CORPORATE DIVIDEND POLICY

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by

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ABSTRACT

The primary objective of this study was to test Gordon's model on stock valuation in forecasting common stock prices under more recent world economic climate and together find an optimum dividend rate for a selected number of Canadian Companies.

Computer program BMDO2R was employed to perform time series multiple regression analysis on the Gordon's model of stock price valuation. Share prices were predicted only for those companies which yielded significant results. The problems of auto-correlation and multicollinearity were recognized in this study. Auto-correlation was tested by means of Von-Neuman ratio and for multicollinearity, simple inter correlations between the three independent variables (i.e. growth in dividends, dividends and size variables) were looked at.

Two of the seven companies gave insignificant results i.e. investors in these companies did not place importance on any of the three variables considered. Two other companies yielded statistically significant results but these were not acceptable as the signs of the related coefficients were negative and beyond any reasonable explanation. Share prices were, therefore, not predicted for these four companies and an optimum dividend rate could not be

determined. One other company revealed that size was the predominant factor in explaining share price. This gave only one share price as size variable was independent of the earnings retention fraction and therefore an optimum dividend rate could not be determined. (Gordon's model assumes that maximization of share price is the sole criterion in formulating dividend policy. Earnings retention fraction was the variable used to generate different share prices). Two other oil companies yielded some encouraging results. In one of them only growth in dividend variable was preferred and in the other, dividend variable was preferred share price predictions compared favourably with the actual share prices in these two companies.

Multicollinearity was almost absent in this study. Despite the presence of auto correlation in most of the companies, the results were accepted wherever these agreed with the theory.

Two main conclusions were drawn from this study:
(1) A general approach to the formulation of (a) the share price model i.e. Eq. (16) in section 4.3 and (b) rate of return on net worth i.e. Eq. (18) in section 4.3, cannot be taken as shown by the results obtained in this study. Therefore, for each company, variables affecting the share price need to be identified through trial and error.
(2) Companies in which investors prefer growth in dividends, should retain the maximum possible amount of earnings and in

companies where dividends are preferred, maximum possible amount of earnings should be distributed through dividends. Maximization of share price, however, has to be the sole criterion in formulation of dividend policy, for the above arguments to hold good.

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CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem: The purpose of this study was to test Gordon's model in forecasting common stock prices and therefrom determine an optimum dividend rate. Numerous conflicting theories have been proposed by investigators in the field of share price valuation and some of these will be reviewed in this chapter.

1.2 Historical Background: It has been a matter of great controversy and confusion as to whether dividends or earnings or both determine the common stock prices. Numerous viewpoints have been expressed under this topic. Some of the viewpoints are reviewed. As for example Beranek (1963) contended:

> The relative importance of the role played by dividends and earnings in determining the value of shares is the subject of sharp controversy. It is sometimes suggested that dividends are all important but it is easy to find supporters of the position that the difference between the two is a 'mere detail'. Gordon is a leading exponent of the former position while Modigliani and Miller argue the latter view.

> Solomon (1963) stated: One of the oldest debates in the area of security evaluation is whether investors capitalize earnings or dividends. Much ink has been spilt on this issue and many regressions have been run.

> Fisher (1958) suggested: There is a considerable degree of twisted thinking and general acceptance of half truths about a number of aspects of common stock investments. However, whenever the significance and importance of dividends is considered the confusion of the typical investor becomes little short of monumental.

In the last few decades, different methods for valuing the price of common stock have been proposed. Williams in 1938 stressed that dividends were more important determinant of stock prices rather than the earnings. He set forth the present value concept on which modern theories of common stock valuation are based.

John B. Williams defined the investment value of a stock as the sum of the anticipated dividends discounted to their present worth at an appropriate rate of interest. Williams (1938) asserted:

> Most people will object at once to the foregoing formula for stocks by saying that it should use the present worth of future earnings, not future dividends. But should not earnings and dividends both give the same answer under the implicit assumptions of our critics? If earnings not paid out in dividends are all successfully reinvested at compound interest for the benefit of the stockholder, as the critics imply, then these earnings should produce dividends later; if not, then they are money lost. Furthermore, if these reinvested earnings will produce dividends, then our formula will take account of them when it takes account of all future dividends; but if they will not, then our formula will rightly refrain from including them in any discounted annuity of benefits.
>
> Earnings are only means to an end, and the means should not be mistaken for the end. Therefore, we must say that a stock derives its value from its dividends, not its earnings ....
>
> In saying that dividends, not earnings, determine value, we seem to be reversing the usual rule that is drilled into every beginner's head when he starts to trade in the market; namely, that earnings, not dividends, make prices. The apparent contradiction is easily explained, however, for we are discussing permanent investment, not speculative trading, and dividends for years to come, not income for the moment only. Of course it is true that low earnings together with a high dividend for the time being should be looked at askance but likewise it is true that

those low earnings mean low dividends in the long run. On analysis, therefore, it will be seen that no contradiction really exists between our formula using dividends and the common precept regarding earnings.

Schabacker (1930), in his discussion, stated that earnings were really the important factor:

> There is perhaps no more flagrant or more widespread misunderstanding regarding stock market affairs than that which concerns itself with dividends of one sort or another on common stocks. When the common stockholder receives a dividend of any sort he generally feels that he is "getting something", that his net worth is increased by the value of that dividend. If it comes in cash he gets in cash, and if it comes in the form of a stock dividend or of right to subscribe, such are also worth money and can be conveniently turned into cash. After such cash money has been received, the stockholder still has the stock certificate and it is not unnatural that, without delving into the more intricate bookkeeping details of his investment, he should reason that his wealth has been increased by the value of the dividend which he has received.
>
> But a moments thought will show the fallacy of such a credo. The common stockholder is a part owner of his corporation and of all its surplus wealth or equity, after allowing for the current and fixed liabilities, including bonds and preferred stock which have prior claim on his company's resources. After such claims are satisfied, however, the residual wealth and assets of the corporation are his in direct proportion to the percentage of total outstanding common stock which he holds. The prior claims of other liabilities are definite. The equities for his common stock are indefinite. They are the "balance" of the company's assets over its liabilities - in simple form, they are the profit and loss surplus of his corporation. It is clear that any profits which the company makes will go to reduce this surplus, this balance, this equity, this true theoretical value of the common stock.
>
> It is perfectly plain, therefore, that if the corporation makes profits on its common stock and does not pay them out in dividends, such profits go to increase the balance or equity behind the common stock, and so increase the basic and theoretical value of that stock. On the other hand, if the company pays out all of such profits on the common stock in dividends on that stock, it is quite clear that the company no longer has those profits, and the balance of equity, or the theoretical value of the common

stock, is reduced by just the amount which the company has paid on the common stock.

> It should be clear that every time a corporation makes a profit the worth of its common stock is raised to the owners of that stock, and everytime the corporation pays out a portion of that profit on its common stock the worth of the stock is decreased to its owners by just the amount of that dividend. Instead of the dividends received on common stock being an addition to the networth of the wealth of the individual who holds that stock, it is the profits realized by the corporation which increase his wealth. The profits are the important thing in the situation, and not the dividends which are paid.
>
> The holder of the common stock who celebrates the success of his corporation because it has just declared a dividend of $10 per share on his common stock is not celebrating logically, for the value of his stock is reduced by just that $10 which he receives. He would be more logical if he celebrated the fact, apparent perhaps several years previous to the dividend payment, that his corporation had actually earned that $10 per share on the stock which he owns. For, theoretically, it was at the time when such profits were actually made that his net worth was increased, and not when the dividend was paid....
>
> In general, the dividend paying stock is preferable to one which is not on a dividend basis. The point to be noted, however, is that the public generally places too much stress upon dividends, for they are not nearly so important as other factors, notably earning.

In an article, King (1931) contended that dividends were the more important of the two:

> It is a matter of common observation that dollar for dollar, dividends are normally valued more highly than are mere reported earnings. One may argue that there should be no difference, for the dollars invested in the corporation's business are the property of the stockholders just as truly as are the dollars paid to the stockholders in dividends. There are, however, two definite reasons for attaching a higher valuation to the dividend dollar than to the dollar of reported earnings:
>
> 1. The dollar of earnings is joint property belonging to all the stockholders, and no one stockholder can spend it.

2. The earnings reported may be mythical, representing nothing more than clever juggling of figures by accountants. Dividends may, of course, be paid even when there are no bonafide earnings, but experience indicates that this occurence is not common enough to destroy the belief that dividends represent tangible evidence of actual earnings at some rather recent date.

As far as valuing stocks is concerned, King (1931) contended:

> Stocks normally have value only because it is anticipated that, in the future, they will entitle the holders to dividends. Mathematicians are agreed that the logical value of a stock is the present worth of all anticipated future dividends, and that the correct way to calculate the present worth of these anticipated dividends is to discount them to the present date at a certain rate of interest.

Graham and Dodd (1962, a) observed that a dollar of dividends has four times the impact on the share price as compared to a dollar of earnings. They stated:

> For the vast majority of common stocks, the dividend record and prospects have always been the most important factor controlling investment quality and value. The success of the typical concern has been measured by its ability to pay liberal and steadily increasing dividends on its capital. In the majority of cases the price of common stock has been influenced more markedly by the dividend rate than by the reported earnings. In other words, distributed earnings have had a greater weight in determining stock prices than have retained and reinvested earnings.

Irwin Friend and Marshall Pucket (1969) stated:

> Theorists tend to support the above stated position; empirical findings also indicate that, in selected areas, when stock prices are related to current dividends and retained earnings, higher dividend payout is frequently associated with higher price earnings ratios.

Attention has been recently directed toward the capitalization of earnings as opposed to dividends in the valuation of stocks. Retention of earnings has become synonymous with growth in recent years and several surveys of shareholder opinion indicate earnings and capital gains do weigh more heavily than dividends.

The major modern proponents of the theory that earnings and not dividends were the important determinant of share prices, was argued by Modigliani and Miller (1967):

> As long as management is presumed to be acting in the best interests of stockholders, retained earnings can be regarded as equivalent to a fully subscribed, pre-emptive issue of common stock. Hence, for present purposes, the division of the stream between cash dividends and retained earnings is mere detail.

According to Modigliani and Miller (1967) it follows that the dividend pay-out would merely determine how a given return would be split between current dividends and future capital gains and would not affect either the size of the total return or the current value of the shares. Based on this position it is to the benefit of the shareholders if earnings are reinvested rather than paid out, provided the reinvested earnings produce a return at least equal to the earnings yield on the market price of the common stock. This means that if the corporation can earn more with retained earnings than the stockholder could earn with them in the form of dividends, which are subject to the stockholder's tax rate, then a low payout ratio would be in the best interests of the stockholder. However, in the absence of preferential tax treatment of capital gains, the capitalization of either earnings or dividends will give the same results.

1.3 Policies, Considerations and Constraints in Dividend Decisions: In order to determine the policies, considerations and constraints in dividend decisions, Edwin P. Harkins and Francis J. Walsh, Jr. conducted a survey of 166 firms.

In their introduction on this report Harkins and Walsh (1971) stated:

> Retained earnings are the principal source of funds for growth in many corporations. Consequently, it is important that these earnings be managed wisely and efficiently. The most formidable obstacle to the achievement of this goal is the problem of dividend policy. Dividends also come out of retained earnings and they represent the tangible, present return to the owners on the funds they have committed to the business. It is understandable, therefore, that many stockholders expect a generous return when their companies enjoy profitable operation.
>
> The conflict between stockholders' desires for substantial dividends and management's wishes to reinvest earnings is at the heart of the problem of establishing dividend policies. Most corporations try to steer, a middle course between these opposing interests, usually with the result that each of the interested parties is only partially satisfied.
>
> Most of the companies whose financial executives responded to this survey rely on a variety of informal considerations and constraints in making decisions concerning cash dividends on their common stock. Only 28 of the 166 firms have a stated policy on dividends, while 127 say that they have no such policy. A small minority of 11 executives declined to answer questions as to the existance of a dividend policy.

According to Harkins and Walsh, there were a number of considerations that influenced the dividend decisions of the companies surveyed. Following five guidelines or considerations were most frequently cited in the survey:

(1) The company's earnings record and its future prospects: The most frequently cited consideration in dividend decisions was a company's earnings record, including its past and present performance as well as its future prospects.

Companies that took earnings as an index for distribution of dividends usually set a target percentage of earnings they planned to distribute. About 7 out of 10 companies on an average planned to distribute 40-59% of earnings in dividends. Fifty percent was the most frequently cited target in the survey.

There was a difference in practice among the participating companies as to which of several possible earnings figures had the greatest significance while considering the dividend payouts. Some firms for example, based the decision on earnings for the prior year; others relied on earnings for the most recent quarter; and a third group based dividends on projected earnings for varying periods in the future. Still others considered all three possibilities on the assumption that a trend would result there from.

One important aspect of dividend payouts in relation to earnings as reported by Harkins and Walsh:

Despite the fact that the level of current and expected earnings looms so large in the dividend deliberations of the survey respondents, 98 of the 144 companies supplying information on this point say that they would seriously consider paying a cash dividend in excess of earnings if it seemed to be in the best interest of the company and its stockholders.

Executives who see no strong objection to keeping up their usual cash dividend payout rates, despite a drop in earning, stress that the earnings reduction should be the result of temporary conditions only. A longer term decline in the company's fortunes would, of course, require a corresponding reduction in dividend payments. It is interesting to note that the 30 respondants who would not consider paying cash dividends in excess of earnings feel that their position is likewise in the best interests of the stockholders and, furthermore, is best for the company's investment image.

(2) Regularity of Payment: According to executives participating in the survey, maintaining a regular dependable record of quarterly payments was an extremely important factor in dividend decision making for many companies.

A senior Vice-President of an aerospace company cited his company's reason for maintaining a quarterly dividend schedule as follows: "We believe in quarterly dividends as we think this provides <u>the most favourable effect upon the price of our stock.</u>"

(3) Stability of Rate: Another important consideration in dividend decisions for many companies was the desire to maintain a stable rate, or amount per share of stock. As a machinery company Vice-President expressed: "This company appears to consider a dividend rate once established as a sacred obligation never to be reduced."

Companies that placed a high value on such stability usually tried, before increasing their dividend rates, to assure themselves that their earnings growth was sufficiently secure for the increased rate to be sustainable.

(4) Availability of Cash: When the board of directors of corporations contemplated a dividend declaration, the present cash position of the company, its cash flow, and its future cash needs for investment purposes and for other major expenditures received a great deal of attention.

(5) Stockholders' Needs and Expectations: These were also influenced by the dividend policy formulation. On one side were the owners of closely held corporations who preferred to forego current dividend income so that all earnings could be plowed back into expanding their business. Whereas, on the other side were elderly retired stockholders, who needed all the income they could get and preferred generous and steady current dividend payouts.

Another factor was the efforts of the top management to maximize the long term return to the stockholders. This in turn involved capital gains and current dividends for the stockholders. If the stockholders could get rates of return greater than if they invested elsewhere, reinvestment of earnings by the company would be justified. If they could get a higher rate of return elsewhere, then current dividends would be justifiable.

(6) Other Influences on Dividend Decisions: Companies that had large amounts of long term debt outstanding were usually confronted by provisions in the loan agreements or bond indentures that limited in some way the firms' freedom of action in declaring and paying dividends to stockholders. These provisions were demanded by the lenders as a protection against a downturn in the borrowing company's fortunes.

CHAPTER 2

MODELS PROPOSED AND EMPIRICAL STUDIES MADE BY OTHER INVESTIGATORS

In this chapter, models proposed and empirical studies made by investigators in the field are reviewed. Tests were conducted by some of these investigators on their models to check the validity of the theory in different industries. Most of these tests were made through regression analysis of either time series data or on cross-section basis. This study employed time series multiple regression analysis to examine the validity of Gordon's model.

2.1 Fisher's Work on British Stocks

In order to determine the factors that influence common stock prices, Fisher presented some estimation of the effect of dividends, undistributed profits and company size on share prices obtained from cross-sectional samples of common stock listed on the London Stock Exchange.

According to Fisher (1961, a), price of common stock is a function of the last declared dividend per share, the last declared undistributed profit per share and the effect of other variables which were introduced later.

The above represented in a functional form:

$$p = f(d,u,v)$$

therefore $$p = a_1d + a_2u + v$$

where p = price of the share

d = last declared dividend/share

u = last undistributed profits/share

v = a residual term summarising the effect of all other relevant variables.

The five samples used by Fisher (1961, b) were: a sample of 28 brewery company shares, 33 shares of companies in the electrical goods industry, 27 shares of retail stores, 29 shares of companies in the woolen industry, and a cross-sectional sample of shares from all industries made up of large companies and consisting of 48 shares.

In all cases, a_1 was greater that a_2; that is, investors capitalize dividends at a higher rate than retained earnings. It was also found that a_1 had a tendency to decrease over time and a_2 to increase over time. Fisher mentioned that variations between companies in dividend alone were sufficient to explain prices of their shares, whereas, the consideration of retained earnings along with dividends became important towards the end of the period.

In order to improve his model, Fisher took into consideration the company size and tried to find this variable's effect on share price. Company size was the net tangible assets of a particular company. Fisher (1961, c) mentioned that a difference in sizes between two companies of, say, £100,000 would have greater effect on prices if the sizes of the firms were in the neighbourhood of £0.5 million than if they were around £40.0 million.

On introducing company size into his model, he found that this had a significant effect in the explanation of share prices, that this effect was fairly stable over time and was only true when samples of share were classified by industry. In his conclusions Fisher (1961, d) mentioned the following points: (1) Variations in the last declared dividend per share explained an important proportion of the variation in corresponding share prices between companies, (2) Dividends were always capitalized at a very much higher rate than undistributed profits, (3) The influence of a unit of dividends and a unit of retained earnings appeared to be fairly stable from year to year, (4) Under dividend restraint, undistributed profits had generally less effect on prices, (5) The past rate of growth in dividends per share was no indication of the company's future prospects, (6) In most cases, the introduction of size provided a significant improvement in the explanation of share prices.

2.2 Harkavy's Propositions and Tests

Harkavy (1953, a) made a distinction between a security analyst's viewpoint and that of the fiscal theorist. He explained the two by separating the long run from the immediate effects of retention of earnings on the share's price. According to Harkavy, the security analyst believes that two stocks, identical in all respects except in their dividend payouts, a higher value would be placed on stock of the company which was distributing a greater proportion of its earnings in dividends. Whereas, from the fiscal theorist's point of view, stock of a firm, which enjoyed a rapid increase in the demand for its products, would appreciate more than the stock of a slow growing or declining firm, although the growth firm retained more of its earnings than the non-growth one.

He stated that there was no conflict about the statement that the average price of a share in a particular year varied directly with the proportion of earnings distributed during that particular year, whereas, over a longer period, greater price appreciations were associated with the greater proportion of earnings retained. He quoted Graham and Dodd and Saltzer in support of his above argument.

Harkavy tested his propositions through statistical analysis of representative stock price indexes and of a large sample of stocks. He conducted these tests in order to answer two questions:

1. How did annual common stock prices vary with the proportion of earnings distributed in a given year?
2. Did stocks of companies which had high retained earnings appreciate more than stocks of companies which retained a small proportion of earnings?

To answer the first question, Harkavy (1953, b) used correlation techniques on sixty gas and electric companies and found a positive correlation between average dividend earnings ratios and average price-earnings ratios. He concluded that the result gave statistical support to the proposition that the greater the amount of earnings paid out, the higher the price of the stock.

Harkavy (1953, c) also made a time series correlation analysis for the Cowles All-Stock Index for the period 1871-1937 and Standard and Poor's Industrials, Rails, and Composite Indexes for the period 1934-1950. It resulted in a correlation coefficient of +0.986 between average price-earnings and dividends-earnings for the Cowles All Stock Index. Others also showed positive results. He also made a cross-section analysis for year 1950 on a sample of ninety stocks in all lines of business, and a positive correlation resulted between price earnings and dividend earnings ratios, though a low one.

Concerning the second question, results generally showed that those companies which retained a large proportion of their earnings experienced greater appreciation in the price of their stock than those companies with low retained earnings. Harkavy (1953, d) found that, of the companies examined, only a limited number showed this same result; this was due to the fact that earnings retained did not, in themselves, cause price appreciation. Other variables had to exist for the retained earnings variables to take effect; one of these critical variables was the growth in the demand for the company's product.

Harkavy (1953, e) concluded that a low dividend payout did not ensure high appreciation of the price of a stock of any company. If price appreciation of the stock was to take place in a firm with a high retention of earnings, an increase in earning power had to accompany these earnings retained.

2.3 Walter's Model

Walter (1965, a) constructed a theoretical model showing the relationship between dividend policies and stock prices. Walter's main proposition, was that over long periods, stock prices reflected the present values of expected dividends.

The capitalization rate and not the multiplier was used to find the present worth of future dividends. The capitalization rate was reciprocal of multiplier.

Walter classified stocks into three categories: growth, intermediate and creditor stocks; dividend policy of the company being the major force in this classification. Growth stocks were the ones that paid low dividends, intermediate stocks paid high or medium dividends and stable dividends, those which did not fluctuate with earnings, were paid by creditor stocks.

Walter (1965, b) constructed the following model where the present value of a common stock was:

$$V_c = \frac{D + \frac{R_a}{R_c}(E-D)}{R_c}$$

where D = cash dividends,

E = earnings,

R_a = rate of return on additional investment,

R_c = market capitalization rate.

When the rate of return on additional investment (retained earnings) exceeded the market capitalization rate, the present value of the common stock increased as the retention rate increased. If R_a declined below R_c, a lower dividend payout ratio would depress the market value of stock. If R_a continued to exceed R_c, then retention of earnings would be a benefit to the stockholders.

2.4 Durand's Study - Bank Stock Prices

Durand's objective was to investigate the importance of factors that affected bank stock prices and therefore, the bank's ability to raise more money through new equity issues. The ratio of share price to book value was an important factor in raising capital for a banking institution. To compensate the investor, a bank's stock, over the long run, would require its market value above its book value.

A cross section multiple regression analysis was performed on 117 bank stocks divided into six groups for eight years from 1946 to 1953.

The independent variables that were taken into consideration were: book value of the stock, dividends, and earnings with weights given to these important factors. He considered some other factors together with the above three. These other factors were divided into two categories:

i) those for which published data were available

ii) those for which confidential data was required.

Durand (1957, a) classified the first category of other factors into the following six:

1. Total capital, as a measure of size of bank.
2. Ratio of assets to capital.
3. Ratio of risk assets to capital.

4. Ratio of current dividend rate to average past dividend rate.
5. Average annual rate of increase in earnings.
6. Stability of earnings.

The second category comprised of reserves, such as reserves for taxes and reserves for contingencies. According to Durand these reserves constituted hidden additional capital that might affect stock prices. These figures were requested from confidential data because they were either not clearly stated in the financial statement or were not at all included in these statements.

Logarithm of the equation used by Durand (1957, b) in his regression analysis was:

$$\log P' = \log k + b \log B + d \log D + e \log E + \log P - \epsilon$$

where B = book value per share

D = dividends per share

E = earnings per share

P = observed price

ϵ = the deviations of log P about the regression function.

Other factors were added to the above equation to check their effectiveness on the price of the bank's stock. The modified equation thus is:

$$\log P' = \log k + b \log B + d \log D + e \log E + C_1 \log C + C_2 \log A/C + C_3 (\log A/C)^2$$

The above was made to test the effects of size and ratio of assets to capital. Therefore, C is total capital and A is total assets. Variable $(A/C)^2$ was included to test the expected nonlinearity between A/C and price.

As noted earlier, the 117 bank stocks were divided into six groups. This was done because the bank stocks were not homogeneous in character and similar stocks were placed in one group.

In his study, Durand (1957, c) concluded that the influence of each of the above factors considered in the study on bank stock prices varied substantially from group to group. Except for one bank group, dividends played a major role in most of the other groups. The variation of the factors was great from group to group, but this variation was not apparent from year to year within the eight year period under study. That is why a general conclusion was difficult and could not be applied to all bank stocks as a whole.

And finally, Durand (1957, d) concluded that dividends and earnings, played a major role in determining ratios of bank stock prices to book value. The other factors, namely, size of bank, ratio of assets to capital, etc., were of minor importance and as determinants of a bank's stock price, they displayed less influence and a position inferior to that of dividends and earnings.

2.5 Graham and Dodd's Work

Graham and Dodd (1962, b) classified stocks into three categories: growth stock, below average and middle group.

Growth stocks consisted of issues whose earnings per share had increased at an average annual rate of 7.2 percent; that is, earnings doubled in ten years. Below average group, according to Graham and Dodd, were stocks that had been sold at less than one and one half times their book value in the last five years, and had earned a return on book value below that of Standard and Poor's 425 industrial stocks.

According to Graham and Dodd (1962, c) the following methods applied to evaluation of stocks of different kinds described above:

> First, in valuing growth shares the dividends can be for all practical purposes ignored and sole reliance placed on expected earnings.
>
> Second, in valuing below-average shares, dividends are of paramount importance and should have the traditional weighting ....
>
> Third, in valuing shares in the middle groups, the role of dividends is still dominant, but the weighting will be less than in the case of the below average shares.

While dealing with below-average shares of industrial and railroad stocks, Graham and Dodd (1962, d) suggested that dividends be given a specific weighting in relation to earnings:

$$V = M(D + 1/3E)$$

i.e. Value = earnings multiplier times (expected dividend + one third expected earnings)

The above formula was based on the premise that a dollar paid out in dividends had three times the weight than that of a dollar of retained earnings.

For valuation of growth stocks, they described two methods. In both the methods, they assumed a discount rate of 7.5% for all companies, a normal price-earnings ratio and also that 60% was a normal payout ratio and the higher the growth the smaller was the payout ratio.

Graham and Dodd (1962, e) called their first method as the preferred method. They limited their projected earnings growth for a seven year period. A multiplier was applied to the average of seven years' earnings, i.e. the fourth year's earnings. This multiplier depended on the expected rate of growth for the next seven years, but would lie between thirteen to twenty because of the limits of the growth rate from 3.5% to 20%.

In their second method, Graham and Dodd (1962, f) included the following factors:

$$V = E(8.5 + 2G)$$

Value = current normal earnings (8.5 + twice the average annual growth rate expected for the next 7 - 10 years).

They worked out this formula on the basis that a multiplier of 8.5 was appropriate for a company with zero expected growth, and a 2.5% growth rate called for a multiplier of 13.5.

2.6 Modigliani and Miller's Model

Modigliani and Miller (1961, a) stressed that under certainty and in the absence of tax advantages, it would make no difference whether a company retained earnings or paid dividends which could then be reinvested in the same company by the stockholders.

In reaching the above conclusion their assumptions were:

1. Perfect capital markets in which all investors were rational. Information was available to all at no cost; transactions were instantaneous and without cost; and no investor was large enough to affect the market price of a stock.
2. An absence of floatation costs.
3. An absence of taxes.
4. A given investment policy for the firm.

Their main contention was that the effect of dividend payments on stockholder's wealth was offset by other means of financing. When the firm had made its investment decision, it would have to decide whether to retain earnings or pay dividends and sell new stock in the amount of these dividends in order to finance the investments.

They stated that the sum of the discounted value per share after financing and dividends paid was equal to the market value per share before the payment of dividends. Therefore, the decline in the market price of the stock due to external financing offset exactly the payment of the dividend. These offsetting factors were the reasons why the stockholder was indifferent to the relationship of dividends and retained earnings.

This position of Modigliani and Miller (1961, b) was reflected in the following two models:

$$V(o) = \frac{X(o)\ (1-k)}{p - kp^*}$$

and

$$Do(o) \sum_{t=0}^{\infty} = \frac{X(o)\ (1-k_r)}{p - g}$$

where

$V(o)$ = market price of the stock

$X(o)$ = total initial earnings of the firm

$D(o)$ = total initial dividends of the firm

p = market rate of return

p^* = internal rate of return

t = time

k = ratio of investment to total earnings in time

k_r = investment financed from internal sources

g = the rate of growth of dividends

Given the internal profitability rate of the firm and its initial earnings, the growth rate in earnings would depend only on the ratio of investment to total earnings per period.

While total dividends and earnings were less affected by external financing, dividends per share and earnings per share were more influenced because external equity financing determined the number of shares of stock that would be outstanding. If external financing was made through debt, Modigliani and Miller contended that the real costs of equity financing and debt were the same.

Modigliani and Miller's model could be used to demonstrate that the dividend policy of the firm depends on the relation between p* (internal rate of return) and P (market rate of return):

If $p^* = p$

or $p^* < p$

then the firm could increase its value by paying all of its earnings as dividends.

Whereas, if $p^* > p$

then the value of the firm could be increased if earnings were retained.

The assumptions made by them in their thesis were criticized by other investigators as unrealistic.

Although Modigliani and Miller changed their assumption of complete certainty to uncertainty, they still held that dividends were not important as an influencing factor. They stated that the investor was indifferent as to how earnings were split between dividends and retained earnings. Gordon (1963, a) stated that uncertainty on the part of investors increased at an increasing rate with the distance in the future of prospective cash payments. He contended that investors did not express indifference between dividends and capital gains; they preferred the early resolution of uncertainty and were willing to pay a higher price for the stock that offered the greater current dividend, all other things held constant.

The burden of floatation costs favoured the retention of earnings. And finally as capital gains were taxed at a lower rate than dividends, in growth companies, investors preferred their funds reinvested into the company.

2.7 The Perpetual Growth Model

Brigham and Gordon (1968, a) made an attempt to resolve the issue of whether the cost of debt and the cost of retained earnings were dependent on a firm's debt and dividend policies. They defined cost of capital as the rate of return the firm would have to earn on new investment in order to maintain the market price of its existing common stock unchanged. Therefore, if a firm's rate of return on a debt financed investment was larger than the cost of that debt, that leverage factor tended to raise the corporation's stock price. It followed, therefore, to test a cost of capital theory, a test had to be made first on a stock value theory.

Brigham and Gordon (1968, b) developed a perpetual growth dividend capitalization model. According to that model, the price of a share was equal to the current dividend divided by the amount by which the rate of return investors required exceeded the expected rate of growth in dividend:

$$P_o = \frac{D_o}{K_e - g}$$

where P_o = the current market price per share of stock

D_o = the current dividend per share

K_e = rate of return investors require on the share

g = the growth rate in dividends per share

Rearranging the above, $D_o/P_o = K_e - g$, a regression model could be run from the above for a sample of companies,

$$\frac{D_o}{P_o} = a_o + a_1 g$$

Brigham and Gordon (1968, c) stated that if it was found that $a_1 = -1$, then the dividend policy had no influence on share value. But if $a_1 > -1$, K was not independent of g; then investors preferred current dividends to capital gains.

To test the proposition that the cost of capital and share price were independent of dividend and debt policies, the following regression model was adopted:

$$\frac{D_o}{P_o} = a_o + a_1 g + a_2 h + a_3 u + a_4 e + a_5 s$$

where g = growth rate based on past growth in retained earnings

h = debt-equity rate

u = index of earning stability

e = electricity sales as a percentage total revenues

s = corporate size

This model was tested on a sample of sixty-nine electric utility stocks. It was concluded that investors preferred current dividends to capital gains, all other things being the same, and that the cost of equity capital increased with the firm's retention rate.

2.8 Findings by Van Horne and McDonald

In order to test their model on share price valuation, Van Horne and McDonald (1971) conducted tests on electric utility industry and electronic and electronic components industry, for the year 1968. Their primary objective in this study was to examine the effect of dividend policy and new equity financing on the price of common stock.

Eighty-six electric utilities and thirty-nine electronic and electronic component companies (U.S.) were selected for their study. The model used in the study was:

$$\frac{P_o}{E_o} = a_o + a_1(g) + a_2(D_o/E_o) + a_3\ (\text{lev.}) + u$$

where

P_o/E_o = closing market price in 1968 divided by average earnings per share for 1967 and 1968, adjusted to a consistent" flow through" accounting basis by adding back deferred taxes to reported earnings for each firm.

g = expected growth rate, measured by the compound annual rate of growth in assets per share for year 1960 through 1968, where the first three years and last three years were normalized and the growth rate computed for the resulting six-year span.

D_o/E_o = dividend payout.

Lev. = financial risk, measured by interest charges divided by the difference of operating revenues and operating expenses.

u = error term

Regression analysis on the above model (for electric utility industry) showed that at moderate levels of new issues of common and securities convertible into common, the net preference of investors for dividends more than offset the cost disadvantage of new issues relative to the retention of earnings. At high levels of new issues, the cost disadvantage was significant and retained earnings were much cheaper than issuing new stock.

For regression analysis of electronic and electronic components industry, a new independent variable was included in the model. This was operating risk variable, measured by the standard error for the regression of operating earnings per share on time for 1960-1968.

Regression analysis on this industry did not reveal any significant results on the above model.

In the next chapter, the model employed in this study will be looked at in detail.

CHAPTER 3

FORMULATION OF OBJECTIVES

Gordon (1960) developed and tested a mathematical model that provides a solution to the problem of distribution of earnings into dividends and reinvestment of earnings, when maximization of share price is the optimization criterion.

Theory of stock price formation is stated and a model derived therefrom, that yields an optimum dividend rate is described as follows:

3.1 Gordon's Model (1960):

The 'notation' to be used in the statement of the model is:

Y_t = income a share of stock is expected to earn in period 't'.

D_t = dividend a share of stock is expected to pay in period 't'.

B_t = book value or common equity per share of stock at the end of period 't'.

b = fraction of income the corporation is expected to retain $b = (Y_t - D_t)/Y_t$, $t = 1, 2, \ldots\ldots\ldots\ldots$

r = average return the corporation is expected to earn on the investment of bY_t, $t = 1, 2 \ldots$

g = the rate at which the corporation's dividend is expected to grow.

P_o = the price of the corporation's stock at $t = 0$

k = the rate at which the corporation's future dividends are discounted at $t = 0$ to arrive at their present value.

Assumption: Expectations 'b' and 'r' are assumed to be the same for each future period.

The value of an investment opportunity is the present value of the future payments it is expected to provide. It has been shown (Gordon 1959) that for a share of stock these future payments are the dividends.

Therefore $P_o = {}_o\int^{\alpha} D_t + e^{-kt} dt$ (1)

By definition

$$D_t = (1 - b) Y_t \tag{2}$$

If the corporation is expected to retain bY_t in each future period, and if it is expected to earn a return of 'r' on investment, the rate at which the dividend will grow is

$$g = b \times r \tag{3}$$

To show this, from the above assumption

$$Y_{t+1} = Y_t + rbY_t = Y_t (1+rb) \tag{4}$$

If growth takes place continuously

$$Y_t = Y_o e^{gt} \tag{5}$$

and making use of Eq. (2)

$$D_t = (1-b) Y_o e^{gt} \tag{6}$$

Substituting this value of D_t in Eq. (1), it becomes

$$P_o = (1-b)Y_o \int_o^{\alpha} e^{-t(k-g)} dt \qquad (7)$$

The price of the share is finite and the integration may be carried out if $k > g$, in which case

$$P_o = \frac{(1-b)Y_o}{K-br} \qquad (8)$$

The above equation states that the value of a share is equal to the current dividend divided by the rate of profit required on the share less the rate of growth in the dividend.

In much of the theoretical work on investment and finance, it is assumed that r and k are independent of b. If this is true,

Taking derivative of Eq. (8) with respect to b,

$$\delta_P/\delta_b = \frac{Y_o(r-k)}{(k-br)^2} \qquad (9)$$

Therefore, from Eq. (9) the price of share rises indefinitely, falls indefinitely or is independent of the retention rate depending on whether $r \gtreqless K$. However, it may not be assumed that 'r' and 'K' are independent of 'b'. This is the crux of the problem and more realistic assumptions are developed below.

Consider the implicit assumptions in the above model that the future values of the return on investment and the fraction of income retained may be represented by the quantities 'r' and 'b'. It is evident that a stockholder must estimate the return a corporation will earn on investment if he is to make rational investment decisions. Considerably the return in each future period can be estimated, but the difficulties involved in this course of action make an estimate that takes the form of a single value reasonable.

The fraction of earnings that a corporation retains may be varied by the directors at their will. A technological restraint on its variation does not exist as is the case for the return on investment which the corporation tries to maximize. However, it has been shown by Lintner that corporations have a policy of paying out a stable fraction of their normal earnings in dividends. Investors may, therefore, use historical data to arrive at a meaningful expectation with respect to the value of 'b' as well as 'r'.

Returning to the relation between a corporation's return on investment and its retention rate, it is generally accepted that a corporation's return will increase with the annual rate of investment upto some value, and beyond that point, the rate of return will fall indefinitely as the level of investment increases. A firm may finance its investment by any combination of retained earnings, borrowing, and the sale of additional stock. It is evident then that for 'r' and 'b' to be independent of each other, the process by which a firm arrives at its investment decision must be independent of the financing.

Neo-classical economic theory has demonstrated that when the future is known with certainty the investment decision is made without reference to the method of financing. In fact financing is a nonsense problem under certainty. Modigliani and Miller have tried to show that substantially the same conclusion is reached under certainty, i.e. financing is a second order problem, the solution of which is obtained after the investment decision is made.

Ideally to solve the dividend policy one needs a general theory of investment that simultaneously establishes the level of investment and its financing. However, the development of such a theory is not relevant here. Instead, it will be assumed that corporations engage in no outside equity financing and the amount that each borrows is set so that the corporation's debt remains a constant fraction of the ownership equity. Studies of business financing policy indicate that these assumptions reflect self-imposed restrictions on freedom of action that are widely practiced by manufacturing corporations.

The relation between 'r' and 'b' now depends on the relation between the return on investment and its annual rate. It is possible that the variation in the return on investment with the rate of investment is so small that 'r' may be considered a constant. A decline in the return as the rate of investment increases is more reasonable and for the purposes of the model, it will be assumed that:

$$r = \frac{r_o}{1+\lambda b} \tag{10}$$

r_o and λ being positive constants. More complex functions may be more accurate but are not necessary here. It may be assumed that in any use of the model a corporation could arrive at r_o and λ from internal capital budget data.

Turning now to the relation between k and b, the rate of profit required on a share or the rate at which the expected future dividends are discounted will depend on various characteristics of the share. For example, the greater the uncertainty of the expectation the higher the rate at which the expectation will be discounted.

Hence, the following procedure could be adopted: Eq. (8) above may be rewritten as:

$$P_o = (1-b)Y_o d^{-1} \tag{11}$$

With d = k-br, called the dividend yield required by the market. It is reasonable to believe that the dividend yield required on a share is equal to some value $1/a_o$. When there is no expectation of growth in the dividend, and that the yield falls, asymptotically approaching zero, as the expected rate of growth increases. In short

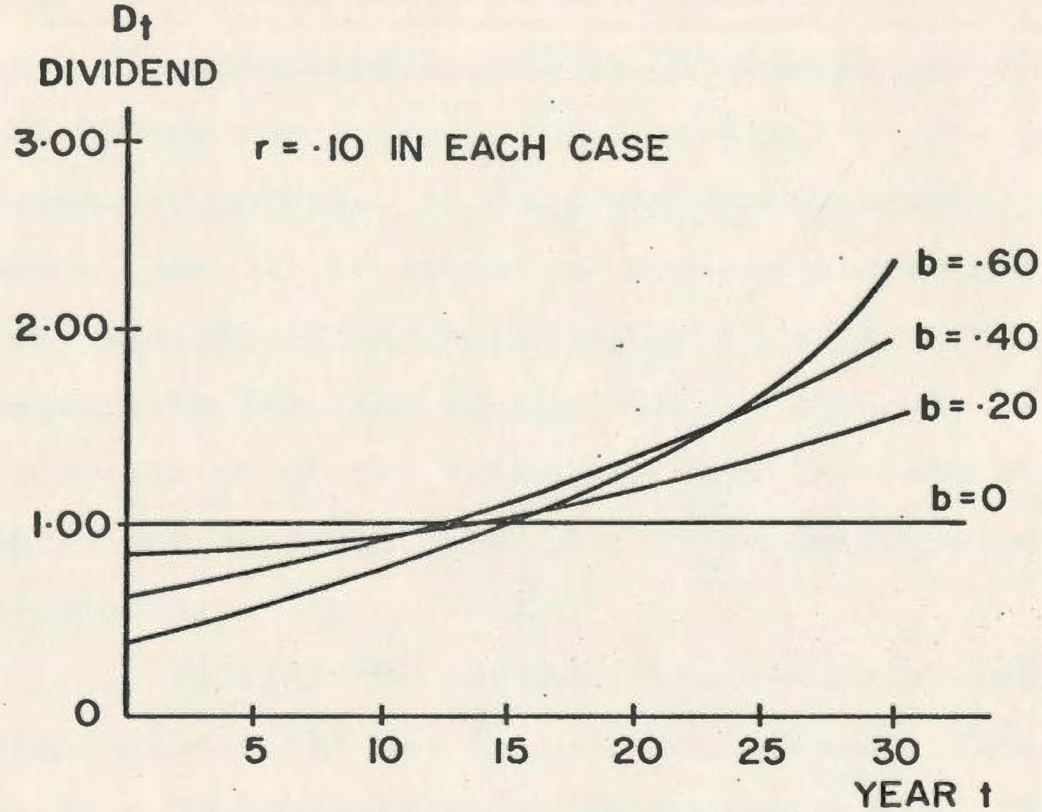
$$d = 1/a_o \times a_1^{-br} \tag{12}$$

is a plausible form for the functional relation. Making the indicated substitutions for 'd' and 'r' in Eq. (11), therefore:

$$P_o = (1-b)Y_o a_o a_1^{\frac{bro}{1+\lambda b}} \tag{13}$$

The values of b, Y_o, r_o and λ_b may be obtained from knowledge of the corporation and a_o and a_1 are market parameters. Taking the derivative of P_o with respect to 'b'.

$$\therefore \delta_P/\delta_b = Y_o a_o a_1^{\frac{bro}{1+\lambda b}} \quad -1 + \frac{(1-b)r_o \ln a_1}{(1+\lambda b)^2} \tag{14}$$



FIG· 3·1

VARIATION IN DIVIDEND STREAM WITH RETENTION RATE

One of a share's characteristics is the time distribution of its dividend expectation. Fig. 3.1 illustrates various possible dividend expectations with a given initial earnings per share and a given rate of return on investment. It is evident that even if we allow for a decline in 'r' as 'b' increases, increasing 'b' lowers the initial value of the dividend and increases its growth. It has been shown already by Gordon that (1) if investors have an aversion to risk, and (2) if the uncertainty of a payment increases with its time in the future, then the required rate of profit increases with the rate of growth in the dividend. Hence k is an increaseing function of b.

To find the optimum dividend rate, the relation between 'k' and 'b' could be given a functional form, substitute this expression and Eq. (10) for 'k' and 'r' in Eq. (8) and then solve that expression for the value of 'b' that maximizes 'P_o'. Numerical values of the parameters that describe the relation between 'k' and 'b' depend on market, i.e. stockholder preferences, and estimates could be obtained from sample data. However, there are formidable statistical problems connected with this course of action.

When r_o, $\ln a_1$ and λ are positive, the above expression has only one stationary value and it is a maximum and for certain values of the parameters the maximum will take place for 'b' in the interval $0 < b < 1$.

Now statistical estimates will be developed from the sample data in order to find the market parameters needed to determine the optimum dividend rate.

The estimating equation employed for this purpose is:

$$\ln(P/B)_t = \ln a_o + g_t \ln a_1 + a_2 \ln(D/B)_t + a_3 \ln S_t + a_4 \ln u \qquad (15)$$

The differences between this expression and the logarithm of Eq. (13) are explained below:

P_t is the average of the high and low prices over the three months September, October and November of the year 't', B_t is the end of year book value per share, g_t is the product of the current retention rate, $b_t = \frac{Y_t - D_t}{Y_t}$ and the current earnings rate, $r_t = Y_t/B_t$, D_t is the dividend paid during the year. Both P_t and D_t are deflated by B_t in order to avoid correlation between P_t and D_t due to the presence of high and low priced shares in the sample. The dividend coefficient 'a_2' should be equal to one, but if a dividend equal to some percentage of book value per share is considered normal by stockholders the result would be $a_2 < 1$, so that estimation of its value is desirable.

To obtain the best estimate of the growth coefficient any other variables with which the price of a share might be expected to vary should be included. The two variables included are S_t, the size of the corporation, and U, the instability of past earnings. The size of a corporation is taken as the total book value of the common equity at the end of the year. Investor knowledge about a corporation, liquidity of its shares, and confidence in expected dividends may all be expected to vary with the size of the corporation. Hence, the price at which a share sells should vary with the corporation's size.

The instability of earnings is the standard deviation of the corporation's return on its common equity over a prior period.

Gordon selected four industries and two years, 1951 and 1954, and using the above estimating equation, he performed cross section multiple regression analysis on a number of companies.

He reported that the results of regression analysis were quite encouraging though not entirely in accordance with what he anticipated.

Gordon concluded in his paper as follows:

"The model is a reasonable formulation of the problem, but the sample data under the rules used for measuring the variables provide estimates of the parameters that are of questionable accuracy for use in obtaining a corporation's optimum dividend rate. Possible refinement in the measurement of growth may permit scientific statements with a satisfactory confidence interval on the optimum dividend rate. For the present all we can say is that the data provides strong evidence in support of the more general proposition that a company's retention rate should vary with the rate of profit it can be expected to earn on investment".

Gordon's model had limitations in that one could only operate between the limits set out by the past historical data of the corporation. For example, in the case of prediction of 'r' with varying 'b' one could only predict between those values of 'b' which were observed in the historical data of the company. Secondly, the relation between 'r' and 'b' did not seem to be reasonable. On going through historical data of corporations, it was observed that the rate of return on net worth generally increased with equity. Hence, a more realistic relationship was needed to be developed between 'r' and 'b'.

Gordon's model, which included some restrictive assumptions was employed in this study because of two main reasons:

1) It gives different share prices under different dividend policies, i.e. depending on the rate of retention of earnings.
2) It is also capable of giving an optimum dividend policy.

In complete contrast to Gordon's model, Modigliani and Miller's model was restricted to a theoretical analysis of relationship between dividends and stock prices. Their basic model was formulated under assumptions of perfect capital markets, complete certainty and rational investor behaviour. They, however, admitted the possibility of dividends affecting share prices due to dividend's informational content or because of systematic imperfections in the capital markets.

Models presented by other investigators did not attempt to find an optimum dividend policy and were therefore not suitable for this study.

3.2 Overall Objective of this Study:

The primary objective of this study was to test Gordon's model on stock valuation in forecasting common stock prices under more recent world economic climate and therefrom find an optimum dividend rate for a selected number of Canadian companies.

3.3 Specific Objectives of this Study:

(1) To develop a relationship between the expected rate of return on net worth 'r' and retention fraction of earnings 'b'.

(2) By performing a time series multiple regression analysis on Gordon's model using past historical data from 1950 to 1970 (historical data such as stock price, rate of return on net worth, growth in dividends, dividends per share and size of the company), forecast common stock prices for 1971 and 1972 and determine an optimum dividend rate, for the following selected* Canadian companies:

(i) British Columbia Telephone Company (Head office: Vancouver)

(ii) Hiram Walker - Gooderham and Worts Limited (H.O.: Walkerville, Ontario)

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* The criteria of including a company in the study were: (1) It was listed on a Canadian stock exchange (2) It published financial data from 1950 to 1972 (3) Dividend per share over the period of study was two percent or more of the book value per share. Westinghouse, however, was an exception to this criterion and was included to cover a broader range of industries.
Requirement (3) excluded companies with meaningless yields because of a temporary fall in their dividend to or close to zero.

(iii) Texaco Canada Limited

(H.O.: Don Mills, Ontario

(iv) Imperial Oil Limited

(H.O.: Toronto)

(v) Westinghouse Canada Limited

(H.O.: Hamilton, Ontario)

(vi) The Steel Company of Canada Limited

(H.O.: Toronto)

(vii) Alcan Aluminum Limited

(H.O.: Montreal)

CHAPTER 4

FINANCIAL ANALYSIS AND METHODOLOGY OF APPLICATION OF THE MODEL

This chapter looks at the criteria of selection of the companies and sources of data collection for the study. In order to get some idea about management efficiency in the respective companies, ratio trend analysis was performed and finally the methodology of application of the model was discussed.

4.1 Collection of Data:

Selection of companies was the first problem encountered in the collection of data for study. After considerable research in the university library, having gone through newspapers, microfilms and journals, 'Survey of Industrials', a monthly, was found appropriate for preliminary selection of companies. The above monthly, however, did not publish all the relevant data needed for study and therefore it was necessary to find an alternative source for data collection. The criteria of selection of a company for study were: (1) it was listed on a Canadian Stock exchange (2) it published financial data from 1950 to 1972 (3) dividend over the period of study was two percent or more of the book value per share. One of the selected companies, Westinghouse

Canada Limited was an exception to this rule and was included in the study to cover a broad range of industries. Requirement (3) was needed to exclude corporations with meaningless yields because of a temporary fall in their dividend to or close to zero. The following eight Canadian companies were selected:

(1) British Columbia Telephone Company

(2) Hiram Walker - Gooderham and Worts Limited

(3) Texaco Canada Limited

(4) Imperial Oil Limited

(5) Westinghouse Canada Limited

(6) The Steel Company of Canada Limited

(7) Alcan Aluminum Limited

(8) Union Carbide Canada Limited

Two possible sources were contacted for data on the above companies:

(1) The Financial Post Corporation Service, Toronto

(2) The Canadian Analyst Limited, Toronto.

The former agreed to furnish the data needed, which was compiled by them from annual reports on these companies.

Union Carbide was dropped from the study as it did not make a public offering of its shares until 1964.

All the selected companies were requested to send their annual reports from 1950 to 1972. In most of the cases, reports were available only from 1960 onwards and in some of them, only for the last few years.

4.2 Financial Analysis

In order to get some idea about the management efficiency in these selected companies, ratio trend analysis was performed. A brief summary of the activities of the companies were also mentioned. The following financial ratios were observed:

(a) Return on net worth (as a percentage)

(b) Return on total assets (as a percentage)

(c) Profit margin on sales (as a percentage)

(d) Total assets turnover (times)

(e) Inventory turnover (times)

In addition some other relevant financial data was reported. These ratios and other relevant financial data are tabulated in Appendix-B.

4.2.1 British Columbia Telephone Company:

The Company and its subsidiary own and operate an integrated communications system in British Columbia.

Four division areas, the costal, island, interior, and northern divisions, are set up to serve the whole province. Four company owned submarine cables are in operation between the mainland and Vancouver Island. Through interchange arrangement connections are maintained between British Columbia and the rest of the world. In addition, the company provides special service including teletype service, the transmission of radio and television programs, mobile radio-telephone service, data transmission, operating through telephone channels, and closed circuit television. The company also has an investment in Telsat Canada, a corporation established by Federal legislation to build and manage a domestic communications satellite system.

The following statistics revealed the financial growth of this company, over the period of study:

(1) Range of rate of return: It varied from 7.95% in 1953 to 8.55% in 1972. This, however, fluctuated considerably during the first half of the study.

(2) Range of total assets:

(a) Current: From $14,534,495. in 1953 to $46,698,000. in 1972.

(b) Fixed: From $89,717,329. in 1953 to $849,200,000. in 1972.

(3) Range of total liabilities:

(a) Current: From $4,622,493. in 1953 to $42,626,000. in 1972.

(b) Longterm debt: From $101,590,660. in 1953 to $756,768,000. in 1972.

From the point of view of management efficiency, ratio-trend analysis was performed for the period 1953 to 1972. The following ratios were looked at and shown in fig. 4.1:

(a) Return on net worth (as a percentage).

(b) Return on total assets (as a percentage).

(c) Profit margin on sales (as a percentage).

(d) Total assets turnover (times).

Return on net worth ratio has been advancing steadily for the years 1962 to 1972, except for the year 1971. Net profit for year 1971, reveals that the profit has not kept pace with the net worth for that particular year. In their 1970 annual report, it was reported that (1) general national and international conditions were not good, (2) a record time loss incurred by work stoppages in British Columbia Industries. This has obviously affected results for 1971 as well. Fast recovery was made in 1972, due to increased tariff rates approved by the Canadian Transport Commission in 1971 as reported in the 1971 annual report.

Return on total assets also shows the same trend as above except for year 1967. This was due to higher expenses involved in plant and equipment as was evident from their 1967 annual report.

Profit margin on sales indicates that its service charges had been low and needed to be increased as the total operating revenue has clearly an advancing trend for the period of study. As noted above, tariff rates were subsequently revised and an advancing trend in profit margin on sales was the result in 1972.

Total assets turnover ratio indicates that the Company's business had been steadily growing, especially in the last decade or so and has clearly an advancing trend. This is confirmed by the total operating revenue curve.

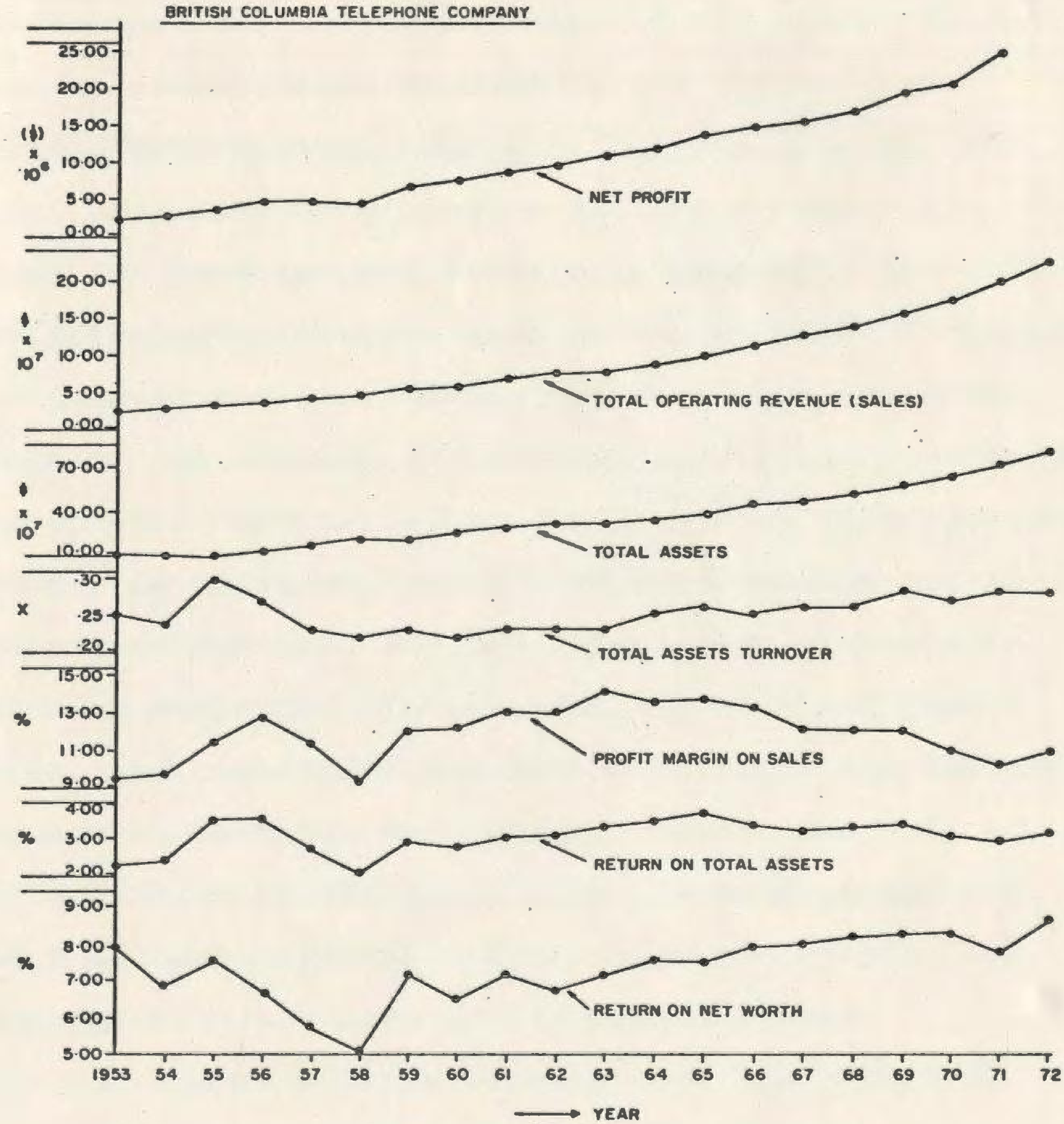


FIG. 4.1

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR THE BRITISH COLUMBIA TELEPHONE COMPANY.

4.2.2 <u>Hiram Walker-Gooderham and Worts Limited:</u>

The company is a holding company owning or controlling, either directly or through subsidiary holding companies, all or majority of the voting stock of various corporations engaged in the business of producing, warehousing, bottling, buying, selling, importing, exporting or otherwise dealing in alcoholic products for beverage and industrial purposes, by-products and articles and materials used in the production thereof and incidental thereto. Among the alcoholic beverages produced by the company are Canadian, American and Scotch whiskies, gins, cocktails, cordials, vodka, brandy, cognac and rums. In addition, certain of its Canadian subsidiaries act as agencies for the importation and sale in Canada of a number of wines, brandies, gins and Scotch whiskies, and certain of the subsidiaries in the United States act as agencies for the importation and sale of Scotch and Irish whiskies and wine. Approximately 80% of the total consolidated net sales of the company and its subsidiaries are made in the United States.

Growth of this company over the period of study is revealed by the following statistics:

(1) <u>Range of rate of return on net worth</u>: From 10.43% in 1952 to 12.10% in 1972.

(2) Range of total assets:

(a) Current: From $140,962,879. in 1952 to $456,646,657. in 1972.

(b) Fixed: From $29,984,115 in 1952 to $169,284,299. in 1972.

(3) Range of total liabilities:

(a) Current: From $26,819,323. in 1952 to $169,167,641. in 1972.

(b) Longterm debt: From $153,058,784. in 1952 to $471,532,855. in 1972.

In order to get an idea about the management efficiency in this company, ratio trend analysis was performed and these ratios are shown in fig 4.2.

Return on net worth graph shows that the trend is clearly an increasing one from 1959 to 1968 and then till 1971, it had started falling down, though only by about 2% from 1968 to 1971. This could be attributed to the sagging economy of the United States as was reported in their 1970 annual report. After 1971, once again increasing return pattern seems to have been established.

Return on total assets also has the same pattern as return on net worth.

Profit margin on sales graph indicates a healthy note for the company. Almost all through the period of study the ratio has an advancing trend. The company has a reasonably good buffer against any lowering of price in its product line before making a net loss.

Total assets turnover indicates that the management has not been using its assets to full capacity. This is inherent of this type of business due to high inventory of liquor needed for aging.

Inventory turnover also indicates increasing high inventory, especially after 1966. This is possibly due to aging of liquor so that whatever the company anticipates to sell after a few years, investment in the raw materials has to be made some years earlier.

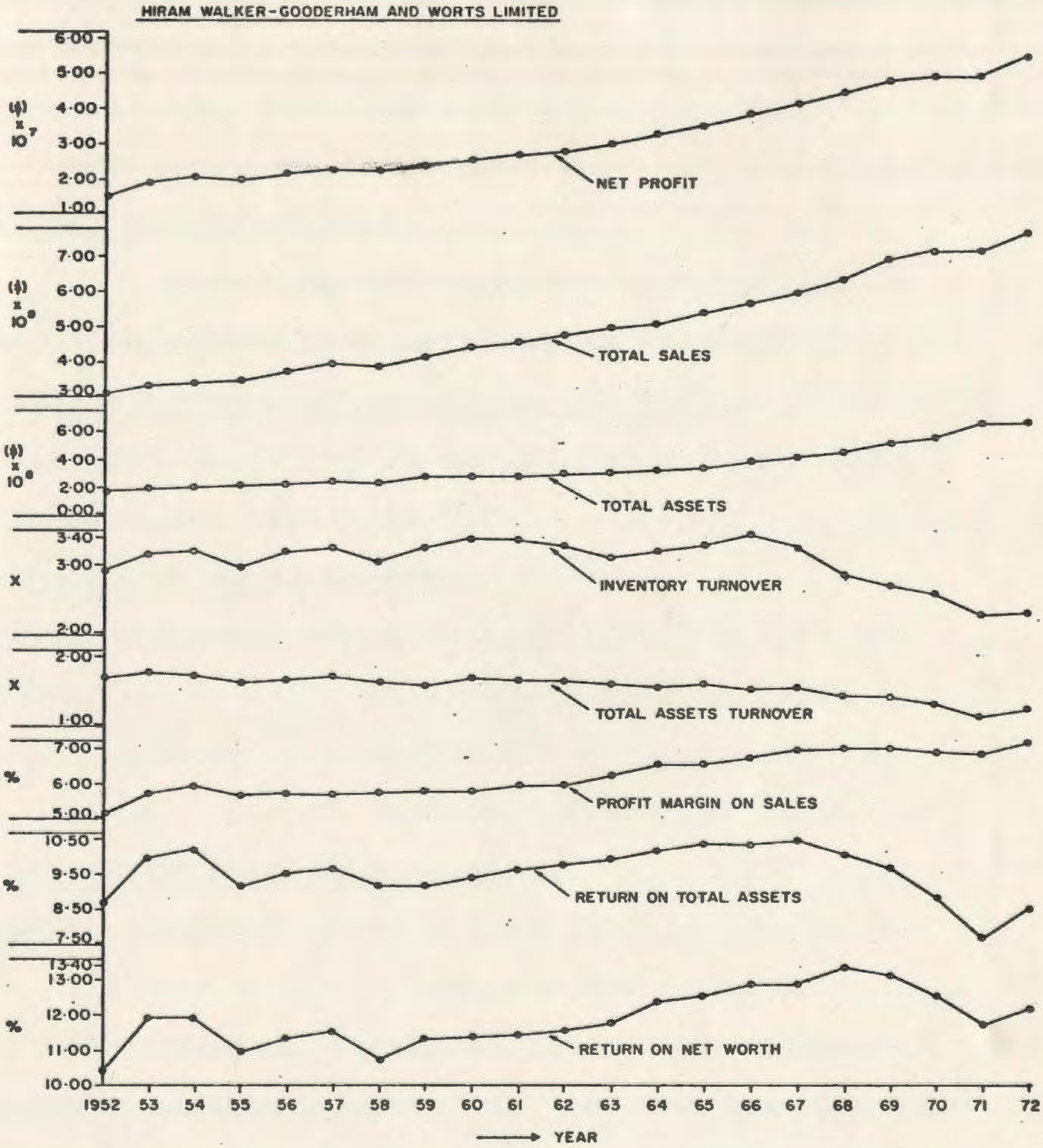


FIG. 4.2

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR HIRAM WALKER - GOODERHAM AND WORTS LIMITED.

4.2.3 Texaco Canada Limited:

A fully integrated oil company, engaged in exploration for, production and refining of crude oil and natural gas, and distribution in Canada of industrial oil, lubricants, gasoline, fuel oils, liquified petroleum gases and petrochemicals.

Growth of this company over the period of study is indicated by the following statistics:

(1) Range of rate of return on net worth: From 13.4% in 1952 to 16.19% in 1972. The highest rate of return was 16.95% in 1955.

(2) Range of total assets:

(a) Current: From $37,735,120. in 1952 to $154,355,000. in 1972.

(b) Fixed: From $37,047,822. in 1952 to $237,932,000. in 1972.

(3) Range of total liabilities:

(a) Current: From $13,532,827 in 1952 to $59,609,000 in 1972.

Various financial ratios were looked at from management efficiency point of view and are shown in fig. 4.3. The return on net worth graphs shows a healthy trend in this company from the year 1962 onwards. It has been steadily increasing.

Return on total assets has also been increasing at a steady rate since 1963 except for years

1968 and 1970.

As reported in their 1968 and 1970 annual reports, investment in total assets in these years increased at a greater rate as compared to previous years, which explains the reason for this deviation from their average behaviour pattern.

Profit margin on sales graph also indicates an advancing trend showing that the company has been having an adequate amount of buffer in its pricing policy before the company could undergo loss.

For total assets turnover, it does not show any particular trend as there have been several fluctuations over the period of study, notably in 1968. As is evident from total assets graph which shows a higher rate of growth in assets in 1968 as compared to previous years and on the other hand sales have not grown at the same rate as previous years resulting in this sharp decrease of total assets turnover ratio in 1968.

Inventory turnover ratio shows an advancing trend indicating that sales have been steadily growing in relation to the inventory.

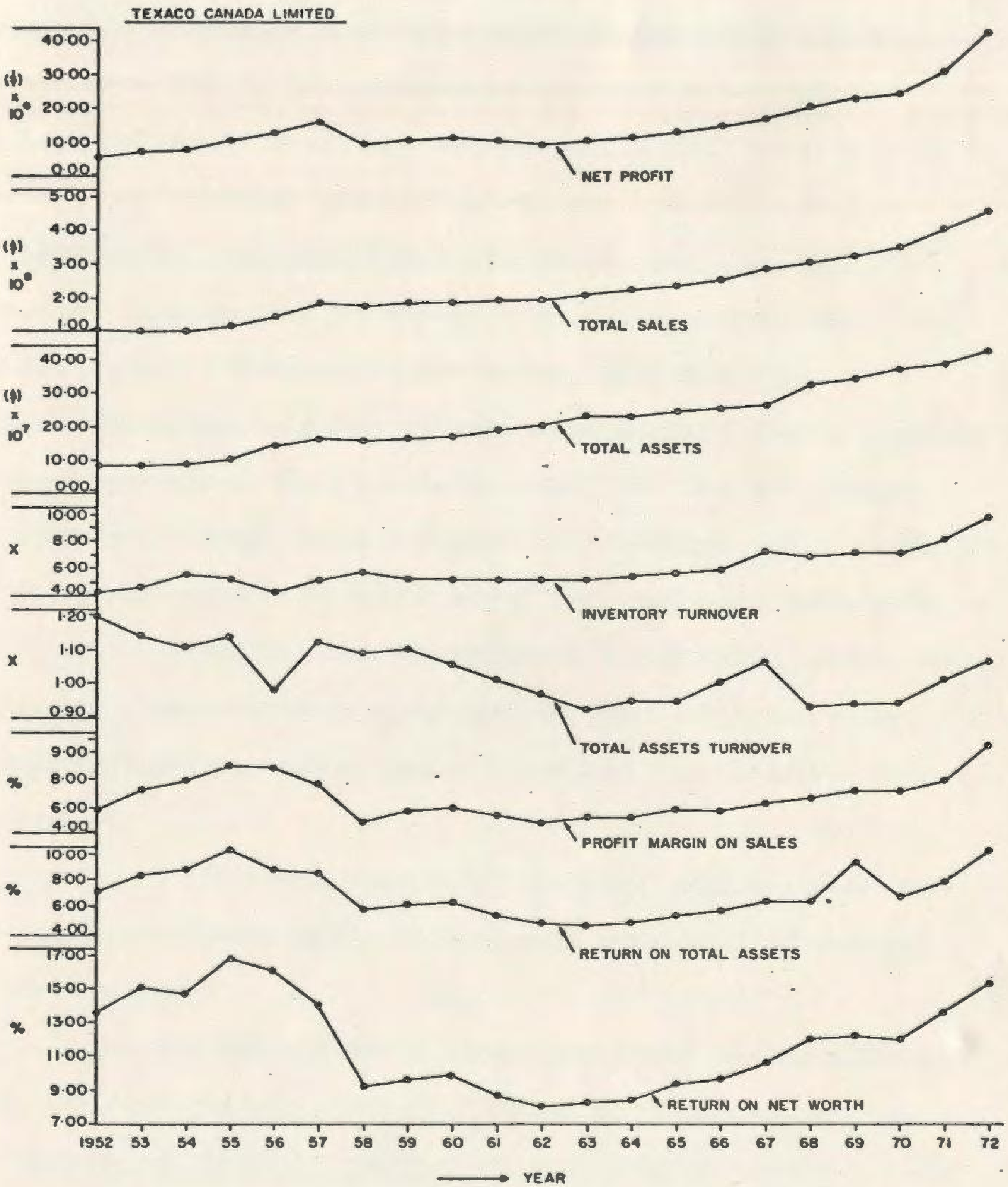


FIG. 4.3

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR TEXACO CANADA LIMITED.

4.2.4 Imperial Oil Limited:

Company together with its subsidiaries, comprises a fully integrated oil enterprise and is the largest such unit in Canada. It engages either directly or through subsidiaries in exploration for and production of crude oil, natural gas and gas by-products, transports crude oil by ocean going and lake tankers, pipe lines and tank cars, operates nine refineries and distributes and markets petroleum products in every province in Canada as well as the Northwest Territories. Chemicals, fertilizers and a wide range of building products are also manufactured and marketed.

Imperial is developing a national chain of 'Voyageur' restaurants associated with ESSO service stations, and is taking participation in Toronto and Calgary.

It is the largest marketer and refiner of petroleum products and the largest producer of crude oil in Canada.

Growth of this company, over the period of study is revealed by the following statistics:

(1) Range of rate of return on net worth: From 11.54% in 1953 to 11.07% in 1972. The lowest return was recorded in 1958 (7.36%) and the highest (12.48%) in 1955.

(2) Range of total assets:

(a) Current: From $231,398,179. in 1953 to $658,000,000. in 1972.

(b) Fixed: From $291,904,708 in 1953 to $1,043,000,000. in 1972.

(3) Range of total liabilities:

(a) Current: From $67,950,571. in 1953 to $269,000,000. in 1972.

(b) Longterm debt: From $561,268,512. to $678,000,000. in 1972.

Relevant financial ratios were looked at from the management efficiency point of view and are shown in Fig. 4.4.

Return on net worth ratio shows an appreciating trend except for years 1967 and 1969.

Return on total assets indicates some fluctuation during the period of study. It can be inferred that the company is not generating enough profits for its total resources. This could be inherent in this type of business due to speculative investments made in exploration ventures.

Profit margin on sales do not show any clear trend. In the years 1966 through 1969 this ratio was all the time decreasing though not dangerously. In their 1969 annual report, it was reported that this downturn had been due to (1) changes in federal income tax regulations, (2) prices which did not keep pace with labour, raw material and service costs and the general economic conditions in the prairies.

In the case of total assets turnover, excessive investments seem to be inherent in this type of business venture as was seen in the case of Texaco Canada Limited. The trend is not very clear as it is fluctuating in nature.

Inventory turnover has generally, an advancing trend although the absolute value is low as compared to Texaco.

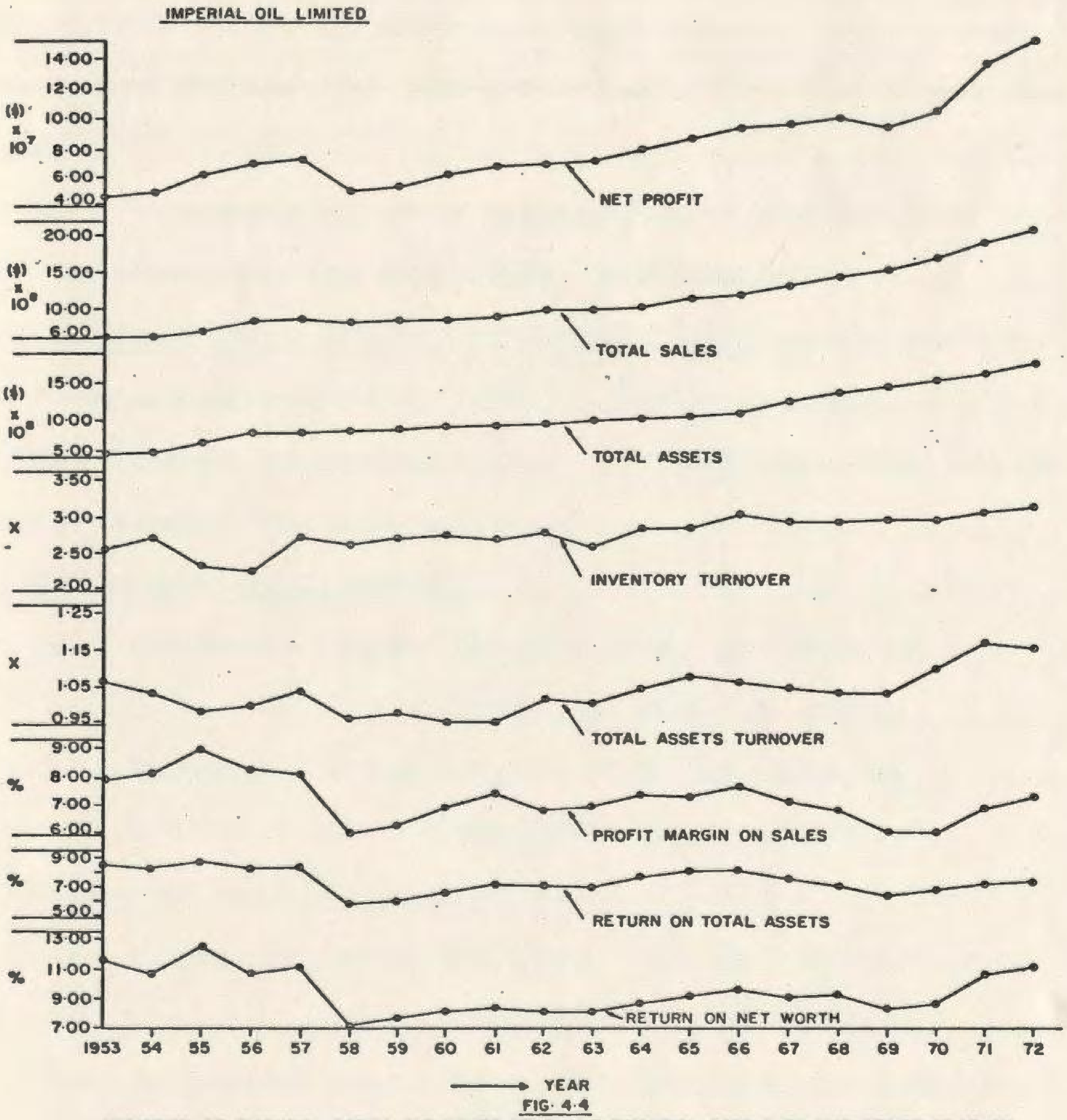


FIG. 4.4

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR IMPERIAL OIL LIMITED.

4.2.5 <u>Westinghouse Canada Limited</u>:

The company manufactures a wide range of utility, industrial and commercial apparatus; electronic equipment; a range of consumer appliances; industrial brakes; and mechanical products including steam and gas turbines.

Growth of this company over the period of study is shown by the following statistics:

(1) <u>Range of rate of return on net worth</u>: It varied from a maximum of 17.80% in 1950 to 3.35% in 1972. The lowest record was that in 1960 when the return was almost zero percent.

(2) <u>Range of total assets</u>:

(a) Current: From $42,448,479. in 1950 to $107,109,000. in 1972.

(b) Fixed: From $8,194,607. in 1950 to $42,706,000. in 1972.

(3) <u>Range of total liabilities</u>:

(a) Current: From $20,792,502. in 1950 to $51,701,000. in 1972.

(b) Longterm debt: From $31,104,028. in 1950 to $34,275,000. in 1972.

Relevant financial ratios were looked at to get an idea about management efficiency. These are shown in Fig. 4.5.

Return on net worth graph indicates drooping characteristic in 1967 and 1972. Annual reports of these years indicate that the company was plagued by strikes, which affected their earnings position greatly.

The strikes in the company have obviously affected the return on total assets in the same way as in above and same is the case with profit margin on sales. This ratio on an average seems to be quite low and that there is no proper buffer in this case to protect the company against loss. Either the pricing system is not adequate, which of course is determined by forces of demand and supply and competition or the labour cost is high which was reported in their 1972 annual report.

In the total assets turnover graph, the trend drops in 1967, 1969, and 1972. It was reported in the 1969 annual report that the investment in new plant and equipment amounted to more than double the 1968 level, which accounts for the drop in 1969, whereas in 1967 and 1972, strikes led to the drop in this characteristic which affected the sales position of the company.

The dip in inventory turnover ratio in 1969 is due to high inventory in this year as the sales graph shows fairly good growth in sales.

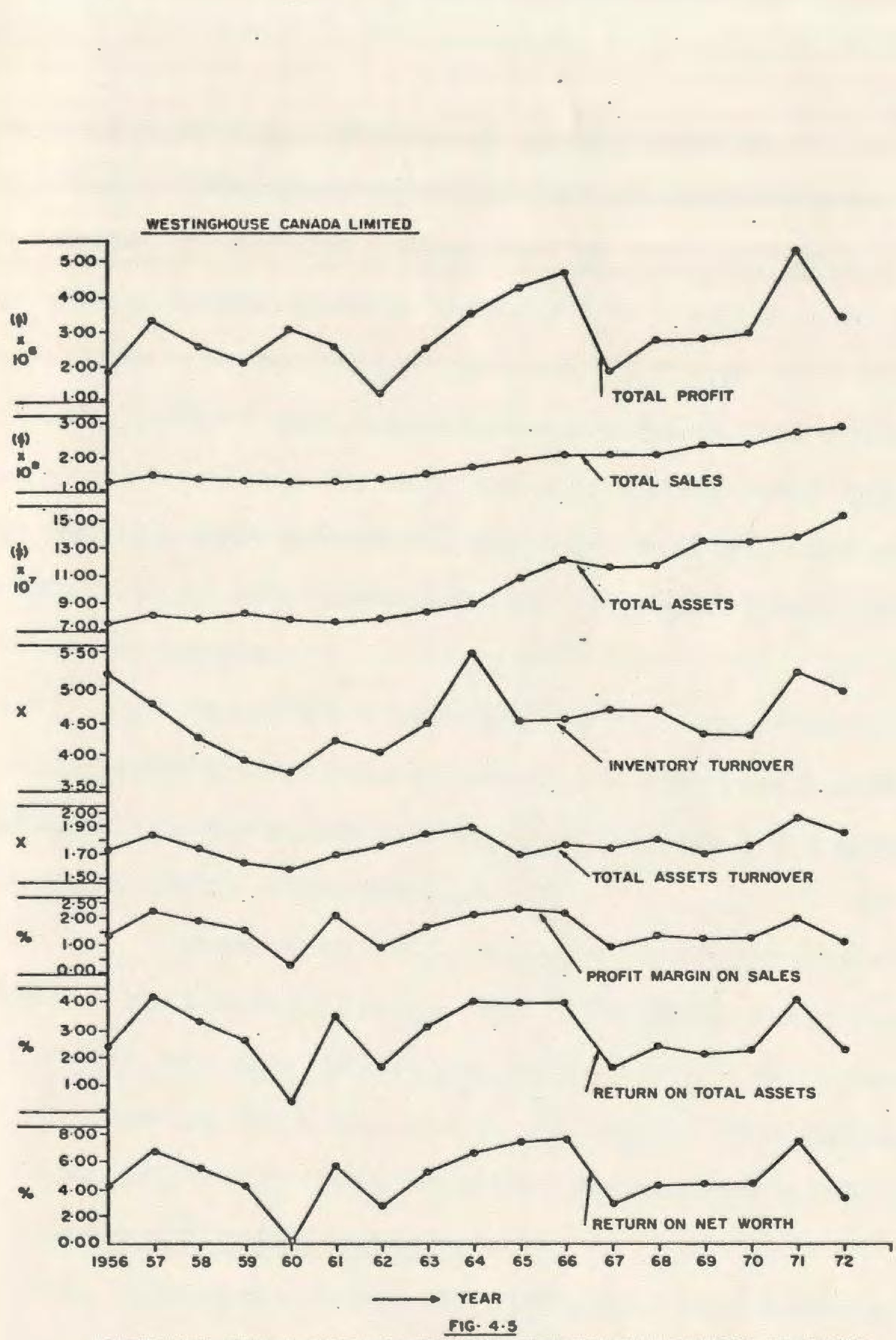


FIG- 4·5

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR WESTINGHOUSE CANADA LIMITED

4.2.6 The Steel Company of Canada Limited:

The company is the largest producer of steel in Canada, producing about 40% of the nation's steel. The annual steel making capacity is over six million tons. Operations are fully integrated. It produces a wide range of flat, rolled and coated steels, bars, rods, wire and wire products, piping and tubing, fasterners and forgings. The company has interest, directly and through subsidiaries in coal, iron and limestone properties in both Canada and the United States.

Manufacturing facilities, comprising 18 plants, are situated in Ontario, Quebec, Alberta and Saskatchewan. Products are marketed throughout Canada and exported to more than fifty countries.

Growth of this company, over the period of study is reflected through the following statistics.

(1) Range of rate of return on net worth: It varied from 11.09% in 1954 to 10.77% in 1972. The maximum return was 16.19% in 1955 and the minimum of 6.07% in 1969.

(2) Range of total assets:

(a) Current: From $95,177,411. in 1954 to $332,613,000. in 1972.

(b) Fixed: From $70,808,318 in 1954 to $671,778,000 in 1972.

(3) Range of total liabilities:

(a) Current: From \$25,055,345 in 1954 to \$133,080,000 in 1972.

(b) Longterm debt: From \$47,962,750 in 1954 to \$244,747,000 in 1972.

Various financial ratios were looked at from management efficiency point of view and shown in Fig. 4.6.

There is a lot of fluctuation in return on net worth over the period of study. It declines at many places, notably in the year 1969. In their 1969 annual report, it was stated that the company faced a crippling strike at two of its plants and there was no production during the two months' strike and after the strike, labour costs rose sharply, due to union demands. For the period after 1970, the trend clearly appreciates for the years 1971 and 1972.

In the return on total assets ratio, it shows a drooping characteristic in 1969 and 1972. Reason for 1969 is quite obvious as stated above and in their 1972 annual report, it was stated that the company had to incur heavy expenditures for: (1) plant rearrangement and major repair programs and (2) abnormally high start-up and break-in costs on several new production units brought into operation.

The graphical representarion for profit margin on sales ratio shows the same characteristics as stated in above two ratios. On an average, it seems safe to conclude that the company has an adequate buffer against any small price changes, before the company undergoes a net loss.

Total assets turnover graph confirms the fact that in 1972, although the profits were low, the sales position of this company was strong. The ratio in 1972 was the same as in 1971, due to heavy expenditures incurred in plant and equipment.

Graphical representation of inventory turnover ratio indicates that in 1972 the inventory was greater in proportion of sales.

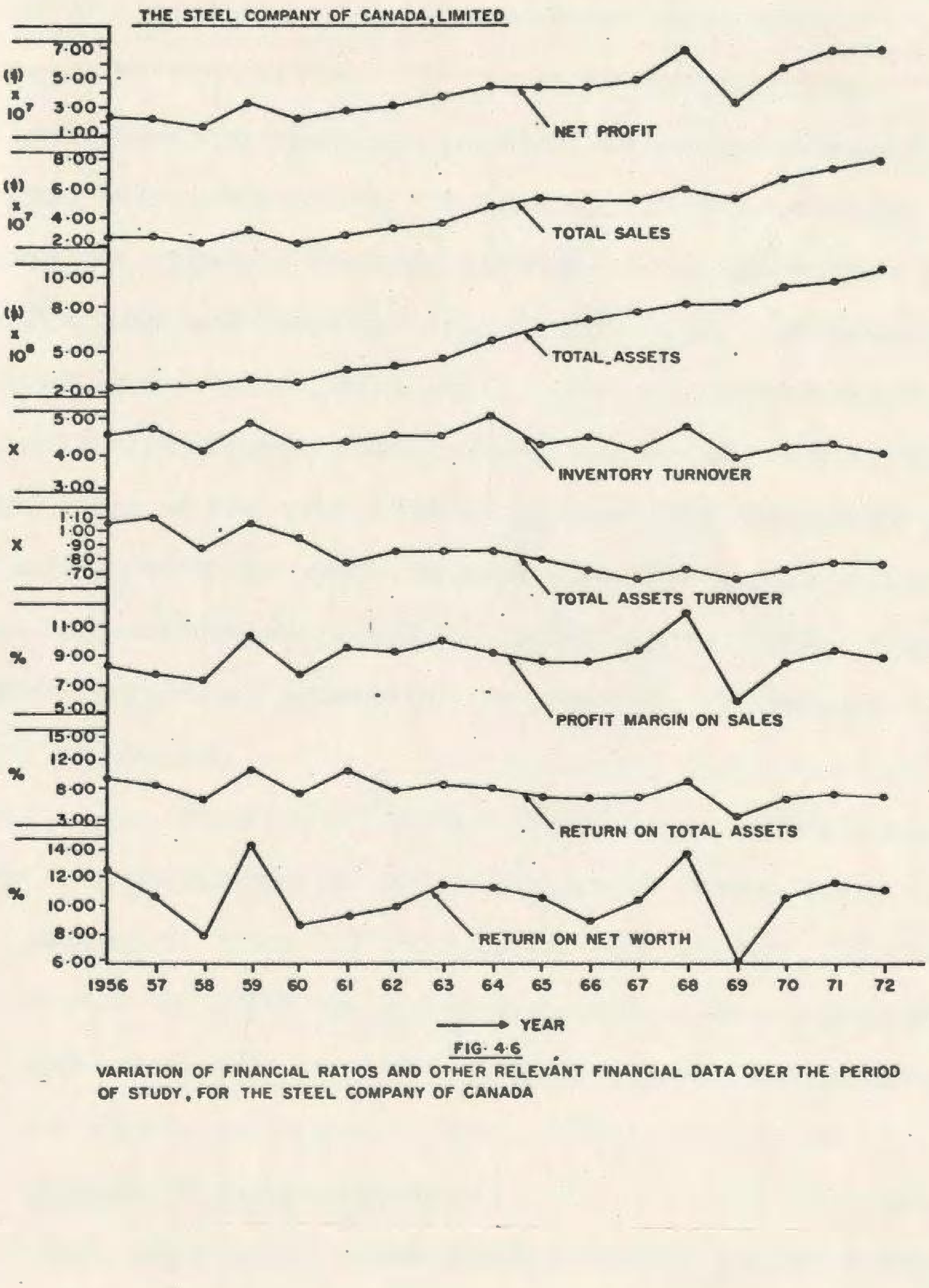


FIG. 4.6

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR THE STEEL COMPANY OF CANADA

4.2.7 Alcan Aluminum Limited:

The company, through subsidiaries and affiliates, is one of the largest producers of aluminum ingot in the world and operates large aluminum fabrication facilities in some 34 countries. It is a holding company, owns all the outstanding common stock of Aluminum Company of Canada Limited and a majority of important interest in some 100 companies engaged in the mining of bauxite; the production, fabrication and sale of aluminum, aluminum products and related industrial chemicals; and the production and sale of hydro-electric power. Operations are conducted in 34 countries, while the international distribution organization has sales offices and representatives or agents in more than 100 countries. Sales of products other than aluminum include calcined bauxite, industrial chemicals and various metal products.

Growth of this company, over the period of study, is revealed by the following statistics:

(1) Range of rate of return on net worth: It varied from 6.91% in 1953 to 6.77% in 1972. The maximum return was recorded in 1954 (14.61%) and the minimum of 5.26% in 1958.

(2) Range of total assets:

(a) Current: From $195,733,148 in 1953 to $892,337,000 in 1972.

(b) Fixed: From $510,493,583 in 1953 to $1,233,956,000 in 1972.

(3) Range of total liabilities:

(a) Current: From $94,187,444 in 1953 to $424,552,000 in 1972.

(b) Longterm debt: From $432,157,174 in 1953 to $1,310,014,000 in 1972.

In order to get an idea about the management efficiency in this company, ratio trend analysis was carried out and shown in Fig. 4.7.

Return on net worth ratio shows a lot of fluctuation over the period of study notably in 1963, 1967, 1970, 1971 and 1972. In all of these annual reports, it was stated that continuous decline in price level (due to supply being greater than demand) had been the major factor for low return. In 1963 overhead expenses rose sharply due to acquisition of four fabricating companies. In 1970, earnings were affected due to strike at one of its plants.

Almost the same character in graphs is confirmed in return on total assets and profit margin on sales.

Total assets turnover ratio, however, has an advancing trend for most of the period of study, which indicates a healthy sales position in relation to the total assets of the company. This is quite obvious from graphs on total assets and total sales, which show an advancing trend for almost whole of the period of study.

The drooping characteristic in inventory turnover ratio for some of the years of study is explained by the directors in their annual reports, that the estimated demand was higher than the actual and therefore increased supply in the world resulted in large inventories in these years.

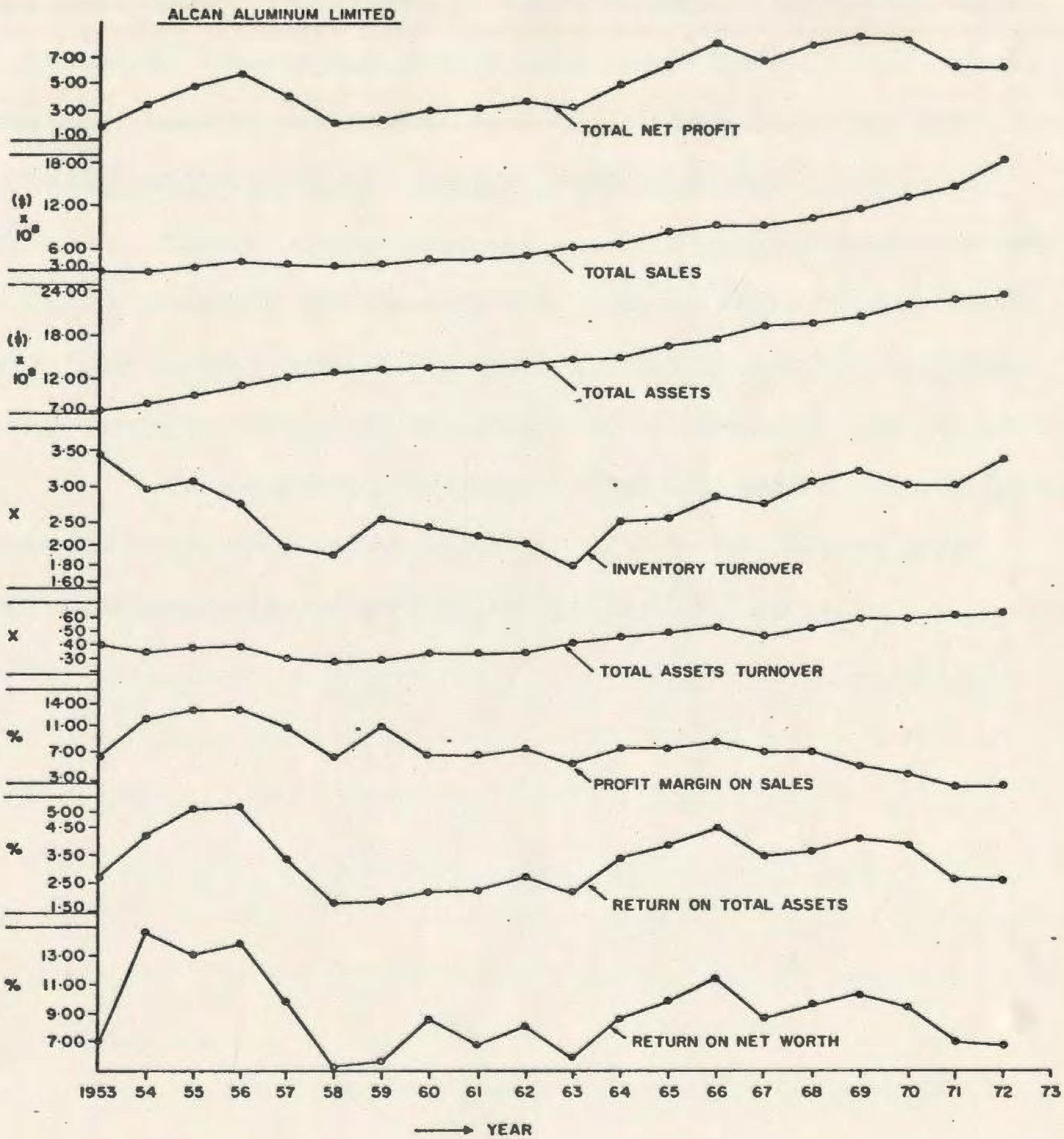


FIG. 4.7

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA OVER THE PERIOD OF STUDY, FOR ALCAN ALUMINUM LIMITED.

4.2.8 Conclusions on Ratio Trend Analysis

From the graphs on variation of financial ratios and other relevant financial data, it is clear that three of the seven companies were rather unstable during the period of study and if looked at from the investors' point, their future record would look skeptical. These companies were (1) Westinghouse Canada (2) Steel Company of Canada (3) Alcan Aluminum. Rest of the four companies presented a fairly stable outlook for the future, if past is some reflection of the future.

On an overall basis, the financial condition of most of the companies in the 1950-1959 range, was rather unstable as compared to 1960-1970 span.

4.3 Regression Analysis and Application of the Model:

In order to be able to predict the share prices, various unknown parameters in equation number (15) - (refer section 3.1) were to be determined. These were determined by performing time series multiple regression analysis on equation number (15), which was:

$$\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \ln(D/B)_t$$

$$+a_3 \ln S_t + a_4 \ln U$$

For each year between 1950 and 1970 (depending on the availability of data on a particular company), various independent variables and the dependent variable were determined and tabulated in the above log. form (complete input data for all companies are attached in Appendix - A). Variables in the above equation were:

(1) $(P/B)_t$, which is price per share divided by book value per share - in a particular year. Price of the stock was taken as the average of the high and low values in a particular year.

(2) g_t, the growth in dividends was determined by the product of 'b', the earnings retention fraction and 'r_t', the rate of return on net worth. This was shown in section 3.1.

(3) $(D/B)_t$, which is the dividends divided by the book value per share in a particular year.

(4) S_t, the size of the corporation was determined by the product of (a) number of outstanding common stock for a particular year and (b) the corresponding book value per share.

(5) U_t, the instability of past earnings was not included in the study as it would have made the model complicated.

The final estimating equation, therefore, was:

$$\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \ln (D/B)_t + a_3 \ln S_t \qquad (16)$$

For time series multiple regression analysis, computer program BMDO2R was used, explained later in the chapter. After feeding data on a particular company in the log form, various unknown parameters i.e. $\ln a_o$, $\ln a_1$, a_2 and a_3 were determined with the help of the above computer program. It must be noted, however, when predicting the share prices for 1971, data up to 1970 was considered and data up to 1971 was included, when predictions for 1972 were made. After obtaining values of the unknown parameters, when share prices were to be predicted for a particular year, different variables in the above equation were determined in the following manner:

(1) B_t was the book value per share in the year for which share prices were to be predicted.

(2) g_t, the growth in dividends, being the product of 'b' and 'r_t'. Retention rate 'b' was the variable which gave different share prices and the limits of

variation of 'b' were determined by the two limits found in past historical data of the company. Expected rate of return on net worth 'r_t' was also predicted with the help of the above computer program, by performing time series regression analysis on the relationship between 'r' and 'b', which was developed after a series of trials on different models incorporating 'r' and 'b'. The model suggested by Gordon as explained in Section 3.1 (equation 10) was found to be unsuitable and after a number of trials the following model was found suitable and adopted in this study:

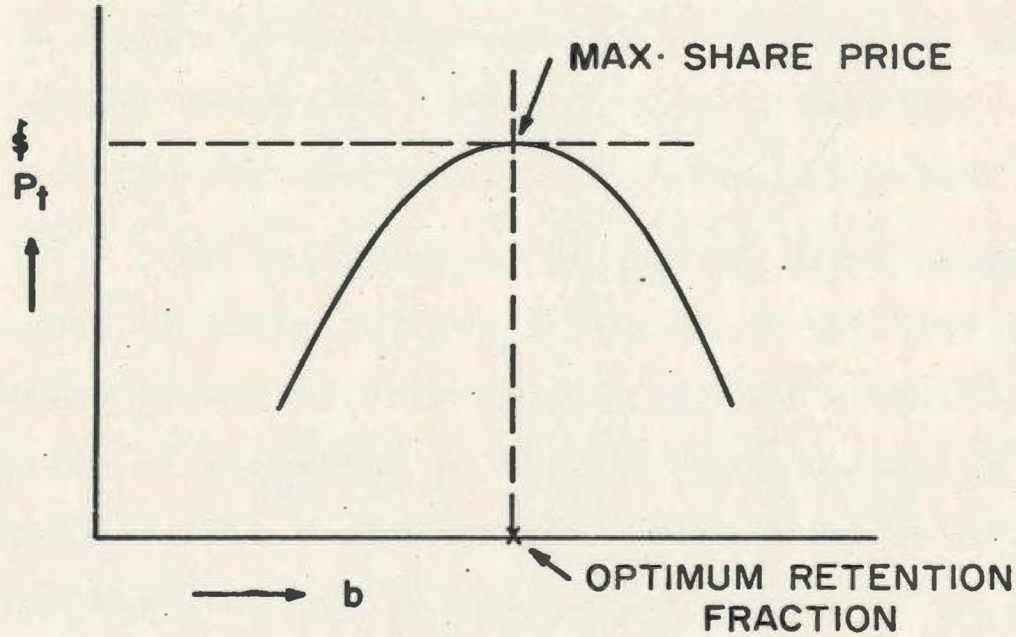
$$r = W(1+b)^{m} \tag{17}$$

In the log form, the above model is:

$$\ln r = \ln W + m \ln (1+b) \tag{18}$$

This is a straight line relationahip, ln W being the cut off on the y - axis and 'm' slope of the straight line.

When a time series regression analysis on the above model was performed, data up to 1970 was taken into account when shares prices for 1971 were predicted and for prediction of share prices for 1972 data up to 1971 was considered.



FIG· 4·8

EXPECTED SHARE PRICE VARIATION WITH EARNINGS RETENTION RATE·

(3) B_t, the book value per share for a given year was known and 'D_t' by definition is (1-b) Y_t, where Y_t is the earnings per share in that particular year and 'b' is the variable which generated different share prices as explained above.

(4) S_t, size of the company was determined by product of number of shares outstanding in a particular year and the corresponding book value per share.

As noted above, different share prices were generated by using different values of 'b', the earnings retention fraction. Acording to Gordon's model, the sole objective of a company in its dividend policy is the maximization of its share prices. Therefore, optimum retention rate is the value of 'b' corresponding to which the share price is the maximum. In other words (1-b) is the optimum dividend rate, where value of 'b' is the one, corresponding to which the share price is the maximum. The expected graph between the predicted share price'P_t' and the retention rate 'b' is shown in Fig. 4.8. However, this type of a graph was not obtained due to limitations on the values of 'b' which depended on the limits in the values of 'b' in past historical data of the company.

It must, however, be noted that share prices were predicted only where a variable was found to be making a significant contribution to the share price.

For some of the companies, complete data starting from 1950 was not available and therefore in these companies, analysis was performed for a few years less than the proposed period of twenty years i.e. from 1950 to 1970.

The share price considered in the analysis was the average of high and low values during the year and this was a limitation of the analysis. A true average share price is desirable but was not possible due to data limitations.

4.3.1 Computer Program Used for Regression Analysis:

The computer program used for time series multiple regression anslysis of the two equations, i.e. = n (16) and (18) was BMDO2R - STEPWISE REGRESSION. General description of the program is given below:

(a) This program computes a sequence of multiple linear regression equations in a stepwise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares. Equivalently it is the variable which has highest partial correlation with the dependent variable partialled on the variables which have already been added; and equivalently it is the variable which, if it were added, would have the highest 'F' value. In addition, variables can be forced into the regression equation. Non-forced variables are automatically removed when their 'F' values become too low.

(b) Output from this program includes:

(1) At each step:

(a) Multiple R

(b) Standard error of estimate

(c) Analysis of variance table

(d) For variables in the equation:

(1) Regression coefficient

(2) Standard error

(3) 'F' to remove.

(e) For variables not in the equation:

(1) Tolerance

(2) Partial correlation coefficient

(3) 'F' to enter

(2) Optional output prior to performing regression:

(f) Means and standard deviations

(g) Covariance matrix

(h) Correlation matrix

(3) Optional output after performing regression:

(i) List of residuals

(j) Plots of residuals vs input variables

(k) Summary table

Computer input data on the companies is attached in Appendix - A and output from the computer print out is Summarised in the next chapter on 'Regression Results'.

4.3.2. Autocorrelation and Multicollinearity

Whenever regression analysis is done, problems like autocorrelation and multicollinearity do come into play. These problems were recognized in this study and statistical techniques were employed to test if these problems would distort the results.

(a) Autocorrelation:

It is the lag relationship in time series samples. When the value of a variable in a given time unit is correlated with the value of that same variable in the previous time unit, this lag relationship is called auto correlation. Therefore, this problem is mainly encountered in time series analysis.

Ya-lun Chou (1969, a) states:

> Auto correlation enters into time series in a number of ways: First, when time units are too short, random terms are automatically correlated. For instance, if a series is reported in time units of months or weeks, then the random terms have to absorb the effects of the months being different in length, weather, and holidays-effects that are not random in the short period but that follow with the recurrence of a year. Second, the existance of the trend element in a series also produces serial correlation. The trend values appear in ordered sequence, and each value is, in a sense, determined by the value that precedes it. Finally, cyclical variations impose a regularity among successive observations of the variable over time and thus introduce the same effects into the series as does the trend.

The method employed to test the independence in time series is based on the mean-square-successive difference and is called the Von Neuman Ratio (K).

This value of K is defined as:

$$K = \frac{\bar{m}^2}{Sy^2}$$

where m^2 stands for the mean-square-successive difference and is obtained by

$$m^2 = \frac{(y_{i+1} - y_i)^2}{n - 1}$$

and $$sy^2 = \frac{1}{n} \quad (y_i - \bar{y})^2$$

where 'y' is the value of the variable and 'n' the number of years under study.

About the value of K, Chou (1969, b) stated that:

> ....the ratio K is closely related to the variance of the first difference. When these differences are small, a small K will result and positive serial correlation in the population is indicated. When these differences are large, a large K will result and negative serial correlation is revealed. Thus, very large and very small values of K would lead us to the rejection of randomness or independence.

(b) Multi Collinearity

High intercorrelation between the dependent variables can make the regression results misleading in terms of their coefficients and their standard errors. One way to look at the magnitude of this problem is to see the simple correlation between the dependent variables.

About the problem of multi collinearity, Johnston (1963) stated:

> This is the name given to the general problem which arises when some or all of the explanatory variables in a relation are so highly correlated one with another that it becomes very difficult, if not impossible, to disentangle their separate influences and obtain a reasonably precise estimate of their relative effects.

Regarding problems associated with multi collinearity, Goldberger (1964) contended:

> In practice an exact linear relationship is highly improbable but the general interdependence of economic phenomena may easily result in the appearance of approximate linear relationships in time series of regressors ....multi collinearity may produce large standard errors of the coefficients; we will be very uncertain of their population values; we will be unable to reject very diverse hypothesis concerning them. Note that it is entirely possible to have a relationship that fits very well- R^2 can be very high- while no coefficient tests to be significantly different from zero. (Suppose a simple correlation on X_1 gives a high R^2, and consider what will happen when a multiple regression is taken on X_1 and X_2, where x_2 is virtually a constant multiple of X_1. The R^2 cannot fall, of course, but the standard errors will explode).

In this study intercorrelation between the independent variables rarely got as high as .8 or .9, as will be seen later, therefore, multicollinearity was not much of a problem.

Auto correlation was present in the companies undertaken in this study. In cases where auto correlation was significant, results were compared with the theory to decide whether the conclusions were justified or not.

Statistical results should support the theory so as to make the conclusions valid, irrespective of the presence of auto correlation.

Correlation matrices for the share price model are attached in Appendix - C. These matrices were looked at while determining the presence of multi collinearity.

For calculation of Von-Neuman ratio, a computer program was written. These results are attached in Appendix - D.

CHAPTER 5

REGRESSION RESULTS AND DISCUSSION

In this study, seven companies were examined with the help of time series multiple regression analysis. Computer program BMDO2R was used for this purpose. Tests were conducted to examine accuracy of regression results. The period of study was between 1950 and 1970.

Two kinds of regression were performed: first was to regress expected rate of return on net worth 'r' on the earnings retention fraction 'b'. Second, share price 'P_t' was regressed on the three independent variables, i.e. growth in dividends 'g_t', dividends 'D_t' and size 'S_t'. These two models were the equations (18) and (16) respectively (Section 4.3).

In companies where significant results were obtained, an attempt was made to forecast share prices for 1971 and 1972 and therefrom determined an optimum dividend rate. These predicted share prices were then compared with the actual share prices in order to determine the accuracy of prediction.

While forecasting share prices for 1972, data for 1971 was also included. From here onwards samples including data up to 1970 and 1971 will be called 1970 and 1971 samples respectively.

Each of the seven companies was analysed individually as explained in the following pages.

5.1 British Columbia Telephone Company.

This company had been regularly paying out dividends and the value of 'b', the fraction of earnings retained was between 0.2 and 0.5.

(a) For regression equation, $\ln(r) = \ln(w) + m\ln(1+b)$, time series regression analysis was made and tests were conducted to determine the accuracies of the regression results.

Looking at Table 5.01, standard error of coefficient 'm' for the years 1970 and 1971 is .13 and .12, respectively and coeff./its standard error is more than six. Therefore, the coefficient is significant at 5 percent level, in both the cases.

The coefficient of determination, 'R^2' is about 75% in both the cases and therefore, the independent variable 'b' explains about 75% of the variation the rate of return on net worth 'r' which is quite significant.

F-ratio indicates that the regression relationship between the above two variables is highly significant, being greater than 99.9%.

Accuracy of the estimate is reflected through the standard error of estimate, which is about .06, being quite low, proves that the results are fairly accurate.

In Table 5.02, values of the expected rate of return on net worth 'r' are predicted for 1971 and 1972 using different values of the earnings retention fraction 'b'. The limits of variation of 'b' were dependent on the two extreme values of 'b' found in the past historical data of the company. Values of the cut off '$\ln\ddot{w}$' and the slope 'm' were used from table 5.01.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g + a_2 \ln(D/B)_t + a_3 \ln(S)_t$, time series multiple regression analysis revealed the following:

Referring to Tables 5.03 and 5.04 for 1970 and 1971 samples respectively, greatest contribution to share price is made by growth factor. Value of the coeff./its standard error is < 2 and therefore is not significant at the 5% level. Same is the case with the other two variables in the equation, i.e. none of the coefficients is significant at the 5% level.

The coefficient of determination 'R^2' is very low in both the cases, about 4-10%. The results are not at all reliable as the F-ratio is very low and the level of significance is therefore less than 90%.

As shown by the above results, this company was one of the two companies in this study which failed to produce any significant results. No influencing factor could be determined. It seems, in this company, investors place value on some other variable which have not been taken into account in this study.

Due to insignificant results obtained above, share prices were not predicted and an optimum dividend rate could not be determined.

TABLE 5.01

REGRESSION OF RATE OF RETURN ON NET WORTH 'r' ON THE EARNINGS RETENTION FRACTION 'b' - BRITISH COLUMBIA TELEPHONE COMPANY (PERIOD 1953 - 1970 & 1971)

Analysis \ Input Data Upto Year-	1970	1971
Value of constant 'lnw'	1.71799	1.71768
Value of coeff. 'm'	0.90269	0.90742
Standard error of coeff. 'm'	0.13151	0.12676
Correlation coeff 'R'	0.8640	0.8665
'R^2'	0.7465	0.7490
Degrees of freedom : regression/residual	1/16	1/17
'F' - Ratio	47.117	51.244
Level of significance (from tables)	greater than 99.9%	greater than 99.9%
Standard error of estimate	0.0669	0.0650

TABLE 5.02

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - BRITISH COLUMBIA TELEPHONE COMPANY

(Limits of variation of 'b' depending on past historical data of the company, using values of constant term and the coefficient from Table 5.01)

Variation of 'b' \ Predicted Values of 'r' for year-	1971	1972
0	5.5906	5.5719
0.1	6.0719	6.0749
0.2	6.5482	6.5740
0.3	7.0189	7.0692
0.4	7.4846	7.5609
0.5	7.9467	8.0494

TABLE 5.03

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - BRITISH COLUMBIA TELEPHONE COMPANY

(Period 1953 - 1970)

Input Data Upto Year 1970		
1st. Step: Variable Included: $(g)_t$		
Value of constant: $\ln a_0$		0.25907
Value of coeff: $\ln a_1$ (std. error)	0.02446	(0.01919)
Multiple corr. coeff. 'R'		0.3036
'R^2'		0.0921
Standard error of estimate		0.0848
Degrees of freedom: reg/residual		1/16
F-Ratio		1.625
Level of significance (from tables)	less than 90%	
2nd Step: Variables Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		0.22574
Value of coeff: $\ln a_1$ (std. error)	0.01559	(0.02403)
Value of coeff: a_3 (std. error)	0.02502	(0.03943)
Multiple corr. coeff. 'R'		0.3405
'R^2'		0.1159
Standard error of estimate		0.0864
Degrees of freedom: reg/residual		2/15
F-Ratio		0.983
Level of significance	less than 90%	
3rd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.46968
Value of coeff: $\ln a_1$ (std. error)	0.01483	(0.02535)
Value of coeff: a_2 (std. error)	0.09278	(0.59984)
Multiple corr. coeff. 'R'		0.3427
'R^2'		0.1174
Standard error of estimate		0.0894
Degree of freedom: reg/residual		3/14
F-Ratio		0.621
Level of significance	less than 90%	

TABLE 5.04

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - BRITISH COLUMBIA TELEPHONE COMPANY

(Period 1953 - 1971)

Input Data Upto Year 1971

1st. Step: Variable Included: $(g)_t$		
Value of constant: $\ln a_0$		0.26521
Value of coeff: $\ln a_1$ (std. error)	0.01797	(0.02073)
Multiple corr. coeff. 'R'		0.2057
'R^2'		0.0410
Standard error of estimate		0.0928
Degrees of freedom: reg/residual		1/17
F-Ratio		0.751
Level of significance (from tables)	less than 90%	

2nd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	
Value of constant: $\ln a_0$		0.5928
Value of coeff: $\ln a_1$ (std. error)	0.01625	(0.02319)
Value of coeff: a_2 (std. error)	-0.07509	(0.39725)
Multiple corr. coeff. 'R'		0.2108
'R^2'		0.0444
Standard error of estimate		0.0955
Degrees of freedom: reg/residual		2/16
F-Ratio		0.372
Level of significance	less than 90%	

3rd. Step: Variable Included: (1) g_t	(2) $(D/B)_t$	(3) $(S)_t$
Value of constant: $\ln a_0$		-0.02895
Value of coeff: $\ln a_1$ (std. error)	0.01723	(0.02796)
Value of coeff: a_2 (std. error)	-0.10951	(0.65348)
Value of coeff: a_3 (std. error)	-0.00471	(0.06955)
Multiple corr. coeff. 'R'		0.2115
'R^2'		0.0447
Standard error of estimate		0.0987
Degrees of freedom; reg/residual		3/15
F-Ratio		0.235
Level of significance	less than 90%	

5.2 Hiram Walker-Gooderham and Worts Limited:

The company had been regularly paying out dividends all along the period of study, though the earnings retention fraction 'b' has been fluctuating over the period of study and varied between 0.2 and 0.8 over this period.

(a) For regression equation, $\ln(r) = \ln(w) + m\ln(1+b)$ time series regression analysis was done and tests were conducted to examine accuracies of the regression results.

Looking at Table 5.05 the value of coeff./ its standard error in both the samples is < 2, therefore, the coefficient is not significant at 5 percent level.

The coefficient of determination 'R^2' for both 1970 and 1971 samples is about 6%, i.e. only 6% of the variation in the expected rate of return on net worth 'r' is explained by variation in the earnings retention rate 'b'. This is confirmed by the poor F-ratio which is less than 90% significant.

In fact, the above relationship is poor and a new structure for this relationship is called for. Nevertheless, an attempt has been made to use the same results as obtained above for prediction of the share price. Therefore, the values of 'r', the expected rate of return on net worth have been predicted for different values of 'b', the earnings retention rate, in Table 5.06. The limits of variation of 'b' were, of course, dependent on the company's past historical data. Values of the two parameters determined by regression analysis were taken from table 5.05.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \times \ln(D/B)_t + a_3 \ln(S)_t$

time series multiple regression analysis revealed the following:

Referring to Tables 5.07 and 5.08 maximum contribution to the share price is made by size $(S)_t$ variable and its sign is also positive, which is in line with what was anticipated. In both cases, ratio of the size coefficient to its standard error is greater than 5, hence, the coefficient is significant at the 5% level.

Variation in share price is explained to the extent of 73% and 63% for 1970 and 1971 samples, respectively, by variation in the size variable. Looking at F-ratio when only size is included in the regression equation, it is quite high and this relationship is more than 99.9% significant in both the cases. The standard error of estimate, which is 0.17 and 0.19, respectively for 1970 and 1971 samples is quite low and therefore, the above results are fairly accurate.

The other two variables, i.e. dividends and the growth factor do not affect the share prices to any significant extent and their coefficients are not significant at the 5% level. In the second sample i.e. for year 1971, growth factor made such insignificant contribution to the share price that it was not included in the analysis.

The simple intercorrelation between the three independent variables are quite low thus negating the possibility of any multi-collinearity present. The low value of Von Neuman ratio (K) which is .58 and .21, respectively for values of rate of return on new worth 'r' and $(P)_t$ the share price, indicates that these fall below the critical value of 1.38 (for sample size 21 at 0.05 level of significance). Although auto-correlation is present in this data, even then it does not alter the conclusion that size is an important factor in explaining the share price as it agrees with the theory.

Share price is predicted and shown in Tables 5.09 and 5.10 for years 1971 and 1972 respectively, when only size factor is taken into account. Since size is not affected by the value of the earnings retention fraction 'b', share prices are therefore constant at one value for each of the years 1971 and 1972.

According to Gordon's model, investors do not place any value on the dividends paid out by the company and growth in dividends. The share price predicted for 1971 and 1972 respectively is $62.01 and $63.54 and is independent of the earnings retention rate. This is shown in Tables 5.09 and 5.10. The actual price for these years was $38.50 and $47.50, respectively, with values of 'b', being 0.48 and 0.53.

Obviously the relationship of dependence of share price on different variables needs to be improved and some other factors taken in account in attempting to explain variation in share prices.

TABLE 5.05

REGRESSION OF RATE OF RETURN ON NET WORTH 'r' ON THE EARNINGS RETENTION FRACTION 'b' - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Period 1952 - 1970 & 1971)

Analysis / Input Data Upto Year -	1970	1971
Value of constant 'lnw'	2.37821	2.37870
Value of coeff. 'm'	0.24241	0.23831
Standard error of coeff. 'm'	0.22964	0.22338
Correlation coeff. 'R'	0.2480	0.2439
'R^2'	0.0615	0.0594
Degrees of freedom: regression/residual	1/17	1/18
F-Ratio	1.114	1.138
Level of significance (from tables)	less than 90%	Less than 90%
Standard error of estimate	0.0683	0.0665
Value of 'K' (Von-Neuman ratio)	0.58	0.58

TABLE 5.06

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Limits of variation of 'b' depending on past historical data of the company, using value of constant and the coefficient from Table 5.05)

Variation of 'b' \ Predicted Values of 'r' for year -	1971	1972
0.2	11.2729	11.2699
0.3	11.4938	11.4870
0.4	11.7021	11.6916
0.5	11.8995	11.8855
0.6	12.0871	12.0697
0.7	12.2661	12.2453
0.8	12.4372	12.4133

TABLE 5.07

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Period 1952 - 1970)

Input Data Upto Year 1970		
1st. Step: Variable Included: $(S)_t$		
Value of constant: $\ln a_0$		-0.44165
Value of coeff: a_3 (std. error)	0.96613	(0.14167)
Multiple corr. coeff. 'R'		0.8557
'R^2'		0.7356
Standard error of estimate		0.1703
Degrees of freedom: reg/residual		1/17
F-Ratio		46.505
Level of significance (from tables)	greater than 99.9%	
2nd Step: Variables Included: (1) $(g)_t$ (2) $(S)_t$		
Value of constant: $\ln a_0$		-0.27121
Value of coeff: $\ln a_1$ (std. error)	-0.04242	(0.032205)
Value of coeff: a_3 Std. error)	1.03763	(0.14879)
Multiple corr. coeff. 'R'		0.8710
'R^2'		0.7586
Standard error of estimate		0.1667
Degrees of freedom: reg/residual		2/16
F-Ratio		25.157
Level of significance	greater than 99.9%	
3rd. Step: Variables Included: (1) g_t (2) $(D/B)_t$ (3) S_t		
Value of constant: $\ln a_0$		-0.54568
Value of coeff: $\ln a_1$ (std. error)	-0.06304	(0.07087)
Value of coeff: a_2 (std. error)	-0.12428	(0.37797)
Value of coeff: a_3 (std. error)	1.08692	(0.21428)
Multiple corr. coeff. 'R'		0.8720
'R^2'		0.7603
Standard error of estimate		0.1715
Degrees of freedom: reg/residual		3/15
F-Ratio		15.872
Level of significance	greater than 99.9%	
Value of K		0.21

TABLE 5.08

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - HIRAM WALKER GOODERHAM AND WORTS LIMITED

(Period 1950 - 1971)

Input Data Upto Year 1971		
1st. Step: Variable Included: $(S)_t$		
Value of constant: $\ln a_0$		-0.33415
Value of coeff: a_3 (std. error)	0.81887	(0.14578)
Multiple corr. coeff. 'R'		0.7980
'R^2'		0.6368
Standard error of estimate		0.1931
Degrees of freedom: reg/residual		1/18
F-Ratio		31.554
Level of significance (from tables)	greater than 99.9%	
2nd Step: Variables Included: (1) $(D/B)_t$ (2) $(S)_t$		
Value of constant: $\ln a_0$		0.27154
Value of coeff: a_2 (std. error)	0.21238	(0.19618)
Value of coeff: a_3 (std. error)	0.80090	(0.14603)
Multiple corr. coeff. 'R'		0.8125
'R^2'		0.6601
Standard error of estimate		0.1922
Degrees of freedom: reg/residual		2/17
F-Ratio	16.514	
Level of significance	greater than 99.9%	

TABLE 5.09

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1971 - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Using values of constant term and the coefficients from Table 5.07 for year 1971. Values of the rate of return on net worth 'r_e', taken from Table 5.06)

Acutal Share Price = $38.50

Prediction for Year 1971

Variable Included: $(S)_t$

Values of 'b'	Share Price 'P_t' in $
0.2	62.01
0.3	(constant
0.4	for
0.5	different
0.6	values of
0.7	'b')
0.8	

TABLE 5.10

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1972 - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Using values of constant term and the coefficients from Table 5.07 for year 1972. Values of the rate of return on net worth 'r_t', taken from Table 5.06)

Actual Share Price = $47.25

Prediction for Year 1972

Variable Included: $(S)_t$

Values of 'b'	Share Price 'P_t' in $
0.2	63.54
0.3	(constant
0.4	for
0.5	different
0.6	values of
0.7	'b')
0.8	

5.3 Texaco Canada Limited:

This company had been regularly paying out dividends all through the period of study. The retention fraction 'b' varied between 0.4 and 0.8 over the period of study.

(a) For regression equation, ln(r) = ln(w) +mln(1+b), time series regression analysis was made and tests were conducted to examine accuracies of the regression results.

Looking at Table 5.11, the standard error of coefficient 'm' for the 1970 and 1971 samples is 0.73 and 0.66, respectively, and in both cases, coeff./its standard error is greater than four. Hence, the coefficient is significant at 5 percent level in both cases.

The coefficient of determination 'R^2', which is the percentage of variation in dependent variable explained by variation in the independent variable, is 63% and 60% for 1970 and 1971 samples, respectively. From the F-ratios for both the years, it is clear that the regression relationship between the two variables is highly significant, therefore, the results are reliable.

The standard error of estimate of 0.14 and 0.15 for 1970 and 1971, respectively, is quite low, which shows that the results are fairly accurate.

Using the above results, values of the expected rate of return on net worth 'r' are predicted in Table 5.12

for different values of the earnings retention fraction 'b'.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \times \ln(D/B)_t + a_3 \ln(S)_t$, time series multiple regression analysis revealed the following:

Referring to Tables 5.13 and 5.14, maximum contribution to the share price is made by the dividends and the sign of the coefficient is also positive. The next variable added is the growth factor and the last one, of course, is the size. This is the case with both 1970 and 1971 samples. When only dividend factor is included the results are quite encouraging. The values of dividend coeff./its standard error is very high, therefore, the dividend coeff. is quite significant at 5% level. In both, 1970 and 1971 samples, coefficients other than dividends are not significant at 5% level as evidenced by the ratio of coeff./its standard error.

When only dividend factor is taken into the regression equation, the coefficient of determination 'R^2' for 1970 and 1971 samples is 78% and 72%, respectively, which is quite high. The results are reliable as evidenced by very high F-ratio in both the samples, giving a level of significance of greater than 99.9%.

Looking at the standard error of estimate when only dividends are taken in the regression analysis, it is 0.10 and 0.12 for 1970 and 1971 samples, respectively which is quite low, showing that the results are quite accurate.

From the above results, it is quite obvious that for this company, common stock investors place a high value on the dividends paid out by the company.

An examination of simple inter-correlation amongst the three independent variables reveals low values generally, therefore, multi-collinearity is not much of a problem in this case. Auto-correlation is present here as the Von Neuman ratio is below the critical limit of 1.38 at 0.05 level of significance, in both share price (P_t) and rate of return on net worth 'r'. This should not affect the conclusions outlined earlier as the results obtained are in agreement with the theory in this study.

Share prices are predicted in Tables 5.15 and 5.16 for 1971 and 1972, respectively, only when dividends are considered in the regression equation since dividends is the only factor which contributes maximum to the share price and gives reliable and significant results.

According to Gordon's model, the company should retain somewhere around 0.4 of its earnings in both the cases and possibly lesser, for maximization of its share price. The actual share price in 1971 and 1972, respectively, was \$31.37 and \$47.37 and according to Gordon's model, for these share prices the value of 'b', the retention fraction of earnings would have been somewhat around 0.7 in both the samples. Company's actual 'b' for these years was respectively 0.73, which very well agrees with Gordon's model. These are shown in Figs. 5.1 and 5.2.

TABLE 5.11

REGRESSION OF RATE OF RETURN ON NET WORTH 'r' ON THE EARNINGS RETENTION FRACTION 'b' - TEXACO CANADA LIMITED

(Period 1952 - 1970 & 1971)

Analysis \ Input Data Upto Year -	1970	1971
Value of constant 'lnw'	0.58530	0.82849
Value of coeff. 'm'	4.00701	3.45063
Standard error of coeff. 'm'	0.73237	0.66254
Correlation coeff. 'R'	0.7986	0.7753
'R^2'	0.6377	0.6010
Degrees of freedom: regression/residual	1/17	1/18
F-Ratio	29.935	27.125
Level of significance	greater than 99.9%	greater than 99.9%
Standard error of estimate	0.1497	0.1554
Value of 'K'	0.29	0.29

TABLE 5.12

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - TEXACO CANADA LIMITED

(Limits of variation of 'b' depending on past historical data of the company, using value of constant and the coefficient from Table 5.11)

Variation of 'b' \ Predicted values of 'r' for year -	1971	1972
0.4	6.9138	7.3121
0.5	9.1155	9.2775
0.6	11.8058	11.5918
0.7	15.0520	14.2890
0.8	18.9262	17.4044

TABLE 5.13

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY -TEXACO CANADA LIMITED

(Period 1952 - 1970)

Input Data Upto Year 1970

1st. Step: Variable Included: $(D/B)_t$		
Value of constant: $\ln a_0$		4.19160
Value of coeff: a_2 (std. error)	1.20942	(0.15180)
Multiple corr. coeff 'R'		0.8861
'R^2'		0.7851
Standard error of estimate		0.1076
Degrees of freedom: reg/residual		1/17
F-Ratio		63.474
Level of significance (from tables)	greater than 99.9%	
2nd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	
Value of constant $\ln a_0$		4.69287
Value of coeff: $\ln a_1$ (std. error)	-0.01545	(0.01269)
Value of coeff: a_2 (std. error)	1.33978	(0.18407)
Multiple corr. coeff 'R'		0.8981
'R^2'		0.8065
Standard error of estimate		0.1061
Degrees of freedom: reg/residual		2/16
F-Ratio		33.376
Level of significance	greater than 99.9%	
3rd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		5.25062
Value of coeff: $\ln a_1$ (std. error)	-0.01757	(0.01306)
Value of coeff: a_2 (std. error)	1.60493	(0.36667)
Value of coeff: a_3 (std. error)	0.11084	(0.13214)
Multiple corr. coeff. 'R'		0.9029
'R^2'		0.8152
Standard error of estimate		0.1071
Degrees of freedom: reg/residual		3/15
F-Ratio		22.073
Level of significance	greater than 99.9%	
Value of K		0.63

TABLE 5.14

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - TEXACO CANADA LIMITED

(Period 1952 - 1971)

Input Data Upto Year 1971		
1st Step: Variable Included: $(D/B)_t$		
Value of constant: $\ln a_0$		3.63107
Value of coeff: a_2 (std. error)	1.02126	(0.14664)
Multiple corr. coeff 'R'		0.8540
'R^2'		0.7293
Standard error of estimate		0.1212
Degrees of freedom: reg/residual		1/18
F-Ratio		48.502
Level of significance (from tables)	greater than 99.9%	
2nd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	
Value of constant: $\ln a_0$		3.53755
Value of coeff: $\ln a_1$ (std. error)	0.00491	(0.01191)
Value of coeff: a_2 (std. error)	1.00192	(0.15729)
Multiple corr. coeff. 'R'		0.8556
'R^2'		0.7320
Standard error of estimate		0.1241
Degrees of freedom: reg/residual		2/17
F-Ratio	23.218	
Level of significance	greater than 99.9%	
3rd. Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		3.55338
Value of coeff: $\ln a_1$ (std. error)	0.00491	(0.01228)
Value of coeff: a_2 (std. error)	1.01016	(0.35636)
Value of coeff: a_3 (std. error)	0.00392	(0.15099)
Multiple corr. coeff. 'R'		0.8556
'R^2'		0.7320
Standard error of estimate		0.1279
Degrees of freedom: reg/residual		3/16
F-Ratio		14.569
Level of significance	greater than 99.9%	
Value of K		0.63

TABLE 5.15

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1971 - TEXACO CANADA LIMITED

(Using values of constant and the coefficient from Table 5.13 for year 1971. Values of the rate of return on net worth 'r_t' taken from Table 5.12)

Actual Share Price = $31.37

Prediction for year 1971

Variable Included: $(D/B)_t$

Values of 'b'	Share Price 'P_t' in $
0.4	75.58
0.5	60.63
0.6	46.29
0.7	32.68
0.8	20.01

TABLE 5.16

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1972 - TEXACO CANADA LIMITED

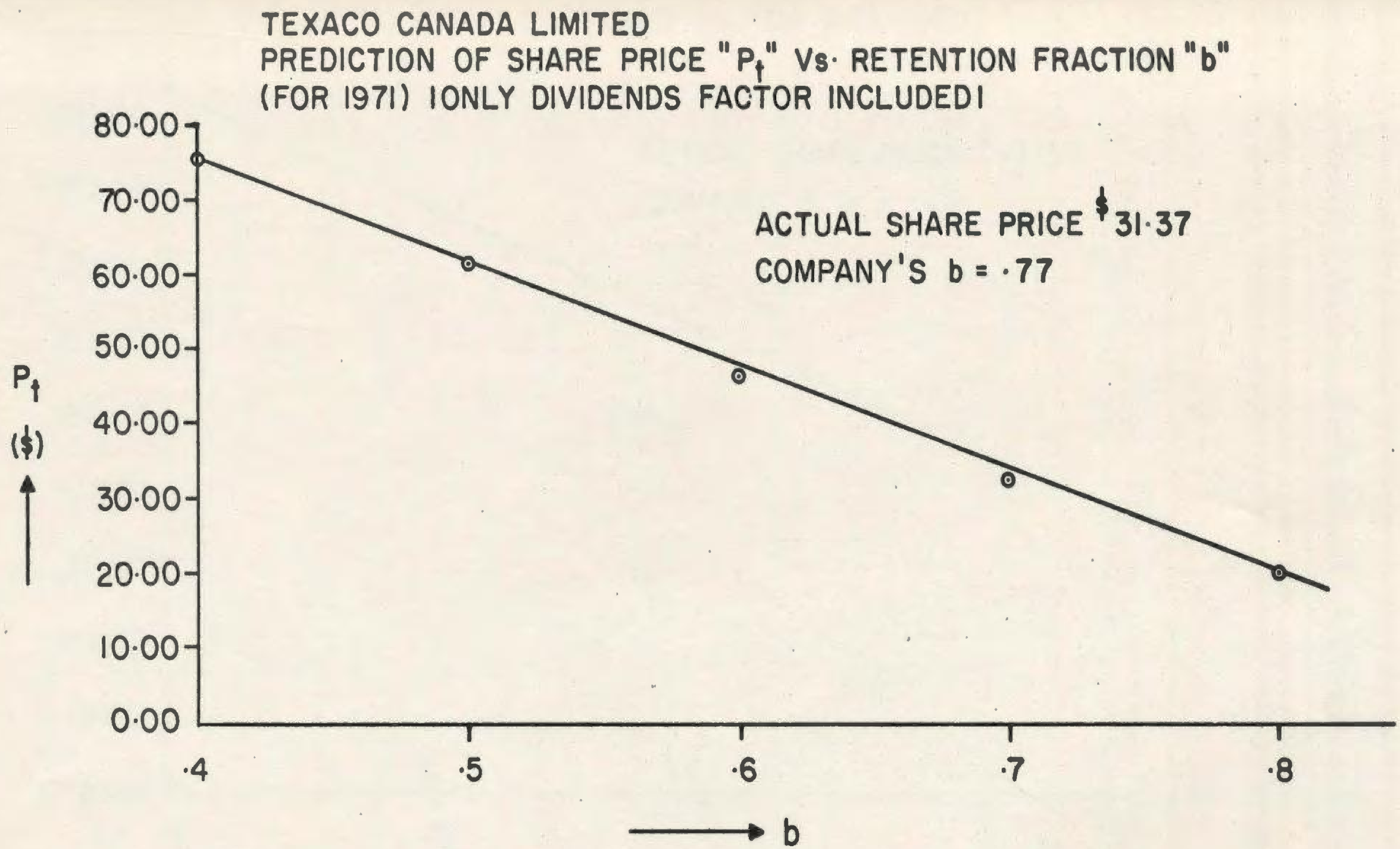
(Using values of constant term and the coefficients from Table 5.14 for year 1972. Values of the rate of return on net worth 'r', taken from Table 5.12)

Actual Share Price = $47.37

Prediction for Year 1972

Variable Included: $(D/B)_t$

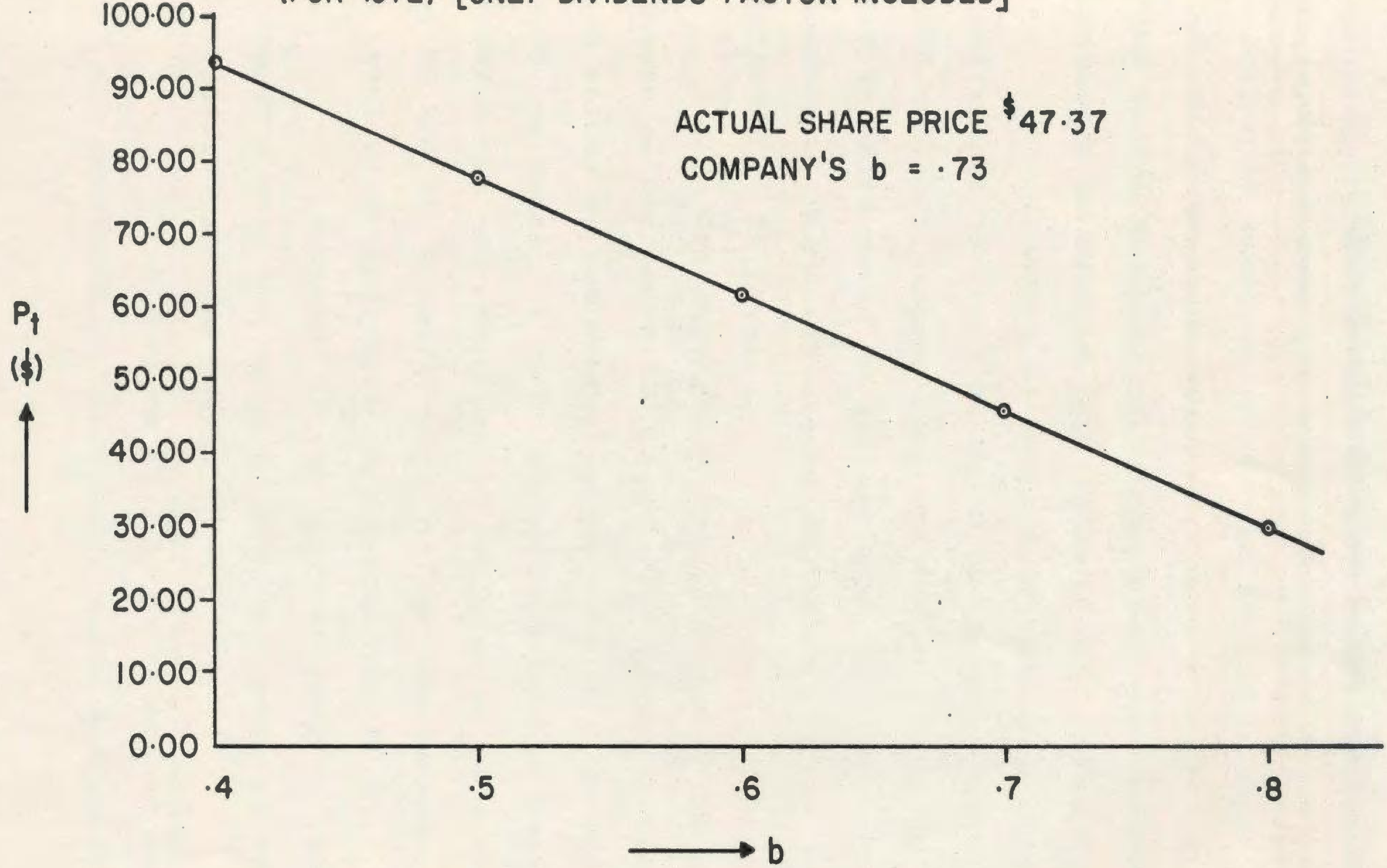
Values of 'b'	Share Price 'P_t' in $
0.4	93.36
0.5	77.50
0.6	61.70
0.7	45.99
0.8	30.40



FIG· 5·1

PREDICTED SHARE PRICE VARIATION WITH EARNINGS RETENTION RATE, FOR TEXACO CANADA LIMITED (FOR 1971)

TEXACO CANADA LIMITED
PREDICTION OF SHARE PRICE "P_t" Vs. RETENTION FRACTION "b"
(FOR 1972) [ONLY DIVIDENDS FACTOR INCLUDED]



FIG· 5·2

PREDICTED SHARE PRICE VARIATION WITH EARNINGS RETENTION RATE, FOR TEXACO CANADA LIMITED (FOR 1972)

5.4 Imperial Oil Limited:

This company had been regularly paying out dividend all over the period of study. The retention fraction of earnings 'b' varied from 0 to about 0.6.

(a) For regression equation: $\ln(r) = \ln(w) + m\ln(1+b)$ time series analysis was carried out and tests were conducted to examine accuracies of the regression results.

Looking at Table 5.17, standard error of coefficient 'm' is 0.26 and 0.24 for the sample years 1970 and 1971 respectively and the ratio of the coeff./ its standard error is greater than 2 in both cases. Therefore, the coefficients in both the cases are significant at 5% level.

The percentage of variation in the rate of return on net worth 'r', explained by the variation in the values of the retention fraction 'b', is 81% in both the cases. A very reliable measure of relationship between the two variables is revealed by very high F-level of 69 and 77, respectively, for the two samples, giving a level of significance of greater than 99.9%.

Accuracy of the above results is reflected through a very low value of standard error of estimate of 0.06 in both the cases.

Next, values of rate of return on net worth 'r' are predicted in Table 5.18, using different values of the retention fraction 'b', and the values of the two parameters are taken from Table 5.17. Value of 'b' in this case varies from 0 to 0.6.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \ln(D/B)_t + a_3 \ln(S)_t$,

time series multiple regression analysis revealed the following:

Referring to Tables 5.19 and 5.20 for 1970 and 1971 samples respectively, maximum and a significant contribution to share price of this company is made by the growth factor. In both samples, the ratio of growth coeff./its standard error is greater than two and therefore, the coefficient is significant at 5 percent level.

In both cases, only when growth factor is considered, about 45% variation in the share price is explained by the variation in growth factor. The results are 99.5% reliable as the F-ratio is quite high. Therefore, the above relationship is quite significant.

Also, the standard error of estimate of 0.11 and 0.12, respectively, for the two samples is quite low and therefore, the above results are quite accurate.

Going to the next steps, in case of 1970 year sample, the other two coefficients are not significant at 5 percent level, as the ratio of the coefficients/their standard error is less than two. As will be seen later share prices for 1971 were predicted only when growth factor was taken into account. In the case of 1971 sample, in the second step, size $(S)_t$ has also contributed to the share price to some extent and the ratio of the size $(S)_t$ coeffieient to its standard error is greater than two and is, therefore, significant at the 5 percent level. Coefficient of determination 'R^2', is 0.60, i.e. now 60% of the variation of share prices is explained by variation in growth and size of this company. The F-ratio associated with the second step for 1971 sample is also high giving significance level of the relationship greater than 99.9%. The results are quite accurate as evidenced by a low standard error of estimate. Therefore, when predicting for 1972, size was also taken into account. Dividends do not seem to affect the share price at all. An examination of simple intercorrelation between the three independent variables in this case reveals that multi-collinearity is not present as these correlations were generally low. Auto-correlation is present as the Von Neuman ratio is below the critical limit of 1.36 at 0.05 level of significance. Despite the problem of auto-correlation, it does not alter the conclusions outlined earlier as the results are in agreement with the theory employed in this study.

For 1971, share prices are predicted in Table 5.21, when only growth factor is taken into account and for 1972, prediction is made in Table 5.22, taking into account growth and size factors. This is also shown in Figs. 5.3 and 5.4.

According to Gordon's model, for 1971, the company should retain 0.6 of its earnings for maximization of the share price to $26.53 as shown in Table 5.21. The actual share price for 1971 was $25.50 and the company's 'b', the retention fraction, was 0.43. For 1972, according to Gordon's model, when both, growth and size factors are taken into account as shown in Table 5.22, the company should again retain 0.6 of its earnings for maximization of its share price to $38.30. The actual share price for 1972 was $40.12 and the company's 'b' was 0.48, i.e. the company is retaining less and according to Gordon's model, it should retain at least up to 0.6 of its earnings.

For 1972, share price is predicted when growth and size factors are taken into account as both of these factors make a significant contribution to the share price as indicated by the above results.

TABLE 5.17

REGRESSION OF RATE OF RETURN ON NET WORTH 'r' ON THE EARNINGS RETENTION FRACTION 'b' - IMPERIAL OIL LIMITED

(Period 1953 - 1970 & 1971)

Analysis \ Input Data Upto Year -	1970	1971
Value of constant 'lnw'	1.55360	1.54916
Value of coeff. 'm'	2.17032	2.18883
Standard error of coeff. 'm'	0.26113	0.24903
Correlation coeff. 'R'	0.9011	0.9053
'R^2'	0.8119	0.8195
Degrees of freedom: regression/residual	1/16	1/17
F-Ratio	69.075	77.255
Level of significance (from tables)	greater than 99.9%	greater than 99.9%
Standard error of estimate	0.0663	0.0645
Value of 'K'	0.73	0.73

TABLE 5.18

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - IMPERIAL OIL LIMITED

(Limits of variation of 'b' depending on past historical data of the company, using value of constant and the coefficient from Table 5.17)

Variation of 'b' \ Predicted Values of 'r' for year	1971	1972
0	4.7284	4.7075
0.1	5.8150	5.7995
0.2	7.0237	7.0162
0.3	8.3562	8.3597
0.4	9.8143	9.8319
0.5	11.3996	11.4347
0.6	13.1135	13.1696

TABLE 5.19

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - IMPERIAL OIL LIMITED

(Period 1953 - 1970)

Input Data Upto Year 1970)

1st. Step: Variable Included: g_t		
Value of constant: $\ln a_0$		0.41406
Value of coeff: $\ln a_1$ (std. error)	0.07217	(0.01993)
Multiple corr. coeff 'R'		0.6711
'R^2'		0.4503
Standard error of estimate		0.1148
Degrees of freedom: reg/residual		1/16
F-Ratio		13.107
Level of significance (from tables)	greater than 99.5% less than 99.9%	

2nd. Step: Variables Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		-0.12134
Value of coeff: $\ln a_1$ (std. error)	0.10529	(0.02837)
Value of coeff: a_3 (std. error)	0.20506	(0.13007)
Multiple corr. coeff. 'R'		0.7269
'R^2'		0.5283
Standard error of estimate		0.1098
Degrees of freedom: reg/residual		2/15
F-Ratio		8.405
Level of significance	greater than 99.5% less than 99.9%	

3rd. Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.07769
Value of coeff: $\ln a_1$ (std. error)	0.10350	(0.03292)
Value of coeff: a_2 (std. error)	0.05990	(0.49792)
Value of coeff: a_3 (std. error)	0.19415	(0.16224)
Multiple corr. coeff. 'R'		0.7273
'R^2'		0.5289
Standard error of estimate		0.1136
Degrees of freedom: reg/residual		3/14
F-Ratio		5.240
Level of significance	greater than 99.5% less than 99.9%	
Value of K		0.52

TABLE 5.20

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - IMPERIAL OIL LIMITED

(Period 1953 - 1971)

Input Data Upto Year 1971

1st. Step: Variable Included: g_t		
Value of constant: $\ln a_0$		0.40278
Value of coeff: $\ln a_1$ (std. error)	0.07831	(0.02052)
Multiple corr. coeff. 'R'		0.6793
'R^2'		0.4614
Standard error of estimate		0.1203
Degrees of freedom: reg/residual		1/17
F-Ratio		14.564
Level of significance (from tables)	greater than 99.5% less than 99.9%	
2nd Step: Variables Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		-0.20397
Value of coeff: $\ln a_1$ (std. error)	0.11138	(0.02300)
Value of coeff: a_3 (std. error)	0.23593	(0.10010)
Multiple corr. coef. 'R'		0.7747
'R^2'		0.6001
Standard error of estimate		0.1068
Degrees of freedom: reg/residual		2/16
F-Ratio		12.010
Level of significance	greater than 99.9%	
Value of K		0.52

TABLE 5.21

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1971 - IMPERIAL OIL LIMITED

(Using values of constant and the coefficient from Table 5.19 for year 1971. Values of the rate of return on net worth 'r' taken from Table 5.18)

Actual Share Price = $25.50

Prediction for Year 1971

Variable Included: g_t

Values of 'b'	Share Price 'P_t' in $
0	15.03
0.1	15.68
0.2	16.64
0.3	18.02
0.4	19.96
0.5	22.69
0.6	26.53

TABLE 5.22

PREDICTED SHARE PRICES FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION, FOR 1972 - IMPERIAL OIL LIMITED

(Using values of constant and the coefficient from Table 5.20 for year 1972. Values of the rate of return on net worth 'r' taken from Table 5.18)

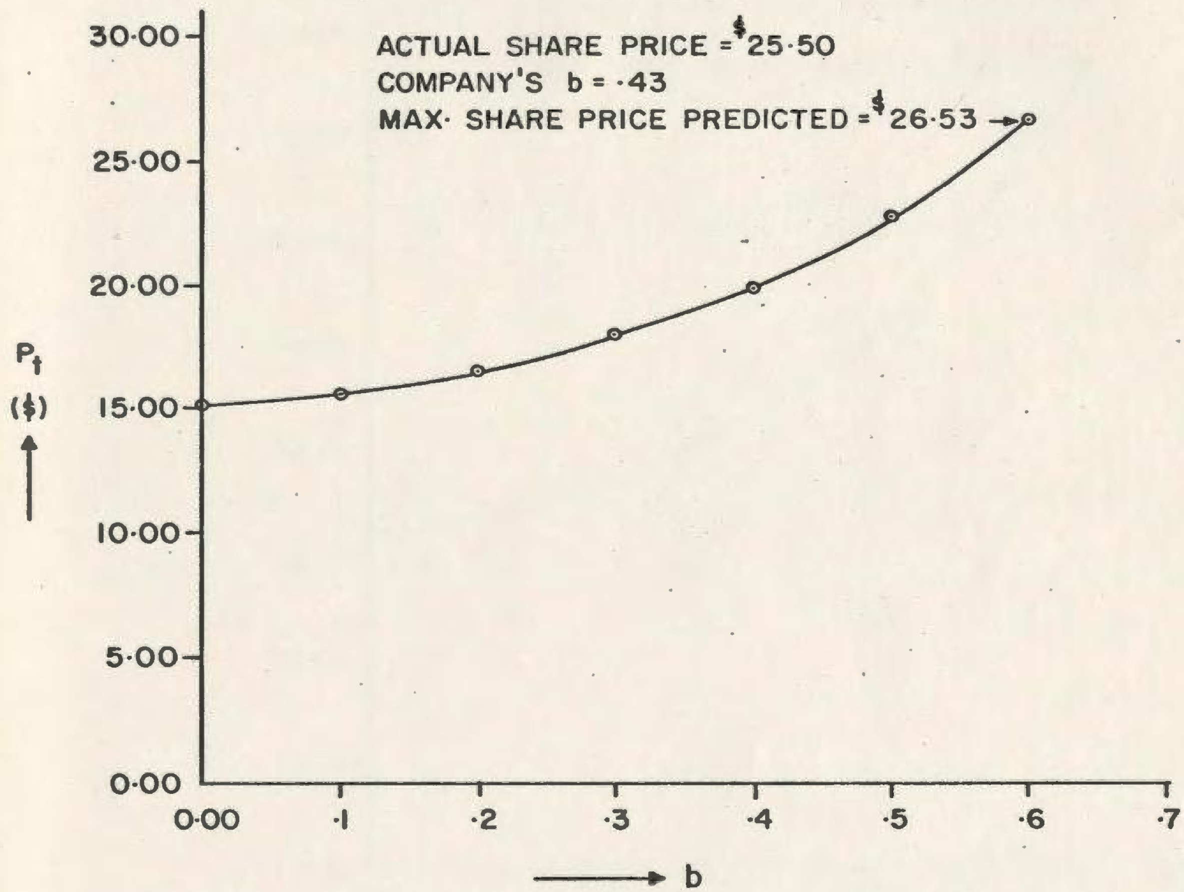
Actual Share Price - $40.12

Prediction for Year 1972

Variables Included: g_t and S_t

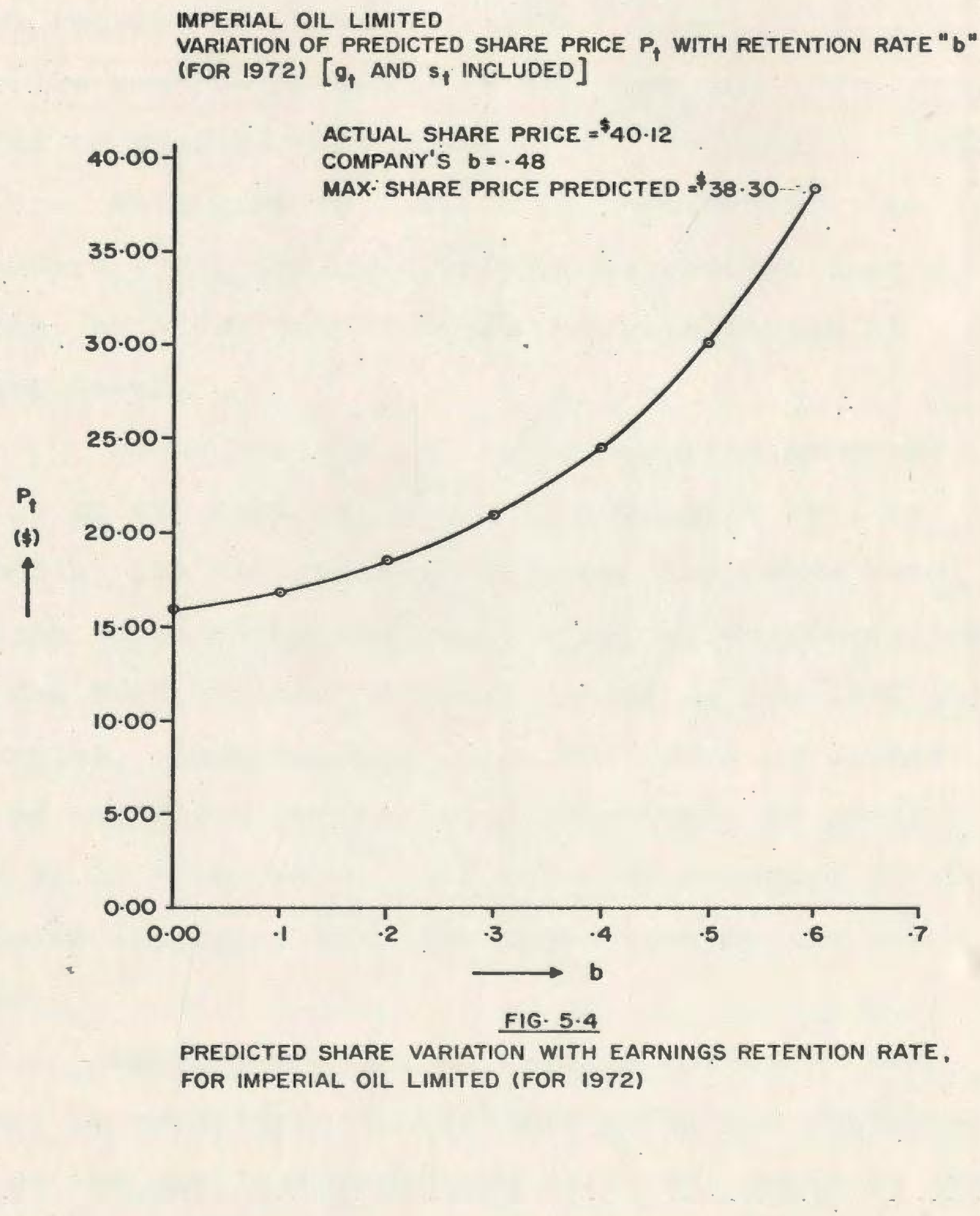
Values of 'b'	Share Price 'P_t' in $
0	15.88
0.1	16.94
0.2	18.57
0.3	21.00
0.4	24.62
0.5	30.03
0.6	38.30

IMPERIAL OIL LIMITED
VARIATION OF PREDICTED SHARE PRICE P_t WITH RETENTION RATE b
(FOR 1971) [ONLY g_t INCLUDED]



FIG· 5·3

PREDICTED SHARE PRICE VARIATION WITH EARNINGS RETENTION RATE, FOR IMPERIAL OIL LIMITED (FOR 1971)



FIG· 5·4

PREDICTED SHARE VARIATION WITH EARNINGS RETENTION RATE, FOR IMPERIAL OIL LIMITED (FOR 1972)

5.5 Westinghouse Canada Limited:

This company's earnings position has been very erratic and so have been the dividends paid out.

(a) For regression equation, $\ln(\hat{r}) = \ln(w) + m\ln(1+b)$ time series regression analysis was done and tests were conducted to examine accuracies of the regression results.

Referring to Table 5.23, coefficient 'm'/ its standard error for both samples is greater than 2, therefore, both the coefficients are significant at 5 percent level.

About 52% and 53% (of respective samples) variation of the rate of return on net worth 'r', is explained by the variation of earnings retention rate 'b', which is shown by the coefficient of determination 'R^2'. The high F-ratio of about 21 and 22 for 1970 and 1971 samples, respectively, gives the level of significance of the above regression relationship to greater than 99.9% in both cases. Low value of standard error of estimate indicates that the above results are quite accurate.

Next, the expected rate of return on net worth 'r' is predicted for 1971 and 1972, for different values of the earnings retention rate 'b'. This is shown in Table 5.24.

In this case, the limit of variation of 'b' is from 0 to 0.9 as observed in the past historical data of this company.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \ln(D/B)_t + a_3 \ln(S)_t$, time series multiple regression analysis revealed the following:

Referring to Tables 5.25 and 5.26, maximum contribution to the share price in both the samples is made by the size factor $(S)_t$, though sign of the coefficient is negative. This is contrary to a reasonable interpretation of effect of size on share prices, i.e. share prices vary directly with the size of the company. The reason for this is that the share prices have been very erratic, whereas the size $(S)_t$ has been gradually rising; thus giving negative correlation.

About 33% and 35% (for the respective samples) of the variation of the share prices is explained by variation in the size factor. High F-value of 9 and 11 for the respective samples, gives the significance of greater than 99% for the above relationship between share price and the size factor. The low value of the standard error of estimate indicates that the above results are quite accurate.

In the next two steps, for both the samples, when the other two variables are added, the contribution made by these two variables is highly insignificant as evidenced by value of the respective coefficients/ their standard errors. This is also reflected in negligible increase in the value of coefficients of determination 'R^2', over the variable $(S)_t$ which was added in the first step in both the samples.

The simple inter-correlation between the three independent variables is quite low which confirms the absence of multi-collinearity.

Von Neuman ratio (K) of 1.77 and 1.89 for the share price (P_t) and rate of return (r) respectively shows that auto-correlation problem does not exist in this case and are between the safe limits at 0.05 level of significance.

Share prices were not predicted as the results obtained were not in agreement with the theory employed in this study and therefore an optimum dividend rate could not be determined.

TABLE 5.23

REGRESSION OF RATE OF RETURN ON NET WORTH 'r'
ON THE EARNINGS RETENTION FRACTION 'b'
- WESTINGHOUSE CANADA LIMITED

(Period 1950 - 1970 & 1971)

Analysis / Input Data Upto Year -	1970	1971
Value of constant 'lnw'	-0.63063	-0.63252
Value of coeff. 'm'	4.52683	4.53908
Standard error of coeff. 'm'	0.98472	0.95377
Correlation coeff. 'R'	0.7257	0.7287
'R^2'	0.5266	0.5310
Degrees of freedom: regression/residual	1/19	1/20
F-Ratio	21.133	22.649
Level of significance (from tables)	greater than 99.9%	greater than 99.9%
Standard error of estimate	0.7693	0.7501
Value of 'K'	1.89	1.89

TABLE 5.24

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - WESTINGHOUSE CANADA LIMITED

(Limits of variation of 'b' depending on past hisrotical data of the company, using values of constant and the coefficient from Table 5.23)

Predicted values of 'r' for year - / Variation of 'b'	1971	1972
0	0.5322	0.5312
0.1	0.8193	0.8188
0.2	1.2149	1.2153
0.3	1.7454	1.7478
0.4	2.4412	2.4467
0.5	3.3361	3.3465
0.6	4.4681	4.4855
0.7	5.8792	5.9064
0.8	7.6153	7.6559
0.9	9.6281	9.7855

TABLE 5.25

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - WESTINGHOUSE CANADA LIMITED

(Period 1950 - 1970)

Input Data Upto Year 1970		
1st. Step: Variable Included: S_t		
Value of constant $\ln a_0$		1.20187
Value of coeff: a_3 (std. error)	-1.03013	(0.33203)
Multiple corr. coeff. 'R'		0.5799
'R^2'		0.3362
Standard error of estimate		0.3327
Degrees of freedom: reg/residual		1/19
F-Ratio		9.626
Level of significance (from tables)	greater than 99% less than 99.9%	
2nd Step: Variables Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		0.87802
Value of coeff: $\ln a_1$ (std. error)	0.02274	(0.02666)
Value of coeff: a_3	-0.88387	(0.37584)
Multiple corr. coeff.'R'		0.6017
'R^2'		0.3620
Standard error of estimate		0.3352
Degrees of freedom: reg/residual		2/18
F-Ratio		5.105
Level of significance	greater than 97.5% less than 99%	
3rd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.82088
Value of coeff: $\ln a_1$ (std. errors)	0.02351	(0.02760)
Value of coeff: a_2 (std. error)	-0.01745	(0.07779)
Value of coeff: a_3 (std. error)	-o.89241	(0.38804)
Multiple corr. coeff. 'R'		0.6033
'R^2'		0.3639
Standard error of estimate		0.3444
Degrees of freedom: reg/residual		3/17
F-Ratio		3.242
Level of significance	greater than 90% less than 95%	
Value of K		1.77

TABLE 5.26

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - WESTINGHOUSE CANADA LIMITED

(Period 1950 - 1971)

Input Data Upto Year 1971		
1st. Step: Variable Included: S_t		
Value of constant: $\ln a_0$		1.16538
Value of coeff: a_3 (std. error)	-1.00502	(0.3978)
Multiple corr. coeff. 'R'		0.5973
'R^2'		0.3567
Standard error of estimate		0.3247
Degrees of freedom: reg/residual		1/20
F-Ratio		11.091
Level of significance (from tables)	greater than 99.9%	
2nd Step: Variable Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		0.88909
Value of coeff: $\ln a_1$ (std. error)	0.02244	(0.02492)
Value of coeff: a_3 (std. error)	-0.89046	(0.32882)
Multiple corr. coeff. 'R'		0.6189
'R^2'		0.3830
Standard error of estimate		0.3262
Degrees of freedom: reg/residual		2/19
F-Ratio		5.899
Level of significance	greater than 97.5% less than 99%	
3rd Step: Variable Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.83225
Value of coeff: $\ln a_1$ (std. error)	0.02320	(0.02577)
Value of coeff: a_2 (std. error)	-0.01744	(0.07561)
Value of coeff: a_3 (std. error)	-0.89917	(0.33943)
Multiple corr. coeff. 'R'		0.6204
'R^2'		0.3849
Standard error of estimate		0.3347
Degrees of freedom: reg/residual		3/18
F-Ratio		3.754
Level of significance	greater than 95% less than 97.5%	
Value of K		1.77

5.6 The Steel Company of Canada Limited:

This company had been regularly paying out dividends over the period of study. The company has tried to maintain absolute dividends paid out in the previous years even when the earnings for a particular year declined.

(a) For regression equation, $\ln(r) = \ln(w) + m\ln(1+b)$, time series regression analysis was carried out and tests were conducted to examine accuracies of the regression results.

Looking at Table 5.27 the ratio of coeff. 'm' to its standard error, for both the samples is greater than two, therefore, the coefficient is significant at the 5 percent level in both the samples.

Also, in both the samples about 69% of the variation in the rate of return on net worth 'r' is explained by variation in the earnings retention fraction 'b'. F-ratio of 34 and 37 for 1970 and 1971 samples respectively shows that the above relationship is highly significant.

The low value of the standard error of estimate shows that the above results are quite accurate.

In Table 5.28, different values of expected rate of return on net worth 'r' are predicted for 1971 and 1972, for different values of the earnings retention rate 'b'. In this company, 'b' historically varied from 0 to 0.8.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + \ln a_1 \times g_t + a_2 \times \ln(D/B)_t + a_3 \ln(S)_t$, time series multiple regression analysis revealed the following:

Referring to Tables 5.29 and 5.30, maximum contribution to share price is made by growth $(g)_t$ for 1970 sample and size $(S)_t$ for 1971 sample. In both the samples, ratio of coefficient to its standard error is less than two, therefore, both the coefficients are not significant at 5% level.

Only 10 and 12% variation in the share price is explained by variations in growth $(g)_t$ and size $(S)_t$ for first and second sample, respectively. F-ratio of 1.7 and 2.2 for first and second samples, respectively, gives the level of significance of relationship equal to less than 90% which is poor and therefore, is not acceptable.

When the other two variables are taken into account, for both the samples, contribution by each of these variables is not at all significant and the other tests are also negative.

It seems that investors in this company place importance on factors other than the three considered in this study.

Share prices were not predicted due to the insignificant results obtained above.

TABLE 5.27

REGRESSION OF RATE OF RETURN ON NET WORTH 'r'
ON THE EARNINGS RETENTION FRACTION 'b'
- THE STEEL COMPANY OF CANADA LIMITED

(Period 1954 - 1970 & 1971)

Analysis \ Input Data Upto Year -	1970	1971
Value of constant 'lnw'	1.59654	1.59598
Value of coeff. 'm'	1.72066	1.72557
Standard error of coeff. 'm'	0.29235	0.28269
Correlation coeff. 'R'	0.8354	0.8364
'R^2'	0.6978	0.6995
Degrees of freedom: regression/residual	1/15	1/16
F-Ratio	34.641	37.259
Level of significance (from tables)	greater than 99.9%	greater than 99.9%
Standard error of estimate	0.1277	0.1238

TABLE 5.28

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - THE STEEL COMPANY OF CANADA LIMITED

(Limits of variation of 'b' depending on past historical data of the company, using values of constant and the coefficient from Table 5.27)

Variation of 'b' \ Predicted Values of 'r' for year -	1971	1972
0	4.9359	4.9331
0.1	5.8155	5.8150
0.2	6.7547	6.7670
0.3	7.7522	7.7578
0.4	8.8065	8.8161
0.5	9.9165	9.9307
0.6	11.0812	11.1006
0.7	12.2996	12.3248
0.8	13.5708	13.6024

TABLE 5.29

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - THE STEEL COMPANY OF CANADA LIMITED

(Period 1954 - 1970)

Input Data Upto Year 1970

1st. Step: Variable Included g_t		
Value of constant: $\ln a_0$		0.15689
Value of coeff: $\ln a_1$ (std. error)	0.01727	(0.01311)
Multiple corr. coeff. 'R'		0.3221
'R^2'		0.1037
Standard error of estimate		0.1350
Degrees of freedom: reg/residual		1/15
F-Ratio		1.737
Level of significance (from tables)	less than 90%	
2nd Step: Variables Included: (1) g_t (2) S_t		
Value of constant: $\ln a_0$		0.22025
Value of coeff. $\ln a_1$ (std. error)	0.01380	(0.01546)
Value of coeff. a_3 (std. error)	-0.03849	(0.08417)
Multiple corr. coeff. 'R'		0.3420
'R^2'		0.1169
Standard error of estimate		0.1387
Degrees of freedom: reg/residual		2/14
F-Ratio		0.927
Level of significance	less than 90%	
3rd. Step: Variables Included: (1) g_t (2) $(D/B)_t$ (3) S_t		
Value of constant: $\ln a_0$		0.18361
Value of coeff: $\ln a_1$ (std. error)	0.01369	(0.01631)
Value of coeff: a_2 (std. error)	-0.01139	(0.31094)
Value of coeff: a_3 (std. error)	-0.03679	(0.09880)
Multiple corr. coeff. 'R'		0.3421
'R^2'		0.1170
Standard error of estimate		0.1439
Degrees of freedom: reg/residual		3/13
F-Ratio		0.574
Level of significance	less than 90%	

TABLE 5.30

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - THE STEEL COMPANY OF CANADA LIMITED

(Period 1954 - 1971)

Input Data Upto Year 1971

1st. Step: Variable Included: S_t		
Value of constant: $\ln a_0$		0.36850
Value of coeff: a_3 (std. error)	-0.10358	(0.06958)
Multiple corr. coeff. 'R'		0.3488
'R^2'		0.1216
Standard error of estimate		0.1394
Degrees of freedom: reg/residual		1/16
F-Ratio		2.216
Level of significance (from tables)	less than 90%	
2nd Step: Variable Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		0.27702
Value of coeff: $\ln a_1$ (std. error)	0.01021	(0.01557)
Value of coeff: a_3 (std. error)	-0.07914	(0.08005)
Multiple corr. coeff. 'R'		0.3823
'R^2'		0.1461
Standard error of estimate		0.1420
Degrees of freedom: reg/residual		2/15
F-Ratio		1.284
Level of significance	less than 90%	
3rd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.08114
Value of coeff: $\ln a_1$ (std. error)	0.00972	(0.01630)
Value of coeff: a_2 (std. error)	-0.06056	(0.31442)
Value of coeff: a_3 (std. error)	-0.06934	(0.09713)
Multiple corr. coeff. 'R'		0.3853
'R^2'		0.1484
Standard error of estimate		0.1467
Degrees of freedom: reg/residual		3/14
F-Ratio		0.813
Level of significance	less than 90%	

5.7 Alcan Aluminum Limited:

Alcan had been regularly paying out dividends from the year of study, i.e. 1953 to 1970. There have been variations in the dividend payouts, primarily dependent on its earnings. The value of 'b', the earnings retention fraction, has varied between 0 and 0.7.

(a) For regression equation: $\ln(r) = \ln(w) + m\ln(1+b)$, time series regression analysis was carried out and tests were conducted to examine accuracies of the regression results.

Looking at Table 5.31, standard error of coefficient 'm' for 1970 and 1971 samples is 0.3920 and 0.3924, respectively, and the values of coeff. 'm'/its standard error is more than three in each case. Therefore, the coefficient is significant at 5 percent level, in both the cases.

The coefficient of determination, R^2, which is the percentage of variation in the values of the dependent variable, i.e. 'r', explained by variation in the independent variable, i.e. 'b' for years 1970 and 1971 is about 48% in both the cases.

As a measure of the significance of the regression relationship between the two variables, F-ratio is used. The level of significance of the regression relationship as shown in Table 5.31 for both 1970 and

1971 samples is greater than 99.5%, which is highly significant and therefore, the results are reliable.

The accuracy of the estimate is reflected through the standard error of estimate, i.e. about 0.22 for both the cases, which is quite low and therefore, shows that the results are fairly accurate.

Next, values of the expected rate of return on net worth 'r' are predicted for 1971 and 1972, corresponding to different values of the fraction of retention of earnings 'b'. This is shown in table 5.32. The limits of variation of 'b' were selected on the basis of the past historical data of the company and were between 0 and 0.7.

(b) For regression equation: $\ln(P/B)_t = \ln a_o + g_t \ln a_1$

$$+ a_2 \ln(D/B)_t + a_3 \ln S_t,$$ time

series multiple regression analysis revealed the following:

Referring to Tables 5.33 and 5.34, maximum contribution to share price is made by the size factor but sign of the coefficient is negative, which is contrary to what was expected, i.e. share price should increase with size. This is possibly due to the erratic share price variation over the period of study.

For 1970 sample, the next variable included is dividends. Again sign of the coefficient is negative, which is contrary to the expected results and is, therefore, not acceptable. For 1971 sample, the next variable included is growth in dividends.

For 1970 and 1971 samples, when only size factor is included in the first step, value of the size coefficient/its standard error is greater than two. Therefore, the coefficient is significant at 5 percent level in both the samples.

The coefficient of determination 'R^2' is 35% and 44%, respectively for 1970 and 1971 samples i.e. the above variation in the share price is explained by variation in size of this company. The results are reliable as shown by high F-ratios.

Standard error of estimate of about 0.25 shows that the results are quite accurate.

When the other two variables are included in the above equation, either their coefficient is not significant or the sign is not reasonable or their contribution to the share price is so negligible that it can be ignored.

No attempt was made to predict the share prices as the results were not reasonable and therefore, an optimum dividend rate could not be determined.

TABLE 5.31

REGRESSION OF RATE OF RETURN ON NET WORTH 'r'
ON THE EARNINGS RETENTION FRACTION 'b'
- ALCAN ALUMINIUM LIMITED

(Period 1953 - 1970 & 1971)

Analysis \ Input Data Upto Year -	1970	1971
Value of constant 'lnw'	1.61523	1.60008
Value of coeff. 'm'	1.53343	1.54163
Standard error of coeff. 'm'	0.39204	0.39249
Correlation coeff. 'R'	0.4887	0.4758
Degrees of freedom: regression/residual	1/16	1/17
F-Ratio	15.299	15.428
Level of significance	greater than 99.5% & less than 99.9%	greater than 99.5% & less than 99.9%
Standard error of estimate	0.2194	0.2197
Value of 'K'	1.17	1.17

TABLE 5.32

PREDICTION OF EXPECTED RATE OF RETURN ON NET WORTH 'r' FOR DIFFERENT VALUES OF EARNINGS RETENTION FRACTION 'b' - ALCAN ALUMINIUM LIMITED

(Limits of variation of 'b' depending on past historical data of the company, using values of constant term and the coefficient from Table 5.31)

Variation of 'b' \ Predicted Values of 'r' for year -	1971	1972
0	5.0290	4.9534
0.1	5.8204	5.7374
0.2	6.6512	6.5610
0.3	7.5198	7.4227
0.4	8.4248	8.3211
0.5	9.3650	9.2549
0.6	10.3392	10.2231
0.7	11.3465	11.2246

TABLE 5.33

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - ALCAN ALUMINIUM LIMITED

(Period 1953 - 1970)

Input Data Upto Year 1970		
1st. Step: Variable Included: S_t		
Value of constant: $\ln a_0$		1.51832
Value of coeff: a_3 (std. error)	-0.57920	(0.19686)
Multiple corr. coeff. 'R'		0.5925
'R^2'		0.3510
Standard error of estimate		0.2363
Degrees of freedom: reg/residual		1/16
F-Ratio		8.657
Level of significance (from tables)	greater than 99% less than 99.5%	
2nd Step: Variables Included: (1) $(D/B)_t$ (2) S_t		
Value of constant: $\ln a_0$		0.09336
Value of coeff: a_2 (std. error)	-0.51080	(0.31027)
Value of coeff: a_3 (std. error)	-0.66787	(0.19471)
Multiple corr. coeff. 'R'		0.6711
'R^2'		0.4503
Standard error of estimate		0.2246
Degrees of freedom: reg/residual		2/15
F-Ratio		6.146
Level of significance (from tables)	greater than 97.5% Less than 99%	
3rd. Step: Variables Included: (1) g_t (2) $(D/B)_t$ (3) S_t		
Value of constant: $\ln a_0$		-0.22144
Value of coeff: $\ln a_1$ (std. error)	0.04142	(0.02203)
Value of coeff: a_2 (std. error)	-0.58297	(0.28951)
Value of coeff: a_3 (std. error)	-0.72659	(0.18277)
Multiple corr. coeff: 'R'		0.7492
'R^2'		0.5613
Standard error of estimate		0.2077
Degrees of freedom: reg/residual		3/14
F-Ratio		5.969
Level of significance	greater than 99% less than 99.5%	
Value of K		0.25

TABLE 5.34

REGRESSION OF PRICE PER SHARE ON GROWTH IN DIVIDENDS, DIVIDENDS PER SHARE AND SIZE OF THE COMPANY - ALCAN ALUMINIUM LIMITED

(Period 1953 - 1971)

Input Data Upto Year 1971

1st. Step: Variable Included: S_t		
Value of constant: $\ln a_0$		1.72798
Value of coeff: a_3 (std. error)	-0.72610	(0.19547)
Multiple corr. coeff. 'R'		0.6694
'R^2'		0.4481
Standard error of estimate		0.2545
Degrees of freedom: reg/residual		1/17
F-Ratio		13.799
Level of significance (from tables)	greater than 99.5% less than 99.9%	

2nd Step: Variables Included: (1) g_t	(2) S_t	
Value of constant: $\ln a_0$		1.57103
Value of coeff: $\ln a_1$ (std. error)	0.04339	(0.02476)
Value of coeff: S_t (std. error)	-0.74781	(0.18496)
Multiple corr. coeff. 'R'		0.7328
'R^2'		0.5370
Standard error of estimate		0.2403
Degrees of freedom: reg/residual		2/16
F-Ratio	9.276	
Level of significance	greater than 99.5% less than 99.9%	

3rd Step: Variables Included: (1) g_t	(2) $(D/B)_t$	(3) S_t
Value of constant: $\ln a_0$		0.00116
Value of coeff: $\ln a_1$ (std. error)	0.04938	(0.02347)
Value of coeff: a_2 (std. error)	-0.55960	(0.31387)
Value of coeff: a_3 (std. error)	-0.85700	(0.18401)
Multiple corr. coeff. 'R'		0.7861
'R^2'		0.6179
Standard error of estimate		0.2254
Degrees of freedom: reg/residual		3/15
F-Ratio		8.086
Level of significance	greater than 99.9%	
Value of K		0.25

Looking at the overall results, no particular variable could be identified as being preferred by investors of common stock. Therefore, a general conclusion could not be made.

However, on an individual basis, especially Texaco and Imperial Oil, yielded some encouraging results. These were the only two companies which gave different share prices for different values of the earnings retention fraction 'b' and on comparison with the actual share price, fared well. On examining the share price variation in these two companies, it was observed that in case of Texaco, dividends were found to be preferred by investors and it was also observed that in 1971 the company was retaining much more than what it should have retained for maximization of share price. In the following year, i.e. in 1972, Texaco increased the dividends paid out, thereby decreasing the earnings retained and in 1972, the share price had appreciated considerably. Same was true for Imperial Oil, where growth in dividends is preferred and according to Gordon's model, (for maximization of share price) in 1971 the company should have retained much more than it actually did and it was observed that in 1972, the company retained larger fraction of earnings and the share price again appreciated considerably.

In two other companies, i.e. British Columbia Telephone Company and The Steel Company of Canada, the relationship adopted in this study proved inadequate.

Hiram Walker showed the preferance of investors for size factor only. Consequently, this company gave only one value of share price as size variable is independent of the earnings retention fraction 'b'.

Two other companies, Alcan and Westinghouse, did not give reasonable results as the signs of coefficients were negative, though the overall results were statistically accurate and significant. Share prices were not predicted for this group too for reason cited above.

As outlined in section 1.3, while trying to formulate their dividend policy, companies are confronted with certain other constraints and considerations. Therefore, maximization of share price may not be the sole critèrion in their dividend policy. This could well be one of the reasons for poor results obtained in four of the seven companies. Poor results obtained in at least three of the four companies did not come as a surprise as these three companies (Alcan, Westinghouse and Steel Company) had a rather unstable financial position over the period of study. This was shown in conclusions on ratio trend analysis section (refer section 4.2.8). Moreover, Westinghouse had a meaningless dividend yield over the period of study i.e. dividends were less than 2% of the book value, which was one of the criterion of including a company in this study.

Relatively better results obtained in the oil industry in general gives an impression that these industries may be looking for maximization of their share prices due to the resultant ease in raising huge capital requirements needed for exploration and development purposes, which is inherent in this type of industry.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary

This study had as its primary objective to use Gordon's model of stock price valuation to forecast common stock prices for 1971 and 1972 for a selected number of Canadian companies and therefrom also determine an optimum dividend rate. The stock prices were predicted only for those companies where the regression analysis revealed statistically significant results.

The background literature concerning dividends-earnings controversy was reviewed. John B. Williams contended that the investment value of a stock was determined by discounted value of future dividends. Graham and Dodd observed that a dollar of dividends affects the share price four times as does a dollar of retained earnings.

The above was opposed by Modigliani and Miller. They argued that the dividend payout would merely determine how a given return would be split between dividends and capital gains and would not affect the value of stocks. They contended that under certainty and in the absence of tax advantages, it should make no difference whether a company pays dividends or retains the earnings. In their conclusion they stated that the investor is indifferent as to how earnings are split between dividends and retained earnings.

The model used in this study assumes that the companies' sole criterion in their dividend policy is to maximize their share prices. This may not be necessarily so. A survey conducted and reported by Harkins and Walsh was presented which revealed that besides trying to maximize their share prices, they are confronted by certain considerations and constraints in their dividend deliberations. Constraints such as the company's earnings records and its future prospects, regularity of payment, stability of rate, availability of cash, stockholder's needs and expectations, government and debtors' controls.

To prove validity of the theories presented before, tests were conducted by various investigators in this field. Fisher's sample of British stocks showed that dividends are always capitalized at a very much higher rate than retained earnings. Durand studied banks' stock prices and came up with conclusions that dividends played a major role in several of the bank groups. Tests conducted by Brigham and Gordon showed that investors prefer current dividends to capital gains and that the data provide no support for the hypothesis that investors are indifferent to the dividend rate. On the other hand, Modigliani and Miller tested the relationship between capital structure and value of the firm. Their samples were taken from the electric utility industry. They concluded that the effect of dividends upon valuation was sufficiently small and uncertain to be neglected and that the impact of dividends was mainly informational. Their work was criticized by many as far as their methodology and measurement of the variables was concerned.

After this presentation of the related literature, seven companies were selected for study. The basis on which these companies were selected were: (1) it being listed on a Canadian stock exchange, (2) it published financial data back from 1950 to 1972. (3) dividend over the period of study was two percent or more of book value. The period of study was from 1950 - 1970. In some of the companies, due to data limitations, the study was made for a few years less.

The seven companies selected were: (1) British Columbia Telephone Company, (2) Hiram Walker-Gooderham and Worts Limited, (3) Texaco Canada Limited, (4) Imperial Oil Limited, (5) Westinghouse Canada Limited, (6) The Steel Company of Canada Limited, (7) Alcan Aluminum Limited.

A brief description of the activities of each company was given and a financial analysis of the companies was carried out with the help of relevant financial ratios. This was necessary to give some idea about management efficiency of these companies over the period of study.

The model employed in this study was the one presented by Gordon on stock price valuation. The final estimating equation is given below:

$$\ln(P/B)_t = \ln a_o + g_t \ln a_1 + a_2 \ln(D/B)_t$$

$$+ a_3 \ln S_t + a_4 \ln U$$

where

P_t = price of a corporation's stock at time = t

g_t = the rate at which the corporation's dividend is expected to grow in period t

D_t = dividend a share of stock is expected to pay in period t

B_t = book value or common equity per share of stock at the end of period t

S_t = total book value of the common equity at the end of period t

U = instability of earnings

and a_o, a_1, a_2, a_3 and a_4 are parameters to be determined from past historical data. The last factor, i.e. instability of earnings was not taken into consideration in this study as it would have made the model complicated. For determination of g_t, a relationship between the expected rate of return on net worth 'r' and the earnings retention fraction 'b' was developed and is:

$$r = w\ (1 + b)^m$$

where

r = expected rate of return on net worth

b = fraction of earnings retained

and w and m are paramenters to be obtained from past historical data.

Numerically $g_t = bxr$

and $D_t = (1-b)Y_t$, where Y_t is the earnings/share for period t.

According to the theory, it was expected that the share price would vary directly with growth in dividends, dividends and size of the corporation.

A time series multiple regression analysis was carried out on each of the seven companies with the help of BMDO2R computer program. From this analysis, above parameters were determined for both of the above equations. Next, for different values of the fraction of earnings retained 'b' (which depended on the range of 'b' values in the past historical data), values of the expected rate of return on net worth were predicted.

Using these values of 'r' for different values of 'b' and the parameters as determined from regression analysis of the above share price model, share price was predicted. The optimum dividend rate (1-b) was the value of 'b' for which share price was maximum (if maximization of share price is the sole objective of a corporation). Share prices were predicted only for those companies where significant results were obtained.

It must be recognized that whenever regression analysis is carried out, certain statistical problems come into play. These are auto-correlation and multi-collinearity. Auto correlation comes into play when the values of adjacent observations in the same time series are correlated. Multi-collinearity comes into play when the independent variables in an equation are highly correlated with one another. Von Neuman ratio (K) was used to test for presence of auto correlation. This tests the accuracy and randomness of the results. The three independent variables in the share price model were examined to see if any multi-collinearity was present in the data. This was done by looking at simple inter correlation between the three variables.

6.2 Conclusions

No general conclusions could be drawn on the basis of overall results obtained from this study. None of the three independent variables considered in this study could be identified as contributing significantly to the share price, on an overall basis.

Of the seven companies analysed in this study, two failed to give any significant results. These were (1) British Columbia Telephone Company and (2) The Steel Company of Canada Limited. In both of these companies time series regression analysis on the model relating expected rate of return on net worth 'r' to earnings retention fraction 'b', revealed statistically significant results. But the share price model needs to include variables other than the ones considered in this study as the time series multiple regression analysis failed to give any significant results. Therefore, no attempt was made to forecast share prices and an optimum dividend rate could not be determined.

Two other companies which failed to give any meaningful results were: (1) Westinghouse Canada Limited and (2) Alcan Aluminum Limited.

Time series regression analysis on both the models, i.e. involving relationship between 'r' and 'b' and the share price model, gave statistically significant results.

In case of Alcan, maximum contribution to the share price was made by the size factor, which though statistically significant, is not reasonable as size coefficient is negative. This is contrary to what was expected, i.e. share prices vary directly with size of the company. The other two variables do not make any significant contribution to the share price. Westinghouse Canada also yielded the same results. Although maximum contribution to the share price was made by size factor, this was again not reasonable as its coefficient was negative.

As the above results were not reasonable, again, no attempt was made to forecast share prices and an optimum dividend rate could not be determined.

Regression analysis on Hirman Walker revealed a significant and meaningful results as far as the share price model was concerned but for the model involving the relationship between the expected rate of return on net worth 'r' and the earnings retention fraction 'b' gave very insignificant results. The model adopted for this relationship needs some other suitable form. Anlaysis on share price model revealed that size was the predominant factor in this case and the other two variables did not make any significant contribution to share price. Therefore, share price was predicted for 1971 and 1972, considering only the size factor. An optimum dividend rate could not be determined as size is independent of the earnings retention fraction 'b'. Predicted share price for 1971 was found to be higher than the actual share price and this relatively large difference was aggravated by a downturn in share price for 1971. However for 1972, the gap between the actual and predicted share price was reduced as the actual share price appreciated considerably.

Two companies which yielded encouraging results were: (1) Imperial Oil Limited and (2) Texaco Canada Limited.

In both of the above companies, time series regression analysis on the relationship between the expected rate of return on net worth 'r' and the earnings retention fraction 'b' yielded very significant results.

In case of Imperial Oil, time series multiple regression analysis on the share price model revealed that the maximum contribution to share price was made by the growth in dividends factor, when data up to year 1970 was analyzed and for data up to year 1971, maximum contribution to share price was made by growth and size factors. For 1971, share price was predicted for different values of the earnings retention fraction 'b' taking into account only the growth factor. According to Gordon's model, for maximization of share prices, the company should have retained as much as 0.6 of earnings where as actually in 1971, company retained 0.43 of earnings, though the actual share price was close to the predicted value for maximum share price. While forecasting share prices for 1972, growth and size factors were taken into account. Maximum predicted share price was again very close to the actual one. Again the company had retained 0.48 of its earnings against 0.6 suggested by the model for maximization of share price. Possibly by retaining more of its earnings, the share price would have appreciated, as the investors place more value on the growth in dividends.

In case of Texaco also, time series multiple regression analysis of the share price model gave highly significant results. Maximum contribution to the share price for both the samples was made by dividends variable. Contribution by the other two variables was however, insignificant.

The actual share prices and values of the earnings retention fraction 'b' compared favourably with the predicted share prices and the corresponding 'b' values both for 1971 and 1972, although for maximization of share prices, according to Gordon's model, the company was retaining too much of its earnings. According to the model, for the said objective, the company should have retained 0.4, whereas the actual retention fraction was about 0.7.

In both of the companies the actual variation in share price agrees with the model, i.e. according to the model when investors view growth in dividends factor as important, then, the company should retain more of its earnings for maximization of share price, which is quite evident from looking at the actual share price and values of 'b', in case of Imperial Oil for 1971 and 1972. In 1972, when company increased the value of earnings retention fraction 'b', there was a considerable appreciation in share price as compared to 1971. In the same way, according to Gordon's model, if the investors view dividends to be more important than the company should retain lesser and lesser for maximization of share price. This is confirmed by looking at the share price and value of 'b' for 1971 and 1972 for Texaco. In 1972, the company retained less as compared to 1971 and consequently there was a considerable appreciation in its share price.

Multi-collinearity was almost absent in all the companies analysed. Auto correlation was present in most of the companies but wherever results agreed with the theory, the results were accepted.

Poor results obtained in at least three of the four companies did not come as a surprise as these three companies (Alcan, Westinghouse and Steel Company) had a rather unstable financial position over the period of study. This was shown in conclusions on ratio trend analysis section (refer section 4.2.8). Moreover, Westinghouse had a meaningless dividend yield over the period of study i.e. dividends were less than 2% of the book value, which was one of the criterion of selection of companies in this study. Despite this low yield, Westinghouse was included in this study to cover a broad range of industries.

Relatively better results obtained in the oil industry in general gives an impression that these industries may, in fact, be looking for maximization of their share prices due to the resultant ease in raising huge capital requirements needed for exploration and development purposes, which is inherent in this type of industry. This is confirmed by their annual reports in which they mention repeatedly that they are always on the lookout for attracting huge capital investments needed for exploration and development purposes.

Gordon obtained relatively better results as compared to this study. Possible reasons for this are:

(1) The economic climate in his period of study (1951-1954) was different to the more recent economic conditions over which this study is made.

(2) The number of industries covered in his study were far greater than the ones considered here. Gordon's study was conducted on a cross-section basis where as this study employed time series multiple regression analysis. It is quite possible if larger number of companies had been considered, the overall results might have been better than

those obtained in this study.

More specifically the conclusions obtained from this study are:

(1) A general approach to the formulation of (a) the share price model i.e. Eq. 16 (Section 4.3) and (b) rate of return on net worth model i.e. Eq. 18 (Section 4.3), cannot be taken as shown by the results obtained in the study. Therefore, for each company, variables affecting the share price need to be identified through trial and error. This also is true for the model involving relationship between rate of return on net worth 'r' and the earnings retention fraction 'b'.

(2) Companies in which investors place importance on growth in dividends, should retain the maximum possible amount of earnings and in companies where dividends are preferred, the maximum amount of earnings should be distributed through dividends. Maximization of share price, however, has to be the sole criterion in formulation of dividend policy for the above arguments to hold good.

6.3 Limitations of this Study

(1) The expected variation of share price with earnings retention fraction 'b' (Fig. 4.8) could not be obtained due to the operating limits on the value of the earnings retention fraction 'b'. This value was restricted to the limits of 'b' found in the past historical data of the companies.

(2) A true average share price (perhaps on daily or weekly basis) was most desirable but an average of the high and low share price values during the year had to be used due to data limitations.

(3) The major limitation of this study was whether maximization of share price is <u>the sole</u> criterion of companies while formulating their dividend policy? This assumption is questionable as companies are confronted with certain considerations and constraints besides having maximization of their share prices as their objective (refer section 1.3), while formulating dividend policies.

(4) This study assumed that the cause and effect occur in the same time interval of one year but this may not necessarily be so. Perhaps dividends paid out or earnings in the previous year may also be having an effect on the share price on the following year. This could possibly be resolved by taking into account an average of previous year's and the following year's statistics.

6.4 Recommendations for Further Study

(1) As seen before, a general approach to the formulation of both the share price and the expected rate of return on net worth models cannot be taken, therefore, it would be necessary to incorporate <u>other</u> independent variables into the above models and by trial and error, determine

the appropriate variables affecting the share price for a particular company.

(2) Twenty years may have been too long a period of study as the economic climate in the 1950's was different from the more recent economic climate. Possibly, study could be undertaken for shorter periods of 10 to 15 years, which might improve the results. It was observed in section 4.2.8 that on an overall basis, the financial condition of the companies in 1950 - 1959 range was unstable as compared to 1960 - 1970 span of study. It is quite possible that a study on the 1960-1970 span might yield better results.

(3) Some way of incorporating the effect of the previous year's earnings and dividend rate could also be udertaken as it seems reasonable that the previous year's dividend rate would affect share prices in the first quarter of the following year.

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APPENDIX - A

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL AND TIME SERIES REGRESSION ANALYSIS ON RATE OF RETURN ON NET WORTH MODEL.

TABLE A-1

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL - BRITISH COLUMBIA TELEPHONE COMPANY

Year	Earnings/ share (Y_t) ($)	Dividend/ Share (D_t) ($)	Earnings ret. frac. $b=\frac{Y_t-D_t}{Y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Shares Outstanding
72	6.11	3.20	.476	8.55	56.15	3,236,625
71	5.40	3.20	.407	7.73	54.52	3,326,625
70	5.10	3.05	.401	8.00	52.35	2,877,000
69	5.28	3.00	.431	8.24	50.61	2,877,000
68	7.93	2.70	.452	8.10	46.99	2,589,000
67	4.49	2.55	.432	7.93	45.01	2,589,000
66	4.30	2.40	.441	7.86	45.01	2,589,000
65	4.16	2.40	.423	7.41	71.73	2,589,000
64	3.67	2.40	.346	7.58	38.59	2,301,000
63	3.31	2.30	.305	7.06	37.77	2,301,000
62	3.29	2.20	.331	6.74	36.79	2,301,000
61	3.21	2.20	.314	7.10	35.35	1,918,000
60	2.91	2.20	.243	6.46	34.18	1,644,000
59	3.04	2.05	.325	7.10	33.69	1,500,000
58	1.72	2.00	-.162	5.06	32.51	1,200,000
57	2.62	2.00	.236	5.71	32.74	1,200,000
56	2.86	2.00	.300	6.49	34.12	1,200,000
55	3.28	2.00	.390	7.56	30.29	800,000
54	2.71	2.00	.261	6.85	29.76	800,000
53	2.90	2.00	.310	7.95	28.55	640,000

Table A-1 continued

Share Price (P_t) ($)	$(P/B)_t$	$(D/B)_t$	Size $(S)_t$= B_tx sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
60.75	1.0819	.0569	19.662	.0787	4.073	-2.8648	2.9786
63.44	1.1636	.0586	20.533	.1515	3.446	-2.8354	3.0220
63.50	1.2129	.0582	18.268	.1930	3.208	-2.8428	2.9051
68.75	1.3584	.0592	19.779	.3063	3.551	-2.8255	2.9846
61.75	1.3141	.0574	15.988	.2731	3.661	-2.8566	2.7718
61.50	1.3663	.0566	15.924	.3121	3.425	-2.8707	2.7678
64.75	1.4984	.0555	16.765	.4044	3.466	-2.8906	2.8192
67.75	1.6235	.0575	17.542	.4846	3.134	-2.8557	2.8645
61.25	1.5871	.0621	14.097	.4619	2.622	-2.7775	2.6459
54.75	1.4623	.0614	12.601	.3800	2.153	-2.7898	2.5337
49.81	1.3539	.0597	11.464	.3029	2.230	-2.8167	2.4392
48.88	1.3824	.0622	9.373	.3238	2.229	-2.7768	2.2378
44.56	1.3036	.0643	7.325	.2651	1.569	-2.7431	1.9912
41.50	1.2911	.0608	6.525	.2551	2.307	-2.7993	1.8756
41.44	1.2746	.0615	4.972	.2426	-.819	-2.7884	1.6038
42.13	1.2864	.0610	5.054	.2519	1.347	-2.7954	1.6201
47.50	1.3921	.0586	5.700	.3308	1.947	-2.8367	1.7404
47.00	1.5516	.0660	3.760	.4398	2.948	-2.7176	1.3244
40.00	1.3577	.0678	3.200	.3058	1.787	-2.6898	1.1631
34.44	1.2063	.0700	2.755	.1875	2.464	-2.6585	1.0134

TABLE A-2

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS
ON RATE OF RETURN ON NET WORTH MODEL -
BRITISH COLUMBIA TELEPHONE COMPANY

Year	'r'	(1+b)	ln'r'	ln(1+b)
1972	8.55	1.476	2.1468	.3893
71	7.73	1.407	2.0451	.3414
70	8.00	1.401	2.0794	.3371
69	8.24	1.431	2.1091	.3583
68	8.10	1.452	2.0918	.3729
67	7.93	1.432	2.0706	.3590
66	7.86	1.441	2.0617	.3653
65	7.41	1.423	2.0028	.3537
64	7.58	1.346	2.0255	.2971
63	7.06	1.305	1.9544	.2662
62	6.74	1.331	1.9080	.2859
61	7.10	1.314	1.9600	.2730
60	6.46	1.243	1.8656	.2175
59	7.10	1.325	1.9600	.2814
58	5.06	.838	1.6213	-.1767
57	5.71	1.236	1.7422	.2118
56	6.49	1.300	1.8702	.2623
55	7.56	1.390	2.0228	.3293
54	6.85	1.261	1.9242	.2319
53	7.95	1.310	2.0731	.2700

TABLE A-3

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL - HIRAM WALKER - GOODERHAM AND WORTS LIMITED

Year	Earnings/ share (Y_t) ($)	Dividend/ Share (D_t) ($)	Earnings ret. frac. $b=\frac{y_t-D_t}{y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Shares Outstanding
1973	3.670	1.500	.5912	12.91	28.46	17,376,096
72	3.140	1.450	.5382	12.10	25.90	17,376,096
71	2.810	1.450	.4839	11.62	24.14	17,376,096
70	2.820	1.450	.4858	12.41	22.73	17,376,096
69	2.780	1.450	.4784	13.09	21.26	17,376,096
68	2.570	1.300	.4941	13.31	19.31	17,376,096
67	2.370	1.300	.4514	12.80	18.41	17,376,096
66	2.210	1.200	.4570	12.82	17.24	17,376,096
65	2.010	1.200	.4029	12.45	16.14	17,376,096
64	1.870	.600	.6991	12.27	15.25	17,376,096
63	1.730	1.000	.4219	11.68	14.77	17,376,096
62	1.610	1.000	.3788	11.51	13.99	17,376,096
61	1.525	.925	.3934	11.40	13.39	17,376,096
60	1.455	.875	.3986	11.37	12.79	17,376,096
59	1.380	.875	.3659	11.24	12.25	17,376,096
58	1.270	.350	.7244	10.75	11.80	17,376,096
57	1.306	.666	.4900	11.48	11.37	17,376,096
56	1.216	.666	.4523	11.29	10.77	17,376,096
55	1.116	.666	.4032	10.90	10.23	17,376,096
54	1.170	.625	.4658	11.93	9.79	17,376,096
53	1.103	.500	.5466	11.89	9.26	17,376,096
52	.905	.666	.2640	10.43	8.67	17,376,096

TABLE A-3 continued

Share Price (P_t) ($)	$(P/B)_t$	$(D/B)_t$	Size $(S)_t$= B_tx sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
51.81	1.8204	.0527	4.9452	.5990	7.6323	-2.9430	1.5984
47.25	1.8243	.0559	4.5004	.6012	6.5122	-2.8826	1.5041
38.50	1.5948	.0600	4.1945	.4667	5.6229	-2.8123	1.4337
42.43	1.8666	.0637	3.9495	.6241	6.0287	-2.7521	1.3736
42.50	1.9990	.0682	3.6941	.6926	6.2622	-2.6852	1.3067
36.75	1.9031	.0673	3.3553	.6435	6.5764	-2.6982	1.2105
32.87	1.7854	.0706	3.1989	.5796	5.7779	-2.6505	1.1628
31.18	1.8085	.0696	2.9956	.5925	5.8587	-2.6649	1.0971
37.56	2.3271	.0743	2.8045	.8446	5.0161	-2.5989	1.0312
31.09	2.0386	.0393	2.6498	.7123	8.3325	-3.2354	.9745
29.09	1.9695	.0677	2.5664	.6777	4.9277	-2.6925	.9425
25.81	1.8448	.0714	2.4309	.6124	4.3599	-2.6383	.8882
24.59	1.8364	.0690	2.3266	.6078	4.4847	-2.6724	.8444
18.37	1.4362	.0684	2.2224	.3620	4.5320	-2.6821	.7985
18.21	1.4865	.0714	2.1285	.3964	4.1127	-2.6390	.7554
12.54	1.0627	.0296	2.0503	.0608	7.7873	-3.5179	.7180
12.37	1.0879	.0585	1.9756	.0842	5.6252	-2.8374	.6809
11.35	1.0538	.0618	1.8714	.0524	5.1064	-2.7832	.6266
12.18	1.1906	.0651	1.7775	.1744	4.3948	-2.7317	.5752
9.97	1.0183	.0638	1.7011	.0182	5.5569	-2.7513	.5312
7.81	.8455	.0539	1.6090	-.1677	6.4990	-2.9188	.4756
7.75	.8938	.0768	1.5065	-.1121	2.7535	-2.5663	.4097

TABLE A-4

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS ON RATE OF RETURN ON NET WORTH MODEL - HIRAM WALKER - GOODERHAM AND WORTS LIMITED

Year	'r'	(1+b)	ln'r'	ln(1+b)
1973	12.91	1.5912	2.5580	.4644
72	12.10	1.5382	2.4932	.4306
71	11.62	1.4839	2.4527	.3946
70	12.41	1.4858	2.5185	.3959
69	13.09	1.4784	2.5718	.3909
68	13.31	1.4941	2.5885	.4015
67	12.80	1.4514	2.5494	.3725
66	12.82	1.4570	2.5510	.3763
65	12.45	1.4029	2.5217	.3385
64	12.27	1.6791	2.5071	.5182
63	11.68	1.4219	2.4578	.3519
62	11.51	1.3788	2.4432	.3212
61	11.40	1.3934	2.4336	.3317
60	11.37	1.3986	2.4309	.3354
59	11.24	1.3659	2.4194	.3118
58	10.75	1.7244	2.3749	.5448
57	11.48	1.4900	2.4406	.3987
56	11.29	1.4523	2.4329	.3731
55	10.90	1.4032	2.3887	.3387
54	11.93	1.4658	2.4790	.3824
53	11.89	1.5466	2.4756	.4360
52	10.43	1.2640	2.3446	.2342

TABLE A-5

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL - TEXACO CANADA LIMITED

Year	Earnings/ share (y_t) ($)	Dividend/ share (D_t) ($)	Earnings ret. frac. $b=\frac{y_t-D_t}{y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Share Price(P_t) ($)
1972	4.32	1.14	0.736	16.19	26.45	47.57
71	3.21	0.72	0.775	13.62	23.26	31.37
70	2.51	0.88	0.649	11.91	20.77	23.93
69	2.36	0.84	0.644	12.15	19.14	28.87
68	2.12	0.76	0.641	11.90	17.53	29.5
67	1.74	0.66	0.620	10.59	16.17	23.16
66	1.49	0.60	0.597	9.69	15.09	20.93
65	1.33	0.55	0.586	9.28	14.18	18.16
64	1.15	0.53	0.539	8.47	13.39	19.43
63	1.09	0.53	0.513	8.39	12.77	16.45
62	.983	0.53	0.460	7.92	12.21	16.91
61	1.033	0.53	0.486	8.63	11.76	20.66
60	1.126	0.53	0.529	9.80	11.25	17.37
59	1.053	0.53	0.496	9.67	10.65	20.83
58	.953	0.53	0.443	9.19	10.13	19.97
57	1.416	0.55	0.611	13.97	9.84	21.75
56	1.316	0.45	0.658	16.15	7.86	18.29
55	1.283	0.40	0.688	16.95	6.96	13.25
54	.983	0.33	0.664	14.77	6.08	10.54
53	.903	0.33	0.634	15.05	5.42	10.35
52	.726	0.33	0.545	13.42	4.85	13.31

TABLE A-5 continued

Shares Outstanding	$(P/B)_t$	$(D/B)_t$	Size $(S)_t$ = B_tx sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
9,715,359	1.7909	.0431	25.6971	.5827	11.9158	-3.1442	3.2463
9,715,359	1.3486	.0309	22.5979	.2991	10.5555	-3.4752	3.1178
9,715,359	1.1521	.0423	20.1788	.1416	7.7295	-3.1613	3.0046
9,715,359	1.5083	.0438	18.5951	.4110	7.8246	-3.1261	2.9229
9,715,359	1.6828	.0433	17.0130	.5204	7.6279	-3.1383	2.8350
9,715,359	1.4322	.0408	15.7097	.3592	6.5658	-3.1986	2.7542
9,715,359	1.3870	.0397	14.6604	.3271	5.7849	-3.2248	2.6851
9,715,359	1.2806	.0387	13.7763	.2473	5.4380	-3.2496	2.6229
9,715,359	1.4510	.0395	13.0088	.3723	4.5653	-3.2293	2.5656
9,715,359	1.2881	.0415	12.4065	.2532	4.3040	-3.1819	2.5182
9,715,359	1.3849	.0434	11.8624	.3256	3.6432	-3.1371	2.4733
9,715,359	1.7568	.0450	11.4252	.5634	4.1941	-3.0995	2.4358
9,715,359	1.5440	.0471	10.9297	.4343	5.1842	-3.0552	2.3914
9,715,359	1.9558	.0497	10.3468	.6708	4.7963	-3.0004	2.3366
9,715,359	1.9713	.0523	9.8416	.5787	4.0711	-2.9503	2.2866
9,715,359	2.2103	.0558	9.5599	.7931	8.5356	-2.8842	2.2575
9,524,307	2.3269	.0572	7.6362	.8445	10.6267	-2.8602	2.0329
7,823,889	1.9037	.0574	6.7618	.6438	11.6616	-2.8564	1.9113
7,823,889	1.7335	.0542	5.9069	.5501	9.8072	-2.9136	1.7761
7,823,889	1.9095	.0608	5.2657	.6468	9.5417	-2.7987	1.6612
7,823,889	2.7443	.0680	4.7119	1.0095	7.3139	-2.6876	1.5501

TABLE A-6

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS ON RATE OF RETURN ON NET WORTH MODEL - TEXACO CANADA LIMITED

Year	'r'	(1+b)	ln'r'	ln(1+b)
1972	16.19	1.736	2.7843	.5515
71	13.62	1.775	2.6115	.5738
70	11.91	1.649	2.4773	.5001
69	12.15	1.644	2.4973	.4791
68	11.90	1.641	2.4765	.4953
67	10.59	1.620	2.3599	.4824
66	9.69	1.597	2.2710	.4681
65	9.28	1.586	2.2278	.4612
64	8.47	1.539	2.1365	.4311
63	8.39	1.513	2.1270	.4140
62	7.92	1.460	2.0693	.3784
61	8.63	1.486	2.1552	.3960
60	9.80	1.529	2.2823	.4246
59	9.67	1.496	2.2690	.4027
58	9.19	1.443	2.2181	.3667
57	13.97	1.611	2.6369	.4768
56	16.15	1.658	2.7819	.5056
55	16.95	1.688	2.8302	.5235
54	14.77	1.664	2.6923	.5092
53	15.05	1.634	2.7113	.4910
52	13.42	1.545	2.5967	.4350

TABLE A-7

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL - IMPERIAL OIL LIMITED

Year	Earnings/ share (Y_t) ($)	Dividend/ share (D_t) ($)	Earnings ret. frac. $b=\frac{Y_t-D_t}{Y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Share Price(P_t) ($)
1973	1.7600	0.8000	.5454	16.20	10.81	37.68
72	1.1700	0.6000	.4871	11.07	10.52	40.12
71	1.0600	0.6000	.4339	10.59	9.94	25.50
70	0.8200	0.5250	.3597	8.73	9.34	18.37
69	0.7300	0.5250	.2808	8.35	8.75	20.21
68	0.7800	0.5250	.3269	9.35	8.33	18.06
67	0.7450	0.5250	.2953	9.14	8.15	15.78
66	0.7250	0.5000	.3103	9.59	7.57	13.37
65	0.6775	0.4625	.3173	9.20	7.38	13.76
64	0.6250	0.4375	.3000	8.56	7.28	12.93
63	0.5625	0.3875	.3111	8.17	6.87	10.67
62	0.5400	0.3500	.3518	8.19	6.60	11.42
61	0.5350	0.3500	.3457	8.40	6.38	10.98
60	0.4850	0.3375	.3041	8.26	5.88	8.46
59	0.4325	0.3000	.3063	7.59	5.70	9.95
58	0.4025	0.3000	.2546	7.36	5.70	10.79
57	0.5725	0.3000	.4759	11.07	5.17	11.93
56	0.5500	0.3000	.4545	10.71	5.13	12.40
55	0.5200	0.2375	.5432	12.43	4.18	9.68
54	0.4150	0.2250	.4578	10.62	3.91	8.50
53	0.4025	0.2000	.5031	11.54	3.48	7.82

TABLE A-7 continued

Shares Outstanding	$(P/B)_t$	$(D/B)_t$	Size $(S)_t$= B_tx sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
130,117,139	3.4856	.0740	14.0656	1.2486	8.8354	-2.6036	2.6437
129,520,215	3.8136	.0570	13.6255	1.3385	5.3921	-2.8641	2.6119
129,104,873	2.5653	.0603	12.8330	.9412	4.5950	-2.8073	2.5520
128,594,067	1.9668	.0562	12.0106	.6764	3.1401	-2.8786	2.4857
128,527,727	2.3097	.0600	11.2461	.8371	2.3446	-2.8134	2.4200
128,437,096	2.1680	.0630	10.6988	.7738	3.0565	-2.7642	2.3701
128,201,596	1.9361	.0644	10.4484	.6607	2.6990	-2.7423	2.3464
127,166,632	1.7661	.0660	9.6265	.5688	2.9757	-2.7173	2.2645
126,884,532	1.8644	.0626	9.3640	.6229	2.9191	-2.7698	2.2368
126,674,092	1.7760	.0600	9.2218	.5744	2.5680	-2.8118	2.2215
126,443,452	1.5531	.0564	8.6866	.4402	2.5416	-2.8752	2.1617
126,427,992	1.7303	.0530	8.3442	.5482	2.8812	-2.9368	2.1215
126,407,792	1.7210	.0548	8.0648	.5429	2.9038	-2.9029	2.0875
125,855,708	1.4387	.0573	7.1732	.3637	2.5118	-2.8577	1.9703
125,847,200	1.7456	.0526	7.1708	.5571	2.3248	-2.9444	1.9700
125,805,008	1.8929	.0526	7.1708	.6381	1.8738	-2.9444	1.9700
125,770,608	2.3075	.0580	6.5023	.8361	5.2682	-2.8468	1.8721
125,719,548	2.4171	.0584	6.4494	.8825	4.8654	-2.8390	1.8639
119,462,764	2.3157	.0568	4.9935	.8397	6.7519	-2.8678	1.6081
119,405,104	2.1739	.0575	4.6687	.7765	4.8618	-2.8551	1.5408
119,388,908	2.2471	.0574	4.1547	.8096	5.8057	-2.8564	1.4242

TABLE A-8

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS
ON RATE OF RETURN ON NET WORTH MODEL -
IMPERIAL OIL LIMITED

Year	'r'	(1+b)	ln'r'	ln(1+b)
1973	16.20	1.5454	2.7850	.4352
72	11.07	1.4871	2.4042	.3968
71	10.59	1.4339	2.3599	.3603
70	8.73	1.3597	2.1667	.3072
69	8.35	1.2808	2.1222	.2474
68	9.35	1.3269	2.2353	.2828
67	9.14	1.2953	2.2126	.2587
66	9.59	1.3103	2.2607	.2702
65	9.20	1.3173	2.2192	.2755
64	8.56	1.3000	2.1471	.2623
63	8.17	1.3111	2.1004	.2708
62	8.19	1.3518	2.1029	.3014
61	8.40	1.3457	2.1282	.2969
60	8.26	1.3041	2.1114	.2655
59	7.59	1.3063	2.0268	.2671
58	7.36	1.2546	1.9960	.2268
57	11.07	1.4759	2.4042	.3892
56	10.71	1.4545	2.3711	.3746
55	12.43	1.5432	2.5201	.4338
54	10.62	1.4578	2.3627	.3769
53	11.54	1.5031	2.4458	.4075

TABLE A-9

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS ON SHARE PRICE MODEL - WESTING HOUSE CANADA LIMITED

Year	Earnings/ share (Y_t) ($)	Dividend/ share (D_t) ($)	Earnings ret. frac. $b=\frac{y_t-D_t}{y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Share Price(P_t) ($)
1972	1.29	0.50	0.612	3.35	38.19	21.18
71	2.04	0.50	0.754	7.38	27.66	13.00
70	1.12	0.50	0.553	4.28	26.13	9.75
69	1.07	0.50	0.532	4.18	25.51	14.12
68	1.06	0.50	0.528	4.23	24.95	16.12
67	0.70	0.50	0.285	2.86	24.40	17.12
66	1.79	0.37	0.790	7.59	23.62	20.94
65	1.66	0.40	0.759	7.37	22.40	18.25
64	1.40	0.15	0.892	6.52	21.53	9.90
63	1.04	0.00	1.00	5.08	20.46	7.37
62	.50	0.15	0.701	2.58	19.42	7.12
61	1.06	0.15	0.859	2.58	19.07	8.54
60	.12	0.25	-1.000	0.06	20.28	9.62
59	.86	0.25	0.71	4.22	20.41	11.43
58	1.06	0.25	0.765	5.37	19.81	12.62
57	1.29	0.25	0.806	6.66	19.34	10.68
56	.73	0.25	0.66	4.27	17.27	10.25
55	0.62	0.43	0.294	3.69	16.78	14.68
54	0.58	0.50	0.137	3.48	16.61	17.31
53	1.61	0.50	0.690	9.76	16.54	15.87
52	1.29	0.50	0.613	8.41	15.36	16.93
51	1.51	0.50	0.668	10.35	14.56	19.12
50	2.53	0.50	0.802	17.80	14.22	16.87

TABLE A-9 continued

Shares Outstanding	$(P/B)_t$	$\ln(P/B)_t$	g_t=bxr	$(D/B)_t$	$\ln(D/B)_t$	Size$(S)_t$ = B_tx sh. out.	$\ln(S)_t$
2,627,304	.5545	-.5902	2.0502	.0130	-4.3928	10.0325	2.3058
2,601,929	.4699	-.7552	5.5645	.0180	-4.0173	7.1969	1.9736
2,559,976	.3731	-.9859	2.3668	.0191	-3.9580	6.7937	1.9159
2,599,976	.5535	-.5914	2.2237	.0196	-3.9322	6.6325	1.8919
2,999,973	.6460	-.4369	2.2334	.0200	-3.9120	6.4869	1.8691
2,597,973	.7016	-.3543	.8151	.0204	-3.8922	6.3390	1.8467
2,582,773	.8865	-.1200	5.9961	.0158	-4.1477	6.1005	1.8083
2,565,372	.8147	-.2049	5.5938	.0178	-4.0285	5.7464	1.7485
2,482,226	.4598	-.7769	5.8158	.0069	-4.9762	5.3442	1.6760
2,449,364	.3602	-1.0210	5.0800	0.00	0.00	5.0113	1.6116
2,449,369	.3666	-1.0034	1.8085	.0077	-4.8665	4.7566	1.5595
2,449,352	.4478	-.8034	4.7932	.0078	-4.8536	4.6709	1.5413
2,449,344	.4743	-.7459	-.06	.0123	-4.3981	4.9672	1.6028
2,449,340	.5600	-.5798	2.9962	.0122	-4.4063	4.9991	1.6092
2,445,336	.6370	-.4509	4.1080	.0126	-4.3740	4.8442	1.5777
2,442,132	.5522	-.5938	5.3679	.0129	-4.3505	4.7230	1.5524
2,442,124	.5935	-.5217	2.8182	.0144	-4.2405	4.2175	1.4392
2,442,100	.8748	-.1337	1.0848	.0260	-3.6496	4.0918	1.4104
2,383,492	1.0421	-.0412	.4798	.0301	-3.5032	3.9589	1.3759
2,324,516	.9594	-.0414	6.7344	.0302	-3.4999	3.8447	1.3466
2,294,296	1.1022	-.0973	5.1553	.0325	-3.4265	3.5240	1.2595
2,294,252	1.3131	-.2723	6.9138	.0343	-3.3726	3.3404	1.2060
2,294,216	1.1821	-.1672	14.27	.0351	-3.3495	3.2623	1.1824

TABLE A-10

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS ON RATE OF RETURN ON NET WORTH MODEL - WESTINGHOUSE CANADA LIMITED

Year	'r'	(1+b)	ln'r'	ln(1+b)
1972	3.35	1.612	1.2089	.4774
71	7.38	1.754	1.9987	.5618
70	4.28	1.553	1.4539	.4401
69	4.18	1.532	1.4303	.4265
68	4.23	1.528	1.4422	.4239
67	2.86	1.285	1.0500	.2507
66	7.59	1.790	2.0268	.5822
65	7.37	1.759	1.9974	.5647
64	6.52	1.892	1.8748	.6376
63	5.08	2.000	1.6253	.6931
62	2.58	1.701	.9477	.5312
61	5.58	1.859	1.7191	.6200
60	0.06	0.00	-2.8134	0.00
59	4.22	1.710	1.4398	.5364
58	5.37	1.765	1.6808	.5681
57	6.66	1.806	1.8961	.5911
56	4.27	1.660	1.4516	.5068
55	3.69	1.294	1.3056	.2577
54	3.48	1.137	1.2470	.1283
53	9.76	1.690	2.2782	.5247
52	8.41	1.613	2.1294	.4780
51	10.35	1.668	2.3369	.5116
50	17.80	1.802	2.8791	.5888

TABLE A-11

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS
ON SHARE PRICE MODEL -
THE STEEL COMPANY OF CANADA LIMITED

Year	Earnings/ share (Y_t) ($)	Dividend/ share (D_t) ($)	Earnings ret. frac. $b=\frac{Y_t-D_t}{Y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Share Price(P_t) ($)
1973	3.56	1.30	.634	13.00	27.36	32.12
72	2.73	1.25	.542	10.77	25.28	31.81
71	2.74	1.25	.543	11.48	23.83	24.75
70	2.30	1.20	.478	10.45	21.99	22.75
69	1.28	1.20	.062	6.07	21.01	24.31
68	2.79	1.00	.641	13.33	20.94	22.56
67	1.94	.85	.561	10.09	19.17	22.56
66	1.77	.85	.519	9.79	18.08	23.68
65	1.80	.85	.527	10.48	17.16	29.56
64	1.91	.85	.554	11.10	16.27	24.87
63	1.82	.775	.574	11.18	16.28	21.06
62	1.50	.475	.683	9.83	15.22	20.20
61	1.35	.60	.555	9.26	14.59	18.40
60	1.23	.60	.512	8.71	14.12	18.56
59	1.89	.525	.722	14.19	13.34	19.84
58	.94	.475	.494	8.00	11.83	14.43
57	1.22	.475	.610	10.73	11.41	14.62
56	1.31	.437	.666	12.40	10.58	17.15
55	1.47	.387	.736	16.19	9.10	12.67
54	.89	.337	.621	11.09	8.05	9.40

TABLE A-11 continued

Shares Outstanding	$(P/B)_t$	$(D/B)_t$	Size $(S)_t = B_t$ x sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
24,639,399	1.1739	.0475	6.7413	.1603	8.2420	-3.0467	1.9082
24,618,899	1.2583	.0494	6.2236	.2297	5.8373	-2.0068	1.8283
24,344,847	1.0386	.0524	5.8013	.0378	6.2336	-2.9478	1.7580
24,335,347	1.0345	.0545	5.3513	.0339	4.9951	-2.9082	1.6773
24,335,347	1.1570	.0571	5.1128	.1458	.3763	-2.8626	1.6317
24,330,347	1.0773	.0477	5.0947	.0745	8.5445	-3.0416	1.6830
24,139,052	1.1768	.0443	4.6274	.1628	5.6604	-3.1158	1.5320
24,139,052	1.3097	.0470	4.3643	.2698	5.0810	-3.0573	1.4734
24,139,052	1.7226	.0495	4.1422	.5438	5.5229	-3.0051	1.4214
24,139,052	1.5285	.0522	3.9274	.4243	6.1494	-2.9518	1.3679
20,377,595	1.2936	.0476	3.3174	.2574	6.4173	-3.0448	1.1992
20,245,576	1.3272	.0312	3.0813	.2830	6.7138	-3.4670	1.1253
20,245,576	1.2611	.0411	2.9538	.2320	5.1393	-3.1911	1.0831
17,353,352	1.3144	.0424	2.4502	.2734	4.4595	-3.1584	.8962
17,353,352	1.4872	.0393	2.3149	.3969	10.2451	-3.2351	.8393
17,275,300	1.2197	.0401	2.0436	.1986	3.9520	-3.2150	.7147
17,275,300	1.2813	.0416	1.9711	.2479	6.5453	-3.1789	.6785
17,275,300	1.6209	.0413	1.8277	.4830	8.2584	-3.1867	.6030
14,807,400	1.3923	.0425	1.3474	.3309	11.9158	-3.1576	.2982
14,807,400	1.1677	.0418	1.1919	.1550	6.8868	-3.1733	.1756

TABLE A-12

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS
ON RATE OF RETURN ON NET WORTH MODEL -
THE STEEL COMPANY OF CANADA LIMITED

Year	'r'	(1+B)	ln'r'	ln(1+b)
1973	13.00	1.634	2.5649	.4910
72	10.77	1.542	2.3767	.4330
71	11.48	1.543	2.4406	.4337
70	10.45	1.478	2.3466	.3906
69	6.07	1.062	1.8033	.0601
68	13.33	1.641	2.5900	.4953
67	10.09	1.561	2.3115	.4453
66	9.79	1.519	2.2813	.4180
65	10.48	1.527	2.3494	.4233
64	11.10	1.554	2.4069	.4408
63	11.18	1.574	2.4141	.4536
62	9.83	1.683	2.2854	.5205
61	9.26	1.555	2.2257	.4414
60	8.71	1.512	2.1644	.4134
59	14.19	1.722	2.6525	.5434
58	8.00	1.494	2.0794	.4014
57	10.73	1.610	2.3730	.4762
56	12.40	1.666	2.5176	.5104
55	16.19	1.736	2.7843	.5515
54	11.09	1.621	2.4060	.4830

TABLE A-13

INPUT DATA FOR TIME SERIES MULTIPLE REGRESSION ANALYSIS
ON SHARE PRICE MODEL -
ALCAN ALUMINUM LIMITED

Year	Earnings/ share (Y_t) ($)	Dividend/ share (D_t) ($)	Earnings ret. frac. $b=\frac{Y_t-D_t}{Y_t}$	return on net worth, 'r' as %	Book Value B_t = N.W. ($)	Share Price (P_t) $
1973	2.42	.90	.6280	8.63	27.71	31.31
72	1.78	0.80	.5505	6.77	25.76	21.31
71	1.75	1.00	.4285	6.90	24.78	20.18
70	2.35	1.20	.4893	9.50	23.82	24.87
69	2.42	1.12	.5351	10.24	22.67	30.62
68	2.12	1.02	.5165	9.50	21.33	26.25
67	1.94	1.00	.4845	8.60	21.43	30.81
66	2.41	.92	.6161	11.35	19.90	35.75
65	1.93	.82	.5725	9.97	18.07	30.93
64	1.52	.65	.5723	8.65	16.44	31.00
63	1.01	.60	.4059	5.96	15.61	25.93
62	1.23	.60	.5121	8.03	15.30	24.43
61	1.00	.60	.4000	6.79	14.70	32.37
60	1.28	.70	.4531	8.51	15.03	30.56
59	.79	.55	.3037	5.52	14.36	31.75
58	0.74	.75	-.0135	5.26	14.08	30.68
57	1.37	.45	.6715	9.77	14.05	40.37
56	1.85	.78	.5783	13.75	13.47	41.25
55	1.61	.71	.5590	13.03	12.35	31.25
54	1.29	.66	.4883	14.61	11.05	20.16
53	.72	.66	.0833	6.91	10.41	15.79

TABLE A-13 continued

Shares Outstanding	$(P/B)_t$	$(D/B)_t$	Size $(S)_t$= b_tx sh.out.	$\ln(P/B)_t$	g_t = bxr	$\ln(D/B)_t$	$\ln(S)_t$
34,396,686	1.1299	.0324	9.5313	.1221	5.4196	-3.4271	2.2545
32,946,549	.8272	.0310	8.4870	-.1896	3.7268	-3.4719	2.1385
32,944,072	.8143	.0403	8.1635	-.2053	2.9566	-3.2100	2.0996
32,943,632	1.0440	.0503	7.8471	.0431	4.6483	-2.9882	2.0601
32,941,961	1.3506	.0496	7.4679	.3006	5.4794	-3.0032	2.0106
32,280,599	1.2306	.0480	6.8854	.2075	4.9067	-3.0354	1.9294
32,270,164	1.4377	.0466	6.9154	.3630	4.1667	-3.0647	1.9337
31,137,066	1.7964	.0464	6.1962	.5858	6.9927	-3.0686	1.8239
31,086,642	1.7116	.0456	5.6173	.5374	5.7078	-3.0866	1.7258
31,050,817	1.8856	.0395	5.1047	.6342	4.9503	-3.2305	1.6301
31,024,054	1.6611	.0384	4.8428	.5074	2.4191	-3.2587	1.5775
30,724,158	1.5967	.0392	4.7007	.4679	4.1121	-3.2386	1.5477
30,662,472	2.2020	.0408	4.5073	.7893	2.7160	-3.1986	1.5057
30,553,250	2.0332	.0465	4.5921	.7096	3.8558	-3.0667	1.5243
30,357,552	2.2110	.0383	4.3593	.7934	1.6764	-3.2622	1.4723
30,283,289	2.1789	.0532	4.2638	.7788	-.0710	-2.9324	1.4561
30,168,212	2.8733	.0320	4.2386	1.0554	6.5605	-3.4411	1.4442
30,041,541	3.0623	.0579	4.0465	1.1191	7.9516	-2.8489	1.3978
29,927,070	2.5303	.0574	3.6959	.9283	7.2837	-2.8561	1.3072
27,109,146	1.8244	.0597	2.9955	.6012	7.1340	-2.8179	1.0971
27,041,982	1.5168	.0634	2.8150	.4166	.5756	-2.7582	1.0349

TABLE A-14

INPUT DATA FOR TIME SERIES REGRESSION ANALYSIS
ON RATE OF RETURN ON NET WORTH MODEL -
ALCAN ALUMINUM LIMITED

Year	'r'	(1+b)	ln'r'	ln(1+b)
1973	8.63	1.6280	2.1552	.4873
72	6.77	1.5505	1.9125	.4385
71	6.90	1.4285	1.9315	.3566
70	9.50	1.4893	2.2512	.3983
69	10.24	1.5351	2.3263	.4285
68	9.50	1.5165	2.2512	.4164
67	8.60	1.4845	2.1517	.3950
66	11.35	1.6161	2.4292	.4800
65	9.97	1.5725	2.2995	.4526
64	8.65	1.5723	2.1575	.4525
63	5.96	1.4059	1.7850	.3406
62	8.03	1.5121	2.0831	.4134
61	6.79	1.4000	1.9154	.3364
60	8.51	1.4531	2.1412	.3736
59	5.52	1.3037	1.7083	.2652
58	5.26	0.9865	1.6601	-.0135
57	9.77	1.6715	2.2793	.5137
56	13.75	1.5783	2.6210	.4563
55	13.03	1.5590	2.5672	.4440
54	14.61	1.4883	2.6817	.3976
53	6.91	1.0833	1.9329	.0800

APPENDIX - B

VARIATION OF FINANCIAL RATIOS AND OTHER RELEVANT FINANCIAL DATA, OVER THE PERIOD OF STUDY - IN TABULAR FORM

TABLE B-1

VARIATION OF FINANCIAL RATIOS - BRITISH COLUMBIA TELEPHONE COMPANY

(Period 1953 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratios	Return on Net Worth = Net Profit after Taxes/ Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times
1953	7.95	2.39	9.50	.25
1954	6.85	2.43	9.84	.24
1955	7.56	3.49	11.32	.30
1956	6.49	3.59	12.92	.27
1957	5.71	2.73	11.42	.23
1958	5.06	2.05	9.29	.22
1959	7.10	2.90	12.16	.23
1960	6.46	2.77	12.31	.22
1961	7.10	3.02	13.05	.23
1962	6.74	3.05	12.94	.23
1963	7.06	3.33	14.12	.23
1964	7.58	3.43	13.63	.25
1965	7.41	3.65	13.74	.26
1966	7.86	3.36	13.20	.25
1967	7.93	3.20	12.09	.26
1968	8.10	3.26	12.15	.26
1969	8.24	3.39	12.08	.28
1970	9.00	3.04	10.90	.27
1971	7.73	2.89	10.21	.28
1972	8.55	3.11	10.91	.28

TABLE B-2

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT - BRITISH COLUMBIA TELEPHONE COMPANY

(Period 1953 - 1972)

Year \ Variable	Total Assets ($) x 10^7	Total Sales ($) (operating Revenue) x 10^7	Net Profit ($) x 10^6
1953	10.62	2.67	2.54
1954	11.94	2.95	2.91
1955	10.69	3.29	3.73
1956	13.35	3.71	4.80
1957	17.30	4.13	4.72
1958	20.34	4.48	4.17
1959	22.97	5.48	6.67
1960	26.12	5.88	7.24
1961	29.03	6.73	8.79
1962	31.02	7.32	9.48
1963	32.79	7.73	10.92
1964	24.75	8.74	11.92
1965	27.45	9.97	13.70
1966	44.08	11.25	14.83
1967	47.88	12.68	15.33
1968	51.82	13.93	16.93
1969	56.35	15.80	19.19
1970	62.51	17.48	19.05
1971	70.45	19.98	20.41
1972	79.93	22.77	24.86

TABLE B-3

VARIATION OF FINANCIAL RATIOS - HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Period 1952 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratios	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales/ Inventory Times
1952	10.43	8.71	5.10	1.70	2.93
1953	11.89	9.96	5.66	1.76	3.17
1954	11.93	10.21	5.96	1.71	3.20
1955	10.90	9.13	5.66	1.61	2.95
1956	11.29	9.50	5.68	1.67	3.17
1957	11.48	9.68	5.67	1.70	3.22
1958	10.75	9.20	5.68	1.61	3.06
1959	11.24	9.17	5.74	1.59	3.27
1960	11.27	9.47	5.69	1.66	3.37
1961	11.40	9.66	5.86	1.64	3.34
1962	11.51	9.73	5.90	1.64	3.24
1963	11.68	9.89	6.19	1.59	3.09
1964	12.27	10.13	6.45	1.56	3.17
1965	12.45	10.33	6.52	1.58	3.25
1966	12.82	10.30	6.72	1.53	3.40
1967	12.80	10.43	6.91	1.51	3.22
1968	13.31	9.91	6.97	1.42	2.82
1969	13.09	9.58	6.94	1.38	2.69
1970	12.41	8.87	6.80	1.30	2.56
1971	11.62	7.54	6.78	1.11	2.27
1972	12.10	8.45	7.12	1.18	2.29

TABLE B-4

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT
- HIRAM WALKER-GOODERHAM AND WORTS LIMITED

(Period 1952 - 1972)

Year \ Variable	Total Assets ($) $\times 10^8$	Total Sales ($) (operating revenue) $\times 10^8$	Net Profit ($) $\times 10^7$
1952	1.79	3.06	1.56
1953	1.91	3.37	1.90
1954	1.98	3.39	2.02
1955	2.11	3.41	1.93
1956	2.21	3.70	2.10
1957	2.32	3.96	2.24
1958	2.37	3.84	2.18
1959	2.58	4.12	2.36
1960	2.64	4.40	2.50
1961	2.72	4.49	2.63
1962	2.89	4.69	2.77
1963	2.99	4.78	2.96
1964	3.17	4.98	3.21
1965	3.34	5.29	3.45
1966	3.69	5.65	3.80
1967	3.90	5.90	4.07
1968	4.46	6.34	4.42
1969	5.00	6.90	4.79
1970	5.48	7.15	4.86
1971	6.41	7.13	4.84
1972	6.40	7.60	5.41

TABLE B-5

VARIATION OF FINANCIAL RATIOS - TEXACO CANADA LIMITED

(Period 1952 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratio	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales Inventory Times
1952	13.42	7.12	5.90	1.20	4.32
1953	15.05	8.32	7.28	1.14	4.63
1954	14.77	8.74	7.84	1.11	5.52
1955	16.95	10.24	8.93	1.14	5.35
1956	16.15	8.79	8.93	.98	4.17
1957	13.97	8.55	7.59	1.12	5.10
1958	9.19	5.90	5.37	1.09	5.65
1959	9.67	6.22	5.63	1.10	5.33
1960	9.80	6.36	5.94	1.06	5.31
1961	8.63	5.43	5.35	1.01	5.11
1962	7.92	4.84	4.98	.97	5.21
1963	8.39	4.62	5.01	.92	5.05
1964	8.47	4.81	5.05	.95	5.47
1965	9.28	5.34	5.59	.95	5.61
1966	9.69	5.73	5.72	1.00	5.89
1967	10.59	6.47	6.06	1.06	7.20
1968	11.90	6.31	6.75	.93	6.92
1969	12.15	9.32	7.05	.94	7.07
1970	11.91	6.65	7.04	.94	7.29
1971	13.62	7.90	7.80	1.01	8.15
1972	16.19	10.03	9.26	1.06	9.85

TABLE B-6

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT - TEXACO CANADA LIMITED

(Period 1952 - 1972)

Year \ Variable	Total Assets ($) x 10^7	Total Sales ($) x 10^8	Net Profit ($) x 10^6
1952	8.31	1.00	5.92
1953	8.79	1.00	7.31
1954	9.08	1.01	7.99
1955	10.03	1.15	10.28
1956	14.51	1.42	12.76
1957	16.29	1.83	13.92
1958	15.97	1.75	9.42
1959	16.69	1.84	10.38
1960	17.49	1.86	11.10
1961	18.76	1.90	10.19
1962	20.05	1.94	9.70
1963	23.22	2.14	10.73
1964	23.59	2.24	11.36
1965	24.61	2.35	13.15
1966	25.44	2.54	14.58
1967	26.36	2.81	17.05
1968	32.86	3.06	20.73
1969	34.42	3.27	23.08
1970	36.80	3.48	24.50
1971	39.60	4.01	31.31
1972	42.09	4.55	42.22

TABLE B-7

VARIATION OF FINANCIAL RATIOS - IMPERIAL OIL LIMITED

(Period 1953 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratios	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales/ Inventory Times
1953	11.54	8.54	7.92	1.07	2.58
1954	10.62	8.42	8.06	1.04	2.72
1955	12.43	8.86	8.87	.99	2.33
1956	10.71	8.33	8.25	1.00	2.28
1957	11.07	8.49	8.14	1.04	2.74
1958	7.36	5.87	6.03	.97	2.63
1959	7.59	6.16	6.29	.98	2.71
1960	8.26	6.77	7.00	.96	2.74
1961	8.40	7.22	7.47	.96	2.70
1962	8.19	7.17	6.99	1.02	2.78
1963	8.17	7.09	7.00	1.01	2.61
1964	8.56	7.74	7.42	1.05	2.84
1965	9.20	8.07	7.41	1.08	2.89
1966	9.59	8.27	7.69	1.07	3.05
1967	9.14	7.65	7.24	1.05	2.93
1968	9.35	7.15	6.87	1.04	2.93
1969	8.35	6.40	6.12	1.04	2.97
1970	8.73	6.75	6.13	1.10	2.96
1971	10.59	8.25	7.00	1.17	3.10
1972	11.07	8.43	7.26	1.16	3.16

TABLE B-8

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT - IMPERIAL OIL LIMITED

(Period 1953 - 1972)

Year \ Variable	Total Assets ($) $\times 10^8$	Total Sales ($) $\times 10^8$	Net Profit $\times 10^7$
1953	5.61	6.05	4.79
1954	5.88	6.14	4.95
1955	7.01	7.00	6.21
1956	8.29	8.37	6.90
1957	8.48	8.84	7.20
1958	8.61	8.38	5.06
1959	8.84	8.66	5.45
1960	9.02	8.73	6.12
1961	9.38	9.07	6.78
1962	9.53	9.77	6.84
1963	10.02	10.15	7.10
1964	10.20	10.81	7.90
1965	10.67	11.61	8.61
1966	11.17	12.01	9.24
1967	12.47	13.19	9.55
1968	13.97	14.55	10.00
1969	14.67	15.36	9.40
1970	15.55	17.11	10.50
1971	16.48	19.41	13.60
1972	17.91	20.80	15.10

TABLE B-9

VARIATION OF FINANCIAL RATIOS - WESTINGHOUSE CANADA LIMITED

(Period 1956 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratios	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales/ Inventory Times
1956	4.27	2.39	1.37	1.74	5.21
1957	6.66	4.17	2.25	1.84	4.77
1958	5.37	3.25	1.86	1.74	4.27
1959	4.22	2.58	1.57	1.64	3.94
1960	.06	.3	.25	1.59	3.77
1961	5.58	3.46	2.04	1.69	4.21
1962	2.58	1.55	.88	1.75	4.07
1963	5.08	3.05	1.65	1.84	4.48
1964	6.52	3.96	2.09	1.89	5.47
1965	7.37	3.89	2.30	1.69	4.50
1966	7.59	3.83	2.17	1.76	4.52
1967	2.86	1.56	.89	1.74	4.65
1968	4.23	2.37	1.31	1.80	4.62
1969	4.18	2.06	1.21	1.70	4.30
1970	4.28	2.18	1.24	1.75	4.27
1971	7.38	3.91	1.98	1.96	5.20
1972	3.35	2.21	1.19	1.85	4.93

TABLE B-10

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT
- WESTINGHOUSE CANADA LIMITED

(Period 1956 - 1972)

Year \ Variable	Total Assets ($) $\times 10^7$	Total Sales ($) $\times 10^8$	Net Profit ($) $\times 10^7$
1956	7.51	1.30	1.80
1957	8.12	1.50	3.39
1958	7.90	1.39	2.60
1959	8.16	1.34	2.11
1960	7.74	1.23	3.07
1961	7.52	1.27	2.60
1962	7.92	1.38	1.23
1963	8.35	1.54	2.54
1964	8.79	1.66	3.48
1965	10.87	1.84	4.23
1966	12.08	2.12	4.65
1967	11.56	2.01	1.81
1968	11.57	2.09	2.74
1969	13.42	2.29	2.77
1970	13.31	2.33	2.91
1971	13.57	2.67	5.31
1972	15.20	2.81	3.37

TABLE B-11

VARIATION OF FINANCIAL RATIOS - THE STEEL COMPANY OF CANADA LIMITED

(Period 1956 - 1972)

(Ratios looked at from management efficienty point of view)

Ratios / Year	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales/ Inventory Times
1956	12.40	9.07	8.31	1.09	4.59
1957	10.73	8.29	7.69	1.07	4.70
1958	8.00	6.31	7.27	.86	4.11
1959	14.19	10.70	10.22	1.04	4.89
1960	8.71	7.13	7.57	.94	4.21
1961	9.26	10.14	9.49	.77	4.31
1962	9.83	7.57	9.12	.83	4.56
1963	11.18	8.35	9.99	.83	4.54
1964	11.10	7.72	9.13	.84	5.03
1965	10.48	6.60	8.41	.78	4.26
1966	9.79	6.03	8.46	.71	4.42
1967	10.09	6.14	9.12	.67	4.10
1968	13.33	8.37	11.52	.72	4.66
1969	6.07	3.86	5.88	.65	3.86
1970	10.45	6.07	8.44	.71	4.17
1971	11.48	6.90	9.12	.75	4.20
1972	10.77	6.49	8.64	.75	3.92

TABLE B-12

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT - THE STEEL COMPANY OF CANADA LIMITED

(Period 1956 - 1972)

Year \ Variable	Total Assets ($) x 10^8	Total Sales ($) X 10^7	Net Profit ($) x 10^7
1956	2.50	2.72	2.26
1957	2.54	2.74	2.11
1958	2.59	2.25	1.63
1959	3.07	3.21	3.28
1960	2.99	2.31	2.13
1961	3.70	2.88	2.73
1962	4.00	3.32	3.02
1963	4.43	3.70	3.70
1964	5.64	4.77	4.36
1965	6.57	5.16	4.34
1966	7.08	5.04	4.27
1967	7.60	5.12	4.67
1968	8.12	5.89	6.79
1969	8.03	5.28	3.10
1970	9.21	6.63	5.59
1971	9.65	7.30	6.66
1972	10.32	7.75	6.70

TABLE B-13

VARIATION OF FINANCIAL RATIOS - ALCAN ALUMINIUM LIMITED

(Period 1953 - 1972)

(Ratios looked at from management efficiency point of view)

Year \ Ratios	Return on Net Worth = Net Profit after Taxes/Net Worth as a Percentage	Return on Total Assets = Net Profit after Taxes/ Total Assets as a Percentage	Profit Margin on Sales = Net Profit after Taxes/Sales as a Percentage	Total Assets Turnover = Sales/Total Assets Times	Inventory Turnover = Sales/ Inventory Times
1953	6.91	2.65	6.37	.41	3.47
1954	14.61	4.12	11.73	.35	2.95
1955	13.03	5.05	12.97	.38	3.07
1956	13.75	5.13	13.16	.39	2.75
1957	9.77	3.42	10.74	.31	2.19
1958	5.26	1.76	6.27	.28	2.08
1959	5.52	1.82	10.69	.29	2.53
1960	8.51	2.21	6.69	.33	2.43
1961	6.79	2.24	6.65	.33	2.30
1962	8.03	2.69	7.50	.35	2.20
1963	5.96	2.22	5.34	.42	1.88
1964	8.65	3.33	7.51	.44	2.50
1965	9.97	3.79	7.60	.49	2.55
1966	11.35	4.47	8.35	.53	2.84
1967	8.60	3.40	7.11	.47	2.77
1968	9.50	3.66	7.01	.52	3.08
1969	10.24	4.02	7.03	.57	3.21
1970	9.50	3.60	6.12	.58	3.14
1971	6.90	2.62	4.35	.60	3.13
1972	6.77	2.58	4.20	.61	3.37

TABLE B-14

VARIATION OF TOTAL ASSETS, TOTAL SALES AND NET PROFIT
- ALCAN ALUMINIUM LIMITED

(Period 1953 - 1972)

Year \ Variable	Total Assets ($) x 10^8	Total Sales ($) x 10^8	Net Profit ($) x 10^8
1953	7.33	3.05	1.94
1954	8.47	2.98	3.49
1955	9.53	3.71	4.81
1956	10.84	4.24	5.56
1957	12.08	3.85	4.14
1958	12.73	3.57	2.24
1959	13.17	3.93	2.40
1960	13.58	4.49	3.01
1961	13.62	4.60	3.06
1962	13.99	5.03	3.77
1963	14.69	6.12	3.27
1964	14.94	6.62	4.97
1965	16.15	8.21	6.24
1966	17.35	9.29	7.76
1967	19.10	9.15	6.51
1968	19.54	10.20	7.15
1969	20.44	11.69	8.22
1970	22.12	13.04	7.98
1971	22.96	14.55	6.01
1972	23.70	18.14	6.12

APPENDIX - C

SIMPLE CORRELATION MATRICES FOR SHARE PRICE MODEL - 1970 AND 1971 SAMPLES

(Taken from results obtained by performing time series multiple regression analysis on Eq. (16) shown in section 4.3)

TABLE C-1

SIMPLE CORRELATION MATRICES FOR SHARE PRICE MODEL - BRITISH COLUMBIA TELEPHONE COMPANY

AND HIRAM WALKER - GOODERHAM AND WORTS LIMITED

(Variable 1: Share price, 2: Growth in dividends, 3: Dividends, 4: Size)

BRITISH COLUMBIA TELEPHONE COMPANY

(PERIOD 1973-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,304	-0,204	0,302
2		1,000	-0,377	0,581
3			1,000	-0,809
4				1,000

(PERIOD 1953-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,206	-0,123	0,143
2		1,000	-0,391	0,596
3			1,000	-0,808
4				1,000

HIRAM WALKER - GOODERHAM AND WORTS LIMITED

(PERIOD 1952-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,159	0,245	0,856
2		1,000	-0,765	0,363
3			1,000	0,143
4				1,000

(PERIOD 1952-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,160	0,243	0,798
2		1,000	-0,765	0,340
3			1,000	0,114
4				1,000

TABLE C-2

SIMPLE CORRELATION MATRICES FOR SHARE PRICE MODEL
TEXACO CANADA LIMITED AND IMPERIAL OIL LIMITED

(Variable 1: Share price, 2: Growth in dividends, 3: Dividends, 4: Size)

TEXACO CANADA LIMITED

(PERIOD 1952-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,408	0,888	-0,757
2		1,000	0,582	-0,443
3			1,000	-0,886
4				1,000

(PERIOD 1952-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,304	0,854	-0,765
2		1,000	0,298	-0,259
3			1,000	-0,898
4				1,000

IMPERIAL OIL LIMITED

(PERIOD 1953-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,671	0,182	-0,309
2		1,000	0,011	-0,741
3			1,000	0,367
4				1,000

(PERIOD 1953-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,679	0,219	-0,119
2		1,000	0,036	-0,610
3			1,000	0,388
4				1,000

TABLE C-3

SIMPLE CORRELATION MATRICES FOR SHARE PRICE MODEL - WESTINGHOUSE CANADA LIMITED

AND THE STEEL COMPANY OF CANADA LIMITED

(Variable 1: Share price, 2: Growth in dividends, 3: Dividends, 4: Size)

WESTINGHOUSE CANADA LIMITED

(PERIOD 1950-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1.000	0.407	0.076	-0.580
2		1.000	0.187	-0.456
3			1.000	-0.171
4				1.000

(PERIOD 1950-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,381	0,081	-0,597
2		1,000	0,182	-0,387
3			1,000	-0,171
4				1,000

THE STEEL COMPANY OF CANADA LIMITED

(PERIOD 1954-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,322	-0,188	-0,258
2		1,000	-0,409	-0,491
3			1,000	0,572
4				1,000

(PERIOD 1954-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,301	-0,269	-0,349
2		1,000	-0,395	-0,465
3			1,000	0,610
4				1,000

TABLE C-4

SIMPLE CORRELATION MATRICES FOR SHARE PRICE MODEL

ALCAN ALUMINUM LIMITED

(Variable 1: Share price, 2: Growth in dividends, 3: Dividends, 4: Size)

ALCAN ALUMINUM LIMITED

(PERIOD 1953-1970)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,203	-0,139	-0,593
2		1,000	0,088	0,139
3			1,000	-0,277
4				1,000

(PERIOD 1953-1971)

CORRELATION MATRIX

VARIABLE NUMBER	1	2	3	4
1	1,000	0,253	-0,010	-0,669
2		1,000	0,114	0,067
3			1,000	-0,322
4				1,000

APPENDIX - D

COMPUTER PRINTOUT ON COMPUTED VALUES OF VON-NEUMAN RATIO FOR SHARE PRICE MODEL AND RATE OF RETURN ON NET WORTH MODEL.

(Von-Neuman ratio was used in this study to test for presence of auto-correlation)

COMPUTER PRINTOUT

K = Von Neuman ratio

THE INPUT FOR THIS PROBLEM

1	-0,18960
2	-0,20530
3	0,04310
4	0,30060
5	0,20750
6	0,36300
7	0,58580
8	0,53740
9	0,63420
10	0,50740
11	0,46790
12	0,78930
13	0,70960
14	0,79340
15	0,77880
16	1,05540
17	1,11910
18	0,92830
19	0,60120
20	0,41660

PROBLEM NUMBER 1 VALUE OF K= 0,2561 (for share price P_t)
(Alcan Aluminium Limited)

THE INPUT FOR THIS PROBLEM

1	1,91250
2	1,93150
3	2,25120
4	2,32630
5	2,25120
6	2,15170
7	2,42920
8	2,29950
9	2,15750
10	1,78500
11	2,08310
12	1,91540
13	2,14120
14	1,70830
15	1,66010
16	2,27930
17	2,62100
18	2,56720
19	2,68170
20	1,93290

PROBLEM NUMBER 2 VALUE OF K= 1,1724 (for rate of return r)
(Alcan Aluminium Limited)

```
THE INPUT FOR THIS PROBLEM
    1            0,22970
    2            0,03780
    3            0,03390
    4            0,14560
    5            0,07450
    6            0,16280
    7            0,26980
    8            0,54380
    9            0,42430
   10            0,25740
   11            0,28300
   12            0,23200
   13            0,27340
   14            0,39690
   15            0,19860
   16            0,24790
   17            0,48300
   18            0,33090
   19            0,15500
```

PROBLEM NUMBER 3 VALUE OF K= 1,0784 (for share price P_t)

(The Steel Company of Canada Limited)

```
THE INPUT FOR THIS PROBLEM
    1            2,37670
    2            2,44060
    3            2,34660
    4            1,80330
    5            2,59000
    6            2,31150
    7            2,28130
    8            2,34940
    9            2,40690
   10            2,41410
   11            2,28540
   12            2,22570
   13            2,16440
   14            2,65250
   15            2,07940
   16            2,37300
   17            2,51760
   18            2,78430
   19            2,40600
```

PROBLEM NUMBER 4 VALUE OF K= 2,4881 (for rate of return r)

2 (The Steel Company of Canada Limited)

216

THE INPUT FOR THIS PROBLEM

1	0,58270
2	0,29910
3	0,14160
4	0,41100
5	0,52040
6	0,35920
7	0,32710
8	0,24730
9	0,37230
10	0,25320
11	0,32560
12	0,56340
13	0,43430
14	0,67080
15	0,67870
16	0,79310
17	0,84450
18	0,64380
19	0,55010
20	0,64680
21	1,00950

PROBLEM NUMBER 5 VALUE OF K= 0,6341 (for share price P_t)

(Texaco Canada Limited)

THE INPUT FOR THIS PROBLEM

1	2,78430
2	2,61150
3	2,47730
4	2,49730
5	2,47650
6	2,35990
7	2,27100
8	2,22780
9	2,13650
10	2,12700
11	2,06930
12	2,15520
13	2,28230
14	2,26900
15	2,21810
16	2,63690
17	2,78190
18	2,83020
19	2,69250
20	2,71130
21	2,59670

PROBLEM NUMBER 6 VALUE OF K= 0,2948 (for rate of return r)

(Texaco Canada Limited)

3

THE INPUT FOR THIS PROBLEM	
1	-0,59020
2	-0,75520
3	-0,98590
4	-0,59140
5	-0,43690
6	-0,35430
7	-0,12000
8	-0,20490
9	-0,77690
10	1,02100
11	-1,00340
12	-0,80340
13	-0,74590
14	-0,57980
15	-0,45090
16	-0,59380
17	-0,52170
18	-0,13370
19	0,04120
20	-0,04140
21	0,09730
22	0,27230
23	0,16720

PROBLEM NUMBER 7 VALUE OF K= 1,7744 (for share price P_t)

Westinghouse Canada Limited

THE INPUT FOR THIS PROBLEM	
1	1,20890
2	1,99870
3	1,45390
4	1,43030
5	1,44220
6	1,05000
7	2,02680
8	1,99740
9	1,87480
10	1,62530
11	0,94770
12	1,71910
13	-2,81340
14	1,43980
15	1,68080
16	1,89610
17	1,45160
18	1,30560
19	1,24700
20	2,27820
21	2,12940
22	2,33690
23	2,87910

PROBLEM NUMBER 8 VALUE OF K= 1,8900 (for rate of return r)

4 (Westinghouse Canada Limited)

THE INPUT FOR THIS PROBLEM

1	0,60120
2	0,46670
3	0,62410
4	0,69260
5	0,64350
6	0,57960
7	0,59250
8	0,84460
9	0,71230
10	0,67770
11	0,61240
12	0,60780
13	0,36200
14	0,39640
15	0,06060
16	0,08420
17	0,05240
18	0,17440
19	0,01820
20	-0,16770
21	-0,11210

PROBLEM NUMBER 9 VALUE OF K= 0,2189 (for share price P_t)

(Hiram Walker-Gooderham and Worts Limited)

THE INPUT FOR THIS PROBLEM

1	2,49320
2	2,45270
3	2,51850
4	2,57180
5	2,56850
6	2,54940
7	2,55100
8	2,52170
9	2,50710
10	2,45780
11	2,44320
12	2,43360
13	2,43090
14	2,41940
15	2,37490
16	2,44060
17	2,42390
18	2,38870
19	2,47900
20	2,47560
21	2,34460

PROBLEM NUMBER 10 VALUE OF K= 0,5875 (for rate of return r_t)

(Hiram Walker-Gooderham and Worts Limited)

THE INPUT FOR THIS PROBLEM

1	0,07870
2	0,15150
3	0,19300
4	0,30630
5	0,27310
6	0,31210
7	0,40440
8	0,48460
9	0,46190
10	0,38000
11	0,30290
12	0,32380
13	0,26510
14	0,25510
15	0,24260
16	0,25190
17	0,33080
18	0,43980
19	0,30580
20	0,18750

PROBLEM NUMBER 11 VALUE OF K= 0,5427 (for share price P_t)

(British Columbia Telephone Company)

THE INPUT FOR THIS PROBLEM

1	2,14680
2	2,04510
3	2,07940
4	2,10900
5	2,09180
6	2,07060
7	2,06170
8	2,00280
9	2,02550
10	1,95440
11	1,90800
12	1,96000
13	1,86560
14	1,96000
15	1,62130
16	1,74220
17	1,87020
18	2,02260
19	1,92420
20	2,07310

PROBLEM NUMBER 12 VALUE OF K= 0,8113 (for rate of return r_t)

(British Columbia Telephone Company)

THE INPUT FOR THIS PROBLEM

1	1,33850
2	0,94210
3	0,67640
4	0,83710
5	0,77380
6	0,66070
7	0,56880
8	0,62290
9	0,57440
10	0,44020
11	0,54820
12	0,54290
13	0,36370
14	0,55710
15	0,63810
16	0,83610
17	0,88250
18	0,83970
19	0,77650
20	0,80960

PROBLEM NUMBER 13 VALUE OF K= 0,5297 (for share price P_t)

(Imperial Oil Limited)

THE INPUT FOR THIS PROBLEM

1	2,40420
2	2,35990
3	2,16670
4	2,12220
5	2,23530
6	2,21260
7	2,26070
8	2,21920
9	2,14710
10	2,10040
11	2,10290
12	2,12820
13	2,11140
14	2,02680
15	1,99600
16	2,40420
17	2,37110
18	2,52010
19	2,36270
20	2,44580

PROBLEM NUMBER 14 VALUE OF K= 0,7388 (for rate of return r)

(Imperial Oil Limited)