UNFUNDED PAST SERVICE OBLIGATIONS:
AN EFFICIENT MARKETS HYPOTHESIS TEST

by

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Unfunded Past Service Obligations: An Efficient Markets Hypothesis Test

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ABSTRACT

In financial statement footnotes the reported value of unfunded past service obligations has increased dramatically over the past two decades. While associated with the introduction of or the improvement to a pension plan, these obligations have been discussed in the accounting literature as representative of future wages. The question is whether these obligations represent liabilities on the part of the employer to his employees. If a liability exists, then the discussion centers on whether there is some related asset or whether there is an immediate expense.

To date empirical testing of the pension obligation as a liability has been lacking. This thesis reports on the reaction of the Canadian stock market to first reports of unfunded past service obligations.

The basis for the test is a method used by Fama, Fisher, Jensen and Roll in their 1969 article entitled, "The Adjustment of Stock Prices to New Information," in the International Economic Review (February, 1969, 1-21). This method is based upon the efficient markets hypothesis and the market model taken from the finance literature.

The hypothesis to be tested may be stated as follows: When the unfunded past service obligation first appears in a group of
A market reaction to unfunded past service obligations is evident if the sample firms' rates of return change in relation to the market rate of return. This change in the relationship of the rates of return for the companies and the market is measured by the use of regression analysis. Cumulative average residuals, are then calculated based upon the coefficients determined in the regressions.

The hypothesis was tested using data from forty-five Canadian firms which had unfunded past service obligations disclosed in their footnotes. The data covers a period of twenty years commencing in 1960. The test is centered upon the year when the unfunded past service obligations first appear in the notes to a firm's financial statements. The primary measure used in this test is a plot of the cumulative average residuals for a sixty month test period.

The results showed no systematic change in the measure over the test period. This market reaction to the unfunded past service obligation information was unexpected.

Four possible reasons were offered for the apparent absence of market reaction. One suggestion is that market analysts typically discount or ignore unfunded past service obligation information. This point is supported by the results of a small survey of ten security analysts. The second reason discussed is the possibility that the market received the data prior to the
statement date. A third explanation is that the market sees the unfunded past service obligations as being offset by a lower negotiated wage. Finally, consideration is given to potential problems with the sample, the Canadian market and the method of analysis that may have made this study an insensitive test of the hypothesis.

The thesis lends some support to those who would argue that unfunded past service obligations are not liabilities. An alternative view is that they are in fact liabilities but that the Canadian market is not efficient. This latter view could be tested with a replication using U.S. data. However, the possibility exists that the obligations are liabilities associated with an asset and the market is efficient because it recognizes both the asset and liability. The implication which seems to be the most important and which arises from this thesis is that footnote information is not carefully attended to by market participants. This implication could be tested using Canadian data for other types of footnote information.
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CHAPTER I
INTRODUCTION

In 1966 the American Accounting Association, in an attempt to define accounting theory, stated that "... accounting ... [is] the process of identifying, measuring, and communicating economic information to permit informed judgements and decisions by users of the information" (American Accounting Association, 1966, 1). There are, however, many different methods of supplying "economic information" to potential users. For example, items may be reported in newspapers, in the body of a financial report or in the footnotes accompanying a set of financial statements. According to one widely espoused theory, the efficient markets hypothesis in its semi-strong form,¹ alternative methods of supplying publicly available information to potential users will have the same final result. That is, if the data represent information pertinent to the evaluation of a firm, then the information will be immediately used by actual or potential investors and reflected in the price of the shares.

Although many types of data have been used in the efficient markets hypothesis tests,² one type of data which has not been examined with regard to its effects in the market is unfunded past service obligations arising under pension plans. Unfunded
past service obligations arise when two conditions occur together. First, a pension contract is negotiated which rewards employees for prior years of employment. The second condition which must occur is that these past service obligations are not paid immediately and therefore, remain unfunded. These increased benefits are based on the total number of years the employees have been with a firm instead of being based on the number of years of service since the inception of the pension plan.

These unfunded past service obligations are just one portion of the total pension costs and the amount of these obligations is actuarially estimated. The years each individual employee has worked for a firm is determined. While the years of past service may be determined by an actual examination of employment records, other factors are estimated. For instance, the probability of how many of those presently employed will still be with the firm at retirement age, and therefore be eligible for benefits, is estimated. Also, an estimate of the overall life expectancy is necessary. A third factor which is estimated is the expected earnings both of the employees and earnings on any pension fund assets that may exist. The employees' benefits are usually tied to their earnings. For example, the pension benefits may depend upon earnings for the last five years of an employees' working life or, the average earnings of an employee may serve as the basis for the pension. The firm's earnings may be estimated using different rate of return assumptions. An actuary must make his best estimate based upon his knowledge
of the past record of the firm and of the employees involved in the pension contract.

If a firm sets aside assets to meet past service obligations, then the past service obligations are funded. In such a case, the firm would debit a pension expense account for the amount set aside and credit an asset account, possibly cash. This set of entries is made when a liability is not initially established in the firm's accounts. (See Chart I in Chapter II).

In accounting for pension expenses and funding requirements, it should be noted that the two procedures, expensing and funding, do not have to coincide. In accounting textbooks these differences in timing occupy most of the discussion (Meigs, et al., 1975, 617-620).

In Canada the unfunded past service obligation must be "charged to operations over a reasonable period of time" and these obligations may not be treated as prior period adjustments according to the CICA Handbook (Section 3460, paragraph 18). The decision of what constitutes a reasonable period depends upon management and its decisions regarding how to dispose of the actuarially estimated obligation. If management has no other rationale for choosing the period of time, then the write-off period may coincide with a period dictated by tax laws which are more specific than the Handbook recommendation.

According to both the Canadian Institute of Chartered Accountants (hereafter, CICA) and The Financial Accounting Standards Board of the U.S. (hereafter, FASB), unfunded past
service obligations are not liabilities to be reported in the body of the financial statement but are to be reported in the footnotes. Moreover, the data presented in the footnotes varies considerably from one firm to another.6

The amount of unfunded past service obligations disclosed in the notes to the financial statements have been growing rapidly in the last 15 to 20 years. Statistics Canada has compiled data on actuarial deficiencies7 and unfunded past service obligations and total employer pension costs for the years 1970 and 1977.

Table I

Comparison of Unfunded Past Service Obligations and Actuarial Deficiencies to Total Employer Pension Contributions

<table>
<thead>
<tr>
<th></th>
<th>1970*</th>
<th>1977**</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in millions of dollars)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuarial deficiencies and unfunded past service obligations (AD and UPSO)</td>
<td>$148</td>
<td>$729</td>
</tr>
<tr>
<td>Total (employer) private pension contributions (TPP)</td>
<td>508</td>
<td>1,998</td>
</tr>
<tr>
<td>Ratio AD and UPSO to TPP</td>
<td>29%</td>
<td>36%</td>
</tr>
</tbody>
</table>

* (Statistics Canada, 1974, Table T, 78).
** (Statistics Canada, 1977, Table XVIII, 48).

Two facts are evidenced in the above table. First, the increase of the ratio of unfunded past service obligations and actuarial deficiencies to total employer contributions has increased from 29% to 36%. Second, the overall increase in private pension contributions has been quite substantial (almost 400%).
Due to the changing demographic characteristics of Canada's population, concern has been expressed over our future ability to pay pension benefits. Presently fifteen percent of those over twenty years of age are in fact over 65 years of age. By the year 2030, this will double to thirty-three percent (Economic Council of Canada, 1979, 3). This means that in 2030 two people in the workforce will be supporting one retired individual.

The British Columbia Government, during the Summer of 1980, disclosed that it was concerned that there would not be enough pension funds in the provincial government plans for future retired persons. This particular announcement was annoying to the service sector employees covered by the family of provincial retirement plans as the B.C. Government used this statement to argue against the continued full indexation of pensions. The B.C. Government's concern with the indexation of pensions was tied to the regulations which govern provincial pension contributions. Both employers and employees have the right to attempt to persuade the B.C. Government to execute an Order in Council and thereby not meet increased contributions. If this situation were to occur as the demographics of the population change, then the employees might expect the provincial government to make-up the deficit in the pension payments.

The provincial government's concern with the pensions of public sector employees is not divorced from the growth of unfunded past service obligations in the private sector since both pensions are subject to the same changes in demographic
patterns. Also, benefits under both public and private pension plans have been improved in the past decade. In particular, the growth of unfunded past service obligations may be traced at least in part to negotiated improvements. With the higher inflation rates in the past decade many pension plans have been incremented in an attempt to ensure the future security of retired persons. This process of improvement will continue or accelerate as long as inflation continues. (Skinner, 1980, 5). Finally, as public pensions are improved, added pressure is brought upon the private sector. Whereas the public plans, through the government, can increase taxes and pension benefits, the private sector must meet increased pension demands out of earnings. Consequently, the private sector faces a burden that the public sector's actions intensify.

In the accounting literature there exists a debate concerning the proper treatment of these unfunded past service obligations. One group argues that the amount reported in the footnotes as unfunded past service obligations should not be recognized as a liability (Hicks, 1965, 84) in the body of the statement of financial position. Others (Hall and Landsittel, 1977, 25-27) argue that an unfunded past service obligation is a liability and should be recognized as such. As outlined, the accounting discussion seems to ignore the efficient markets hypothesis entirely.

If unfunded past service obligations are liabilities, then there are at least two possible ways to record them. One method
(capitalization) recognizes a liability and an asset, while the second method (expensing) recognizes a liability and an expense. In both situations the total unfunded past service obligation is recognized immediately.

Method I:

\[
\begin{align*}
\text{Dr. Asset} & \quad \text{\$XXX} \\
\text{Cr. Past Service Obligation} & \quad \text{\$XXX}
\end{align*}
\]

Method II:

\[
\begin{align*}
\text{Dr. Expense} & \quad \text{\$XXX} \\
\text{Cr. Past Service Obligation} & \quad \text{\$XXX}
\end{align*}
\]

Method I is the method recommended for handling unfunded past service obligations by the Accountants International Study Group (1977). The second method is suggested for use by Hall and Landsittel (1977).

These two methods represent two diverse economic situations. In each case, the market may react very differently and still be efficient in a semi-strong sense. Even with the existing footnote presentation, if the market sees the offsetting "entry" to the unfunded past service obligation as an asset, then there may be no reaction to the first appearance of the unfunded past service obligation in the statement footnotes. However, if the market reads the offsetting "entry" as an expense, then the market may react. As noted above, recognition of unfunded past
service obligations as a liability is not the procedure recommended by the CICA and the FASB.

This thesis will investigate whether unfunded past service obligations are interpreted by the market as liabilities offset by an expense. Six chapters will comprise the remainder of this study. The second chapter will discuss some of the pension literature. This second chapter will examine both present practice and some suggestions for changing practices in the future. The third chapter will examine the literature surrounding the efficient markets hypothesis.

The fourth chapter will be divided into three parts. The first section will outline the model to be used for testing purposes. The second portion of Chapter Four will state the hypotheses, null and alternative, to be tested. Finally, the third section will discuss the data to be used in this study. Included in the third section will be a description of the required data, where the data were collected and how the data were modified to make them usable for the proposed tests.

The fifth chapter will be concerned with the results of the tests outlined in the fourth chapter. The first section of Chapter Five will compare the estimated statistics derived from this study to the estimated statistics derived in Fama, Fisher, Jensen and Roll (1969) and Charest (1980b). The second and third portions of the chapter will present the empirical results of two types of tests.

A discussion of a survey of security analysts and four alter-
native explanations for the test results will make up Chapter Six. The survey results will be presented in the first part of the chapter.

The seventh and final chapter will offer the summary and conclusions of this study. Also, the opportunity will be used to outline several areas for further study.
Notes

1. The efficient market hypothesis is discussed in detail in Chapter Two. However, a brief statement concerned with the semi-strong form seems in order here. While the efficient markets hypothesis in general describes the market's reaction to information, semi-strong form tests focus upon publicly available information. For example, when a piece of information is published, the associated firm's stock price should change immediately depending upon whether the information is positive or negative and holding all other factors constant. Efficiency is said to exist when there are no lags between the time the information becomes public and the time when the price changes. The semi-strong form of the efficient markets hypothesis implies that the method of conveying the information to the market will not matter.

2. A few of the topics addressed in The Accounting Review and the Journal of Accounting Research include the effects of discretionary vs. nondiscretionary changes (Harrison, 1977), the information content of fully diluted earnings per share, (Rice, 1978), the reaction to accounting changes, (Abdel-Khalik and McKeown, 1978) and the effects of mergers (Hong, Kaplan and Mandelker, 1978).

3. Some accounting theorists define past and prior service costs as two separate ideas. Past service costs are defined as those unfunded costs which result from the original signing of a pension contract. Prior service costs designate those costs which arise when pension contracts are renegotiated. In this paper past and prior service costs are used synonymously with unfunded past service obligations.

Actuarial deficiencies possibly were included in the unfunded past service obligation amounts up until October, 1973. In 1973, the CICA recommended that actuarial deficiencies be included as current pension costs (CICA Handbook, Section 3460, paragraph 22). The date of October 1973 is important to this thesis since most of the firms in the sample are centered on earlier years. Consequently, actuarial deficiencies may be included in the unfunded past service obligations in the company's footnotes. (See Appendix A). Due to this, no distinction has been made between the obligations and actuarial deficiencies.

4. The terms funded or funding are used in this text in a very specific manner. Funding (or funded) will be used to indicate an economic step to meet a pension obligation. This economic activity will be a cash payment to a trustee
or to a pensioner; alternatively, a firm may set aside assets to meet future pension obligations.

5. The CICA's pronouncements are listed in section 3460 of the Handbook. The present recommendations were primarily made between 1968 and 1973. However, as late as June, 1978, the Handbook section was under review.

The FASB has followed its predecessor's statements on this topic until recently. This pronouncement came from the APB's Opinion No. 8 (1966). In 1980, the FASB issued its Statement No. 36 concerned with amending Opinion No. 8, (FASB, 1980).

For a comparison of the CICA and the Opinion No. 8 recommendations see the Accountants International Study Group publication (1977).

6. In examining Canadian financial statements for unfunded past service obligations, a very diverse group of footnotes was found to co-exist. Some firms list the unfunded past service obligation as a present value sum, the amount to be paid out each year, and the number of years over which the funding will occur. Other firms give some, but not all of the details. (See Appendix A for further details.)

7. Actuarial deficiencies are not defined by Statistics Canada in its two publications (Statistics Canada, 1974; and Statistics Canada, 1977). Actuarial deficiencies are assumed to refer to the deficiencies in funding which arise from periodic revaluations of pension plans as outlined in the CICA Handbook, (Section 3460, paragraph 21).

8. "Empty Pension Fund Called Cruelest Hoax," The Vancouver Sun, A12, Saturday, June 21, 1980. Also, see the series of articles on pension funds in The Vancouver Sun by Odam (1980) and the article entitled "Teachers Warn They'll Strike in Pension Indexing Fight," The Vancouver Sun, October 4, 1980.

9. The pension plans referred to cover many workers in B.C. Some of the groups include the public school teachers, the college teachers, the municipal employees and some B.C. Government employees. Although some of those covered could be termed "public sector" employees, the pensions are not public pension programs but instead are private pensions. The only public pension programs in Canada are the Old Age Security (OAS), Canada Pension Plan (CPP) and the Quebec Pension Plan (QPP) (Economic Council of Canada, 1979, 13).
In general, the recent literature on pension plans has stemmed primarily from two sources. One source has been the U.S. Government. In 1974, the U.S. Government passed legislation which clearly established obligations with regards to unfunded past service obligations on the part of employers. The Employee Retirement Security Act also defined the extent of obligations under differing financial conditions such as bankruptcy (Skinner, 1980, 52). The second source of pension literature arises from the pronouncements of the accounting rule-making bodies such as the FASB and the CICA. These groups are interested not in the establishment of pension obligations but in the dissemination of information about the obligations. Consequently the informational discussions are concerned with whether unfunded past service obligations should be footnote items or stated liabilities.

In drawing from these two sources of pension literature this chapter will cover three main topics. First the present accounting treatment of unfunded past service obligations in Canada and the U.S. as well as two simplified alternative
accounting treatments will be given. Second, a discussion will outline research which has been concerned with unfunded past service obligations. Third, a few articles which studied pension funds will be examined.

Present and Alternative Accounting Treatments

The present Canadian treatment of unfunded past service obligations is outlined in the CICA Handbook, Section 3460. The treatment recommended by the Institute calls for the unfunded past service obligations to be listed in the notes to the financial statements even when these obligations are not vested. Vested unfunded past service obligations are to be reported in the non-current liabilities section of the balance sheet. Where these unfunded past service obligations are not vested the rationale for relegating these obligations to a footnote is that they are not liabilities.¹

The U.S. treatment of unfunded past service obligations is similar to that used in Canada. The latest U.S. pronouncement, Statement No. 36, while calling for more information to be disclosed regarding pension plans, still does not recommend recognition of the unfunded past service obligation as a liability.

The U.S. accounting treatment of unfunded past service obligations was the result of a study by Hicks (1965). Hicks' did not even consider that an unfunded past service obligation might be a liability (1965, 44-57). Instead Hicks' was concerned
with whether the obligation should be written-off immediately against retained earnings or whether it should be amortized. His conclusion was that the unfunded past service obligations should be amortized systematically over a reasonable period (Hicks, 1965, 5-6). This treatment, along with the requirement that unfunded past service obligations be shown in the notes to the financial statements, appeared in the APB's Opinion No. 8 (1966, paragraph 46, subsection 5).²

While it is inevitable for companies both to amortize and to fund their unfunded past service obligations, an illustration may help to clarify both present practice and the proposed alternatives. In this example, interest on the unfunded past service obligations is ignored. Present practice begins at the top of Chart I with the decision not to record unfunded past service obligations when the obligations arise. Consequently except for a footnote notation, there are no entries to make. At some later point in time (below the broken line in the diagram) the unfunded past service obligation is amortized over a chosen number of periods. This occurs by debiting a pension expense account and crediting a pension liability account. When the obligation is funded (i.e., a cash payment is made) or the retired employees are paid their pensions, a journal entry is made to decrease (debit) the pension liability account and decrease (credit) the cash account. The journal entries for amortization of the obligation and for making a cash payment will coincide when the firm amortizes and funds its obligation
over the same period of time. In this case a compound journal entry will be made where a pension expense account is increased (debited) and the cash account is decreased (credited). This entry combines the boxes in Chart I designated as A and B.

The alternative approach which is not used currently is to recognize the unfunded past service obligations as either an asset or as an expense immediately upon the recognition of these obligations. Tracing the line down the "yes" side of the diagram, the pension asset or the pension expense is debited and a pension liability is credited. In the case of the pension expense an expense account is debited and a pension liability is credited. The expense recorded is the lump sum of the unfunded past service obligation and no further entries are made until the trust is paid into or the retired employees are paid.

With the use of an asset account, the asset is recognized as an expense over a period of time. The recognition of the asset as an expense may or may not coincide with the payments made to the trustee and/or the retired employees. As noted in the diagram whether the "yes" or "no" alternatives are followed, the final entry is the same.

While the FASB over the past several years has been studying the question of how to better account for pensions, it has not recommended either the asset or the expense alternative. Instead, FASB Statement No. 36 calls for more detailed reporting, including: the present value of vested and unvested accumulated benefits, the interest assumption used in calcula-
Record Unvested Unfunded Past Service Obligation (UPSO)

- YES -
  - Record UPSO as asset or expense
    - ASSET
      - DR. Pension asset
      - CR. Pension liability
    - EXPENSE
      - DR. Pension expense
      - CR. Pension liability

- NO -
  - Recognize in a footnote

Amortize or expense over X periods:
- DR. Pension expense
- CR. Pension liability

Payment of pension to employees or payment to trustee:
- DR. Pension Liability*
- CR. Cash

* If the firm chooses to hold or administer segregated assets within the firm (and not use an outside trustee) then
- DR. Pension plan investments
- CR. Cash

Later, when assets are paid out to pensioners
- DR. Pension liability
- CR. Pension plan investments

CHART I
Accounting for Unfunded Past Service Obligation
ting these benefits, and the valuation date. Even with these changes, the accounting for unfunded past service obligations remains the same, a footnote. A new statement to supersede or further augment Opinion No. 8 is expected sometime in 1982.

Research Recommendations Concerned with Unfunded Past Service Obligations

Three studies have been published which make specific recommendations with regard to unfunded past service obligations. Hall and Landsittel (1977) argue that unfunded past service obligations are liabilities of the same nature as that of delivering future services or fulfilling warranty obligations (Hall and Landsittel, 1977, 35). They would like to see this liability entered and offset by a lump sum pension expense.

In comparing the practices for pension fund accounting in Canada, the United Kingdom and the United States, the Accountants International Study Group (1977) examined unfunded past service obligations. In the conclusion the group stated unequivocally that these obligations are liabilities and should be recorded as a long-term liability in the balance sheet offset by an entry to a deferred expense (an asset account) (Accountants International Study Group, 1977, paragraph 48, subsection C).

Skinner (1980) presents three alternative treatments for the offsetting entry in recording unfunded past service obligations: (1) as a prior period adjustment, (2) as an expense recognized and amortized over a period of time and (3) as a form of good-
will. Although Skinner does not specifically recommend one treatment over the others, he does argue that the amount of the obligation should be separated into two parts. One component would represent a true benefit increase while the second component would be attributed to catching-up with inflation. The true increased benefit component could be written-off over time. However, Skinner did not suggest that this amount be treated as a liability (1980, 51). The inflation catch-up portion would be accounted for separately and would not be treated as a liability (Skinner, 1980, 71-81). 4

Pension Fund Studies

The Employment Retirement Income Security Act of 1974 (ERISA)\(^5\) has altered much of the focus of the literature. Prior to 1974 an individual glancing through the literature on pensions would have found discussions of various pension models used for actuarial purposes (Tepper and Affleck, 1974). Alternatively, one found discussions of whether the use of actuarial cost methods in determining pension expenses and liabilities led to the development of sound accounting practices. (Dewhirst, 1971).

Since 1974, much of the literature has focused upon the new requirements and the implications of the minimum funding requirements called for under ERISA. One study which dealt directly with this latter point was published in 1975 (Kreiser). A second study examined the requirements called for by ERISA.
The conclusions of the authors were that the new requirements would be beneficial to financial statement users by lending more credibility to the statements. (Deaton and Weygandt, 1975). These added legal requirements were then used to argue for a revamping of pension accounting by the accounting profession.

Although much discussion has been centered on unfunded past service obligations and pension plans in general, the conjectures are not supported by any empirical work. The pension literature tends toward arguments which are concerned with the "right way" to account for pensions and the issue of whether unfunded past service obligations are liabilities. However, the efficient markets hypothesis used in the finance literature attempts to provide evidence that the marketplace can fully comprehend (or react to) information as long as it is publically available somewhere. If the efficient markets hypothesis holds, then the unfunded past service obligations should be impounded in the stocks' returns whether the information is in a footnote or in the body of the statement. In short, if the information is available in the footnotes and the market is reacting to it then the liability debate can end. If the information is available and the market is not reacting to it, then the situation may be one where the market sees the unfunded past service obligations as liabilities which have corresponding assets. Alternatively, the market may not be reacting because the footnote information is being ignored or because the unfunded past service obligations are seen as being offset by decreased future wages.
There are at least two possible reasons for investors to ignore unfunded past service obligations. First, the market may regard the numbers being produced by actuaries and accountants as being so speculative that the information is being heavily discounted. This point is made in several of the studies discussed above (Hall and Landsittel, 1977; Skinner, 1980; and Deaton and Weygandt, 1975) especially with regard to the different methods available for use in accounting for pension funds.

The second reason, which may or may not be coupled with the first reason described above, is the possibility that investors already "suspected" that firms had these obligations before they were reported. If either or both of these reasons are true, then the market may not react to unfunded past service obligations since the market would not attach any concise or new meaning to the numbers given in the footnotes.

While this chapter has given only a brief overview of the pension fund literature, it does serve to establish a background for the remainder of the study. In view of the lack of any previous empirical test of unfunded past service obligations, the purpose here is to perform a test -- however modest. The third Chapter will review the efficient markets hypothesis literature and the primary model used in empirical tests.
Notes

1. The CICA will be publishing a study in the fall of 1980 on pension plans. The publication will be called Pension Costs and Liabilities: A Reconciliation of Accounting and Actuarial Practice by T. Ross Archibald ("Pension Plan 'Breakthrough'," CA Magazine, May, 1980).

2. The FASB has actually issued two new statements which discuss pension plans. Statement No. 35 is not discussed because it deals with the accounting and reporting for defined benefit pension plans in the pension plan statements.

3. In general in the U.S. the handling of pensions usually refers to the accounting for vested pension benefits. This is at least in part due to U.S. federal legislation.

4. One point is repeated by all three studies Hall and Landsittel (1977), the Accountants International Study Group (1977) and Skinner (1980). This point is that the methods available for use in accounting for pensions should be narrowed and made more consistent.

5. ERISA spells out provisions for plan participation, vesting of benefits, funding standards, portability of retirement benefits, and who may act as a fiduciary. The ERISA requirements differ somewhat from accounting rules. In the APB's Opinion No. 8, funding requirements were given simply as being charged against income over a reasonable period of time. ERISA requires that funding must be accomplished in thirty years.
CHAPTER III

THE EFFICIENT MARKETS HYPOTHESIS AND THE MARKET MODEL:
AN OVERVIEW

This chapter will attempt to do several things. First, the efficient markets hypothesis and its three forms will be discussed. Second, a discussion of the market model and the capital asset pricing model will be detailed. Third, U.S. tests of the semi-strong efficient markets hypothesis will be outlined. Finally, eleven articles which examine the Canadian market will be reviewed.

As a preamble to the discussion of the literature, one point should be made explicit. The number of articles written about the efficient markets hypothesis and/or the models used in testing the hypothesis is very large and growing. Therefore, some criteria needed to be followed in the selection of papers for presentation. First if an article served as a clarification for the proposed test in this study, then the article was outlined. Second, if a paper represented the recent direction of research in this area, then the paper was discussed. Finally, if a study was concerned with the Canadian market, then the study was examined.
The Efficient Markets Hypothesis

The efficient markets hypothesis [EMH, hereafter] is an hypothesis based upon the concept that the capital market processes information efficiently. If the market does process information efficiently, then prices will "fully reflect" all available information. The importance of prices reflecting this information has to do with market allocation. Prices which encapsulate all information will lead investors to allocate their monies such that resources are allocated efficiently throughout the market.

The tests of the EMH have taken three forms: the weak, semi-strong and strong forms, which will be described below. However, a note of caution is required. The EMH cannot be tested by itself. In order to make the EMH testable, models must be introduced which represent forms of market equilibrium. When the hypothesis is tested using an equilibrium model, the test conducted will be a simultaneous test of the EMH and the model of market equilibrium.

The EMH has three forms (Fama, 1970, 383). The two extreme cases of market efficiency are the weak form and the strong form. The third formulation, the semi-strong form, is the form which will be used in this thesis. However, a brief discussion of the weak and strong forms will be outlined to illustrate the limits of the hypothesis.

The weak form of the EMH says that the current price of a security fully reflects all the historical price information
available about that security. Also, the price of a security is seen as an unbiased estimate of the security's future price. This is known as the random walk. The economic implication of a random walk is that when prices are charted, the prices do not appear to follow any definable pattern. This is in direct contradiction to the belief of technical analysts. A few studies which have supported the weak EMH formulation will be discussed below.¹

The weak form EMH has been tested in several ways using data derived from the New York Stock Exchange² [hearafter, NYSE]. Two specific types of tests will be explained here. The first set of tests are based upon a model of market equilibrium which calls for expected returns to be positive. That is at time t-1, the market will set the price for security j such that the expected rate of return in time t will be strictly positive. This model for market equilibrium is the basis for tests which examined filter rules and the beliefs of chartists. A filter rule is a rule which states that if a stock price rises by X percent above a previous low price then the investor should buy and hold that stock until the price decreases by Y percent from a subsequent high price. A chartist then is a technical analyst who believes that new information is not quickly absorbed into the stock's price.

The three major tests which examined filter rules were written by Alexander (1961; and 1964) and Fama and Blume (1966). These empirical tests showed that when minimum trading costs
were included in the calculations of profits from the filter rules that these profits were no better than the returns from a simple strategy of buying and holding a firm's stocks.

The second set of tests were used to examine the autocorrelation terms from a series of lagged regressions. These studies were based upon a model of market equilibrium which states that expected returns are constant. The importance of this model is that information about past returns on security $j$ are important in the prediction of the expected return of $j$ in time $t$. However, the past returns are not relevant information about the deviation of the actual return on security $j$ in time $t$ from the expected return on $j$ in period $t$. Therefore, the investor cannot use past returns to predict a future return except to assume that the future return will be constant.

The primary test of this specification of the weak EMH form was conducted by Fama (1965a). In this test the autocorrelation term was examined to see how much variance in the firm's rate of return may be explained by the firm's past rates of return. This test examines the random walk because the random walk implies that returns distributions are independent from one period to the next. If these distributions are independent, then the autocorrelation terms should be equal to zero. Fama showed that while the autocorrelation terms were non-zero, the numbers were too small to reject the hypothesis that past rates of return were not useful in predicting future rates of return (Fama, 1965a; and for an overview of this topic see Fama, 1970).
The weak EMH form concentrates on past returns and past prices. The other extreme form, the strong EMH formulation, posits that all information whether publicly available or not will be impounded into the prices. The model of market equilibrium used for these tests was the Sharpe-Lintner capital asset pricing model (Sharpe, 1964; and Lintner, 1965a). This model states that the rate of return on a security will be a function of a risk-free rate plus a risk adjusted market rate.

Although several studies have tested the strong form of the EMH, Jensen's article (1969) is one of the most important. Jensen examined mutual fund performance on the basis that mutual fund managers might have access to inside information that the average investor could not be expected to know. Jensen found that mutual funds did not consistently outperform the market and concluded that the strong EMH form appeared to hold. Subsequent studies, for example Collins (1975), Jaffe (1974) and Finnerty (1976) have produced tests which did not support the strong form. Collins examined segmented reporting by product line before and after the U.S. Securities and Exchange Commission issued its requirement that this information be made public. Insiders were able to make abnormal returns before the requirement became effective. Finnerty (1976) and Jaffe (1974) studied insider trades of stock and both found that insiders appeared to be able to earn abnormal profits. 4

Between the two extremes, the semi-strong EMH form makes a somewhat different statement about market equilibrium. In the
semi-strong form, the market is said to incorporate all publicly available information into stock prices or rates of return. To a great extent tests of the semi-strong form EMH focus on the speed with which company specific information is impounded into stock prices. The tests focus on the behaviour of the cumulative average residuals generated from either the market model (the model of market equilibrium) or a combination of the market model and the capital asset pricing model. Due to the key role played by the market model in the semi-strong form tests and this thesis, it will be delineated before the semi-strong literature is reviewed.

The Market Model and the CAPM

By far the most popular method of testing for semi-strong market efficiency has been the so-called market model (Sharpe, 1963). In statistical form, the market model is a simple linear regression model which suggests a particular relationship between a firm's rate of return and the rate of return on the market. The model appears as:

$$ R_{jt} = \alpha_j + \beta_j R_{mt} + \xi_{jt} $$

The individual security's rate of return ($R_{jt}$) is a function of an intercept ($\alpha_j$) plus the market rate ($R_{mt}$) multiplied by a measure of security j's systematic risk ($\beta_j$) plus a residual term ($\xi_{jt}$). It is assumed that the random disturbances, the $\xi_{jt}$'s, have properties that:
In addition to the statistical interpretations, the market model is usually given an economic interpretation in the EMH tests. The market rate of return \((R_{mt})\) is said to reflect economy-wide information which becomes available at time \(t\). This information will affect all securities in the market to some extent. The extent to which this information does affect an individual security is reflected in the systematic risk term, \(\beta_j\). The disturbance term, \(\xi_{jt}\), then is the factor in the market model which reflects information made available at time \(t\) that is specific to firm \(j\). Or, alternatively, the residuals are studied rather than the rates of return in order to hold the effects of economy-wide information constant. Basically, then, the market model provides the model of market equilibrium for many semi-strong form tests.

A second model often referred to in the finance literature is the capital asset pricing model [CAPM, hereafter]. The CAPM was originally introduced by Sharpe (1964) and Lintner (1965a) and added to by Mossin (1966). The CAPM and the market model are said to be related when bivariate normality is assumed between the securities' rates of return and returns on the market (Fama, 1973, 1184-1185. Also see Fama, 1968).
There are several assumptions which set a background for the CAPM. These assumptions are:

1. Investors are risk averse and expected utility of wealth maximizers.
2. Investors have homogeneous expectations over joint normal distributions of rates of return and all investors are price takers. (Or alternatively all investors have quadratic utility.)
3. A risk-free rate exists, lending and borrowing at this rate is unlimited.
4. While there are a finite number of assets, the assets are perfectly divisible. Also, all assets are marketable.
5. Markets are frictionless and information is costless. Information is available to all investors simultaneously.
6. There are no transaction costs, no taxes and no restrictions on short selling.

Perhaps the key result to emerge from the CAPM is an ex ante trade off between risk and return. The tradeoff, known as the Security Market Line (SML), is given by

\[ E(R_j) = R_f + \left[ E(R_m) - R_f \right] \beta_j. \]

In equation (2) \( E(R_j) \) is the expected return on asset \( j \). \( R_f \) is the risk-free rate of return. \( E(R_m) \) is the expected return on the market portfolio. \( \beta_j = \text{Cov}(R_j, R_m)/\sigma_m^2 \) is the systematic risk of security \( j \).
If there is no riskfree borrowing or lending, the ex ante SML, extended by Black (1972, 450), is

\[ E(R_j) = E(R_z) + [E(R_m) - E(R_z)] \beta_j \]

(3)

where the terms in this equation are defined as in (2) except that \( E(R_z) \) represents the rate of return on a minimum variance portfolio which has a \( \beta \) equal to zero. This portfolio lies on the mean-variance frontier but on the inefficient portion.

Recently, the zero-beta CAPM has been used as the model of market equilibrium in some semi-strong form tests. These test made by Charest (1978a; and 1978b) will be discussed below in the review of the literature. But the basic idea is that instead of studying the residuals generated from the market model, i.e.,

\[ \xi_{jt} = R_{jt} - \hat{\alpha}_j - \hat{\beta}_j R_{mt} \]

(4)

he studied the residuals generated from the empirical analogue of the zero-beta CAPM, i.e.

\[ \xi_{jt} = R_{jt} - \hat{\gamma}_{0t} - \hat{\gamma}_{1t} \cdot \hat{\beta}_j, \]

(5)

where Fama and MacBeth (1973, 1974) show that \( \hat{\gamma}_{0t} \) and \( \hat{\gamma}_{1t} \) are estimates of \( R_{zt} \) and \( (R_{mt} - R_{zt}) \) respectively.

The next two sections will outline articles which tested the semi-strong EMH form primarily by the use of the market model. The first section will outline U.S. studies while the final section will outline Canadian market tests. A few articles mentioned do not utilize the market model. Where the model used is different, the reader will be alerted to this fact.
U.S. Market Studies

The seminal article in the semi-strong literature was written by Fama, Fisher, Jensen and Roll (1969). The test employed the CAPM to determine whether the U.S. market reacted to stock split information. Also, the researchers examined whether the possibility existed for investors to earn excess returns by investing in stocks after the stock split date. This study indicated that the stock split information was impounded into the security price prior to the date of the split. Consequently, it was concluded that there were no excess returns accruing to those who purchased the stocks subsequent to the stock split date (Fama, et al., 1969, 202). To reiterate, the paper's key contribution was to introduce the residual analysis as a means of studying market efficiency.

The information effects of dividends, earnings, accounting changes and mergers have been examined using methods similar to Fama, et al. (1969). Foster and Vickrey (1978) tested the market's reaction to stock dividend announcements. This study indicated that the U.S. market did anticipate the declaration of stock dividends and that there was a slight chance for investors to make positive abnormal returns (Foster and Vickrey, 1978, 366).

A number of studies have examined the information content of earnings. A seminal article Ball and Brown (1968), using an average performance index, found that accounting income numbers were apparently anticipated by the market prior to their public
release (Ball and Brown, 1968, 174). A second study by Basu (1978) used the Ball and Brown article as a starting point. Basu examined whether an "association existed between accounting earnings numbers and security prices" (1978, 600). He found that the earnings yields of common stocks influenced the relationship between the accounting income numbers and security prices (Basu, 1978, 617).

Quarterly earnings reports were studied by Joy, Litzenberger and McEnally (1977). The authors showed that by watching quarterly earnings reports, an investor could make abnormal returns particularly when favourable reports were used (Joy, et al., 1977, 222). This conclusion was based upon the fact that the information contained in the quarterly earnings report was not immediately impounded into the security's prices.9

Two recent studies examined market reactions to accounting changes (Abdel-khalik and McKeown, 1978; and Harrison, 1977).10 The Abdel-khalik and McKeown article used the combination of switches to LIFO and the projected earnings per share to determine whether the market reacted differentially to the changes (Abdel-khalik and McKeown, 1978, 852). A differential reaction was found to occur in the market when the expected earnings per share increased or decreased after the change. Harrison (1977), also, took accounting changes and tested for a difference in the market reaction. The market was shown to be reacting differently to those changes which were at management's discretion as opposed to those changes which were not (Harrison,
Mergers and their alternative accounting treatments were the subject of a paper by Hong, Kaplan and Mandelker (1978). This paper examined two accounting treatments of mergers, pooling and purchase. The popular belief used to be that the pooling of interests method would lead to an increase in stock prices. This belief may have influenced the APB to disallow the pooling of interests in mergers. Hong, et al. (1978), however, found that those firms using the purchase method of accounting for mergers had larger price increases than those companies which had used the pooling of interest treatment. This study is relevant because it highlights an important point pertaining to market efficiency with respect to information. If information exists in alternative forms, the market will not react differentially to those forms where the underlying economic meanings are the same. Where accounting changes signal economic changes in the firm, then the market will react.

As noted earlier, more recent studies have focused on the zero-beta form of the CAPM as the model of market equilibrium. For example Charest (1978a and 1978b) used this formulation. Charest's studies had interesting results which contrasted with an earlier study which used the market model (Fama, Fisher, Jensen and Roll, 1969). In the stock split study (1978b) Charest found that the U.S. market appeared to be fairly efficient although for a short three-month period after the split date abnormal returns were not equal to zero. In the dividend study
Charest found that abnormal returns could be made using dividend changes as indicators as to hold (or not hold) those securities where the dividends were altered.

**Canadian Market Studies**

While the body of literature based upon markets other than the U.S. is small, at least eleven articles have been written using Canadian data. This group of eleven articles falls into two general areas of study. One group used Canadian data to test for the market coming to equilibrium while the other group specifically examined Canadian data for reaction to information. Not all of the articles referred to employ the market model for testing. Since the number of articles using Canadian data is small, all of the studies will be briefly mentioned. The Canadian market data used was almost exclusively taken from the Toronto Stock Exchange (TSE, hereafter).

Charest performed two tests using the market model as his model of equilibrium, (1980a; and 1980b). In one article he tested the market's reaction to splitting stocks while in the other he examined the Canadian market's reaction to dividend changes. Charest's results indicated that splitting stocks had large, negative abnormal returns. This result was not expected and even Charest was puzzled by his findings (1980b, 23). In the dividend-changes paper, Charest found that the Canadian market appeared to contain inefficiencies since abnormal returns could have been made using dividend changes to indicate whether to
hold or sell a particular stock (1980a). These two articles may serve to indicate the inefficiency of the Canadian market. Alternatively however, these articles may serve as a caution for those using U.S.-oriented testing techniques on the Canadian market. At this stage there is not enough evidence to determine which of these points is true.

Three of the studies which use Canadian data were tests of the Canadian market's efficiency. Two of the tests are based upon the concept of "thinly traded" securities (Fowler, Rorke and Riding, 1977; and Fowler, Rorke and Jog, 1979). A market characterized by "thinly traded" securities is one in which the number of stocks traded is small and/or the stocks are traded infrequently or irregularly. In Fowler, Rorke and Riding (1977) a market model test using Canadian data was made in order to discover whether the use of the market model on "thinly traded" market data would result in significant measurement errors in variables. A large number of buyers and sellers in a market is assumed when using the EMH (re: buyers and price-takers). In a "thinly traded" market, the number of buyers and sellers is small. In the case of the "thinly traded" market the measured rate of return will not capture the true rate of return of traded securities. The findings supported the idea that significant errors in measurement did result from the use of data from a "thinly traded" market. The second test using Canadian data aimed to test for $\beta$ (the measure of a firm's systematic risk with the market) stability. While this study indicated that
"thinly traded" stocks appeared to have $\beta$'s which were more stable than the more frequently traded securities, the authors found that this result was spurious (Fowler, Rorke and Jog, 1979, 7-8). 13

The third paper which used Canadian market data was also a test of market efficiency, Dipchand and Roberts(1976) set out to examine the relative risk characteristics of a sample of Canadian firms. Their test also served to examine whether increasing the number of different firms' securities in a portfolio led to a decline in the non-systematic risk of the portfolio. The systematic risk characteristic was found to be strongly correlated with the market index (e.g., TSE Industrial Index) (Dipchand and Roberts, 1976, 5). Also, the amount of non-systematic risk associated with a portfolio decreased as the number of firms was increased (Dipchand and Roberts, 1976, 12).

Belkaoui examined issues concerning systematic risk in two other papers. In one paper Belkaoui found that the systematic risk of common stocks was correlated with financial leverage (1976, 8). Belkaoui specifically states that the betas determine financial leverage. However, his test does not lag the measurement of financial leverage after the measure of beta. In fact the design of the test does not appear to meet even superficial requirements of determining causality. In a second article, Belkaoui (1977) found using a factor analysis approach that accounting based risk measures were reflected in the systematic risk of fifty-five companies.
An insider trading test, strong EMH form, was performed in part using Canadian data (Baesel and Stein, 1979). The test was to see whether bank managers could utilize information not publicly available to increase their earned rates of return in the market. Bank managers were found to earn greater positive returns than either other insiders or informed buyers. However, the conclusion was not that the Canadian market was necessarily inefficient. Instead the authors concluded that excess returns may have existed because of inefficiencies in the informational market (Baesal and Stein, 1979, 568).

A second study which performed a strong form EMH test as well as a semi-strong form test was carried out by Kryzanowski (1978). He used TSE trading suspensions as indications of stock manipulation. Using thirty-four companies which released important information during a trading suspension, he tested whether the market reacted to the new information. What Kryzanowski observed was that the market did not appear to incorporate the signal that the stocks were being manipulated into the security's price. This lack of reaction was shown to exist before the suspension (the strong form test) and also to exist subsequent to the suspension (the semi-strong form test). Kryzanowski argued that these EMH tests should not only be used to determine a market's efficiency but also should be utilized to indicate inefficient market practices. Such inefficient practices might then be rectified (Kryzanowski, 1978, 367).

The final two articles which used Canadian market data did
not rely upon the market model. One study used a multiple regression model (Tinic and West, 1974) while the other used a calculated index measure (Close, 1975). Tinic and West tested to see whether the TSE had higher prices for marketability services as opposed to the NYSE and the over-the-counter market in the U.S. They observed that the higher prices for services on the TSE were in part due to the use of agents in the market (Tinic and West, 1974, 743). Close's market index was an attempt to examine large block trades and their effect upon the TSE and the Montreal Stock Exchange. He found that the volume of stocks which experienced large block trades increased after such a trade but the price only increased following a buy transaction that involved a large block trade (Close, 1975, 51-52, 56).

This chapter has presented an overview of a vast body of literature including the EMH and its three forms, the market model and the CAPM, also studies which tested the semi-strong form of the EMH have been reviewed. Some articles have necessarily been neglected. Most of the articles presented in the U.S. market section represented studies which measured market reactions to accounting data. While the results were somewhat mixed, the semi-strong EMH form was not disproved by those results.

If some caution is called for, it appears to be associated with the use of the market model and Canadian data together. The Canadian studies presented in the final section of the chapter were not fully supportive of the semi-strong EMH nor do the
studies indicate how the Canadian market arrives at equilibrium. Many of the Canadian studies have not been published and as indicated some seem to have methodological problems. Consequently, the market model will be used for the purposes of this thesis but the points made concerned with the use of this model in conjunction with the Canadian market should be kept in mind. The next chapter will briefly outline the technical aspects of using the market model, the hypotheses for testing and the data collection procedures.
Notes

1. Cheng and Deets, (1971, 11) question whether successive price changes are independent. This represents a questioning of the validity of the weak form EMH. Despite such criticisms, the EMH in its weak form is basically accepted.

2. The NYSE information comes primarily from the CRSP tape which is a computer tape put together by the Center for Research in Security Prices at the University of Chicago. The first mention of this tape appears to be Fisher and Lorie (1964).

3. While the weak form EMH explanation belongs to the common domain, the explanation incorporating models of equilibrium which state returns are positive or returns are constant used here is derived primarily from the work of Fama (1976).

4. The results in a paper by Collins (1975, 156) are not unambiguous. The segment earnings not reported to the public appear to have allowed insiders to make abnormal returns for two years, 1968 and 1969. However, when data for 1970 are included, it is unclear as to whether insiders could make abnormal returns on the basis of the unreported segment earnings information.

Also mutual funds studies have been mentioned as providing support to the strong form of the EMH. If mutual funds have access to insider information, then the studies concerned with their performance suggest that the EMH holds in the strong form since on average the funds did not outperform the market (for example see Jensen, 1968; and Williamson, 1972). However, the unanswered question is whether mutual funds receive inside information on a consistent basis (Dyckman, Downes and Magee, 1975, 32).

5. Although almost all semi-strong EMH tests have dealt with firm specific information, at least two exceptions exist. One study examined margin constraints (Grube, Joy and Panton, 1979) while a second study examined discount rates (Waud, 1970).

6. Also see Lintner (1965b) for a similar model and its derivation.

7. Black, Jensen and Scholes (1972) tested the CAPM as well as Fama and MacBeth (1973), Blume and Friend (1970 and 1973) and Miller and Scholes (1972).
8. A different test was performed by Beaver, Kettler and Scholes (1970). This study focused upon accounting risk measures and the relationship between these measures and the market risk measure ($\theta_j$). Their conclusion was that accounting risk measures could be sued to rank portfolios with essentially the same results as using the market risk measure (Beaver, Kettler and Scholes, 1970, 679).

9. Griffin (1977) performed a weak form EMH test that also indicated that the market does not respond efficiently to the quarterly earnings report. Griffins conclusion was based upon his result that his sample's prices violated the random walk (1977, 82).

10. Two earlier papers examined changes in depreciation methods which resulted in higher reported accounting incomes but which did not alter future cash flows (Comiskey, 1971; and Archibald, 1972). While Comiskey (1971, 281) does not use a market model formulation similar to Fama, et al., (1969), Archibald (1972, 25-26) does. Both studies indicated that the market was efficient in a semi-strong sense. The evidence illustrated that an increase in accounting income numbers did not cause a corresponding increase in the firms' rates of returns. A change in form then did not signal any economic differences.

     A third study which also examined accounting change was conducted by Ball (1972). Ball examined several types of accounting technique changes and did not limit his study only to changes in depreciation policies. As in the two studies discussed above, the accounting changes did not confuse the market in its pricing of securities.

11. For a comprehensive survey of some of the earlier literature in this area see Gonedes and Dopuch (1973).

12. Two other articles which do not use U.S. data are sometimes referred to in the literature. In Deakin, et al. (1974) the Tokyo market was studied while in Dimson (1979) the London market was examined.

13. Fowler, Rorke, and Jog (1979) seem to be begging the question in their study. In deciding whether the "thinly traded" stocks are more stable than "fat" stocks, they adjust the betas of the "thinly traded" stock by a minimum variance measure.
CHAPTER IV
THE MODEL, THE HYPOTHESIS AND THE DATA

The market model will be used as the basis for the tests to be performed in this study. A discussion of the model will be given in the first part of this chapter.

The second portion of the chapter will focus upon the hypothesis to be tested in this study. The null and alternative hypotheses will be described along with the possible outcomes which might be expected from the tests.

While most EMH tests have been designed around the U.S. market, the data used in the present investigation are derived from the Canadian market. The third section of this chapter will outline the data collection procedures, the decisions faced while collecting the data and the use of the Laval returns tape.¹

The Model

In 1969, Fama, Fisher, Jensen and Roll used the market model in a series of tests to examine whether the U.S. stock market reacted to the announcements of stock splits. As stated in the third chapter the market model was first outlined by Sharpe (1964), and Lintner (1965a and 1965b).
The market model is a single parameter equation which gives the relationship between a firm's rate of return, its systematic risk and the market rate of return. The standard form of the equation appears as equation (1) in Chapter III and is reproduced here for convenience.

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

where:

- \( R_{jt} \) is the return on firm \( j \) in time period \( t \).
- \( R_{mt} \) is the return on the market in time \( t \).
- \( \alpha_j \) is the intercept of the equation for firm \( j \).
- \( \beta_j \) is the slope of the regression line. It is also the \( \text{Cov}(R_{jt}, R_{mt}) / \text{Var}(R_{mt}) \).
- \( \xi_{jt} \) is the residual, or unexplained, variance in firm \( j \)'s return in the \( t \)-th time period.

In this study the coefficients, \( \alpha_j \) and \( \beta_j \), are estimated by using all the data except for a period of fifteen months before the date of interest and fifteen months after that date.\(^2\) This procedure follows Fama, et al., (1969, 190) who delete fifteen months prior to the stock split date and fifteen months after the split date.

It should be noted that estimates of \( \alpha_j \) and \( \beta_j \) might be affected by the inclusion of the thirty months. For example, when studying an event such as the first appearance of a footnote mentioning an unfunded past service obligation, there is the possibility that the information contained in the footnote became public at an earlier date. The pension contract, its signing and its resulting unfunded past service obligation
might have been described in newspapers. Alternatively, the public may not have gained access to the published financial statements for up to six months after their release. In both instances described, the dissemination of the information and the reaction to the information may extend over a lengthy period.

After the regression coefficients are estimated for a specific firm, residuals are computed using the following equation.

$$\xi_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_jR_{mt})$$  \hspace{1cm} (6)

These $\xi_{jt}$'s are then computed for a centered sixty month period around the event (see Chart II). Computation of these residuals is the first step in obtaining a series of plots. The plots will be used in the determination of the market's reaction to the unfunded past service obligation.

The second step is the calculation of the average residuals for the entire sample of firms. The average residuals are defined as:

$$\xi_m = \frac{\sum_{j=1}^{N} \xi_{jm}}{N_m}$$  \hspace{1cm} (7)

The $\xi_{jm}$ is the residual for firm j in month m. The sample size for month m is represented by $N_m$. By summing the residuals for all firms for one month and then dividing by the number of firms in the sample, the average residual is calculated.
Chart II

A Timeline Reference for the 102 Month Regression

| t=-65 | t=-29 | t=-14 | t=0 | t=15 | t=30 | t=66 |

The period deleted in calculating the $\hat{\alpha}_j'$s and $\hat{\beta}_j'$s

The sixty month test period over which the cumulative average residuals for the sample are calculated.\textsuperscript{a}

The total time period used for each stock's $\beta$ estimates is equal to 132 months less the thirty months (t=-14 to t=15) deleted for regression purposes.\textsuperscript{b}

\textsuperscript{a} The time period is sixty months where $t=0$ represents the end of a period. Also, $t=0$ is the end of the financial year.

\textsuperscript{b} The dates vary between stocks.
In depicting the market's reaction to new information, the third step is to calculate the cumulative average residual (Fama, et al., 1969, 193). The cumulative average residual is defined to be:

$$ E_m = \sum_{K=-29}^{M} \xi_m $$

(8)

In this study, the number of months used is sixty. The cumulative average residuals ($E_m$) will be plotted and these will result in the graphs needed for examination.

The market model and the residual calculations described above are based on the basic linear equation (1). The form used in the literature and the form reported to give the "best" results computationally is the logarithmic version (Fama, et al., 1969, 189; Charest, 1980a, 4; and Charest, 1980b, 6). The reason that these are the "best" results is due to the distribution of returns which is closer to log normal than to linear normal. The residual calculation of the logarithmic equation appears as:

$$ \xi_{jt} = [\ln(1+r_{jt})] - [\hat{a}_j + \hat{b}_j \ln(1+r_{mt})] $$

(9)

Two other definitions of the residuals will also be used in the tests.

$$ \xi_{jt} = [\ln(1+r_{jt})] - [\ln(1+r_{mt})] $$

(10)

$$ \xi_{jt} = [r_{jt}] - [r_{mt}] $$

(11)
Both equations (10) and (11) were used by Charest (1980b, 5) in his studies of the Canadian market.\(^3\) It should be observed that (10) and (11) are based upon the assumption that the mean value will equal zero and that the mean \(\beta\) value for a sample will equal one. The four forms of the residual computation, (6), (9), (10) and (11), will be used as checks to ensure that one formulation does not miss a reaction which might be extracted by a different form.

The Hypothesis

Once the cumulative average residuals are calculated, they are plotted on a graph. The plots are examined for patterns which illustrate whether or not the market reacted to specific information. The testing convention has historically been an examination of the plots which result from the calculation of the cumulative average residuals (e.g., Fama, et al., 1969; and Charest, 1980b).

Knowledge of how the tests are to be conducted is background to the hypotheses to be tested. The null hypothesis (\(H_0\)) and the alternative (\(H_a\)) are stated as:

\(H_0:\) When unfunded past service obligations are introduced (or first appear) in footnotes to a group of firms' financial statements, then there will be no noticeable change in that group's rate of return. This will be marked by the absence of change in the cumulative average residuals.
When unfunded past service obligations are introduced (or first appear) in footnotes to a group of firms' financial statements, then there will be a noticeable decrease in the group's rate of return. This change will be evidenced by a significant alteration in the pattern of the cumulative average residuals.

If the semi-strong EMH holds and the market regards the unfunded past service obligations as liabilities offset by expenses, then $H_0$ should be rejected. Alternatively, if the market is not counting the unfunded past service obligations as liabilities offset by expenses, then $H_a$ will be disconfirmed. ($H_0$ will not be rejected.)

The evidence will consist of cumulative average residual plots similar to those depicted in Figures I and II which illustrate polar cases.

If $H_0$ is rejected and the alternative hypothesis is supported, then one would anticipate that the residuals plot for an experimental group of firms would bear some resemblance to Figure I. In other words, the cumulative residuals will randomly fluctuate around the zero point on the vertical axis prior to time $t=0$, which represents the time period when the unfunded past service obligations first appear in the footnotes to the financial reports. After $t=0$, if $H_a$ is supported, then the cumulative average residuals will fall. This decrease will stop at some point, and the cumulative average residuals will thereafter fluctuate around this lower value.
In the empirical literature testing the EMH by means of the market model, the cumulative average residuals are interpreted as "...measures of the average percent abnormal returns [which are] experienced by the sample stocks over a number of months relative to information event month zero" [Charest, 1978a, 269]. A decline in cumulative average residuals is consistent
with a market reaction to the new information regarding unfunded past service obligations.

The plot may not look exactly like Figure I even if the market does react to the obligations as mentioned. If the market has more timely sources of information than the annual reports, then the residuals will begin to fall prior to \( t=0 \) if \( H_a \) is supported.\(^4\)

A second use of the resulting diagram (Figure I) is to examine the length of time it takes the market to react to the new data. The number of months from the beginning of the pattern of decline to a stabilization of the plot is an indication of how long it takes the market to adjust. The quicker the market adjusts, the more efficient the market is thought to be.

If, however, the unfunded past service obligations are not read as liabilities offset by expenses, then \( H_0 \) will not be rejected. Figure II depicts such a situation. Since most of the semi-strong tests of the EMH have been shown to support that form, it will be inferred that the market does not see unfunded past service obligations as liabilities offset by expenses.

Some decision rule is required if the plots do not appear as in Figures I and II. For example, if the cumulative average residual plot does decline near \( t=0 \) but begins to increase several months later, then the plot will have to be examined to establish whether similar declines occur elsewhere in the plot. Perhaps such a decline in the plots occurs every twelve or
fifteen months. If the declines are of a similar magnitude, then the plots will be seen as picking-up some specific piece of cyclical information. One such piece of information could be the reported annual earnings of the firms. With regards to a non-polar result, the primary point is that the plot will have to be examined carefully.

Consideration of the article by Fama, et al., (1969) led to the decision to employ the model described above. However, the article is also useful as an indicator of secondary tests to run. In their study the authors divided their sample into two groups. One sub-sample had dividend increases after the stock split, the other half of the sample was characterized by dividend decreases (Fama, et al., 1969, 201). This particular example is not directly applicable to the unfunded past service obligation study. However, the idea of dividing the sample into sub-groups is useful.

Several sub-samples will be set-up in order to study the market's reaction to the footnotes which mention the unfunded past service obligation. Four sets of sub-samples are proposed for use. First, the sample will be divided into two halves, firms where the unfunded past service obligation is greater (less) than some percentage of net income after taxes. The second partition will be formed by taking the sample of forty-five and dividing it into two equal groups based upon the ratios of the unfunded past service obligations to the firms' retained earnings. The third partition will be formed on the
basis of the size of the unfunded past service obligations relative to the firms' total assets. The fourth and final partition will be formed on the basis of net income growth. Three groups will be established for this third test, those firms where income increased by more than five percent, those companies where income decreased by more than five percent, and those firms where income either increased by less than five percent or did not increase by more than five percent in the year from \( t=-12 \) to \( t=0 \).

The purpose of forming sub-groups is to examine the data in several possible ways. In using the four different forms of the residual calculation, the purpose is to inspect the reaction in the market and to avoid missing any subtle reaction. This reasoning holds true for the partitioning of the sample as well.

The Data

In order to compute the residuals as described above, a potential sample had to be selected and the necessary data had to be collected. The residuals are calculated using the firms' rate of return \( (R_{jt}) \). The rate of return is defined as:

\[
R_{jt} = \frac{P_{jt} + D_{jt} - P_{jt-1}}{P_{jt-1}}
\]  

Equation (12) states that firm \( j \)'s rate of return in period \( t \) is the current price \( (P_{jt}) \) plus any dividends paid \( (D_{jt}) \) in period \( t \) minus the preceding period's price all divided by the
preceding period's price \( (P_{jt-1}) \). The dividends referred to may be either cash or stock dividends.\(^5\)

While equation (12) seems quite straightforward, it must be adjusted by two other capital changes as well. These adjustments are for (a) stock splits and (b) the issuance of stock rights.

It was decided to collect monthly data for eleven years. This provided five years of monthly returns on either side of the year where the unfunded past service obligation first appeared in the footnotes.

To locate a suitable sample, the recent financial statements of Canadian companies were reviewed. The primary focus of attention was the footnotes where an unfunded past service obligation was listed.

This search process yielded 70 companies for use with an unfunded past service obligation disclosed in the footnotes. For these 70 firms, past statements were examined to pin-point the first appearance of this footnote.

Other information was also obtained from the financial statements. This information included the amount of total assets, net income before and after taxes and the amount of retained earnings. Eleven years of statements were required.

Due to the unavailability of this financial data, several firms were eliminated from the sample. Several firms were not public corporations for the full eleven years. Several firms were subsidiaries of other companies in the sample and these
had to be deleted to avoid double-counting.

Several more firms were eliminated from the sample because they were not listed on the Toronto Stock Exchange (TSE, hereafter) for the required length of time. One company, Great Lakes Paper, Ltd., was not listed on the TSE for the full eleven years. To keep this firm in the sample, two Montreal Stock Exchange prices were used. This is the only exception to the rule that the companies had to be listed on the TSE.

After beginning with a possible 70 firms for inclusion in the sample, the group was reduced to 45 companies. The names of the firms, the dates used and the total asset sizes for both the beginning and ending years are listed in Appendix B. Appendix C lists the companies by industry. This serves to illustrate that the sample was spread among several industries and not heavily concentrated in one or two industries.

The price data were collected from The Globe and Mail for the last trading day of each month for the 132 month period. The price noted was the closing price. As exhibited in Appendix B, the eleven year span differs from company to company. Therefore, The Globe and Mail was used for the period starting in July, 1960 and ending in June, 1980.

Since an individual firm's stocks may not trade on every day, a closing price did not always exist for each firm. When a trade did not occur on the last trading day of the month, the bid and ask prices were collected. These two amounts were then added together and divided by two to yield a proxy for the
missing closing price.\textsuperscript{6}

In a few cases even bid and ask prices were missing. When this situation occurred, the missing price was noted. For the month where the price was missing, the rate of return was calculated by using the month immediately prior and the month immediately following. A two-period rate of return was then calculated. The geometric mean was taken of the two period rate in order to obtain a proxy for both the month missing the price and for the succeeding month.\textsuperscript{7}

Some companies have listed on their balance sheets more than one class of common stock. Where more than one class of stock exists, a decision must be made as to the class of stock to be used in the research. Although most companies in the sample only listed one type of common stock, there were three firms which had two classes of common stock throughout the eleven year period. Seven companies\textsuperscript{8} began the eleven year period with only one class of common stock, but during that time the stock was split into two classes. Where different classes of common stock existed, criteria had to be adopted to facilitate the making of consistent decisions as to the appropriate class to include in the sample.

The criteria used in this study were the same as those used by the creators of the Laval tape (Morgan and Turgeon, 1978). The four rules are: (1) Stock classes which are 100\% controlled by an identified group were excluded. (2) If a class of shares are preferred to as to dividends or claims upon liquidation,
then these shares were not used. (3) If a choice still existed between tax paid and non-tax paid shares, the non-tax paid class was chosen. (4) If two classes of stock were still available for inclusion in the sample, the class with the vote was used.

The dividend data were collected from The Financial Post Dividend Record for the years 1960 through 1979. For the first six months of 1980, The Globe and Mail was used to locate the ex-dividend date and the amount of the dividends to be paid. The ex-dividend date was the date used to determine the month in which the dividend was used in the rate of return calculation.

The issuance date of stock rights was obtained from the companies' financial statements. The rights' prices were also from The Globe and Mail. The price used in the computation was the first closing price after the rights were issued.9

Once the data were collected, the tape was programmed using a set of PL/1 programs.10 These programs calculated the rates of return and were used in a checking process between the tape for this study and the Laval returns tape. After the rates of return were computed, then regressions were run for individual firms. These regressions resulted in the estimates of the alphas and betas required for the residual calculations. The regressions were run using a packaged program, the Econometric Software Program (ESP). (Econometric Software Program User's Manual, Synergy, Inc.).
After the data had been collected and computations partially completed, a copy of the stock returns tape produced by Laval University was acquired. The Laval tape is different in some respects from the tape compiled for this study. For example, the price data contained in the Laval tape came from The Toronto Stock Exchange Review. This means that the Laval tape's returns are not always based upon the closing price of the last trading day of the month. The closing price quoted in The Review may be the closing price of any day within the month as long as this price represents a trade. This results in the Laval tape having fewer bid and ask prices used as proxies for closing prices. The Review's policy on the listing of the closing price means that the Laval tape has a different number of missing prices.

There is one other difference between the Laval tape and the tape compiled for this thesis. The Laval tape's creators used a different price for rights issued. When the rights first traded, the closing price used on the Laval tape was taken from The Review. Thus, only by accident would the rights' prices used in the Laval tape be equivalent to those used in the tape used in this thesis.

One point was consistent between the two tapes. The prices used for the rate of return calculations represented the same classes of shares.

For this study, the Laval tape was used as a check on the accuracy of the compiled rates of return. A PL/1 program
was written which compared all monthly returns which occurred on both tapes. Where the returns differed by more than 0.001, these numbers were listed-off separately by the computer.

These inconsistent returns were inspected for the use of bid and ask prices first. The tape compiled for this study was examined and whenever a bid and ask proxy was found, this was noted. Next, The Toronto Stock Exchange Review was checked to see whether a closing price was given. Where the compiled tape used a bid-ask price equivalent and The Review gave a closing price, the prices were almost always found to be different.

The described checking procedure did not account for all of the differences between the two sets of returns. Consequently, where a difference still existed, the prices collected from The Globe and Mail were verified by returning to the newspaper and ensuring that the prices were recorded accurately. Where The Globe and Mail prices noted differed from The Review's recorded price, The Globe and Mail price was used.12

After going through these checking procedures, there were still some differences unaccounted for between the two sets of returns. For instance, where the prices quoted by The Globe and Mail and The Review were the same, then the dividends were re-examined. This was an attempt to ensure that the dividends on the compiled tape were recorded in the appropriate month. Where differences still existed after this procedure, only undetected errors could explain the remaining differences.

The Laval tape was used in a second way for this study. The
tests were re-run using the Laval data. The Laval tape begins in January, 1963 and ends in December, 1978. To use the Laval data, the time period for residual calculations was shortened from sixty months to forty-eight months. (See Exhibit B). The results of the tests using both the Laval data and the compiled tape will be described in detail in the following chapter.

In equation (1) the market rate of return, \( R_{mt} \), is used. Two measures were used as proxies for the market rate, the TSE 300 Index adjusted for dividends\(^{13}\) and a market rate computed using the Laval tape.\(^{14}\) These two market measures are different. The TSE 300 Index is a value weighted index which means that the number of outstanding shares of a stock are used in calculating the index.\(^{15}\) The Laval market rate is an equally weighted index. This means that all the stocks are given a weight equal to one.

The types of stocks used in calculating the two indices also differ. Whereas the Laval market rate is composed of common stocks, the TSE 300 Index incorporates the returns of both common and preferred shares. The returns used in the sample in this study are all based on common stocks as detailed previously.

The Laval market rate would appear to be more compatible with the compiled tape due to the exclusive use of common stocks and due to the equal weighting of the returns which compose it.\(^{16}\) However, if a sixty month test period were used employing the Laval market rate, then the sample size would
Chart III
A Timeline Reference for the 84 Month Regression

| t=-53 | t=-23 | t=-11 | t=0  | t=12 | t=24 | t=54 |

- The period deleted in calculating the $\hat{\alpha}_j$'s and $\hat{\beta}_j$'s

- The forty-eight month test period over which the cumulative average residuals for the sample are calculated.\(^a\)

- The total time period used for each stock's $\beta$ estimates is equal to 108 months less the twenty-four months ($t=-11$ to $t=12$) deleted from the regressions.\(^b\)

\(^a\) The time period is forty-eight months where $t=0$ represents the end of a period. Also, $t=0$ is the end of the financial year.

\(^b\) The dates vary between stocks.
have decreased to only twenty-eight firms. Therefore, in order to use the Laval market rate and maximize the sample size, the regressions were run using eighty-four months instead of one hundred and two months and the residuals were calculated using a forty-eight month period instead of a sixty month period as outlined above. (See Chart III.)

This chapter has presented a brief overview of the model to be used, the hypothesis to be tested and the data used in the tests. This study extends the previous studies by applying the EMH to unfunded past service obligations and their first appearance in the statement notes. A thorough search of abstract titles for unpublished Ph.D. dissertations did not yield any projects on the subject of unfunded past service obligations.

A major contribution of this thesis is the body of data collected. The data collected for this research are original (see Appendix D) and differ somewhat from the subset derived from the Laval returns tape. For example, the time span covered is longer and as noted in the chapter, certain items were handled differently. Also, the major source for price data differs between the two tapes.

The following chapter will outline the results obtained from using the model described in the first section of this chapter. Plots of the residuals and other tables will be presented to enhance the discussion.
Notes

1. The Laval returns tape is a computer tape which was created and composed by researchers at Laval University. Its originators were Professors Ieuan Morgan and Gilles Turgeon (1978). There is more than one tape; however, due to the cost only the rates of return tape was purchased. Professor Guy Charest of Laval University made the tape available quickly and answered many questions about the tape.

2. The regressions run in order to estimate the $\alpha_j$'s and $\beta_j$'s use different periods in the regressions. For example, Charest (1980a and 1980b) uses sixty months before the period he wishes to examine in his regressions. Charest, however, does not follow this as a hard-and-fast rule. He uses sixty months which for some firms was composed of months prior to and after the examination period.

   In another article the authors (Larcker, et al., 1980, 268) note that the time period used for estimating the $\alpha_j$'s and $\beta_j$'s is usually a period prior to the date researchers wish to begin their examination. However, they also note that the estimation period may also include months after the examination date.

3. Charest (1980b, 5) also uses one other equation. This equation looks just like equation (2) except that the alpha and beta are time subscripted as $\alpha_{jt}$ and $\beta_{jt}$. These are moving estimates of $\alpha_j$ and $\beta_j$. However, Charest in an appendix to his article (1980a, 26) notes that this particular method created a negative bias in the residuals. Consequently, this equation was not used in this study.

4. The reaction of the residuals as pictured in Figure I may be described as follows. If we assume that increasing a firm's liabilities will decrease its price, the $P_{jt}$ will decrease. This decrease, ceterus paribus, will cause $R_{jt}$ to fall. If the market is relatively stable, $R_{mt}$ will not change. Also, $\alpha_j$ and $\beta_j$ are not time subscripted and therefore should not decrease. This means that only the $\xi_{jt}$'s will decrease.

5. The stock dividends were converted to a dollar value by locating the closing price for the stock on the exdividend date or for the first day it traded after the exdividend
date. Thus, the stock dividend could be treated like a cash dividend in the calculations.

6. Out of a total of 5,985 prices, 840 prices were bid-ask proxies or approximately 14%. In most cases there were not very many bid-ask proxies used per firm. However, six firms had fifty or more of these calculated proxies.

7. There were only twenty-two missing prices out of the 5,985 prices collected.

8. Three companies began the period with more than one type of common stock listed in their financial statements. These firms were Steinberg's, Simpsons-Sears and Woodward's. Only Class A for each of these companies was listed on the TSE. All three Class A shares were non-voting.

Federal Pioneer, Ltd. was one of the seven companies which began the period of study with only one class of common stock listed in its financial statements. Unlike the other six firms, which also split one class of common stock into two classes, Federal Pioneer's Class A shares were the only class traded on the TSE after division.

9. The market value of the stock rights were treated in the calculations as a dividend.

10. Messrs. Frederick Shen and Stephen Spector are owed many thanks for their kind aid in writing the required programs for this study.

11. This idea was suggested by Professor John Herzog.

12. Since the daily newspaper is the source most investors use when they are following stock prices, it was assumed that The Globe and Mail prices better portrayed the information an investor used. In general, investors probably do not wait for The Review to be published once a month in order to ascertain how well their stocks are performing.

13. The TSE 300 Index, adjusted for dividends, was supplied independently by two sources. First, A.G. Becker, Ltd. was asked for the figures and these were given freely. Second, Professor Guy Charest of Laval University made his own TSE 300 indices available to this researcher. Thanks are owed to both sources for this information.

14. The Laval market index was compiled using the rates from the Laval returns tape. These market rates were freely supplied by Professor Guy Charest of Laval University.
15. It is necessary to provide a caution to the reader at this point. The TSE 300 Index is not a value weighted index as usually referred to in the finance literature.

The TSE 300 Index is adjusted for major blocks of stock (20% or greater) where an identifiable individual or group may be distinguished. These control blocks are then subtracted from the total number of shares outstanding before the shares are multiplied by the price. This procedure decreases the amount of weight a company is given in the TSE 300 Index.

Two examples from this study's sample would be Rio Algom Mines, Ltd. and Acklands, Ltd. One company with an identifiable major shareholder would be Rio Algom Mines, Ltd. which is controlled by Rio Tinto Mines, Ltd. A company which has a control block owned by an identifiable group is Acklands, Ltd. Both of these companies would have their outstanding number of shares decreased before being included in the Index.

16. If portfolios had been formed using the firms in this sample, then the share prices would have been weighted by the number of outstanding shares. However, because of the small sample size (N=45), portfolios were not formed.

In the tests using cumulative average residuals, the prices are not weighted by the number of shares. This probably is overlooked because the researchers are using standardized variables. That is, rates of return are being used and a ten percent rate of return is a ten percent rate of return whether the company is very large or very small. Being based upon the rates of return, the $\xi_{jt}'s$ have an expected value of zero which corresponds to the mean of a standardized variable in statistics.
CHAPTER V
PRESENTATION OF THE TEST RESULTS

This chapter is concerned with a discussion of the actual tests. The tests will be described in three sections. The first section will describe the results of the regressions.

The cumulative average residuals will be presented in the second section. Plots for both the sixty month and the forty-eight month test periods will be given as illustrations of the results. The plots will include some of those which resulted from partitioning of the sample as described in Chapter Four.

The third portion of the chapter will present a set of tables based upon average rates of return. The average rates of return for the sample and the average rates of return for the market will be listed. This procedure is based upon one used by Charest (1980b, 11-12). The exhibits will represent a sixty month test period and a forty-eight month test period.

Examination of the Regression Results

As outlined in the previous chapter, the primary reason for running the regressions was to calculate the estimates of the $\alpha_j$'s and $\beta_j$'s for each firm in the sample. The distributions
of these estimates, $\hat{\alpha}_j$ and $\hat{\beta}_j$, are of interest. Table II presents statistics concerning the summarization of the estimated alphas. Likewise Table III represents a similar summarization for the estimated betas. In order to better understand these two tables a few comments and comparisons are necessary. The comparisons will be made using two articles, Fama, et al. (1969) and Charest (1980b). Most of the specific comparisons will be made for the log form [Equation (9)] of the regressions.

Two common statistics used in describing a distribution are the mean and the median. In both Fama, et al. (1969, 190) and Charest (1980b, 10) the mean of the estimated alphas is 0.000 while the median is 0.001. The sample sizes are respectively 940 and 152. In this project the sample sizes used are forty-five or thirty-six. Despite the large difference in sample sizes between this project and the other two samples, the mean and the median of the alphas are not very different. For this sample the mean and median both vary between 0.003 and -0.004 depending on the sample size, the length of time and the form of the equation.

The form of the equation which appears to have comparable alphas to the two previous studies and which qualifies for comparison is the log form equation based on 102 months. The mean and the median alphas for this equation are 0.001. The log form based upon 132 months does not qualify as a comparison equation because it was not used for residual calculations. The
### TABLE II

Summary of Relevant Statistics for the ALPHAS by Equation

<table>
<thead>
<tr>
<th>EQUATION</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Skewness³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Regression (132 months)¹</td>
<td>.003</td>
<td>.002</td>
<td>.005</td>
<td>-.009</td>
<td>.017</td>
<td>.552</td>
</tr>
<tr>
<td>Log Regression (132 months)¹</td>
<td>.0005</td>
<td>.0002</td>
<td>.005</td>
<td>-.012</td>
<td>.015</td>
<td>.346</td>
</tr>
<tr>
<td>Linear Regression (102 months)¹</td>
<td>.003</td>
<td>.003</td>
<td>.006</td>
<td>-.083</td>
<td>.019</td>
<td>-.792</td>
</tr>
<tr>
<td>Log Regression (102 months)¹</td>
<td>.001</td>
<td>.001</td>
<td>.006</td>
<td>-.012</td>
<td>.015</td>
<td>.244</td>
</tr>
<tr>
<td>Linear Regression (84 months - Market measure: TSE)²</td>
<td>.001</td>
<td>.001</td>
<td>.006</td>
<td>-.018</td>
<td>.013</td>
<td>-.595</td>
</tr>
<tr>
<td>Log Regression (84 months - Market measure: TSE)²</td>
<td>-.002</td>
<td>-.002</td>
<td>.006</td>
<td>-.022</td>
<td>.012</td>
<td>-.717</td>
</tr>
<tr>
<td>Linear Regression (84 months - Market measure: LAVAL)²</td>
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<td>-.001</td>
<td>.001</td>
<td>-.023</td>
<td>.010</td>
<td>-1.335</td>
</tr>
<tr>
<td>Log Regression (84 months - Market measure: LAVAL)²</td>
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<td>-.004</td>
<td>.001</td>
<td>-.027</td>
<td>.006</td>
<td>-1.295</td>
</tr>
</tbody>
</table>

2. Sample size N=36.
3. The measure of skewness used in the SPSS program is given as:

\[
\frac{N}{(N-1)} \left\{ \frac{\sum_{i=1}^{N} X_i^2 - 3 \left(\frac{\sum_{i=1}^{N} X_i}{N}\right)^2 + \frac{\sum_{i=1}^{N} (\sum_{i=1}^{N} X_i^2)}{N} - \left(\frac{\sum_{i=1}^{N} X_i}{N}\right)^3}{\left(\frac{\sum_{i=1}^{N} X_i^2 - N \left(\frac{\sum_{i=1}^{N} X_i}{N}\right)^2}{(N-1)}\right)^{3/2}} \right\}
\]

(Nie, et al., 1975, 185).
132 month regression statistics are recapitulated for comparisons with the 102 and 84 month equations.

Using the 132 month equations for comparisons, the estimated $\alpha_j$'s means are the same for both the 132 month and 102 month linear regressions. Both Fama (1970, 403-404) and Charest (1980b) state that the mean value of the alphas should be close to zero when the regressions are run without the test period included. When the regressions are re-run with the test period included, and if the null hypothesis, $H_0$, is false then the $\alpha_j$ and $\beta_j$ estimates should be different. Table II indicates only a small difference between the means and the medians for the 132 month regressions and the 102 month regressions.

For the alphas the minimum and maximum values are given as -0.06 and 0.04 in Fama, et al. (1969) and -0.034 and 0.024 in Charest (1980b). The minimum and maximum values for this study compare favourably with these earlier estimates. For instance, for the 102 month log regression, the minimum value is -0.012 and the maximum value is 0.015. In this case, the smaller difference between in the extreme values is probably due to the smaller sample size of forty-five.

The Fama, et al., study cites two other statistics concerned with the estimated alphas. The standard deviation is listed as 0.007 and the skewness is given as "slightly left" (1969, 190). Examination of all the equations run for this study, shows that the standard deviation ranges from 0.006 to
0.001. However, the skewness measure varies more widely than the standard deviation. For example, the 102 month log regression is slightly skewed to the right while the 84 month log regression run using the Laval market rate is skewed to the left.

A t-statistic\(^1\) has been calculated using the Fama, et al., information and the 102 month log regression statistics, the mean and standard deviation. The calculated t-value is -1.118. The alphas appear to be from the same population at a 95% confidence level.

An inspection of Table III offers the pertinent statistics with regards to the sample \(\beta_j\)'s. According to Charest (1980b, 11) the mean of the \(\beta_j\)'s should be close to one.\(^2\) Charest's sample mean and median are 1.018 and 0.959. Fama, et al. (1969, 190) give the mean and median of the \(\beta_j\)'s as 0.984 and 0.880. As listed in Table III the mean and the median are 0.897 and 0.934, respectively for the 102 month log regression. These statistics compare well to the statistics cited in the other two studies.

For the \(\beta_j\)'s the minimum and maximum values are closer to those reported by Fama, et al. (1969) than to those reported by Charest (1980b). The Fama, et al., article lists the extreme values as -0.10 and 1.95. Charest's minimum and maximum values for the \(\beta_j\)'s are -0.443 and 0.959. Using the 102 month log regression, the minimum is 0.314 and the maximum is 1.498.
TABLE III  
Summary of Relevant Statistics for the BETAS by Equation

<table>
<thead>
<tr>
<th>EQUATION</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Regression (132 months)</td>
<td>.886</td>
<td>.928</td>
<td>.272</td>
<td>.330</td>
<td>1.465</td>
<td>-.149</td>
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<tr>
<td>Log Regression (132 months)</td>
<td>.878</td>
<td>.902</td>
<td>.272</td>
<td>.347</td>
<td>1.415</td>
<td>-.185</td>
</tr>
<tr>
<td>Linear Regression (102 months)</td>
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<td>.934</td>
<td>.279</td>
<td>.326</td>
<td>1.484</td>
<td>-.226</td>
</tr>
<tr>
<td>Log Regression (102 months)</td>
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<td>.937</td>
<td>.276</td>
<td>.314</td>
<td>1.498</td>
<td>-.228</td>
</tr>
<tr>
<td>Linear Regression (84 months - Market measure: TSE)</td>
<td>.878</td>
<td>.913</td>
<td>.285</td>
<td>.226</td>
<td>1.395</td>
<td>-.403</td>
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<tr>
<td>Log Regression (84 months - Market measure: TSE)</td>
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<td>.902</td>
<td>.285</td>
<td>.233</td>
<td>1.383</td>
<td>-.408</td>
</tr>
<tr>
<td>Linear Regression (84 months - Market Measure: LAVAL)</td>
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<td>.756</td>
<td>.256</td>
<td>.200</td>
<td>1.293</td>
<td>-.151</td>
</tr>
<tr>
<td>Log Regression (84 months - Market measure: LAVAL)</td>
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<td>.776</td>
<td>.253</td>
<td>.213</td>
<td>1.253</td>
<td>-.217</td>
</tr>
</tbody>
</table>

2. Sample size N=36.
3. Mean R² for the 45 equations was .2617.
4. Mean R² for the 36 equations was .2538.
5. Mean R² for the 36 equations was .2318.
6. For the definition of skewness see note 3 on Table II (Nie, et al., 1975, 185).
While all the skewness measures listed in Table III are slightly skewed to the left, the distribution described in Fama, et al., is slightly skewed to the right. The standard deviation for the $\beta_j$'s is 0.305 for the Fama, et al., sample whereas the standard deviation varies from 0.253 to 0.285 for the sample used in this study.

As in the case of the alphas, the mean betas and standard deviations from Fama, et al., and this study are used to calculate t-values. The mean and standard deviation used from the present study came from the 102 month log regression equation. The calculated t-value is -0.1181. It appears that the betas are from the same population at a 95% confidence level.

One final regression statistic is noted at the bottom of Table III. This statistic is the mean $R^2$'s for three of the log regressions. The forty-five firm, 102 month log regression has a mean $R^2$ of 0.2617. Charest (1980b, 10) cites a mean $R^2$ for sixty-two regressions of 0.175. Neither Charest's nor the mean $R^2$ cited for this study reach the value given in Fama, et al. The mean $R^2$ for the U.S. study is approximately 0.399 (Fama, et al., 1969, 190).

Two basic conclusions may be drawn from Tables II and III. First, the mean $\hat{\alpha}$ is close to zero and the mean $\hat{\beta}$ is close to one. Second, despite the smaller sample size used in this study, the relevant statistics are comparable with those quoted from the two other research projects (Fama, et al., 1969; and Charest, 1980b).
Examination of the Cumulative Average Residuals

This section illustrates the results of running the various formulations of the model as detailed in the preceding chapter. Although partitions were run for all four forms, (6), (9), (10) and (11), only representative plots are given. In general, the plots drawn are for the forty-five firms, sixty month log forms. However, two plots, Figures III and IV, illustrate the thirty-six firm sub-sample (see Chart III, Chapter IV).

The first two graphs show the cumulative average residuals plotted over time. As mentioned in conjunction with Figure I in Chapter Four, the cumulative average residuals tend to cluster around the horizontal axis prior to \( t=0 \) (see Figures III and IV). However, after \( t=0 \) the graphs do not look like Figure I where the cumulative average residuals fall and then level-off at a new lower level. In addition the pattern in Figure III and IV does not resemble Figure II's random pattern. Instead in Figures III and IV, there is a definite downward trend in the cumulative average residuals after \( t=0 \).

An explanation for this overall downward trend is related to Figure XIII. That figure which depicts the cumulative average residuals for fourteen firms that had a decrease in income of more than five percent from \( t=-12 \) to \( t=0 \). These residuals are apparently the cause of the trend in the full sample diagrams.

As explained in Chapter Four, when a situation arises where the cumulative average residuals do not resemble the two
FIGURE III - Cumulative (Monthly) Average Residuals for Forty-five Firms - Log Equation (9) Using the TSE Index as the Market Rate
FIGURE IV - Cumulative (Monthly) Average Residuals for Thirty-six Firms - Log Equation(10) Using the TSE Index as the Market Rate
extreme cases (Figures I and II), then attention must be given to the specifics of the pattern.

The primary focus of attention should be around \( t=0 \). As noted earlier, the market may begin to react to the unfunded past service obligation three or four months prior to (or after) the statement date. In both Figures III and IV, there is a lack of reaction prior to the statement date. This lack of reaction is characterized by the cumulative average residuals' values being similar for the four months preceding \( t=0 \).

A change in the pattern does occur between \( t=+1 \) and \( t=+2 \) where a fairly large increase in the cumulative average residual occurs. This increase in the value is followed by a decrease between periods \( t=+2 \) to \( t=+5 \). One might see this as the reaction of the market to the unfunded past service obligation. Upon closer inspection this is apparently not the situation.

Examining the two plots from \( t=-29 \) to \( t=+30 \), a pattern becomes apparent. If \( t=+2 \) is used as a starting point, count backward twelve months. Next, count forward twelve months from \( t=+2 \). In both instances, \( t=-9 \) and \( t=+14 \), the cumulative average residual is balanced near a peak and just prior to a fall in the pattern. What appears to be a possible reaction to the unfunded past service obligation at \( t=+2 \), upon closer examination and comparison is an annual cycle.\(^5\).

Although a bit more erratic, this cycle is also seen in the forty-eight month time period tests. Two figures have been
reproduced to illustrate the similarity of the plots for the two samples. Figure V represents the cumulative average residuals plotted for thirty-six firms where the market rate was the TSE rate. Figure VI shows a similar plot using the Laval market rate of return.

Also, the cycle is seen in almost all of the figures duplicated here for the partitions of the data set. The degree of the reaction varies from figure to figure but this apparent cyclical pattern is there. Note that the pattern appears to be associated with the publication of the financial statements. (See Figures VII through XII).

The next six plots represent the sample partitioned as suggested in Chapter Four. (See Appendix E). A cautionary point must be made. The cumulative average residual plots scales differ from figure to figure. Due to this difference in scale, the figures are not directly comparable.

In Figure VII, twenty-three firms' cumulative average residuals are plotted. The scale goes from a plus sixteen percent to a minus thirty-two percent. This sub-group portrays the residuals for the "low" ratio firms. The ratio is based upon the unfunded past service obligation (UPSO) as a percentage of retained earnings (RE). For inclusion in the "low" ratio group, the percentage could not exceed 4.5 percent. If the ratio exceeded 4.5 percent, the firm was classified as a "high" ratio firm. These firms' residuals are plotted in Figure VIII. There are eight of the fourteen decreasing income firms
FIGURE V - Cumulative (Monthly) Average Residuals for Thirty-six Firms - Log Equation (9) Using the TSE Index as the Market Rate
FIGURE VI - Cumulative (Monthly) Average Residuals for Thirty-six Firms - Log Equation (9) Using the Laval Index as the Market Rate
FIGURE VII - Cumulative (Monthly) Average Residuals for twenty-three Firms with a Low UPSO/RE Ratio - Log Equation Using the TSE Index as the Market Rate
in the group of twenty-three. Obviously, as can be seen in Figure VII, this group of eight firms has a powerful influence on the overall trend of the residuals since the pattern decreases over time. Figure VIII in comparison appears more erratic. However, these high ratio firms' residuals vary between plus ten percent and minus two percent. Given the scale differences between Figures VII and VIII, the cumulative average residuals of the "risker" group of twenty-two actually show less overall reaction.

The same type of downward pattern in the cumulative average residuals is seen in Figure IX. In Figures IX and X the basis for the partition is the unfunded past service obligation (UPSO) as a percent of total assets (TA). The cutoff percentage used to split the group was 1.3 percent. Of the twenty-three firms pictured in Figure IX, six of those companies had a decrease in net income of greater than five percent between t=-12 and t=0. Figure IX like Figure VII evidences a pattern which results from the inclusion of these six firms. Figure X which depicts the "high" ratio firms appears more erratic in comparison to Figure IX. As in the case of Figures IX and X, the scales are very different with the "erratic" pattern in X being emphasized by a stretched scale for the cumulative average residuals.

The figures formed by using unfunded past service obligations as a percentage of net income after tax (NIAT) as a basis have approximately the same scale (see Figures XI and
FIGURE VIII - Cumulative (Monthly) Average Residuals for Twenty-two Firms with a High UP50/RE Ratio - Log Equation (9) Using the TSE Index as the Market Rate
Figure IX - Cumulative (Monthly) Average Residuals for Twenty-three Firms with a Low UPSO/TA Ratio - Log Equation (9) Using the TSE Index as the Market Rate
FIGURE X - Cumulative (Monthly) Average Residuals for Twenty-two Firms with a High UPSO/TA Ratio - Log Equation (9) Using the TSE Index as the Market Rate
XII). The cutoff percentage used was twenty-one percent. Of the fourteen income decreasing firms listed in Appendix F, six are included in the twenty-three firm partition shown in Figure XI. Both Figures XI and XII show an overall downward trend in the cumulative average residuals.

As in Figures III through VI, the last six figures show decreases near t=0. Again as stated before, similar decreases are seen at other points in time. The magnitude of these decreases at t=0 are no larger than other decreases and therefore, cannot be used to infer a market reaction to the unfunded past service obligations.  

The last five plots reproduced represent the partitioning of the data set by a so-called naive rule. Based upon a similar naive rule which employed historical information (Ball and Brown, 1968, 161), this rule looks at whether the income for the year which ended t=0 differed in comparison with the previous fiscal year (t=-12). 

The rule employed states that if income increased by more than five percent at time t=0 over time t=-12, then the firm becomes part of this sub-group. The decreases in income group relates to a decrease of more than five percent. Those companies which had income increases of less than five percent but whose income did not decrease by as much as five percent composes the third group. (See Appendix F for the companies in each group.)
FIGURE XI - Cumulative (Monthly) Average Residuals for Twenty-three Firms with a Low UPSO/NIAT Ratio - Log Equation (9) Using the TSE Index as the Market Rate
FIGURE XII - Cumulative (Monthly) Average Residuals for Twenty-two Firms with a High UPSO/NIAT Ratio - Log Equation (9) Using the TSE Index as the Market Rate
The cumulative average residuals for these three groups are pictured in Figures XIII, XIV and XV. These plots are for the log form as in equation (9). In Figure XIII the cumulative average residuals are plotted for the income decrease group. Figure XIV depicts the companies which had either increases or decreases in income which were less than a five percent change. Figure XV shows the income increase group. The three plots are consistent up to t=0 with at least one previous study based on the market's reaction to an unexpected increase (decrease) in income (Ball and Brown, 1968).

The income increase group builds from negative cumulative average residuals up to t=0 and then levels-off for a period of time between t=+2 and t=+16. The income decrease group has an opposite pattern. In Figure XIII prior to t=0, the cumulative average residuals fall. After t=0, the residual pattern fluctuates at a new lower percentage. Finally Figure XIV shows an erratic pattern for the cumulative average residuals for the group where income neither increased by more than five percent nor decreased by more than five percent.

Figure XVI represents the combination of the two subsamples depicted in Figures XIV and XV into one group. This combination serves to illustrate that the "erratic" behaviour of the cumulative average residuals shown in Figure XIV wash out when the two partitions are combined into one sample. Figure XVII shows the scale differences inherent in Figures XVI and XIII. The dashed line, which represents the combined group, is almost
FIGURE XIII - Cumulative (Monthly) Average Residuals for Fourteen Firms with a Decrease in Income of More than Five Percent - Log Equation (9) Using the TSE Index as the Market Rate
Figure XIV - Cumulative (Monthly) Average Residuals for Seven Firms with Either an Increase or a Decrease in Income of Less Than Five Percent - Log Equation (9) Using the TSE Index as the Market Rate
FIGURE XV - Cumulative (Monthly) Average Residuals for Twenty-four Firms with an Increase in Income of More Than Five Percent - Log Equation (9) Using the TSE Index as the Market Rate
flat in comparison to the plot for the income decreasing group.

From the plots which resulted from the tests, there appears to be a denial of the alternative hypothesis, $H_a$, which states that the market reacts to the first appearance of the unfunded past service obligation footnote. The plots seem to point to the acceptance of the null hypothesis, $H_0$.

In conjunction with this acceptance of $H_0$, one point needs to be strongly emphasized. The evidence rests in part upon the sample partitions based upon income changes between $t=-12$ and $t=0$ (see Figures XIII, XIV and XV). The downward trend seen in Figure XIII, which was a reaction to a decrease in income, has pulled the other cumulative average residuals down. However, this does not adequately explain why the plot in Figure XIII is downward past $t=+12$.

In examining the fourteen decreasing income companies' residuals, at least nine firms had large negative residuals from $t=+12$ to $t=+30$. These negative residuals did not correspond to the same months from firm to firm. Therefore, as some companies' residuals became positive, others were negative. In relation to the positive residuals, the negative residuals also tended to be large. It appears that once the downward trend began, the negative residuals tended to swamp the positive residuals. 9

A final analysis of the market's reaction or lack of reaction to the unfunded past service obligation is to compare average rates of return. The third section of this chapter
FIGURE XVI - Cumulative (Monthly) Average Residuals from Figures XIV and XV Combined into One Plot (Thirty-one firms)
FIGURE XVII - Cumulative (Monthly) Average Residuals from Figure XVI (- - -) Superimposed onto Figure XIII (α-α-α)
examines and compares two sets of average rates of return.

**Average Performance Indicators**

Charest (1980b, 11) calculates and shows the results of an average rate of return for his sample and a parallel cumulative market measure. First, the calculation of these measures will be described. Second, three tables indicating the results will be discussed.

For the sample of forty-five firms the average performance is defined as:

\[ AP_t = \frac{1}{N_t} \sum_{j=1}^{N_t} R_{jt} \]  

(13)

The average performance \(AP_t\) is simply the sum of all the rates of return \(R_{jt}\) divided by the number in the sample for any month \(t\). The cumulative average performance for the sample then is simply a summation over the months:

\[ CAP_t = \sum_{l=t}^{1} AP_t. \]  

(14)

The parallel average market performance is given as:

\[ PMP_t = \frac{1}{N_t} \sum_{j=1}^{N_t} R_{mt,j}. \]  

(15)

where \(PMP_t\) represents the parallel market performance, \(N_t\) is the number of firms in the sample and \(R_{mt,j}\) is the market rate of return that occurs in month \(t\) simultaneously to a specific firm \(j\)'s month \(t\). In other words, since month \(t\) is a
different month for different firms, then month \( t \) also has a sum of different market rates which compose the parallel market return.

The cumulative parallel market performance is as follows:

\[
CPMP_t = \sum_{l=t_1}^{l=t} PMP_l. 
\]  \hspace{1cm} (16)

Equation (16) simply represents a summation of the calculated parallel market performance (\( PMP_t \)) from months -29 to +30.

The results of the above procedure are shown in Tables IV, V and VI. Tables IV and V illustrate the forty-five firm sample over a sixty month period. Table VI shows the smaller thirty-six firm sample along with two cumulative parallel market performance measures.

In Charest (1980b, 11-12) the results indicate that the positive information regarding stock splits was incorporated into the cumulative average performance measures. The evidence offered by Charest is shown by the average performance measures for the sample increasing more than the cumulative parallel market performance. In Charest the differences between these two measures (\( CAP_t - CPMP_t \)) increase up to month \( t=0 \) and then the increasing pattern diminishes. This pattern is similar to Charest's cumulative average residual plot as well.

In this study, if the market is reacting to the unfunded past service obligations, then one might expect to see no definite pattern of increase (or decrease) prior to \( t=0 \) in the differences. However, after \( t=0 \), a decrease might be expected
Table IV

Cumulative Average Performance (CAP) of the Sample (N=45) vs. Cumulative Parallel Market Performance (CPMP)

<table>
<thead>
<tr>
<th>Month</th>
<th>CAP %</th>
<th>TSE CAP CPMP %</th>
<th>CAP CPMP %</th>
<th>Month</th>
<th>CAP %</th>
<th>TSE CAP CPMP %</th>
<th>CAP CPMP %</th>
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</thead>
<tbody>
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<td>-29</td>
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<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td>24.9</td>
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<td>2.9</td>
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<tr>
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<td>2.2</td>
<td>-0.2</td>
<td>2</td>
<td>27.0</td>
<td>22.0</td>
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in the difference between the cumulative average performance measure and the cumulative parallel market measure.

In Table IV an apparent anomaly exists. While Figure III had a downward trend, the difference between the sample's cumulative average performance is almost always greater than the cumulative parallel market performance. However one should note two points. First, the diagram in Figure III is based upon logarithms while Table IV is not. A second point, which does not explain the difference, is that the corresponding linear plot to Figure III (not reproduced in the thesis) also had a downward trend and was very similar to Figure III.

A simple test was made using the average $\alpha_j$ and $\beta_j$ from the linear 102 month regression along with the average $R_{jt}$'s and $R_{mt}$'s used to make the calculations in Table IV. The $R_{jt}$'s and $R_{mt}$'s were substituted into an equation with the noted average $\alpha_j$ and $\beta_j$. This calculation resulted in average sample residuals $\xi_t$'s. These average residuals were then cumulated. The cumulated $\xi_t$'s very closely approximated the plot given in Figure III. The meaning of this situation is not quite clear except that the use of the $\alpha_j$'s and $\beta_j$'s, while close to zero and one, are not exactly equal to the expected values. Thus, the resultant cumulative average residuals have a downward trend.

As a second check, the rates of return for the firms and for the market were put into logarithms for the sixty month time period. These rates of return were then averaged as
Table V

Cumulative Average Performance (CAP) Based upon Log \((1+R_{jt})'s\) for the Sample (N=45) vs. Cumulative Parallel Market Performance (CPMP) Based upon Log \((1+R_{mt})'s\)

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indicated previously. The results of this procedure are given in Table V.

In Table V the cumulative average performance is almost without exception less than the cumulative parallel market performance beginning at t=-6. While month -29 in Table V has a comparison of 0.5 to 0.3, month -16 has a comparison of 4.7 to 5.5 and month 0 offers a comparison of 14.2 to 17.0. In the differences between the $\text{CAP}_t$'s and $\text{CPMP}_t$'s, the trend is for the differences to decrease continually in Table V after t=0. Table V's differences column, if plotted, would look much like Figure III.

Table VI provides a cumulative average performance measure for the sample and for two market measures. In comparisons of the sample measure to the TSE and Laval measures, the sample measure has a lower value which is similar to the case in Table V. This explains why the predominant trend in the residual plots were forever decreasing over time (e.g., see Figures III and IV). In this smaller sample (N=36), the differences in the cumulative average rates of return and the cumulative parallel market performance are larger and are mostly negative when compared to the differences between the $\text{CAP}_t$ and $\text{CPMP}_t$ in Table IV. Also of interest in Table VI is the wider difference between the sample and the Laval market rate. Although the rates for both the TSE market measure and the Laval market rate are increasing, the equal weighted Laval rate is growing more quickly over time than either the TSE average market measure or
Table VI
Cumulative Average Performance (CAP) of the Sample (N=36) for 48 months vs. Cumulative Parallel Market Performance for Two Market measures (CPMP)

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</tr>
<tr>
<td>-5</td>
<td>6.0</td>
<td>11.2</td>
<td>-5.2</td>
<td>21.0</td>
<td>-15.0</td>
<td>19</td>
<td>25.7</td>
<td>29.9</td>
<td>-4.2</td>
<td>56.6</td>
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<td></td>
</tr>
<tr>
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<td>8.5</td>
<td>12.8</td>
<td>-4.3</td>
<td>23.0</td>
<td>-14.5</td>
<td>20</td>
<td>27.3</td>
<td>29.3</td>
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<td></td>
</tr>
<tr>
<td>-3</td>
<td>8.5</td>
<td>13.5</td>
<td>-5.0</td>
<td>23.9</td>
<td>-15.4</td>
<td>21</td>
<td>26.4</td>
<td>28.5</td>
<td>-2.1</td>
<td>54.1</td>
<td>-27.7</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>6.4</td>
<td>10.3</td>
<td>-4.1</td>
<td>22.1</td>
<td>-15.7</td>
<td>22</td>
<td>28.0</td>
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<td>-5.0</td>
<td>55.3</td>
<td>-28.4</td>
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<td>-4.0</td>
<td>27.6</td>
<td>-16.0</td>
<td>24</td>
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<td>32.8</td>
<td>-6.1</td>
<td>52.9</td>
<td>-27.2</td>
<td></td>
</tr>
</tbody>
</table>
the sample average measure. Other than this overall decreasing pattern in the differences, no other trend is evidenced in Table VI. Thus, the implication is that the market is not reading and reacting to the first mention of unfunded past service obligations in the statement footnotes.

One point should be examined before proceeding on to the next chapter. A control group might have added to the richness of this thesis. However, there were at least two problems with producing a control group. First, the "best" control group would have contained firms which did not have pension funds at all. Given the large number of small private pension funds in Canada, this sample probably did not exist. Second, a control group could have been formed which had pension plans but no unfunded past service obligations. Whether this second control sample would have proved useful probably would depend upon whether the market reads the offsetting entry to the unfunded past service obligation as an asset or as an expense. If the market is using these obligations at all, it would appear from the figures produced above that the market is reading the obligations' offsetting entry as assets. Therefore, a control sample probably would not have added much to the results of the tests.

There is at least one other major difficulty that arises with the use of a control group in a study similar to this one. Since $t=0$ is not a unique date, a conceptual basis would be needed to aid in the selection of the control group and for the
years to be covered. The time-period-definition task alone might be accomplished. However, when the time-period problem is coupled with the sample problems outlined in the previous paragraph, the task of gathering a suitable control sample might become impossible.

This chapter has presented the results of the regressions, the cumulative average residual tests and finally, average performance measures for both the sample and the market. The results of the last two sections have been unexpected.

The sixth chapter will present several possible reasons for the unexpected results found in the tests. Included in the sixth chapter will be the details of a small survey of security analysts.
Notes

1. The t-statistic was calculated for both the alphas and the betas by application of the following formula. The formula compares statistics from two samples to test whether the two samples are derived from the same population.

\[
\text{t-value} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}^{1/2}
\]

\(\bar{X}_1\) and \(\bar{X}_2\) are the sample means of the coefficients.

\(S_1^2\) and \(S_2^2\) are the variances (standard deviations squared) for the estimated coefficients.

\(n_1\) and \(n_2\) are the numbers of observation in each sample.

2. The average beta is expected to be equal to one because of the basic theoretical assumptions made about beta. Betas which are equal to one are said to vary directly with the market rate. Aggressive securities will usually have betas greater than one and will gain more than the market in good periods but will lose more than the market in a bad period. These aggressive stocks are riskier than those securities whose betas equal one. Securities whose betas are less than one will gain less than the market rate in a good period but will also lose less than the market rate in a bad period. These stocks are the least risky of the three groups.

If a sample of firms is chosen which includes betas which are greater than, equal to and less than one, then the expected mean beta value will be one overall.

3. The statistic given in Fama, et al. (1969) is the mean \(r_j\) which is 0.632.

4. One statistic missing in Charest (1980b) and Fama, et al. (1969) is the Durbin-Watson statistic. These statistics for the 102-month regression for the 45 firm sample ranged from 1.75 to 2.5600. Given the number of observations for each firm, this indicates that positive serial correlation for the \(\hat{\epsilon}_{jt}\)'s did not exist. However at a five percent significance level, approximately seven firms fall in the inconclusive or negative serial correlation range. Negative serial correlation is more in line with previous results and statements (Larcker, 1980, 272).
5. A cycle would not be consistent with the EMH if it occurred regularly throughout time. The "appearance" of the cycle is probably due only to the aggregation of the fourteen firms depicted in Figure XIII that had income decreases greater than 5% between \( t=-12 \) and \( t=0 \). Again, the pattern is being dominated by the very large, negative cumulative average residuals of these firms.

6. The two groups have different means and medians for their respective unfunded past service obligations (UPSO) and retained earnings (RE).

<table>
<thead>
<tr>
<th>Groups</th>
<th>UPSO Mean in (000)'s</th>
<th>UPSO Median in (000)'s</th>
<th>RE Mean in (000)'s</th>
<th>RE Median in (000)'s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 22 high ratio firms</td>
<td>$3,173</td>
<td>$23,092</td>
<td>$40,996</td>
<td>$93,666</td>
</tr>
<tr>
<td>2. 23 low ratio firms</td>
<td>898</td>
<td>2,043</td>
<td>42,147</td>
<td>66,144</td>
</tr>
<tr>
<td>3. 22 less C.P. Ltd.</td>
<td>3,600</td>
<td>7,304</td>
<td>45,936</td>
<td>61,103</td>
</tr>
</tbody>
</table>

The differences in the means of the two groups is partially explained by the numbers associated with Canadian Pacific Limited (C.P. Ltd.). When C.P. Ltd. is deleted, the means of the retained earnings are fairly close. The means of the unfunded past service obligations although closer in magnitude are still quite different. In percentages the group of 22 firms without C.P. Ltd. has a ratio of 12% (UPSO/RE) compared to 3.1% for the low ratio group.

7. Not reproduced here are two plots which represented a different partitioning of the sample. The sample was divided between those firms that were "large percentage" companies and those which were not. To be a member of the large percentage group, a firm had to have an unfunded past service obligation greater than 4.5 percent of retained earnings, 1.3 percent of total assets and 21 percent of net income after taxes.

The cumulative average residuals were plotted for the two groups described. The results were consistent with those pictured and therefore, were not duplicated here.

8. The sample was also partitioned on a rule which might be termed "more sophisticated." First an average income was calculated for the five years ending \( t=-12 \). Based upon an average of those five years, the year ending at \( t=0 \) was examined to see whether net income increased or decreased over this average. The results have not been pictured here.
because of the similarity to the "naive" plots already shown.

9. When the nine firms which had more than eight negative residuals in their last fifteen \((t=+15\) to \(t=+30\)) were deleted from the sample of forty-five, the plot (not reproduced here) changed. The trend began to climb toward zero at the end of the plot.

10. Equations (13) through (16) are those used by Charest (1980b, 6-7). Even the notation used is that employed by Charest. Geometric means have been suggested as more appropriate for these calculations. However, the arithmetic means are the calculations actually made in the literature.

11. A plot of equation (11), where the residuals were equal to the \(R_jt's\) less the \(R_{mt}'s\), produced a plot which closely reflected the results given in Table IV. The plot of equation (11) did not support the alternative hypothesis, \(H_a\). The overall pattern was very similar to the "cycle" seen in Figure II but without the constant downward trend.
CHAPTER VI
POSSIBLE EXPLANATIONS OF THE TEST RESULTS

The results presented in Chapter V seem contrary to the EMH. The hypothesis leads one to think that all information, especially publicly available information, is immediately impounded into the market prices of securities. However, the tests show that some available footnote information, the unfunded past service obligation, appears to be disregarded or it is observed, but not viewed as "bad news."

This chapter will attempt to rationalize that apparent contradiction. It will be divided into two parts. The first portion will discuss a survey of ten security analysts. The survey is used as a means to gauge how important the investors' advisors view unfunded past service obligations. The second part of this chapter will be used to present four alternative explanations of the unexpected results presented in the preceding chapter.

A Survey of Security Analysts

Vancouver, Canada, serves as the home office for only a few security firms. Consequently, there are only a few security analysts available to discuss financial statements. Those
analysts who were available were phoned and an appointment was made for an interview. During the interview, the analysts were asked to answer a few questions. (The survey questions are reproduced along with summarized answers in Appendix G.)

The purpose of the survey was portrayed as being only a discussion of the use of financial statements by security analysts. It was feared that any further explanation might bias the answers. The survey questions are primarily concerned with footnotes and the individuals' surveyed probably realized this very quickly. However, the topic of unfunded past service obligations was not introduced by the interviewer until the fifth question.

Question five was not the only opportunity the analysts were given to introduce unfunded past service obligations. In the third and fourth questions, those interviewed were asked to list the footnotes which attracted their attention in (3) in general and in (4) with regard to accounting policies. Only one individual mentioned unfunded past service obligations in answering the third question. This was the only voluntary mention of unfunded past service obligations by those interviewed.

In the fifth question, those surveyed were asked to rank the five footnote topics in the order of the amount of time the analysts' spent on each topic. A top ranking for one topic meant that the analyst spent the most time on that subject in comparison to the other four.

The five subjects ranked by those surveyed were inven-
stories, contingent liabilities, depreciation policies, pension plans and foreign currency translation. All of the subjects except pension plans were ranked number one or two on someone's ranking. The highest pension plans were ranked was third. However, of the ten surveyed four ranked pension plans as fourth and the remaining five ranked pension plans as fifth in importance of the amount of time spent upon it. It should be mentioned that one person stated that if the unfunded past service obligation was extremely large, then pension plans would be ranked higher.

In Question 6 those surveyed were asked what they specifically looked for in three of the five footnote topics. The three subjects were randomly chosen from the list except for the pension plan topic. Each person surveyed was queried about pension plans. Three of those interviewed stated they did not look at this footnote. The remaining seven stated they specifically looked at the size of the unfunded past service obligation. Several of the seven remarked that they were interested in the size of the unfunded past service obligation as compared to the net income. This last statement was independently tested as shown in Figures XI and XII in Chapter Five. As noted in the preceding chapter the test did not produce positive results.

Since the number surveyed was small, ten, and because the survey was quite informal, the survey results are only an indicator of how advisors view unfunded past service obligation footnotes. For the ten surveyed, the indication is reasonably
clear. Pension plans and unfunded past service obligations are not given as much attention as other footnote topics.

Many investors rely upon their security analysts to determine good investments and the proportion of their investment portfolio to invest in a given security. If the investors' advisors do not use unfunded past service obligations in their decision-making, then this may be one explanation of why the test outlined in Chapter Five had unexpected results.

Alternative Explanations of the Test Results

Four explanations will be given in this section as possible reasons for the unexpected test results as described in Chapter Five. The first explanation will involve an argument about the market ignoring the unfunded past service obligations. The second alternative will discuss the possibility of the market receiving the data prior to the statement date. If this second alternative holds, then the dates when the market actually receives the information may be random and not related to the date of first appearance on the financial statement. The third explanation offers a justification that depends upon the concept of present values. Finally, the potential problems that may exist with the sample and/or the Canadian market will be sketched.

The first possible explanation of the negative results is quite simple. The investors in the market may be ignoring the existence of unfunded past service obligations. This would
account for the cumulative average residuals failing to form a plot which would have supported the alternative hypothesis of a noticeable decrease in the cumulative average residuals. (See Figure I). The possibility that the market is ignoring this information is supported in part by the survey of the ten security analysts. If the analysts do not trust the quality of information they receive, then the analysts will be passing this impression along to the investors they advise. There are three possible problems which have to do with the quality of the information provided.

First, from a perusal of the literature, it is clear that actuarial methods are not very well understood (Trowbridge and Farr, 1976; Skinner, 1980; and Hall and Landsittel, 1977). Not only are the methods not understood but the assumptions employed in arriving at valuations are usually not available to the reader of financial statements.  

Second, the lack of detail in the actuarial assumptions is not the only case of sparse information. Decision-makers may find it difficult to determine exactly how unfunded past service obligations are being accounted for by a firm especially since the information presented varies across firms.

The final problem discussed in the literature is the latitude of choosing between acceptable methods. Skinner (1980) argues for less flexibility in these choices. If this calls attention to unfunded past service obligations then perhaps the market will react.
Alternatively, the market may be incorporating the information concerned with unfunded past service obligations before the statement date. This situation could occur as a result of information being printed in newspapers or by being distributed via other public sources. In conjunction with the above, the market may even anticipate such obligations in a firm. This might occur if other firms in a given industry already have published their unfunded past service obligations. Thus, the market might adjust the rates of return for a firm prior to the appearance of this unfunded past service obligation in the financial statement notes.

If this situation occurs, then there may not exist a known date useful for testing. For instance, one company's pension plan may be re-negotiated six months prior to the statement date while a second firm's plan may be re-negotiated ten months prior to the statement date. This situation would make it almost impossible to choose a point in time (a \( t=0 \)) in order to synchronize the data for testing purposes. This would be true whether the market receives specific information about individual firms or whether the information is more general and relates to the industry.\(^4\)

Also as noted in Chapter Four, the \( t=0 \) in this test cannot be assigned to a specific year. Occasionally in accounting, a specific date becomes important due to a requirement which affects many firms' statements and takes effect on a stated date. In the case of unfunded past service obligations the
requirement became effective in Canada as of December, 1968. This requirement, however, did not affect a large group of firms simultaneously. Of the forty-five firms in the test sample, nineteen listed their unfunded past service obligations on or before December, 1968. The remaining twenty-six firms' compliance to the requirement spans the years from 1969 to 1974. (For further details see Appendix E). From this discussion the important point to emerge is the differences in the timing of the specified notes appearance. A test using this information would be difficult to formulate for the relatively small Canadian market.

A third explanation is that pension plans may be offered in lieu of increases in direct cash wages. Therefore when the negotiations are completed, it may be that the present value of the unfunded past service obligation may just equal the difference in the lower wage negotiated and a higher wage that might have been demanded otherwise.

The fourth explanation of the unexpected results has to do with the sample used in this thesis. The sample size is modest, forty-five companies. It may be that the sample is too small and therefore, the design of the test is unreliable. If this is the situation, then a larger sample might still show evidence that the market uses the unfunded past service obligation information.

The sample size may not be the only problem. The unexpected results may be due to the Canadian market. The literature on
the Canadian market points out several anomalies to market efficiency. The Canadian market is characterized as being "thinly traded" and not very large (Fowler, et al., 1977; and Fowler, et al., 1979). As noted in Chapter Three, "thinly traded" means that a specific stock may trade only infrequently or that the number of shares traded may be small. While some of the companies in the sample were traded almost every day and in sizeable numbers, e.g. Abitibi and Noranda Mines, most of the firms were less frequently traded. Also, the Canadian stock market is much smaller than its counterpart in the U.S. Thus far the semi-strong version of the EMH has been generally supported in the U.S. Consequently, the characteristics of the data may cause questionable results. However for the purposes of this study, the Canadian market was assumed to be efficient.

In connection with the use of Canadian market data, the results may have been partially due to the use of the market model. If a model works well in a U.S. context, this does not imply it will work for all other markets. Perhaps the Canadian market cannot be approximated by a simple linear regression model. Alternatively, the market model may not be sensitive enough to small markets such as the Canadian stock market. This point was made in Chapter Three in discussing Charest's results which were puzzling (Charest, 1980a; and 1980b). Finally, in the Canadian context, it may be that neither an equally weighted nor a value-weighted index is an appropriate approximation for the market rate of return. This means that
researchers may need to try different market measures in their tests. This discussion implies that further tests of the Canadian market may need to be conducted using radically different models and market proxies.

Four alternative explanations have been outlined in an attempt to explain the unexpected results given in Chapter Four. The order of presentation is not meant to imply a ranking of the importance of the four alternatives. Also, it may be that the actual explanation is a combination of two or more of the possible explanations.

One further point may be made concerning empirical tests. The "state-of-the-art" is continually changing. Whereas the test which was made for this study was reasonable now, tomorrow better testing methods may be made available for researchers. As recently as June, 1980, an article offering a new testing method was published (Larcker, et al., 1980). This particular article performed tests based upon hypothetical data, but it did introduce a new method of testing which may someday supplant the cumulative average residuals test.6

The final chapter of this study will present a brief summary of all the preceding chapters. Also, a few possible extensions of this study will be suggested for future investigation.
Notes

1. The survey, reproduced in Appendix G, was suggested by Professor John Herzog. Professor Daniel McDonald aided in the refinement of the questions.

2. The design of this thesis did not utilize a control sample for purposes of comparisons. If Abdel-khalik and Ajinkya (1979, 83) are correct, then a control sample may not enhance a study where the results do not apparently support the theory. Also, Chapter Five outlined the problems with collecting and using a control sample.

3. This is being rectified at least in part by the FASB's latest statements, Statement No. 35 and Statement No. 36. (Statement No. 35 is primarily concerned with the accounting for pension funds in the plan's statements. Statement No. 36 offers intermediate steps for accounting for pension plans on the employer's financial statements.)

4. As stated in note three of Chapter One, actuarial deficiencies due to revaluations might be included in the financial statement notes until October, 1973. Consequently, a second set of dates would be introduced when the revaluations are also included.

5. Professor Daniel McDonald suggested this idea.

6. One point that Larcker, et al. (1980, 270-271) stresses is that with their data, the cumulative average residuals are always shown to increase up to time $t=0$. This pattern in their study occurs whether the $\theta$'s are stationary or non-stationary. Also, the pattern was not altered whether the information was positive, negative or nonexistent. In Figures III through XV reproduced in Chapter IV, this pattern was not evidence. As in the case of all new models, more tests will need to be made using the Larcker, et al., model before it will supercede the more established cumulative average residuals model.
CHAPTER VII

A SUMMARY, CONCLUSIONS AND IMPLICATIONS FOR FURTHER STUDY

With regard to pension plans the Canadian experience has been different from that of the U.S.\(^1\) Included in the differences is the fact that the Canadian government has not established rules as stringent as those of ERISA\(^2\) in the U.S.

However, potential future pension payments are growing at an alarming rate. Inflation has caused unions and other groups to bargain more determinedly for indexing of plans.\(^3\) The overall economic well-being of the 1960's and most of the 1970's have allowed for benefit increments in many areas of society. These increased benefits coupled with the changing demographics of Canada suggested for example by Premier Bill Bennett of B.C., that an empty pension fund upon retirement would be "... the cruelest hoax of all" ("Empty Pension Fund Called Cruelest Hoax," The Vancouver Sun, June 4, 1980, A12).

One part of total pension benefits is the unfunded past service obligations. This study has made an attempt to examine whether the market reacts to the first appearance of unfunded past service obligations in the footnotes to financial statements. In this chapter, the following sections will discuss a summary of this thesis and some conclusions and implications for further study.
A Summarization

Working from the premise that the EMH used in conjunction with the market model provided the researcher with a framework for testing the stock market's reactions to many types of accounting data, a test of unfunded past service obligations was designed. The thesis was composed of five major chapters.

The second chapter focused upon present accounting practices and the literature involved with unfunded past service obligations. Although much of the literature was found to be a comprehensive discussion of the accounting problems concerned with pensions, there were only two articles which even attempted to use empirical data. Of these empirically oriented papers, neither tested nor discussed unfunded past service obligations.

In the third chapter, the literature concerned with tests of the EMH was discussed. The first section of the chapter outlined the EMH. The second section discussed the market model and its links to the Sharpe-Lintner CAPM. Several U.S. studies which examined the EMH were briefly reviewed in this context. In the fourth and final section eleven Canadian studies were briefly addressed in order to indicate the nature of the research being conducted using Canadian data.

The literature surveyed in the second and third chapters led directly into the fourth chapter. The fourth chapter outlined the test to be used to examine the market's reaction to the first footnote appearance of unfunded past service obligations. The discussion of the model was followed by the presentation of
the null and alternative hypotheses to be tested. The null hypothesis, $H_0$, stated that if the market did not react to the unfunded past service obligations of a sample of firms, then there would be no significant change in the plotted patterns of cumulative average residuals. The alternative hypothesis stated that there would be a detectable market reaction. After presentation of the hypotheses, the data to be used in the tests were discussed in detail. The sources for the data were outlined along with the procedures for utilizing the collected data and comparing these with the sample derived from the Laval returns tape.

The results of the tests outlined in Chapter Four composed the body of Chapter Five. Cumulative average residual plots were given in an attempt to illustrate the market's reaction. The market did not react in a significantly different pattern when the unfunded past service obligations first appeared in the notes to the financial statements. Therefore, the null hypothesis, $H_0$, could not be rejected. As supporting evidence to the plots, statistics were presented which indicated that the estimated regression coefficients, $a_j$'s and $b_j$'s, were similar to those found in other studies. This gives one some confidence that the results are not due to the use of faulty data or test designs. Also as a check on the final results, average rates of return were calculated for the market and the sample of firms. In two of three cases the parallel performance of the market was, almost without exception, greater than the
average sample rate of return. This fact is reflected in the downward trend of the cumulative average residuals seen in the plots. There is no explanation for this phenomenon unless firms with pension plans containing unfunded past service obligations are perceived to be (a) less risky over the entire time period or (b) have less promising investment potential.

Since $H_0$ could not be rejected, this would appear to suggest that the market was not using a piece of publicly available information. Four reasons were briefly presented. First, the market may have ignored the unfunded past service obligations. Second, the market may have incorporated the unfunded past service obligation information before the statement date and at different points in time for each firm. The third explanation relied upon the discounting of future cash outflows as an alternative reason for the reaction. If the market reads an unfunded past service obligation as equal to a saving in wages over the future years, then the market would not react to the footnote. Finally, the fourth explanation critically examined the sample and the model used in the study. It may have been that the sample size was too small or that the "thinely traded" Canadian market coupled with the market model, may have caused the tests to be unreliable.

As partial confirmation of the market's lack of reaction to the unfunded past service obligation footnotes, a series of interviews with a small sample of ten security analysts was discussed. Almost without exception, the analysts did not introduce
pension plans or unfunded past service obligations as a footnote that they thought was important. The survey while small did lend some credibility to the test results presented in the thesis.

The one clear point derived from the first six chapters is that using the sample (see Appendix B) chosen, along with the model outlined in the fourth chapter $H_0$ could not be rejected.

Several conclusions may be made about this type of study. The next section will present these conclusions along with several implications for further study.

**Conclusions and Implications**

As stated above the null hypothesis of "no market reaction" could not be rejected. However, a caution is in order before attempting to draw any strong conclusions. The sample size was small and the data came from a "thinly traded" market. Hasty conclusions should not be drawn and making conservative judgments is important.

One safe conclusion to make is that given the sample and the model, the market does not appear to attend to the first footnote appearance of unfunded past service obligations. There may be many reasons for this lack of attention. For example, using Appendix A as a guideline, those individuals investing in the market may not understand the terminology. The terms vary not only between companies but sometimes between years for the same firm.
If one were to ask whether unfunded past service obligations were liabilities offset by an expense, the answer which comes out of this test would be "no." However, the answer is ambiguous for several reasons. Having used Canadian data, perhaps the lack of reaction is due to the data. Comments made by the analysts surveyed suggest that Canada had not experienced any defaults in its pension plans and consequently, unfunded past service obligations may not be seen as potential economic threats. One implication then is to replicate this study for the larger U.S. market. Such a study perhaps could be centered around the introduction of ERISA in 1974. ERISA would represent a focal point where the investing public's attention turned to pension plans in general and unfunded past service obligations in particular.\(^4\)

The final implication of this study may be that the EMH does not hold with respect to the TSE and information in the footnotes to Canadian financial statements. A further examination of footnotes could be done, for example, by locating a sample of companies where court cases were settled against the firms. Then using an earlier appearance of a contingent liability which related to the settlement, a test similar to that presented in this study could be performed. The test would be used first, to check whether the market reacted to the contingency and second, when the reaction occurred. The reaction period would need to span a period of time from the appearance of the contingency in the footnotes until some point after the settlement date.
Finally, no single empirical study is ever the proof or the invalidation of an hypothesis. While the market does not appear to read unfunded past service obligation as liabilities, this study needs to be replicated and perhaps even re-examined using a different model (Larcker, 1980). After several tests, then a more definitive conclusion might be forthcoming.
Notes

1. In the U.S. some companies have found it difficult to meet their pension payments. For example, the well-known case of the United States Steel Company in the early 1960's is often cited as an example of the manipulation that pensions may be subjected to by a company.

2. ERISA was outlined briefly in Chapter Three, Note 6.

3. For example, see The Vancouver Sun, October 4, 1980, ("Teachers Warn They'll Strike in Pension Index," A18) which outlines the proposed change which would see pension indexing held to eight percent in B.C. Government pension plans. In particular, the teachers are upset and are reacting militantly to such a suggestion.

4. Even the date for ERISA may not be useful for testing purposes. If the investing public's attention focused upon unfunded past service obligations at this time, then the test might work. However, if the investors attention was not attracted to these obligations until the latest FASB pronouncements, Statements No. 35 and No. 36, then a test centered upon a 1974 date associated with ERISA would yield little or no results. Once again, the problem with when the market could be expected to react is questionable.
Footnotes from Forty-five Firms' Financial Reports
Introducing Unfunded Past Service Obligations

The following footnotes have been reproduced for the convenience of the reader. The date listed after the firm's name indicates the set of financial statements in which the footnote appeared. Page numbers are listed for those reports which had page numbers. The content and the terminology varies from one note to another. This variance across firms may tend to confuse some readers of financial reports.

For example, thirty of the firms referred to the unfunded past service obligation as a "liability." Even amongst this group, the phrases employed are not identical. Of the remaining fifteen firms, ten referred to the "unfunded or past service obligation." Five firms referred to "unfunded past service costs" while one firm used the phrase "unfunded portion of past service benefits."

Several other differences exist in the wording of the footnotes. One interesting difference is whether the firms planned to "fund" or to "amortize" their unfunded past service obligations. Twenty-four of the forty-five companies stated that their unfunded past service obligations would be funded. Nine of the forty-five firms stated intentions to amortize the amount without any mention of how or when funding would occur. These
firms may be paying their employees directly from future earnings. The remaining twelve firms in the sample gave the impression that their unfunded past service obligations would be both funded and amortized over a period of time. This conclusion is based upon the footnotes which stated that the amounts in question would be paid and charged to income. (See Chapter III, Chart I for an indication of the alternative accounting treatments.) In total, thirty-six firms in the sample appear to be combining the entries to fund and amortize the unfunded past service obligations. This probably indicates that the companies are making a compound entry (ignoring interest payments) which is a debit to the pension expense account and a credit to the cash account.

Another point of interest is the number of firms which listed exact amount to be accounted for each year. Nineteen firms listed an exact dollar value. Four firms stated that the amount to be used would be equal annual installments. The remaining twenty-two firms in the sample did not list an amount.

The number of years over which payments were to be made or amortized was inconsistent as well. Where firms listed differing payments to be made over a series of years of varying lengths, the series of years given with the ending date closest to the statement date is used in the table. The two categories of sixteen to twenty years and twenty-one to twenty-five years hold the majority of firms with thirty-four of the total forty-five.
Table A-1

<table>
<thead>
<tr>
<th>Years of Payment or Amortizing the Unfunded Pension Obligation</th>
<th>Number of Years</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-30</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>21-25</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>16-20</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>11-15</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Number of years not given</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total number of firms</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

Only one firm mentioned vested benefits. This was Moore Corporation (1972) where the footnote states that all of the vested benefits were fully funded.

Section 3460 of the CICA Handbook states that the present value of vested unfunded past service obligations "... should be recognized in the accounts as a deferred charge offset by a liability" (CICA Handbook, Section 3460, paragraph .20). However the Handbook does not state whether the unvested portion of the unfunded past service obligations must be given as a present value. Only two companies, Falconbridge Nickel Mines, Ltd., and Cassiar Asbestos, Ltd. specifically noted that the amount listed was a present-value. There were, however, twenty-eight firms which referred to the amount as having been determined by an actuarial method, thus implying the sum was a present-value. Fourteen other firms simply referred to an "estimated" value. while one firm, Great Lakes Paper, Ltd., stated that the amount given was the one determined by its underwriters.
Sixteen of the forty-five footnotes refer to dates other than the statement's date as the date of the improvement of pension benefits or as the date of the actuarial estimate. These dates were noted when determining where the introduction of unfunded past service obligations first appeared. For example, MacLaren Power and Paper, Ltd., (1974) states that its pension benefits for past service were increased in 1973 and that there was an unfunded pension liability as of December 31, 1973 of $1,655,000. However, this information was not given in the 1973 financial reports of MacLaren Power and Paper.

In summary, the footnotes are reproduced with a few comments. The primary focus of the comments is whether funding and amortization policies are mentioned. Major information gaps not commented upon are usually due to the lack of a list of the actuarial assumptions made in arriving at the numbers. As noted by Skinner (1980, 30) a change of one-quarter of one percent will have a six to seven percent impact on the calculated number. The footnotes follow immediately.
Abitibi Paper Company Limited, December 31, 1966

8. The amount charged to earnings in 1966 in respect of employees' pension plans includes payments on account of past service costs resulting from retroactive improvement of benefits instituted in 1963. These past service costs are being funded over a period not exceeding 20 years. Based on the most recent independent actuarial report, the single-sum liability for unfunded pension benefits is estimated at $3,500,000 at December 31, 1966.

Comment: Abitibi will be funding its unfunded past service obligation to a trustee. No amount is listed for the yearly funding. Amortization policy is not mentioned.

Acklands, November 30, 1974, (p. 27)

9. PENSION PLAN

In 1974 the company changed its pension plan and provided further past service benefits. This has given rise to an unfunded past service liability of approximately $1,700,000 which will be paid and charged to income over a nineteen year period.

Comment: Acklands will pay and charge its unfunded past service obligation. While this implies that the amount will be funded and amortized, there is no distinction made as
Algoma Central Railway, December 31, 1972

12. Commencing October 1, 1972 the Company upgraded the benefits payable under its pension plans. As a result the Company has incurred an unfunded past service pension liability. The amount of this liability, still to be actuarially computed, is expected to be approximately $1,350,000. The liability may be funded over the next twenty years at an annual amount estimated to be $118,000. The Company will charge to operations each year the amount paid to meet the unfunded liability.

Comment: Algoma Central Railway states that the company may fund and charge to operations the same amount ($118,000) over the next twenty years.

Asbestos Corporation Limited, December 31, 1972

12. Contingent and unfunded liabilities:

In 1972 the Company improved the retirement benefits under its pension plan for hourly employees. It is estimated that the resulting unfunded past service liability as at December 31, 1972 is approximately $1,000,000. The Company intends to pay the amount of the unfunded liability and to charge operations over a period which will be determined
after the completion of an actuarial study but which will not extend beyond the period permitted by applicable legislation.

Comment: Asbestos Corporation seems to be stating that funding and amortization of the unfunded past service obligations will occur simultaneously. This, however, is not clear. Also, no amount is given for the funding and amortization of the obligation. Asbestos Corporation does introduce a different idea into its footnote. The legal period for write-off of the unfunded past service obligation is referred to explicitly.

Bridge and Tank Company of Canada Limited, December 31, 1967

8. Contingent liabilities and commitments:

The unfunded liability for past service costs under the companies' pension plans is approximately $845,000 at December 31, 1967 based on actuarial studies made as at December 31, 1966. The liability of $845,000 is being funded in the amount of $58,333, including interest, annually to December 31, 1989.

Comment: The footnote states specifically how the unfunded past service obligation will be funded. Amortization of the obligation is not mentioned. Notice that unlike Asbestos Corporation, no mention is made of the legal period of amortizing the obligation.
5. **Pensions** - An actuarial evaluation in 1967 of the Company's pension plan indicates an unfunded liability of $1,500,000 for past service at December 31, 1966. It is intended to fund this liability by charging additional pension contributions against earnings over a period of 25 years; these additional contributions will be charged against earnings as they are paid.

Comment: B.C. Forest Products will fund their obligation. The amount per year is not specified. If charging is synonymous with amortization, then the two policies of funding and amortization will coincide. Again, no mention is made of the legal period allowed for amortization.

Calgary Power Limited, December 31, 1970, (p. 15)

4. **Pension Plan**

Effective January 1, 1970, the Company's pension plan had been revised to a "Formula Plan" under which an employee's pension benefit is related to years of service and salary prior to retirement. As at January 1, 1970 an unfunded past service obligation estimated at approximately $1,795,000 existed mainly in respect to projected future salary growth. Based on actuarial advice, this amount is being funded and charged to operations in annual amounts of $164,000 over a period of 20 years. Past service pension
costs for service prior to 1943 have been fully funded and a special payment made for this purpose in 1965 is being amortized against income in approximate annual amounts of $105,000.

Comment: Two points of interest are made in this footnote. (1) A special payment was made to fund obligations arising from service rendered prior to 1943. This amount must have been reported as an asset. (2) The amount which will be funded and amortized is stated.

Canada Malting Company Limited and subsidiary company, December 31, 1972

6. The unfunded obligation for past service on the Company's pension plan of approximately $610,000 is being amortized by annual payments through to 1989.

Comment: Canada Malting does not mention whether the obligation will be funded or not.

Canadian Pacific Limited, December 31, 1971 (p. 18).

14. Pension Plan

Amendments to the pension plan effective July 1, 1971 include improved benefits, funding of past service costs as required by legislation; and the payment by the fund of all pensions, including the portion formerly paid directly by the Company. The unfunded liability at December 31, 1971, as determined by an actuarial survey, was $354,643,000 of
which $79,366,000 is to be funded by equal annual payments to 1992 and $275,277,000 is to be funded by equal annual payments to 2027. In total, these changes do not significantly affect the annual pension expense borne by the Company.

Comment: The firm's amortization policy is not given.

Canadian Salt Company Limited and subsidiary companies,
June 30, 1969.
The employees of the company and its subsidiaries are eligible for membership in a non-contributory pension plan. During the year ended June 30, 1969 the plan was changed from an 'insured' plan to a 'trusteed' plan and provision was made for increased benefits to be paid on retirement. The unfunded liability in respect of past services at June 30, 1969, based on an actuarial valuation made as of December 31, 1968, is estimated to be $518,000 and is being amortized by payments of $41,300 over 21 years which will be charged to operations. Pension costs charged in the accounts during the year ended June 30, 1969 amounted to $236,440 including amounts in respect of past services.

Comment: Canadian Salt Company has obscured the difference between amortization and funding. It is unclear what "amortized by payments" means. Perhaps the firm is indicating that funding and amortization are occurring at the same time.
10. The company together with certain of its affiliated companies has in effect a pension plan covering substantially all of its employees. At December 31, 1967, the company's share of the aggregate unfunded liability for past service costs under the plan amounted to approximately $403,000. Such unfunded liability, generally, is being absorbed as a charge against income on a basis which will result in the amortization of the amount over periods of approximately ten years. During 1967 approximately $184,000 was charged against income in respect of current services and in respect of the amortization of the unfunded liability for past service costs.

Comment: Canadian Utilities appears only concerned with the amortization of its unfunded past service obligation. Funding policies are not given.

Canron Limited, December 31, 1971 (p. 12)

8. Retirement Plans

As at December 31, 1971 there existed a net obligation for past service pension benefits estimated at $898,000 under various retirement plans of the company and certain subsidiaries. This liability is being funded by annual instalments over 25 years.

Comment: Canron is funding its obligation. However, no mention is made as to whether the amount is being amortized on
the same basis or whether amortization will occur at some later date.

Cassiar Asbestos Corporation Limited and its subsidiaries, December 31, 1971 (p. 10)

7. Pension Plan
The present value of the unfunded portion of past service benefits is approximately $540,000 at December 31, 1971 based on actuarial estimates made as at January 1, 1971. The amount is being funded and charged to operations by annual payments of $47,900, including interest, to December 31, 1988.

Comment: Cassiar Asbestos seems to be funding and amortizing its unfunded past service obligation on the same basis.

Cominco, December 31, 1967 (p. 19)

8. Pensions
At December 31, 1967 investments with a current value of approximately $49,000,000 were held by trustees under Cominco's pension arrangements. Actuarial estimates of these arrangements made to December 31, 1965 indicate an unfunded cost of $9,500,000 for past service at that date. It is intended to fund approximately $5,300,000 of this amount over 23 years starting in 1968.
Separate pension plans are in effect for certain consolidated subsidiaries. The unfunded cost for past service of one consolidated subsidiary is estimated at $1,860,000 which amount is being funded over 40 years, there are no other significant unfunded past service obligations.

Cominco and its consolidated subsidiaries charged earnings for 1967 and 1966 with provisions which reflected their estimates of the accruing pension costs related to both past and current service.

Comment: Cominco states that it has $49,000,000 in pension assets held by trustees and still there is an unfunded past service obligation of $9,5000,000. Of this latter amount, only $5,300,000 will be funded over the twenty-three years following the statement date. One wonders what will happen to the remainder, $4,200,000. Also, the amortization policy is not given.

Consumer's Gas Company, September 30, 1967 (p. 10)

9. Pension Plan Liability

The unfunded past service liabilities of the company and its subsidiaries according to independent actuarial valuations made as at September 30, 1967 amounted to $1,800,755 at that date. This obligation is being satisfied and charged to operations in the amount of $234,090.
annually. Annual contributions are made and charged to operations in amounts estimated by the actuarial valuation to be sufficient to fund all current costs of the plan.

Comment: This is a "vague" footnote. The Consumer's Gas Company will satisfy and charge its obligations against operations. It is unclear what satisfy means particularly since the following sentence in the footnote states that contributions made are "sufficient to fund all current costs." One wonders about the funding of the unfunded past service obligations.

R.L. Crain Inc., December 31, 1972 (p. 12)

5. Effective January 1, 1973 the Company has amended its pension plan to increase employee benefits for service prior to July 1, 1968. The cost to the Company of providing these increased benefits is estimated to be $1,600,000 as at January 1, 1973. It is the Company's intention to fund this cost through equal annual instalments of $140,000, including interest, from 1973 through to 1989.

Comment: R.L. Crain Inc. is very explicit about its funding policy. Again, however, there is no mention of the firm's amortization policy.

Dominion Bridge Company Limited, October 31, 1967 (p. 10)

7. The estimated unfunded liability as at October 31, 1967
under Employees' Contributory Pension Plans amounted to $2,746,000. This liability is being amortized by equal monthly charges to operations and will be liquidated by 1987.

Comment: Dominion Bridge is only amortizing its obligation. No funding policy is given.

Dominion Stores Limited, March 21, 1970 (p. 12)

8. PENSION PLAN

The estimated unfunded liability under the pension plan as of October 31, 1969 amounted to $10,273,000 which will be paid over the next 20 years by means of annual instalments of approximately $772,000.

Comment: If "paid" and "funded" are synonymous, then Dominion Stores funding policy is given. If the words are not synonyms, then it is unclear what Dominion Stores accounting policy is. The amortization policy is not mentioned.

Domtar Inc., December 31, 1970 (p. 22)

7. Pension Fund:

The company and its subsidiaries have pension plans for their employees. The unfunded past service pension liability at December 31, 1970 approximates $6,600,000 and is being funded over the next twenty years as recommended by the actuaries.
Comment: Domtar's funding policy is given but the amount to be paid each year is not listed. The firm's amortization policy is not mentioned.

Falconbridge Nickel Mines Limited, December 31, 1971 (p. 21)

13. Retirement plans

The company and certain of its Canadian consolidated subsidiaries maintain retirement plans providing retirement, death and termination benefits for substantially all salaried and hourly-rated employees. The plans have been amended from time to time and, based on the most recent actuarial evaluation, such amendments have resulted in unfunded past service obligations having a present value of $9,186,000 at January 1, 1972 which have not been provided for in the company's accounts.

The company has accepted the recommendations of its actuary and intends to fund these obligations through annual payments of $1,141,000 in each of the next four years and $667,000 in each of the following thirteen years.

The charges to operations in respect of the plans were $2,967,000 in 1971 (including $1,141,000 in respect of past service obligations) and $2,500,000 in 1970.

Comment: The funding policy to be followed by Falconbridge is explicit. However, the amortization policy is not mentioned.
Federal Pioneer Limited, June 30, 1971

9. Unfunded pension costs:

Based on a report by independent actuaries, unfunded past service pension costs amounted to approximately $425,000 at July 1, 1970. Annual payments charged to operations are designed to fund these costs by 1989.

Comment: Federal Pioneer will be funding its unfunded past service obligation but no amount is given to meet these yearly obligations. The amortization policy is not given.

Fraser Companies, Limited, December 31, 1974 (p. 13)

7. Pension Plans

According to actuarial reports on the Company's pension plans as of December 31, 1973 but giving effect to benefit improvements effected January 1, 1974, there is an unfunded liability of $3,322,000, due totally to the benefit improvements, which is being amortized by annual payments of $312,000 for fifteen years as recommended by the actuaries. The Company has made a provision of $1,100,000 in its 1974 accounts for a possible additional contribution to its pension plans in view of the decline in market value of the assets of the plans.

Comment: The Fraser Companies amortization policy is not mentioned. Of special interest is the provision by the firm in its accounts for a hedge against the possible market decline in plan assets's value.
Gaz Metropolitain, Inc., December 31, 1971

7. Pension Plan

Unfunded past service cost for the employees' pension plan, as determined by independent actuaries, amounted to $333,972 as at December 31, 1970. This amount together with interest thereon is being funded by annual payments of $77,676 for the five years commencing in 1971. The company contributed $258,200 for 1971 current service costs (1970 -- $65,000).

Comment: Gaz Metropolitain's funding policy is clearly stated. The amortization policy is not given.

The Great Lakes Paper Company Limited, December 31, 1967 (p. 16)

7. The amount charged against earnings in 1967 in regard to the employees pension plan includes payments on account of past service costs resulting from a retroactive increase in benefits. These past service pension costs are being funded over a period not exceeding seventeen years. Based on the report, prepared by the company's underwriters, the liability at December 31, 1967 for unfunded pension benefits is estimated at $1,200,000. Contributions charged to income in respect of such past service costs were $100,000 in 1967.

Comment: Neither the annual amount to be paid into the fund nor the amortization policy is listed.
Hudson Bay Mining and Smelting Company Limited, December 31, 1972 (p. 12)

12. Pension fund

The unfunded past service pension liability at December 31, 1972, approximates $5,000,000 and is being funded over the next 16 years as recommended by the actuaries.

Comment: The Hudson Bay Mining and Smelting note does not mention the amount to be paid into the fund each year nor is the company's amortization policy given.

The John Inglis Company Limited, December 31, 1966

8. The unfunded liability of the Company under the Pension and Retirement Plans as at December 31, 1966, is estimated by the consulting actuary to be $1,955,000. The company plans to fund this amount by twenty-three equal annual payments to the Trustee.

Comment: Inglis does not list the annual amount to be paid into the fund nor its amortization policy.

Inland Natural Gas Company Limited, June 30, 1970 (p. 13)

10. Pension Plan

The Company revised its pension plan for salaried employees effective January 1, 1970. The actuarial liability for past service benefits arising from these revisions, $207,000 as at June 30, 1970, is being funded and charged to operations over a twenty year
period to 1989 in annual amounts of $18,400.
Comment: This note implies that funding and amortizing (changing) will coincide.

Interprovincial Pipe Line Company, December 31, 1965 (p. 15)
7. Retirement Plan
Effective January 1, 1966, the company revised the Retirement Plan for its Canadian employees for both past and future service including integration with the Canada Pension Plan. Actuarial studies indicate that the liability for past service benefits to December 31, 1965 approximates $800,000 and this will be amortized by charges to earnings over a 20-year period.
Comment: Interprovincial Pipe Line does not state whether funding will occur. Also, the amount to be amortized each year is not listed.

John Labatt Limited, April 30, 1972 (p. 22)
12. Pensions
As a result of increased past service benefits the company's pension plans, based on a recent actuarial valuation, now indicate an unfunded liability of $3,600,000 at December 31, 1971. The company intends to fund this liability over periods not exceeding 18 years by annual contributions in addition to the cost of funding current service benefits.
Comment: The amount to be funded each year is not given. Also, the amortization policy is not stated.

Maclaren Power and Paper Company Limited, December 31, 1974
(p. 13)

8. Pensions
As a result of increased past service benefits and improvements in the company's pension plans there was an unfunded liability of $1,655,000 as at December 31, 1973 based on actuarial calculations as at that date. This obligation is being funded in accordance with the Quebec Pension Act over a period not exceeding 17 years. As at December 31, 1974 the unfunded liability is $1,511,000.
Comment: The amount to be funded each year is not stated nor is the amortization policy spelled out.

Molson Industries Limited, March 31, 1969

7. Past service costs of a subsidiary's employee pension plans are being funded over periods not exceeding 30 years. The unfunded liability for such past service costs amounted to approximately $2,700,000 at March 31, 1969.
Comment: Molson's has not provided the reader with a very informative footnote. The obligation will be funded but no amount to be paid each year is stated. The amortization policy is not stated. Finally, "a period not exceeding thirty years" for funding is not a very explicit statement.
Moore Corporation Limited, December 31, 1972 (p. 14)

8. RETIREMENT PLANS

In 1972 retirement plans were revised along with the actuarial methods and assumptions used to evaluate these plans. All vested benefits under the amended plans are fully funded. Pursuant to the recommendations of independent consulting actuarial firms, an actuarial obligation of $20,000,000 has been calculated with respect to that portion of the benefits expected to accrue and vest in the future which are related to prior service. This amount is being amortized and funded over a period of thirty years commencing in 1972 with respect to $18,000,000 under the United States plans and seventeen years commencing in 1973 with respect to $2,000,000 under the Canadian plan.

Comment: Moore Corporation appears to be amortizing and funding its obligation over the same time period. However, the sum to be amortized and funded is not listed.

Noranda Mines, Limited, December 31, 1966

5. The estimated future cost of funding past service pension obligations of consolidated subsidiary companies is $3,600,000.

Comment: The number of years are not even estimated for funding. The amount to be paid each year is not listed. Amortization is not mentioned.
5. PENSION PLANS
The majority of the Company's employees are covered by either the Canada Pension Plan and/or various union or Company administered retirement plans. The amount charged to income (including amounts paid to government pension plans) was $74,700 in 1967 and $69,400 in 1966 which amounts included amortization of prior service costs. The unfunded past service pension costs at December 31, 1967 were approximately $162,500 and these will be charged to operations over the next thirteen years.

Comment: The amount of the obligation will be amortized. Funding is not mentioned.

14. Unfunded Pension Benefits
Based on the most recent independent actuarial reports, the single-sum liability for unfunded past service pension benefits not provided for in the accounts at 31st December 1967 is estimated to be $4,300,000. The actuarial reports also indicate that, at the current rate of the Company's contributions, the Pension Plan will be fully funded, in accordance with the Supplemental Pension Plan Act of Quebec, by 31st December 1990.

Comment: The amount funded each year is not stated. Also, the amortization of the pension is not mentioned.
Reichhold Chemicals (Canada) Limited and Subsidiaries, December 31, 1968 (p. 13)

6. Pension Plan

Under the pension plan of a subsidiary company, the unfunded liability for past service benefits was calculated as at July 31, 1966 as $98,951. This amount is being satisfied by the payment of and charge to the accounts of the subsidiary in the amount of $6,523 annually.

Comment: The number of years over which the payments will be made is not listed.

Rio Algom Mines, Limited, December 31, 1972 (p. 21)

9. COMMITMENTS AND CONTINGENT LIABILITIES

(V) Unfunded liability for pension funds at December 31, 1972 was estimated at $2,824,000 including provisions for improvements in pension benefits which were approved by the directors in April 1972. This is presently being funded over a period of 16 years as follows:

(i) $333,700 per annum for 1973 to 1975,
(ii) $243,600 per annum for 1976 to 1977, and
(iii) $213,600 per annum for 1978 to 1988 inclusive.

Comment: This footnote is reasonably clear. The amortization policy is not given.
Ronyx, Limited, June 30, 1967

9. **Liability for past service pension benefits**

At June 30, 1967 an amount of $376,000 is required to fund past service pension obligations. This liability is not reflected in the accompanying financial statements but is being paid and charged to operations at the rate of $31,000 annually to account for the full liability by 1989.

Comment: The phrase "paid and charged" is used by Ronyx, Limited.

Silverwood Industries, Limited, January 3, 1971 (p. 20)

10. **Pensions**

As at January 3, 1971 the companies' liability in respect of past service pension benefits not provided for in the attached consolidated financial statements amounted to approximately $250,000. It is the intention of the companies to provide for and pay this liability in equal annual instalments over the next nineteen fiscal periods.

Comment: The meaning of "to provide for and pay" is not apparent. Silverwood does not disclose the exact amount to be paid each year.

Simpsons-Sears Limited and Consolidated Subsidiary Companies,

January 5, 1972 (p. 15)

10. **Supplementary Pension Plan:**

In prior years Simpsons-Sears Limited has paid allowances
to supplement retirement income provided by the Profit Sharing Retirement Fund and Government plans. Effective from January 1, 1971 the Company has adopted a non-contributory pension plan designed to fully fund these supplemental retirement benefits. For the fiscal year 1970 the supplemental allowances amounted to $459,287 and for the fiscal year 1971 payments for current and past service under the supplementary pension plan amounted to $1,238,000. The unfunded obligation for past service at January 5, 1972, estimated by independent actuaries to be approximately $8,990,000, is to be amortized by annual payments through 1989.

Comment: Simpsons-Sears policy is obscured by the phrase "to be amortized by annual payments." Are the obligations being amortized and funded? Also, no fixed amount is listed to be paid each year.

The Steel Company of Canada, Limited and Subsidiary Companies, December 31, 1966 (p. 18)

8. Pension costs charged against income in the year include payments made to trust funds in respect of past service and amounts paid or payable in respect of current service. Past service costs are being funded over periods not exceeding 25 years. The total unfunded past service liability at December 31, 1966 is estimated at approximately $48,000,000.
Comment: The money used to meet the obligation is sent to a trustee. The exact number of years is not listed nor are the amounts funded each year listed.

Steinberg's Limited, July 31, 1971 (p. 20)

6. RETIREMENT PLAN

There is an obligation for past service pension benefits amounting to $416,000 in accordance with an actuarial valuation as at July 26, 1970. This obligation is being satisfied by annual payments of $33,000, with the final payment to be made in 1990.

Comment: The company's amortization policy is not given.

Union Gas Company of Canada Limited, March 31, 1967 (p. 25)

9. Pension plan liability

The company's pension plan was revised as of January 1, 1966.

The unfunded past service liabilities of the company and its subsidiaries are estimated by the company's consulting actuary to be $2,314,000 at March 31, 1967. The company is following a policy of funding the liability and charging the costs to operations over a period of fifteen years at an annual estimated cost of $226,000.

Comment: It appears that Union Gas Company follows funding and amortization policies that are timed the same.
Westinghouse of Canada Limited, December 31, 1967 (p. 8)

5. PENSION COSTS

The total unfunded past service pension liability at December 31, 1967, including the liability arising from amendments effective January 1, 1968, is estimated at $23 million. This amount will be amortized over future years up to 1989.

Comment: The exact number of years the obligation will be amortized over is not given. The amount to be amortized over is not listed.

Woodward Stores Limited, January 31, 1968

6. Contingent Liabilities and Commitments:

(d) The estimated unfunded liability with respect to the staff employees' pension plan is $8,767,000 which will be amortized and absorbed against income over 22 years.

Comment: Funding of its obligation is not mentioned by Woodward Stores. Also, the sum to be amortized each year is not listed.
## APPENDIX B

### The Firms in the Sample

<table>
<thead>
<tr>
<th>Name</th>
<th>Assets (000's)</th>
<th>Statements Used</th>
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<td>CALGARY POWER LTD.</td>
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* 1978 statement last available in library.
APPENDIX C

Firms by Industry

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APPENDIX C
Firms by Industry (cont'd)

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1. The description of the firms' endeavors is taken from The Financial Post Survey of Industrials (1971) and The Financial Post Survey of Mines (1971). The year 1971 was chosen because all firms in the sample had data being collected for them in this year.
APPENDIX D
Price and Dividend Data

One of the major contributions of a research project is the data. Even though this thesis has a small sample, the data collection process took many months. So that the data will be available to other researchers and in order to illustrate the volume of information collected, the raw data has been reproduced on the following pages.

There are two basic presentations of the data. The most common presentation has three columns repeated three times. The information contained in the "three-column" form has a price column, a dividend column and a number of shares column. In the alternative form, the data are presented in a four column format, repeated twice. The first column contains the prices, the second column lists the dividend information, the third column contains stock rights' prices and the fourth column presents the number of shares outstanding in that month. The last two pieces of information are (1) a shortened form of the firm's name and (2) the month and year of the first price listed on each line.

Of special interest are three symbols used in the data. Whenever a 900 precedes a price, this indicates that the number listed as the price is a bid-ask price proxy. A negative 99 in the price column indicates a missing price. Finally, when a negative number (e.g., -3.000) is listed in the dividends...
column this indicates a stock split. In the case of a negative three, the stock split three-for-one.

As noted in the body of the thesis, the price data was collected from The Globe and Mail. The dividends primarily came from The Financial Post Dividend Records. The number of shares outstanding each month was taken from The Toronto Stock Exchange Review. The stock rights were found by reading the firms' financial statements.
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MACLAREN POWER & PAPER COMPANY - CLASS B
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**Simpsons-Sears Limited - Class A**
### APPENDIX E

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</tr>
<tr>
<td>CANADA MALTING</td>
<td>1972</td>
<td>610</td>
<td>51,980</td>
<td>12,913</td>
<td>2,836</td>
<td>1.2</td>
<td>4.7</td>
<td>21.5</td>
</tr>
<tr>
<td>CANADIAN PACIFIC LTD.</td>
<td>1971</td>
<td>354,643</td>
<td>2,356,244</td>
<td>777,489</td>
<td>63,661</td>
<td>15.1</td>
<td>45.6</td>
<td>557.1</td>
</tr>
<tr>
<td>CANADIAN SALT</td>
<td>1969</td>
<td>518</td>
<td>31,166</td>
<td>23,943</td>
<td>2,264</td>
<td>1.7</td>
<td>2.2</td>
<td>22.9</td>
</tr>
<tr>
<td>CANADIAN UTILITIES</td>
<td>1967</td>
<td>403</td>
<td>73,984</td>
<td>9,309</td>
<td>2,917</td>
<td>0.5</td>
<td>4.3</td>
<td>13.8</td>
</tr>
<tr>
<td>CANRON</td>
<td>1971</td>
<td>898</td>
<td>122,009</td>
<td>30,578</td>
<td>4,220</td>
<td>0.7</td>
<td>2.9</td>
<td>21.3</td>
</tr>
<tr>
<td>CASSIAR ASBESTOS</td>
<td>1971</td>
<td>540</td>
<td>78,989</td>
<td>20,546</td>
<td>4,628</td>
<td>0.7</td>
<td>2.6</td>
<td>11.7</td>
</tr>
<tr>
<td>COMINCO</td>
<td>1967</td>
<td>9,500</td>
<td>429,694</td>
<td>257,514</td>
<td>38,484</td>
<td>2.2</td>
<td>3.7</td>
<td>24.7</td>
</tr>
<tr>
<td>CONSUMERS GAS</td>
<td>1967</td>
<td>1,801</td>
<td>342,544</td>
<td>45,201</td>
<td>15,932</td>
<td>0.5</td>
<td>4.0</td>
<td>11.3</td>
</tr>
<tr>
<td>R.L. CRAIN INC.</td>
<td>1972</td>
<td>1,600</td>
<td>14,348</td>
<td>9,179</td>
<td>1,233</td>
<td>1.2</td>
<td>17.4</td>
<td>129.8</td>
</tr>
<tr>
<td>DOMINION BRIDGE</td>
<td>1967</td>
<td>2,746</td>
<td>130,870</td>
<td>55,571</td>
<td>5,017</td>
<td>2.1</td>
<td>4.9</td>
<td>54.7</td>
</tr>
<tr>
<td>DOMINION STORES</td>
<td>1970</td>
<td>10,273</td>
<td>134,824</td>
<td>66,854</td>
<td>9,318</td>
<td>7.6</td>
<td>15.4</td>
<td>110.2</td>
</tr>
<tr>
<td>DOMTAR</td>
<td>1970</td>
<td>6,600</td>
<td>531,609</td>
<td>102,566</td>
<td>17,618</td>
<td>1.2</td>
<td>6.4</td>
<td>37.5</td>
</tr>
<tr>
<td>FALCONBRIDGE NICKEL</td>
<td>1971</td>
<td>9,186</td>
<td>704,574</td>
<td>203,946</td>
<td>16,217</td>
<td>1.3</td>
<td>4.5</td>
<td>56.6</td>
</tr>
<tr>
<td>FEDERAL PIONEER</td>
<td>1971</td>
<td>425</td>
<td>370,083</td>
<td>11,131</td>
<td>2,163</td>
<td>1.1</td>
<td>3.8</td>
<td>19.6</td>
</tr>
<tr>
<td>FRASER COMPANIES</td>
<td>1974</td>
<td>3,322</td>
<td>135,194</td>
<td>86,761</td>
<td>14,892</td>
<td>2.5</td>
<td>3.8</td>
<td>22.3</td>
</tr>
<tr>
<td>GAZ METROPOLITAN</td>
<td>1971</td>
<td>334</td>
<td>194,830</td>
<td>13,777</td>
<td>5,071</td>
<td>0.2</td>
<td>2.4</td>
<td>6.6</td>
</tr>
<tr>
<td>GREAT LAKES PAPER</td>
<td>1967</td>
<td>1,200</td>
<td>84,679</td>
<td>25,463</td>
<td>4,210</td>
<td>1.4</td>
<td>4.7</td>
<td>28.5</td>
</tr>
<tr>
<td>HUDSON BAY MINING AND SMELTING</td>
<td>1972</td>
<td>5,000</td>
<td>216,431</td>
<td>45,936</td>
<td>11,379</td>
<td>2.3</td>
<td>10.9</td>
<td>43.9</td>
</tr>
<tr>
<td>JOHN INGLIS</td>
<td>1966</td>
<td>1,955</td>
<td>17,752</td>
<td>(1,181)</td>
<td>1,526</td>
<td>11.0</td>
<td>262.8</td>
<td>128.1</td>
</tr>
<tr>
<td>INLAND NATURAL GAS</td>
<td>1970</td>
<td>207</td>
<td>52,091</td>
<td>6,289</td>
<td>2,142</td>
<td>0.4</td>
<td>3.3</td>
<td>9.7</td>
</tr>
</tbody>
</table>
APPENDIX E
Information Relevant to Establishing Sub-samples
(continued)

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Year</th>
<th>Unfunded Past Service Obligation (UPO) (000's)</th>
<th>Total Assets (TA) (000's)</th>
<th>Retained Earnings (RE) (000's)</th>
<th>Net Income After Tax 2 (NIAT) (000's)</th>
<th>UPO as % of TA</th>
<th>UPO as % of RE</th>
<th>UPO as % of NIAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERPROVINCIAL PIPE LINE¹</td>
<td>1965</td>
<td>$800</td>
<td>$234,943</td>
<td>$45,051</td>
<td>$20,337</td>
<td>0.3</td>
<td>1.8</td>
<td>3.9</td>
</tr>
<tr>
<td>JOHN LABATT</td>
<td>1972</td>
<td>3,600</td>
<td>281,378</td>
<td>61,805</td>
<td>17,260</td>
<td>1.3</td>
<td>5.8</td>
<td>20.9</td>
</tr>
<tr>
<td>MACLAREN POWER AND PAPER²</td>
<td>1974</td>
<td>1,511</td>
<td>107,227</td>
<td>59,315</td>
<td>16,071</td>
<td>1.4</td>
<td>2.5</td>
<td>9.4</td>
</tr>
<tr>
<td>MOLSON LTD.</td>
<td>1969</td>
<td>2,700</td>
<td>150,798</td>
<td>77,817</td>
<td>15,028</td>
<td>1.8</td>
<td>3.5</td>
<td>17.9</td>
</tr>
<tr>
<td>MOORE CORP.³</td>
<td>1972</td>
<td>20,000</td>
<td>389,558</td>
<td>257,687</td>
<td>46,022</td>
<td>5.1</td>
<td>7.8</td>
<td>43.5</td>
</tr>
<tr>
<td>NORANDA MINES¹</td>
<td>1966</td>
<td>3,600</td>
<td>349,039</td>
<td>169,780</td>
<td>43,420</td>
<td>1.0</td>
<td>2.0</td>
<td>8.3</td>
</tr>
<tr>
<td>PHOTO ENGRAVERS</td>
<td>1967</td>
<td>163</td>
<td>5,300</td>
<td>2,425</td>
<td>87,626</td>
<td>9.30</td>
<td>4.9</td>
<td>46.2</td>
</tr>
<tr>
<td>PRICE COMPANY</td>
<td>1967</td>
<td>4,300</td>
<td>300,898</td>
<td>87,626</td>
<td>9,300</td>
<td>1.4</td>
<td>4.9</td>
<td>46.2</td>
</tr>
<tr>
<td>REICHHOLD CHEMICALS</td>
<td>1968</td>
<td>99</td>
<td>10,629</td>
<td>2,631</td>
<td>322</td>
<td>0.9</td>
<td>3.8</td>
<td>30.7</td>
</tr>
<tr>
<td>RIO ALGOM MINES</td>
<td>1972</td>
<td>2,824</td>
<td>275,705</td>
<td>84,455</td>
<td>16,980</td>
<td>1.0</td>
<td>3.5</td>
<td>16.6</td>
</tr>
<tr>
<td>RONYX LTD.</td>
<td>1967</td>
<td>376</td>
<td>4,371</td>
<td>328</td>
<td>765</td>
<td>8.6</td>
<td>114.6</td>
<td>49.2</td>
</tr>
<tr>
<td>SILVERWOOD INDUSTRIES</td>
<td>1971</td>
<td>250</td>
<td>52,557</td>
<td>14,732</td>
<td>1,410</td>
<td>0.5</td>
<td>1.7</td>
<td>17.7</td>
</tr>
<tr>
<td>SIMPSONS-SEARS</td>
<td>1972</td>
<td>8,990</td>
<td>542,919</td>
<td>87,967</td>
<td>18,951</td>
<td>1.7</td>
<td>10.2</td>
<td>47.4</td>
</tr>
<tr>
<td>STEINBERG LTD.</td>
<td>1971</td>
<td>416</td>
<td>266,685</td>
<td>75,169</td>
<td>9,459</td>
<td>0.2</td>
<td>0.6</td>
<td>4.4</td>
</tr>
<tr>
<td>STEEL COMPANY OF CANADA¹</td>
<td>1966</td>
<td>48,000</td>
<td>708,189</td>
<td>304,630</td>
<td>42,744</td>
<td>6.8</td>
<td>15.8</td>
<td>112.3</td>
</tr>
<tr>
<td>UNION GAS¹</td>
<td>1967</td>
<td>2,315</td>
<td>212,045</td>
<td>31,963</td>
<td>8,833</td>
<td>1.1</td>
<td>7.2</td>
<td>26.2</td>
</tr>
<tr>
<td>WESTINGHOUSE OF CANADA LTD.</td>
<td>1967</td>
<td>23,000</td>
<td>115,666</td>
<td>49,437</td>
<td>1,815</td>
<td>19.9</td>
<td>46.5</td>
<td>1267.2</td>
</tr>
<tr>
<td>WOODWARD STORES</td>
<td>1968</td>
<td>8,767</td>
<td>108,541</td>
<td>36,056</td>
<td>5,996</td>
<td>8.1</td>
<td>24.3</td>
<td>146.2</td>
</tr>
</tbody>
</table>

1. Companies not used in sample of 36 firms when plotting cumulative average residuals for 48 months.
2. Net income after taxes but before extraordinary items.
3. Expressed per the statements in U.S. dollars.
4. The CICA Handbook recommendations on pension plans first appeared on December, 1968. Three statistics pertaining to the years when unfunded past service obligations might be of interest. The mean year is 1969.44, the median year is 1970 and the mode year is 1967.
## APPENDIX F

The Firms Listed According to Their Inclusion in the Naive Income Rule

<table>
<thead>
<tr>
<th>Income Increased by More Than 5%</th>
<th>Income Decreased by More Than 5%</th>
<th>Income Increased Less Than 5% and Decreased Less Than 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acklands</td>
<td>Asbestos Corp.</td>
<td>Abitibi</td>
</tr>
<tr>
<td>Calgary Power</td>
<td>B.C. Forest Products</td>
<td>Algoma Central Rail</td>
</tr>
<tr>
<td>Canron</td>
<td>Bridge and Tank</td>
<td>Dominion Stores</td>
</tr>
<tr>
<td>Canada Malting</td>
<td>Cassiar Asbestos</td>
<td>Domtar Ltd.</td>
</tr>
<tr>
<td>Consumer' Gas</td>
<td>Canadian Salt</td>
<td>Inland Natural Gas</td>
</tr>
<tr>
<td>Canadian Pacific</td>
<td>Cominco</td>
<td>Steinberg's Ltd.</td>
</tr>
<tr>
<td>Canadian Utilities</td>
<td>Dominion Bridge</td>
<td>Steel Co. of Canada</td>
</tr>
<tr>
<td>R.L. Crain, Inc.</td>
<td>Falconbridge Nickel Mines</td>
<td></td>
</tr>
<tr>
<td>Federal-Pioneer</td>
<td>Fraser Companies</td>
<td></td>
</tr>
<tr>
<td>Gaz Metropolitain</td>
<td>Great Lakes Paper</td>
<td></td>
</tr>
<tr>
<td>John Inglis, Ltd.</td>
<td>Hudson Bay Mining and Smelting</td>
<td></td>
</tr>
<tr>
<td>Interprovincial</td>
<td>Price Company</td>
<td></td>
</tr>
<tr>
<td>Pipe Line</td>
<td>Reichhold</td>
<td></td>
</tr>
<tr>
<td>John Labatts, Ltd.</td>
<td>Chemicals</td>
<td></td>
</tr>
<tr>
<td>Molson, Ltd.</td>
<td>Westinghouse of Canada</td>
<td></td>
</tr>
<tr>
<td>Moore Corporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacLaren Power and Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noranda Mines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photo Engravers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rio Algom Mines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ronyx Corp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silverwood Industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simpsons-Sears</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Union Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodward, Ltd.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Firms 24 14 7
APPENDIX G
Survey Questions and Summarized Answers

Question 1: Of the three major financial statements (balance sheet, income statement and statement in changes in financial position), which statement do you attend to the most?

Answers: | Balance Sheet | Income Statement | Statements of Changes in Financial Position |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Individuals Who Answered</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Question 2: With respect to the statement (the one listed in Q1) how much time do you spend on the footnotes which relate to it?

Answers: One individual spent more time on the footnotes than on the actual statements.

Two of those surveyed spent as much time on the associated footnotes as on the statements. This meant reading all of the footnotes sometimes.

Three said they spent zero to five percent of the total time in reading the statements in examining the associated footnotes.

One person indicated the time varied.

Three individuals spent very little time on the footnotes except for exceptional items.

Question 3: Now let's turn our attention to the footnotes. Are there any footnotes which attract your attention right away? If so, which one(s)?

Answers: | Topic | No. of Those Mentioning Topic |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting Changes and practices</td>
<td>5</td>
</tr>
<tr>
<td>Auditor's report</td>
<td>3</td>
</tr>
<tr>
<td>Contingencies</td>
<td>2</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>1</td>
</tr>
<tr>
<td>Depletion</td>
<td>1</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1</td>
</tr>
<tr>
<td>Extraordinary events</td>
<td>3</td>
</tr>
<tr>
<td>Foreign currency translation</td>
<td>2</td>
</tr>
<tr>
<td>Leases</td>
<td>1</td>
</tr>
<tr>
<td>Long-term debt and convertible shares</td>
<td>1</td>
</tr>
<tr>
<td>Subsequent events</td>
<td>2</td>
</tr>
<tr>
<td>Unfunded past service obligations</td>
<td>1</td>
</tr>
</tbody>
</table>
Question 4: When you glance at the footnote on accounting policies, which policies attract your attention?

Answers:

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Those Mentioning Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitalization of expenditures</td>
<td>5</td>
</tr>
<tr>
<td>Consolidation principles</td>
<td>1</td>
</tr>
<tr>
<td>Depletion</td>
<td>4</td>
</tr>
<tr>
<td>Depreciation</td>
<td>3</td>
</tr>
<tr>
<td>Foreign currency translation</td>
<td>4</td>
</tr>
<tr>
<td>Inventories</td>
<td>5</td>
</tr>
<tr>
<td>Joint ventures</td>
<td>1</td>
</tr>
<tr>
<td>No policies attract attention</td>
<td>3</td>
</tr>
</tbody>
</table>

Question 5: From the following list of footnote subjects, would you please rank the topics in order of the amount of attention you generally give each one of them?

Inventories
Contingent liabilities
Depreciation policies
Pension plans
Foreign currency translation

Answers:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Number of Times Ranked as:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#1</td>
</tr>
<tr>
<td>Inventories</td>
<td>1</td>
</tr>
<tr>
<td>Contingent liabilities</td>
<td>1</td>
</tr>
<tr>
<td>Depreciation policies</td>
<td>4</td>
</tr>
<tr>
<td>Pension plans</td>
<td>0</td>
</tr>
<tr>
<td>Foreign currency translation</td>
<td>4</td>
</tr>
</tbody>
</table>

\[10 \quad 17 \quad 10 \quad 9 \quad 10\]

a Several of the interviewed put a qualifier on their ranking. The stated that the ranking would depend upon how "ordinary" each of the footnotes appeared. In one case the individual stated that if the unfunded past service obligation was extremely large, then it would rank higher.

b One person ranked these two topics as equal.

c One individual ranked these two subjects as equal.

(From the above rank order pick three items and ask:)

\[\text{\textbf{Answer:}}\]
Question 6:  
(a) What do you specifically look at when you examine the footnote concerned with _________? 

(b) What do you specifically look at when you examine the footnote concerned with _________? 

(c) What do you specifically look at when you examine the footnote concerned with _________? 

Answer:  
(Although three topics were discussed with each interviewee, only the answers regarding pension plans are summarized here.) 

Three of those surveyed stated that they did not look at the pension plan footnote in general. 

The remaining seven stated that they looked at the size of the unfunded pension liability. Also, six of the seven said that they were interested in how large the unfunded past service obligation was in relationship to net income.
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"Cutting up the Pension Cake." The Vancouver Sun, A1 and A9 (June 25, 1980).


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