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CORPORATE FORECASTING WITH PROBABILISTIC FINANCIAL STATEMENTS

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ABSTRACT: Today's financial environment is a broad arena of uncertain economic, political and operational factors. Because of this, financial forecasting models are currently receiving a growing acceptance among corporations of all sizes. For the most part, however, these models are deterministic and neglect to assess the riskiness, or likelihood, of the projections fed to them. This omission may indicate model users' general unfamiliarity with risk analysis techniques. The current study illustrates the mechanics of capturing risk in financial projections. The article delineates the requirements for an effective planning model, designs and validates such a model, applies the model under several scenarios, presents the resulting forecasts and risk profiles, and discusses the propriety of emphasizing forecasted ROI as the model's critical performance measure.

1. INTRODUCTION TO THE PROBLEM

Most firms, whether domestic or international, face problems of inflation, liquidity, rising trade barriers, sudden shifts in foreign exchange, changing tax policies, and the ever-present energy conundrum. To cope more effectively with these issues, firms have begun using corporate planning models. Modeling's adoption has been broad-based with more than 2000 corporations [Naylor and Schauland, 1976] using, developing, or planning to develop some form of a corporate planning model.

Even though corporate planning has been widely accepted, it often does not provide a reliable basis for assessing today's challenges. The reasons for occurrence of less than desired results are manifold; however, one of the principal causes is that 94 percent [Naylor and Schauland, 1976] of currently used models are deterministic. Since deterministic models use only single estimates for key forecast variables, they have greatest applicability during relatively stable economic periods, such as the late 1950s and the early 1960s. The continued use of such an approach is myopic because similar periods are not expected to prevail in the near future. Given today's economic environment, managers must be able to evaluate all viable options in reliable probabilistic terms. Anything less may be misleading and confusing because the actual values for decision variables, such as sales growth, interest rates, and price earnings ratios will inevitably differ from any single set of estimated values. A need exists for the development of a practical approach that a company can use to derive decisions having the greatest chance of achieving the firm's objectives.

2. INTRODUCTION TO THE SOLUTION

This study describes the formulation of a probabilistic corporate financial planning model that projects Sears, Roebuck and Company's (Sears') future financial condition by giving explicit consideration to the impact of risk. Model formulation involves an internal examination as well as an environmental observation by management. The objective is to gather data that form an analytical framework for determining if the firm will employ its resources in a productive manner as measured by predetermined financial objectives. Such specified objectives are represented by decision rules which not only specify minimal acceptable target values, but also specify minimal acceptable probabilities that such values will occur.

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The model's applicability is not limited to the analysis of any one particular company. Sears is selected only as an illustration to demonstrate how risk analysis planning can be used by a firm to increase the probable occurrence of profitable results. This requires that the future be viewed in terms of several scenarios, not just one course of action. The capacity to evaluate several scenarios is provided by the model's ability to answer difficult "What if?" questions that affect a firm's financial well-being. Consideration is limited to Sears' financial operations because a comprehensive model encompassing the firm's total environment has questionable merit. Comprehensive models are either too detailed and, consequently, applicable only to the specific firm being modeled, or so general that they are not applicable to any firm. The current model is applicable to a large number of varied firms.

3. REQUIREMENTS AND CONCEPTUAL FRAMEWORK OF THE MODEL

From examining current corporate models and reviewing the present state of the art, it was determined that the major requirements of an effective corporate financial planning model are:

- o realistic quantification of uncertainty (assignment of probabilities),
- o reflection of the unpredictability of future events (repeated random selection of key variables),
- o recognition of the critical interdependencies among variables and events (simultaneous equations),
- o utilization of the sales projection as the base for formulating the remaining equations,
- o employment of time as an explicit variable to make the model dynamic,
- o generation of clear, concise reports presented in usable formats,
- o flexibility to meet current needs as well as capability to adapt to future demands, and
- o speed, accuracy, and practicality (computer application).

Based on an analysis of these established requirements, it was concluded that an effective corporate financial planning model must be designed with the concepts of randomness, simulation, probability, and simultaneous equations in mind. The element of chance is considered through the use of Monte Carlo simulation which employs random sampling to approximate the unknown effects that chance has on real world outcomes. Monte Carlo simulation is also selected because of its adaptability to computer application.

Risk is recognized by acknowledging that decision making involves a choice among uncertain alternatives. Consequently, no particular value can be assigned with complete certainty to any given decision variable. Instead, for each variable the decision maker is provided a range of possible values with a given probability of each occurring. Additionally, the planner must be aware of the effect that the value of one variable has on other variables. The assessment of the interactive and consequential effects among a model's variables is accomplished by employing simultaneous equations. The benefit of jointly using random sampling, computer simulation, risk analysis, and simultaneous equations is the determination of a reliable probability estimate for achieving some generally accepted performance standard, such as return on investment (ROI).

4. FORMULATION OF THE MODEL

The current probabilistic financial planning model [Chesser and Coats or C-C] was formulated by applying the above requirements and concepts to the Warren and Shelton (W-S) model [Warren and Shelton, 1971]. W-S's study was utilized because its equations represent generally accepted accounting definitions that produce a balance sheet, income statement, and other widely understood financial analyses. However, there are very fundamental differences between the two models. The most discriminating difference is that the W-S model is deterministic, which means that it uses only a single best estimate to represent each input variable. Conversely, the C-C model is probabilistic and uses a random selection of input data, based on a range of possible values described by a set of probabilities. By explicitly considering risk, each of W-S's equations which forecast a variable must be expanded to store a simulated value for 100 interations each year.

The inclusion of risk analysis is invaluable because of the reliability that it adds to the information generated by the C-C model. Reliability is gained by describing each forecast variable in terms of (1) its expected values, (2) its standard deviation, (3) the probability its actual value will be within the limits of the mean class, and (4) the probability its acutal value will be within one standard

deviation of its expected mean value. Additionally, upon request, a risk profile which shows the probability of any forecast variable attaining a particular value can be printed.[1] Application of "risk adjusted" information provides the firm with a greater chance of meeting its financial objectives.

The current model's driving force and, consequently, its most important exogenous variable is the firm's sales projection. As shown in Exhibit 1, all other variables hinge either directly or indirectly on sales. The purpose of the model's twenty-three simultaneous equations is to produce clear, concise reports in usable formats which make business sense and are easily interpreted. Toward this goal, the model provides reliable projections about:

- o the firm's sales, operating and net income, interest costs, and funds available for dividends (See Exhibit 2),
- o the firm's pro forma financial condition (See Exhibit 3),
- o the firm's asset requirements and capital needs to achieve the above projections (See Exhibit 4),
- o the implications of the above forecasted results on the firm's common stock earnings ratio, shares issued, earnings per share data, rates of return to investors, and capital structure (See Exhibit 4), and
- o the probability of achieving various rates of return on investment, the financial measure upon which most of the implications depend (See Exhibit 5).

5. AN APPLICATION OF THE MODEL

5.1 One Forecasted Scenario

The C-C model's effectiveness as a financial planning model was evaluated by applying it to Sears' 1979 and 1980 operations. In preparing the forecast, data were analyzed with the objective of providing reliable projections about the above five major delineated decision areas with the projected results reported in easily understood formats. The attainment of such a goal requires an eclectic approach that combines traditional and generally accepted financial analysis with risk analysis. Such an approach is illustrated in Exhibits 2, 3, and 4. Even though Exhibits 2 and 3 basically follow the format of a typical income statement and balance sheet, giving critical projections regarding the firm's operating results and pro forma financial position, there is a fundamental difference between these reported results and those provided by traditional statements. The yearly values reported for each variable represent that variable's expected (arithmetic mean) value based upon 100 possible outcomes for both itself and other variables upon which its outcome depends. Acknowledging that no one particular outcome can be associated with complete certainty to any specific event is the model's method of explicitly recognizing risk. Recognition that risk does affect real world outcomes distinguishes the current model from most others.

Each forecast variable is also described by its standard deviation which statistically measures the amount of dispersion about the variable's expected value. Succinctly, this means that the standard deviation contributes much needed perspective to a planner's outlook by giving an indication of how accurately the expected value describes the possible outcomes. Perhaps, even more enlightening information is provided by the probabilities that the actual value of each variable will be within either the range of the mean class or within one standard deviation of the projected mean value. Presentation of these data allows one to better assess the impact of uncertainty by identifying the variable(s) whose expected value(s) is the least likely to occur and the impact that such an occurrence will have on the forecasted results.

The effects that Sears' operating results and current financial condition are projected to have on its overall financial status are summarized in Exhibit 4. For example, a highlight of the 1980 effects discloses that:

- o Earnings per share are expected to increase by 13.47 percent or from $2.82 to $3.20.
- o Dividends per share are projected to increase by 13.60 percent or from $1.25 to 1.42.

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[1] Only a risk profile for ROI is presented in the current study; however, as stated, a risk profile for any forecast variable can be printed upon request.

EXHIBIT 1

The System of Simultaneous Equations Used In
Corporate Financial Planning Model

(subscript $_o$ indicates period (t-1))

Section 1 - Generation of Sales and Earnings Before Interest and Taxes for Period t.

(1) $SALES = SALES_o \ (1 + GSALES)$

(2) $EBIT = (REBIT) \ (SALES)$

Section 2 - Generation of Total Assets Required for Period t.

(3) $CA = (RCA) \ (SALES)$

(4) $FA = (RFA) \ (SALES)$

(5) $A = CA + FA$

Section 3 - Financing the Desired Level of Assets for Period t.

(6) $CL = (RCL) \ (SALES)$

(7) $NF = (A - CL - PFDSK) - (L_o - LR) - S_o - R_o - b \ ((1-T) \ (EBIT - i_o \ (L_o - LR)) - PFDIV)$

(8) $NF + b \ (1-T) \ ((IE) \ (NL) + (UL) \ (NL)) = NL + NS$

(9) $L = L_o - LR + NL$

(10) $S = S + NS$

(11) $R = R_o + b \ ((1-T) \ (EBIT - i \ (L) - (UL) \ (NL)) - PFDIV)$

(12) $i = i_o \ ((L_o - LR) / L) + IE \ (NL / L)$

(13) $K = L / (S + R)$

Section 4 - Generation of Per Share Data for Period t.

(14) $EAFCD = (1 - T) \ (EBIT - (i) \ (L) - (UL) \ (NL)) - PFDIV$

(15) $CMDIV = (1 - b) \ EAFCD$

(16) $NUMCS = NUMCS_o + NEWCS$

(17) $NEWCS = NS / ((1 - US) \ P)$

(18) $P = (m) \ (EPS)$

(19) $EPS = EAFCD / NUMCS$

(20) $DPS = CMDIV / NUMCS$

Section 5 - Indicators of Profitability for Period t.

(21) $EPSGR = (EPS - EPS_o) / EPS_o$

(22) $ROA = (EAFCD + ((UL) \ (NL) \ (1 - T))) / A$

(23) $ROI = (((EPSGR + 1) \ (EAFCD / NUMCS)) \ (NUMCS + NEWCS / P)) - EAFCE + ((i) \ (1 - T) \ (NL))) / ((b) \ (EAFCD) + NEWCS + NL)$

EXHIBIT 2

SEARS, ROEBUCK AND COMPANY
INCOME STATEMENT FOR YEARS ENDING JANUARY 31
(IN MILLIONS OF DOLLARS)

	1978	1979				1980			
	INITIAL VALUE	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2	MEAN (LIMITS OF MEAN CLASS	STANDARD DEVIATION	PROBABILITIES P1	P2
SALES	17224.00	19267.92 (19261.0-19284.5)	37.57	39	76	21747.35 (21732.3-21785.1)	84.46	39	76
OPERATING INCOME		1708.75 (1700.9-1729.2)	45.38	39	76	1928.73 (1020.0-1954.3)	54.99	38	76
INTEREST EXPENSE		181.58 (178.1-182.4)	6.65	40	77	191.14 (190.5-192.2)	3.51	18	87
INCOME BEFORE TAXES		1527.18 (1514.1-1546.8)	51.98	41	76	1737.60 (1718.9-1752.2)	52.41	47	76
TAXES		622.18 (617.6-635.0)	27.86	38	76	707.88 (700.9-719.1)	28.92	42	76
NET INCOME		905.00 (896.5-911.8)	24.13	46	76	1029.72 (1018.0-1033.1)	23.51	47	76
AVAILABLE FOR COMMON DIVIDENDS		905.00 (896.5-911.8)	24.13	46	76	1029.72 (1018.0-1033.1)	23.51	47	76
EARNINGS RETAINED		504.43 (499.9-510.8)	17.39	42	76	573.93 (567.5-578.6)	17.57	48	76
COMMON DIVIDENDS		400.58 (396.6-401.0)	6.75	44	76	455.81 (454.5-458.4)	5.97	45	76
DEBT REPAYMENTS		1866.40 (1825.0-1961.2)	217.72	39	76	1866.40 (1825.0-1961.2)	217.72	39	76

NOTE: VALUES APPEAR FOR THE INITIAL YEAR OF CERTAIN VARIABLES. THESE VALUES ARE PROVIDED BY MANAGEMENT BECAUSE THEY ARE REQUIRED BY THE MODEL'S SYSTEM.
P1: PROBABILITY 1; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN THE LIMITS OF THE MEAN CLASS.
P2: PROBABILITY 2; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN ONE STANDARD DEVIATION OF THE PROJECTED MEAN VALUE.

EXHIBIT 3

SEARS, ROEBUCK AND COMPANY
BALANCE SHEET FOR YEARS ENDING JANUARY 31
(IN MILLIONS OF DOLLARS)

	1978	1979				1980			
	INITIAL VALUE	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2
ASSETS									
CURRENT ASSETS		9223.32 (9212.7-9250.2)	60.4	39	76	9866.6 (9852.3-9905.8)	85.81	38	76
FIXED ASSETS		5851.39 (5842.0-5875.4)	58.46	39	76	6726.90 (6718.5-6749.6)	49.73	38	76
TOTAL ASSETS		15074.61 (15054.6-15125.5)	113.50	39	76	16593.35 (16570.8-16655.4)	135.54	38	76
LIABILITIES AND NET WORTH									
SPONTANEOUS LIABILITIES		5650.63 (5612.3-5750.1)	220.53	39	76	6378.22 (6336.9-6500.0)	261.39	37	76
OTHER LIABILITIES	2000.00	2214.66 (2214.4-2215.2)	1.59	39	76	2400.56 (2398.6-2400.7)	3.95	21	77
COMMON STOCK	675.00	705.00 (654.0-731.1)	123.06	37	88	736.37 (671.6-770.1)	157.00	39	76
RETAINED EARNINGS	6000.00	6504.39 (6499.9-6510.8)	17.39	42	76	7078.32 (7067.4-7089.5)	34.96	46	76
TOTAL LIABILITIES & NET WORTH		15074.61 (15054.6-15125.5)	113.50	39	76	16593.35 (16570.8-16655.4)	135.54	38	76

P1: PROBABILITY 1; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN THE LIMITS OF THE MEAN CLASS.

P2: PROBABILITY 2; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN ONE STANDARD DEVIATION OF THE PROJECTED MEAN VALUE.

EXHIBIT 4

SEARS, ROEBUCK AND COMPANY
FINANCIAL ANALYSIS FOR YEARS ENDING JANUARY 31

FINANCIAL DATA - IN MILLIONS UNLESS OTHERWISE NOTED BY (*)

	1978	1979				1980			
	INITIAL VALUE	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2
EXTERNAL FUNDS NEEDED		2056.85 (2038.3-2092.2)	86.11	38	76	2030.18 (1995.6-2104.6)	174.20	39	76
VALUE NEW DEBT ISSUED		2081.08 (2036.3-2171.8)	216.36	39	76	2052.31 (2010.1-2144.9)	215.28	39	76
VALUE NEW COMMON ISSUED		30.01 (-21.0-56.1)	123.06	39	76	31.36 (17.7-39.0)	33.94	39	76
INTEREST RATE ON NEW DEBT (*)		0.07868 (.07826-.07963)	.00218	39	87	0.07868 (.07826-.07963)	.00218	39	87
INTEREST RATE ON TOTAL DEBT (*)	0.13	0.08199 (.08058-.08251)	0.00296	42	89	0.07962 (.07929-.08008)	0.00159	21	87
NUMBER OF NEW SHARES COMMON ISSUED		1.19 (-.378-2.200)	3.85	50	76	0.91 (0.511-1.173)	0.98	51	76
TOTAL NUMBER COMMON SHARES OUT-STANDING	319.84	321.03 (319.462-322.040)	3.85	50	76	321.94 (319.972-323.212)	4.83	50	76
EPS COMMON STOCK (*)	2.62	2.8203 (2.776-2.845)	0.1085	48	87	3.2003 (3.138-3.215)	0.1203	46	82
RETENTION RATE (*)		0.55725 (.55643-.55914)	.00434	39	87	0.55725 (.55643-.55914)	.00434	39	87

EXHIBIT 4 (continued)

1978	1979				1980			
INITIAL VALUE	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2	MEAN (LIMITS OF MEAN CLASS)	STANDARD DEVIATION	PROBABILITIES P1	P2
DPS COMMON STOCK (*)	1.248 (1.226-1.250)	0.036	48	87	1.416 (1.412-1.438)	0.039	39	87
MARKET PRICE COMMON PER SHARE (*)	33.138 (32.805-34.367)	2.510	36	77	37.601 (37.080-38.837)	2.810	39	77
P/E RATIO	11.7328 (11.650-11.922)	0.4354	39	87	11.7328 (11.650-11.922)	0.4354	39	82
DEBT/EQUITY RATIO	0.3073 (0.30643-0.30914)	0.0043	39	87	0.3073 (0.30643-0.30914)	0.0043	39	87
TAX RATE	0.4073 (0.40643-0.40914)	0.0043	39	87	0.4073 (0.40643-0.40914)	0.0043	39	87
GROWTH RATE IN SALES	0.1187 (0.11826-0.11963)	0.0022	39	87	0.1287 (0.12826-0.12963)	0.0022	39	87
OPERATING INCOME TO SALES	0.0887 (0.08826-0.08963)	0.0022	39	87	0.0887 (0.08826-0.08963)	0.0022	39	87
CURRENT ASSETS TO SALES	0.4787 (0.47826-0.47963)	0.0022	39	87	0.4537 (0.45326-0.45463)	0.0022	39	87
FIXED ASSETS TO SALES	0.3037 (0.30326-0.30463)	0.0022	39	87	0.3093 (0.30911-0.30979)	0.0011	39	87
SPONTANEOUS LIABILITIES TO SALES	0.2932 (0.29118-0.29797)	0.0109	39	87	0.2932 (0.29118-0.29797)	0.0109	39	87
RETURN ON TOTAL ASSETS	0.0672 (0.06687-0.06737)	0.0008	48	87	0.0689 (0.06846-0.06913)	0.0009	46	87
RETURN ON NEW INVESTMENT	0.0645 (0.05805-0.06616)	0.0126	47	87	0.0897 (0.08942-0.09110)	0.0026	44	89

P1: PROBABILITY 1; THE PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN THE LIMITS OF THE MEAN CLASS.

P2: PROBABILITY 2; THE PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN ONE STANDARD DEVIATION OF THE PROJECTED MEAN VALUE.

EXHIBIT 5

SEARS, ROEBUCK AND COMPANY

SUMMARY OF RISK PROFILE STATISTICS

RETURN ON INVESTMENT FOR 1979 AND 1980

ROI OUTPUT RANGES (PERCENTAGE)			PROBABILITY OF OCCURRENCE*	CUMULATIVE PROBABILITY**
1979				
9.0513	TO	9.8629	3 %	3 %
8.2397	TO	9.0513	6 %	9 %
7.4282	TO	8.2397	4 %	13 %
6.6166	TO	7.4282	24 %	37 %
5.8050	TO	6.6166	47 %	84 %
4.9934	TO	5.8050	5 %	89 %
4.1818	TO	4.9934	6 %	95 %
3.3702	TO	4.1818	3 %	98 %
2.5586	TO	3.3702	1 %	99 %
1.7470	TO	2.5586	1 %	100 %
ARITHMETIC MEAN VALUE = 6.4533 %				
EXPECTED STANDARD DEVIATION = 1.2616 %				
1980				
9.7789	TO	9.9461	1 %	1 %
9.6116	TO	9.7789	1 %	2 %
9.4443	TO	9.6116	3 %	5 %
9.2771	TO	9.4443	6 %	11 %
9.1098	TO	9.2771	5 %	16 %
8.9425	TO	9.1098	44 %	60 %
8.7752	TO	8.9425	26 %	86 %
8.6080	TO	8.7752	4 %	90 %
8.4407	TO	8.6080	6 %	96 %
8.2734	TO	8.4407	4 %	100 %
ARITHMETIC MEAN VALUE = 8.9678 %				
EXPECTED STANDARD DEVIATION = 0.2639 %				

*NOTE: PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN THE DESIGNATED CLASS INTERVAL.

**NOTE: PROBABILITY THAT THE ACTUAL VALUE WILL EXCEED THE APPLICABLE MINIMUM CLASS VALUE.

EXHIBIT 5 (CONT.)
SEARS, ROEBUCK AND COMPANY

RISK PROFILE
RETURN ON INVESTMENT FOR 1979 AND 1980

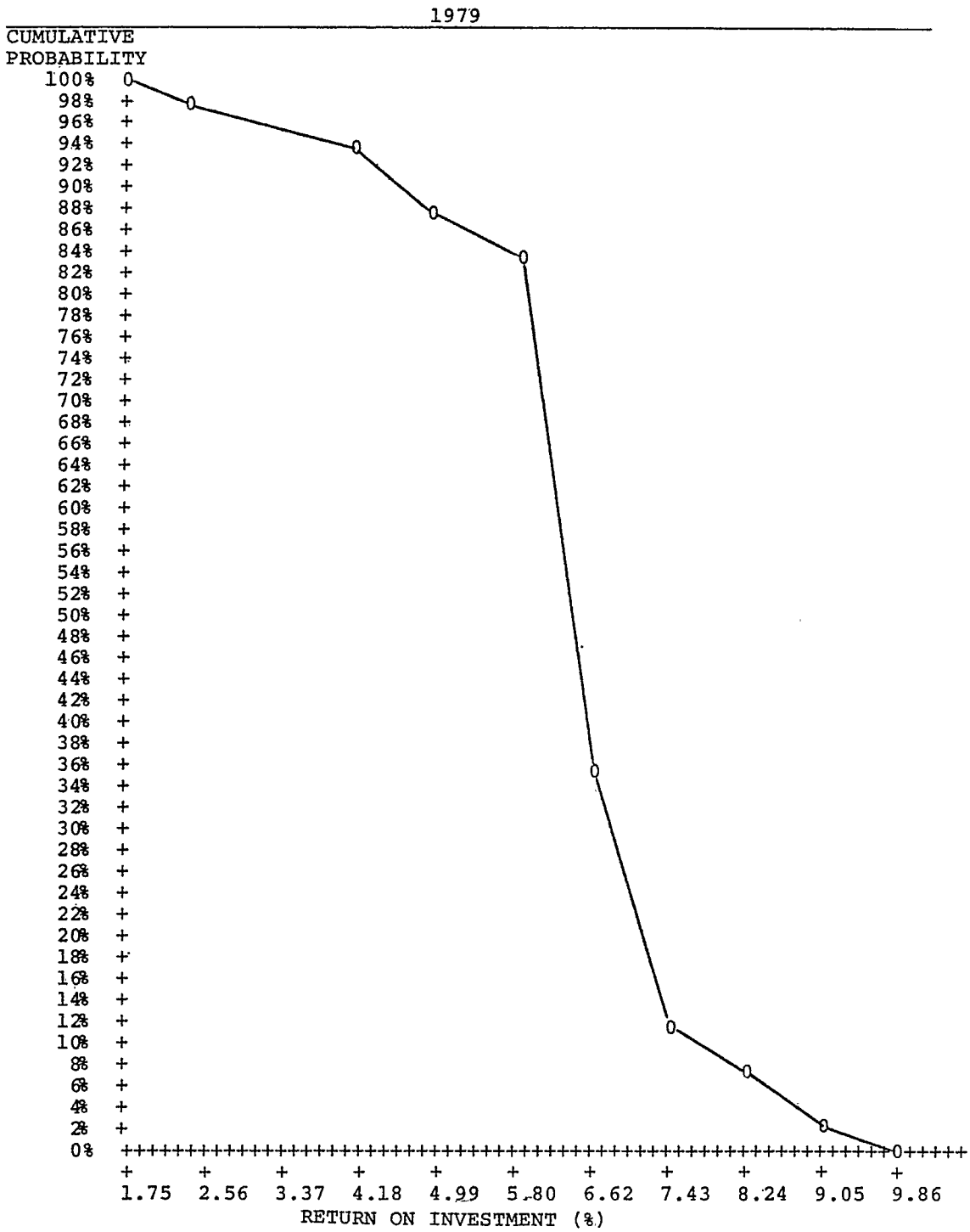
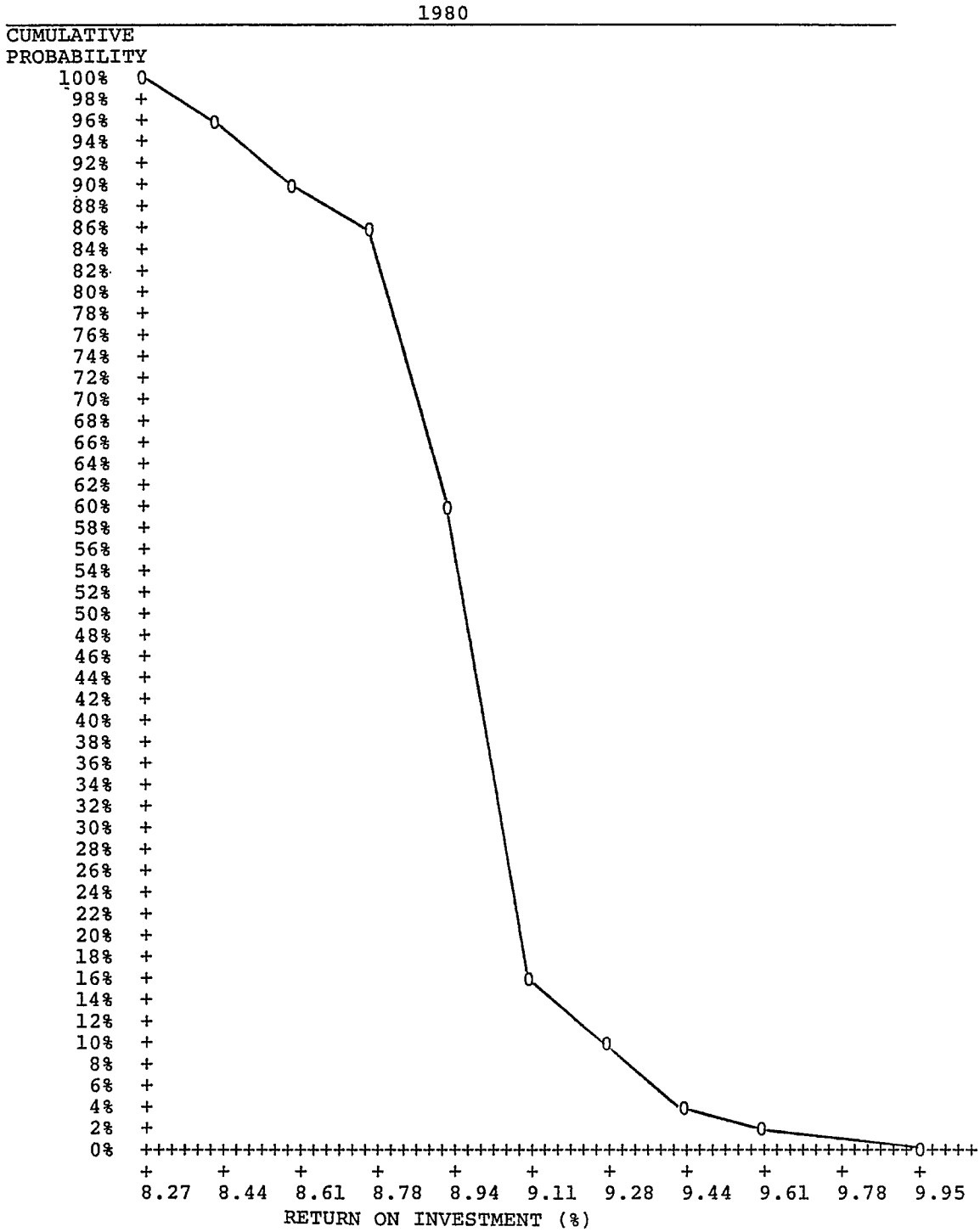


EXHIBIT 5
(CONT.)



- o. Market price of common stock is forecasted to increase by 13.46 percent or from $33.13 to $37.59.
- o Rate of return on total assets is predicted to increase by 2.53 percent or from 6.72 percent to 6.89 percent.
- o Rate of return on new investment is anticipated to increase by 39.14 percent or from 6.44 percent to 8.96 percent.

As shown in Exhibit 4, a more comprehensive analysis can be made for any desired variable. For example, an examination of the 1980 growth rate in sales shows that its expected value [E(G Sales)] is 12.87 percent with a standard deviation ($\sigma_{G\ Sales}$) of .22 percent. The probability that the actual value for growth rate in sales will be between 12.83 and 12.96 percent (the limits of the mean class) is 39 percent. While the probability that the actual value will be within one standard deviation (12.65-13.09 percent) of 12.87 percent [E(G Sales)] is 87 percent. Given these results, it is concluded that 12.87 percent is a reliable estimate for the growth rate in 1980 sales. Since sales are the model's driving force, credence is given to other projected results.

5.2 The Featured Performance Variable ROI

A fundamental concern of management is which performance measure best summarizes and indicates a firm's capability to compete effectively in its economic environment. Given that financial management's overriding responsibility is to use assets as efficiently as possible, the selected performance measure must reflect both the productivity and profitability of capital. Since the easiest and usually the quickest way to improve profitability is by increasing capital productivity, return on investment (ROI) is selected as the critical performance measure.

A recent survey [Reece and Cook, 1978] of the Fortune "1000" supports the use of ROI as the generally accepted performance measure. For the 620 firms responding, 459 or 74 percent used investment centers to assess performance, while 93 percent (427) of these 459 respondents used either ROI or the combination of ROI and residual income to evaluate the productivity of their investment centers. ROI is demanded as the performance measure because of the interrelated effects of inflation, capital scarcity, and increased capital costs. As capital costs increase, so must the return on capital employed, for if a company cannot earn a ROI that exceeds its cost of funds, the company is not economically profitable and, thus, cannot compete effectively in its environment.

Reece and Cool [1978] specify the advantages for adopting ROI as the primary performance measure:

- o ROI, being a percentage-return measurement, is consistent with how companies measure their costs of capital.
- o ROI provides comparability for diverse results. Since the return is a ratio, it normalizes results for various operations.
- o ROI uses generally accepted definitions of profits, investment, and value in its calculations, so it is easily interpreted.
- o ROI is useful to people outside the firm, because it can be calculated by financial analysts for purposes of evaluating the economic performance of a company and for making intercompany performance comparisons.[2]

The current study uses two rates of return measures--rate of return on total assets (ROA) and rate of return on new investment (ROI). Since management has limited influence over long-term capital funds committed in previous periods, the more relevant measure is return on new investment because the productivity of potential or planned capital has the greater effect on projected results. Thus the rate of return on new investment is the measure emphasized and the variable implied, unless otherwise stated, when ROI is used hereafter.

Since ROI is the featured performance variable, more detailed information is given on the probability of its occurrence through the preparation of a risk profile which is presented in Exhibit 5. ROI's effectiveness as a performance criterion is strengthened when used with decision rules for purposes of estimating the firm's likelihood of attaining its financial goals. Otherwise such goals need to be evaluated in terms of both expected values and the probability these expected values will be achieved. For illustrative purposes, assume that Sears' major financial performance goal is specified in the following decision rules:

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[2] For another excellent discussion supporting ROI as the bench mark for measuring corporate performance, see Searby (1975).

- Expected ROI must have a minimum value of 6 percent.[3]
- There must be a minimum probability of 80 percent that ROI will be at least 6 percent.
- There must be a minimum probability of 90 percent that ROI will exceed the firm's after-tax cost of capital which is assumed to be 5 percent.

From examining Exhibit 5 and by comparing its reported results with the above decision rules, it is concluded that Sears' 1979 and 1980 projected financial performance is acceptable. The precise criteria established is largely dependent upon management's willingness to accept risk and the general economic outlook.

5.3 Examining Alternative Scenarios

Knowledge of only the expected results is not enough. To compete effectively, managers must be prepared to meet contingencies by having reliable answers to difficult "What if?" questions that critically affect the firm's financial well-being. For example, what will be the projected effects on the 1980 results if for each of the two forecasted years (1) sales grow at only 10 percent, (2) the relationship between fixed assets and sales increases to 33 percent, (3) the relationship between current assets and sales increases to 55 percent, (4) spontaneous liabilities (low cost or interest-free debt) fall to 20 percent of sales, and (5) the rate of interest on long-term debt capital increases to 10 percent? The model can analyze, simultaneously or individually, these and other effects within a matter of minutes. Exhibit 6 highlights the simultaneous effects the above events are projected to have on 1980 operations.

EXHIBIT 6

COMPARISON OF CONTINGENT AND EXPECTED 1980 RESULTS

	Mean Value Contigent (Expected)	Limit of Mean Class (Expected)	Standard Deviation (Expected)	Probabilities P_1 Contingent (Expected)	Probabilities P_2 Contingent (Expected)
EPS COMMON STOCK	$1.91 ($3.20)	$1.86-$1.93 ($3.14-$3.22)	$.11 ($.12)	50% (46%)	87% (82%)
DPS COMMON STOCK	$ .84 ($1.42)	$ .82-$ .85 ($1.41-$1.44)	$.04 ($.04)	44% (29%)	87% (87%)
MARKET PRICE COMMON PER SHARE	$22 ($38)	$22-$23 ($37-$39)	$2.11 ($2.81)	36% (49%)	76% (79%)
RETURN ON TOTAL ASSETS	5.98% (6.89%)	5.94%-6.00% (6.86%-6.91%)	.1% (.1%)	44% (46%)	87% (87%)
RETURN ON NEW INVESTMENT	6.91% (8.96%)	6.88%-6.94% (8.94%-9.11%)	.1% (.3%)	37% (44%)	89% (89%)

P1: PROBABILITY 1; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN THE LIMITS OF THE MEAN CLASS.

P2: PROBABILITY 2; PROBABILITY THAT THE ACTUAL VALUE WILL BE WITHIN ONE STANDARD DEVIATION OF THE PROJECTED MEAN VALUE.

[3] As shown in its definitional equation (Exhibit 1), ROI is calculated on an after-tax basis so that it can be compared directly with the firm's after-tax cost of capital.

The most significant effects would occur in the mean values and, consequently, the limits of the mean class. Each variable's mean value significantly declines. However, the firm's financial performance is still judged acceptable by the established decision rules in that there is a 100 percent probability that ROI will exceed both the 5 and 6 percent requirements. The capability to evaluate almost instantaneously the interactive and simultaneous effects of these and other innumerable possible outcomes is essential in helping prevent or minimize future problems as well as taking advantage of opportunities. Perhaps the greatest advantage of this type modeling is the freedom it provides for experimenting with ideas and alternatives without committing actual resources. A corporation's adaptability and reaction capability plays a critical role in its future survival.

A prime objective is to develop a good understanding of the firm's points of leverage and vulnerability. In most all business enterprises, there is an abundance of information and opinion; unfortunately, much of it is false. After examining Sears' history, Drucker [1974] drew the conclusion that:

> "The basic answers are always obvious in retrospect. The basic lesson of the Sears story is that the right answers are likely to be anything but obvious before they have proven themselves. 'Everybody knew' around 1900 that to promise 'satisfaction guaranteed or your money back' could only bring financial disaster to a retailer. 'Everybody knew' around 1925 that the American market was sharply segmented into distinct income groups.... 'Everybody knew'--as late as 1950--that the American consumer wanted to shop downtown, and so on."

Myths and assumptions must be tested; however, the cost of manually testing and evaluating them is prohibitive. Such analysis is feasible only through the utilization of computer-based models that offer a practical means of studying, testing, and evaluating proposed courses of action and their effects prior to the actual utilization of resources. In other words, effective decision making results from the synthesis of several scenarios, not from the analysis of only one course of action. The C-C model is designed to permit this type of planning.

6. VALIDATION OF THE MODEL

The model's performance was tested by evaluating its accuracy in replicating the financial position of Sears during the four two-year periods of 1964-65, 1969-70, 1974-75, and 1976-77. A comparison between the model's simulated results and the firm's actual results for the major variables is presented in Exhibit 7. An examination of Exhibit 7 discloses there is very close agreement between the actual and simulated results. Such a condition lends credence to the model's effectiveness as a planning tool. Recognition, however, is given that accurate forecasts for past periods do not guarantee the occurrence of accurate forecasts in future periods. Future accuracy is predicated upon a correct analysis of impending conditions.

A strength of the C-C model is its utilization of fundamental accounting equations which are not likely to change. Thus any unexpected outcomes are attributable to misjudgment of numerical values, not functional relationships. The likelihood of this type of error occurring emphasizes again the importance of providing the decision maker a probabilistic statement regarding the probable outcomes for critical variables.

7. SUMMARY AND CONCLUSION

Since a firm's future is generally thought of in terms of its financial performance, corporate financial planning is experiencing widespread and rapid adoption. Such planning usually involves the use of a model designed after the firm's financial structure. Financial models are selected as the planning tool because their quantitative nature permits management to communicate more clearly the firm's goals and needs.

Evidence shows that the effectiveness of corporate financial models is directly related to their (1) capability of explicitly considering the probable impact of risk on the firm's future operations, and (2) orientation to the user's understanding and needs. With these requirements in mind, the current study involved the formulation and empirical testing of a risk analysis model based upon several years' operations for Sears, Roebuck and Company. Given the model's extensive testing and accurate results, it is deserving of further development and analysis. Future consideration should include applying the present approach for risk analysis planning to such other related financial areas as cash budgeting, capital budgeting, and operating results for major divisions of product lines. The intended result is to provide a reliable integrated planning system for a firm's financial operations.

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EXHIBIT 7

COMPARISON OF SIMULATED AND
ACTUAL RESULTS FOR YEARS ENDING JANUARY 31
(In Millions of Dollars Unless Designated by*)

Variable	1964 Simulated (Actual)	1965 Simulated (Actual)	1969 Simulated (Actual)	1970 Simulated (Actual)	1974 Simulated (Actual)	1975 Simulated (Actual)	1976 Simulated (Actual)	1977 Simulated (Actual)
Sales	$5,152.62 (5,152.00)	$5,783.81 (5,783.00)	$8,311.78 (8,311.74)	$8,976.17 (8,976.14)	$12,543.03 (12,543.00)	$13,292.03 (13,292.00)	$13,639.56 (13,639.89)	$14,949.69 (14,950.21)
Operating Income	$ 483.83 (484.00)	$ 600.68 (601.00)	$ 891.68 (891.87)	$ 992.68 (992.87)	1,366.04 (1,367.00)	$ 1,777.07 (1,777.00)	$ 1,057.13 (1,057.08)	$ 1,083.14 (1,083.25)
Net Income	$ 261.12 (261.02)	$ 304.60 (304.09)	$ 419.44 (418.03)	$ 439.17 (440.95)	$ 679.44 (679.90)	$ 511.80 (511.40)	$ 915.37 (915.10)	$ 1,067.95 (1,076.07)
Total Assets	$3,669.18 (3,668.60)	$4,271.92 (4,271.43)	$6,507.73 (6,507.58)	$7,078.82 (7,079.30)	$10,429.16 (10,428.00)	$11,338.83 (11,339.00)	$11,576.16 (11,576.00)	$12,711.00 (12,711.00)
Earnings Per Share	$ 3.46 (2.91)	$ 4.04 (2.55)	$ 2.73 (2.72)	$ 2.85 (2.85)	$ 4.32 (4.33)	$ 3.24 (3.25)	$ 3.20 (3.30)	$ 4.15 (4.35)
Dividends Per Share*	$ 1.76 (1.75)	$ 2.05 (2.00)	$ 1.29 (1.30)	$ 1.33 (1.35)	$ 1.75 (1.75)	$ 1.84 (1.85)	$ 1.79 (1.85)	$ 1.52 (1.60)
Market Price Common*	$ 115.40 ($96-136)	$ 130.67 ($124-154)	$ 63.85 ($60-75)	$ 66.95 ($51-77)	$ 102.39 ($78-123)	$ 63.62 ($41-90)	$ 59.57 ($48-74)	$ 66.80 ($61-79)
Price/Earnings Ratio*	33.90 (33.90)	32.38 (33.37)	23.00 (23.00)	23.00 (23.00)	23.00 (23.00)	20.00 (20.00)	18.6 (18.6)	16.1 (16.1)
Return on Total Assets*	8.0% (8.0%)	8.0% (8.0%)	7.0% (7.0%)	7.0% (7.0%)	7.0% (7.0%)	6.0% (6.0%)	5.0% (5.0%)	5.0% (5.0%)
Return on Additional Investment*	3.0% (3.0%)	8.0% (7.0%)	3.0% (3.0%)	4.0% (4.0%)	4.0% (4.0%)	3.0% (3.0%)	3.0% (3.0%)	10.0% (10.0%)

APPENDIX

Definitions Used in the Corporate Financial Planning Model

(subscript $_o$ indicates period (t-1))

Variables --- Values Provided by Management

$SALES_o$	Sales in Previous Period (dollars)
GSALES	Growth Rate in Sales
RCA	Current Assets as a Percentage of Sales
RFA	Fixed Assets as a Percentage of Sales
RCL	Spontaneous Liabilities (liabilities that increase automatically with sales)
PFDSK	Shares of Preferred Stock Outstanding
PFDIV	Preferred Dividends (dollars)
L_o	Debt in Previous Period (dollars)
LR	Debt Repayment (dollars)
S_o	Common Stock in Previous Period (dollars)
R_o	Retained Earnings in Previous Period (dollars)
b	Retention Rate of Earnings
T	Average Tax Rate
i_o	Average Interest Rate in Previous Period
IE	Expected Interest Rate on New Debt
REBIT	Operating Income as a Percentage of Sales
UL	Underwriting Costs of Debt (rate)
US	Underwriting Cost of Equity (rate)
K	Ratio of Debt to Equity
$NUMCS_o$	Common Shares Outstanding in Previous Period
m	Price-Earnings Ratio
P_o	Price Per Share (dollars)

Variables --- Values Determined by Model

SALES	Sales (dollars)
CA	Current Assets (dollars)
FA	Fixed Assets (dollars)
A	Total Assets (dollars)
CL	Spontaneous Liabilities (dollars)
NF	Needed Funds (dollars)
EBIT	Earnings Before Interest and Income Taxes (dollars) or Operating Income
NL	New Debt (dollars)
NS	New Stock (dollars)
L	Other Liabilities (dollars or liabilities that do not automatically increase with sales)
S	Common Stock (dollars)
R	Retained Earnings (dollars)
i	Interest Rate on Debt
EAFCD	Earnings Available for Common Dividends (dollars)
CMDIV	Common Dividends (dollars)
NUMCS	Number of Common Shares Outstanding
NEWCS	New Common Shares Issued
P	Price Per Share (dollars)
EPS	Earnings Per Share (dollars)
DPS	Dividends Per Share (dollars)
EPSGR	Earnings Per Share Growth Rate
ROA	Rate of Return on Total Assets
ROI	Rate of Return on New Investment

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