THE EFFICIENT MARKET HYPOTHESIS AND A CHANGE TO L.I.F.O : AN EMPIRICAL STUDY ON THE JOHANNESBURG STOCK EXCHANGE

A THESIS PRESENTED TO THE
UNIVERSITY OF CAPE TOWN

IN FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF

MASTER OF COMMERCE

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February 1981

ACKNOWLEDGEMENTS

I extend my sincere thanks to :

Dr John Affleck-Graves of the department of Mathematical Statistics at the University of Cape Town who acted as supervisor and provided invaluable help in completing this thesis.

Professor Arthur Money of the department of Mathematical Statistics (UCT) for advice and encouragement.

Professor Leon Kritzinger, Head of the department of Accounting (UCT) who made this study possible.

Professor Geoff Everingham, formerly of the department of Accounting (UCT) for useful advice.

Mr William Maguire of the department of Accounting (UCT) who acted as supervisor.

Peat, Marwick, Mitchell and Company for the financial assistance for the study.

Mr Barrie Jack of Peat, Marwick, Mitchell and Company for his assistance.

Mrs Susan Newling for successfully typing from such an untidy manuscript.

DECLARATION

I certify that the thesis is my own work and all references are accurately reported.

Signed by candidate

ABSTRACT

This thesis presents a study on :

(1) The impact of the announcement of a change to L.I.F.O on the share prices of firms quoted on the Johannesburg Stock Exchange ,

(2) The efficiency of the Johannesburg Stock Exchange (JSE).

The methodology employed is a contemporaneous association test involving a market model extensively used in the American Literature. The model is a variation of the well known Capital Asset Pricing Model (CAPM), however the assumptions of the CAPM are avoided. An extension has been made to the usual methodology in that a quasi-equivalent group of non-change firms was selected as a control.

The dissertation presents a discussion on the Efficient Market Hypothesis (EMH) with particular reference to the implications for Financial Reporting. Furthermore a conceptual framework is proposed for empirical research in accounting.

The results obtained indicate a significant negative reaction to the announcement of a change to L.I.F.O, in the aggregate, which was shown to be directly proportional to the size of the impact on reported earnings. The relative risk of the firms was shown to be an intervening variable in that the low risk firms experienced a less severe negative reaction.

It is concluded that the JSE is an inefficient market since

the information is impounded slowly. As the market appears to be unable to look behind the accounting numbers, further evidence of inefficiency is apparent.

Finally the thesis concludes that the JSE may be developing as the most recent reactions were less negative and far quicker, on aggregate.

ABBREVIATIONS

AICPA	The American Institute of Certified Public Accountants
B & H	Buy and Hold strategy
CAR	Cumulative abnormal residual
CAPM	Capital Asset Pricing Model
EMH	The Efficient Market Hypothesis
FASB	The Financial Accounting Standards Board
FFH	The Functional Fixation Hypothesis
F.I.F.O	First in First out cost flow assumption of inventory valuation
JSE	The Johannesburg Stock Exchange
L.I.F.O	Last in First out cost flow assumption of inventory valuation
MM	Market Model
NYSE	The New York Stock Exchange
OLSR	Ordinary Least Squares Regression
RWM	Random Walk Model
RWT	Random Walk Theory
SEC	The Securities and Exchange Commission
TR	Trading Rule

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 ORIENTATION

This thesis presents an empirical study on the relationship between accounting data and share prices. More specifically a contemporaneous association test is used to simultaneously evaluate the validity of the EMH on the JSE and determine the impact of an accounting change to LIFO on share prices.[1]

The study constitutes the first test on the 'efficiency' of the JSE in the semi-strong form. Previous studies in the literature on the JSE[2] have been on the other two forms of the EMH[3]. This study further represents the most direct form of test on 'efficiency', being on the speed of adjustment of market prices to specific information.

This form of test provides not only useful environmental information to accountants[4] but also situation specific information on the market reaction to an accounting change to LIFO. No such similar accounting research has been attempted in South Africa.

1.2 LIMITATIONS AND OBJECTIVES

The 'efficiency' evaluated will be limited to that concept

of 'efficiency' implicit in the EMH. The measurement of the speed of adjustment of market prices to this information will be limited to the particular market model employed.[5]

The objectives will be expanded on in the thesis justification[6] however they may be stated as to :

- Provide evidence as to the efficiency or otherwise of the JSE
- Evaluate the impact of a change to LIFO on share prices
- Present a conceptual framework for research into the relationship between accounting data and share prices.

1.3 THESIS ORGANISATION

An overview of the thesis organisation is shown diagramatically in figure 1. This illustrates the interrelationship between the two basic themes which permeate this thesis.

The introduction is followed, in chapter 2, by a bilateral justification of the study. The two basic themes introduced are :

(i) Accounting Research

(ii) Capital Market Research[7]

Chapter 3 flows out of the second part of chapter 2, expanding on capital markets and introducing the concept of efficiency generally and the EMH specifically.

Chapter 4 examines the implications of the EMH with emphasis on the implications to accounting. This is followed in chapter 5 by an examination of the information content of accounting changes and a proposed conceptual framework for empirical research in accounting.

Chapter 6 introduces the market model and research methodology with a brief literature review. Certain limitations and econometric issues will be discussed in this section.

The results of the study are presented in chapter 7, these are further analysed within the framework of chapter 5 and tentatively interpreted.

Chapter 8 concludes the thesis with a short synopsis and a number of conclusions are drawn in relation to both themes based on the chapter 7 interpretations.

DIAGRAMATICAL OVERVIEW OF THESIS ORGANISATION

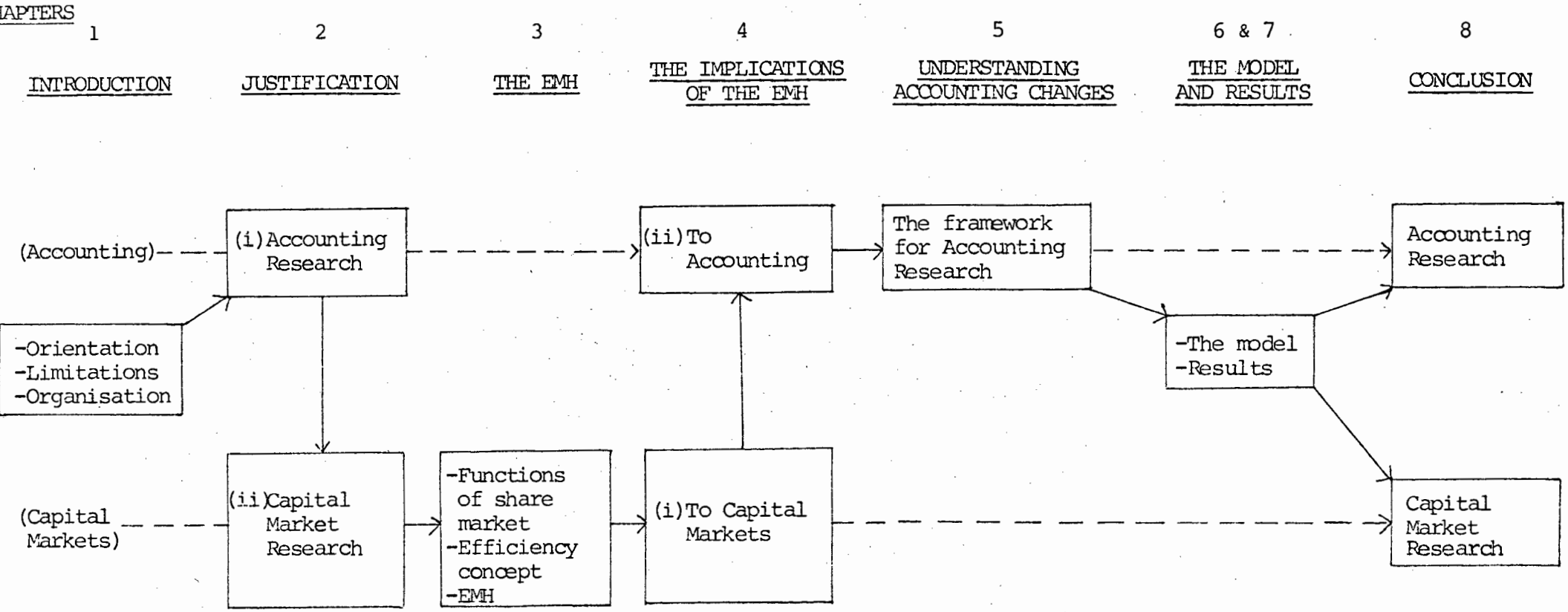


FIGURE 1

CHAPTER 1

FOOTNOTES

1. Sunder (1973) claims that the two cannot be tested simultaneously, i.e. he states that either efficiency should be assumed to test the impact of information or vice versa. This notion is examined and justified in chapter 6.

2. See Affleck-Graves and Money (1975), Hadassin (1976), Gilbertson and Roux (1976) and Du Plessis (1974).

3. Namely the weak form and the strong form.

4. It is suggested that capital market efficiency has implications for accountants.

5. The limitations of this model will be discussed in chapter 6.

6. See chapter 2.

7. This distinction is really artificial in that the results of each have implications for the other. It is this mutually supportive property that facilitates simultaneous examination of market efficiency generally and the relationship between accounting data and share prices specifically.

CHAPTER 2

THESIS JUSTIFICATION

The two basic themes of this thesis were introduced in chapter 1. The impetus for the thesis can be seen as bilateral in the context of these themes :

- Accounting research (environment)
- Capital market research (environment)[1]

It is hoped that as the study unfolds to the reader and the conclusions drawn and implications established the justification will be indubitable.

However it is considered appropriate to give a brief preliminary justification and indicate those economic agents to whom this discourse will be of interest.

2.1 ACCOUNTING RESEARCH

Accountants are often viewed as pragmatists. They tend to behave as though they are dealing with a discipline which is precise, accurate, quantitative and relevant. They speak as though accounting is a way of capturing real world transactions truthfully. One is left with the impression that accounting is merely a process of recording and reporting .[2]

This view of accounting has come under fierce attack

particularly from accounting academics in the United States and the United Kingdom.

The general trend that now emerges in accounting is in a measure / communicate environment.[4] Although no unified theory has yet emerged the emphasis is now to perceive the accounting process within the overall economy.[5] The suggestions vary between an 'information economics' approach where accounting information is viewed as a normal commodity and a 'decision useful' approach wherein accounting satisfies user needs as a costless commodity (to the user).[6] It is beyond the scope of this thesis to survey the approaches to accounting theory construction, let alone suggest a theory, however it is submitted that empirical work of the nature of this study has a place in accounting theory development. Being at the embryonic stage in maturation no discernable theory has emerged, merely a patchwork of ideas. The ultimate theory may be a unified global one or merely an open ended inter-disciplinary codification; it may be achieved through deductive or inductive reasoning. What is certain however is that empirical research will have to be carried out in a number of spheres.[7]

It is imperative that South Africa draws on the experience of professional development in the rest of the world. However, it cannot be overemphasised that the local environment must be carefully researched so that the

politically, legally and socially induced differences can be discerned. Accounting academics bear the responsibility of applying only those relevant conclusions of foreign research to local studies. This holds true at every level of academic and professional endeavour.

For example an accounting standard, though appropriate elsewhere, may not be optimal here due to differences in environment.

This study, although similar to that of Sunder (1973) on the NYSE, is a justified duplication in this environment. It is respectfully submitted however that the current study is far more ambitious in that it seeks to address market efficiency as well, thereby increasing its local relevance (see next section)[8].

More specifically, empirical research on the impact of accounting data on share prices is an indispensable constituent of any research programme in accounting. This is so because investment and consumption decisions are based on the individual's wealth and since share prices represent the individual's wealth, it is imperative that the preparer of information has some idea of the relationship between that information and the wealth of the investor in order that an optimal information set may be provided. Beaver (1972) explains this by assuming the purpose of accounting to be a facilitation of decision making. Thus research must be directed

toward providing the optimal information set for some defined class of decision makers. In this case the class comprises of investors in the shares traded on the JSE.

Further justification of share market/accounting research is seen in the following. Generally accepted accounting practice allows a number of alternative accounting methods for measuring and reporting economic events. Since it is possible that investors may react differently to various methods, the relationship between accounting changes (which represent a decision point between competing alternatives) and share price changes should be of vital interest to the following groups of economic agents :

- The standard setting bodies
- Financial report preparers
- Investors

The short term uses of the results of this study will be to :

(1) indicate to both the management and investors of firms what the impact of a change to L.I.F.O has been on share prices,

(2) provide investors with some information on the likely impact of future changes to L.I.F.O,[9]

(3) provide the management (report preparers) of

companies considering a change with information on the likely impact on their share price (relative).

2.2 CAPITAL MARKET RESEARCH

In the wider context the 'efficiency' of a share market should be of interest. There has been a reasonable amount of debate recently on the efficiency of the JSE. However there has been very little empirical evidence. This study seeks to provide such empirical evidence. This justifies the study on the premise that the overall debate on share market efficiency is non-trivial.

Although this will be examined in greater depth below (see chapter 4), the following economic agents should be concerned with share market efficiency :

(1) Investors - If share markets are efficient, no abnormal returns can be earned by the analysis of publicly available information.

(2) Accountants - Certain accounting dilemmas become trivial in that they are cosmetic only.[10]

(3) Management - In an efficient market,

	use of share prices in cost of capital estimates will be accurate.[11]
(4) Regulators (Including - government - professional accounting bodies and share market overseers)	- The fair game properties of an efficient market have real implications for these agents.

As the share market is an important process in a capitalist economy, its 'efficient' operation is of interest to all. This property should be continually monitored.[12]

This role of a share market will now be expanded on to develop the concept of efficiency as pronounced in the EMH.

This chapter has been presented to justify the study in general terms. Specific justifications, such as for methodology employed, will be dealt with throughout the text.

CHAPTER 2

FOOTNOTES

1. See footnote 7, chapter 1.

2. This is reflected in the emphasis of most research in this country having an obsession with questions of cost allocation and revenue recognition timing. Furthermore the fact that there is not even one research journal in South Africa is reflective of the unquestioning attitudes of accountants in this country. See Affleck-Graves and Money (1980) for a comparative review of research development in accounting.

3. See Tricker (1979).

4. Support for this view is found in Sterling (1972, p.401)

5. See Caplan (1972, p.438) and Sterling (1972, p.401).

6. Sterling (1972), Beaver (1972) and Hendriksen (1977) refer to these categories inter alia.

7. The 'all in' nature of accounting development was acknowledged by the American Accounting Association's Committee on Research Methodology (1972). This committee suggested that accounting was at such an undeveloped stage, research in all possible directions was justified.

8. Sunder (1973) was able to assume market efficiency based on the voluminous empirical evidence which is lacking in South

Africa.

9. It is assumed that the current study will have no influence on market reaction to future L.I.F.O changes!

10. See figure 1 in chapter 4.

11. See chapter 3.

12. This is expanded upon in chapter 3.

CHAPTER 3

THE EFFICIENT MARKET HYPOTHESIS

3.1 PREFATORY COMMENTS

As indicated in chapter 2, this study seeks to lend empirical evidence to the debate on the 'efficiency' of the Johannesburg Stock Exchange (JSE). However it is not the efficiency (or otherwise) *per se* that is of importance, but the implications for the various economic agents. It is at this juncture in the extension of the debate, i.e. where a reasonable consensus has been achieved (or assumed) *vis à vis* efficiency, that confusion abounds, particularly in determining the economic and accounting implications of the degree of market efficiency. It seems that the cause of such confusion is the restrictive definition of 'efficiency' as annunciated in the EMH.

Thus, in anticipation of this problem, it is considered appropriate to examine the purpose or rôle of a stock exchange in order that a market's effectiveness in fulfilling such may be evaluated and the implications to the particular rôle envisaged in the EMH may be discerned.

3.2 THE PURPOSE OF CAPITAL MARKETS WITH PARTICULAR REFERENCE TO THE STOCK EXCHANGE

The economic problem is stated in a most general way as being the allocation of scarce (limited) resources to

satisfy limitless needs. Thus the allocation of capital resources of an economy is of fundamental importance. Speaking in the loosest terms, an appropriate allocation of capital is a necessary condition for the attainment of maximum satisfaction by society. The distribution of this satisfaction in the society is likely to be determined politically. However, different political structures, although equally efficient in terms of their economic objectives, could result in completely different configurations of capital allocation. In both market and centrally controlled economies capital is the determinant of future well being, thus unless the allocative configuration is congruent with the objectives, an economy will have, at best, only short term influence over the well being of the community.[1]

Further, all growth is dependent on appropriate allocation of capital resources enabling those industries with increasing product demand to expand to satisfy such in line with the collective desires of the community.

The process of allocation (either market or committee) will determine the effectiveness of allocation. The effectiveness of allocation is influenced by a number of factors and is measured in a number of ways. Hitherto only 'real' capital has been discussed, namely physical assets, e.g. plant, equipment, factories, inventory, etc., which constitute this factor of production. One of the distinguishing characteristics between market and centrally controlled

economies is that in the latter the allocation process tends to be performed "manually"[2], whereas in the former a market performs this function. The market has developed in these economies away from the physical aspect to a more sophisticated financial capital or money market which controls the allocation of real assets. It is in this 'second order' market category that a stock exchange plays a role.

Thus the term 'capital market' normally refers to the financial capital of an economy. The control of the financial markets over the asset allocation process is very strong, albeit indirect.

The 'money market' is influenced by a number of agents including banks, financial institutions, insurance companies, etc., and of course the State which will influence the market through its fiscal and monetary policies. It is thus the primary function of the whole financial capital spectrum to regulate the allocation of real assets and determine the dynamic configuration of real capital.[3]

Thus the share market should be seen as only a part of a larger capital market, one step removed from the real assets of the economy which determine the communal welfare.

On closer scrutiny the share market can be distinguished from the rest of the financial capital market : whereas

finacial markets are dynamic institutions through which money flows, i.e. borrowed from investors and lent to entrepeneurs, the share market is really a 'static pool'.[4] Although financial capital may initially be supplied by the issue of shares, this cash flow is not a permanent feature of the stock market. The other institutions in the capital market also supply equity capital, but unless raised via the stock market the shares so acquired normally have restricted transferability with the concomitant increased control.

This distinction cannot be regarded as trivial when one considers how little financial capital is raised on the share market once a company is afloat[5] nor when one inspects the mechanism of distribution of funds : the capital markets have a direct control on the flow of funds to the users of real capital and thus can ensure that only the most productive receive money. The share market, on the other hand, has direct control only once at the initial issue, thereafter its control over the users of real capital is merely indirect. However, this will be expanded upon below.

Thus the share market can be viewed as a secondary financial capital market, being two steps removed from the real assets market. It can be viewed as a primary capital market when funds are directly received by corporations.

It is emphasised that the above treatise on share markets

does not purport to be exhaustive, however the perspective, through its simplicity, will facilitate the discussions on the implications of the EMH.

There are a number of important functions served by the share market which the primary capital market could not perform and which justify its existence :

(1) The share market provides a unique mechanism for the separation of ownership and management of the real capital assets. The management of these assets is left to those economic agents with a comparative advantage in making production decisions.

(2) Further it permits long term finance to be provided by short term funds. That is, investors may be prepared to risk only short term investments which are traded, however this does not interfere with the initial long term capital provided.

(3) Another aspect to this function is that large quantities of finance are provided by a large number of investors, each of whom possess only a miniscule amount. Thus a wide ownership of assets are consolidated for optimal size usage by the agents with the comparative advantage.

(4) The transfer of funds is allowed with the minimum of cost and administrative effort.

(5) It provides a liquidity pool whereby investors may

exchange claims to consumption in different time periods in such a way that each participant improves his lifetime consumption pattern.

(6) The pricing mechanism provides management with a vital input variable for their investment decision process by way of the cost of capital. This varies inversely with the price of a company's share. Thus the optimal investment strategy is undertaken by reference to this price.[6]

(7) The pricing mechanism also provides a barometric measure of relative strength of corporations to investors and lenders.

(8) The pricing mechanism allocates financial resources or consumption claims among participants.

(9) Regulatory role : Unlike the primary capital markets a share market has only a once-off direct control of resources. However its indirect regulatory role is indispensable to optimal 'real asset' allocation.

On the other hand primary capital markets are able to directly discipline the management of real assets by the allocation of funds, that is, bad management is punished by the removal or increased cost of finance. One might ask : Why should management care about their company's share price once they have raised their initial finance capital in that market? The obvious answer is that corporations

are aware of their future capital needs and thus have an interest in maximising their share price.[7] Considering how little investment by corporations is financed by new issues relative to other sources of funds, such as retained earnings,[8] this conclusion is not adequate. On the surface it would appear that once management have raised their initial finance they can escape the disciplinary directives of the market.

The secondary capital market (share market) is able to keep the economy's collective nose to the grindstone by a number of indirect regulatory mechanisms :

(a) Relationship with shareholders

Although this group of economic agents have little control over the day to day use of assets they do wield ultimate control over management. Consequently, management would rather keep them content and by what better way than by operating effectively and thereby maintaining a buoyant share price?

(b) Alternative sources of finance

The performance of a company in terms of its profitability can be assumed to be reflected in its share price performance, thus this latter performance has a strong influence on the terms on which the firm is able to raise finance

elsewhere. This is so because the share market will provide a basis for risk assessment.

(c) Exposure to takeover risk

Sub-optimal production behaviour by corporations is likely to result in a poor performance in their share price relative to their optimal-production competitors,[9] thus exposing the former to takeover by the latter. Such takeovers result in the victim's operations being utilised more effectively. This process obviously results in a reallocation of real assets.

(d) Public relations - political stature

From a sociological point of view a corporation is extremely concerned about its public image which is moulded to a large degree by the capitalisation value on the stock market. The repercussions of a loss of image would be, inter alia, a decline in the effectiveness of its marketing strategy leading to a dimunition in demand for its products causing the firm's ultimate economic demise (or takeover).

(10) Influence on other markets :

It is submitted that the share market has a regulatory influence even on non-quoted firms. Although the bulk of private sector business is controlled by quoted firms[10], even those unquoted are disciplined

to a greater or lesser degree as a result of the share market's influence on the primary sources of financial capital. This occurs because risk/prospects assessments for an industry are often based on the share price performance of the constituent quoted companies with reference, of course, to their share of the market. Thus funds are provided to these non-quoted companies on commensurate terms cognisant of their different status.

The list is not exhaustive. However, it is felt that the major functions have been highlighted. The exposition has been discussed on an intuitive and simple (though hopefully not simplistic) level for the sake of clarity.

It is within this framework that the concept of efficiency will be discussed including the EMH and its implications.

To summarise :

(1) Two distinct categories of resources have been highlighted ;
   (i) Real capital, and
   (ii) Financial capital.

(2) Three capital markets have been defined ;
   (i) The market for real assets,
   (ii) Primary financial capital markets, and
   (iii) The secondary capital market.

(3) Two categories of economic agents have been defined;

(i) Producers (corporations)

(ii) Investors in capital markets.

In the real world the interaction between the above categories of economic agents, real and financial assets is highly complex. The role of the share market in this milieu has been isolated for discussion.

3.3 THE EFFICIENCY CONCEPT

The term 'efficiency' has been used so extensively in reference to the share market that it has become jargonistic. This is not the fault of the fine empirical research that has been carried out, but probably due to various interpretations of such works.

To avoid this jargonistic usage a discussion on the concept in a share market context is considered appropriate before formally introducing the EMH.

The term 'efficiency' implies effectiveness of purpose, therefore if a process has a multiplicity of purpose it must have a multiplicity of potential efficiency. It is this very multiplicity of purpose of the share market that has created confusion on the efficiency of the process and the implications thereof.

In the previous section ten major roles (functions) of a share market were highlighted. Although these functions

are mutually supportive, it is submitted that three distinct categories can be defined. The value of this trichotomous distinction is probably more academic than real,but it is proposed merely to clarify the distinct concepts of efficiency.

(1) Exchange Efficiency

Functions 1 through 5 (see section 3.2) can be viewed as supplying a forum for exchange and thus the degree of effectiveness in fulfilling these can be seen as 'exchange efficiency', that is, participants are not forced to create exchange arrangements not already provided by the market.

(2) Production/Allocation Efficiency

Functions 6 and 9 are viewed as interfacing with the production/allocation process in an economy. When an economy is said to be efficient in a production sense, it is a necessary condition that all value maximising firms make pareto optimal production decisions.[11] This will be facilitated if the share market performs said functions effectively.

(3) Information Efficiency

All functions that are achieved, or sought to be achieved, which are dependent on the pricing mechanism can only be as effective as that pricing mechanism. A share market is said to be'information efficient'if :

(i) All share prices are costlessly known to all participants, and

(ii) All available information is fully reflected in share prices.

It is only this second category in this third type of efficiency to which the EMH alludes.

Caveat: It is noted however that this concept should be approached cautiously so as not to ascribe too wide an interpretation to it nor to restrict it too greatly, bearing in mind that the information process affects all the functions of the share market to some extent.

It should now be apparent that the statement, 'An efficient capital market results in an optimal allocation of resources' is too general to have any real meaning.

3.4 THE EFFICIENT MARKET HYPOTHESIS[12]

Due to the fact that much of the empirical work on the EMH and RWT occured prior to the development of the requisite theory, there has been a reasonable amount of confusion regarding the relationship between the EMH and RWT. For this reason, before tracing the chronological development of the EMH, which had its genesis in the RWT, the hypothesis will be formally explained within a theoretical framework. Further, for the sake of clarity, a careful distinction will be drawn between the weak form of EMH, the RWT and other fair game models.

3.4.1 THE EMH AS AN EXPECTED RETURN OR 'FAIR GAME' MODEL

The EMH states that in any efficient market prices will 'fully reflect' all available information (see Fama (1970)).

It has been further defined in terms of three information sets :

(i) The weak form : At this level the information set that is fully reflected is the historic price sequence of each share.

(ii) The semi strong form : Under this section the information set is defined as being all publicly available information regarding each share, thus including the historic price sequence.

(iii) The strong form : This final category defines the information set as all known information including the previous sets and any other information known by 'insiders'.[13]

It is implicit in the above that if prices are to fully reflect certain information sets, new

information will be impounded almost instantaneously in an unbiased fashion.

Fama acknowledges that as stated the EMH has no empirically testable implications so in order to rectify this he expanded on the meaning of the 'fully reflect' concept.

However, he derives testable implications couched in the assumptions of 'expected returns theory'. This general theory posits that market equilibrium can be stated in terms of expected returns. More specifically, the expected return conditional on a specified information set is a function of 'risk'.[14]

Notationally :[15]

$$E(\tilde{\rho}_{j,t+1} \mid \phi_t) = \{1+E(\tilde{r}_{j,t+1} \mid \phi_t)\}\rho_{j,t} \quad , \qquad (1)$$

Where : E = expected value operator

ρ_{jt} = Price of share j at time interval t

$r_{,t+1}$ = the period percentage return $(\rho_{j,t+1} - \rho_{jt}) \; / \; \rho_{jt}$

ϕ_t = symbol for defined information set

$\sim$ = random variable indicator

In this context 'fully reflect' means that all the

information defined by the set ϕ_t is utilised in the share price formation.

It must be emphasised that any inference drawn from tests of such derived implications are as much dependent on the general concept of market efficiency as the validity of the expected returns notion. The expected returns theory, however, introduces risk at this level in a very general undefined way.

There are two assumptions implicit in the above :

(i) Market equilibrium can be stated in terms of expected returns,

(ii) Expected returns are formed on the basis of information set ϕ_t.

The major empirical implication of equation (1) is that no trading system based only on information ϕ_t will have expected returns in excess of equilibrium expected returns.

Thus let

$$x_{j,t+1} = \rho_{j,t+1} - E(\rho_{j,t+1} | \phi_t) \qquad (2)$$

Then

$$E(\tilde{x}_{j,t+1} | \phi_t) = 0 \qquad (3)$$

In economic terms, $x_{j,t+1}$ is the difference between the observed price at the time interval t+1 and the price as projected at time t based

on information ϕ_t.

Let

$$\alpha(\phi_t) = \{\alpha_1(\phi_t), \alpha_2(\phi_t), \ldots, \alpha_r(\phi_t)\}$$

be any trading system based on ϕ_t, which directs the investor to invest α_r of his funds in each security where α_r is the proportion of total funds in share j.

The total excess market value at t+1 that will be generated by such a system is

$$V_{t+1} = \sum_{j=1}^{n} \alpha_j(\phi_t)\{\tilde{r}_{j,t+1} - E(\tilde{r}_{j,t+1}|\phi_t)\}$$

Coupled with the 'fair game property' of (3), if expressed in terms of return rather than price, then

$$E(\tilde{V}_{t+1}|\phi_t) = \sum_{j=1}^{n} \alpha_j(\phi_t) E(\tilde{Z}_{j,t+1}|\phi_t) = 0$$

There are a number of models which can be seen as being included in this general category. As there has been confusion in the empirical literature as to which model is being tested (probably due to the lack of statistical understanding of some researchers), the different forms will be distinguished. This should prevent any confusion in the chapter on the implications of the EMH.

3.4.2 THE SUBMARTINGALE MODEL

Assume for (1) that for all t and ϕ_t

$$E(\tilde{\rho}_{j,t+1} \mid \phi_t) \geq \rho_{j,t} \ ,$$

$$\text{or} \quad E(\tilde{r}_{j,t+1} \mid \phi_t) \geq \tilde{r}_{j,t} \ , \tag{4}$$

Then the price (return) sequence is said to follow a second order Martingale. The implication is that successive price changes are uncorrelated. Since each time-interval price is based on the current information set ϕ_t, any change in price is related to a change in information. Such incremental information exhibits non-randomness. If a sub Martingale is evident then the incremental information sets must be uncorrelated. It is essential to distinguish between the correlation and independence concepts statistically. Whereas correlation is a necessary condition for dependence it is not a sufficient one. The necessity for this seemingly trivial distinction will become evident later.

A Martingale model is one in which (4) is an equality.

3.4.3 THE RANDOM WALK MODEL (STRICT FORM) RWM

The loose random walk theory implies no discernable pattern in successive price changes (see infra)

however in its strict form the RWM posits two distinct hypotheses :

(i) Successive price changes (or one period returns) are independent, and

(ii) Successive price changes are identically distributed.

Where both these hold the RWM is satisfied. When the distribution referred to in (ii) is normal the stochastic process is said to be of the Wiener type.

Formally :

$$f(r_{j,t+1} \mid \phi_t) = f(r_{j,t+1}) \ , \qquad (5)$$

That is, the conditional and marginal probability distributions of an independent random variable are identical.

Stated in terms of the general model, (1) is restricted by the assumption that the expected return on share j is constant over time.

We have :

$$E(\tilde{r}_{j,t+1} \mid \phi_t) = E(\tilde{r}_{j,t+1}) \qquad (6)$$

This satisfies the independence condition but not the distribution condition. It defines ϕ_t as share j's price history.

The RWM thus implies considerably more than the

general assertion of (1). Although the work of Paul Samuelson (1965) and Benoit Mandelbrot (1966) have rigorously shown that the independence of successive price changes is consistent with the EMH, it is submitted that a lack of correlation would be sufficient to support the weak form EMH in an economic sense. That is, a lack of correlation would prevent abnormal returns by trading strategies based only on ϕ_t, defined as the past price history.

Thus it should be seen that the rejection of the RWM does not necessarily constitute a rejection of the EMH. However it must be emphasised that the assertion of an efficient market is vastly stronger than the assertion that successive changes in share prices are independent of one another.

Cheng and Deets (1971) explain the EMH as requiring successive price changes to be mutually stochastically independent and not just pairwise independent[16] which would be sufficient for the RWM. It is submitted that this statement illustrates some of the confusion in the literature and is rejected in economic terms. In the words of Fama (1970):

> 'Thus it is not surprising that empirical tests of the "random walk" model that are in fact tests of "fair game" properties are

> more strongly in support of the model than tests of the additional (and, from the viewpoint of expected return market efficiency, superfluous) pure independence assumption.' (p.387)

3.5 HISTORICAL DEVELOPMENT OF RWT AND EMH

A brief description of the theory's development is considered appropriate which will consist of a chronological survey. However, it must be borne in mind that the theory as explained in this discourse was not developed until after most of the early empirical work.

It was not until the work of Samuelson (1965) and Mandelbrot (1966) in the mid sixties that the 'fair game' or RW theories were developed. Till then however, a fair deal of work was done normally on the sub-Martingale model.

The term 'random walk' was first coined by Karl Pearson and the R^t Hon Lord Rayleigh in 'The problem of the Random walk' in the context of establishing the most efficient search strategy for a drunk who had been left in the middle of a field. Such a walk was purported to have no discernable pattern and the most efficient search strategy would be to merely look at the starting point.

As applied to market prices, Bachelier (1900) made a study

of French commodity prices and found them to be of a random nature, that is, in speculative terms, he concluded that the current price of a commodity was an unbiased estimator of its future price. This, of course, was a Martingale. However the work of Bachelier was ignored although it was 'pregnant with meaning'[17] for investors. In such a market the expected profits of speculation are nil.

Working (1934) theorised on the random nature of prices. However Kendall (1953) in 1953 added some empirical evidence to the debate of the random character of commodity prices in a competitive market. In 1959 Osborne (1959) (a physical scientist) carried out empirical work on the NYSE and likened the pattern of successive price changes to the random movement of particles in solution (known as Brownian movement).

None of these researchers attempted to expound an economic rationale on the phenomenon.

Alexander (1961) used the 'filter rule' technique to determine whether abnormal returns were possible by an analysis of the historical prices. Although this crude study showed slight abnormal returns (they were considered too small to cover even transaction costs), it represents the emergence of a theory for, having introduced the 'fair game' explicitly, Alexander impliedly suggests that the fair game assumption was not sufficient to lead

to a strict random walk.

In the mid sixties Samuelson, Mandelbrot, Cootner, Fama, et al, articulated the EMH.

3.6 MARKET CONDITIONS CONSISTENT WITH EFFICIENCY

To discuss the evidence for the EMH in any market it is necessary to understand the underlying economic rationale so that the implications are carefully discerned and distinguished.

If the prices in a market are to fully reflect a certain information set at all times it is obvious, by definition, that incremental information would need to be impounded instantaneously for the hypothesis to hold true.

If this were the case and because there is no reason to believe that information generating events occur non-randomly, successive changes of price in an efficient market would be random. Non-randomness would indicate a slow adjustment to information in that there would be a trend through successive time periods as the price moved towards a new equilibrium. Such a market would be inefficient by definition since the share price would not 'fully reflect' all information at each time interval.

The following conditions are generally accepted as being

sufficient for an efficient market :

- Zero transaction costs
- All information is costlessly available to all participants
- All participants have homogeneous expectations with regard to prices.

In testing for the validity of the EMH one is really trying to establish the extent to which these conditions are satisfied, for in this extreme form the condition is a tautology with respect to efficiency in the Fama sense.[18]

Fama shows that these conditions can be considerably relaxed and still conform to market efficiency which manifests in prices fully reflecting available information.

Namely :

- Information is available to a sufficient number of participants
- Transaction costs are reasonable
- In the absence of homogeneous beliefs there be no evidence of consistent superiority or inferiority by significant participants.

In this form however, the condition is difficult to achieve in the real world. The terms are too nebulous to be of real value, e.g. the extent of the term 'sufficient', and the meaning of 'reasonable' do not

lend themselves easily to empirical analysis.

That is why the efficiency concept as embodied in the EMH can only be tested in an indirect fashion. These tests may be categorised :

(i) Weak form tests : Fair game implication tests
  (a) statistical
  (b) investment strategy

(ii) Semi strong form tests : Direct tests of the 'speed of adjustment' property

(iii) Strong form tests : Fair game property with inside knowledge.

To epitomise the relationship between the concepts introduced and the implications of such, the following points are emphasised :

- An efficient market will exhibit the fair game property of the Martingales.
- The strict RWM is a stronger assertion than the Martingales.
- A rejection of the RWM is not necessarily a rejection of the Martingales and thus weak form EMH.
- The efficient market assertion is stronger than the RWM. Thus an acceptance of the RWM is only

> consistent with the fair game property of the weak form EMH and not sufficient to prove it.[19]

Having closely examined the functions of a share market and the concept of efficiency and having formally introduced the EMH, the implications of this hypothesis will now be examined in Chapter 4.

CHAPTER 3

FOOTNOTES

1. See Baumol (1965).

2. That is the variables are treated as controllable and overall allocation is attempted via allocation models.

3. The allocation of real capital is not static but constantly moving to new equilibria for optimal use.

4. No flow of funds between share market investors and real asset investors.

5. Although no statistics were found pertaining to South African market, Donaldson (1961) presents evidence of management reluctance to raise new capital on the NYSE.

6. Applying marginalist theory (in a micro-economic sense) to finance capital the perceived marginal efficiency of investment (MEI) will be distorted and thus the MEI ≡ MEC (marginal efficiency of capital) parity construed will be sub-optimal. (See Junankar(1972).)

7. Sunder's assumption re one of the objectives of management as being to maximise the share price is ignored. Sunder (1973).

8. See footnote 5.

9. The term "competitor" is used in the widest possible sense,

taking the view that all firms compete for financial resources.

10. Again no local statistics available, however inferred from U.S. evidence. See Baumol (1966).

11. That equilibrium will be reached where no-one is able to become better off without making someone worse off.

12. A hypothesis adaptable to any competitive market. The validity of the hypothesis can only be considered in the context of a specific market. To cite empirical support for the EMH per se is meaningless since the evidence is non-transferable, support in a particular market does not constitute support in another, but merely provides evidence of 'efficiency' in the tested market.

13. The distinction of form was first proposed by Harry Roberts (1959).

14. There is scope for much debate on risk definition. In this thesis only the beta (β) risk is considered. This will be expanded on in chapter 6.

15. The notation used is that initially used by Fama (1970).

16. Mutually stochastic independence implies pairwise independence but not vice versa.

17. See Hamilton and Lorie (1973)(p.72).

18. It is tautological in that it merely restates the hypothesis

another way.

19. The difficulty in grasping these concepts is acknowledged by Fama (1973) and LeRoy (1976). Further the works of Gilbertson and Roux (1976) and Strebel (1977)(in the South African literature) seem to confuse these issues.

CHAPTER 4

THE IMPLICATIONS OF THE EFFICIENT MARKET HYPOTHESIS

4.1 PREAMBLE

In this chapter the implications of an efficient share market as defined in the EMH will be considered from the viewpoints of a variety of economic agents. An emphasis will be placed on those implications for the accounting process.[1]

However, before leaving the definitional domain introduced in chapter 3, a brief caveat will be issued on the EMH with particular reference to an alternative perspective and a definition of efficiency in the share market context. Furthermore, a survey of empirical work on the EMH on the JSE will be presented before introducing the implications of the EMH.

4.2 A CAVEAT TO THE INFORMATION EFFICIENCY CONCEPT IMPLIED BY THE EMH[2]

Although the various limitations of the EMH will be acknowledged during the discussion on the implications, it is considered appropriate to expose the theoretical definition of the EMH, as illustrated in the previous chapter, to certain criticisms.

In Fama's definition[3], he claims that an efficient market is one in which prices fully reflect all publicly known

information on future share prices. That is, the market is said to be 'efficient' in relation to a generally defined information set. This is a trivial definition in a perfect market composed of rational individuals with homogeneous beliefs about future prices since it is obvious that if all market participants (a) have all information and (b) know their beliefs are shared by all as to the implications of their information, then the information will be 'fully reflected' in prevailing share prices.

If the assumption of homogeneous beliefs is dropped,[4] and the real world heterogeneous beliefs phenomenon is admitted to the discussion,[5] it becomes apparent that a remarkable number of investors could behave in a sub-optimal fashion, but that the market would still be defined as 'Fama-efficient'. This is illustrated by the following example : if an investor knows only a portion of all information and/or believes his information not yet to be impounded into share prices and/or has a different view to other participants as to the implications of an information set, he is likely to perceive certain shares to be over- or undervalued. As a result he is likely to diversify inefficiently. However, he may be unable to earn an abnormal return and thus the market will simultaneously harbour fairly pervasive suboptimal behaviour on the part of participants as well as exhibit Fama-efficiency.

An attempt has been made in academic literature [6] to refine the information efficiency concept in order to remove the abovementioned inconsistency and to extricate it from the Expected Returns domain.

Rubinstein's work is of great interest.[7] He distinguished between new information and all information and defined three types of beliefs, namely homogeneous beliefs, non-speculative beliefs and consensus beliefs.

Non-speculative beliefs are those beliefs for which no portfolio revision is an optimal strategy.

Consensus beliefs can be defined as those beliefs held by an individual who perceives all the information he has to be reflected in share prices.

Rubinstein then proves theoretically, in a fairly general context, a definition of efficiency which includes volume of trading. He distinguishes between trading volume per se and speculative trading.

Moreover, he developed the following axioms :

(1) If all individuals have homogeneous beliefs then all individuals have non-speculative beliefs.

(2) If an individual has consensus beliefs then he has non-speculative beliefs.

Thus he proves :

The condition of homogeneous beliefs is sufficient and,

if consensus beliefs are unique, also necessary for all individuals to perceive all information fully reflected in prices.

The condition of consensus beliefs is necessary and sufficient for all individuals to perceive new information fully reflected in prices.

If all individuals had non-speculative beliefs this would be a necessary and sufficient condition for each individual to perceive his new information fully reflected in share prices[8,9].

The purpose of this caveat was not to undermine the EMH but rather to delineate the ambit of its application to (accounting) information research.

Although Rubinstein and Verrecchia have explicitly attempted to extend the information efficiency concept, the existence of consensus beliefs is of little use outside the academic world unless it is established what information is implied by each consensus belief.

It is submitted that from an accounting standpoint the crucial area to address is not share market efficiency per se, but this implied underlying 'information market'. The above treatise illustrates various relationships in this market although it was not explicitly defined.

Although motivated by the EMH and carried out in a

conventional way[10], the analysis will be undertaken within an expounded conceptual framework. The purpose is to explore the underlying information market[11], and the various factors which may intervene and influence its operation. This approach is directed purely towards accounting research and is presented in chapter 5.

4.3 THE EVIDENCE FOR THE VALIDITY OF THE EMH ON THE JSE

4.3.1 OVERVIEW

A brief survey follows of the empirical evidence for the efficiency or otherwise of the JSE[12]. As there has been a relative scarcity of share market studies in South Africa, the survey will examine various methodological and technical issues encountered in these studies.

The studies will be surveyed through the various levels of the EMH, namely :

(1) Weak Form Tests

(A) Non Correlation Property	(i) Serial correlation tests
	(ii) Runs tests
(B) Homogeneous distribution Property	(i) Distribution tests
(C) Fair Game Property	(i) Trading Rule (TR) tests

(2) Semi Strong Form Tests

Speed of Adjustment tests[13] - No studies[14]

(3) Strong Form Tests

Mutual Fund performance tests

4.3.2 WEAK FORM TESTS

(A) Tests of the non correlation of returns property

(i) Serial correlation tests

Recall equation (6) of chapter 3 :

$$E(\tilde{r}_{j,t+1} \mid \phi_t) = E(\tilde{r}_{j,t+1}) \qquad (1)$$

Where ϕ_t defines the share price history, thus (1) represents the independence condition of the strict RWM. Bearing in mind that a lack of correlation in share returns is a sufficient condition for acceptance of the weak form EMH, tests evidencing a lack of such correlation in a series of share returns would constitute support for the weak form EMH[15].

One of the first share market tests in South Africa was published by Affleck-Graves and Money (1975). They performed a serial correlation test on the returns of 50 shares quoted on the JSE. They used weekly data on 10 lag categories[16], thus 500 coefficients of correlation were calculated[17].

The result was that 33 of the 500 were more than 2 standard deviations from zero, of which 14 were in the lags of 1 and 2 weeks. Accordingly

they concluded that the condition of zero-autocorrelation was a reality for lags of greater than 2 weeks. They admitted that the existence of 7 out of 50 coefficients greater than 2 standard deviations from zero, for lags of 1 and 2 weeks may indicate dependence. They concluded that the results were consistent with what would be expected for weak form efficiency for 80% of the market. Furthermore, they suggest that what little dependence may exist would be useless to a Technical Analyst attempting to earn an abnormal return by analysing price histories[18].

Although in support of the weak form EMH the results are by no means categoric. The authors acknowledge that the conclusions drawn, although logical, are dependent on the implicit assumptions which underlie the tests, namely, normally distributed returns and finite variance.

In a further test on the same data Affleck-Graves (1974) applied the non-parametric Wald-Wolfowitz test[19]. The results led to similar conclusions as the parametric test referred to above. The null hypothesis (i.e. that returns were random) was rejected for a number of shares, however the weak form EMH was an accurate description of most of the

market. Affleck-Graves performed runs tests reviewed in the next section.

Two other works on serial correlation were subsequently published indicating support for the weak form EMH[20]. However, in both tests a certain amount of dependence was observed but not to such an extent as to constitute support for rejection of the weak form EMH. The researchers simultaneously reported the results of runs tests which are reviewed in the next section as well.

It is submitted that an acceptance of zero-autocorrelation is not unjustified on the JSE, thus providing evidence consistent with the weak form EMH. The Technical Analyst could argue that non-linear correlations would escape detection in such tests. These correlations could be capitalised on and thus earn the analyst abnormal returns thus contradicting the EMH. This emphasises how zero-autocorrelation is a condition consistent with the weak form EMH and not a proof. The argument of the analyst is unsupported empirically.

(ii) Runs Tests

A runs test is a test of randomness where a run is defined as a sequence of the same sign

in a time series of data (i.e. positive, negative or zero). In this case it is a sequence of increasing, decreasing or constant price changes that determine the runs.

Affleck-Graves (1974) performed runs test on the same data used in the serial correlation tests referred to above. His results accepted the null hypothesis of randomness at a 95% confidence interval thus concurring with the conclusions of his previous tests. There was evidence consistent with the weak form efficient market condition.

In contrast to their serial correlation tests both Hadassin (1976) and Roux and Gilbertson (1977) found evidence of non-random behaviour.

Hadassin reports significant dependence in share price changes of 24 out of 30 shares using a differencing interval of 1 day and of 12 out of 30 for a differencing interval of 4 days. He thus concluded :

> '(The JSE) ... has been proved to be an inefficient market ... thus ... chartists ... should be able to make greater returns than those of the market.' (p.24)

Roux and Gilbertson admit evidence of non-random

behaviour and thus for rejection of the weak form EMH. However, they point out that a certain dependence has been exhibited by erstwhile efficient markets as shown by Solnik (1973) on the Paris Bourse and by Fama (1965) on the NYSE[21].

Strebel and Saloner (1977) carried out runs tests on 10 highly traded shares and obtained results that evidenced non-randomness, thus being consistent with the weak form EMH. However, they found the converse on 10 thinly traded shares. Their observation on the dependence of Beta (β) on volume and the implied inefficiency of the thinly traded section of the market is addressed in the next section.

The evidence from runs tests is not conclusive even if any shortcomings in method are ignored.

The general conclusion drawn from tests on the correlation condition is that the JSE conforms to a weak form efficient market.

(B) Homogeneous Distribution

Roux and Gilbertson (1976) and Ozen (1977) reported strongly leptokurtic characteristics for the distributions of share returns, i.e. strongly peaked distributions with long tails.

On 6 highly traded shares Schlosberg (1976) compared the distributions to the normal, stable Paretian, Student-t and Compound normal models. He showed that the Student-t and Compound normal provided the best fit. Further, he showed that over short periods share returns do exhibit homogeneous distributions. These short term distributions have been shown to be normal or leptokurtic[22]. Over longer periods these distributions combine to form the Student-t or Compound normal observed by Schlosberg.

Strebel (1977) suggests that thinly traded shares exhibit non-randomness and have lepto-kurtic distributions. He does however acknowledge the very limited number of shares examined. This conclusion he finds consistent with his own runs tests referred to above. He also acknowledged the limited extent of these tests being on only 10 highly traded and 10 thinly traded shares.

The major import of this evidence is not merely to the acceptance or rejection of the RWM but to the appropriatness of statistical tests involving the assumption of a normally distributed population. Strebel states that any test on the JSE which involves an explicit

or implicit assumption of normality would only be appropriate to highly traded shares. He further defines highly traded as those shares with an annual traded volume of 250 000 and more.

This conclusion seems to be based on 3 studies involving only 31 shares :

(1) Strebel and Saloner (1977) using runs tests on 10 shares of each category (i.e. highly and thinly traded) showed that the highly traded shares exhibited randomness while thinly traded shares exhibited non-randomness.

(2) Schlosberg (1976) showed that 5 of the 6 highly traded shares he studied were best described as having a Student-t or Compound normal distribution of returns. Thus not too great a departure from normality. The distributions were symmetrical.

(3) Ozen (1977) showed on tests of only 5 shares that those with leptokurtic characteristics exhibited non-randomness while those with quasi-normal characteristics exhibited randomness.

Although each study is internally valid, the general conclusions drawn from each as to the

whole market are to be cautioned, in view of the limited number of shares examined. It is respectfully submitted that Strebel's final assertion, based on the above, that thinly traded shares on the JSE have lepto-kurtic distributions of returns is not justified.

In another paper Strebel (1978) argues that, inter alia, linear regression tests on thinly traded shares would be worthless as the normality assumption was not valid for these shares. The normality assumption of Ordinary Lease Squares Regression (OLSR) only applies to the tests of significance of the parameters calculated, e.g. F-tests. Notwithstanding any distribution that may prevail the OLSR model, as applied in this study, establishes the best linear unbiased estimate of the relationship being explored.

However the departure from zero-autocorrelation, which Strebel suggests is associated with thinly traded shares, could present a problem to the current model. The estimates, of course, would be unbiased and considering the lack of pervasive evidence to the contrary[23], and the existence of evidence supporting zero-auto-correlation of returns for shares on the JSE[24],

it is submitted that the assumption is valid for the current study. A departure from auto-correlation is unlikely to be an undermining factor to this study[25].

(C) Fair Game property tests.

Trading Rule (TR) Studies.

The rationale behind such an approach to testing the weak form EMH is that for the fair game property to hold[26], no mechanistic market strategy based on historic prices (and volumes) should be able to consistently outperform the market.

Roux and Gilbertson (1976) used the TR approach on the JSE. This is the only published work in this category.

They applied 4 different TRs to 24 shares and found that a buy and hold (B&H) strategy consistently outperformed the TR in each case. This result, they claim, constitutes evidence consistent with the weak form EMH.

Bear and Stevenson (1976), have suggested that the TR approach is the only method of testing market efficiency directly. It is respectfully submitted however that the TR approach is the most indirect test of market efficiency, in

that failure to establish a TR which consistently outperforms the market is merely consistent with the notion of efficiency. This is certainly far short of asserting efficiency. Admittedly the existence of a TR which consistently outperformed the market would constitute a rejection of the EMH, subject to the below-mentioned constraints.

These constraints, the first three of which were acknowledged by Roux and Gilbertson and partially adjusted for subsequently[27], are :

(1) The comparison is biased toward rejection of the TR due to the differences in expected returns with the B&H.[28]

(2) Short term interest rates on uninvested cash should be accounted for.[29]

(3) The outperformance by the B&H must be consistent.

(4) The implicit assumption, that all transactions can be executed at the price which signals action, may not be valid.[30]

Strebel (1977) points out that the TR approach does not avoid the importing of some implicit model with attendant questions of validity.[31] This is so because to compare the two sets of

returns they must be positioned in the same risk class. Thus a market model is implied.

In an interesting application of the TR approach to their previous results, Roux and Gilbertson applied the TRs to the shares which had exhibited non-randomness in their serial correlation tests referred to above. The TRs failed to outperform the B&H strategy. They concluded that the correlation exhibited was insufficient to be capitalised into a trading rule to earn an abnormal return. However, they ignore the possibility of the existence of a more sophisticated rule which could outperform a B&H strategy on the shares exhibiting non-randomness in particular and the market in general.

The general appropriateness of the TR approach and the results of this particular study are inconclusive.

The reader is referred to Jensen (1967) Levy (1967) Praetz (1976) and Bear and Stevenson (1976) for a full debate on the TR approach and for empirical evidence for and against the existence of successful TRs on the NYSE.

Conclusion on the evidence for weak form Efficiency

Despite Strebel's objections it seems that the evidence reviewed supports, in the main, the validity of the weak form EMH on the JSE. Further work is obviously required to validate the complete veracity of the assertion.

4.3.3 STRONG FORM TESTS

MUTUAL FUND PERFORMANCE

Tests of the performance of professionally managed portfolios, such as unit trusts, are generally classified as strong form tests, (see Dyckman, Downes and Magee (1975,p.31)), the rationale being that the managers of these funds are more likely to have access to inside information than the average investor. Thus if these funds could be shown to outperform the average or overall market performance it could be concluded that the market was not efficient in the strong form. However if the premise that the managers do have access to inside information, is incorrect then it is the semi-strong form of the EMH that would be negated.[32] This is so because the funds would be earning an abnormal return by analysing publicly available information. Alternatively, it may be the fair game property of the weak form EMH that would be contradicted.

On the other hand if the funds are proved not to be outperforming the market this would indicate consistency with the strong form EMH, on the premise of access to inside information. If the premise is incorrect and the managers only have publicly available information, consistency only with the semi-strong form may be inferred. Thus the Mutual Fund tests would only be giving the negative assurance of a TR test.[33]

The above illustrates the further problems encountered in hypothesis setting on venturing beyond the weak form EMH. This problem is compounded by the use of indirect negative assurance tests such as mutual fund performance measurement.

Tests of this nature carried out in the United States can be criticised on the above grounds. However certain cognisance has been taken of the problem and the literature indicates that the conclusions have been drawn cautiously. The reader is referred particularly to Jensen (1969(a)) and Friend, Blume and Crockett (1970). These studies indicated that the Funds tested did not outperform the market. There has been a certain misconception that based on these results portfolio managers are proved incompetent. Jensen (1969(a)) asserts that this notion is unjustified as the efficiency of portfolio management should be measured and

compared with the market in ex ante terms and not in ex post terms as in the studies.[34]

There have been two studies published of this type on the JSE; Du Plessis (1974) and Roux and Gilbertson (1976).

Although involving a number of unresolved methodological issues (see Roux and Gilbertson (1976) and Strebel (1977) the results indicate that the funds did not outperform the market. In view of these unresolved methodological issues[35], and the hypothesis setting problems referred to only very tentative conclusions should be drawn from these studies. Suffice to say that the results constitute negative assurance vis à vis efficiency on the JSE subject to the reservations cited.

4.3.4 CONCLUSION ON THE EVIDENCE FOR THE EMH IN THE CONTEXT OF THE JSE

The evidence is by no means voluminous nor conclusive, and seems particularly weak when compared to the evidence on the efficiency of the NYSE.[36] Further, Strebel suggests that the results are not conclusive because the tests to date may have been bedevilled by the phenomenon of 50% of the shares on the JSE being thinly traded.[37] The current study will be defended in chapter 6. The methodology presented is considered invulnerable, in the main, to this

confounding effect. Notwithstanding Strebel's posture on this issue, it is submitted that the evidence for acceptance of the weak form EMH outweighs evidence to the contrary. However no statement is made, even tentatively, on the EMH in any other form in the context of the JSE. It is emphasised that this conclusion does not imply that the JSE is inefficient but merely that its efficiency has not been established. Presently, it is not possible to discuss the implications of the JSE market condition. The following section introduces the implications of efficiency in any market of proven efficiency.

4.4 THE IMPLICATIONS OF THE EFFICIENT MARKET HYPOTHESIS

The implications will firstly be discussed in a general way. The purpose of this will be to highlight those which are relevant to most of the classes of economic agents. The implications will then be presented from the standpoint of various classes of these agents. Within each category the presentation will be directed at each form of the EMH. Finally, the categories of economic agents involved directly in the accounting process will be grouped.

4.4.1 THE GENERAL IMPLICATIONS

The general implications illustrated here are really manifestations of an efficient market. It is

those conditions that create the implications for the economy as a whole.

It is considered useful to proceed by listing these conditions[38]:

(1) Prices fully reflect an implied information set depending on the form of efficiency assumed. ~~essential~~.

(2) Incremental information is instantaneously impounded into prices in an unbiased fashion.

(3) Price changes conform to a random distribution.

(4) The price of a share will be euqal to its intrinsic value in an efficient market of the strong form. However, even in a semi-strong efficient market the price is likely to fluctuate randomly about this value. 'Intrinsic value' is defined as that equilibrium price which would prevail if each individual published all his information, i.e. a market within which all participants have homogeneous beliefs.

It is emphasised that the information referred to is a subset of all information. This subset is that information relevant to future prices known currently. This observation uncovers the competitive

nature of the various sources and types of information. Accounting constitutes only one source of firm specific information which competes with all other sources of firm specific information and all economy wide information sources[39].

4.4.2 THE IMPLICATIONS TO THE ECONOMY

Lord Keynes stated[40]:

> "When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done."

Although made prior to the appearnace of the EMH the comment was made in the context of share markets, referring to the random nature of share prices. However, certain writers have relied on the sentiments expressed to suggest that an implication of the EMH would be a capricious allocation of resources[41], both financial and real. It was their intent to undermine the propriety of the efficient markets paradigm.

Presumably the writers have been alluding to the unpredictability of share price movements and thus are equating such movements to the outcome of an unbiased roulette wheel. The share market and the casino do share the uncertainty condition with regard to the future. To extend the comparison

beyond this attribute would be to ignore the underlying process of causality. The numbers successively emergent from an unbiased roulette wheel are caused by the condition of 37 equi-probable outcomes[42], and, more importantly, each outcome has no information on future or past outcomes. The numbers successively emergent in a share market are the products of economic events and each share price reflects the more likely future value based on current information. It is the random nature of economic events that consequently give share price returns their random nature in an efficient market.

The misconception does highlight two implications of the EMH :

(1) In an efficient market share prices adjust quickly and without bias to new information and,

(2) the information is effectively impounded into share prices.

The proponents of the casino-like nature of the EMH seem to have ignored the second implication. (see Keane (1979,p.196)

It is submitted that the capital allocation is more likely to be a by-product of the activities of a

casino in an efficient market. Lord Keynes seems to have uncovered the paradox of heterogeneous beliefs in an efficient market.[43]

The implications of the EMH to an economy are best viewed in relation to the functions of the share market as expounded in chapter 3.

The pricing mechanism would be as accurate as the underlying information market will allow it to be. However, the market would be fulfilling efficiently only those functions mentioned in that chapter. The EMH gives no insight into the overall economic efficiency of a share market, that is, the other functions of a share market may not be working well and yet exhibit efficiency in the EMH sense.

The implications of an inefficient market are, of course, the most interesting : there would be a capricious pricing mechanism and a number of the share market's roles would be performed badly resulting in an immediate misallocation of funds among investors and ultimately in sub-optimal financial resource allocation to firms with the attendant misallocations of real resources in the economy.

However, the above statement is strongly qualified within the perspective of chapter 3 on the role of share markets. Assuming all other institutions to be operating effectively, the implications of an inefficient market would be dampened. Further, there is a need to consider the extent of inefficiency. For example, the market may be reacting correctly to information, but slowly. This will not have as disruptive an effect as the market wherein the information is reacted to slowly and incorrectly.

The main objective of this section has been to clarify certain misconceptions of the EMH. However, it was designed to re-emphasise the conclusion reached in chapter 3 of the limited ambit of the EMH which then illustrates the limited implications of this hypothesis.

4.4.3 THE IMPLICATIONS TO THE INVESTMENT COMMUNITY

In the weak form the EMH implies that all efforts of analysing a share price history to predict future prices and so to earn an abnormal return, are futile. That is, the efforts of the technical analyst (chartist) are valueless. It is an easy task to construct a chart and show what the pattern of share price movements has been and illustrate signals after the event. What the EMH in its weak

form suggests is that accurate prediction cannot be made before the event ; it is not possible to indicate in advance which shares will follow which patterns or when they will do so. No academic work has shown that charting has an abnormal return. The reader is referred to Black for support of these views.

It has been acknowledged by Lorie and Hamilton (1973) that abnormal returns could be earned by the fundamentalist if the magnitude of funds invested were sufficient[45], or if there was sound originality employed in the analysis.

The further implication of the EMH is imparted by the fair game property previously referred to. This implies that no participant is able to earn a larger return than the overall market, that is, the investor cannot 'beat the market'. That is not to say that in ex post terms a particular share will not be able to earn an above market average return[46]. However, it does imply that an investor cannot have a greater expected return than that commensurate with the ex ante risk relation to a market portfolio.[47] Moreover, it should be noted that in an efficient market investors' expected returns are not zero, but that it is merely the expected return from analysing defined sets of

information which is zero.

It is submitted that the major implication of share market efficiency to the investment community is the import of modern Portfolio Theory[48,49].

Since the implications of Portfolio Theory to accounting will be expanded upon in the next section, it is sufficient to state that the underlying explicit assumption of the theory is market efficiency. Thus a major implication of the EMH to an investment community in which such a hypothesis is evidenced as being a reality is the general appropriateness of applying portfolio theory. Conversely, if a market is not efficient a modern portfolio selection approach would not seem appropriate.

This is illustrated by the passive strategy suggested by Black (1971) which will be referred to in the following section.

The far-reaching impact of the EMH on the investing community has been highlighted. However, there is a certain paradox between the EMH and its implications for investment which was succinctly illustrated by Lorie and Hamilton (1973).

"There is a curious paradox. In order for the

(efficient market) hypothesis to be true, it is necessary for many investors to disbelieve it. That is, market prices will promptly and fully reflect what is knowable about the companies whose shares are traded only if investors seek to earn superior returns, make conscientious and competent efforts to learn about the companies whose securities are traded, and analyse relevant information promptly and perceptively. If that effort were abandoned the efficiency of the market would diminish rapidly." (p.98)

This paradox can be compared to the paradox on any competitive market where abnormal profits are competed away so that participants earn only that return commensurate with the risk taken.

4.4.4 THE IMPLICATIONS FOR FINANCIAL REPORTING

The term financial reporting has been used to emphasise the reference to external, as opposed to internal accounting. The dichotomisation of accounting into external and internal categories is particularly useful for discussing the implications of the EMH for accounting.[50] Obviously it is the external report that constitutes an element of publicly available information and not internal reports. It is the implications of the semi-strong

form of the EMH that are important to the accountant.

Although the objectives of accounting have not been clearly divided or agreed upon universally,[51] it is reasonable to assert that the primary function of accounting is to provided information useful to economic decision making. Support for this premise is given by Beaver (1972) where he states the premise as follows :

> '... the purpose of accounting is to facilitate decision making' (pp 408-409)

Further support is given by both the Trueblood and Corporate reports.[52]

Given this objective and given the fact that investors in the share market constitute a major class of economic decision makers, any insight into the workings of this market should be useful to accountants. Thus if accountants ignore the evidence, both theoretical and empirical, on how the market impounds information, it is unlikely that the stated objective of financial reporting can be fully achieved.

Furthermore, if the objective as stated, could be expanded to that of providing an optimal information set[53], which is intuitively appealing, an insight into the impact of accounting data on share prices

is indispensable.

The two aspects of the EMH previously delineated, namely,

(1) the aspect whereby relevant information is impounded quickly in an unbiased fashion and,

(2) the aspect whereby the relevant information is effectively impounded, (see Beaver (1973, p51))

are the most important to accounting.

The implication of (1) vis à vis accounting is that only relevant accounting information will be impounded instantaneously. Relevant information, in this context, refers to that information with predictive content, vis à vis future prices, not previously known to the market. This drastically reduces the focus of attention to only a sub-set of accounting information in a competitive information environment.

The implication of (2) is that the market will not be fooled by alternative accounting methods that have the same real informational value but generate different numbers.[54]

The implications that flow from this market condition for standard setting are substantial.[55] This is

so, not only because of efficiency per se but also because of the implications of modern Portfolio Theory. The acceptance of the EMH by the investment community will have certain implications for accounting. Reference was made in the previous section to particular works on Portfolio Theory and its development. Although this theory is fairly complex an attempt will be made, in a cursory comment, to convey the essence of that theory so that the implications to accounting may be discerned. The reader is referred to Beaver (1972) for a more in depth discussion.

Portfolio Theory had its genesis in the seminal work by Markowitz (1952) and later Tobin (1958). However, this was prior to development in Operations Research of such techniques as quadratic programming and prior to the development of modern computers. The relevance of this observation is that the Markowitz technique was extremely complex and required a formidable amount of mathematical computation. Without the convenience of modern technology the general acceptance of Markowitz' work was dampened for practical investors.

From the Markowitz' model Sharpe (1963), Lintner (1965) and Mossin (1966) independently developed the well known Capital Asset Pricing Model (CAPM).

It is emphasised that the various market condition assumptions introduced in developing the CAPM constitutes an assumption of the EMH.[56] The model states, notationally[57] :

$$E(R_{it}) = R_{ft} + \{E(R_{mt}) - R_{ft}\}\frac{\bar{0}(R_{it}, R_{mt})}{\bar{0}^2(R_{mt})}$$

with simplifying assumptions :

$$E(R_{it} \simeq R_{ft}(1-\beta_i) + \beta_i E(R_{mt})$$

where :

$$\beta_i \simeq \frac{\bar{0}(R_{it}, R_{mt})}{\bar{0}^2(R_{mt})}$$

$\bar{0}^2$ = variance

E = The expected value operator

R_{it} = The return on share i for period t

R_{ft} = The return on a risk free asset for period t

R_{mt} = The return on the market portfolio for period t

Thus the expected return on a particular share is a linear function of its systematic risk defined by β_i, that is, its responsiveness to the market factor.

The major import of the above is that the only risk of investment in a share that an investor is keen to know is β_i the systematic risk defined above.

This is so because the risk of an investment has two components, the β_i and what is referred to as unsystematic risk which is that risk peculiar to the firm. This is really a function of specific risk factors that have no association with the market or other firms in the market. The theory suggests that what is of concern to the investor is the expected return at a particular level of risk; however it is the risk of the portfolio as a whole that determines this return.

Defining the portfolio risk as follows :

$$\tilde{0}^2(R_{pt}) = \frac{1}{N}\overline{\tilde{0}^2(U_{it})} + \overline{\beta^2}\tilde{0}^2(R^1_{mt})$$

Where :

$\tilde{0}^2(R^1_{mt})$ is the variance of the market factor,

$\overline{\beta^2}$ is the average β squared,

N the number of shares in the portfolio,

$\tilde{0}^2(R_{pt})$ is the overall portfolio risk factor,

$\tilde{0}^2(U_{it})$ the average variance of the individualistic factors U_{it} [58]

It can be clearly shown that the impact of the individualistic risk factors of each component on the risk of the overall portfolio[59], can be driven to zero by increasing N, the number of shares

in the portfolio.

The systematic risk (β) however cannot be removed, hence the terms diversifiable and non diversifiable.

It is considered necessary to discuss the implications of the EMH for Financial Reporting within the context of an environment where risk averse investors hold well diversified portfolios of which the reporting entity is only one element.

It is important to establish the level at which the discussion takes place and further to indicate such changes in level as the discussion proceeds.[60] The different levels are :

- the individual level
- the market level.[61]

It is emphasised that what is true for the individuals comprising a market may not be true for the market as a whole.[62] Thus what is observable at an individual level may manifest in a completely different manner on aggregation to the market level.

The major implications of the EMH are at the market level. This does not mean that the EMH has no significant implications for individual behaviour, but rather that these implications are a consequence of the individual investor accepting the EMH.

STANDARD SETTING

There have been four Accounting Standards of Generally Accepted Accounting Practice (GAAP) issued by the National Council of Chartered Accountants[63](SA). At least two of these are redundant in an efficient capital market.[64] There is of course no substantive evidence of share market efficiency in S.A. Their redundancy stems from the fact that an efficient market is able to see behind purely bookkeeping entries. Thus it is a waste to expend resources defining such terms as "extraordinary items", "abnormal items", "prior year adjustments" and "interperiod tax allocation". The standard setters in an efficient market should focus attention on areas of accounting which may improve the information or predictive content of financial reports, e.g. replacement cost accounting, inflation adjusted accounting, etc.

To illustrate, it is proposed that these trivial accounting issues could be distinguished from the non-trivial by the following decision process : (diagrammatically shown in figure I).[65]

The starting point is an accounting dilemma :

(1) Define the dilemma :

- For example, should Deferred Tax be provided? Should Extraordinary Items be shown after the E.P.S. income figure?

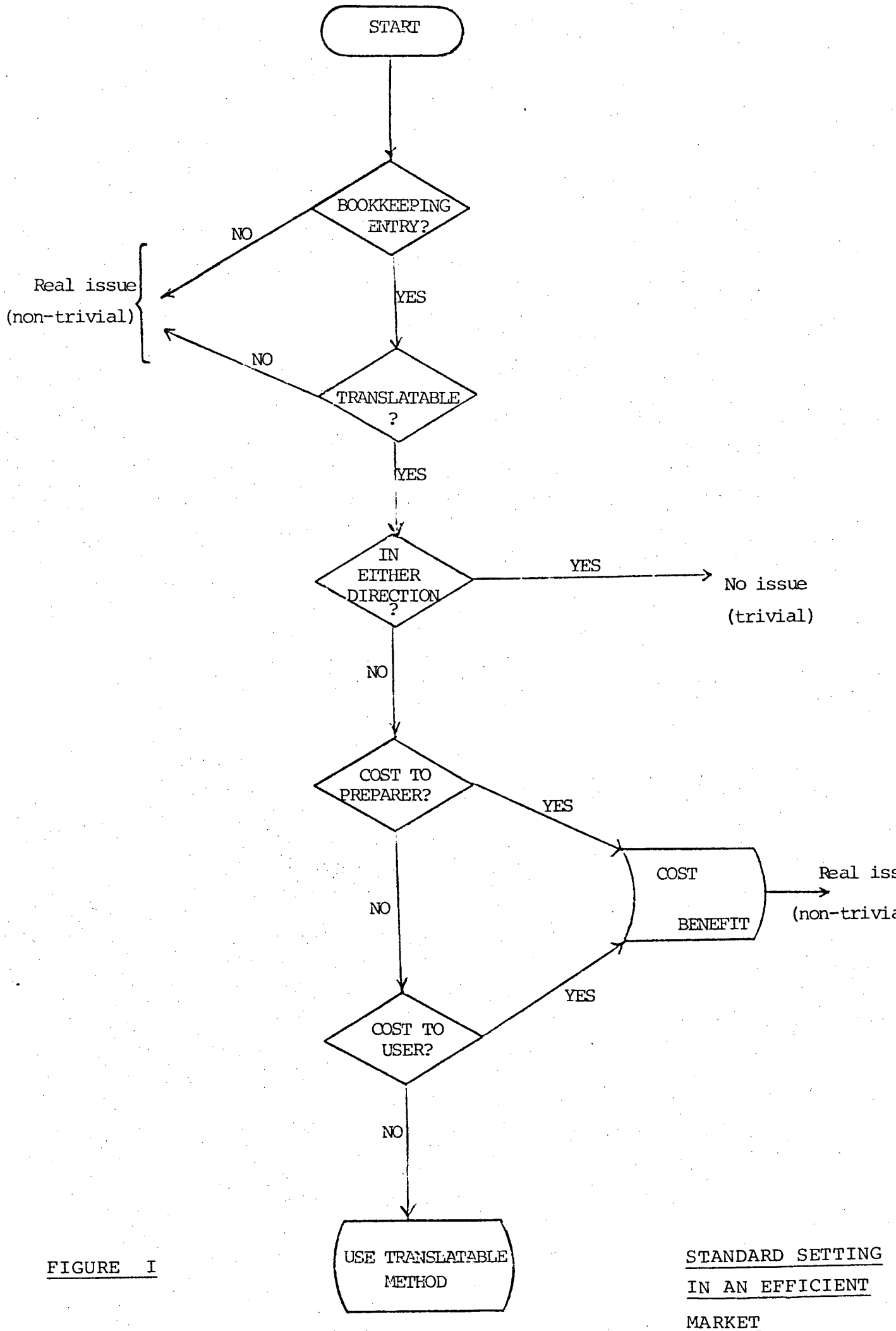


FIGURE I

STANDARD SETTING IN AN EFFICIENT MARKET

(2) Is it a purely bookkeeping entry?

- Deferred Tax is a purely bookkeeping entry. So is the disclosure of Extraordinary Items 'below the line'.

(3) Are the conflicting methods translatable either way?

- Deferred Tax is only translatable when provided, i.e. it can be reversed by the user. Once separately disclosed, the extraordinary item is translatable both ways.[66]

(4) Is there an additional cost to the preparer to provide either method?

- Unlikely for deferred tax as both the tax allowances and accounting deductions are computed whether deferred tax is provided or not. No cost to show the extraordinary item above or below.

(5) Is there a cost of adjustment to the user?

- No, in both cases.

Thus there is a prima facie evidence for providing deferred tax, but the dilemna of showing extra-ordinary items "above or below the line" becomes trivial. It is of no consequence in the efficient marketplace.

Thus most accounting dilemmas are solved within the cost constraints by ensuring that the method chosen is translatable to the alternative (or merely reversible). This would be achieved by disclosing one method with sufficient footnote disclosure to allow translation to the other method.

This simple solution in an efficient market would allow the Accounting Standards Committee to concentrate on the substantive issues including non-translatable methods, excessive costs methods to preparer or users and qualitative information issues, e.g. inflation adjusted accounts rather than historic cost accounts.

This illustrates that once the major concern that the market will be deceived by accounting numbers is removed by the assumption of efficiency many accounting problems will be reduced to trivia.

However, it could be argued that the individual investors may be deceived and that the standard setting body has an obligation to these naïve investors. In the light of the fair-game property of the EMH in which the naïve investor is a price taker, a more sophisticated investor has no advantage by virtue of his greater knowledge of publicly available information. Furthermore, portfolio theory

(see above) indicates that the well-diversified investor is not concerned with the unsystematic risk attaching to individual components of his portfolio.

The standard setters in an efficient market should actively discourage investors from trying to utilise accounting data to detect undervalued or overvalued shares.

As Beaver (1973) wrote :

> "(EMH and portfolio theory) implies that the FASB should actively discourage investors' beliefs that accounting data can be used to detect overvalued or undervalued securities. This also implies that the FASB must not attempt to reduce the complex events of multi-million dollar corporations to the level of understanding of the naïve, or, perhaps more appropriately labeled, ignorant investor. We must stop acting as if all - or even most - individual investors are literally involved in the process of interpreting the impact of accounting information upon the security prices of firms."(p.53)

In the same paper Beaver suggests that the role of the standard setter in the efficient market is a

pre-emptive one : to prevent insiders from being able to use information not publicly available to earn abnormal returns once the information is subsequently released. Thus the lack of cost of disclosing an item is prima facie evidence that the item should be disclosed.

The naïve investor is more likely to be harmed by other investors earning abnormal returns as a result of monopolistic access to information than by being deceived by the accounting data.

The EMH, if validated in South Africa, would have an effect on the approach to standard setting. To illustrate; the reader is referred to figure I in which the possibility exists of a cost benefit decision arising. This decision would need to be made in the context of the EMH and a competitive information market. The relevant question then follows: Is the cost of supplying the information in the annual report more or less than the cost to the users of gaining this information from alternative sources?

To summarise :
In an efficient market environment the standard setting Bodies should take cognisance of :

(1) Investors with well diversified portfolios of which the reporting entity is any one component.

(2) The competitive nature of information.

(3) The protection an efficient market affords naïve investors.

(4) The potential harm to investors of undisclosed information.

(5) The market will not be deceived by purely bookkeeping entries.

ACCOUNTING THEORY AND PRACTICE

Research on efficient markets has substantially improved the understanding of external accounting information. (See Dyckman, Downes, Magee (1975, p.87)) :

(1) Firstly, by providing a research methodology by which the association between accounting data and share prices may be investigated.

(2) Secondly, by providing an economic rationale for such methodology.

Beaver (1972) suggested that the accounting dilemna insolvable by the simple solution in figure I could be resolved by observing the association between the various alternatives. Using Efficient markets research methodology, the alternative having the largest impact on share price, should be chosen as the most

suitable. He claims that it is the method with the largest impact on share prices that has the greatest informational content, the rationale being that the share price change reflects the revealed preferences of the market. This is intuitively attractive reasoning for there has been considerable attention focused on the positive question[67]: "What do investors want or use?" Thus share market studies do at least investigate revealed preferences. Beaver's assertion has come under attack from various quarters : May and Sundem (1973) point out that the approach provides an incomplete basis for ranking alternative procedures since it cannot allow for the potential impact of alternatives that would produce information currently unknown in the market. Gonedes and Dopuch (1974) consider the ability of the market to provide signals for firms' information - production decisions under a series of five conditions. They prove that the EMH fails to provide criteria for optimal information-production decisions when individuals are able to obtain free access to information that is produced and need not decide which information to purchase. Furthermore, since non-purchasers cannot be excluded under the current institutional framework, the impact on share prices cannot be used to establish optimal information production policies.

However, the authors acknowledge the use of such associations referred to by Beaver in determining the effects of various accounting methods on share prices.

Dyckman, Downes and Magee (1975) observe that accounting policies are determined politically. Further, decisions are taken on the policymaker's belief as to the market reaction to such policies. They also claim that the FASB entertains arguments for and against various accounting methods based on beliefs of market reaction. As a number of the examples cited, e.g. extraordinary term disclosure and lease capitalisation, are issues on which the South African profession has expressed interest,[68] it is likely that similar arguments have been used locally. As the various accounting bodies do not make public their proceedings in South Africa, this speculation cannot be positively verified. If it be indeed the case, empirical evidence is required to substantiate these beliefs. This concern over potential market reaction is rooted in a concern for the undiversified investor. Even if there are undiversified investors in the market, which could arise in a market with naïve investors or investors with heterogeneous beliefs, it is submitted that this should not influence the policy maker in an efficient market environment. This

viewpoint is supported by Beaver (1974) :

> "(Nondiversification) at the individual investor level is not sufficient to warrant a consideration of unsystematic risk when making information policy decisions.
>
> It is important to distinguish between the private value of information (which considers one investor in isolation) and the social value of information (which considers all investors in the market). While an individual investor may be willing to pay to reduce his unsystematic risk, this in no way implies that society as a whole would be willing to expend real resources in the same manner." (p.569)

The implications for accounting of the EMH do not include the question of quantity or quality of accounting information. The EMH merely implies that accounting data will be used by the market to the extent that they have informational content not previously supplied to the market. Thus an efficient market condition should not be viewed by accountants as a reflection of the process of their endeavours.

The major implication is the perspective afforded by the EMH of the market to which accountants report.

Beaver's comments above summarise the posture that should be adopted.

It is emphasised that all the implications for accounting which have been examined only pertain to that function of accounting related to share markets and furthermore, only to share markets with exhibited efficiency. It is quite possible that the other functions of accounting (see the Trueblood and Corporate Reports [69]) warrant a posture which contradicts the EMH implications. Uses of financial statements by the other classes of economic decision makers such as regulatory bodies, merger transactors, etc. are not affected by the EMH.

The stance taken by Beaver has been criticised as extreme [70]. However, it is submitted that this is due to a misconception of the perimeters within which the EMH has implications for accounting. These delimitations of efficiency per se have an impact on accounting research. The co-existance of market efficiency and suboptimal diversification due to heterogeneous beliefs as referred to earlier in this chapter is likely to have implications for the accountant in his relationship with individual investors.

Bearing in mind the limitations, the current study investigates the validity of the EMH on the JSE. However, the approach taken is to attempt to establish an insight into the underlying market for information referred to. A conceptual framework for share market studies is now proposed, in chapter 5, to investigate the process by which accounting data are impounded into share prices.

CHAPTER 4

FOOTNOTES

1. The attest function is excluded from this definition of accounting process. There may be certain implications for the Auditor's legal liability. The reader is referred to Anderson (1977) for a discussion of this aspect.

2. It is the semi-strong form of the EMH that is to be emphasised in this chapter.

3. See Fama (1970).

4. Homogeneous beliefs vis à vis information and share prices is that state where each participant is aware of the implications for share prices of the information publicly available. Furthermore, each participant is aware that all other participants have the same information and attitudes on the implications for prices.

5. Heterogeneous beliefs are held where there is no general agreement between participants on the implications of information for prices. The knowledge of their fellow participants' attitudes is irrelevant.

6. See Rubinstein (1974) and Verrecchia (1979).

7. op. cit.

8. op. cit. (p.819)

9. Verrecchia (1979) proves the existence of consensus beliefs theoretically. See also Lintner (1969) and Telser (1972).

10. i.e. it is the speed of adjustment of share prices to incremental information that is being examined.

11. This market has been alluded to by Gonedes and Dopuch (1974).

12. As evidence for the EMH is not transferable from one market to another it is considered inappropriate to review the copious evidence for the EMH on the NYSE. The interested reader is referred to the didactic review of such by Fama (1970).

13. The current study constitutes the first of this type.

14. This fact is further acknowledged by Roux and Gilbertson (1976).

15. Such evidence would not necessarily prove the RWM.

16. These lag categories were lags of (1, 2, 3, 4, 5, 7, 9, 10, 15 and 20) weeks.

17. This was repeated for bi- and tri-weekly data. The results were substantially the same as for weekly data.

18. See section 4.4.3 for the implications for the Technical

Analyst of weak form efficiency.

19. Being a non-parametric test the Wald-Wolfowitz approach is independent of the population parameters from which the sample is drawn. Thus no specific assumptions of distribution are made.

20. Hadassin (1976) and Roux and Gilbertson (1977).

21. Their rationale for citing such presumably being that a small amount of dependence is not sufficient to reject the null hypothesis of randomness, and not the fact of consistency with the observations of efficient markets.

22. See Ozen (1977).

23. Strebel only examined 20 shares in total.

24. See Affleck-Graves and Money (1975) and Affleck-Graves (1974) and Roux and Gilbertson (1976).

25. A defence of the methodology is presented in chapter 6.

26. The fair game property of the EMH was described in chapter 3 section 3.4.1.

27. See Roux and Gilbertson (1978).

28. See Praetz (1976).

29. See Roux and Gilbertson (1978).

30. See Jensen (1967).

31. Refer to Strebel's concern for the appropriateness of statistical models assuming normality for thinly traded shares.

32. This would of course simultaneously negate the strong form.

33. Negative assurance means that the evidence does not contradict the hypothesis; however it does not prove it.

34. It is submitted that the failure of a Fund to outperform the market merely indicates that the managers are competing in an efficient market, not that they are incompetent.

35. These are not central to the current study but flow from Strebel's assertion on the inappropriateness of statistical models assuming normality in the context of thinly traded shares. Furthermore, Strebel and Saloner (1977) claim that because of the volume dependence of β (Beta) for these shares the CAPM is inappropriate. See also Saloner (1977) for the evidence of the volume dependence of β (Beta) for these shares.

36. See Fama (1970).

37. See section 4.3.2.

38. These were discussed in chapter 3.

39. The competitive nature of accounting numbers will be expanded upon in chapter 5. See Gonedes and Dopuch (1974).

40. See Keynes (1936).

41. Findlay III (1977) and Whittington (1979).

42. Ignoring the colour and odd/even combinations and assuming a roulette wheel with 1 zero.

43. Lord Keynes (1936) states in this regard :

> 'For it is not sensible to pay 25 for an investment of which you will believe the prospective yield to justify a value of 30, if you believe that the market will value it at 20 three months hence.'

The reader is referred to section 4.2 of this chapter where the problem of heterogeneous beliefs is addressed.

44. See Allen (1975).

45. The relative size of the abnormal return would be small, however with large quantities invested the absolute magnitude of returns could be large.

46. The average concept obviously implies amounts larger and smaller than the mean.

47. See Beaver (1972).

48. See Seneque (1977).

49. A digression will not be made into the topic, but the reader is referred to Markowitz' (1952) seminal work and to later developments in the works of Sharpe (1964) Lintner (1965) and Mossin (1966). A most readable account on the topic in the South African literature, by Seneque (1977), is recommended.

50. Gonedes (1972) acknowledges this fact.

51. See Dopuch and Sunder (1980).

52. These reports were issued by the American Institute of Certified Public Accountants (1973) and the Institute of Chartered Accountants in England and Wales (1975) respectively.

53. Gonedes and Dopuch (1974) refer to this objective.

54. An example would be the straight line method of depreciation vs the reducing balance method.

55. See Beaver (1972)(1973).

56. Essentially a perfect market was assumed,

    (1) Equilibrium prices
    (2) No transaction costs
    (3) Risk averse investors with the same one period horizons.

Naturally in such a market prices would react equally in an unbiased fashion to information.

57. Beaver's (1972) notation is used.

58. These define the risk peculiar to each share and are thus individualistic factors. In this context they refer to that portion of share price volatility not caused by covariance with the market.

59. Bearing in mind the risk-return relationship.

60. This delineation is important in all branches of economics and the reconciliation between micro- and macro-economics is not a resolved issue. See Samuelson (1970).

61. This is specifically referred to by Beaver (1972).

62. See Beaver (1972,p.408).

63. Now the South African Institute.

64. The statements issued are :

    1.001 The disclosure of accounting policies

    1.002 Taxation in the financial statements of Companies

    1.003 Extraordinary items and prior year adjustments

    1.004 Earnings per share.

65. This process is not meant to be prescriptive but merely a simple exposition on how in an efficient market certain

issues may be easily resolved.

66. By translatable it is merely meant that the numbers generated by one accounting method may be adjusted, with available information, in order to ascertain the numbers that would have been generated by an alternative method.

67. See Benston (1980) and Hendriksen (1977).

68. Documents issued by the South African Institute :

    1.003 on Extraordinary items

    ED22 on Lease Capitalisation

    ED27 on Depreciation.

69. See footnote 52.

70. See Bierman (1974) and Anderson and Meyers (1975). No attempt has been made to answer these criticisms specifically; Beaver adequately does so himself.

CHAPTER 5

A PROPOSED CONCEPTUAL FRAMEWORK FOR THE INVESTIGATION OF THE RELATIONSHIP BETWEEN ACCOUNTING CHANGES AND SHARE PRICES

5.1 INTRODUCTION

This chapter seeks to provide a framework, within which the current study is couched, which may provide a useful guide to further empirical research of this nature.

The limitations of the implications of the EMH for accounting are introduced notationally in section 5.2 with particular reference to the inability of capital market efficiency per se to justify the use of share prices in assessing the desirability of alternative accounting methods. Section 5.3 introduces the concept of the competitive nature of accounting information. Section 5.4 suggests the use of empirical research on accounting changes in a capital market setting for an insight into the rôle of information in share price generation. This is within a proposed conceptual framework. Section 5.5 extends the proposed framework with particular reference to the current study. There will be elements of methodology justification in this section, however it refers only to the rationale of partitioning the study population as described in chapter 7 in which the empirical results will be presented. Section 5.6 introduces the rationale behind the choices of the accounting change to L.I.F.O in the current study.

5.2 THE LIMITATIONS OF THE IMPLICATIONS OF THE EMH FOR ACCOUNTING

The importance of capital market efficiency vis à vis accounting has been adequately dealt with in chapter 4. However, it is considered necessary to illustrate the limitations of the implications of the EMH for accounting. Capital market research studies that seek to establish efficiency have been referred to as Finance Studies[2], whereas research studies concerned with accounting information have been referred to as Accounting Studies. The latter seek to investigate relationships between accounting information and share prices, i.e. they attempt to establish the informational content of accounting numbers. The accounting studies have generallly assumed the condition of efficiency and examined the effects of accounting information. The assumption of efficiency on the JSE would be untenable.[3] In this study an attempt is made to test efficiency as well as investigate the impact of accounting numbers. This simultaneous test of efficiency and informational content is justified in the following chapter. The distinction between finance studies and accounting studies has been introduced to illustrate how additional research is required on behalf of accounting. The condition of market efficiency as demonstrated in the finance studies is not an adequate description of the domain in which accounting performs its role. Thus although efficiency has substantial implications for accounting it is submitted that the extension of accounting research on

capital markets involves more than merely observing which accounting methods are the most highly associated with share prices and assuming these to be the most desirable. Thus the writer respectfully disagrees with Beaver (1972) who states :

> 'If the efficient markets hypothesis is adopted, then the association with security prices provides a simplified preference ordering with which alternative measurement methods can be ranked. That method which is more highly associated with security prices is more consistent with the underlying information set used in setting equilibrium prices. Hence, subject to a more complete anlalysis involving competing sources of information and costs of alternative methods, the finding provides prima facie evidence that the method which is more highly impounded ought to be the method reported in financial statements.' (p.428)

Support for the submitted criticism is found in Gonedes and Dopuch (1974) who theoretically showed that capital market efficiency was not sufficient to justify the use of share prices in determining the most desirable accounting methods.[4]

To illustrate in a simple way the limitations of efficiency per se for accounting research, the following notational sequence is presented :

The activities of the reporting entity can be regarded as

a series of economic events which determine the economic reality of that entity. Accounting seeks to measure and communicate this reality. If the premised objective of accounting is to facilitate economic decision-making, it is implied that the accounting process would seek to describe this economic reality as fully as possible.[5] The reporting of the reality perfectly would constitute the optimal information set previously referred to. In the complex dynamics of modern business an economic reality is difficult to conceive let alone capture completely in accounting numbers. However, accounting should strive to ultimately provide or rather contribute to this optimal information set.

Define : f_i as a particular accounting method

x as the economic reality to be reported

y_i as the accounting information generated by f_i

Then : $f_i(x) = y_i$ (1)

Let : g represent the process of information consumption

x^1 represent the market's interpretation of the reality x

p^1 represent the equilibrium price generated by x^1

I represent all other information available.

That is $\{(I+y_i)_t = \phi_t)\}$

Then $g(y_i \mid I) = x^1 = p^1$ (2)

describes how the market uses the information y_1.

If the market has been proved efficient, the process g will utilise any incremental information not already in

I but present in y_i to interpret the reality, then instantaneously and unbiasedly generate an equilibrium price p^1. However, if y_1 represented a complete description of x, ceteris paribus, an efficient market would interpret y_1 as reflecting x and generate p_0, the optimal equilibrium price.

Thus if, and only if, f_1 was the ultimate accounting measure,

$$x^1 = x \quad \text{and} \quad p^1 = p^0.$$

In all other cases

$$x^1 \neq x \quad \text{and} \quad p^1 \neq p^0.$$

Thus the prices generated in an efficient market are as optimal as the information provided. The fact that $x^1 \neq x$ would be indicative of accounting information constituting a source of market imperfection.[6]

It should be noted that if y_i contains no better a description of x than already available in I, the market's interpretation x^1 would remain unaltered and thus the share price (ceteris paribus) would be unchanged.

This simple notational sequence highlights three phenomena which are considered critical to empirical research investigating accounting information and security prices. In the light of the fact that very little is known about the process g, apart from possibly the institutional characteristic of efficiency, the value of empirical

insight into this is apparent from the accounting point of view:

(1) The existence of a multitude of accounting methods which generate different numbers and which in turn may result in the generation of different equilibrium prices, should be of concern to the accountant. An efficient market, however, would be able to distinguish the cosmetic or purely bookkeeping differences if sufficient information is provided.[2]

(2) The fact that the process g applies to a full information set underlines the competitive nature of information. The accounting researcher should find empirical evidence on the relationship between accounting and other information useful for determining the optimal information set.

(3) An insight into the process of information consumption and price generation (g) would be useful for providing the optimal information set.

Thus it should be noted that although finance studies and accounting studies may tend to be mutually supportive, their respective emphases diverge beyond share market efficiency.

5.3 THE COMPETITIVE NATURE OF ACCOUNTING INFORMATION

Although this phenomenon will not be directly incorporated into the empirical study, it is considered appropriate to give a brief perspective of the phenomenon as it is central to understanding the information consumption and price generation process.

From equation (2) it is implied that the accountant does not have a monopoly on all information pertaining to the description of the entity's economic reality.

To illustrate, the economic reality of a firm could be viewed as a manifestation of all economic impingement on its resources. This impingement could be trichotomised as follows :

(1) Economy wide factors

(2) Industry wide factors and,

(3) Firm specific factors.

The economic reality is not merely determined by (3) being those factors peculiar to the entity, but also by the economic milieu in which it operates.

As modern communication and information systems develop all information on these factors becomes increasingly more available and threaten the informational content of the accounting numbers.

The economy wide factors would include, inter alia,

statistics such as, the money supply changes, rate of inflation, interest rates, government expenditure, all of which are becoming increasingly more available. For example the Bureau for Economic Research (BER) at Stellenbosch University and the government Department of Statistics issue this sort of information regularly and timeously.

In an efficient market the impact of fluctuations in the economy on the firm's operations would be estimated and thus such fluctuations would have potential informational content for the valuation of the firm.

The industry specific factors would be subject to a similar analysis by the market. Naturally the causal link between industry specific factors and the firm's operations is likely to be more easily discernable. Factors in this section would include, product demand statistics, input factor statistics such as prices for labour and raw materials, growth projections for the industry by trade organisations etc.

The accountant does not even have a monopoly on firm specific information, various announcements and forecasts by company officials on the firm's earnings, complete with the published accounting numbers. The possibility of cross-sectional information transfer adds to the competition for information. This is the phenomenon

FIGURE 1 – INFORMATION SPECTRUM

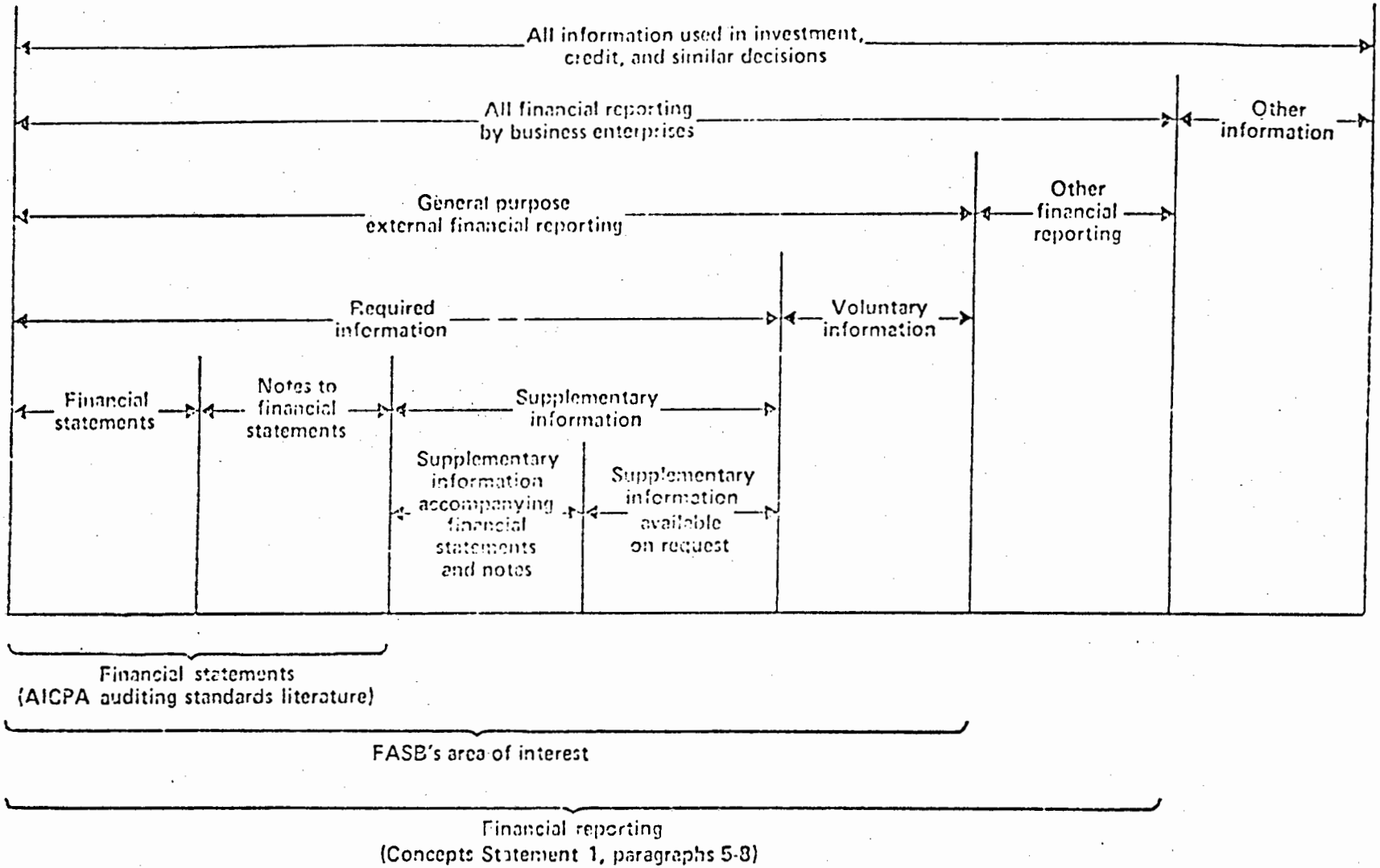


FIGURE 1 - INFORMATION SPECTRUM

needs to have informational value, that is, it must contain some information on the valuation of a future share price hitherto unknown. Informational value is virtually synonomous with the term predictive content. That is incremental information will be impounded into share prices if and only if it predicts the future value of a share. Thus predictive content could be explained as that characteristic of information a prior knowledge of which, ceteris paribus, would enable the prediction of a future price. Beaver, Kennelly and Voss (1968) suggest the predictive value criterion for the evaluation of accounting data.

No attempt will be made in the current study to empirically investigate the competitive nature of information, however the above exposition was provided as a general perspective on the information market. The study does however investigate a potential differential market reaction to accounting information depending on particular variables already known to the market. Thus the relationship between accounting sources and other sources of information is to be considered.

5.4 THE PROPOSED CONCEPTUAL FRAMEWORK

Generally accepted accounting practice permits a number of alternative methods for accounting for the various economic events impinging on a firm. These alternative methods generate different numbers and thus may be interpreted

by the market differently. To establish empirically whether there is a substantial difference in the market interpretation of various accounting methods presents a formidable task. This is so because a comparative analysis of different firms using different methods is not possible. Current technology would not permit a filtering out of all other informational factors specific to each firm. The only alternative is to examine the use of two different methods by the same firm. However, as a firm cannot account for the same event by two different methods simultaneously it is submitted that accounting changes are the best phenomenon to examine in order to establish an insight into how the market interprets various methods. An accounting change occurs when a firm discontinues using a particular method for interpreting an economic reality and proceeds with another method. Thus an accounting change represents a decision point between various accounting methods. This phenomenon permits an accounting change to be studied empirically in relation to share prices as a comparative analysis of the old and new method. The two methods are juxtaposed, as it were, and the market reaction to the change itself should render an insight into the information consumption process.

Although empirical studies on accounting changes may not be able to determine the most desirable accounting alternative[9], the policy maker should be aware of the market reaction to such changes.

In any study on the impact of accounting changes on share prices the results observed may be :

(1) a reaction to the accounting change per se, or

(2) a reaction to the specific informational content of the new method.

Implicit in (1) is that certain categories of accounting changes may have informational content in themselves. For example, an accounting change may reflect a changed management style or the market may interpret management's motives for making the change.

A reaction of the category (2) type may reflect the fact that there has been a gain or loss of information with regard to the economic reality being reported or rather to that aspect of the economic reality reported by the pair of accounting alternatives.

In order to interpret the results of such studies and draw conclusions on the effect of a specific accounting change the confounding effect of the market reaction to the general attributes of the change should be established as these may override the specific effects.

The importance of the distinction between (1) and (2) above is illustrated by the following hypothetical example :

An accounting standards committee had empirically observed that a change from f_1 to f_2 which was merely a bookkeeping

change[10] caused a particular reaction in the market which they found was consistent with the conclusion that f_2 was a better measure of the economic reality, x. Then, based on this conclusion (among other considerations) they issued an accounting standard making the use of f_2 mandatory. Thus all firms would have had to change their accounting methods to f_2. Changes subsequent to the issue of the hypothetical statement would of course be non-discretionary. If the initial market reaction had been caused by the market's interpretation of management's motivation or expectations in making the change this element of information would be lost and ceteris paribus there would subsequently be no market reaction to a change from f_1 to f_2. The initial results were not due to the new method employed, but to the accounting change itself.

Although a simple example, the point remains that the market reaction to a new accounting method may not be a reflection of the market's assessment of the informational content of the numbers per se, but of some insight gleaned from the change.

The following framework is proposed on a conceptual level which should be of some interpretational value. It is acknowledged that to empirically evaluate and distil completely these confounding effects is an impossible task, for reaction to the change itself is a necessary concomitant of adopting the new accounting method. However, an Analysis of Variance approach applied to the residuals[11] of all the

categories of accounting changes proposed should lend some insight on the market reaction to particular kinds of changes. These results would then be useful in tempering the conclusions drawn from studies of particular accounting changes.

The framework is a classificatory one which seeks to determine those characteristics of any accounting change which may lend the change, per se, informational value.

The framework is presented in Figure 2, and shows a three-dimensional matrix of the possible categories of accounting changes, namely :

- discretionary / non-discretionary
- translatable / non-translatable
- with economic implication / without economic implication.

There are thus eight possible classifications of accounting changes.

It should be noted that the description of a change from f_1 to f_2 may be c (where c is the category of change per figure 2). However a change from f_2 to f_1 may be c as well. The only criterion in terms of which accounting changes are consistently reclassified on reversal is the criterion based on the sign of the impact of the change on the unreported numbers. Although this criterion is shown in section 5.4.4 below to be a non-substantial criterion, each type of change presented in figure 2 could have either a positive or negative impact on the reported numbers.

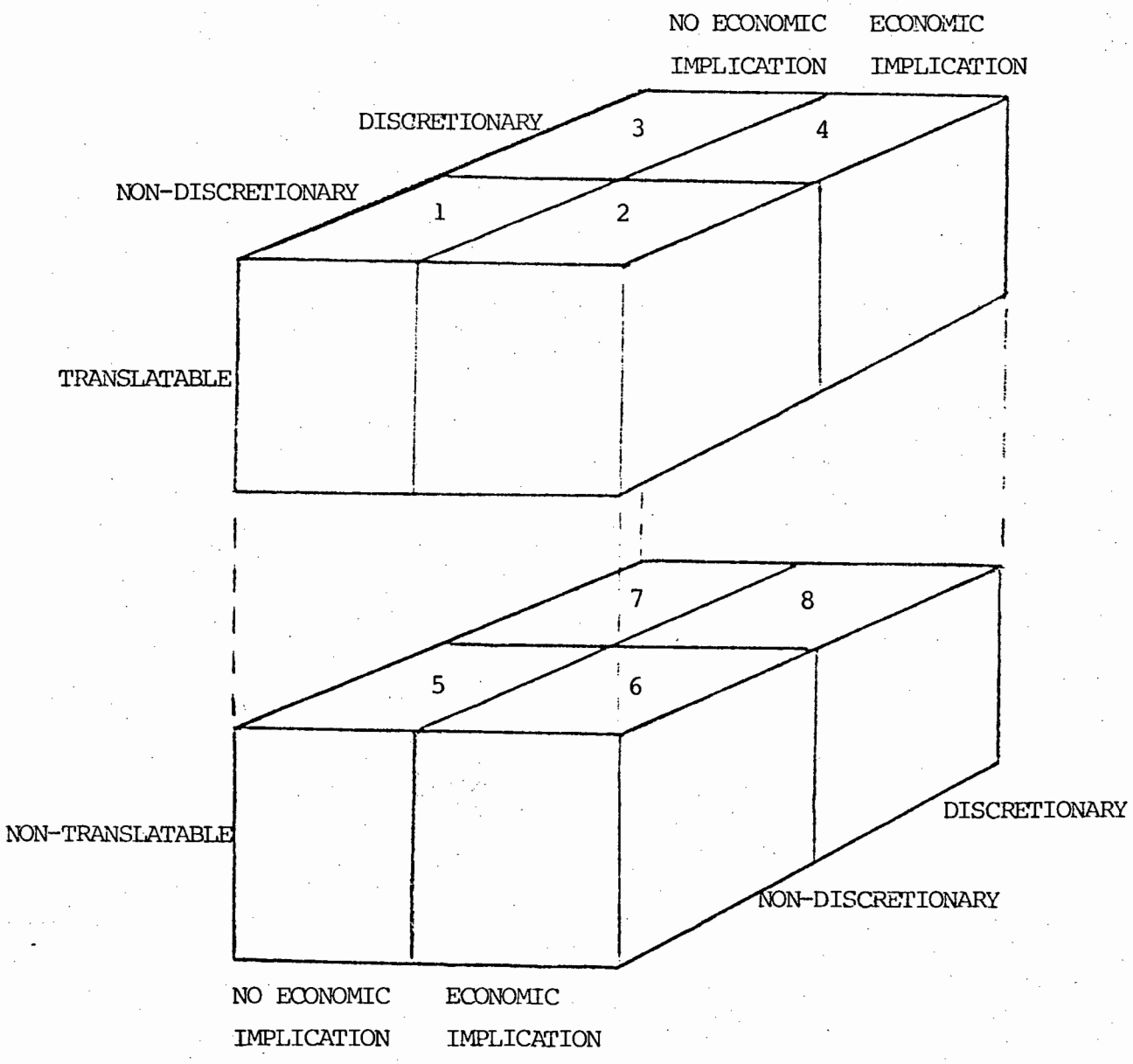


FIGURE 2

A CONCEPTUAL FRAMEWORK FOR THE CLASSIFICATION OF CHANGES IN REPORTED ACCOUNTING METHOD

Thus there are sixteen possible types of accounting changes.

This classification system will be justified intuitively at the level of each criterion before reviewing the system as a whole.

5.4.1 TRANSLATABLE V. NON-TRANSLATABLE[12] ACCOUNTING CHANGES

In an efficient market it has been assumed that providing an accounting change is supplemented with sufficient information to permit a translation of the numbers generated by the new method into the numbers of the old method, the market will ignore the change, i.e.it will not be deceived by the numbers in the sense that the same economic reality is being reported upon.[13]

Notationally :

$$f_1(x) = y_1$$

$$f_2(x) = y_2$$

If y_1 or y_2 were a complete description of the economic reality x given any pair (f,y) the reality x would be discernable or that portion of the total reality that either method purports to report, i.e.:

$$f^{-1}(y_1) = x \Rightarrow p_0$$

or $$f^{-1}(y_2) = x \Rightarrow p_0$$

As either method is unlikely to give a complete description nor is each portrayal likely to be

identical the following set applies :

$$f^{-1}(y_1) = x_1 \Rightarrow p_1$$
$$f^{-1}(y_2) = x_2 \Rightarrow p_2$$

where,

$$x_1, x_2 \in x$$

and

$$x_1 \neq x_2$$

However, provided that a technique and sufficient parameter values[14] are available to the user to establish both x_1 and x_2 with either method an accounting change from f_1 to f_2 will not affect a movement from p_1 to p_2. This is so because the market is aware that the difference between x_1 and x_2 is merely a function of the different methods and that x_2 describes the same reality x. Thus where the following condition is met the change is translatable.

$$h(f_1, f_2, y_2 \mid I) = y_1 \qquad (3)$$

where :

f_1 is the old method rules.

f_2 is the new method rules.

y_2 is the new numbers generated.

h is the technique required to translate.

The requirement isthat sufficient information to reverse the change should be available to the user. Further in a situation where the above condition

prevails and there is no change in the reality x, the accounting change is cosmetic and, ceteris paribus the market will not react whether there was a positive or negative impact on the accounting numbers.

It could be argued that if the different perspectives of x displayed by x_1 and x_2 jointly describe the economic reality more fully than the two perspectives alone, a change which according to the above criterion was cosmetic (without informational value) may actually not be so. This implies that equation (3) above is an inadequate definition of a cosmetic accounting change. However, ignoring the criterion of discretionary/non-discretionary (section 5.4.2) it is submitted that the above does define a cosmetic change and that the argument contradicting such would only apply if x_1 and x_2 taken together fully described the economic reality. Thisis unlikely as x_1 and x_2 can only purport to be interpreting a portion of this reality.

An accounting change that is translatable is unlikely to have information content as the market will be aware of an unchanged economic reality. Conversely if there is a changed economic reality, an accounting change that is translatable will not be able to hide the fact from the market behind the numbers of

a new accounting method.

On the other hand however, if the condition described in (3) is not met and the change is classified as non-translatable it is possible that a movement from x_1 to x_2 by the market could occur. Although the market would be aware that the difference between x_1 and x_2 would be due to a function of the difference between f_1 and f_2, it could not be sure that the economic reality had remained unchanged. Thus it may attribute part of the change in x_1 and x_2 to a change in the economic reality.

Examples of translatable accounting changes are :

- The change from F.I.F.O. to L.I.F.O. in South Africa.
- The change from the non-provision for deferred tax to the provision for deferred tax.

Examples of non-translatable accounting changes are :

- The change from F.I.F.O. to L.I.F.O. in the U.S.A.[15]
- A conversion from the Historic Rate method to the Current Rate method of translating foreign subsidiaries on consolidation.

Thus the translatable/non-translatable criterion is considered important when examining an accounting change. This section particularly illustrated that

where a change is translatable the market reaction is not likely to be a function of the translatability. The converse is, however, true for non-translatability. The non-translatability of an accounting change would have to be regarded as a confounding effect in a study on such changes.

5.4.2 DISCRETIONARY AND NON-DISCRETIONARY ACCOUNTING CHANGES

This attribute was referred to by Harrison (1977) as being a source of differential market reaction to accounting changes. This observation will be referred to when appropriate.

A discretionary accounting change is defined as an accounting change which is decided endogenously to the firm. That is, the decision to report the new method is decided by agents internal to the firm in the absence of external pressures to report a new method.

Conversely, a non-discretionary change is defined as an accounting change decided exogenously to the firm. That is, the decisions taken internally place the entity in that situation where a change in the reported method is forced by external factors. These external factors include the issue of a statement of GAAP, legislation, etc. The decision to change *per se* was not taken by the agents of the entity.

A discretionary change which increases the income figure that would have been reported in terms of the old method, could be subject to the following interpretation by the market.

The change may reflect management's expectation of a future decrease in income. This motivation is thus interpreted as being to cushion the visual impact of this expected decrease on the income figures.

However, a non-discretionary change could not reveal any of management's motivations behind the change as the decision to report a new method was not taken by them. Although this type of change may reflect the exact magnitude of management's conservative bias in previous reports it is submitted that a non-discretionary change with a positive impact on earnings will not have as confounding an effect as a similar discretionary change.

This intuitive assertion was supported by the empirical evidence of Harrison (1977) who concludes :

> "However, the negative return differences for discretionary changes, contrasted with the positive return differences for non-discretionary changes, suggest that the discretion available to management in making the ACs possess information content."(p.105)

The converse situation of a discretionary change decreasing earnings may be interpreted as being a reflection of management's confidence as to future earnings. However, a non-discretionary change of this type may be interpreted by the market as being a reflection of management's liberal bias in previous reports, thus resulting in a reassessment of management. Again however, a non-discretionary change is less likely to have a confounding effect than a discretionary change.

To summarise, it is submitted that discretionary accounting changes may have informational content in themselves, a reaction to which may mask the potential reaction to the new method. This is not likely to be the case for non-discretionary changes which are regarded as neutral vis á vis market reaction.

Examples of non-discretionary changes are :

(1) a provision of deferred tax in response to 1.002,

(2) a switch to L.I.F.O once a decision is taken to use the method for tax.

An example of a discretionary change is a change in depreciation method.

5.4.3 ACCOUNTING CHANGES WITH ECONOMIC IMPLICATION AND WITHOUT ECONOMIC IMPLICATION

An accounting change which heralds a change in the economic reality of the entity should have informational content for the market, unless this change in the reality has already been gleaned by the market from other sources.

Thus a change without an underlying economic cause should, ceteris paribus, cause no reaction in the market, irrespective of the sign of the earnings change.

A change in the economic reality heralded by an accounting change resulting in a change in the earnings figure of the same sign, i.e. increase or decrease, should cause the same reaction in the market, i.e. either positive or negative, assuming all other signals to be neutral. Thus the cause of the change cannot be established in a market of unproven efficiency. The reaction may be to the new reality or merely a blind reaction to the accounting numbers. To investigate such a change it would be necessary to examine the reaction of a general class of changes with economic significance and another general class without economic significance and observe any differential reaction. Further, general classes of accounting changes with positive and negative impacts on accounting

numbers would need to be examined for differential reactions. The results of these two sets of tests would be the equivalent of efficiency tests in that it could be established whether or not the market blindly reacted to the earnings figures. However, if no clarity was achieved the results of the test on the specific change could only be interpreted cautiously as the real cause of the reaction cannot be isolated with certainty.

This classification is most useful however, while there is a change in the economic reality which is inversely related to the change in the accounting numbers. For, holding other signals neutral, the observed reaction will display the overriding cause.

The problem mentioned above does not arise in the case of an accounting change without an economic implication and any reaction observed holding other attributes neutral would be due to the accounting numbers themselves.

Thus this classification criterion is proposed as it distinguishes a potential informational signal (with economic implication) and a neutral one (without economic implication).

Examples of accounting changes with an economic implication are :

(1) Any reported accounting change which coincides with a commensurate change for tax purposes, e.g. F.I.F.O to L.I.F.O.

(2) The introduction of the equity method of accounting for an investment after a changed relationship; the new relationship warranting the new method.

Examples of accounting changes without an economic implication would be :

(1) A change from the deferral method for accounting for deferred tax to the liability method.

(2) A provision for the investment tax allowance.

5.4.4 THE GLOBAL VIEW OF THE FRAMEWORK

It will be noted that the sign of the impact on the accounting numbers of an accounting change are not discussed separately. It is felt that this is not a substantive classification.

It is not considered separately because neither class (positive or negative) presents a neutral category. Instead it is viewed as a co-variable which was considered within each category.

The essence of this conceptual classificatory framework is that three pairs of neutral/active categories

have been discerned. Neutral implies that the attribute per se, has no informational value, whereas active implies a potential informational value of the attribute. The result is shown on figure 2 above. There are eight categories of change within which each change may have a positive or negative impact on the reported earnings. Thus sixteen possible types of accounting changes are established.

Taken as a whole the framework provides a system for rationally establishing the potential confounding effects on the interpretation of the results of an empirical study.

The classification isolated the most neutral two categories 1+ and 1-, being non-discretionary translatable accounting changes without economic implication. These are defined as the cosmetic categories. The accounting changes in these categories are not likely of themselves to have any informational value. Thus any reaction by the market, perceived empirically, is safely attributable to the new method itself. However, in view of the conclusions drawn in S.5.4.1 the new method is unlikely to have any additional information content.

The most active categories would be 8+ and 8-, being discretionary non-translatable changes with an

economic implication. All these factors will be potential information sources. Therefore all the factors may obscure the impact of the new method.

It is submitted that it may prove impossible to make the suggested framework completely operational for empirical research. To do so the whole universe of accounting changes reported in a market would need to be classified according to the framework. The current model which will be introduced in the next chapter could be utilised to establish the residuals for each general category thereby reflecting the impact of such. One would expect a differential reaction between categories. A three way ANOVA[16] could be applied to the results and the individual factor effects established relative to one another. Naturally, the parameters of ANOVA technique would have to be adhered to. Assuming there were sufficient different specific changes constituting each general category the results of the ANOVA would provide a table of reference for expected results for all empirical studies on accounting changes in a particular market.

This would constitute a very interesting and useful research project on its own. No attempt is made in the current study to provide this empirical evidence.

A table of reference would provide the accountant with an insight into the operations of the information market and further provide a basis for establishing the effect on the market of a new accounting method.

The following two questions will now be addressed :

(1) Would the framework apply only in an efficient market ? and

(2) Of what use is the framework on the conceptual level to studies seeking to investigate empirically the relationship between accounting methods and share prices ?

The answer to (1) is yes and no. Yes, in as much as the intuitive rationale implicitly assumed efficiency in the justification of categorising the characteristics as neutral or active. However, an empirical evaluation of the market reaction to general classes of accounting changes would be a useful insight even into a mildly inefficient market. A mildly inefficient market is one which takes some time to impound information, yet it impounds such consistently.

Question (2) refers to the use of the conceptual framework prior to the establishment of empirical evidence for a differential market reaction between categories. The answer is that for the accounting

changes categorised with more than one active element the confounding effect cannot be removed. This would apply to categories 4, 6, 7 and 8. Further, it would also apply to those accounting changes in category 2 in which the impact on earnings of the change was directly related to the economic implication. In such cases a positive economic development is accompanied by an increase in and a negative development by a decrease in earnings. In the absence of contrary evidence the researcher could not adequately interpret the market reaction which could have been caused by the accounting numbers or the economic implications. However, the other categories 1 and 5 and the remainder of 2 are empirically testable within the framework.

5.5 AN EXTENSION OF THE GENERAL FRAMEWORK TO TESTS OF SPECIFIC ACCOUNTING CHANGES

Having categorised the accounting changes according to the framework of figure 2 and considered the possible confounding effects of the various factors, the researcher must decide whether, in the absence of the empirical base suggested, it is intuitively meaningful to study the impact of a specific accounting change on share prices. If an insight is sought on the market's reaction to the new method, the confounding effects of the informational content of the change itself may render the experiment meaningless in the

absence of a technique to account for these effects. Having decided that the confounding effects are unlikely to occur or are likely to be counter directional to the reaction being investigated, the researcher may proceed.

Recalling equation (2) :

$$g(y_i \mid I) = x_i \Rightarrow p_i$$

where :

g is the information consumption process,

y_i is the accounting information generated by the accounting method f_i,

x_i is the market's interpretation of the market reality x based on ϕ_t where $\phi_t = (y_i + I)$,

p_i is the equilibrium price so generated.

An accounting change from f_i will result in a new y_i which will be analysed by the market. The characteristics proposed in the framework of figure 2 are likely to influence this perception. However, apart from these 'co-variables', that is, variables describing the change, there may be other factors known to the market (contained in I) which may influence the market's perception of y_i and thus x_i resulting in a price movement away from p_i.

As such factors mediate between the accounting numbers and the share market they have been referred to as intervening variables. The existence of such variables does

assume that accounting information is jointly processed with other information, i.e. the competitive nature of accounting information is assumed.[7]

The term 'intervening variable' was coined by Abdel-Khalik and McKeown (1978) who wrote :

> "..... intervening variables mediate between accounting based information and the securities market in processing of the signals provided by such information. Different intervening variables may alter the interpretation of the same accounting event." (p.851)

Their ideas are adopted here and tailored into the current framework. It is proposed that a distinction be made between what could be referred to as endogenous intervening variables and exogenous intervening variables.

Endogenous intervening variables are those variables inherent in an event. For example the variables proposed in the framework of figure 2 are endogenous to a particular accounting change. They are really signals emitted simultaneously with a particular event and are thus defined in y_i in equation 2.

Exogenous intervening variables, on the other hand, are those variables already available or from another source and would be defined in I of equation 2.

The endogenous type have been considered in the proposed framework. There may be a number of others, but these are considered to represent the first order group of endogenous intervening variables.

A multitude of exogenous intervening variables may mediate between accounting information and share prices and no attempt is made here to suggest a criterion for establishing those most important or first order variables.

In an adaptation of the diagram presented by Abdel-Khalik and McKeown (1978, p.863) an overview of these relationships is presented in figure 3.

To revive our hypothetical researcher from page 131 above : He should now determine the first order exogenous variables which are most likely to intervene in his investigation. Then he should partition his group into categories determined by the intervening variable. For example, the population would be categorised into high relative risk firms and low relative risk firms if the relative risk were the intervening variable.

Having taken cognisance of the first order exogenous intervening variables an interpretation of the residuals obtained in a contemporaneous association test (explained in chapter 6) should provide useful insight to our researcher on the accounting change being investigated. A comparison of the residuals of the two particular groups

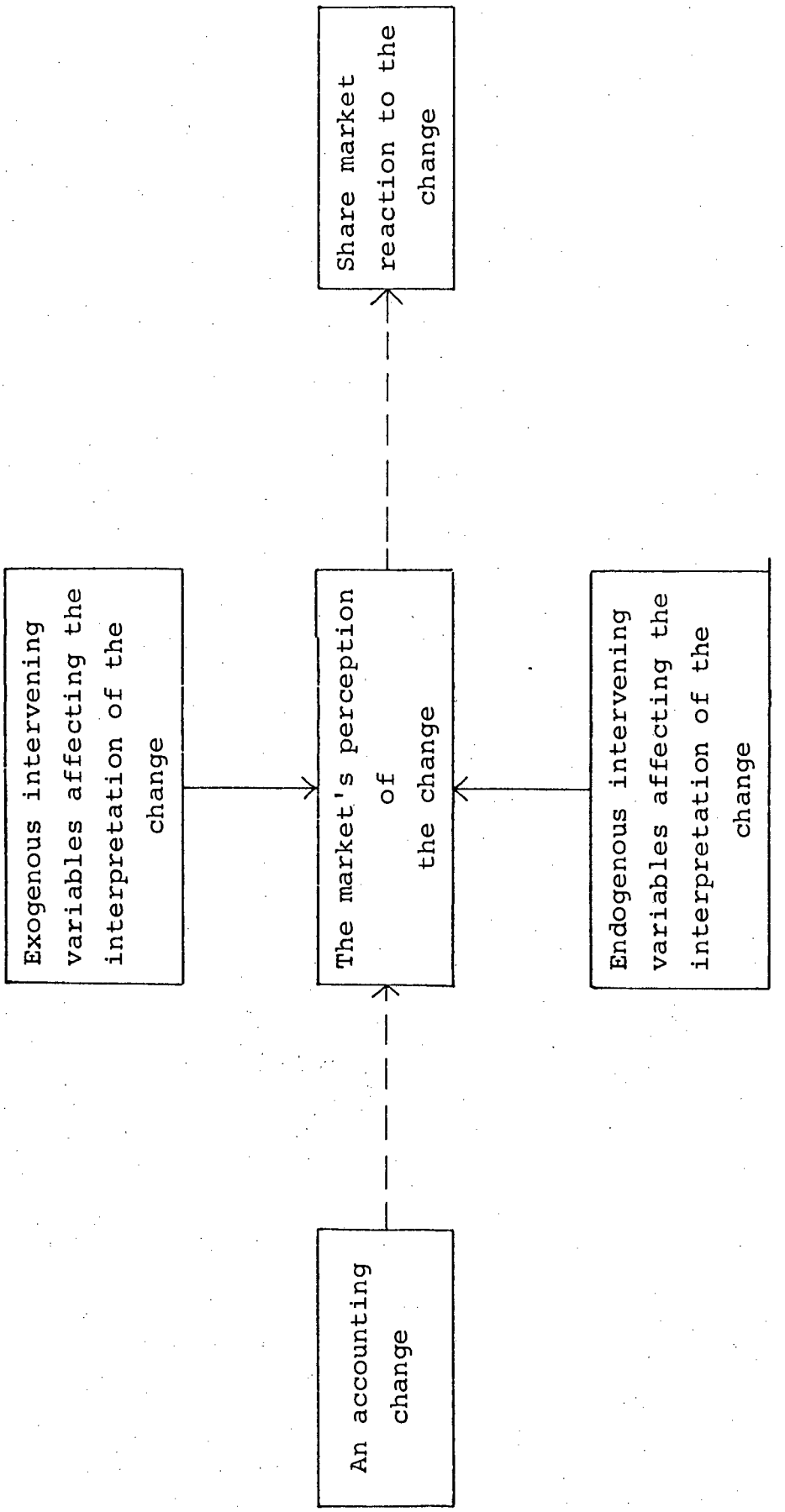


FIGURE 3

THE INFORMATION CONSUMPTION PROCESS

should lend insight into the information consumption process. If the partition criterion is an exogenous interveining variable a differential reaction could be expected.

It is useful to consider that the process being investigated may not remain constant through time. Thus it is hypothesised that as the market develops the information consumption process may change. Therefore, it is recommended in this framework that the researcher examines accounting changes in successive chronological partitions. If a differential reaction is apparent the hypothesis may be accepted. A further implication is that the most current reaction is the most likely to be the same for similar accounting changes in the near future.

This framework has been proposed at an intuitive level under the implicit assumption of a reasonably efficient market. It does not purport to be a rigid theoretical structure nor does it address the empirical question of verification. A cursory observation on a possible empirical route was made. However, as proposed, the framework is considered to be a useful guideline for empirical research on accounting changes. It cautions the interpretation of results in certain cases in which the confounding effects of intervening variables are apparent.

Although the methodology is to be presented in the following chapter it is considered appropriate to justify the use

of the particular accounting change chosen in this study.

5.6 THE CHOICE OF THE ACCOUNTING CHANGE L.I.F.O WITHIN THE PROPOSED FRAMEWORK

A change in accounting method from F.I.F.O to L.I.F.O would be classified according to the proposed framework as a 2- change. It is a translatable non-discretionary change which has an economic implication and a negative impact on earnings. This negative impact on earnings is counter-directional to the economic implication which is positive.

5.6.1 A BRIEF BACKGROUND ON L.I.F.O

L.I.F.O 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 in times of rising prices a lower earnings figure results. This is the converse of the F.I.F.O approach which refers to the first-in-first-out cost flow assumption of inventory valuation whereby year end inventory is valued at the most recent purchase price.

Although only given a cursory mention in the appendix to ED10[18], L.I.F.O was mentioned as an acceptable cost formula for financial reporting in IAS2[19], provided that additional information was disclosed

(see para 26) which was tantamount to ensuring that a switch to L.I.F.O was translatable.

L.I.F.O is given an economic significance by virtue of the fact that if applied to tax reporting 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 L.I.F.O to improve their inflation squeezed cash positions. There are certain immediated implications of a switch to L.I.F.O. The more important are listed below :

(1) Section 22(5) of the Income tax Act No. 58 of 1962 requires that if a Company uses the L.I.F.O system for tax purposes it must use L.I.F.O for financial reporting purposes. However, this section does not prohibit the simultaneous footnote disclosure of F.I.F.O information.

(2) The reported book value of the firm diminishes as inventory is valued at older prices.

(3) The equity of the company reduces and based on book value the firm may seem more highly geared.

(4) If there is a reversal of current trends and the price level falls earnings will be inflated above the F.I.F.O figures and an increased tax will become payable.

(5) L.I.F.O removes the unrealised holding gains reported on a F.I.F.O system and thus the difference between the two earnings figures (L.I.F.O and F.I.F.O) 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 L.I.F.O and not take it for tax purposes, in which case a change to L.I.F.O would have no economic significance whatsoever. No such case has been encountered on the JSE.

5.6.2 IS L.I.F.O A NON-DISCRETIONARY CHANGE?

It could be argued that as the decision to report L.I.F.O for tax was taken endogenously, a change in the reporting for financial purposes is discretionary. It is submitted, however, that management abdicated their discretion vis á vis reported accounting method by taking an economic decision, to optimise their

cash/tax configuration.

As regards the framework, the importance of deciding whether an accounting change was discretionary was the potential confounding effect on the interpretation by the market of management's motives. As the motives for a switch to L.I.F.O are fairly apparent, namely for improved cash flow, the potential discretionary nature of the change is unlikely to have a confounding effect. The issue is that the translatability and non-discretionary characteristics are neutral which means that any reaction to a change to L.I.F.O will be either

(1) a reaction to the improved cash flow (positive economic significance), or

(2) a reaction to the deflated earnings figure.

These effects being counter-directional, the overriding effect will be identifiable.

Thus accounting changes to L.I.F.O lend themselves very readily to investigation within the current framework.

It appears that there will be little confounding effects caused by endogenous invervening variables. In this study the exogenous intervening variable examined will be the relative risk of firms defined by β or the co-variability of the share price with

the market.

Further, the magnitude of the impact on earnings will be examined for potential differential market reaction. Finally, a chronological sequence of partitions will be employed to investigate how the market's response may be changing through time.

5.6.3 POSSIBLE CONCLUSIONS TO BE DRAWN FROM THE STUDY

The potential conclusions of this study are manifold and are briefly listed for the sake of clarity.

(1) Empirical evidence of market efficiency may be obtained.

(2) An insight into the information consumption process should be derived.

(3) Any differential reaction to the intervening variable β would indicate that relative risk was indeed an intervening variable in the market perception of a change to L.I.F.O.

(4) Any differential reaction to the chronological sequence would indicate a developing market information consumption process.

In all, the results could afford the accounting academician an interesting insight into the process by which accounting information is employed in the generation of share prices.

CHAPTER 5

FOOTNOTES

1. The term accounting change is not synonymous with that definition by the AICPA in APB 20. The AICPA (1978) defines an accounting change as a "change in (a) an accounting principle, (b) an accounting estimate, or (c) the reporting entity ..." The current use of the term would fall into sub-section (a) of the above, namely that point where an accounting method is discarded in favour of an alternative method.

2. See Findlay III (1977) for this distinction between finance studies and accounting studies.

3. See chapter 4 for a review of the empirical evidence for the efficiency of the JSE.

4. This has been illustrated in chapter 4.

5. This premise has been supported by Beaver (1972). See chapter 4.

6. The idea that accounting constitutes a source of market imperfection will not be expanded upon here. The interested reader is referred to Birkett and Walker (1974) and Amernic (1975).

7. The concept of cosmetic accounting changes is expanded on later in this chapter.

8. These alternative sources of information were represented by I in equation (2).

9. See Gonedes and Dopuch (1974).

10. In this context a bookkeeping change refers to an accounting change which does not herald a change in the economic reality being reported.

11. Residuals will be fully defined in the research methodology of chapter 6.

12. This section draws on ideas from the work of Park, Everingham and Harbecke (1979).

13. See Kaplan and Roll (1972).

14. Parameter values are any other sources of information necessary to translate a method. For example, to provide for depreciation in a set of accounts not providing such, a parameter value required would be the expected life of the assets to be depreciated. The expected life of the assets in this hypothetical example is a parameter value.

15. L.I.F.O firms may not report F.I.F.O information in their financial statements. The information of F.I.F.O however is likely to be in the S.E.C 10-K form, where the current cost of inventories is required.

16. ANOVA refers to the statistical technique the Analysis of Variance.

17. See section 5.3.

18. ED 10 is the South African exposure draft on inventories.

19. IAS 2 is the statement on inventories issued by the International Accounting Standards Committee (IASC).

CHAPTER 6

THE RESEARCH METHODOLOGY

6.1 INTRODUCTION

This chapter introduces the research methodology employed in the current study. It proceeds with an overview of the various types of accounting empirical studies with a particular justification of market level studies. The two stage time series methodology is introduced in section 6.2.2 followed by a literature review of selected accounting studies employing this methodology. The methodology is explained before introducing the data in section 6.4.2 which is followed by an explanation of the procedure taken. The model is defended in section 6.5. Finally, the chapter concludes with a section on hypothesis setting in general and a justification for simultaneously testing efficiency and market reaction to accounting changes.

The hypotheses are set and tested by reference to the results of the study which are presented graphically in chapter 7.

6.2.1 WHY MARKET LEVEL STUDIES?

There has been a marked trend in accounting academic literature[1] in the United States toward market level studies. According to Benston (1980) the trend has moved from the normative 'What should investors need' approach to a more positive 'What do investors want' approach.

In response to the latter, three general approaches are used :

(1)	Laboratory studies	individual level
(2)	Surveys	individual level
(3)	Share market studies	aggregate level

Laboratory studies observe the reaction of certain individuals to accounting information in a simulated environment. These studies permit the researcher to focus the attention of the subject on the item of interest. Yet, they contain certain serious shortcomings which reduce their validity :

Firstly, the observed actions of the subjects are made in vacuo in the absence of the large body of information which would exist in reality.

Secondly, the subjects may not be representative of the investing population and thus the conclusions drawn from such studies may not be generalised.

Thirdly, it has been the case in most of these studies that the subjects are biased in that they are normally a class of students who have undergone the same education process.

The most well known example of such a study was by Ijiri, Jaedicke and Knight (1966) who performed such a laboratory study and found that their subjects were deceived by the different numbers generated by various accounting methods. In other words, their decision process did not adjust for differences in accounting method. This study gave rise to what is now known as the Funcional Fixation Hypothesis[3] (FFH) which suggests that the user of financial statements becomes fixated with the earnings figure and bases all decisions on this figure irrespective of the accounting method. If the FFH is valid, a change to L.I.F.O would result in a negative impact on share prices because the investors would perceive the reduced earnings as a diminishing economic well-being.

The survey method does remove the bias of the laboratory study as real investors are questioned. However, a new bias is introduced known as the non-response bias. A feature of these studies has been a very low response which is not peculiar to accounting, but is true of most types of survey studies. The consequence of a low response is that the views of

the non-repliers are not accounted for. Furthermore, where the surveys merely request a listing and ranking of the respondents' preferences vis à vis accounting information, it is not assumed that the respondents would actually use the information if it were supplied to them.

The third drawback of the survey method is that the non-respondants are likely to be the real decision makers since the opportunity cost of such individuals' time would prevent them from wasting time on the survey in the first place.

Examples of such works are Jensen (1966) and Dyckman (1966). Jensen surveyed a number of professional security analysts using a comparative case study approach of two almost identical firms using different accounting methods. He concluded that accounting differences did affect the analysts' evaluation of share prices. This constitutes evidence for the FFH.

Share market studies are superior to the laboratory and survey methods as an examination is made of the investors' revealed preferences. The study is carried out in situ as it were, and thus the results are more easily generalised. Such aggregate level studies are not without their shortcomings, particularly where designed to answer the abovementioned positive question ; there can be no revealed preference to

information not presently provided.

There are two general approaches within the share market category. The first is based on a valuation approach where a valuation model is constructed for share prices. The impact of the event of interest is evaluated in terms of this model. For example, O'Donnell (1965) suggested the simple price earnings ratio (P/E) as the model and measured the mean P/E of three groups of electric utilities using different depreciation methods. Comparing the trends in such through time, he concluded that the market perceived the additional earnings reported as a result of a change in depreciation method to be real earnings.

Another study of this type was by Mlynarczyk (1969). He suggested a fairly complicated valuation model whereby a share price was defined as a function of accounting earnings, expected growth, revenues, debt equity ratio and 2 dummy variables, one of which was the use of alternative accounting methods. His conclusion, consistent with that of O'Donnell, was that different accounting methods did influence share prices. Summers (1968) used a similar method to O'Donnell, but did not draw the same conclusion, i.e. he suggested that alternative accounting methods did not effect share prices. Another example of studies of this type is that of Gonedes (1969).

There are however some major criticisms of the valuation approach to share market studies. Firstly, the models are arbitrary and generally lack a theoretical underpinning. Secondly, to date such arbitrary models have emphasised the relationship between the level of earnings (and other variables) and level of share prices. Such correlations are of less interest to accounting researchers than the association between accounting changes and changes in share prices. Further, the valuation approach is likely to be biased by the scale factor inevitable in examining absolute rather than relative values. This is easily understood in view of the fact that it is not the absolute impact on share price levels of accounting information that is of interest, but the relative impact on changes in share price. Thirdly, each share price is examined in isolation thus ignoring cross-sectional associations that may exist between share price changes.[4]

The second and by far the most popular approach in both the finance and empirical accounting literature is the two-stage time series methodology initially employed by Fama, Fisher, Jensen and Roll (1969) (FFJR) in the first direct test of market efficiency on the NYSE. As this methodology is to be employed in the current study, the model will now be formally introduced followed by a brief literature review of

the accounting studies employing this methodology or variants thereof .

6.2.2 THE TWO-STAGE TIME SERIES METHODOLOGY IN MARKET LEVEL STUDIES

The model is formally introduced in this section in order to facilitate the literature review in section 6.2.3 below. However, an explicit explanation of the market model will be presented in section 6.3.

The first stage of the methodology is an attempt to remove those movements in share prices attributable to market wide or common factors. These are factors common to all shares. King (1966) has shown that on the NYSE about 50% of the variance in share prices is due to these common factors. It is questionable whether such evidence is transferable to the JSE, yet it does provide a likely indicator in the absence of local empirical evidence. The relationship between the movements in each share price and changes in the market is established by regressing a time series of each share's returns with a time series of returns on a market index. This index is a surrogate for a market portfolio. The return on share j for time t is defined as

$$R_{jt} = \frac{P_{jt} - P_{jt-1}}{P_{jt-1}} \qquad (1)$$

and the return of the market factor is defined as

$$R_{mt} = \frac{I_t - I_{t-1}}{I_{t-1}} \qquad (2)$$

where P_{jt} is the price of share j in period t

I_t is the value of the market index in period t.

The subscript t refers to the end of period t and in most studies below represents a monthly interval.

The regression model takes the form of equation (3) below which represents the best linear unbiased estimate of the constants β_j and α_j. u_{jt} represents the individualistic factor which has an expected value of zero. u_{jt} represents the individualistic factor which has an expected value of zero. As a result of this regression assumption in (3), periods for which these u_{jt} values are unlikely to be zero must be deleted from the time series for an unbiased estimate of α_j and β_j. The object of these studies has been to establish whether there are any abnormal movements in these individualistic factors which may be attributable to the event in question. Thus the period around the time of the event of interest is deleted from the time series data used to estimate α_j and β_j.

$$R_{jt} = \alpha_j + R_{mt}\beta_j + u_{jt} \qquad (3)$$

The first stage thus establishes estimates of α_j

and β_j based on the non-deleted period for each share in the study.

The second stage in the methodology seeks to examine the abnormal residuals (if any) which may be attributable to the event in question. An abnormal residual is defined as the difference between the expected value zero and the observed value defined as :

$$\hat{u}_{jt} = R_{jt} - \hat{\alpha}_j - \hat{\beta}_j R_{mt} \qquad (4)$$

Thus for each share a u_{jt} value is established for each time interval in the deleted period.

In order to remove or reduce the effect of any events not common to each share in the study, an average residual is established for each time interval defined as :

$$\bar{U}_t = \frac{1}{N} \sum_{j=1}^{N} \hat{u}_{jt} , \qquad t = -(x-1), \ldots, x \qquad (5)$$

where there are 2x intervals in the deletion period and week 0 defines the time of the event common to the N number of shares in the study. $\hat{u}_t$ is also referred to as an abnormal return in period t, being that return observed from an equally weighted portfolio over and above the market return after risk adjustment. β_j represents the risk of each share being a measure of its co-variability with

the market. Finally, a cumulative abmormal return (residual) defined by equation (6) below is established for each interval in the deleted period.

$$U_t = \sum_{i=-(x-1)}^{t} \overline{U_i} \qquad t = -(x-1), \ldots, x \quad (6)$$

U_t and $\bar{U}_t$ both have an expected value of zero and therefore any movements in a plot of U_t away from zero are attributed to the common event. Considering that the deleted periods are different chronological periods for each share, the potential effect of abnormal market behaviour in particular time periods is eliminated.

The product of stage 2 is thus 2x values of cumulative abnormal residuals (CARs) which are plotted graphically. If the accounting event being studied has any informational value, a movement is expected away from zero at week zero. Further, if the market is efficient the movement away from zero is expected to occur rapidly and then the CARs should remain constant at the new level. This aspect is carefully analysed with schematic examples in section 6.6.

6.2.3 LITERATURE REVIEW

It is considered appropriate to present the reader with a brief literature review of accounting studies using this methodology (or variants thereof). The review does not purport to be exhaustive, however

this presentation of the more significant studies should be useful. An exhaustive approach is not considered necessary as none of the studies, mostly being concerned with tests on the NYSE, relate to the JSE.

The first study to employ this methodology was by Fama, Fisher, Jensen and Roll (1969) who examined the impact of the announcement of stock (share) splits by companies on share prices. The rationale was that stock splits were normally announced by companies which had been prospering in their recent past and the majority of such companies were able to increase their dividend payouts after the splits. The ability to pay out increased dividends derived from increased profitability and obviously not from the split itself. The premise was that only firms with increasing profitability ventured stock splits. Thus it was posited that there was a high association between the announcement of a stock split and an increase in dividend. As the improved profitability should have been perceived by the market because information of such would be publicly available, the researchers hypothesised that the announcement of a stocks split would have no impact on share returns since the increased dividend associated with such should have been anticipated, based on the publicly available information set. Their result

was consistent with what would be expected in an efficient market (semi-strong). The CARs in the pre-announcement portion of the deletion period showed an increasing positive value until month zero when the CARs levelled off. This illustrates how the announcement itself had no informational content despite its apparent high association with subsequent dividend announcements. They further showed a differential reaction in the post announcement period between firms increasing dividends (anticipated) and those decreasing dividends (unexpected). The dividend increasers exhibited CARs with a slight upward drift, however the decreasers' CARs showed a drastic reduction.

It should be noted that this study has been briefly reviewed to cite the emergence of this methodology although the work itself was not an accounting study. Accounting studies have borrowed the model from the finance literature.

The review of the accounting studies will concentrate on those studies on the association between accounting changes and changes in share prices employing the model presented. The study by Sunder (1973) on the impact of a change to L.I.F.O on the NYSE will dominate the short review as it is considered the most relevant. A list is provided in table 1 of

accounting studies employing the model or variants of it. Their detailed source references are available in the bibliography.

Sunder (1973) used the two-stage market model methodology to examine the association between the announcement of a change to L.I.F.O and changes in share prices. He used a 12 year inclusion period and a 2 year exclusion period. The 2 year deletion spanned 1 year before the announcement and 1 year after the announcement which was arbitrarily assumed to have been made on the last day of the financial year in which the change was reported.

The behaviour of the CARs derived by Sunder in the second stage of the test are reproduced in figure 1. As he used monthly returns there were 24 points on the deletion period graph. The results show non-random positive behaviour in the pre-announcement residuals, however after the announcement a random pattern emerged. The author acknowledged three different interpretations.

(1) As the post period residuals are random, the announcement had no impact on share returns.

(2) The abnormal positive returns observed in the pre-announcement period may have been caused by the impending switch to L.I.F.O,

information of which had leaked to the market prior to the official announcement.

(3) The results may be a reflection of a sample bias in that improved earnings in the pre-announcement period may have caused the abnormal returns on one hand and motivated management to make the accounting change on the other. Sunder posits an income smoothing motive. Thus he implies that only firms experiencing good times economically make such a change to L.I.F.O.

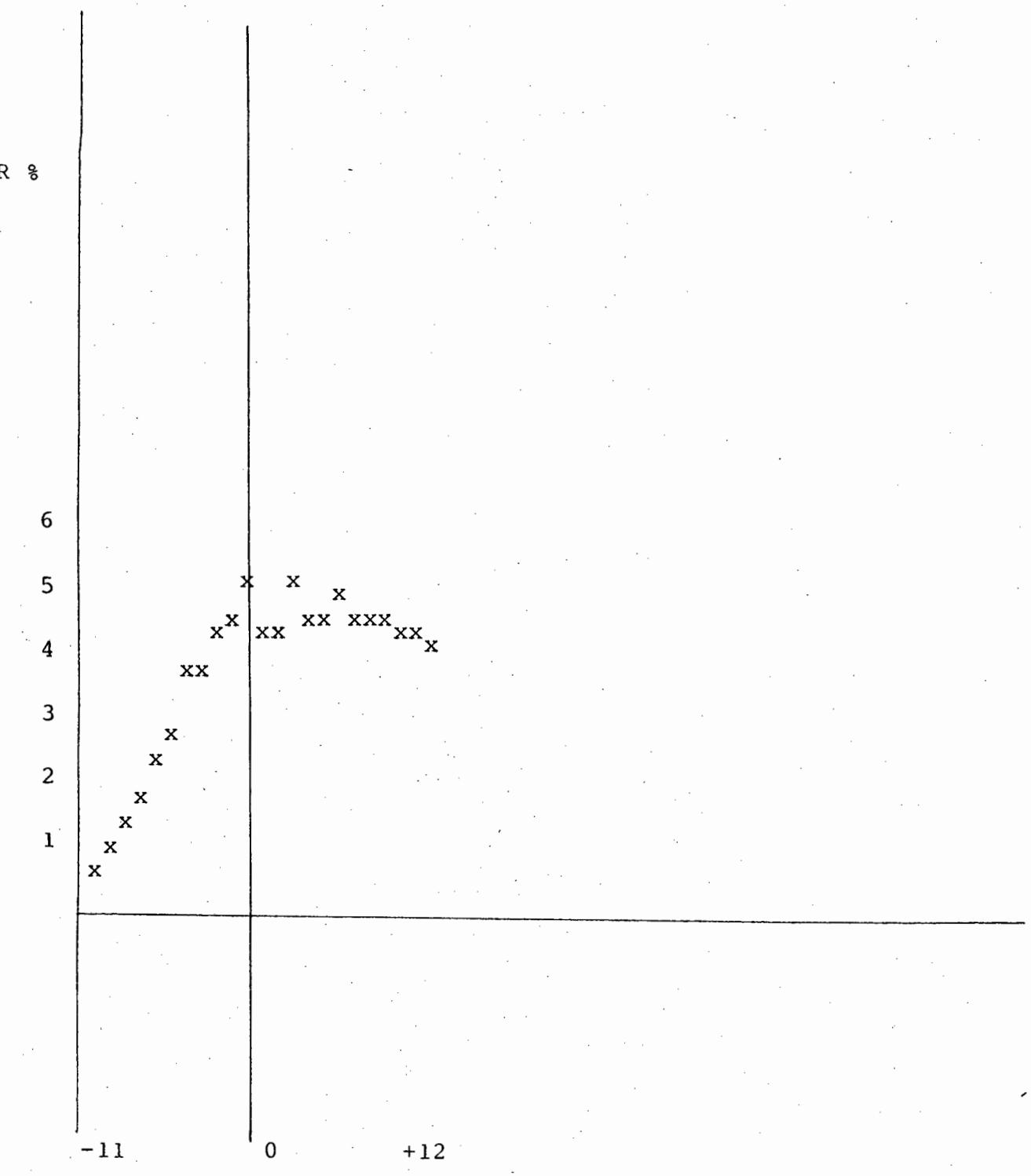
The implications of interpretations (1) and (3) are that a change to L.I.F.O has neither a positive effect due to improved cash flow nor a negative effect due to decreased earnings, on share returns.

However, interpretation (2) implies a positive effect as the market reacts to the news of improved cash flows.

Interpretation (1) is viewed as extremely tenuous as the month 0 in the study may not be the month of the announcement. It is submitted that Sunder's arbitrary choice of announcement date is quite unjustified and thus the interpretation is spurious. Month 0 may not represent the date of announcement and thus not even represent a common factor in the

FIGURE 1

SUNDER'S RESULTS



cross-sectional association. It has been suggested by Meyers (1973) that the announcement is more likely to have been made in the interim reports and thus the month 0 should be around month -6 in the diagram. Thus at least a portion of the observed positive CARs may be a reaction to the L.I.F.O switch.

The selection bias suggested in interpretation (3) is acknowledged by the writer (see section 6), in so far as post selection bias may be problematic where non-random residual behaviour is observed prior to the announcement. In such cases the announcement may only be made by firms with such symptoms and thus, it is submitted, it is difficult to assume that the announcement caused the symptoms. In view of the arbitrary timing decision, however, little can be inferred.

Interpretation (3) ignores the fact that dispite this potential duality of cause the market did not react to the favourable content of L.I.F.O. Thus although only firms enjoying good times may switch to L.I.F.O, the announcement should herald a period of even better times due to increased cash flow. This perspective changes Sunder's interpretation somewhat. If the positive CARs reflect the good times being experienced, it appears that these are reversed in the post announcement period suggesting that

L.I.F.O actually dampened the abnormal returns which may have continued to be enjoyed by the firms. Thus it could be concluded that the market reacted to the accounting numbers and not the underlying economic reality.

Subject to the timing criticism, interpretation (2) seems the most acceptable. The potential pitfalls in interpreting a graph of CARs are adequately covered in chapter 7.

Sunder used a control group comprising of twenty-two firms which reported a change from L.I.F.O back to F.I.F.O, with the reverse effects. The results showed reasonably random returns to month 0 and then a series of a non-random negative returns. This then suggests a negative impact, implying that the market reacts to the underlying economic substance and not to the accounting numbers. Yet, the criticism mentioned above as to Sunder's arbitrary choice of the date of announcement apply here equally. Further, Sunder examined the potential impact of the switch to L.I.F.O on the relative risk of firms (as measured by their β factor). His tentative conclusion was that a change to L.I.F.O increased the relative risk of firms.

A more recent study by Brown (1980) investigated what

he referred to as the short term impact of L.I.F.O on share returns.

This study differs from Sunder's in the following respects :

(1) Weekly data was used.

(2) A 100 week inclusion and 30 week exclusion method was employed in stage 1.

(3) Only changes announced in 1974 and 1975 were examined.

(4) The date of the announcement was deemed to be the date of the publishing of the interim results.

(5) An attempt was made to use a non-equivalent control group of non-changers.

The results, interestingly enough, reflected a swift and negative impact on share returns after the date of the announcement. Furthermore, in so far as only changes in a short period (two years) were examined, the contemporaneous association test employed is undermined to a certain extent in that the exclusion periods for each firm is not significantly different. The attempt to do away with the arbitrariness of the selection of announcement dates constitutes an improvement on Sunder's work. Nontheless, it is submitted that the only acceptable

approach is to establish unequivocally the exact date on which the announcement was made. The use of a non-equivalent control group can be criticised in that a random selection of exclusion periods in the control firms implicity matches each control firm with a change firm. Thus the confounding industry effects may cloud the results. Moreover, if a particular industry is disproportionally represented in the control group as compared with the change group, the results will be biased.

It is acknowledged that the use of weekly data will increase the sensitivity of the test.

Kaplan and Roll (1972) employed the two stage methodology to examine the market reaction to two accounting changes which increased earnings without any economic implications. They used weekly data and a sixty week exclusion period. Although the inclusion period varied between firms, the vast majority included over three hundred observations in the first stage.

The two accounting changes were :

(1) A change to the flow-through method of accounting for the investment credit, and

(2) A change to straight line depreciation.

Their conclusions suggested that the market saw

through the numbers and that there was thus no significant association between the changes and share returns.

Archibald (1972) investigated the market reaction to a single accounting change. This change was the depreciation switch-back examined by Kaplan and Roll (1972). He used monthly data and used a 156 month inclusion period and a two year exclusion period. He concluded that the market was able to see behind the increased earnings numbers and no abnormal association was observed.

The study by Harrison (1977) has been referred to in chapter 5. Employing the two stage methodology he concluded that there was a differential market reaction to discretionary and non-discretionary accounting changes.

Abdel-Khalik and McKeown (1978), also referred to in chapter 5, employed the two stage methodology to investigate for differential market reaction to a change to L.I.F.O depending on the sign of the expected growth in EPS before the announcement was made. They concluded that the sign of the expected growth in EPS was indeed an intervening variable and that the market reacted positively if the sign was positive and negatively if the sign was negative.

Cassidy (1976) replicated the Kaplan and Roll (1972) study on the accounting change from the deferred to

Benston (1967)

Ball and Brown (1968)

Beaver (1968)

Brown (1970)

May (1971)

Beaver and Dukes (1972)

Kiger (1972)

Brown and Kennelly (1972)

Patz and Boatsman (1972)

Baskin (1972)

Taylor (1973)

Foster (1975)

Gonedes (1975)

Morris (1975)

Hagerman (1975)

Joy, Litzenberger and McEnally (1977)

Firth (1978)

Basu (1978)

Rice (1978)

Ro (1978)

Hong, Kaplan and Mandelkei (1978)

Ball, Walker and Whittred (1979)

SOME ACCOUNTING STUDIES USING THE MARKET MODEL

TABLE I

the flow-through method for accounting for the investment tax credit. By respecifying the market index used by Kaplan and Roll, Cassidy concluded that an unexpected accounting change may temporarily deceive the market.

Ball (1972) studied the association of a number of different accounting changes. The changes were categorised according to their directional impact on earnings. Using the market model he concluded that the market was not deceived by the changes in earnings reported as result of a change in accounting method.

The general conclusion of these studies, taken together, is that in a market of proven efficiency such as the NYSE accounting changes without economic impact that are non-discretionary have little informational value and do not deceive the market by reporting higher or lower earnings numbers. The reader is referred to table I for a list of some of the accounting studies using this methodology.

6.3 AN EXPLANATION OF THE METHODOLOGY

It is considered necessary to present a narrative description of how the methodology employed in this study is able to establish the association between the announcement of a switch to L.I.F.O and abnormal changes in share price returns.

The two major problems encountered in studies of market reaction to particular events are :

(1) The timing of the relationship, and

(2) The confounding effects of a multitude of other factors on share prices.

It will be shown that the two problems are not entirely independent.

The problem of timing relates to the establishment of the exact date of the release of the information to the market. To be able to draw inferences on a relationship it is obviously necessary to pinpoint the timing of any release of information to the market. This is not always easy and in fact most studies have merely assumed an arbitrary date, such as the end of the financial year.[5] The other problem related to timing is the possibility of information leakages prior to the official release of information. There is an obvious motivation for individuals to seek information not available to the market which accentuates the likelihood of such leakages. Thus, although the exact date of the release may be established, any inferences drawn about the relationship may be rendered spurious if the informational value of such a release has already filtered through to the market and been impounded into share prices.

The current methodology has overcome the first problem by establishing the exact timing of the release of a change to

L.I.F.O to the public at large. The second problem (potential leakages) is acknowledged. However, by examining the CARs for a period of thirty-four weeks before the announcement certain leakages to the market may be detected.

The second major problem, namely of the confounding effects of a multitude of other factors on share prices, does seem a formidable barrier to the investigation. The proposed statistical model is an adequate technique to overcome this barrier.

Share price changes are caused by innumerable factors which may be categorised into two broad groups :

(1) Economy wide factors

(2) Share specific factors.

The first are those factors that affect all shares in the market to a greater or lesser extent. The second are those factors affecting only a particular share. Already mentioned in section 6.2.2 is a study by King (1966) which showed that more than 50% of changes in share prices are attributable to those factors common to the market as a whole. Thus if a share's relationship with the rest of the market could be established, the effect of market wide factors could be eliminated. An estimation of this relationship would reflect the extent to which the share was affected by particular events in relation to the rest of the market.

Thus the price changes during the period under observation could be compared to market changes in the same period and those changes attributable to the market factors eliminated thus exposing those changes attributable to specific share factors. It is of course imperative that this relationship (Beta) between the individual share and the market remains constant through time. If this assumption is contravened the common factors may be over- or under-accounted for in the period under observation. The first phase regression model applied to the inclusion data[6] estimates the parameters of each share's relationship with a market index representing a market portfolio. Thus the market wide factors are captured, as it were, into the α and β constants. It should be emphasised, however, that the regression model captures more than just market wide factors; it also removes randomly distributed firm specific factors. Thus the longer the period of estimation the greater the capture of random particular events. If an examination is made of residuals for a selected period it could be argued that certain firm specific events were causing the configuration of residuals and not the event under observation. This argument is dispensed by the assumption of this random event occurrence. Throughout its life a share will be effected by a series of random events which will affect its co-variability with the market. Thus the effect of a simultaneously occurring random event (with the event under observation) will be reduced. An example of a criticism which could be levelled at the current study is that the

announcement of a switch to L.I.F.O invariably occurs with the announcement of annual earnings, dividends, etc., and thus the observed reaction of share returns may be equally attributable to these simultaneously occurring events. Although the announcements of earnings and dividends are not random but seasonal,[7] the reaction of the market to such announcements is random and consequently will at least partially be accounted for in the current methodology. Further, the cross-sectional aggregation and averaging of firms in the second phase will further dilute the effect of these confounding events. Moreover, the randomness assumption is reinforced by the fact that the cross-sectional aggregation is performed on sequences of residuals of different chronological time periods. The only common factor between such firms is the event in question and thus, in all probability, the reaction of the CARs in aggregate will be attributable to the common factor of a switch to L.I.F.O.

The timing and confounding events problems are not totally independent for the longer the period around the event examined the greater the chance of the interference of confounding events, despite the dilution of such by the model as explained. However, if the exclusion period is too short some of the reaction may be missed, particularly in view of potential information leakages. Details of the decision on exclusion periods and timing will be presented in section 6.4 along with the research design.

The rationale behind the two phases has been referred to in section 6.2.2.

The purpose of this brief discourse on the model was to clarify potential misconceptions of the model specified in section 6.5.

6.4 RESEARCH DESIGN

6.4.1 OVERVIEW

The methodology employed will be based on the two phase market model presented in section 6.2.2 using the weekly returns of all the shares on the JSE that have announced and quantified the impact of a change to L.I.F.O and the weekly returns on the RDM 100 industrial index.

A suggested quasi-equivalent control group of non-change companies is set up as a comparative control in the study. The results are then further analysed in terms of partitions based on the criteria discussed in chapter five.

6.4.2 DATA

(1) Selection of Firms

A survey was undertaken to establish all the firms quoted on the JSE which employ L.I.F.O. This resulted in the selection of some thirty-two firms. (See appendix A&B) However, only those

firms meeting the following criteria were retained in the study :

(1) All shares must have been quoted continuously from 18 July 1969 to 14 November 1980. (591 weeks)

(2) The firms must not have undergone substantial changes at any one particular time.

(3) The firm must not only have announced a switch to L.I.F.O but the effect must have been quantified. Any reversals on consolidation of L.I.F.O effects would disqualify a firm.

(4) Because the RDM 100 index is employed, non-industrial firms were ignored.

(5) The announcement must have been made at least thirty-five weeks after the 18 July 1969, i.e. since 20/3/70 and before thirty-five weeks before the 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 L.I.F.O were considered, for it is the first change to L.I.F.O that is of interest in this study of the accounting change. For example, a firm which

converts 50% of its stocks from F.I.F.O to L.I.F.O 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.

(2) The timing of the announcement

Unlike Sunder (1973) and Brown (1980) who used an arbitrary date of announcement an attempt was made in the current study to establish unequivocally that 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 between 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.

The problem of leakages referred to in the previous section should be borne in mind. However, this factor could not be controlled in the current study.

(3) Share Price Relatives

Weekly share prices and weekly values of the RDM 100 index were available on a computer file, at the University of Cape Town, from 22 March 1968 through 20 February 1976. The last 250 weeks of data were purchased from the JSE and were interfaced with the above mentioned file. The result was that two new files were created, one containing the L.I.F.O change firms (SWITCH * L.I.F.O) and one containing the non-change control group (SWITCH * F.I.F.O).

The regression analysis was carried out with the use of the STATJOB package and a series of transformation instructions were employed to derive the price relatives from the weekly

prices. Thus the first phase of the study was completed in one computer run.

6.4.3 FORMULATION AND PROCEDURE

Phase 1

Having selected the firms and constructed the data file, an estimation was made of the parameters α and β for each share using the OLSR model based on the 520 observations (share returns) comprising the inclusion period. The inclusion period is defined as all weekly returns between 20 March 1970 and 14 November 1980 (590 observations) less 70 weeks around the announcement date which were deleted. The deletion period consisted of 34 weeks before the announcement, the week of the announcement and 35 weeks after the announcement.

Thus the following model was used :

$$R_{jt} = \alpha_j + RDM100_t B_j + u_{jt}$$

to calculate the α_j and β_j for all shares.

Phase II

The weekly data of the deletion period were then converted to returns and applied to the following formula thereby deriving 70 residuals for each firm

$$\hat{u}_{jt} = R_{jt} - \hat{\alpha}_j - \hat{\beta}_j \, RDM100_t, \qquad t = -34, \ldots, +35$$

where : $\hat{\alpha}_j$ and $\hat{\beta}_j$ were the parameters for share j

derived in phase 1.

The residuals so derived were aggregated and averaged cross-sectionally throughout the population so that 70 average abnormal residuals defined by $\overline{U_t}$ were derived for the whole group :

$$\overline{U_t} = \frac{1}{N} \sum_{j=1}^{m} \hat{u}_{jt} , \qquad t = -34, \ldots , +35$$

where : N = 21 for the full group.

Finally, 70 cumulative abnormal average returns (CAR), defined by U_t, were derived for the group.

$$U_t = \sum_{i=-34}^{t} \qquad t = -34, \ldots , +35$$

These CARs were plotted and analysed graphically. The results are presented in chapter 7.

Quasi-equivalent control group design

In order to ensure that the CAR configuration of the study group is peculiar to such group a number of earlier studies have constructed a test control group of firms 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.

Sunder (1973) did examine a group of firms announcing a change from L.I.F.O to F.I.F.O and observed non-random behaviour in the post-announcement period being

negative in direction. However, his control group of 120 firms selected randomly did exhibit non-random behaviour. This non-equivalent control group design has been used in many studies amongst others that of Brown (1980) mentioned above. A criticism of this approach is that although it purports to be non-equivalent in that no attempt is made to match change firms to non-change firms (which would be impossible), there is an implicit matching of deletion periods. The result of this may be that industry effects obscure the comparison of the control group with the study group, especially if firms are matched across industrial boundaries. Furthermore, it is possible that a particular industry may be disproportionately represented in the control group and thus render the latter not comparable. It should be noted that, although the control group is to provide evidence of the usual non-randomness of the residuals around the spurious date of a hypothetical change, the implicit matching contradicts the non-equivalency of the design.

Another approach has been to incorporate a randomly selected control group as above into a portfolio of equivalent risk. This is referred to as an iso-Beta portfolio analysis. Although the criticisms above apply here equally, this approach reflects

the possible unease felt in using a non-equivalent control group within the current methodology.

The use of a control group is not to provide support for the model itself (the model alone is quite adequate) but to establish the appropriateness of the model in the tested environment.

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

(1) The selection of a shadow firm from the same industry.
(2) Employing the selection method of choosing the firms in the industry with the closest valuation of inventories at the date of the change firm's switch to L.I.F.O.

Thus no attempt is made to match equivalent firms and the level of inventory holding is really a random selection technique. The current procedure does not purport to suggest that an equivalent level

of inventory holding will result in a similar impact of a change to L.I.F.O if the shadow firm made the change. The implications of change to L.I.F.O 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. The selection procedure must be emphasised as being random within the industry. 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 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 with each partner in the study group. The results are presented in figures 1B & 2 B of chapter 7.

Further analysis by partitioning

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

(1) High Beta risk / low Beta risk

(2) High earnings impact / low earnings impact

(3) 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 F.I.F.O system were classified as high earnings impact firms. That is, firms whose F.I.F.O 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 :

2 groups in category (1) of 11 (high β) and 10 (low β) firms,
2 groups in category (2) of 8 (high earnings impact) and 13 (low impact) firms,
2 groups in category (3) 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 F.I.F.O earnings were reduced for all firms in the study group.

The rationale for such an analysis is presented within the conceptual framework of chapter 5.

The various hypotheses are stated in chapter 7 in which

the results are presented and interpreted.

6.5 A DEFENCE OF THE MODEL AND METHODOLOGY

The model will now be defended against popular criticisms and certain econometric issues will be addressed.

6.5.1 ECONOMETRIC ISSUES

The use of the OLSR technique has certain implicit assumptions. If these are contravened the model cannot be relied on to provide the best linear unbiased estimate of the parameters α and β.

The assumptions are :

(1) Stationarity of data (linearity assumption)

(2) The data should exhibit homoscedasticity

(3) Independence of residuals

(4) Normality of the distribution of data

It must be emphasised, however, that assumptions (2) and (4) are only critical to the use of various tests of significance (F-tests, etc.) which are based on these assumptions. As these tests are not applied in the current study, a contravention of assumptions (2) and (4) will not effect the results. The regression analysis will still provide the best linear unbiased estimate of α and β. This phenomenon was referred to in chapter 4 section 4.3.2.

The independence assumption

Should the returns on shares be non-independent, the OLSR model would not provide the best linear unbiased estimate of α and β. The tests carried out by Affleck-Graves (1975) indicate that on the JSE the returns exhibit zero autocorrelation. This evidence will be relied on in the current study ; the assumption does not seem unreasonable.

The stationarity assumption

Essentially, the stationarity assumption states that the value of β is stable through time. If this is so, β estimates based on data from different periods of time will not be significantly different.

Since there is a possibility that a firm's relative risk (β) varies through time and further, in view of the possibility that the announcement of a change to L.I.F.O may cause an adjustment in this relative risk factor, the abovementioned assumption may not be valid.

One method of diminishing the debilitating effect of non-stationarity is to base the β estimates on short periods of time. These short term data are more likely to exhibit stationarity than those of long periods. However, although decreasing the probability of non-stationarity the short term estimates may not adequate-

ly capture the randomly occurring confounding events referred to in section 6.3. For this reason short term estimates alone are considered inappropriate.

A number of methods of establishing more accurate β estimates have been used including Bayesian methods. The reader is referred to Ball (1972) and Basu (1978) for a description of some of these procedures.

The approach taken in the current study has avoided the necessity of reducing the inclusion period. The procedure employed was to reperform the phase 1 estimates 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 L.I.F.O. The CARs so derived are comparatively analysed with the CARs based on the long term data and the results presented in chapter 7. The conclusion drawn is that results based on short term data would result in a not significantly dissimilar configuration of CARs. For this reason the potential non-stationarity of β is not considered to be problematic in the current study.

6.5.2 THE INTERNAL VALIDITY OF THE STUDY[8]

The question of internal validity refers to whether

the configuration of abnormal returns derived in the study are in fact associated with an announcement of a change to L.I.F.O.

The following issues are considered to be relevant in assessing internal validity :

(1) The completeness of the market index

(2) Cross-sectional information loss

(3) The measurement of abnormal returns

(4) Industry effects

(5) The possible discretionary nature of a change to L.I.F.O

(6) Internal management effects.

(1) The completeness of the market index

It has been explained in section 6.3 how the common event method in the cross-sectional alignment of exclusion periods should cancel out certain of the confounding events effecting share returns. However, the use of a particular market index, in this case the RDM 100 industrial index, as a surrogate for a market portfolio may be an inadequate measure of all market wide events. To minimise the potential undermining effect of the possibility of the index not capturing all market wide factors, non-industrial shares were excluded from the study. This potential effect is not

considered to be critical in a study of purely industrial shares.

(2) Cross-sectional information loss

The general problem of information disclosed in many companies'financial statements being captured into the market index and thus resulting in a 'wash out' of information effects is acknowledged. However, it is not considered a serious impingement on internal validity. Yet, in cases where the announcement of a change to L.I.F.O by one firm has a direct implication to another firm which subsequently changes to L.I.F.O, cross-sectional information transfer cannot be ignored. In this study all firms were scrutinised for this possibility and one example was discovered and dealt with as follows :

Huletts Aluminium Limited is 60,8% owned by Huletts Corporation Limited. Both companies are quoted on the JSE.

The subsidiary company announced a change to L.I.F.O on a particular date which had a substantial effect on its earnings. This change had obvious implications for the holding company. A number of months later the holding company released its annual report wherein it announced a change to L.I.F.O and quantified the impact. However, the

change announced by the holding company was in reality the same change as that announced by the subsidiary company. At the date of the initial announcement the information on the impact on earnings was publicly available and thus this date was deemed to be zero week for both holding and subsidiary company. It would have been meaningless to take the date of the holding company announcement as zero week for itself.

(3) The measurement of abnormal returns

It has been claimed that an arbitrary selection of the length of exclusion/inclusion periods may in part be responsible for the configuration of CARs produced by the model.[9]

Further, work done by Ball (1972) suggests that the use of different combinations of exclusion/inclusion lengths result in significantly different configurations.

The use of a short term estimate in this study as a control for the potential non-stationarity of data has indicated that the results are not a function of the length of the inclusion period. Furthermore, it must be acknowledged that a researcher must ultimately decide on a particular exclusion period length in any study. The use

of an arbitrary exclusion length does seem unjustified in the light of Ball's study.

The problem that faces the researcher is that too short an exclusion period, although eliminating confounding effects, may also at least partially eliminate the effects of the event under observation. A too long period, on the other hand, may fail to eliminate confounding events which will obscure the effects of the event in question. Bearing the aforegoing in mind, a decision of 34 weeks before and 35 weeks after the event in this study was based on the following factors :

(1) It was decided to expand the period as long as possible, provided that the exclusion period included only one annual report.

(2) The length was further designed to include one interim report in both the pre- and post-event periods to provide, as it were, a balance of confounding events.

Thus it is respectfully submitted that the different configurations produced in Ball's alternative combinations were not really a function of the arbitrariness of the period but of the underlying effect of various events being excluded or included. A rationalised selection of period

with a view to establishing the effect of a particular event therefore escapes the Ball criticism.

It will have been noticed that no alternative research model has been specified in this thesis. This may seem strange in the light of criticisms in the past which have suggested that the CARs may be functions of the particular model employed. A recent study by Brenner (1979) however, has negated such criticisms and thus also the need to consider currently available alternative specifications. Brenner has tested five different specifications of the current model and found the results to be substantially the same.

A recent paper by Affleck-Graves and Money (1981) has shown how various models estimating β on the JSE give substantially the same result.

(4) Industry effects

This phenomenon is related to the inability of the market index to capture events peculiar to industries. The empirical evidence in the United States provided by King (1966) suggests, however, that these effects are likely to be insignificant in relation to the market wide factors. King indicated that industry effects were responsible for less than 10% of the variance in share prices. Again it is questionable if the evidence

is transferable to the JSE, but in the absence of local evidence King's conclusion is a useful indication. Thus industry effects are not likely to undermine the results.

It is submitted that a greater cause for concern with respect to these industry effects is the fact that the study group may contain a disproportionate representation of each industry. For example, in the current study 36% of the Paper and Packaging industry is included while quite obviously Paper and Packaging does not constitute 36% of the total market. The methodology of aggregation across different time periods should, however, dilute such effects.

(5) <u>The possible discretionary nature of a change to L.I.F.O</u>.

Demski claims that the events which caused the positive abnormal residuals in Sunder's study may have induced the change to L.I.F.O, rather than just being associated with such a change as claimed by Sunder. However, this is unlikely to be the case where, as in the current study, the pre-announcement CARs exhibit reasonably random behaviour.

What remains of this criticism is that the non-

random behaviour of the post-announcement residuals may be a reaction to the announcement per se or the change per se or both.

It is acknowledged that this duality of cause cannot be distinguished. It is submitted, however, that in view of the discussion in chapter 5 the reporting of L.I.F.O may be regarded as non-discretionary or at least neutral discretionary in as much as the motive for improved cash flow was likely to dominate. Thus the reaction is probably due to the implications of the change heralded by the announcement.

(6) Internal management effects

Another phenomenon involving duality of cause may be the possible impact of a change to L.I.F.O on management behaviour. Demski (1973) claims that the observed behaviour of abnormal returns may not be due to the change itself but to the changed management style which may be induced by the change. This is possible where the change to L.I.F.O for external reporting coincides with a change to L.I.F.O for internal reporting.
It is respectfully submitted that at best this phenomenon is a question of external validity since the behaviour of the abnormal returns has in fact been caused by the changes, albeit in-

directly.

6.5.3 THE EXTERNAL VALIDITY OF THE STUDY

External validity is concerned with the generalised conclusion that can be drawn from such a study.

It is conceded that the results of a study of the impact of a change to L.I.F.O on share returns is situation specific. However, within the conceptual framework presented in chapter 5 the results are likely to provide some insight on how the JSE reacts to accounting changes in general. The abovementioned duality of cause may of course restrain very generalised statements on the information consumption process.

It is submitted that a general statement on the efficiency of the JSE is, nevertheless, justified.

Although the market reaction to only one particular piece of information has been examined relating to only twenty-one shares, these twenty-one shares did constitute the full population (universe) of change firms on the JSE at the cut-off-date. Further, as there are no barriers to the purchase of such shares by investors, a sustained consistent over- or under-valuation of a particular group of shares relative to a specific piece of publicly available information indicates an inefficient market. Conversely, a rapid adjustment in price by a number of shares

exposed to a common event would indicate an efficient market.

The fact that only twenty-one shares were examined does not prevent a general statement of efficiency, for the existence of consistent inefficiency or efficiency relative to a particular event is reflective of the quality of the market.

It should be emphasised that the efficiency of a market relates to the market participants and not to the shares themselves. In this study it is all the participants that are being tested in the absence of barriers to entry. The result will reflect the participants' aggregate ability to impound a piece of information with potential informational value.

Finally, it is emphasised that no experience can claim to be perfect, particularly in an embryonic domain such as accounting. This quote from Campbell and Stanley (1966) is considered appropriate :

> "From the standpoint of the final interpretation of an experiment and the attempt to fix it into the developing science, every experiment is imperfect." (p.36)

Before introducing the results, a justification is presented for the simultaneous testing of efficiency and the informational content of an accounting change.

6.6 A JUSTIFICATION FOR SIMULTANEOUSLY TESTING SHARE MARKET EFFICIENCY AND THE INFORMATIONAL CONTENT OF ACCOUNTING CHANGES

Sunder (1973) and others have argued that in studies of capital market reaction to information a maintained hypothesis is required.[10] That is, to test if the market has reacted efficiently to a piece of information, they argue, an *a priori* assumption of how the market should react must be made and this becomes the maintained hypothesis. Similarly, if a test of informational content is sought an *a priori* assumption of efficiency becomes the maintained hypothesis. Thus they conclude an attempt to test both efficiency and informational content is circular in that the maintained hypothesis is being tested as well.

However, it is submitted that no such maintained hypothesis is required in this study. There are two elements to efficiency :

(1) Speed of adjustment to new information, and

(2) reaction only to information relevant to valuing shares, i.e. the market should not be deceived by purely bookkeeping entries.

If informational value defines only that information relevant to valuing a share price correctly, it is acknowledged that as only an efficient market can be relied on to react only to such information, efficiency needs to

be the maintained hypothesis in tests of informational value. The current study, however, seeks only to establish whether the JSE perceived a change to L.I.F.O as having informational content. Naturally a reaction by the JSE to a change to L.I.F.O will be a function of its efficiency. The positive questions to be answered are : what is the reaction of the JSE to a change to L.I.F.O? and, does the market perceive a change to L.I.F.O as having informational value? To answer these questions empirically no assumption on efficiency needs to be made. As the effects on earnings are inversely related to the economic impact of L.I.F.O the following pair of competing hypotheses may be set :

Hypothesis 1[11]

The market expectations of a firm are formed on the basis of the real economic value of the firm. Changes in market price represent changes in the market expectation of the firm's real value and thus accounting changes heralding an increase in economic value are associated with an upward adjustment of price.

Hypothesis 2

The market expectations of a firm are formed on the basis of reported earnings. Thus accounting changes which decrease the reported earnings will be associated with a downward price adjustment

irrespective of any change in the economic value of the firm.[12]

Although these hypotheses intend merely to test the market reaction to L.I.F.O,[13] it is obvious that they implicitly test efficiency as well. If hypothesis (2) is accepted the market is inefficient in that it is being deceived by the accounting numbers.

The element of efficiency which requires the market to react quickly to new information can be directly observed by the examination of the CARs (defined below) around the time of the announcement. No a priori assumption is required vis à vis market reaction.

All the possible outcomes of a simultaneous test of market efficiency and information impact are shown on figures 2, 3 and 4. These represent the cumulative abnormal residuals (CARs) (see below) during the period surrounding the date of the announcement. The expected value of each week's abnormal return is zero and thus by cumulatively totalling weekly values the weekly cumulative values should all be zero as well. If there is a reaction a number of returns immediately after the announcement would depart from zero. However, once the information has been fully impounded the returns should return to zero and thus the cumulative residuals will be arranged parallel to the horizontal axis.

Exhibits 1 and 2 of figure 2 show a once-off adjustment

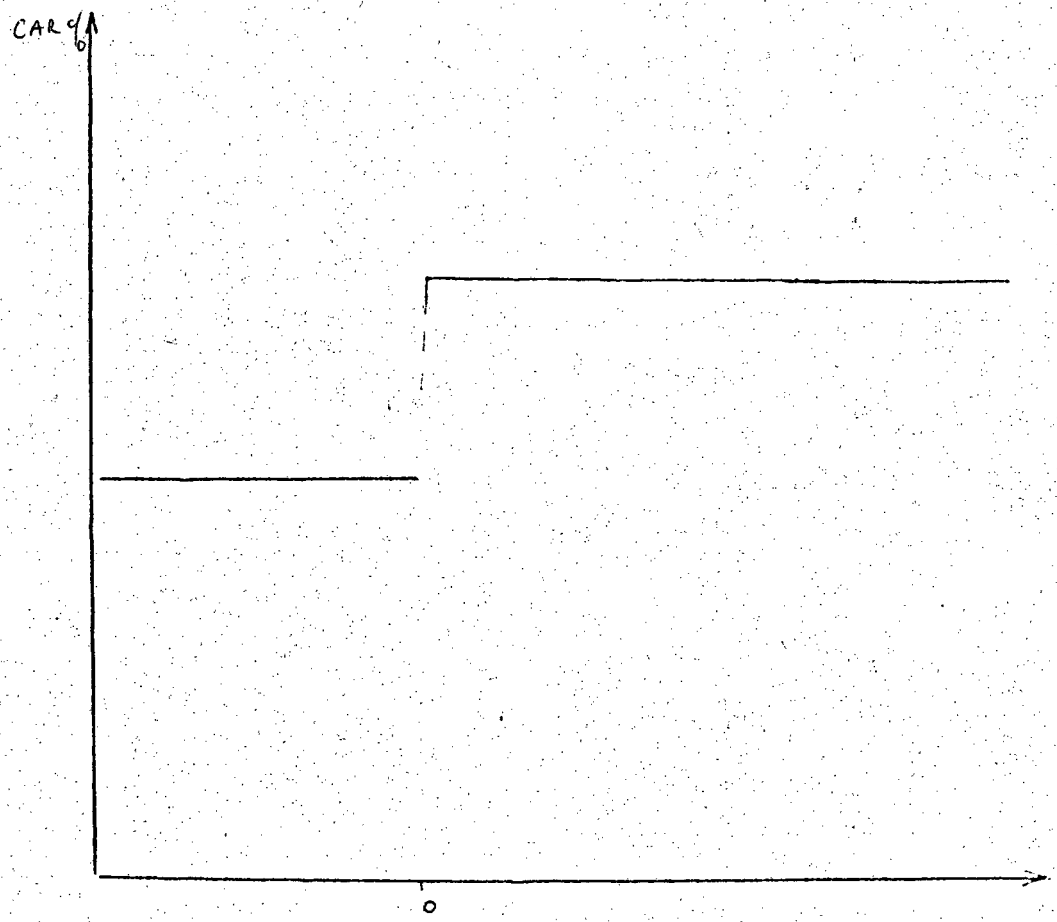


Exhibit 1

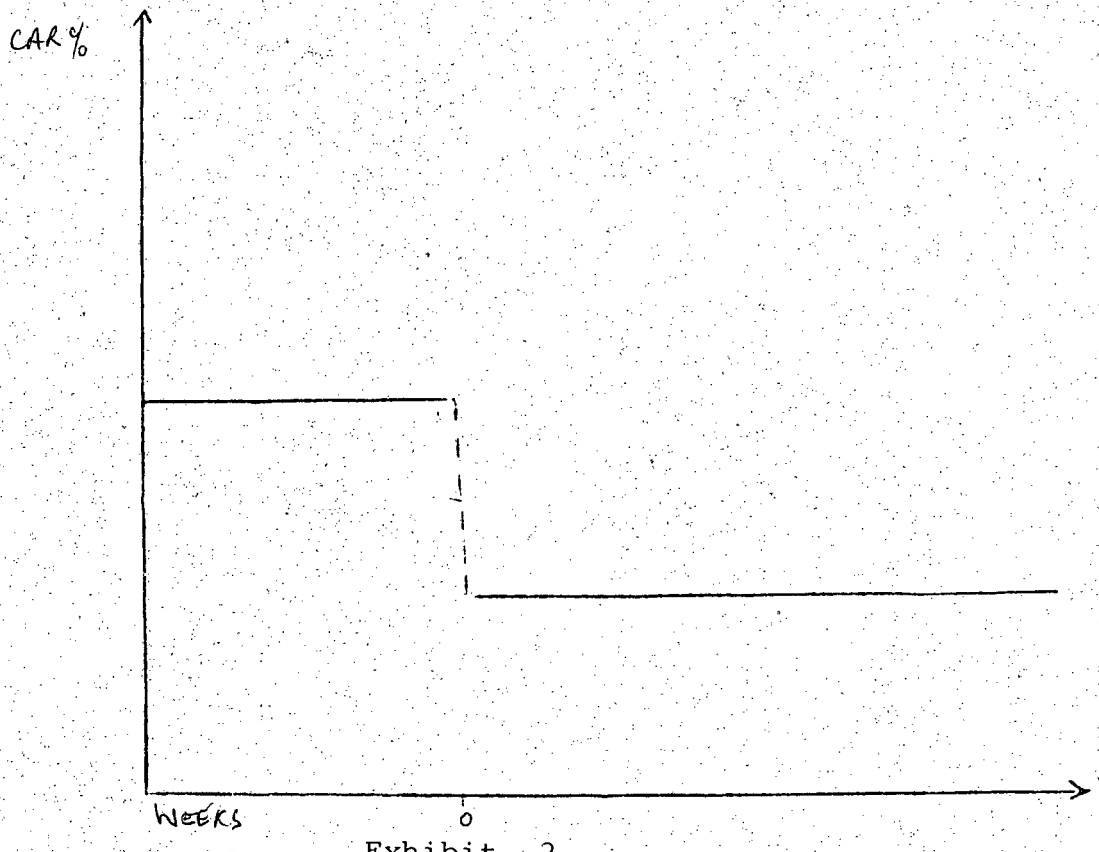


Exhibit 2

FIGURE 2

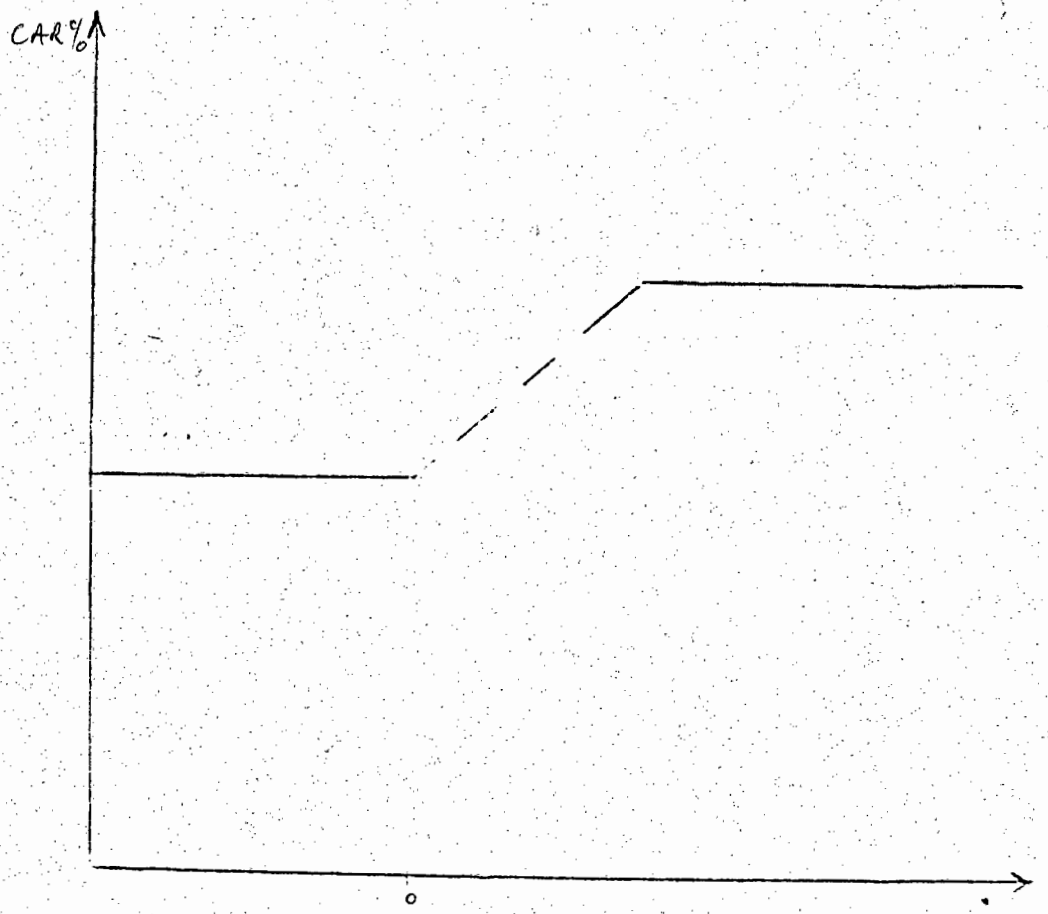


Exhibit 3

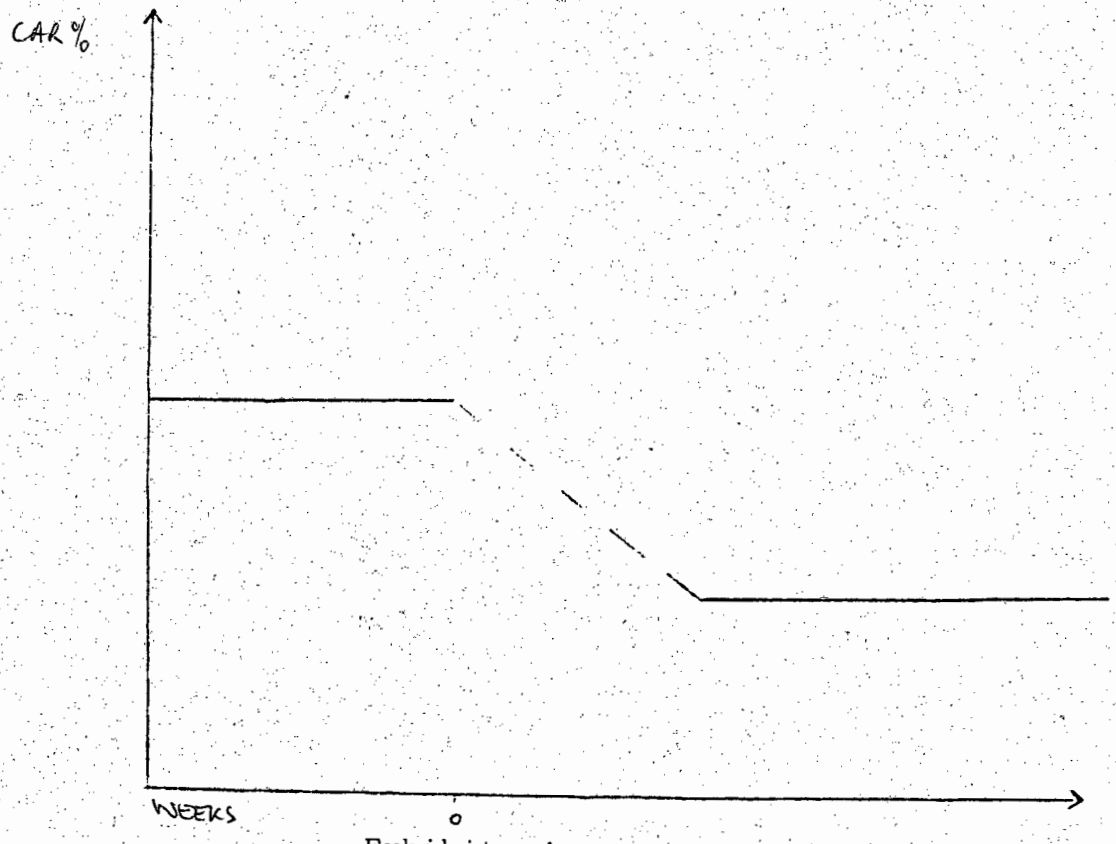


Exhibit 4

FIGURE 3

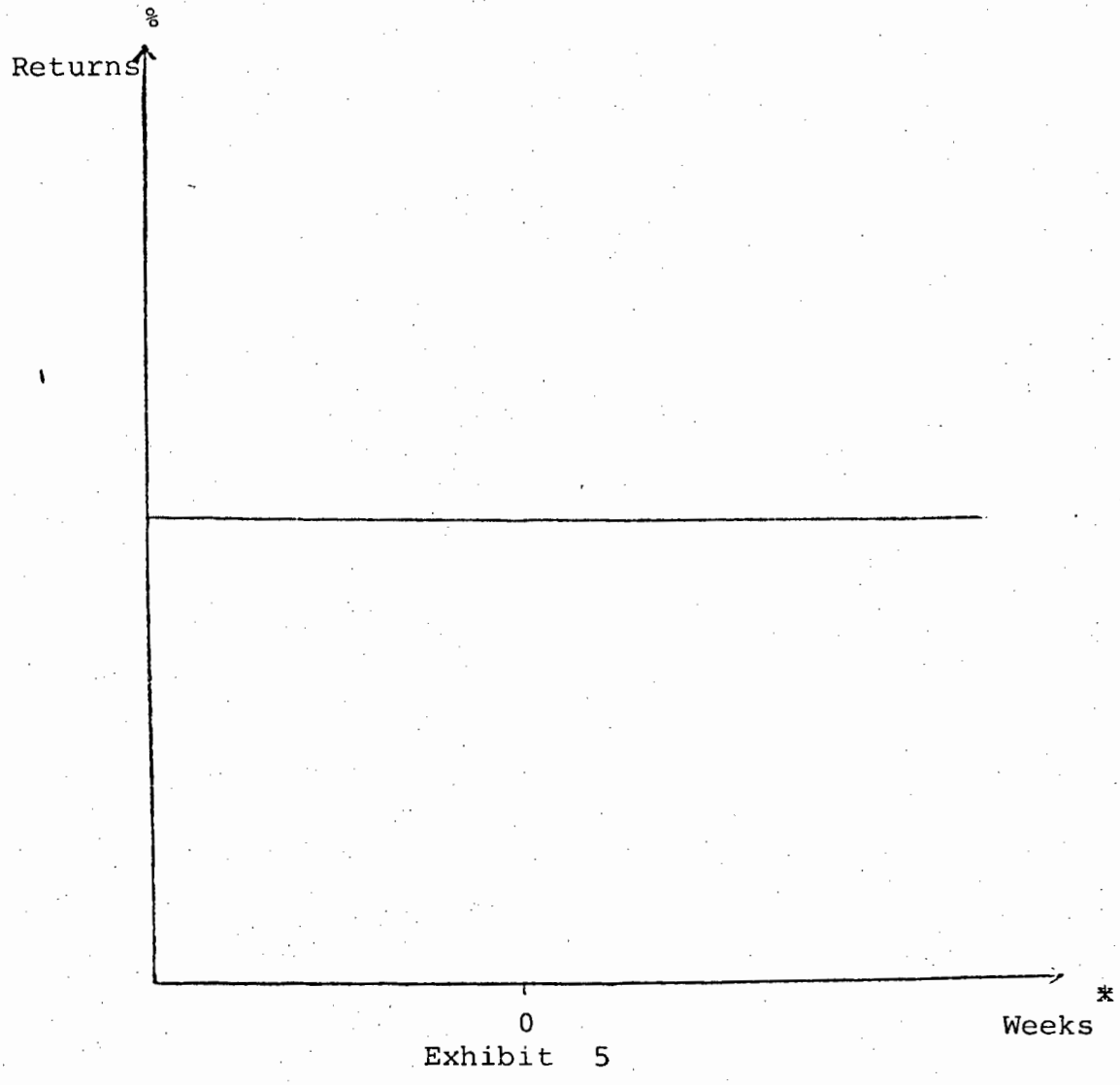


Exhibit 5

* Week 0 is the week of the announcement.

FIGURE 4

at week zero. Without a priori assumptions it can be stated that the market is efficient as far as the speed of adjustment to new information is concerned. The results shown in exhibits 3 and 4 of figure 3 can also be interpreted without a priori assumptions. The market is inefficient as far as speed of adjustment is concerned. The information took a number of weeks to be impounded. It is thus possible in cases 1 through 4 to make a statement on the market's efficiency of speed of adjustment. Further, it is possible in these cases to state what the reaction has been to this particular announcement, that is, positive or negative. It is submitted that in all cases with results defined by exhibits 1 through 4 a statement on efficiency and impact can be made.

However, in cases showing results such as exhibit 5 no statement can be made on efficiency. As there is no discernable reaction the interpretation could be that the announcement had no informational value (it is in fact that there was no reaction) or that the market inefficiently ignored a signal relevant to the valuation of the shares. In such a case a maintained hypothesis is required.

It is acknowledged that no statement can be made on the other element of efficiency (that the market is not deceived by accounting numbers) in cases 1 through 4, without an a priori assumption on the informational content

of the announcement. A normative statement would have to be made on the way a market should react to the announcement, thus introducing a certain circularity.

In the framework proposed in chapter 5 this problem has been addressed and it was concluded that where the discretionary and translatable attributes are neutral and the economic implications and impact on accounting numbers are counter-directional the setting of the competing hypotheses 1 and 2 is justified. It is acknowledged that where hypothesis 2 is accepted and inefficiency concluded there has been an *a priori* assumption *vis à vis* information content, however it took the acceptable form of a competing hypothesis and not a maintained hypothesis. Consequently the logic is then void of circularity.

It is accepted that in cases other than the one cited above circularity would prevent a simultaneous testing of efficiency and information content. Conclusions could still be drawn on the speed of adjustment and actual market reaction (*ex post*).

A result as in exhibit 5 is not interpretable in any situation without a maintained hypothesis. Further, the speed of adjustment measurement is lost.

As the current study examines an accounting change which is non-discretionary translatable and has a real economic implication with a counter-directional impact on earnings

a test of hypothesis 1 and 2 is possible without any a priori assumptions. Furthermore, the results will supply information on what the market reaction to L.I.F.O has been as well as whether the market has been deceived by the accounting numbers. The speed of adjustment element of efficiency is measurable by observation. All of these conclusions are not based on any maintained hypothesis and are justified provided the format of the results is not that of exhibit 5.

It will be shown in chapter 7 that in the main the results fall into the format of exhibit 4.

All the hypotheses are stated and tested in chapter 7.

Although Sunder (1973) assumed market efficiency, his results are often quoted as supporting accounting information efficiency.[14] This is probably illustrative of how the problem of circularity does not apply to the studies of market reaction to a change to L.I.F.O. Sunder's assumption of efficiency does not seem to have been necessary to test his competing hypotheses.

Fortunately Sunder's results supported the equivalent of hypothesis 1. What would the interpretation have been if the results supported hypothesis 2? :

If informational value had been defined as information relevant to the valuation of shares and the test sought

to establish whether a change to L.I.F.O was so relevant, an acceptance of hypothesis 2 would simultaneously suggest that the change did indeed have informational value and disprove the maintained hypothesis of efficiency. This would indeed be a circuitous conclusion!

This section has illustrated some of the problems in hypothesis setting. It is re-emphasised that the current study seeks to investigate the two elements of market efficiency referred to and to establish what the reaction to a change to L.I.F.O has been on the JSE. Thus it seeks to establish whether the announcement of a change to L.I.F.O is perceived by the market as having informational value.

CHAPTER 6

FOOTNOTES

1. A glance through the contents of the two major journals The Accounting Review and The Journal of Accounting Research, will substantiate the statement.

2. See Benjamin and Stanga (1977) and Lee and Tweedie (1975) for examples of this low response.

3. The FFH has alternatively been referred to as the Monopolistic Information Hypothesis which posits that the accountant has a monopoly on information and thus the market will react to the accounting numbers irrespective of other information.

4. See King (1966).

5. See Sunder (1973).

6. Remember the exclusion period around the time of the announcement is so excluded for econometric reasons (see section 6.3.2).

7. The OLSR does not account for seasonal factors.

8. Phase II computations were carried out with a specially written fortran programme.

9. A defence of the model on these grounds is given in response to the criticisms put forward by Demski (1973), Meyers (1973)

and Benston (1980).

10. See Demski (1973).

11. See also Anderson and Meyers (1975).

12. These are essentially the hypotheses tested by Sunder (1973).

13. These hypotheses are tested in chapter 7.

14. See Sunder (1973).

15. See Dyckman, Downes and Magee (1975).

CHAPTER 7

THE RESULTS

7.1 INTRODUCTION

The results of the empirical study will now be presented in a graphical form. The CARs for weeks -34 through +35 are presented for each group described in chapter 6.

The results will be presented in pairs of graphs shown in table 2. Each set of CARs are plotted on a transparency which enables the reader to view the pairs together and individually. Please note that one transparency in each pair is attached to the top of the backing page to facilitate the examination of each graph separately.

The approach will be to set up pairs of competing hypotheses in each section (see table 1) and test them. Tentative conclusions will be drawn in each section. An overall conclusion will summarise the results in section 7.3.

The interpretation of cumulative graphs is not easy and the approach adopted in this analysis is set out. The model employed and the aggregation of CARs should distil confounding events so that the final CAR graph is likely to represent the impact of L.I.F.O only. This has been explained in chapter 6. The assumption of the methodology may not be a 100% 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 for each price, the detailed interpretation and conclusion will concentrate on the eleven weeks surrounding the announcement of the change. Thus the graphs will be reproduced with only twenty-two observations each, the CARs for weeks -11 through +10. 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.

Much time will not 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 for 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 justifies the use of a sliding scale in the analysis of the reduced period graphs. Each category's CAR value is equated to zero for week -1.

Section	Hypotheses / Figure	1 & 2	3 & 4	5 & 6	7 & 8	9 & 10	11 & 12
7.2.1	1 & 2	X	X				
7.2.2	3 & 4			X			
7.2.3	5 & 6				X		
7.2.4	7 & 8					X	
7.2.5	9						X

TABLE 1

SUMMARY OF THE HYPOTHESES TO BE TESTED IN EACH SECTION OF CHAPTER 7

Figure 1 A The full group of L.I.F.O changers weeks -34 through +35

B The quasi equivalent control group of non-changers for the same period

Figure 2 A The full group of L.I.F.O changers weeks -11 through +10

B The quasi equivalent control group of non-changers for the same period

Figure 3 A High risk changers, weeks -34 through +35

B Low risk changers, weeks -34 through +35

Figure 4 A High risk changers, weeks -11 through +10

B Low risk changers, weeks -11 through +10

Figure 5 A Pre 1979 changers, weeks -34 through +35

B 1979 and post 1979 changers, weeks -34 through +35

Figure 6 A Pre 1979 changers, weeks -11 through +10

B 1979 and post 1979 changers, weeks -11 through +10

Figure 7 A Large impact changers, weeks -34 through +35

B Low impact changers, weeks -34 through +35

Figure 8 A Large impact changers, weeks -11 through +10

B Low impact changers, weeks -11 through +10

Figure 9 A Long term Beta estimate full group L.I.F.O changers

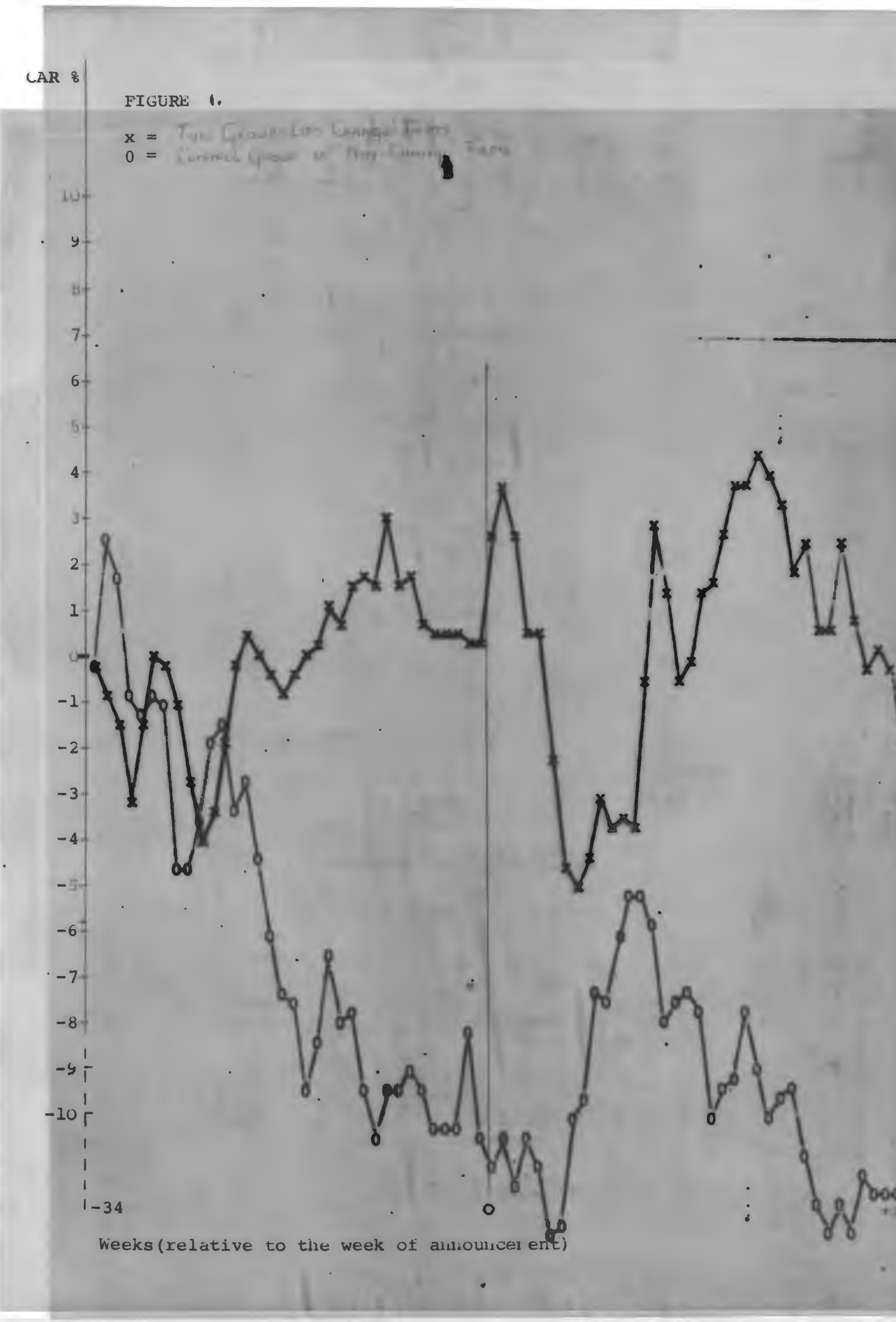
B Short term Beta estimate full group L.I.F.O changers

N.B. All graphs representing weeks -11 through +10 are presented on a sliding scale with week -1 CAR of each pair being equated to zero.

All graphs except 9B are the CARs derived from the long term estimates of Beta.

TABLE 2

SUMMARY OF GRAPHS PRESENTED IN CHAPTER 7


CAR %
FIGURE 1.
x =
0 =
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-34
Weeks (relative to the week of announcement)

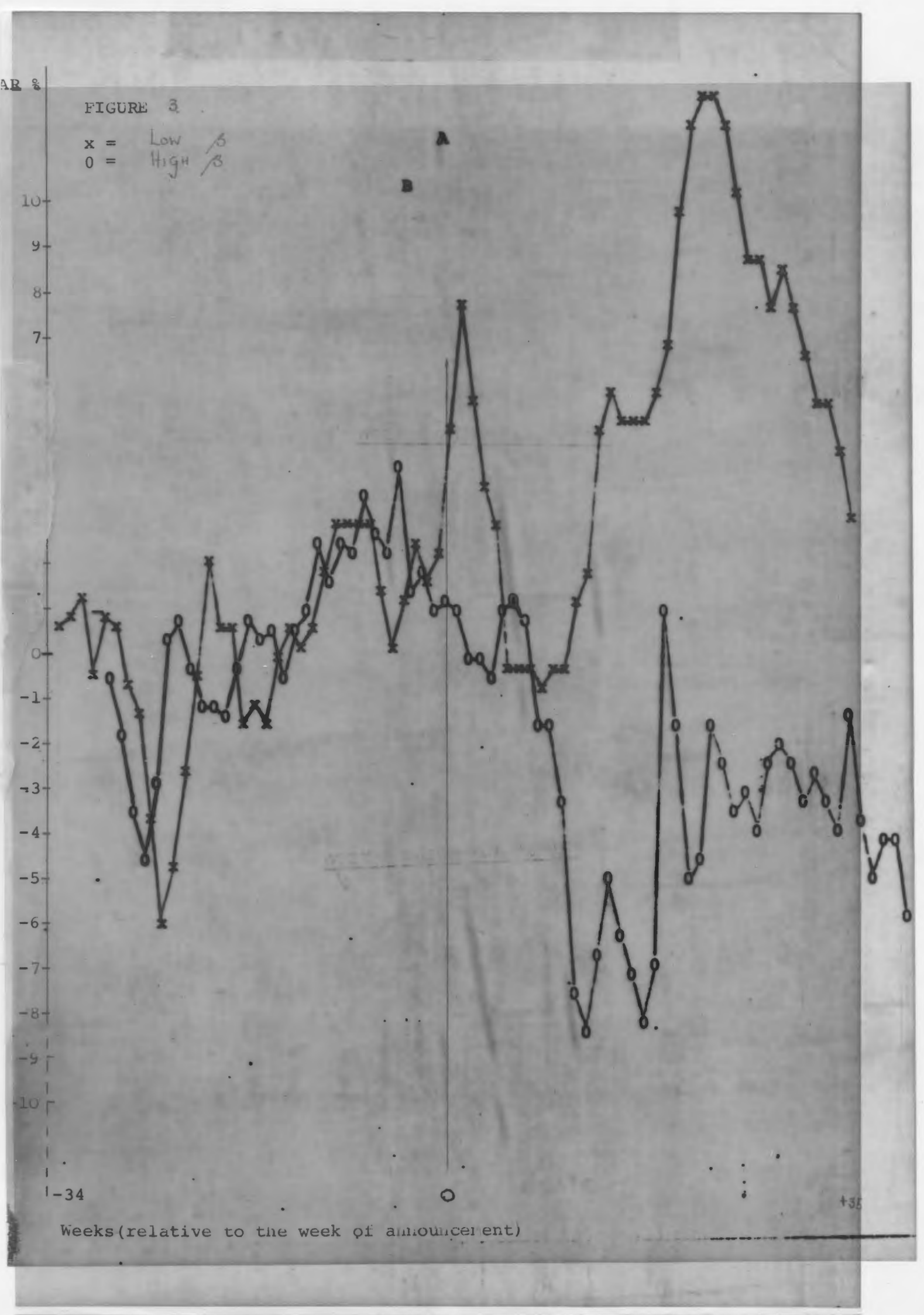

AR %
FIGURE 3
x = Low β
0 = High β
A
B
10
9
8
7
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-34
+35
Weeks(relative to the week of announcement)

FIGURE 2.

x = Full Group of LIFO Change Firms
0 = Control Group of Non-Change Firms.

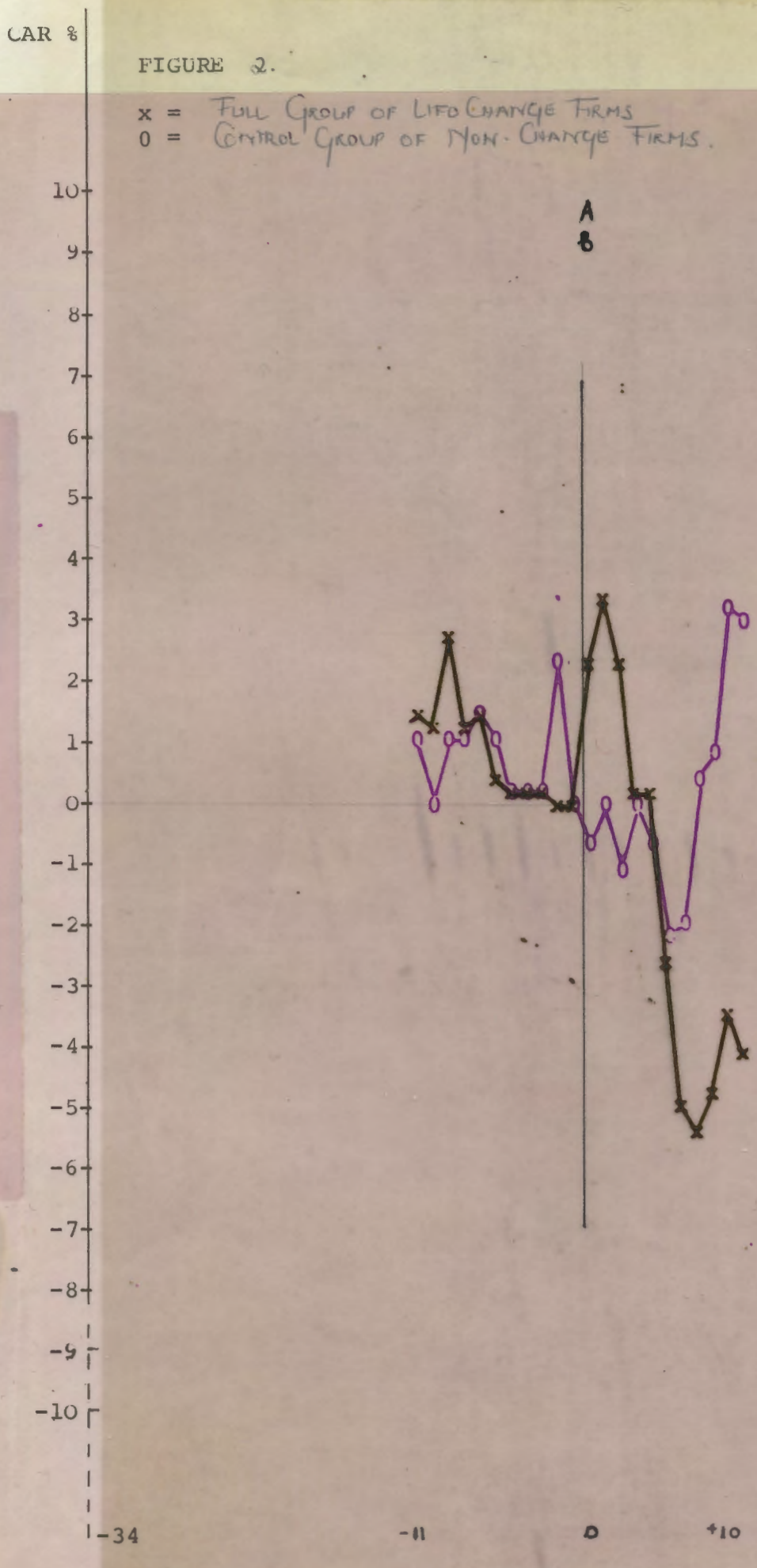


FIGURE 4.

x = Low β
0 = High β

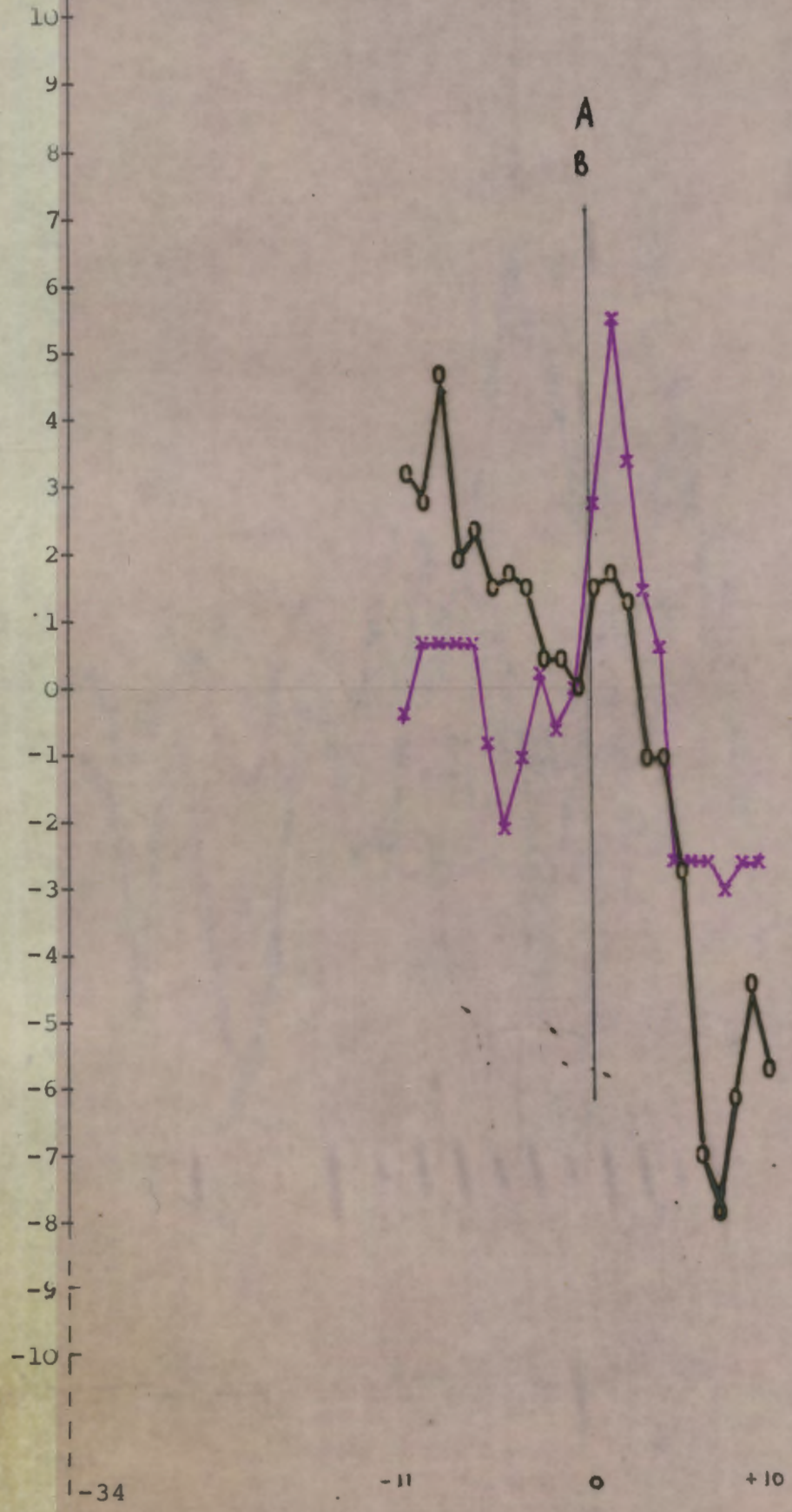


FIGURE 6.

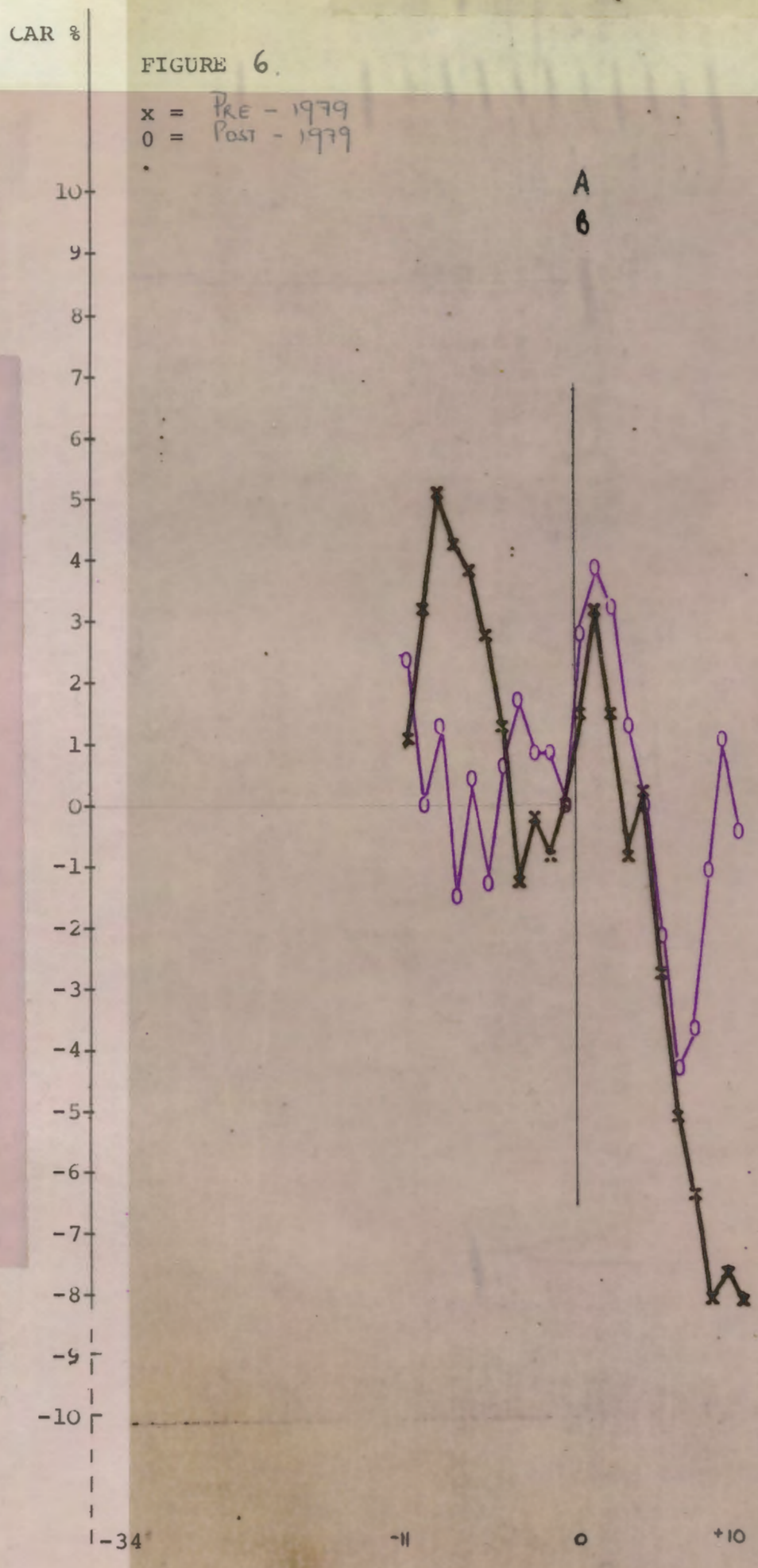

CAR %
x = PRE - 1979
0 = POST - 1979
A
6
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-34
-11
0
+10
Weeks (relative to the week of announcement)

FIGURE 7.


CAR %
x = High Earnings Impact
0 = Low Earnings Impact
A
B
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-34
0
Weeks (relative to the week of announcement)
+35

FIGURE 8.

x = High Earnings Impact
0 = Low Earnings Impact

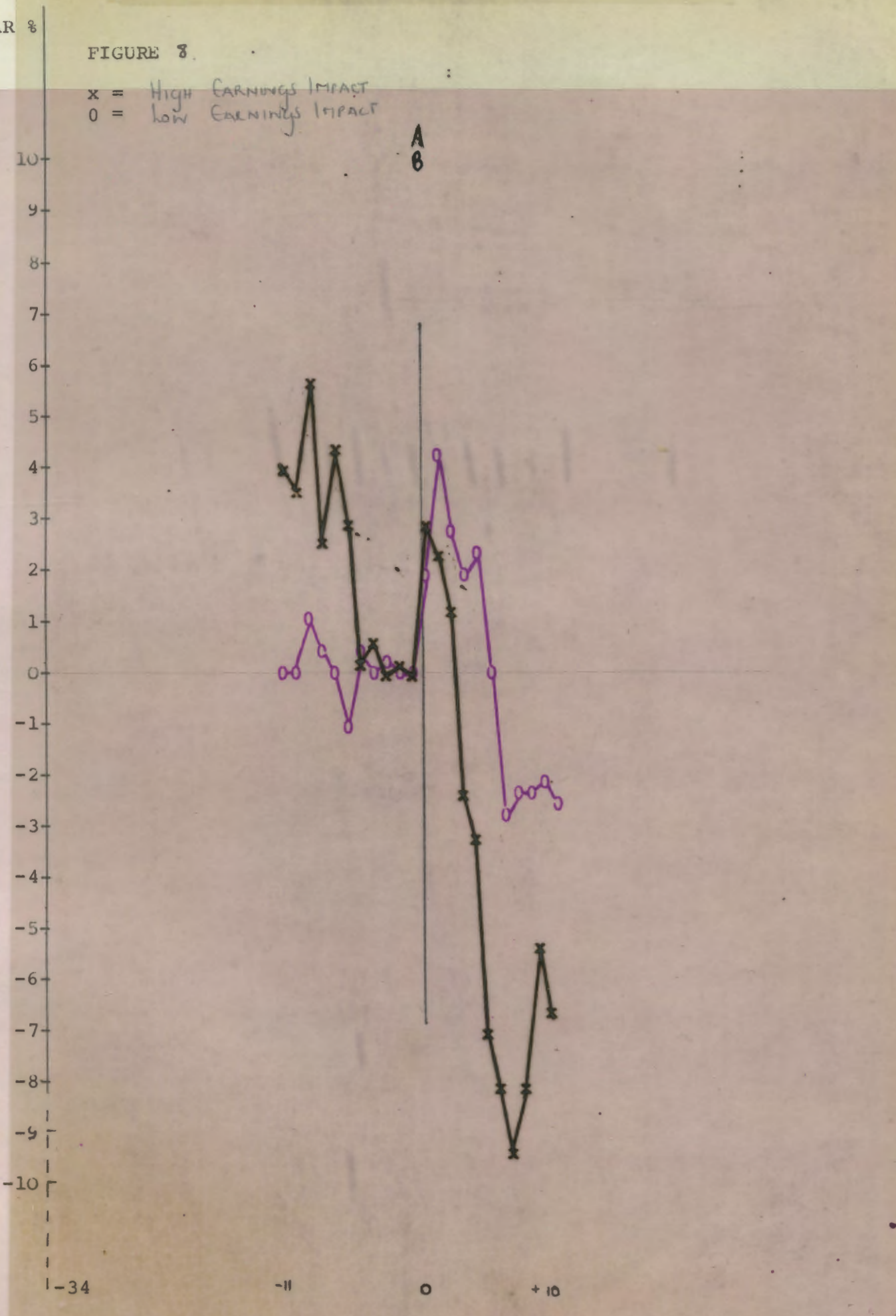
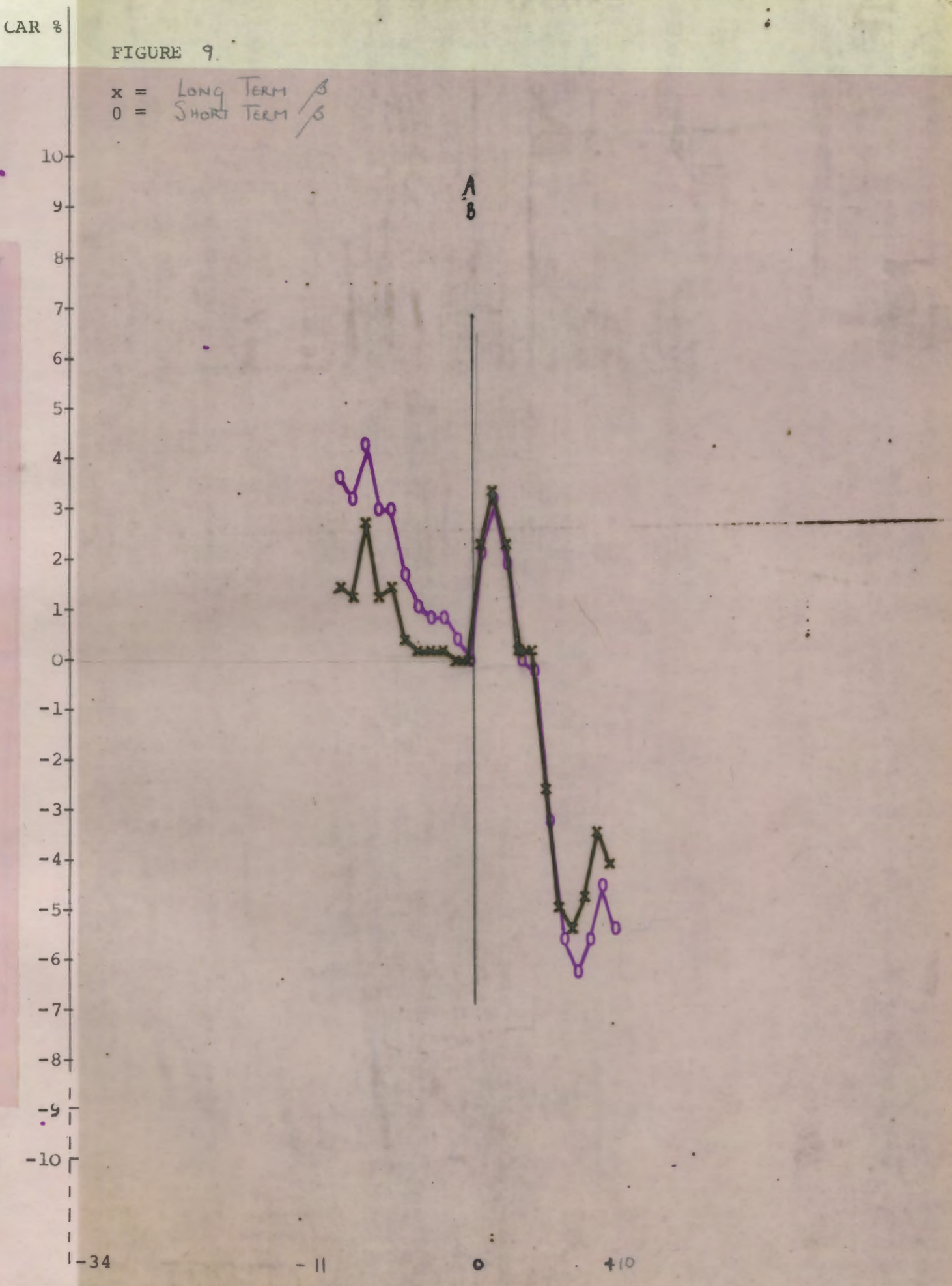


FIGURE 9.


CAR %
x = Long Term β
0 = Short Term β
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
A
B
-34
-11
0
+10
Weeks (relative to the week of announcement)

7.2.1 TESTING HYPOTHESES 1 & 2 AND 3 & 4

This section tests the following two pairs of competing hypotheses.

Hypothesis 1

The market expectations of a firm are formed on the basis of the real economic value of the firm. Changes in market price represent changes in the market expectation of the firm's real value and thus accounting changes heralding an increase in economic value are associated with an upward adjustment of price.

versus

Hypothesis 2

The market expectations of a firm are formed on the basis of reported earnings. Thus accounting changes which decrease the reported earnings will be associated with a downward price adjustment irrespective of any change in the economic value of the firm.

Hypothesis 3

The market is efficient with respect to the speed at which it impounds information. Thus it impounds such quickly.

versus

Hypothesis 4

The market is inefficient with respect to the

speed at which it impounds information. Thus it impounds such slowly.

To test these competing hypotheses it will be necessary to analyse figures 1A and 2A only. Figures 1B and 2B are presented to show how the configuration of residuals is different for the change firms and a quasi-equivalent control group of non-change firms. This lends evidence to the varacity of the assertion that the reaction observed in the former is actually to the common factor of a change to L.I.F.O. The control group week 0 thus represents a spurious date in the history of each firm peculiar to each. Indeed there is no common factor to week 0 between the non-change firms.

Using the comparison of figure 2 on the sliding scale it is obvious that the change firms have a marked downward trend which would support the assertion that the movements observed in the change firms are not merely a function of the model employed.

The reader is now referred to figure 1A by itself.

The CARs fluctuate between nil and -4% settling back to nil in week -15. These fluctuations are fairly random and the cumulative abnormal return 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 preview knowledge of the switch to L.I.F.O 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 announcement.

After the announcement there is a definite occurence 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 +12 is -3,8%! This indicates a very negative impact of a L.I.F.O change considering the negative abnormal return of -7,2% for the period +1 through +12. Thereafter there follows rather volatile, however 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 2A 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 the announcement of a switch to L.I.F.O. 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 afterwhich the effect of L.I.F.O dissipitates and the residuals level off. Movements thereafter are not attributed to the effect of a change to L.I.F.O.

Thus it would appear that although there is an initial

positive reaction it seems that there is an overall negative reaction to L.I.F.O 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 seriously dragged by an overriding inefficiency which slowly impounds the signal negatively.

As far as the hypotheses are concerned, Hypothesis 1 is rejected in favour of 2, and Hypothesis 3 is rejected in favour of 4.

The implication then appears to be that the market is inefficient in respect of this piece of information for two reasons :

(1) The market appears to be deceived by the negative impact on earnings despite the improved cash position, and

(2) This negative impounding seems to take a long time.

The obvious implication of this is that an individual who sells short shares of a L.I.F.O 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 was a random upward. Although a week by week comparative analysis between the two would be meaningless, the trend is apparent.

An interpretation of the pair of graphs including the whole deletion period which is tempting is that after the change date the L.I.F.O firms had returns above the change firms in an absolute sense, implying that L.I.F.O had a relatively positive impact on share prices. This would be incorrect for a number of reasons. Firstly, week zero represents no particular event to any of the non-change firms thus the movement of residuals is just a function of an aggregation of numbers, resulting in a random pattern. Secondly, the absolute values are irrelevant on a cumulative scale and thus a sliding scale comparison is more appropriate.

Finally, the raison d'être of the shadow group, as explained in chapter 6, was merely to ensure that the results of the study were not a function of the model.

7.2.2 TESTING HYPOTHESES 5 & 6

Hypothesis 5

The relative risk of a firm is an exogenous intervening variable in the market's inter-

pretation of a change to L.I.F.O. Thus there will be a differential market reaction to the announcement of a change to L.I.F.O by high risk companies and low risk companies.

versus

Hypothesis 6

The relative risk of a firm is not an exogenous intervening variable in the market's interpretation of a change to L.I.F.O. Thus there will not be a differential market reaction to the announcement of a change to L.I.F.O by high risk firms and low risk firms.

The reader is referred to Figure 3A and B for an overview of the CARs for the full deletion period of the high risk firms (A) and the low risk firms (B).

The interpretation of the full period needs to be taken cautiously. Although the residuals exhibit fairly non-random behaviour in both cases up to week 9 both cumulating a return at just under +3%, the high risk firms show a definite non-random pattern to week 0. 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. Immediately after the change there seems to be a differential reaction with the

low risk firms showing an average abnormal return of 5,4% in two weeks having a CAR value of 7,4% in 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. Both groups showed abnormal positive returns for a number of successive weeks thereafter.

Again it is tempting to draw conclusions from full deletion period and absolute values. From this perspective a differential reaction is discerned with the low risk firms having a net positive result and the high risk firm showing a net negative CAR. It is submitted that for reasons previously mentioned this interpretation would be incorrect.

On closer inspection of the results (turn to figure 4 A & B) on a sliding scale and for periods immediately around the change the differential reaction is less obvious. The differences in the pre change period have been referred to, however an interpretation is difficult, suffice to say that the abnormal positive return exhibited by the group as a whole which was subsequently reversed by a series of abnormal negative return seems to have been caused by the high risk firms. 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 seven or eight weeks both firms experience almost identical abnormal negative returns. The previous positive returns in the case of low risk companies cushioned this effect so that the residuals levelled off just below the point they were before the change. The interpretation is by no means obvious but hypothesis 5 is tentatively accepted in that although the effect of L.I.F.O 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 interpretation of management's motives and expectations. Perhaps the market is skeptical 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.

7.2.3 TESTING HYPOTHESES 7 & 8

Hypothesis 7

The process of information consumption is static and thus the market reaction to similar changes is the same for any time period.

versus

Hypothesis 8

The process of information consumption is not static and thus the market reaction to similar changes can be different in successive time periods as the market learns and becomes more efficient.

Starting with a general review of figures 5 A & B it is seen at a glance that the post 1979 set of residuals display non-random behaviour, albeit fairly volatile, between weeks -34 and 0. The CAR value for week -1 being -1%. The same is not true for the pre 1979 change group. There seem to be three distinct phases in the pre change CARs for the group (A). Weeks -34 through -25 display a sequence of negative returns amounting to -6,6% for this period. However, between weeks -25 and -9 there is a distinct trend of abnormal positive returns amounting to +12,6% for the period giving a CAR value in week -9 of +6%. This is reversed between week

-9 and the week of the announcement. The second phase referred to is broken by two reversals which may be considered random. No interpretation is really possible; however the week -13 through week -9 period of increase may be due to information leakages about the trend. This may have resulted in the general market viewing these shares as overvalued at week -9 according to the information set then publicly available, i.e. sans the information on the change. The downward trend may thus have been an adjustment downward in response to over-valued shares.

The reaction of the market seems to be the same for the two groups as the residuals move up for the first two weeks and then down for another 6-8 weeks before both enter a fairly random fluctuation pattern.

There is, however, a completely different inter-pretation possible when the residuals are placed on a sliding scale and the weeks surrounding the announcement are analysed. The reader is referred to figure 6.

The period between -11 and 0 has been discussed. 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 L.I.F.O 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 hypothesis 8 should be accepted in that the information consumption procees seems to 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 L.I.F.O 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 L.I.F.O the market becomes increasingly aware of the implications of such. However, traditional concern over the accounting earnings figures still seems to prevail.

7.2.4 TESTING HYPOTHESES 9 & 10

Hypothesis 9

Although the market seems to be reacting to the accounting numbers, the fact that a change to L.I.F.O has a positive effect on cash flow, the negative reaction to the earnings will be dampened in the cases where the economic benefit is greatest even though in such cases the negative impact on earnings will be the greatest as well.

versus

Hypothesis 10

The market reacts in the direction of the impact on earnings of a change to L.I.F.O. Thus the magnitude of the reaction will be directly proportional to the magnitude of the impact on the earnings.

An examination of figures 7 A & B together shows

the CARs for the full deletion period. 7(A) presents the residuals for those firms changing to L·I.F.O which had a large impact on earnings and 7(B) the residuals of L.I.F.O companies for which the change had a relatively low impact on the earnings that would have been reported by the F.I.F.O system. 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 a very similar and fairly random configuration of CARs up to the week of the 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 L.I.F.O is quite different for each group.

Interpreting the full deletion period after the change it seems that after a similar increase in abnormal returns there was a more significant series of negative returns for the high impact group. However, thereafter there seems to have been a recovery reflected by a period of positive abnormal returns not matched in the case of the low impact firms. It is tempting to interpret this as follows. Although the negative reaction was greater in the case of the high impact firms (consistent with hypothesis 10) the market eventually, after eight

or nine weeks, realises that the larger theimpact on earnings the greater the economic benefit and vice versa. Thus it readjusts so that the net effect in week +35 is a +6,4% abnormal return for the period since the announcement, compared to a -7% abnormal return for the same period in the case of the changes with a low impact. A possible explanation for this could be that the market is reasonably inefficient in that it is temporarily deceived by the accounting numbers, however after some time the news filters through that L.I.F.O heralds a decreased tax liability with attendent improvement in cash position and there is an adjustment upward. An explanation for the differential reaction in the case of changes to L.I.F.O with relatively low earnings impact may be that the market views skeptically the motives of management where the benefit is not so great. It may interpret such changes as reflecting management's desperation for cash. This interpretation may be that the net negative impact in the case of low impact changes is a blind response to the numbers, however after the drastic negative reaction to the high impact changes market participants may investigate a little deeper and their findings of an improved economic well being results in trading activities which precipitates a revision of prices upwards. In any event the market's inefficiency with regard to

speed of adjustment to information seems irrefutable in the current model.

The above analysis, although intuitively attractive, is vulnerable to the potential criticism of the effect of confounding events in that reactions $\pm$ 20 weeks after the announcement are unlikely to be due to the announcement.

To ensure a consistent evaluation of the reaction, interpretation will be confined to the period immediately after the event. This represents the most likely reaction to L.I.F.O, and escapes the criticism of confounding events.

The reader is now referred to figures 8 A & B where the CARs are presented on a sliding scale for the weeks immediately before and after the announcement, for a more investigatory analysis and interpretation.

The initial reaction to the announcement was about a 4% positive abnormal return in the case of the low impact firms (B) 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 $\pm$ 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 4%! 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 at this level, hypothesis 9 must definitely be rejected in favour of the acceptance of hypothesis 10. It seems that the conclusions drawn in section 7.2.1 are supported. The market seems to react 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 took the same amount of time to negatively impound its reaction to an announcement of a change to L.I.F.O.

It is submitted that this latter conclusion on the limited period graphs is superior to the former full deletion period for reasons mentioned.

7.2.5 TESTING HYPOTHESES 11 & 12

Hypothesis 11

Due to the non stationarity of the data used to estimate the Betas of the change firms, the use of short term Beta estimates is likely

to result in a substantially different configuration of CARs than those presented in figure 2A, which were based on long term estimates of Betas. Thus the OLSR model is inappropriate.

versus

Hypothesis 12

Due to the stationarity (or acceptable level of non stationarity) of the data used to estimate the Betas of the change firms, the use of short term Beta estimates is likely to result in substantially the same configuration of CARs as presented in figure 2A, which were based on long term estimates of Betas. Thus the OLSR model is appropriate.

The reader is referred to figure 9 A & B. It is noted that figure 9A is a reproduction of figure 2A for the readers convenience.

Little 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 theimpact of the announcement of a change to L.I.F.O.

Thus hypothesis 12 can be confidently accepted. The short term Beta estimates are substantially the

same as the long term Beta estimates. This result is consistent with a data set of stationary data. It is submitted that the fears expressed in chapter 6 on the potential non-stationarity of data are allayed.

7.3 A SUMMARY OF THE HYPOTHESIS TESTING (SEE TABLE 3)

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 seems that to date the market has reacted negatively and slowly to the announcement of a change to L.I.F.O. Further, it seems that the relative risk of the change company is an exogenous intervening variable in the information consumption process, where a change to L.I.F.O by high risk companies is not received well by the market. The negative market reaction is directly proportional to the size of the impact on earnings suggesting a further degree of inefficiency in that the market is deceived by the accounting numbers which mask the underlying economic reality.

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 L.I.F.O substantially more quickly and although still in sympathy with the earnings figures, the effect has been less drastic.

These conclusions are of course reached within the constraints of the model and methodological issues reviewed in chapter 6, the most pertinent of which may be the duality of the announcement, that is, the behaviour of the residuals prior to the change may be a function of a set of factors common to L.I.F.O changers and peculiar to them and not due to the change itself. This problem of post selection bias has been referred to in chapter 6. As regards situation specific inferences, namely answers to such questions as - What has the market reaction been to a change to L.I.F.O on the JSE? post selection bias is irrelevant as these common factors are inseparable from the change itself. The problem is encountered when one moves out of the specific domain and attempts generalised conclusions. It is posited that if only certain types of firms change to L.I.F.O, the reaction observed in this study may have been to those characteristics defining the type of firm and not to a change itself. The implication would be that a generalised conclusion on the future reaction of the market to a change to L.I.F.O would only apply to firms sharing these characteristics with the current group. Thus the real value of the study as far as accounting information is concerned is that the reaction has been negative. However, this obviously provides useful insight into the possible reaction of future changes notwithstanding the possibility of post selection bias.

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 L.I.F.O. It could be argued (as mentioned in chapter 6) that as only 21 firms have been studied, inferences cannot be drawn as to the efficiency of the market as a whole. It has been submitted that as the 21 firms represent the universe of L.I.F.O changers (at the date of cut off 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 undervalued according to the publicly available information set.

The final conclusions of this study and selected implications will conclude this thesis in chapter 8.

Hypotheses	Reject	Accept
1	X	
v 2		X
3	X	
v 4		X
5	X	
v 6		X
7	X	
v 8		X
9	X	
v 10		X
11	X	
v 12		X

TABLE 3

A SUMMARY OF THE HYPOTHESES TESTING

CHAPTER 8

CONCLUSION AND IMPLICATIONS

8.1 THE CONCLUSIONS

The results presented in chapter 7 indicate that the announcement of a switch to L.I.F.O has a substantial negative impact on share returns. This negative impact seems to be directly proportional to the extent to which the F.I.F.O 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 L.I.F.O.

Further, this negative impact is impounded into prices rather sluggishly. This factor taken with the reaction to the accounting numbers which were 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.

An alternative interpretation is however 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 L.I.F.O, firms in which management anticipate a cash crisis and a change to L.I.F.O represents an effort to avert such. This interpret-

ation implies that the informational value of L.I.F.O cannot be ascertained. The selection bias criticism was reviewed in the context of Sunder's study in chapter 6. There it was suggested that non-random behaviour prior to the announcement may have been due to exceptionally good times experienced by L.I.F.O firms, and not leakages of information on the impending change. It is however respectively submitted that the post-selection bias criticism is not a valid criticism of the results per se but merely a criticism of the validity of the model.
A considerable portion of this thesis has been devoted to presenting and explaining the research methodology. Certain assumptions were raised and examined for reasonability. One of the assumptions was that the methodology adequately controlled confounding events. The selection bias argument implies that certain confounding events such as 'bad times' and 'good times' are not adequately controlled. To entertain an interpretation of the results that implicitly denies the propriety of the model is untenable. Post selection bias remains a vacuous concept unless specific confounding events can be established, that are not controlled.

In any study the results are subject to the assumptions of the model employed. Thus the initial interpretation is tentatively accepted based on the ability of the model to capture and eliminate the effect of confounding events. The selection bias criticism is relegated to the level of

a general skeptism of the model and is thus dismissed.

Further it is concluded that the relative risk of firms is an exogenous intervening variable in the information consumption process.

The conclusion of the double inefficiency of the JSE must however be tempered. It was acknowledged in chapter 5 that the information consumption process was likely to be highly complex with innumerable intervening variables mediating between the announcement of the change and the market reaction. This complexity implies that an a priori assumption on how the market should react may not be justified. The statement on inefficiency vis à vis speed of adjustment remains. In view of the positive impact a change to L.I.F.O seems to have in a market of proven efficiency,[1] and in view of the probable neutrality of the endogenous intervening variables proposed in the conceptual framework of chapter 5 this a priori assumption on the impact of a change to L.I.F.O of share prices, does not seem an unjustified leap of faith. The double inefficiency of the JSE is thus concluded, however, cautiously.

An insight provided into the information consumption process is that the relative risk of a firm as measured by the β mediates between the accounting change and the market response to that change. Further it is concluded that the market is developing in that the reaction to the most recent

announcements has been less severe and this has been impounded considerably quicker.

An attempt will not be made to generalise the results to other accounting changes for it is acknowledged that they are situation specific to L.I.F.O. It is likely however that the market (the JSE) is likely to react naïvely to accounting changes in particular and accounting numbers in general.

8.2 THE IMPLICATIONS OF A NEGATIVE MARKET REACTION TO THE ANNOUNCEMENT OF A CHANGE TO L.I.F.O.

Under this section the specific implications of a negative response are considered. The next section deals with the general implications of an inefficient market.

8.2.1 THE IMPLICATIONS FOR CORPORATIONS

L.I.F.O precludes the recognition of inventory holding gains in times of rising prices and thus leads to a decreased tax liability. A change in accounting method from F.I.F.O to L.I.F.O thus heralds an increase in the economic value of the firm. Despite this implication the announcement of a change to L.I.F.O. on the JSE has received a negative reaction.

There may be a number of reasons for the seeming

reluctance of firms to change to L.I.F.O,[2] however two particular reasons seem the most likely :

(1) A fear of an adverse effect on share prices due to the decreased reported earnings.

(2) A fear of deflation or erosion of the base layers which would reverse the tax advantages.

It would appear that at the present time the apparent reluctance on the part of corporations is well founded. However, in view of the observed differential reaction of the market to changes prior to 1979 and to changes after 1979, it is conceivable that in time the market will become more efficient. The market will have to be continually monitored until the condition of efficiency is achieved, only then will the fears of potential change firms be allayed.

8.2.2 THE IMPLICATIONS FOR INVESTORS

As the announcement of a change to L.I.F.O appears to have some impact on share returns a prior knowledge of such an announcement is likely to be of some value to investors. It is likely that the announcement of a change to L.I.F.O by a firm

in an investor's portfolio will dampen the overall performance of the portfolio. It is strongly emphasised however that prior knowledge of an impending change to L.I.F.O does not imply that an abnormal gain is realisable in a short sale arrangement.[3] This is so because the study does not refer to absolute prices. All that can be said about short sale arrangements based on the anticipated negative impact of a change to L.I.F.O is that any profit released in such a deal will be greater and any loss incurred will be less than would have been if no announcement was made.

8.2.3 THE IMPLICATIONS FOR THE LEGISLATOR

No attempt will be made in this thesis to venture into the domain of welfare economics, that is the conclusions will not be extended beyond the private value of information. However, the following observation is considered appropriate.

The Legislator has, by the promulgation of S 22 (5) in the Income Tax Act No.50 of 1962 interjected into the reporting process. In terms of this section any person (including juristic persons) wishing to adopt L.I.F.O must also report L.I.F.O in any financial statements issued to shareholders. The motives for such a restriction

defy rationality, and the effect in the South African environment at a market level seems to be disastrous. Firms and their shareholders, which have changed to L.I.F.O are being penalised with a negative adjustment of their share price.

In view of this observation it is not surprising that Haggie Rand Limited on consolidation reversed the impact of L.I.F.O on the earnings of its subsidiaries which had changed to L.I.F.O. This reversal was achieved by merely reinstating the L.I.F.O earnings of the subsidiaries to a F.I.F.O basis for the sole purpose of consolidation into the group earnings. Therefore the group earnings escaped the negative effect of a change to L.I.F.O and thus the group is likely to have averted the penalty of a downward price adjustment.

As the group as a whole is not a taxable entity it is beyond the ambit of the tax act and in view of the results of this study quoted companies considering a change to L.I.F.O would be wise not to report the earnings based on this method of valuation.

The further implications of legislative interjection into the accounting process, such as the possible

hampering of the development of sound accounting principles will not be considered in this thesis.

8.3 THE IMPLICATIONS OF AN INEFFICIENT SHARE MARKET

8.3.1 THE EFFICIENT MARKET HYPOTHESIS

The results of this study indicate that the EMH is not a valid assertion in the context of the JSE. This is so because the results are inconsistent with two of the basic tenets of the EMH ;

(i) That prices adjust rapidly to information

(ii) That prices react only to information relevant to valuation.

The major implication of this contradiction of the EMH is that the perspective supplied in chapter 4 of the implications of the EMH are at present irrelevant in South Africa.

The implications of the seeming inefficiency of the JSE will be briefly considered in the light of the approach taken in chapter 4.

It must be emphasised that inefficiency per se is not likely to be a permanent feature in view of the current results and therefore the discussion in chapter 4 is still of relevance locally.

8.3.2 THE IMPLICATIONS FOR THE ECONOMY AS A WHOLE

Within the constraints of the limited ambit of the efficiency concept expounded earlier, an inefficient share market would not be a desirable feature of a capitalist economy.

The pricing mechanism is likely to be upset and thus there will be a sub-optimal redistribution of wealth among market participants, the result of which is really a welfare question.

Furthermore, pervasive inefficiency will ultimately lead to a sub-optimal allocation of financial resources among firms ultimately leading to a misallocation of real resources in the economy. This will manifest in the reduced welfare of society.

No attempt is made to suggest the exact chain of events in such a situation, however it seems apparent that if the economic signals emitted by the market are spurious, it is likely that the economy will move to a sub-optimal condition.

8.3.3 THE IMPLICATIONS FOR THE INVESTMENT COMMUNITY

The implications of a prior knowledge of a change to L.I.F.O on the JSE have been referred to in section 8.2.1 above. The fact, however that the market is inefficient implies that a prior knowledge is not

requisite. After the announcement, the adjustment process takes as long as eight weeks to impound the negative effect, thus giving investors adequate time to adjust their portfolios accordingly. The general implication of an inefficient market is that the past-time of fundamental analysis is a worthwhile pre-occupation. The analysis of publicly available information should thus be useful in fereting out over- or under-valued shares.

The major implication of the results of this study to the investment community of the JSE is that modern portfolio theory is likely to be inappropriate in that certain implicit assumptions of such are contravened. Modern portfolio theory is based on certain assumptions which if valid would be consistent with market efficiency. Evidence of market inefficiency thus casts serious doubts on the propriety of these assumptions on the JSE.

8.3.4 THE IMPLICATIONS FOR FINANCIAL REPORTING

The implications of these results are rather serious for the accounting standards setting bodies. The simplified decision process illustrated in figure 1 of chapter 4 would be inappropriate. Extreme care would need to be excercised in allowing different accounting methods for financial reporting, as the market seems to be unable to look behind the numbers,

as it were. A tempting short-term solution to the standard setting problem is to allow only one method of accounting for particular events. This would pre-empt the problem of accounting changes once all firms used the same method. The drawback of such a solution is that the market would never become information efficient and the development of accounting principles would be prevented. It is submitted that such a 'straight-jacket' policy by the standard setters would ultimately be a worse evil than information inefficiency.

Standard setting in an inefficient market environment is an almost impossible task. The will o' wisp nature of price reaction to accounting information in such a market confounds any attempt at providing an optimal information set. The concept of an optimal information set is quite vacuous in such an environment.

The accounting profession as a whole is confronted with the task of assisting in the development of a more sophisticated information consumption process. The conclusion reached in chapter 4 that the standard setters should actively discourage naïve investors from analysing accounting information, in an efficient market is even more immenent in an inefficient market. As it is the preponderance of naïve investors

that results in market inefficiency, an improved communication between accountant and professional investor should improve the situation. The accountant in South Africa will have to acknowledge the subjective nature of the numbers he produces to the users of such. The results of this study suggest that the users of financial statements, in aggregate, believe the accountant to have a monopoly on economic information.

It is submitted that as an inefficient market environment is likely to be a restrictive constraint on the development of an optimal set of accounting standards, and considering the social function of accounting vis à vis information production and resource allocation, the accounting profession has a responsibility to ensure that the aggregate user understands the numbers produced.

It is acknowledged that the results of this study are not immutable, however they do constitute the first evidence of how the JSE reacts to accounting information. The conclusion is not encouraging. It is submitted that it is imperative that the accounting academicians mount a programme of ongoing research on the information consumption process in order that the standard setters and accounting statement preparers become more familiar with the

domain in which they operate. A description of the market condition may alter accountants' strategy to discharge their social responsibility.

8.4 THE RESULTS CONSIDERED WITHIN THE CONCEPTUAL FRAMEWORK OF CHAPTER 5

The framework seems to have provided a useful base from which to conduct empirical research. The partition criteria were proved valuable in that a differential reaction was observed between each sub group. Furthermore the counter-directional effect of economic implication and earnings impact of a change to L.I.F.O facilitated the hypothesis setting and testing.

However, a major cause for concern is that a translatable accounting change with no underlying economic implication may not be neutral in an inefficient market.

Although it is felt that this study has provided a certain insight into the information consumption process of the JSE a great deal of further research is required to understand a very complex process. It is hoped that the conceptual framework provides a vehicle for such research.

8.5 CONCLUSION AND SUMMARY

To summarise, the results indicate evidence rejecting the EMH on the JSE, as the market reacted only sluggishly to the announcement of a change to L.I.F.O and in the direction of of the negative earnings impact of such a change and not in the direction

of the positive impact on the present value of the firm. This evidence should be of value to future capital market researchers.

The evidence presented that a change to L.I.F.O has a negative impact on share returns directly proportional to the negative impact on earnings should afford the accounting researcher a useful insight into the accounting process. Furthermore, the results provide evidence of a differential reaction depending on the relative risk (β) of the firm making the change. The high risk firms experience a far greater negative reaction than the low risk firm.

The study further provides hope for both capital market and accounting researcher. It seems that the market may be becoming more efficient, in that the most recent changes to L.I.F.O invoked a far less severe negative market reaction and this reaction was more swift.

Finally, it is emphasised that the results and conclusions are as valid as the model and methodology employed. Every attempt has been made in the execution of this study to provide empirically valid results and conclusions within the bounds of modern technology.

The study will have achieved its purpose if it brings the concept of market efficiency and its implications to the attention of the South African accountant and prompts further debate and empirical research.

CHAPTER 8

FOOTNOTES

1. Sunder's study on the NYSE, a market proved efficient by Fama, *et al*.

2. Only 32 firms on the whole of the JSE.

3. A short sale arrangement is a sale of shares at the current price for future delivery. The seller normally only purchases the shares immediately before delivery thereof at which time he anticipates the price will be lower.

APPENDIX A

L.I.F.O FIRMS INCLUDED IN THE STUDY

	Firm	Date of Announcement	% reduction of F.I.F.O earnings	β
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 Ltd	23 August 1979	50	0,85
4	Seardel Investment Corporation Limited	31 August 1979	20	1,00
5	African Cables Ltd	1 October 1976	13	0,35
6	Huletts Aluminium Ltd	1 June 1977	24	0,55
7	National Bolts Ltd	26 September 1975	50	0,35
8	Stewarts and Lloyds of S.A. Ltd	22 November 1979	31	1,25
9	Vereeniging Refractories Ltd	20 February 1980	9	0,55
10	Coates Brothers (S.A.) Ltd	24 January 1980	23	0,60
11	Kohler Brothers Ltd	15 February 1980	14	0,35
12	Metal Box S.A. Ltd	1 June 1977	41	0,60
13	Sappi Ltd	9 March 1976	7	0,65
14	Huletts Corporation Ltd	1 June 1977	5	0,80
15	Romatex Ltd	30 April 1979	8	1,20
16	Sterns Diamond Organisation Ltd	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 Co. Ltd	31 May 1979	11	1,00

APPENDIX B

L.I.F.O 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 L.I.F.O for copper stocks)
Sasol Limited	(used L.I.F.O from date of floatation)
Scottish Cables (S.A.) Limited	change announced after cut-off date
Edgars Stores Limited	
Cullinan Holdings Limited	
The Union Steel Corporation of S.A. Limited	
Plate Glass and Shatterprufe Industries Ltd	
Anglo American Industrial Corporation Ltd	

APPENDIX C

CONTROL (SHADOW) GROUP OF NON-CHANGE FIRMS

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

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