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AN EXPERIMENTAL STUDY OF THE INFORMATION CHOICES OF SECURITY ANALYSTS

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ABSTRACT

This paper examines the information search behaviour of security analysts, the first stage of their decision process. Their information choice, the set of attributes they selected in valuing the stocks of each and every sampled company, is evaluated against two theoretical models of stock valuation - the discounted cash flow model (DCF) and the capital asset pricing model (CAPM). The results indicate that most analysts' information choice corresponds to those attributes advocated in the DCF model, and attributes advocated in the CAPM are rarely included in the analysts' information choice. Earnings per share, price-earnings ratio, a security's historical prices, sales, net income, and return on common equity dominate the analysts' information choice, and moderate agreement in the analysts' information choice is evidenced.

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1. INTRODUCTION

An objective of financial reporting is to provide investors and creditors with accounting information that allows them to make investment, credit and similar decisions in a rational way (FASB, 1978). The usefulness of accounting information has been examined in various contexts.[1] There is, however, little empirical evidence about how accounting information is used by security analysts when they evaluate common stocks, and thus the present study attempts to examine the roles of this and other types of information in the valuation of stocks by security analysts.

The valuation of common stocks is a two-stage process: the first stage comprises the study of the economic and social environment and the characteristics of individual companies, the purpose of which is to produce a set of forecasts of individual company variable. The second turns these fundamental data about the company and its environment into forecast of security prices.[2]

The decision process involved in making judgments as to future prices of stock is complex and highly unstructured. This is because of both large number of company-related variables and the economy, which variables must be analyzed and predicted. In studying business judgments, past studies have generally employed the lens model and the analysis-of-variance approach.[3] There is, however, a growing interest in the predecisional behaviour of individuals, the focus of which is on the individual's information search behaviour, which, according to Simon (1977), is the first phase of the decision-making process. Evidence about this phase "should help explain any

observed differences in decisions" (Biggs and Mock, 1983, p. 235), and if the divergence in decisions is related to the information search, decision aids can be implemented effectively (Lewis, Shields, and Young, 1983). Thus, subjects in this study are allowed to search for information when making their price forecasts. With this approach, it is possible to identify the type of information selected by individual analysts, and their information choice can also be evaluated against models proposed in the literature.

This paper is divided into five sections as follows: the objectives are described in Section 2; the decision models for security analysis are presented in Section 3; Section 4 describes the methodology; an analysis and a description of the findings comprise Section 5; and Section 6 provides concluding remarks.

2. OBJECTIVES

To date, in an accounting context three studies have explicitly examined the information choices of subjects. In these investigations, subjects were allowed to search for information when making portfolio decisions (Pankoff and Virgil, 1970); when predicting loan default (Abdel-Khalik and El-Sheshai, 1980); and when making a diagnostic judgment on corporate performance (Shields, 1983). Among these three investigations, the study by Pankoff and Virgil is of particular interest since security analysts participated in their experiment.

The security analysts who participated in the Pankoff/Virgil study were given a hypothetical sum of money to purchase information for three industrial concerns. With the acquired information, subjects made forecasts of security prices and portfolio decisions over 13 periods. The most

frequently purchased items were earnings per share, company sales, industry sales and stock price indices. Based on their analysis, Pankoff and Virgil concluded that the analysts' forecasts, on average, are superior to a uniform distribution[4] although the quality of their performance, over time, was not stable.

In contrast to the Pankoff/Virgil experiment, the objective of this study is not to assess the value of information to security analysts, but rather to identify the type of information selected by them in forecasting security prices. Therefore, no restriction is placed on the information search of the subjects, i.e., information is made available to the subjects at no cost. The second objective of this study is to evaluate the information choice of the subjects in the context of certain decision models used for security analysis (i.e., the discounted cash flow model (DCF) and the capital asset pricing model (CAPM)) and to determine if there is any gap between practice and theory. A final objective of the study is to determine the existence of a consensus among the information choice of the security analysts.

The next section provides a description of the decision models and the attributes that were made available to the subjects for the experiment.

3. DECISION MODELS

The discounted cash flow model and the capital asset pricing model are two well-known determinants of a security's price.

The DCF model is based on the concept that the price of a security is equal to the present value of the cash flow that the stockholder expects to receive from it. Various forms of the DCF model are documented in the literature (e.g., Miller and Modigliani, 1961; Gordon, 1962; Malkiel, 1963).

Three major factors account for the cash flow expected by stockholders, and these are dividends, earnings, and growth.[5] Another major determinant of price is the discount rate, which is a function of the dividend yield and the price-earnings ratio (Elton and Gruber, 1981, p. 403).[6] The discount rate is also a function of the riskfree rate of return, the expected return on the market, and the systematic risk (market beta) of the security based on the one-period CAPM (Sharpe, 1964; Lintner, 1965; and Mossin, 1966).[7] Both the riskfree rate and the expected market return are dependent on general economic conditions. Market beta, on the other hand, is related to the fundamental characteristics of each individual company. It has been shown that operating leverage (Percival, 1974; Lev, 1974), financial leverage (Hamada, 1972; Bowman, 1979), and accounting beta (Bowman, 1979) are theoretically associated with the market beta. The relationship of some financial attributes with security prices is summarized in Figure 1. These attributes are made available to the analysts for forecasting security prices.

Figure 1

In a survey made by Chugh and Meador (1984), in the short run, security analysts ranked return on common equity and gross margin to sales as being important attributes for stock valuation. Technical analysts, on the other hand, considered the historical prices of a security to be important when forecasting security prices (Malkiel, 1981, pp. 106-113). Thus, in addition to the 16 attributes advocated in the DCF model and the CAPM, three attributes - return on common equity, gross margin to sales, and a security's historical prices - are also included in the list of attributes.

As return on common equity and gross margin to sales reflects the earnings potential of a company, their associations with a security's future price is expected to be positive, whereas according to the efficient market hypothesis,[8] a security's historical prices should have no association with its future price level.

4. METHODOLOGY

4.1 Participants

A total of 66 investment companies from the Toronto metropolitan area were contacted by the authors. Eleven of these companies agreed to participate in the study, and they ranged from small local firms with 20 employees to large international firms with over 100.

From the 11 investment companies, 17 subjects were obtained; not more than three of these subjects were from the same company.[9] As indicated in Table 1, all but one of the subjects has received a university education, and over 40 percent of the subjects their MBA degrees. Three of the analysts were Chartered Financial Analysts (CFA), and three other analysts were pursuing this certification. The subjects' professional practice in security analysis ranges from one to 30 years, and about 70 percent of the subjects have five or more years of experience in security analysis.

Table 1

The experiment was conducted in the analysts' offices, lasting between 75 and 140 minutes, with an average of about 95 minutes. The objectives of the study were explained before the experiment began. Subjects were told that the study was not intended to measure their professional competence,

and that it was the association of their information choice on price forecasts that was being examined. With this debriefing, subjects were less concerned about their performance, and they were more at ease when performing the experimental task.

4.2 Data Set

A total of 19 attributes was made available to the subjects (see Table 2). The historical data, over the period of January 1981 to December 1985, were used to compute the values of the financial attributes, except for riskfree rate, market return, and security prices, for which weekly data covering the period of January 1985 to May 1986, inclusive, were presented. Clearly, the information is historical, but may aid analysts in assessing the future (FASB, 1978, paragraph .22) and in forecasting security prices.

Table 2

4.3 Sample of Companies

Companies to be evaluated by the subjects were selected from the manufacturing industry because the weight of the industry in the Toronto Stock Exchange (TSE) 300 Composite Index was relatively high, about 25 percent (The Toronto Stock Exchange Review, July 1986). Companies manufactured a variety of products including paper, chemical, rubber, fabricated metal, electrical products, and so forth. With such a broad industry classification, it is possible to see if security analysts make adjustments in their information search owing to differences in product lines.

A total of ten manufacturing companies listed in the TSE was included in the experiment. Financial statement data of these companies were

obtained from the Financial Post Corporation Service and the business section of The Globe and Mail (a national Canadian daily newspaper) was the source for collecting price and index data.

4.4 Experimental Task

A semistructured interview was adopted for this experiment. At the outstart, subjects were provided with some background information on the general economy, which included a forecast for 1986 (The Toronto Stock Exchange Review, December 1985, p. 12), a list of economic indicators for 1981 to 1985 (Bank of Canada Review, January 1986), and an industrial outlook for 1986 (Quarterly Provincial Forecast, August 1985, p. 6). This constituted a review of the economic environments as well as a description of the manufacturing industries. The aforementioned information was summarized in a booklet (Appendix A) and provided to the subjects for examination.

To familiarize the subjects with the activities of the sampled companies, a brief description of the product lines of each individual company was provided (Appendix B). Subjects were told that these were real manufacturing concerns; the names of these companies were not disclosed to avoid subject bias. Each subject was given two opportunities to select information, and they were required to provide two price forecasts for each individual company. To avoid possible bias of the first forecast on the second, the sample of companies was presented to the subjects in random order.

After reviewing the description of the product line of a specific company, a list of financial attributes was presented to the subjects via a microcomputer (Figure 2a).[10] To further avoid possible bias in the selection process, the financial attributes in the list were randomly

ordered. Next, each subject was asked to select the minimum attributes that he or she felt necessary for making a three-month price forecast. These three steps, i.e., review of the product-line description, selection of minimum attributes, and forecast of security prices, were repeated for each of the ten companies.

After the first price forecasts for the ten companies were made, a list of financial attributes for each company was again presented to the subjects (Figure 2b). This time, those attributes that have been selected for the first forecast were identified with asterisks, and subjects were then asked to select as many attributes as they desired to make the second forecast. Since the companies were randomly presented, it is expected that price revision made by the subjects would be directly related to the additional attributes selected by the subjects.

Figures 2a and 2b

Among the 17 subjects, four did not participate in the second phase of the experiment, i.e., the selection of additional attributes, and providing a second forecast of security prices, because of time constraints.

5. ANALYSES[11]

To identify the information choice of the subjects, it is necessary to make sure that their information search is not random. Accordingly, a check on the consistency of the subjects' information search should be conducted prior to performing any data analyses.

5.1 Consistency of Subjects' Information Search

If an individual subject were perfectly consistent in his information search, the same attributes would be selected for each of the ten companies. This, however, was not observed (see Tables 3 and 4). Thus, a goodness-of-fit test was employed to determine if subjects were consistent in the manner of their information search. The test is as follows:

Tables 3 and 4

For each subject, the attributes he or she selected for one company were compared with those selected for another company. A total of 45 pairwise comparisons were required for the sample of ten companies. If an attribute was selected for one company but not for another, it was defined as a "failure"; otherwise as a "success". Thus, under the null hypothesis of perfect consistency, there should be N successes for each comparison where N was the number of attributes selected at least once by the subject in the first (or second) forecast. Based on the χ^2 statistics in Table 5, the null hypothesis could not be rejected at the 0.05 level of significance with the exception of Subject 14 in the first forecast. This implies that, by and large, the information search of the subjects is consistent for the sample of companies despite differences in the companies' product lines.

Table 5

In the following analyses, the most frequently selected attributes are identified. This provides an overall ranking of the perceived usefulness of the attributes to the subjects as a group. As subjects are consistent in

their information search, it is then appropriate to identify those financial attributes that constitute their information choice. The information choice of the subjects can then be evaluated against the financial attributes advocated in the DCF model and the CAPM to determine which model best describes their information choice. Finally, the degree of consensus among information choice of subjects is examined.

5.2 Frequency of Financial Attributes Selected

The most frequently selected attributes reported in the Pankoff/Virgil study (1970) are earnings per share, company sales, industry sales, and stock price index. However, results of the present study indicate that the most frequently selected attributes are earnings per share, price-earnings ratio, security prices, and sales. Risk measures, on the other hand, are rarely selected, whereas dividend data are chosen more often for second price forecasts (Tables 3 and 4). When implicitly computed attributes are included in the analysis, there is little change in the rankings of the financial attributes (Table 3). In fact, the Spearman's rank correlation coefficient is 0.9638 which is significant at the 0.01 level ($t = 14.000$).

Earnings per share and sales are the two top-ranked attributes reported in both the Pankoff/Virgil study and the present study. This implies that in stock valuation security analysts, as professionals, are much concerned with the earnings potential of a company. With earnings data, analysts form an expectation of cash flow which, as specified in the DCF model, is a major determinant of security prices.

The high ranking of the price-earnings ratio found in this study is in contrast to the findings of Pankoff and Virgil. The price-earnings ratio was ranked 19 in 35 information items provided for subjects by Pankoff and Virgil. In fact, these researchers suspected that the price-earnings ratio

was underranked because they observed that several analysts had computed the ratio based on other purchased data. Their suspicion is valid. As was indicated by several analysts during the experiment of this study, the price-earnings ratio reflects the market's aggregate evaluation of the stock, thereby affecting the discount rate used in determination of security prices.

Despite the random walk hypothesis,[12] reliance on historical prices in forecasting security prices is evident. Since the historical price data were presented in graph form, it was observed that most subjects marked the last closing price of the security and made comment on its historical trend, thereby implying that some form of technical analysis (analysis of a security's price trend) was used in conjunction with fundamental analysis (analysis of the intrinsic value of the security) by the subjects.

A total of four risk measures was made available to the subjects in accordance with the CAPM. Among these risk measures, debt-equity ratio was selected by 70 percent of the subjects, whereas for the other three - operating leverage, market beta, and accounting beta, they constituted less than six percent of the total requests and were in the bottom third of the rankings. This implies that for the subjects as a group, systematic risk is not of great importance in forecasting security prices. Their major concerns, however, were with whether the company's debt structure was reasonable. Thus, financial risk (or risk of bankruptcy) plays a fairly important role in stock valuation.

Although dividend is advocated as a major source of cash flow to stockholders (Gordon, 1962), it is found to be of secondary importance to forecasting security prices. As indicated in Table 3, less than one-quarter of subjects consistently requested information about dividend policy; about

half of the subjects, on the other hand, requested some kind of dividend information (dividends per share, dividend payout, or yield) for about eight to ten companies during the second forecast (Table 4). Besides, of the 350 requests made during the second forecast 138 (39.43 percent) were related to dividend information. In forecasting security prices, these data imply a supplementary role for dividend-related attributes.

In sum, other than price-related data, income statement items and profitability measures are the items most frequently selected. Except for financial risk, other risk measures are considered irrelevant to making price forecasts. Dividend data, on the other hand, are of secondary importance; being selected more often during the second price forecasts. Clearly, the CAPM is not used extensively by the subjects in stock valuation, whereas when applying the DCF model, most subjects analyze earnings first and then dividends, in forming an expectation of the cash flow.

Since the most frequently selected attributes are based on their selection by the total sample of subjects, little is known about the information-seeking behaviour of each individual. Thus, an examination of the financial attributes selected by each subject is conducted to identify their information choice, as well as to determine any difference or similarity among the subjects' information choice.

5.3 Components of Subjects' Information Choice

The information choice of each subject is defined to consist of those attributes which he or she has selected for all ten companies when forecasting security prices. As for the first forecast, not many attributes were selected for all ten companies (Table 3) because subjects were required to select the minimum attributes. Thus, when given the second opportunity,

the subjects were more at ease in selecting attributes and the number of attributes being selected for all ten companies increases. For the 13 subjects who participated in the second phase of the experiment, there is an average increase of four attributes in their information choice. This increase is greater than zero at the 0.01 level of significance ($t = 4.721$). A summary of the subjects' information choice based on both selections is presented in Table 6.

Table 6

The inclusion of historical prices in the information choice of 14 of the 17 subjects is not surprising as it was observed that most used this attribute as the starting point of analysis. Thus, despite some subjects' disclaimant as technical analysts, historical price data are of some use in forecasting security prices, at least in the short run (a three-month price forecast was required in the present study).

Except for Subjects 5 and 10, all subjects have included earnings per share and price-earnings ratio in their information choice. This implies that the subjects, as a group, tended to estimate earnings for the specific company and to then apply the price-earnings ratio in forming a judgment on future prices of stock. That is to say, the DCF model has wide acceptance among analysts where earnings are perceived as a major source of cash flow and price-earnings ratio the principal determinant of discount rate.

Sales and net income were included in the information choice of 11 of the 17 subjects (and a total of 12 subjects when implicitly computed attributes were included in the analysis). These two attributes provided complementary information about a company's earnings potential - evidence

that further confirms the relevance of earnings to the subjects in forecasting security prices by means of the DCF model. Other than earnings, dividend has been advocated as a major source of cash flow to stockholders. Dividend-related attributes, however, were included in the information choice of Subjects 11 and 17 (as well as Subject 14 when implicitly computed attributes were included in the analysis) in the first forecast and these were added to the information choice of five other subjects in the second forecast. This implies that only few subjects regarded dividend as the major source for cash flow estimation and the earnings discount model was more commonly employed when compared to the dividends discount model.

Although return on common equity is not among the 16 attributes specified in the DCF model and the CAPM, it is included in the information choice of a majority of the subjects (9). This indicates that subjects were not only concerned about the profitability of the company, but also about the return on their investment in stock valuation.

According to the CAPM, market beta is the principal determinant of a security's riskiness. None of the subjects, however, has included market beta in his or her information choice. Operating leverage and accounting beta, on the other hand, were included in the information choice of only one subject (Subject 15). Nonetheless, about one-third of the subjects has included debt-equity ratio as a component of their information choice. The evidence, by and large, indicates that the sample of subjects was not concerned with the systematic risk of a company and the CAPM was rarely used in forecasting security prices. This may be attributable to the relative complexity in estimating systematic risk - the collection of additional price and dividend data as well as the use of linear regression.

In sum, income statement items and profitability measures dominated the information choice of the sampled subjects, and financial leverage was the risk factor of most relevance to the subjects in forecasting security prices. It was also observed that the earnings discount model was most commonly used in stock valuation, whereas there was little use made of the CAPM in forecasting security prices.

5.4 Consensus of Choice

By identifying the information choice of each subject, decision aids can be developed to suit specific needs. These development costs, however, can be reduced only if similarities among the subjects' information choices are significant. What follows is an examination of consensus among subjects' information choice.

The analysis was conducted on an aggregate basis (i.e., across the ten companies) because there was no association between the type of financial attributes selected and the identity of the company (χ^2 = 30.4 for the first forecast and χ^2 = 37.1 for the second).

For each subject, the 19 attributes were ranked on the basis of the number of times it was selected when making the first price forecasts.[13] Kendall's coefficient of concordance (W) is 0.4018, which indicates that there is moderate agreement (significant at the 0.01 level) among the subjects in their selection of attributes for forecasting security prices. However, there may be substantial agreement within certain subgroup.

The subgroups were identified by comparing the attributes selected by one subject with those selected by another for each company. To perform the required analysis, the following rule was applied: if an attribute was selected by one subject but not by another, it was defined as a "failure"; otherwise as a "success". The number of successes was averaged across the

ten companies for all pairs of subjects. Of 136 pairwise comparisons, the average number of success ranged from a minimum of 5.9 to a maximum of 16.5 attributes. Clearly, no two subjects were in perfect agreement regarding the type of financial attributes used in forecasting security prices. A cutoff point of 14 successes (in about the top 25 percentile) was used for subgrouping, and a total of 38 comparisons were examined.

From Table 7, Subjects 4, 7, 11, 14, and 15 had little agreement with the other subjects in their selection of attributes to forecast security prices (the average number of "successes" of these five subjects with other subjects was less than 14, the cutoff). These five subjects were, in general, a group of maximal data users. There was, however, only moderate agreement within this subgroup ($W = 0.429$ and significant at the 0.01 level). In fact, earnings per share, price-earnings ratio, and sales were the only three attributes common to their information choice.

Table 7

Earnings per share, price-earnings ratio, sales, return on common equity, and net income were those attributes being selected by Subjects 3, 5, 8, 9, 12, and 16 for at least eight of the ten companies. Subject 17, whose selection of attributes was similar to Subjects 3, 5, 8, 12, and 16 (see Table 7), was also included in forming the first subgroup. For these seven subjects, the Kendall's coefficient of concordance is 0.607 and significant at the 0.01 level. That is, there is substantial agreement in the information choice within this subgroup. In general, this subgroup of subjects has employed the earnings discount model and disregarded dividend data and risk factors when forecasting security prices.

The second subgroup consists of Subjects 1, 2, and 13. The principal components of their information choice are earnings per share, price-earnings ratio, historical prices, and return on common equity. With four common attributes in their information choice, the agreement within this subgroup ($W = 0.555$) is significant at the 0.01 level and relatively high as compared to the maximal data user subgroup, as well as to the entire group of subjects. For this subgroup, the earnings discount model is employed as well and the subjects do not select other income statement items (e.g., sales and net income) as much as do the first subgroup. Dividend data and risk factors were also disregarded by this subgroup.

On the other hand, Subjects 6 and 10 were excluded from these two subgroups. This is because return on common equity, an attribute selected consistently by the ten subjects, was not selected by them at all when making the first price forecasts. The evidence, by and large, indicates that there is moderate degree of consensus among the subjects in the selection of attributes.[14] Individual differences are also substantial as seven of the 17 subjects were not classified into any subgroup. It is likely then that the decision aids would have to be tailor made for individual analysts. Certain attributes, e.g., earnings per share, price-earnings ratio, security prices, sales, net income, and return on common equity, however, must be a consideration when developing the decision aids as they are demanded by a majority of the subjects.

6. CONCLUSION

As security analysis is a highly unstructured task, substantial efforts have been devoted to the search and development of stock valuation models. Among these models, the DCF model and the CAPM have had significant

recognition in both the academic and the investment community. The purpose of the present study is to identify the financial attributes selected by security analysts in forecasting security prices and to compare the analysts' information choice with those advocated in the DCF model and the CAPM.

The most frequently selected attributes found in the present study are earnings per share, price-earnings ratio, historical prices, and sales. This implies that subjects, as a group, are, in stock valuation, much concerned with the earnings potential of a company. An examination of each individual information choice indicates that the DCF model has wider acceptance than has the CAPM in stock valuation. This may be attributable to the simplistic nature of the DCF model. The earnings discount model, on the other hand, has greater application in forecasting security prices. The little reliance on dividends may be attributed to the strategy of most companies in maintaining a stable dividend policy.

There is, however, moderate agreement in information choice. Among the 17 subjects, only two subgroups of subjects are identified; this is based on the type of attributes selected. Seven subjects were not classified into any subgroup because of their distinctive information-seeking behaviour. Generally speaking, earnings per share, price-earnings ratio, a security's historical prices, sales, and return on common equity constitute the information choice of most analysts. Risk measures and dividend data, on the other hand, are of importance only to some analysts.

By and large, decision models of the subjects are represented by the earnings discount model. There are, however, other heuristics (e.g., the reputation of the management, the audit opinion, and so forth) used by the subjects that are not captured by the DCF model and the CAPM. This is a

shortcoming of the present study. Other limitations include the small sample of subjects, the small number of companies for stock valuation, and the use of manufacturing companies, which all restrict generalizing these findings.

As the information choice of each subject has been identified, other issues worth examination include assessment of the impact of the subject's information choice on his or her price forecasts; whether or not the difference in the subjects' price forecasts is attributable to a difference in information choice; what is the subject's perception of the interrelationships of the financial attributes included in his information choice; and finally the subject's perception of the association of these attributes with a security's future price. Continuing research efforts along this line are essential to uncover the analysts' decision process in stock valuation, such that their expertise can be incorporated in the development of decision support system.

Table 1

Characteristics of Security Analysts

Subject	Position	Educational Background	Years of Experience in Security Analysis
1	Vice President	Bachelor	30
2	analyst	MBA	7
3	analyst	Bachelor, CFA[1]	3
4	analyst	MBA	17
5	analyst	MBA, CFA[1]	4
6	analyst	Bachelor	5
7	Vice President	MBA, CFA	7
8	analyst	MBA, CFA[1]	3
9	asst. analyst	Bachelor	1
10	analyst	MBA, CFA	6
11	analyst	Bachelor	16
12	analyst	CA[2]	10
13	analyst	MBA	7
14	analyst	Bachelor	30
15	analyst	Bachelor	28
16	analyst	MA, CFA	21
17	representative[3]	Bachelor	11

[1]Certification of CFA is in progress.

[2]Chartered Accountant.

[3]Subject 17 is a registered representative who is also a Fellow of the Canadian Securities Institute. He provides investment advice to clients based on his analysis.

Table 2

List of Financial Attributes Subject to Security Analysts' Choice

Financial Attributes	Remarks[1]
1. Sales	
2. Operating Expenses	
3. Net Income	
4. Earnings Per Share	Primary Earnings Per Share
5. Dividends Per Share	
6. Dividend Payout	Dividends Per Share / Earnings Per Share
7. Gross Investment	Total Assets
8. Return on Investment	Net Income / Total Assets
9. Price-Earnings Ratio	Security Price / Earnings Per Share
10. Dividend Yield	Dividends Per Share / Security Price
11. Expected Return on Market	Weekly Toronto Stock Exchange 300 Composite Index Over the Period of January 1985 to May 1986, Inclusive
12. Riskfree Rate of Return	Yield on 3-month and 6-month Treasury Bills Over the Period of January 1985 to May 1986, Inclusive
13. Market Beta[2]	Regression Coefficient of Company's Monthly Return to Market's Monthly Return[3]
14. Operating Leverage	% Change in Earnings Before Interests and Taxes to % Change in Sales
15. Financial Leverage	Debt-to-Equity Ratio
16. Accounting Beta[4]	Regression Coefficient of Company's Annual Earnings-Price Ratio to Market's Annual Earnings-Price Ratio
17. Gross Margin to Sales	(Sales - Operating Expenses) / Sales
18. Return on Common Equity	Net Income / Common Equity
19. Security Prices	Weekly Prices of Security Over the Period of January 1985 to May 1986, Inclusive

[1]Annual data of 1981 to 1985 and the average over the five-year period are presented except for expected return on market, riskfree rate of return, market beta, accounting beta, and security prices.

[2]Market beta is computed based on the monthly return over the period of January 1981 to December 1985.

[3]The Toronto Stock Exchange 300 Composite Index is a surrogate for the market.

[4]Accounting beta is computed based on the annual earnings-price ratio over the period of 1981 to 1985.

Table 3

Frequency of Financial Attributes Selected by Analysts in Making the First Price Forecasts

Financial Attributes	Subjects																	Rank
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Earnings Per Share	10	10	10	10	9	10	10	10	10	10	10	10	10	9	10	10	10	1[1] (1)[2]
Price-Earnings Ratio	10	10	10	8	8	10	10	10	10	-	10	10	10	9	9	9	10	2 (2)
Security Prices	10	10	10	8	10	10	9	-	10	10	10	10	-	4	10	10	10	3 (3)
Sales	6	-	10	9	10	-	10	8	10	10	10	8	10	8	9	9	9	4 (4)
Return on Common Equity	10	10	10	-	9	-	10	8	10	-	10	9	10	7	10	10	6	5 (5)
Net Income	-	-	9	9	10	-	10	8	10	9	10	10	-	7	9	9	8	6 (6)
Debt-Equity Ratio	-	9	7	1	2	-	5	7	10	10	10	-	1	9	9	-	9	7 (8)
Gross Margin to Sales	-	8	-	1	-	-	10	-	-	10	10	6	10	7	10	8	-	8 (9)
Return on Total Assets	10	7	9	-	1	-	10	2	9	-	5	-	10	7	9	-	-	9 (7)
Operating Expenses	-	-	9	8	1	-	1	-	9	-	10	-	-	9	9	-	-	10 (11)
TSE Index	10	-	-	2	1	2	8	-	10	-	9	10	-	-	-	-	3	11 (12)
Yield	-	6	-	-	-	4	9	-	-	-	10	-	-	1	-	-	10	12 (13)
Total Assets	-	-	-	9	-	-	-	-	7	-	7	-	-	7	9	-	-	13 (10)
Operating Leverage	-	-	4	-	-	-	1	-	-	1	6	2	-	4	9	-	-	14 (16)
Dividends Per Share	-	-	1	9	-	-	1	-	-	-	10	-	-	4	-	-	1	15 (14.5)
Market Beta	-	-	-	-	4	-	3	2	-	-	9	1	-	1	4	-	-	16 (17)
Dividend Payout	-	-	1	7	1	1	-	-	-	-	10	1	-	1	-	-	-	17 (14.5)
Riskfree Rate	-	-	-	-	-	-	10	-	-	-	9	-	-	-	-	-	-	18 (18)
Accounting Beta	-	-	-	-	-	1	-	-	-	-	-	-	-	-	9	-	-	19 (19)

[1]Rank of financial attributes based on explicitly selected attributes.

[2]Rank of financial attributes based on both the explicitly selected and implicitly computed attributes.

Table 4

Frequency of Financial Attributes Added by Analysts in Making the Second Price Forecasts

Financial Attributes	Subjects																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Earnings Per Share														1			
Price-Earnings Ratio				2										1	1	1	
Security Prices				1			1						10	3			
Sales				1				2				2		2	1	1	
Return on Common Equity						2		1						1			
Net Income		1		1				2		1				3	1	1	
Debt-Equity Ratio		1	2			10	5	1							1	8	
Gross Margin to Sales		1		6		5		6				4		2		2	
Return on Total Assets		3		2		7		7	1					3	1		
Operating Expenses			1	2			9							1	1		
TSE Index							2									1	
Yield						3	1	8	10					8	2		
Total Assets				1			10		2				10	3	1	4	
Operating Leverage		4	5	8		5	1					7		1	1		
Dividends Per Share				1		5	9	9	10			4		6	1	9	
Market Beta						1	6							1	1		
Dividend Payout				3			9	1	10				8	9	2	10	
Riskfree Rate																	
Accounting Beta															1		

Table 5

Goodness-of-Fit Test on Subjects' Consistency of Information Search over the Ten Companies

Subject	Chi-Square Statistic[1] First Forecast	Second Forecast
1	3.429[2] (3.429)[3]	*[4]
2	20.000 (20.000)	15.600 (20.091)
3	18.000 (30.462)	11.000 (22.154)
4	50.083 (40.385)	15.786 (11.500)
5	35.083 (42.500)	*
6	16.000 (20.625)	56.000 (42.500)
7	23.563 (24.667)	3.778 (2.278)
8	45.125 (54.778)	26.667 (22.231)
9	4.818 (0.818)	1.429 (0.643)
10	5.113 (5.113)	1.286 (1.286)
11	16.278 (15.778)	*
12	21.545 (24.000)	10.333 (16.083)
13	1.286 (1.286)	2.900 (6.750)
14	95.313 (92.000)	17.813 (17.813)
15	48.643 (48.643)	8.706 (11.353)
16	23.429 (23.429)	9.333 (14.231)
17	28.000 (31.000)	*

[1] $\chi^2 = 60.141$ (α=0.05, degree of freedom=44)
$\chi^2 = 63.702$ (α=0.025, degree of freedom=44)
$\chi^2 = 67.947$ (α=0.01, degree of freedom=44)

[2] χ^2 statistics based on the explicitly selected attributes.

[3] χ^2 statistics based on both the explicitly selected and implicitly computed attributes.

[4] Subjects who did not provide the second price forecasts because of time constraints.

Table 6

Information Choice of the Subjects

Subject	Financial Attributes	
1	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Return on Common Equity
	Return on Total Assets	TSE Index
2	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Return on Common Equity
	Debt-Equity Ratio	Return on Total Assets
3	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Operating Expenses
4	Earnings Per Share	Price-Earnings Ratio
	Sales	Net Income
	Operating Expenses	Total Assets
	Dividends Per Share	Dividend Payout
	(Return on Total Assets)[1]	
5	Security Prices	Sales
	Net Income	
6	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Debt-Equity Ratio
7	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Net Income
	Debt-Equity Ratio	Gross Margin to Sales
	Return on Total Assets	Operating Expenses
	TSE Index	Yield
	Total Assets	Dividends Per Share
	Riskfree Rate	(Dividend Payout)
8	Earnings Per Share	Price-Earnings Ratio
	Sales	Net Income
	(Dividend Payout)	
9	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Net Income
	Debt-Equity Ratio	Return on Total Assets
	TSE Index	Yield
	Dividends Per Share	Dividend Payout
	(Total Assets)	

con't.

Subject	Financial Attributes	
10	Earnings Per Share	Security Prices
	Sales	Net Income
	Debt-Equity Ratio	Gross Margin to Sales
11	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Net Income
	Debt-Equity Ratio	Gross Margin to Sales
	Operating Expenses	Yield
	Dividends Per Share	Dividend Payout
12	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Net Income	Gross Margin to Sales
	TSE Index	
13	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Gross Margin to Sales
	Return on Total Assets (Net Income)	Total Assets
14	Earnings Per Share	Price-Earnings Ratio
	Sales	Net Income
	Return on Total Assets	Operating Expenses
	Total Assets	Dividends Per Share
	Dividend Payout	
15	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Net Income
	Debt-Equity Ratio	Gross Margin to Sales
	Return on Total Assets	Operating Expenses
	Total Assets	Operating Leverage
	Accounting Beta	
16	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Sales
	Return on Common Equity	Net Income
	Gross Margin to Sales (Dividends Per Share)	Dividend Payout
17	Earnings Per Share	Price-Earnings Ratio
	Security Prices	Yield

[1]Financial attributes in parentheses are included in subjects' information choice when implicitly computed attributes are also included in the analysis.

Table 7

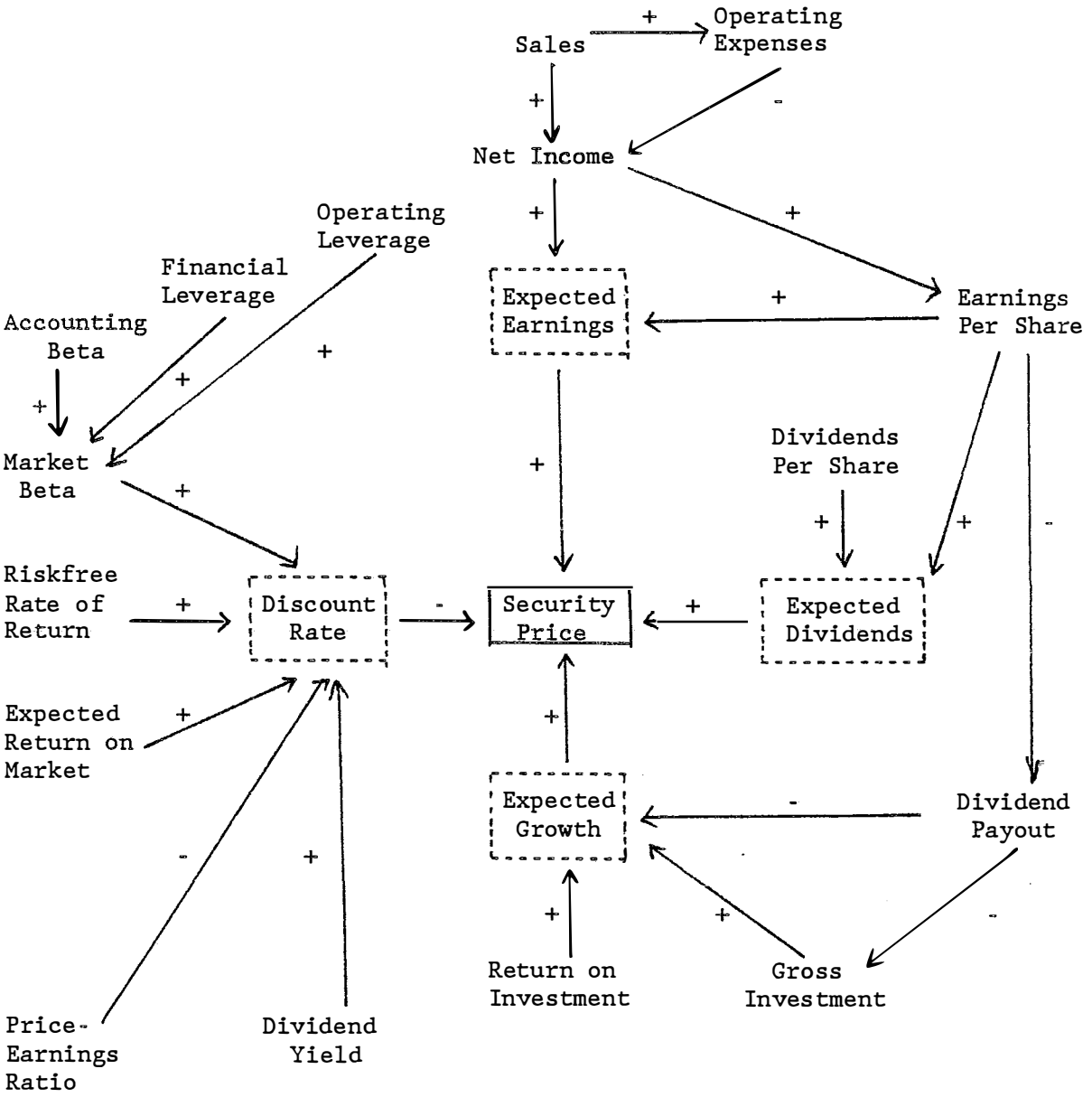
Average Number of Successes[1] Between Pairs of Subjects

First Subject	Second Subject	Average Number of Successes
1	2	14.8
1	3	14.4
1	5	14.6
1	6	15.0
1	9	14.9
1	12	15.5
1	13	15.5
1	16	14.9
2	6	14.8
2	13	15.1
2	16	14.7
2	17	14.6
3	5	15.0
3	8	14.3
3	9	15.9
3	16	14.7
3	17	14.0
5	6	14.0
5	8	15.5
5	9	14.1
5	10	14.4
5	12	15.7
5	16	16.5
5	17	15.0
6	16	14.5
6	17	14.4
8	10	14.1
8	12	14.2
8	13	15.2
8	16	15.6
8	17	15.5
9	12	14.2
10	16	15.5
10	17	14.4
12	16	15.9
12	17	14.5
13	16	14.7
16	17	15.3

[1]When an attribute was selected by one subject and not by another, it was defined as a "failure", otherwise as a "success". An average over the ten companies was computed to measure the degree of similarities between subjects' information choice.

Figure 1

Linkages of Financial Attributes to Security Prices



notes: [1]A ⟶ B describes the most likely association of attribute A with attribute B. + indicates a positive association and - indicates a negative association.

[2]The 16 financial attributes are sales, operating expenses, net income, earnings per share, dividends per share, dividend payout, gross investment, return on investment, dividend yield, price-earnings ratio, expected return on market, riskfree rate of return, market beta, accounting beta, financial leverage and operating leverage.

Figure 2a

List of Financial Attributes Presented for the First Forecast

```
 1  ...   Price Earnings Ratio
 2  ...   Dividend Payout
 3  ...   Yield
 4  ...   Return on Common Equity
 5  ...   Return on Total Assets
 6  ...   Total Assets
 7  ...   Risk Free Rate
 8  ...   TSE Index
 9  ...   Security Prices
10  ...   Net Income
11  ...   Gross Margin to Sales
12  ...   Operating Expenses
13  ...   Sales Revenue
14  ...   Market Beta
15  ...   Debt-Equity Ratio
16  ...   Operating Leverage
17  ...   Dividend
18  ...   Earnings per Share
19  ...   Accounting Beta
Please choose the MINIMUM attributes which you would like to see for Co. 5
1 3 5 11 13 18
```

Figure 2b

List of Financial Attributes Presented for the Second Forecast

```
for Company 5
You have already chosen the attributes indicated by ASTERISKS for Co. 5
**    1  ...   Price Earnings Ratio
      2  ...   Dividend Payout
**    3  ...   Yield
      4  ...   Return on Common Equity
**    5  ...   Return on Total Assets
      6  ...   Total Assets
      7  ...   Risk Free Rate
      8  ...   TSE Index
      9  ...   Security Prices
     10  ...   Net Income
**   11  ...   Gross Margin to Sales
     12  ...   Operating Expenses
**   13  ...   Sales Revenue
     14  ...   Market Beta
     15  ...   Debt-Equity Ratio
     16  ...   Operating Leverage
     17  ...   Dividend
**   18  ...   Earnings per Share
     19  ...   Accounting Beta
What other attributes would you like to see for a SECOND forecast?
10 15
```

Footnotes:

[1]The usefulness of accounting information has already been examined in areas of bankruptcy prediction (see e.g., Altman, 1968; Beaver, 1968; Libby, 1975; Zimmer, 1980); risk prediction (see e.g., Beaver, Kettler and Scholes, 1970; Eskew, 1979; Elgers, 1980) and loan classification (see e.g., Dietrich and Kaplan, 1982; Marais, Patell, and Wolfson, 1984).

[2]In Canada, the accuracy of forecasts of stock prices as well as other fundamental variables is documented in the Research Evaluation Service published by the Financial Post Information Service. This illustrates the public's as well as the investment community's concern on how accurate analysts, as a profession, can forecast security prices.

[3]To cite a few, the lens model has been used in studying the judgment of student subjects in forecasting security prices (Wright, 1977a; b), and the judgment of bank loan officers in the prediction of corporate failure (Zimmer, 1980). The analysis-of-variance paradigm, on the other hand, has been used in studying the judgment of brokers in the rating of the growth potential of stocks (Slovic, 1969) and the judgment of auditors in evaluating the strength of the internal control of a payroll subsystem (Ashton, 1974).

[4]The probability the analysts assigned to the actual change in price was compared to a uniform distribution to evaluate how accurate their price forecasts were.

[5]Discounted cash flow models:

With a given discount rate (k), dividend (D) is assumed to grow at the same rate (g) into the indefinite future. Then the price of a security (P) is given by:

$$P = \frac{D}{(k-g)} \qquad \text{Dividends Discount Model - (1)}$$

Assume a certain proportion (b) of the earnings (E) is retained by the company for investment (growth), and the remainder is distributed as dividend. Then the price of a security (P) is given by:

$$P = \frac{E(1-b)}{(k-g)} \qquad \text{Earnings Discount Model - (2)}$$

Based on equations (1) and (2), dividends (D), earnings (E), and growth (g) are the principal determinants of security price.

[6]From (1), $k = D/P + g$.
From (2), $k = (1-b) / (P/E) + g$.
Thus, dividend yield (D/P) has a positive association with discount rate, whereas the association of price-earnings ratio (P/E) with discount rate is negative.

[7]Capital asset pricing model:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f); \text{ or}$$

$$P_i = \frac{E_i}{1 + R_f + \beta_i(E(R_m) - R_f)};$$

where $E(R_i)$ = expected return on security i;
$E(R_m)$ = expected return on market;
R_f = riskfree rate of return;
β_i = market beta of security i;
P_i = price of security i; and
the one-period discount rate is given by $R_f + \beta_i(E(R_m) - R_f)$.

[8]The weak form of the efficient market hypothesis states that all information contained in a security's historical prices is fully reflected in the current price (Elton and Gruber, 1981, p. 358).

[9]With the exception of Subjects 1 and 13, for the other subjects who work for the same company, there is little agreement in their information choice (see Section 5.4). This implies that the subject's affiliation with a particular investment company is unlikely to have influence on his information choice.

[10]An interactive program, written in BASIC, is designed for conducting the experiment. The program serves two purposes. First, it provides company-specific information requested by subjects, except for the weekly data on Treasury Bills, TSE 300 Composite Index, and security prices, which are presented in graphical forms. Second, it records the subjects' responses which include their choice of financial attributes and price forecasts.

[11]Among the 19 attributes, some attributes can be computed directly from other attributes included in the list. For example, dividend payout can be computed when dividends per share and earnings per share are selected. It was observed that some subjects (e.g., Subjects 4, 9, 11, and 14) selected all three attributes whereas for others (e.g., Subjects 8 and 13), two of the three were selected. In order to account for the possibility of implicit computation by the subjects, the impact of the implicitly computed attributes on the findings is also reported.

[12]The random walk hypothesis simply states that at a given point in time the size and direction of the next price change is random with respect to the stock of knowledge available at that point in time (Dyckman, Downes, and MaGee, 1975, p.5).

[13]The number of times an attribute is selected for the second forecast is excluded from the ranking because these attributes are supplementary to those attributes selected for the first forecast.

[14]When implicitly computed attributes are included in the analysis, with the exception of Subjects 4, 6, and 11, the remaining sample of subjects can be classified into three subgroups: Subgroup 1 consists of Subjects 7, 14, and 15 ($W = 0.573$), Subgroup 2 consists of Subjects 5, 8, 10, 12, 16, and 17 ($W = 0.531$), and Subgroup 3 consists of Subjects 1, 2, 3, 9, and 13 ($W = 0.541$). Based on the Kendall's coefficient of concordance, consensus in information choice is evident in each of the three subgroups.

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APPENDIX A

General Information:

a) forecasts of the economy for 1986;

b) monetary aggregates for 1981 to 1985;

c) selected economic indicators for 1981 to 1985;

d) price indexes for 1981 to 1985;

e) unemployment rate for 1981 to 1985;

f) interest rates for 1981 to 1985; and

g) manufacturing industries in 1986.

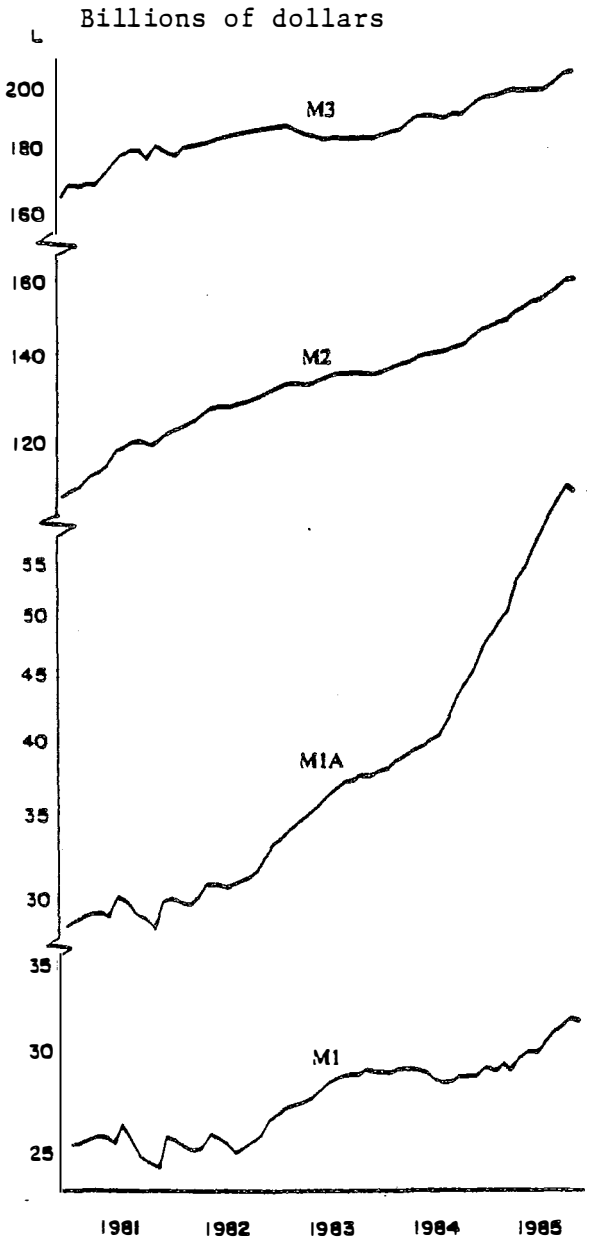
FORECASTS FOR 1986

Surveys by the Conference Board of Canada, the OECD, and the press, predict that Canada's current economic expansion will continue into 1986, and possibly into 1987. They are generally agreed that the real rate of growth will be about 3 percent in the coming year, with strong consumer confidence boosting spending.

Analysts predict interest rates will continue to fall in the short-term as United States rates move lower. Oil prices will decline globally with the possibility of a price war between suppliers. Lower oil prices should also help keep the rate of inflation at or below the 4 per cent level. No real change in the rate of unemployment is expected because growth will be too slow to generate enough jobs to make a dent in the unemployment rate. Cost-cutting measures by the federal government are not expected to have a significant impact on the federal budget deficit.

Monetary aggregates

Seasonally adjusted - monthly average of Wednesdays



M2 plus non-personal fixed-term deposits of residents booked in Canada (M3)

M1A plus other notice deposits and personal term deposits (M2)

M1 plus daily interest chequable deposits plus non-personal notice deposits (M1A)

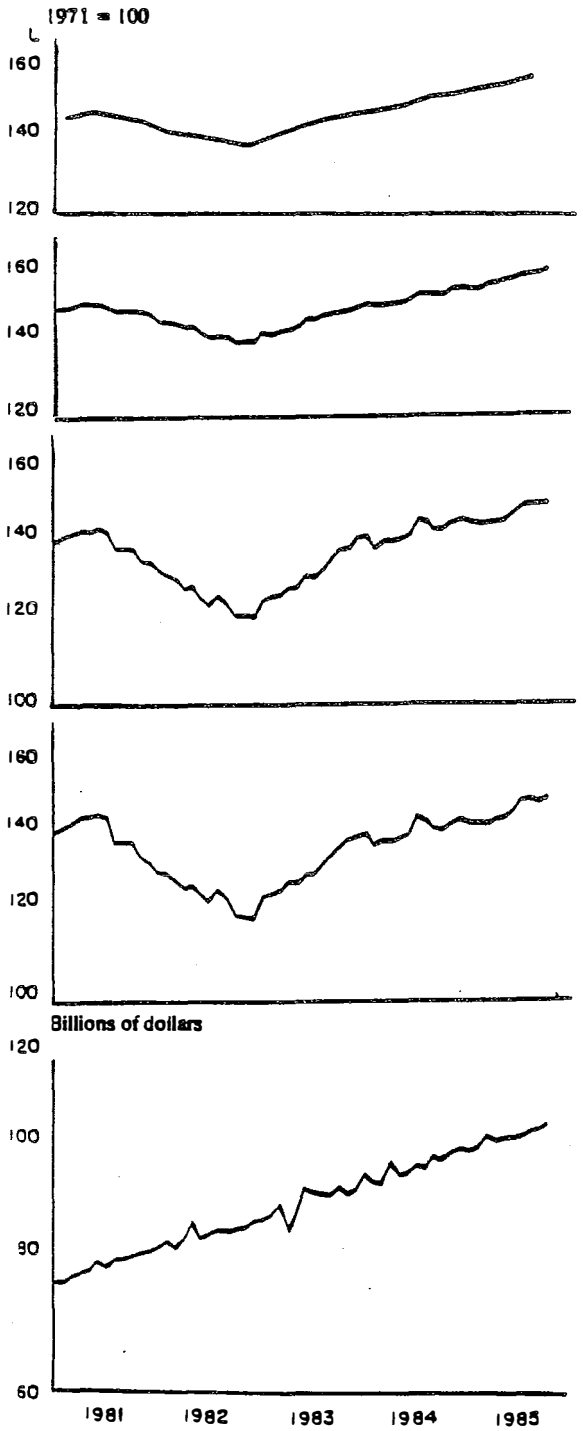
Currency and demand deposits (less private sector float) excluding Government of Canada deposits (M1)

Data prior to January 1982 have been adjusted to eliminate major discontinuities in November 1981 in the series resulting from the revision to the Bank Act 1980 and the introduction of a new statistical reporting system.

Selected economic indicators

Production indexes and retail sales

Seasonally adjusted



GNP at constant prices

Gross domestic product
(excluding agriculture)

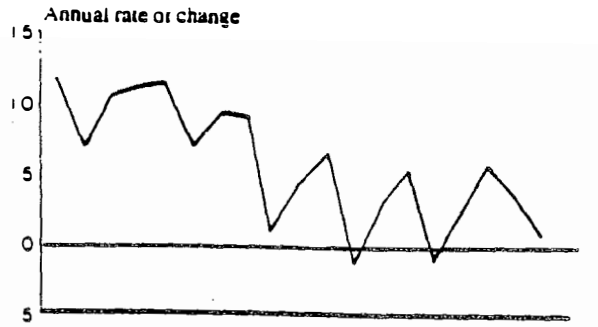
Industrial production

Manufacturing production

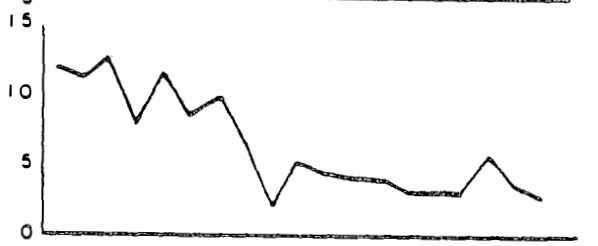
Retail trade
(excluding all cars)

Prices

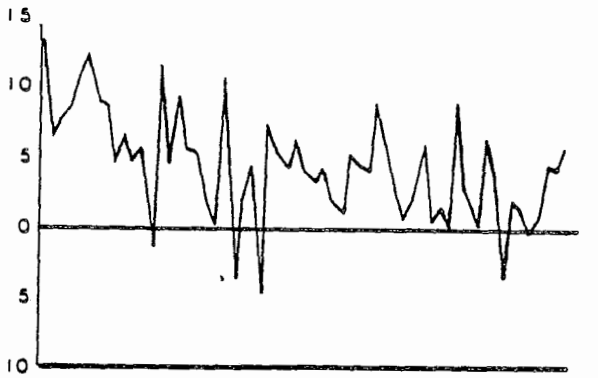
Aggregate measures - seasonally adjusted



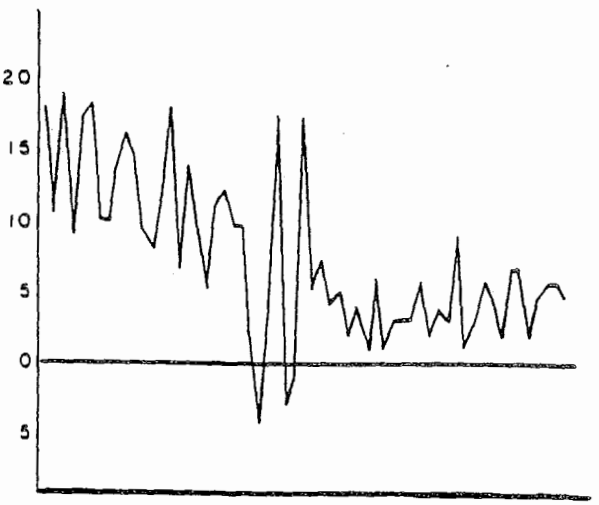
GNP deflator



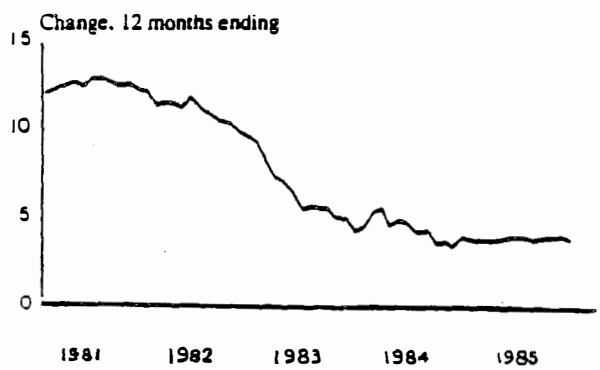
Final domestic demand deflator
(quarterly changes at annual rates)



Industry selling prices
(monthly changes at annual rates)



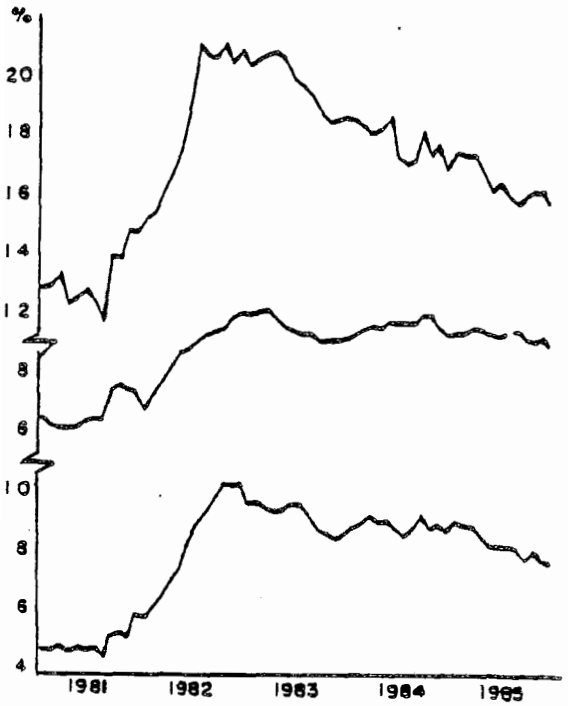
Consumer price index:
Total excluding food
(monthly changes at annual rates;
not seasonally adjusted)



Consumer price index
(not seasonally adjusted)

Unemployment rate

Seasonally adjusted



Both sexes: 15-24 years

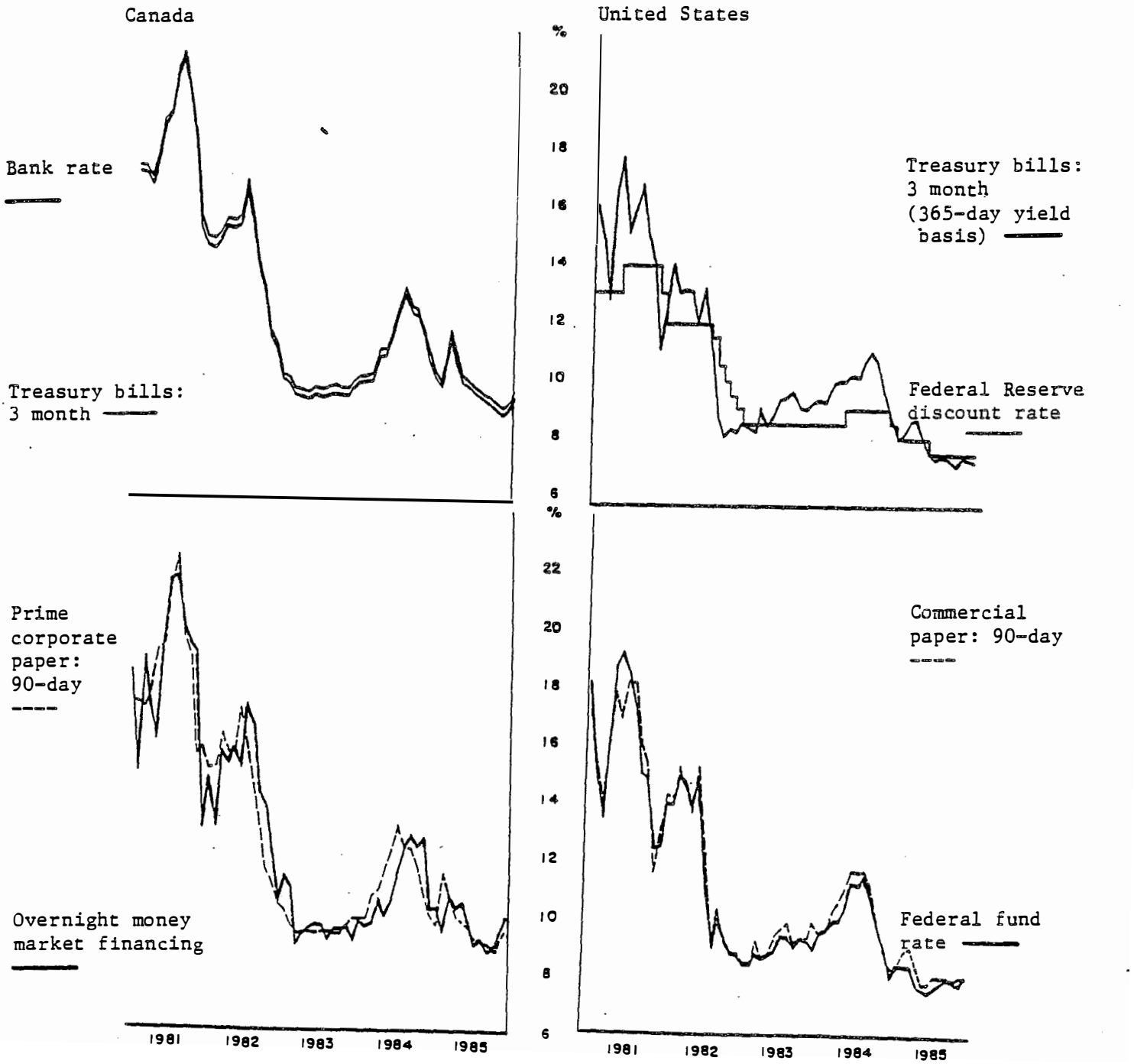
Women: 25 years and over

Men: 25 years and over

Interest rates

Canadian-U.S. money market rates

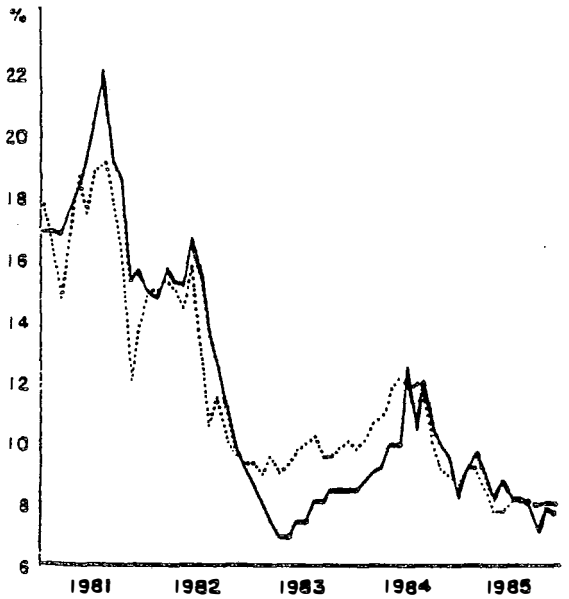
Monthly



Interest rates

Short-term (90-day) rates

Monthly

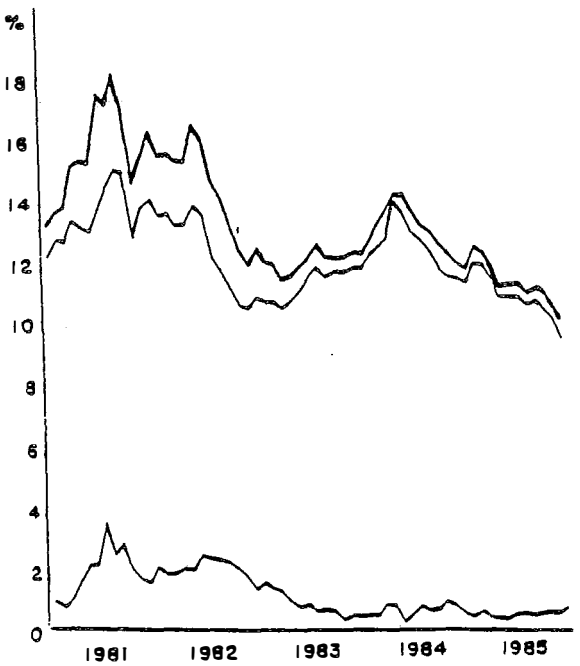


Chartered bank deposit receipts ——

Euro-dollar rates ....

Long-term rates: Canada-United States

Monthly



Government of Canada ——

U.S. Treasury ——

Uncovered differentials ——

MANUFACTURING INDUSTRIES IN 1986

An imminent deceleration is in the works for manufacturing following the sector's post recession break-neck expansion. A 3 per cent increase in manufacturing production forecast for 1985 and similar growth for 1986 are signals of a healthy sector returning to a more normal post-recovery performance.

The most significant slowdown this year is apparent in the transportation equipment industries and the subsidiary sectors such as rubber and primary metals that depend heavily on the auto assembly lines. The emerging weakness in auto production is largely predicated upon much slower exports of autos and parts to the United States. Last year, this category's export volume grew by a whopping 36 per cent. A healthy 6.5 per cent expansion anticipated for 1985 sales in comparison with such unprecedented growth. However, domestic consumption of autos is expected to continue to thrive.

Strong exports are expected to aid the paper and allied product industries to record growth in excess of 4 per cent in 1985, whereas growth in investment will support expansion in machinery production. Food beverage industries are expected to expand sluggishly this year, largely because of a decline in production in the first quarter.

The manufacturing sector will perform well in 1986. Output will rise again by about 3 per cent, and growth will emanate from all sectors of the industry. No spectacular showing is in the offing by any one manufacturing group, because export demand will be slowing in line with lower growth expected in the United States.

Since recovering from the low point it reached at the end of 1982, manufacturing production has increased dramatically. By the end of the forecast period in the fourth quarter of next year, it is expected to reach a level 30 per cent higher than the nadir reached in the last quarter of 1982. As losses in production mounted in the 1981-82 recession, employment in manufacturing followed an equally distressing downward path. A worrisome feature of the recovery up to now has been that, even though job gains resumed in the sector, the speed of recovery in employment significantly lags that of output expansion, and manufacturing employment is not expected to pick up fast enough to recover all losses incurred during the recession.

APPENDIX B

COMPANY ONE

The Company, a holding and management concern, is engaged through subsidiaries in the design and manufacture of electronic controls, aircraft simulators, automotive parts, industrial equipment and metal fabrication and die castings for worldwide markets.

COMPANY TWO

The company, directly and through subsidiaries and associated companies, manufactures a wide range of general chemicals, industrial chemicals, agricultural chemicals and fertilizers, plastics, explosives, specialty chemicals and paints. It is also involved in the sales of chemical process technology, oil and gas exploration, the manufacture and marketing of specialty mining equipment, property development, and the provision of waste management services.

COMPANY THREE

The company is engaged primarily in the manufacture and marketing of industrial electronic products and home furnishings. The company also provides service and related research and development to customers and operates television and radio stations.

COMPANY FOUR

The company is engaged, directly and through subsidiaries, in the manufacture and sale of equipment and devices for the distribution and control of electrical energy. It produces a broad range of power and distribution transformers, low and medium voltage switch-gear, including power and molded case circuit breakers, panel boards, switchboards, fusible equipment and fuses, unit and power substations and bus duct, load control devices, and heating equipment.

COMPANY FIVE

The company, directly and through subsidiaries, manufactures and sells a wide range of molded plastic components, household appliances, building specialties, pumps, water heaters and specialty electronic products for use in the transmission and reception of communications signals.

COMPANY SIX

The company is engaged, directly and through subsidiaries, in the manufacture of freight railway equipment, forgings, railway axles, railway and industrial wheels, mining, forestry and sawmill equipment and in the production of railway castings, and precision castings in heavy duty metals for specialized applications; in the repair and overhaul of aircraft jet engines and manufacturing of their components; highway trailer repairs and parts services; the rental of railway tank cars, the provision of graphics services and research, design and test engineering.

COMPANY SEVEN

The company manufactures and supplies cement and a broad range of concrete products through three operating groups. Products include cement, ready-mix concrete, architectural concrete block, concrete manhole covers and catch basins, concrete reinforced box sections for culverts, soil erosion control systems, concrete aggregates, and construction related chemicals.

COMPANY EIGHT

The company produces bare copper and aluminum conductors and manufactures building and electric wires and cables for the construction, communications, power, mining, and resource industries. With manufacturing plants, warehouses and sales offices across Canada, the company sells its products worldwide.

COMPANY NINE

The company, directly and through subsidiaries, is engaged in the manufacture, sale and distribution of fine, coated printing, business and specialty papers.

COMPANY TEN

The company is a holding company which, through subsidiaries and divisions, is engaged in the manufacturing of rolled rings, shafts and impression die forgings which are sold primarily to the aircraft, energy, railroad and heavy vehicle industries and produces steel laminations and wound electrical cores which are basic components of transformers, lighting ballasts and electric motors. The company is also engaged in the design, manufacture, selling and servicing of industrial and commercial refrigeration systems for petrochemical, recreational, food storage and supermarket customers.

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