty-two observations – the CAR's for weeks -11 through +10 (Figure 7). It is submitted that this time period is the most accurate description of the impact. Although arbitrary, the reduced period of examination further diminishes the possibility of confounding events disturbing the expected residuals.

Figure 7



Little time will be devoted to trying to explain in detail the fluctuations observed during weeks -34 through -12 and weeks +11 and +35 as these may be due to spurious confounding events. The full deletion period is presented to give a full perspective only.

As the graphs are cumulative the absolute position of an observation in any particular week is irrelevant. What is of importance in a week-by-week analysis is the relative position to the previous week's observation because this measures the CAR for a particular week. Further, in this particular study the period after week 0 (the week of the announcement) is the most interesting. These two factors taken together justify the use of a sliding scale in the analysis of the reduced period graphs. Thus each category's CAR value was equated to zero for week -1.

In order to test the efficiency of the JSE and to ascertain the informational content of a change to LIFO only the graphs of the 21 LIFO firms need be studied. The graph of the quasi-control group in Figure 7 is only presented to show how the configuration of residuals is different for the change firms and the non-change firms. That is, the control group clearly shows through Figure 7 that the LIFO change group behave differently on aggregate to the rest of the market. Thus the announcement of a change to LIFO definitely does have an impact on share price and this is studied below.

Figure 6 indicates that initially the CAR's fluctuate between 0 and -4% settling back to 0 in week -15. These fluctuations are fairly random and the cumulative average residual at week -15 is at the expected zero level.

However, for weeks -14 through -9 there does appear to be a certain non-random behaviour. It seems that the change firms experienced a positive abnormal return for six weeks of cumulative value 3%. This is rather difficult to interpret. It may however be due to leakages of the impending announcement. Thus the trading activities of investors with prior knowledge of the switch to LIFO may be responsible for this non-random behaviour. It may however be an inexplicable confounding event. This

cumulative abnormal return is lost in the following three weeks and the CARs settle back to the expected zero value for the six weeks up to the week of the announcement.

After the announcement there is a definite occurrence of abnormal positive return so that week +1 has a cumulative value of 3,4% however this is immediately followed by a number of successive weekly negative abnormal returns so that the CAR for week +2 is -3,8%! This indicates a very negative impact of a LIFO change considering the negative abnormal return of -7,2% for the period +1 through +12. Thereafter there follow rather volatile, although random, fluctuations of the cumulative residuals. It is considered inappropriate to interpret extensively the behaviour of the CARs beyond week +12.

Turning now to Figure 7 attention will be directed to the 11 weeks before the announcement and the 11 weeks after the announcement (including the week of the announcement). Effectively this assumes the fluctuations before week -11 and after week +10 to be random or not a function of the announcement. Obviously the longer the period of the analysis the greater the chance of confounding effects, obscuring the reaction to the announcement.

Apart from the possibility of a leakage effect, the behaviour of the residuals immediately prior to the announcement is as expected, i.e. a random movement along the zero line.

There is a definite reaction in the week of the announcement. Considering the model and methodology employed this can be confidently attributed to either the announcement of a switch to LIFO or to the fact that an announcement was made. There is a very rapid increase in abnormal return to 4,3%, however this is followed by a slow but very definite trend downwards moving steadily down to a low of -5%. Thus there was a cumulative negative return of 8,4% in 7 weeks after which the effect of LIFO dissipates and the residuals level off. Movements thereafter are not attributed to the effect of a change to LIFO.

Thus it would appear that although there is an initial positive reaction it seems that there is an overall negative reaction to LIFO of about -4%. Further, it seems that the downward adjustment has taken at least 8 weeks.

The interpretation does not intend to be dogmatic. However it appears that the potential efficiency exhibited by the rapid initial upward movement is subsequently reversed by an overriding inefficiency which slowly impounds the signal negatively. The implication then appears to be that the market is inefficient in respect of this piece of information for two reasons:

- (i) the market appears to be deceived by the negative impact on earnings despite the improved cash position; and
- (ii) this negative impounding seems to take a long time.

The obvious implication of this is that an individual who sells short shares of a LIFO switcher would have earned an abnormal return of 4% based on publicly available information.

The movement of the residuals of a quasi-equivalent group of non-change firms followed a random pattern. Although a week-by-week comparative analysis between the two would be meaningless, the trend is apparent.

Finally, it must be stressed that the *raison d'être* of the shadow group, was merely to ensure that the results of the study were not a function of the model.

5 FURTHER ANALYSIS BY PARTITIONING

The results presented in the previous section were aggregate results for all of the 21 securities examined in the study. However there may be numerous other factors which might cause the share price of an individual company changing from FIFO to LIFO to behave somewhat differently. Therefore, to examine the effect of a change to LIFO more closely further tests were carried out.

The study group was thus partitioned into pairs according to the following criteria:

- (a) High beta risk/low beta risk
- (b) High earnings impact/low earnings impact
- (c) Pre-1979 changes/1979 and post-1979 changes.

The procedure was to classify all firms with a beta above 0,75 as high beta firms and those with beta below 0,75 as low beta firms. Firms which reported earnings which were less than 80% of the earnings that would have been reported under the FIFO system were classified as high earnings impact firms, that is, firms whose FIFO earnings were reduced by less than 20% were classified as low earnings impact firms.

Finally, the pre-/post-1979 criteria refers to the date of the announcement and not the financial year of the firms.

The result was:

Two groups in category (a) of 11 (high β) and 10 (low β) firms;

Two groups in category (b) of 8 (high earnings impact) and 13 (low impact) firms;

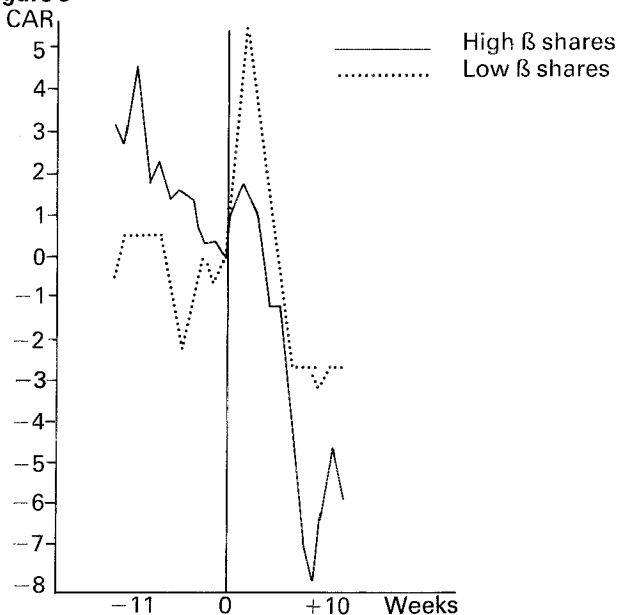
Two groups in category (c) of 10 (pre-1979) and 11 (post-1979) firms.

Appendix A shows the date of the change, the beta values and the percentage by which FIFO earnings were reduced for all firms in the study group.

(i) Relative risk

It can be argued that the relative risk of a firm is an exogenous intervening variable in the market's interpretation of a change to LIFO, i.e. an outside factor which effects the extent of the reaction. That is, there will be a differential market reaction to the announcement of a change to LIFO by high risk companies and low risk companies. This hypothesis can be examined with reference to Figure 8 below.

Figure 8



Prior to week 0 the high risk firms show a definite non-random pattern. Week -9 to week 0 was an almost continuous period of negative returns resulting in an abnormal negative return of 4,5%. In the same period the low risk firms exhibited fairly random residual behaviour. These differences in the pre-change period are extremely difficult to interpret, suffice to say that the abnormal negative return exhibited by the group as a whole prior to week 0 (Figure 7) appears to have been caused by the high risk firms.

Immediately after the change (i.e. after week 0) there appears to be differential reaction with the low risk firms showing an average abnormal return of 5,4% in the two week period comprising the week of change and week +1. During the same two weeks the high risk firms showed an average abnormal return of 1,6%. Thereafter there was a period of definite non-random behaviour when abnormal negative returns were earned for 6 or 7 weeks before levelling out.

The reaction in the first two weeks was considerably greater for the low risk firms, which suggests that the relative risk is an exogenous intervening variable. This could be explained by the fact that the market is more confident in the management of low risk firms. However, it should be noted that for the next six or seven weeks both firms experience almost identical abnormal negative returns. The interpretation is by no means obvious but it would appear that although the effect of LIFO was negative on both, the change seems to have had a less severe impact on returns in the case of low risk firms. This may be explained in terms of the market's interpretation of management's motives and expectations. Perhaps the market is sceptical of any changes made by high risk firms. Further, the market may feel the change represents a risky way for an already risky firm to raise extra cash.

It is interesting to note that the market took just as long to impound the information in both cases.

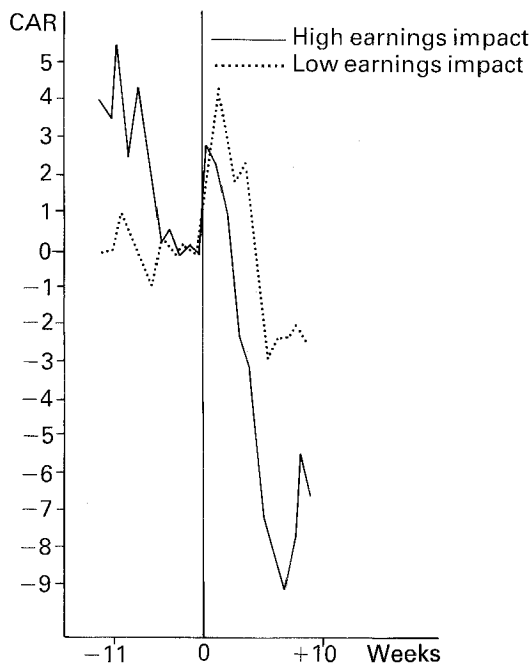
Thus it is concluded that relative risk seems to be an exogenous intervening variable, however the impact is negative for both high and low risk firms.

(ii) The effect of impact on earnings

It might be hypothesised on the basis of the results presented in the previous section that the market reacts in the direction of the impact on earnings of a change to LIFO and thus the magnitude of the reaction will be directly proportional to the magnitude of the impact on the earnings.

This aspect of the study can be examined with reference to Figure 9.

Figure 9



Again it is difficult to interpret the pre-change pattern and indeed it is probably pointless. However, this partition criterion results in two groups which display similar and fairly random configuration of CARs immediately prior to the week of change. This is to be expected in a period during which no common event with informational value impacted the firms. The pattern after the week of the announcement of a change to LIFO is quite different for each group.

The initial reaction to the announcement was about a 4% positive abnormal return in the case of the low impact firms while it was about 3% for the high impact firms. Thereafter there followed a period of abnormal negative returns for both groups. There was a startling negative abnormal return of approximately 11,5% for the period between week +1 and week +7 for the high impact firms whereas the negative abnormal return for the low impact firms for the same period was only about 7%! Admittedly by week +10 about 2,5% of this had been regained by the high impact firms. It must be emphasised, however, that the returns after week +7 may be part of the expected random return. Week +7 represents the end of a non-random period of abnormal returns, in both cases.

Thus, it appears irrefutable that the market reacts in the direction of the earnings figures and not in relation to the economic implication of the change.

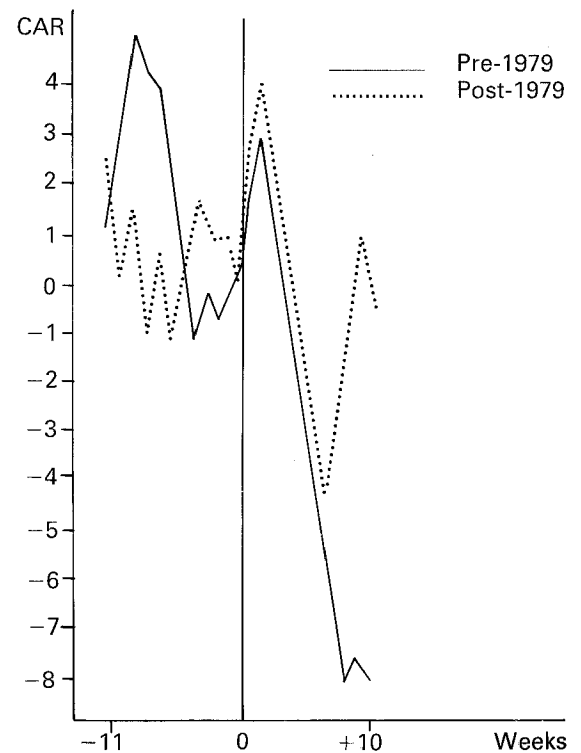
It is interesting to note that in the case of both groups the market once again took the same amount of time to negatively impound its reaction to an announcement of a change to LIFO.

(iii) The effect of time

The securities examined in this report changed from FIFO to LIFO at different times between 1975 and 1980. As more firms adopted the change so the average investor has become more aware of what the change involves and what it might mean to future dividends. Thus it is of interest to examine whether there has been any change in the market's assessment from the early LIFO switchers to the more recent switchers.

Figure 10 below presents the plot of the CAR for the pre-1979 change group and the post-1979 group.

Figure 10



As mentioned before, the pre week-0 period is very difficult to analyse and in the absence of clear proof to the contrary it must be concluded that both groups display fairly similar behaviour. But for the post week-0 analysis certain differences are apparent.

Both groups had the same initial positive reaction of the same magnitude for the same period. This reversed for both groups in week +2 (CAR +3%). The downward trend however persisted considerably longer for the pre-1979 change group and eventually bottomed out in week +11, having experienced a negative cumulative abnormal return of 10,8%. However, the post-1979 change group bottomed in week +7, thereafter a series of positive returns were earned (as there was for the pre-1979 group after week 11).

This is a very interesting result for it implies that in the case of the most recent changes to LIFO the market reaction has still been negative but far less severe. The net negative return between week 0 and week +7 for the post-1979 change group was around 4%, however the net negative return for the pre-1979 change group between week 0 and 11 was 7,8%! This implies that the market reaction has been almost halved in the most recent changes. This implies that the information consumption process may be changing. The other very interesting aspect of this result is that the market impounded the information in the case of the post-1979 change group nearly 40% quicker than in the case of the pre-1979 change group.

The result is extremely encouraging for it appears as if the market is becoming educated with regard to LIFO and although it still seems to be deceived by the accounting numbers it is impounding the information more quickly and less severely.

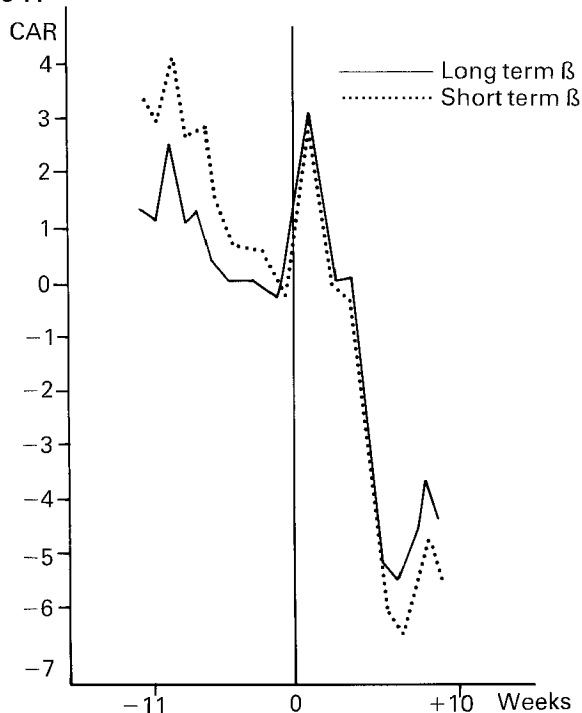
This may be explained by the fact that as more and more companies start changing to LIFO the market becomes increasingly aware of the implications of such. However, traditional concern over the accounting earnings figures still seems to prevail.

(iv) The effect of non-stationarity in the market model

The beta coefficients used in removing the overall market effect were estimated using approximately 10 years of past data. It is possible that if the beta coefficient is not stable over time (which seems to be the case – Affleck-Graves, Money and Carter (1981)), the use of a short-term beta estimate could result in a substantially different configuration of CAR's than those presented in Figure 7.

To examine this possibility the beta coefficients were re-estimated and the analysis of the previous section repeated using only short term periods of data, namely 70 weeks prior to a 70 week exclusion period. No data after the exclusion period were used in view of the potential risk changes that may accompany a change to LIFO. The CARs so derived are comparatively analysed with the CARs based on the long-term data and the results presented in Figure 11.

Figure 11



It should be noted that the graph of the long-term β is merely a reproduction of Figure 7 for the reader's convenience.

Little formal analysis is required. It is patently obvious that the two graphs are almost identical and would certainly not lead to a different interpretation as to the impact of the announcement of a change to LIFO. Thus, the conclusion drawn is that results based on short-term data would not result in a significantly dissimilar configuration of CARs. For this reason the potential non-stationarity of β is not considered to be problematic in the current study.

6 CONCLUSIONS

The results present some very interesting information, and taken as a whole provide a certain insight into the process of information consumption by the JSE. To summarise, it appears that the announcement of a switch to LIFO has a substantial negative impact on share returns. This negative impact seems to be directly proportional to the extent to which the FIFO earnings are reduced by the new valuation method. Thus it would appear that the market reacted to the accounting numbers rather than to the economic message inherent in a change to LIFO.

Further, this negative impact is impounded into prices rather sluggishly. This factor taken with the reaction to the accounting numbers which was counter-directional to the economic implications suggests the double inefficiency of the JSE. Not only was the market unable to see through the accounting numbers but it took a long time to adjust to the announcement.

However, there is a gleam of hope! The market seems in the case of the most recent changes to be impounding the informational content of a change to LIFO substantially more quickly and although still in sympathy with the earnings figures, the effect has been less drastic. Thus, the market appears to be 'learning' how to interpret the change to LIFO.

It is important to note that an alternative interpretation is possible. The negative abnormal returns observed in the post announcement period may not be caused by the announcement itself but may be a function of a selection bias. That is, only a certain type of firm may switch to LIFO, firms in which management anticipate a cash crisis and a change to LIFO represents an effort to avert such. This interpretation implies that the informational value of LIFO cannot be ascertained. However, it should be noted that the model was designed to obviate the effects of any confounding events and thus the important conclusion reached by the study is that the announcement of a change to LIFO does have a negative impact on the share price. Whether this is because of the economic implications of the change or because the investment public view the announcement of the change as an indication of a possible cash crisis, the model cannot determine.

As far as generalised conclusions on market efficiency, again a situation specific inference can be drawn, namely that the market is information inefficient in respect of the announcement of a change to LIFO. It could be argued that as only 21 firms have been studied, inferences cannot be drawn as to the efficiency of the market as a whole. It is submitted, however, that as the 21 firms represent the universe of LIFO changers (at the cut-off date for this study) and as there are no barriers to the purchase or sale of these shares on the market, the existence of a group of over-valued (according to this naïve market) shares for a number of weeks is unjustified in an efficient market. It is submitted that to be efficient a market must impound **all** relevant information quickly and unbiasedly so that no shares are over or under-valued according to the publicly available information set.

Thus, the overall conclusions of this study are twofold:

Firstly, the efficient market hypothesis is not valid for the JSE. This evidence should be of value to future capital market researchers. However, the market is 'learning' to interpret the change to LIFO but it cannot be determined whether this is as a result of a growing efficiency in the market itself or in a growing understanding of LIFO.

Secondly, the evidence is that a change to LIFO has a negative impact on share returns directly proportional to the negative impact on earnings. Thus the investing public appears to be more concerned with the magnitude of the accounting numbers than with the economic benefits which may accompany a change in accounting procedure.

Finally, it should be noted that the implications of an inefficient market for financial reporting, accounting policy decisions and standard setting are hair-raising. However a discussion on these implications is beyond the scope of the paper.

Appendix A

LIFO firms included in the study

Firm	Date of announcement	% reduction of FIFO earnings	R
1 Anglo Alpha Cement Limited	1 March 1979	6	0,90
2 AECI Limited	11 March 1976	14	0,80
3 The Natal Chemical Syndicate Limited	23 August 1979	50	0,85
4 Seardel Investment Corporation Limited	31 August 1979	20	1,00
5 African Cables Limited	1 October 1976	13	0,35
6 Huletts Aluminium Limited	1 June 1977	24	0,55
7 National Bolts Limited	26 September 1975	50	0,35
8 Stewarts & Lloyds of S.A. Limited	22 November 1979	31	1,25
9 Vereeniging Refractories Limited	20 February 1980	9	0,55
10 Coates Brothers (S.A.) Limited	24 January 1980	23	0,60
11 Kohler Brothers Limited	15 February 1980	14	0,35
12 Metal Box S.A. Limited	1 June 1977	41	0,60
13 Sappi Limited	9 March 1976	7	0,65
14 Huletts Corporation Limited	1 June 1977	5	0,80
15 Romatex Limited	30 April 1979	8	1,20
16 Sterns Diamond Organisation Limited	13 June 1979	42	0,90
17 Trek Beleggings Limited	23 April 1975	8	0,85
18 Steelmetals Limited	27 September 1976	4	0,75
19 Metal Closures Group S.A. Limited	7 February 1980	13	0,70
20 Suncrush Limited	21 March 1975	7	0,50
21 B & S Steel Furniture Company Limited	31 May 1979	11	1,00

Appendix B

LIFO firms excluded from the study

Rustenburg Platinum Holdings Limited	Non-industrial
Haggie Limited	Reversed effect
Malbak Limited	Not quantified
Associated Engineering (S.A.) Limited	Always used LIFO for copper stocks
Sasol Limited	Used LIFO from date of flotation
Scottish Cables (S.A.) Limited	
Edgars Stores Limited	
Cullinan Holdings Limited	
The Union Steel Corporation of S.A. Limited	Change announced after cut-off date
Plate Glass and Shatterprufe Industries Limited	
Anglo American Industrial Corporation Limited	

Appendix C

Control (shadow) group of non-change firms

1 Everite Limited	12 Nampak Limited
2 Sentrachem Limited	13 Carlton Paper Corporation Limited
3 Plascon Evans Paints Limited	14 Lonrho Sugar Corporation Limited
4 Rex Trueform Clothing Company Limited	15 African and Overseas Enterprises Limited
5 ASEA Electric South Africa Limited	16 Gresham Industries Limited
6 African Oxygen Limited	17 Chemical Holdings Limited
7 Globe Engineering Works Limited	18 Reunert & Lenz Limited
8 Dorman Long Vanderbijl Corporation Limited	19 Trio-Rand (S.A.) Beperk
9 Dunswart Iron & Steel Works Limited	20 Uniewyn Beperk
10 Press Supplies Holdings Limited	21 Sam Steele Holdings Limited
11 Evelyn Haddon & Company Limited	

References

- 1 Affleck-Graves, J. F., Money, A. H. and Carter, K. (1981). The Estimation of Beta Coefficients in the Market Model. *Technical Report No. STM-5*, Department of Mathematical Statistics, University of Cape Town.
- 2 Brown, Robert M. (1980). Short Range Market Reaction to Changes to LIFO Accounting Using Preliminary Earnings Announcement Dates. *Journal of Accounting Research*, Vol. 18, 38-63.
- 3 Fama, E., Fisher, L., Jensen, M., and Roll, R. (1969). The Adjustment of Stock Prices to New Information. *International Economic Review* (February), Vol. 10, 1-21.
- 4 King, Benjamin F. (1966). Market and Industry Factors in Stock Price Behaviour. *Journal of Business* (Supplement, January). Vol. 39, 136-190.
- 5 Knight, R. F., (1981). *The Efficient Market Hypothesis and a Change to LIFO: An Empirical Study on the JSE*. An unpublished M.Com. thesis, University of Cape Town.
- 6 Sunder, Shyam (1973). Relationship Between Accounting Changes and Stock Prices: Problems of Measurement and Some Empirical Evidence. *Empirical Research on Accounting: Selected Studies 1973*. Supplement to the *Journal of Accounting Research*, 1-45.