SIMULATION OF THE FINANCIAL PLANNING PROCESS OF P-L INSURERS

JAMES A. GENTRY

ABSTRACT

This article reviews the investment-financing decision process of property and liability companies. It indicates the problems of measuring cost of capital and the need for an improved decision criterion for evaluating investment alternatives. A model is developed that simulates the long-run financing process of property and liability insurance companies. One of the key decision variables determined by the model is the rate of return required on new investments in order to produce management's desired earnings per share growth objective. Thus, the model links the investment and financing processes of property and liability insurance companies and provides decision makers probabilistic-oriented information for analyzing investment alternatives.

One of the difficult problems in financial theory is the linking of the investment process and the long-run financing process. These two decision areas focus on long-run management decisions and are considered by some financial theorists to be the basis of the finance function.[1] In recent years the analysis of the investment-financing decision process for property and liability insurance companies (P&L) has been of interest to several authors.[2]

The objectives of this paper are to review the linkages of the investment-financing decision process for P&L companies; to develop a model that simulates the long-run financing process of property and liability insurance companies; and to offer a new measure for evaluating investment alternatives.

Review of Theory

Investment and Financial

Investment and financial theory are usually discussed in the context of an industrial firm. Investment theory assumes the firm perceives a demand for a good or service. In order to meet this demand,

James A. Gentry, D.B.A., is Associate Professor of Finance at the University of Illinois (Urbana-Champaign). He has been a member of the Risk Theory Seminar since 1968.

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[1] Ezra Solomon, *The Theory of Financial Management* (New York: Columbia University Press, 1963); Alexander A. Robichek and Stewart C. Myers, *Optimal Financing Decisions* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1965); James C. Van Horne, *Financial Management and Policy* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971).

[2] For example: Clement G. Krouse, "Portfolio Balancing Corporate Assets and Liabilities with Special Application to Insurance Management," *Journal of Financial and Quantitative Analysis*, 5 (March, 1970), pp. 77-104; Robert A. Haugen, "Insurer Risk Under Alternative Investment and Financing Strategies," *Journal of Risk and Insurance*, 38 (March, 1971), pp. 71-80; J. J. Launie, "The Cost of Capital of Insurance Companies," *Journal of Risk and Insurance*, 38 (June, 1971), pp. 263-268.

the firm has to make an investment in plant and equipment. The schedule of investment costs and returns are conceptualized in a marginal efficiency of investment schedule (MEI).

There are two financial theories for explaining the relationship between cost of capital (k) and capital structure, debt/equity mix (D/E). Traditional financial theory assumes the relationship between k and D/E is a saucer-shaped average cost curve.[3] Modigliani and Miller (MM) assume there is no relationship between k and D/E.[4] However, if a long time horizon is assumed, these conflicting views disappear because traditional theory assumes the firm operates on the flat portion of the saucer-shaped average cost curve. MM assume the firm is always operating on this flat sector. Thus, when a firm perceives it is operating on the long-run equilibrium sector of the average cost curve, cost of capital is identical under either theory.

Although the investment process and the capital structure process are treated separately, they are linked by the cost of capital. In the simple case, it is assumed the firm accepts an investment alternative if the benefits, discounted at k, exceed the discounted cost. The complex cases will not be reviewed here, but a thorough discussion is found in Van Horne.[5]

Although economists normally perceive an industrial type firm when discussing investment and financial theory, these theories also apply to P&L insurance companies. The management of a P&L company identifies the demand for various lines of insurance. These lines of insurance are proposed as investment opportunities for the firm. Management and staff analyze the benefits and costs related to each proposed line of business and make subjective allowances for the riskiness of each alternative. Theoretically, if the discounted expected benefits on a line of business are greater than the discounted expected cost the alternative is accepted. This top management decision authorizes the expenditures of funds to acquire the necessary capital, human and physical, to make the new insurance line operational.

When the P&L company receives premiums from the new line, debt (loss reserves and/or unearned premium reserves) and assets (portfolio investments) are created simultaneously. It is this process of acquiring debt and assets that creates a conceptual cause and effect dilemma in insurance literature. One view is the insurance operation creates a financial obligation, debt, which in turn creates an asset. This thought process is opposite the process advanced in capital investment theory.

Investment for P&L companies is both human and physical capital, which differs from the traditional view of investment theory. However, capital investment theory indicates the costs of investment are those expenditures required to make the investment operational. This economic framework suggests the investment process is initiated when management analyzes the benefit-cost data of a proposed line of insurance and decides to invest in this line of business. Applying an economic framework to the P&L investment process shows debt does not create assets, rather the investment decision creates debt and assets simultaneously.

Cost of Capital

The cost of capital concept is widely accepted as a decision-criterion for investment decision making.[6] Although many theorists have advanced the cost of capital concept, it is widely recognized there is difficulty in measuring k accu-

[3] Van Horne, *op. cit.*, pp. 207-211.

[4] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, 48 (June, 1958).

[5] Van Horne, *op. cit.*, Chapters 3, 5 and 6.

[6] Krouse indicated that to the extent other constraints dominated the investment decision, k may be an inappropriate measure. See Krouse, *op. cit.*, p. 79.

rately. Calculating the cost of equity capital is a primary problem in determining k because equity capital problems are complex, dynamic and probabilistic.

Gordon developed a dynamic valuation model [7] for measuring cost of equity capital. However, this model has two major weaknesses. It excludes debt from the capital structure and does not explicitly include uncertainty in the process. Also, the Gordon model has created substantial controversy among theorists concerning the relationship between rate of return on assets and retention of earnings.[8] Thus, measurement problems related to k make its use questionable as a decision tool. These observations concerning k create an uneasy softness in long-run financial theory.

The cost of debt for P&L companies is an unresolved issue. There are several conflicting views on this topic. For example, Plotkin [9] argues there is an opportunity cost related to loss reserves and unearned premium reserves. The Plotkin concept is based on an implicit cost to society for funds channeled to P&L companies. Launie believes there are two separate costs of debt for P&L companies—an explicit and an implicit opportunity cost.[10] The explicit cost is the loss on operation divided by total debt.[11] If there are no losses or if gains exceed losses over time, the explicit costs are negative. The opportunity cost is the difference between the return on a nonregulated portfolio and a regulated portfolio.[12] These explicit and implicit costs are summed to equal the cost of debt capital to P&L companies. Hammond and Shilling state the cost of debt is zero because the reserves are a necessary by-product of the insurance transactions.[13] These conflicting views indicate the cost of debt to a P&L company is an unresolved issue.

In calculating the overall cost of capital to P&L companies, Launie suggests using a simple weighted average of debt and equity.[14] Haugen indicated the cost of capital should be calculated by line of business. He sums the claims and expenses related to a line of business and divides by premiums received on the line.[15]

After a brief review of the theoretical shortcoming related to cost of capital and the problems related to measuring cost of debt for P&L companies, one observation seems clear. There is need for either a clarification of the cost of capital as it applies to P&L companies [16] or a better operational mechanism for linking investment and financing decisions than cost of capital. The latter task is undertaken in this paper.

An EPS Growth Model

The model developed in this paper assumes the objective of P&L insurance company management is long-run maximization of the value of their common stock.[17] To accomplish this objective it is assumed management opts for a reasonably stable and competitive mean growth rate of earnings per share (EPS) for a defined planning period.

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[7] Myron J. Gordon, *The Investment Financing and Valuation and Corporation* (Homewood, Illinois: Richard D. Irwin, 1962), Chapter 3.

[8] Van Horne, *op. cit.*, p. 96.

[9] Irving H. Plotkin, "Rates of Return in the Property and Liability Insurance Industry," *Journal of Risk and Insurance*, 36 (June, 1969), p. 184.

[10] Launie, *op. cit.*, pp. 264-265.

[11] *Ibid.*, p. 264.

[12] *Ibid.*, p. 265.

[13] J. D. Hammond and N. Shilling, "A Review Article: The Little Report on Prices and Profits in the Property and Liability Insurance Industry," *Journal of Risk and Insurance*, 36 (March, 1969), p. 137.

[14] Launie, *op. cit.*, p. 266.

[15] Haugen, *op. cit.*, p. 73.

[16] The author wishes to thank the referee for making this observation.

[17] This model includes concepts of financial mobility suggested by Professor Gordon Donaldson, *Strategy for Financial Mobility* (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1969).

Professors Lerner and Rappaport[18] found the growth rate of EPS to be the most important financial objective of 163 large companies. The authors stressed the need for management to determine an expected EPS growth rate in order to avoid selecting investments that might produce erratic EPS in the future. Lerner and Rappaport concluded the expected growth rate in EPS should act as a standard in comparing investment alternatives.

The interest of corporate executives, financial analysts, and investors in the future growth of a firm's common stock is related to its future EPS. That is, in equation form:

$$P_t = f\ (EPS_{t+n})$$

where: P_t = current price per share

EPS_{t+n} = earnings per share in the future

EPS is difficult to estimate because it is a residual value resulting from a series of decisions related to portfolio investments, lines of business, claims, and expenses. However, theoretically, if the expected growth of EPS occurs, stockholder wealth should be maximized in the long run.

Financial theory specifies the variables and relationships involved in the EPS growth model. It is assumed management has a list of investment alternatives and desires to combine existing assets with a set of new investments that will produce the desired EPS growth rate for n years.

The variables included in the model are identified in Figure 1. Values are given for one set of variables at time t. These variables are called given and they are: total assets (T), total debt (loss reserves + unearned premium reserves) (D), policyholder surplus (TNW), total shares of common stock (CS), expected return on total admitted assets for n years (ROX), and after tax interest rate for all debt, (RAT).

Figure 1 shows the six variables in the EPS growth model. They are: desired growth rate of EPS (R), investment (DI), debt/total asset ratio (DD), i.e., loss reserve (LR) + unearned premium reserve (UPR)/total assets (T), retained earnings (P), i.e., (1-DPS/EPS), PE ratio (PER), and interest cost of debt (RAT). The decision maker(s) assigns discrete probability values to these six variables. Although there may be some joint dependencies between these six variables, financial theory does not explicitly define a general model for these interrelationships.

This model assumes each variable is independent. The author has tested this assumption by replicating the actual financial operations of several companies and has found the simulated results are very close to the actual results. The model takes the given variables and picks randomly a value for each of the six decision or state variables. It computes the required rate of return for each year in the planning cycle. This same process is simulated for 100 times. The result is a distribution of the rates of return necessary to produce the desired growth rate of EPS for each year and a frequency distribution for each of the key variables in each year. The mean and standard deviation of each variable are determined for each year in the planning period. These data are reported in a separate table.

ROI—The Decision Criterion

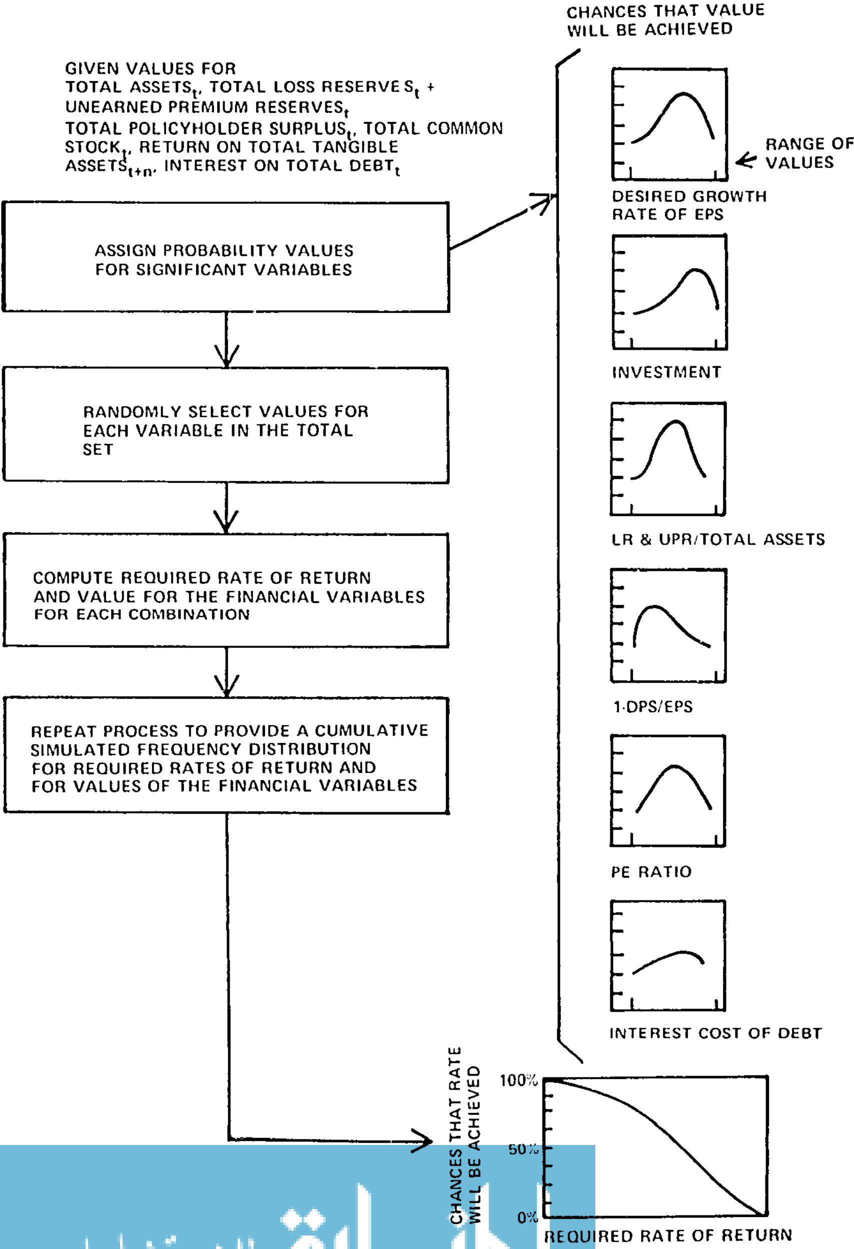
In the EPS growth model, the decision criterion for accepting or rejecting investment alternatives is the rate of return required on new investments (ROI) in order for a firm to produce its desired range in long-run growth of EPS. The task for management is to select investments with internal rates of return (IRR)[19] for a

[18] Eugene M. Lerner and Alfred Rappaport, "Limit DCF in Capital Budgeting," *Harvard Business Review*, 46 (September-October, 1968), pp. 133-139.

[19] The Fisher Algorithm produces an internal rate of return. Lawrence Fisher, "An Algorithm

FIGURE 1

SIMULATION OF A LONG RUN FINANCIAL PLANNING PROCESS FOR STOCK PROPERTY AND LIABILITY COMPANIES



defined time horizon that are equal to or greater than the computed ROI. Following this decision rule management can maximize the long-run price of the common stock.

In this EPS growth model, ROI replaces cost of capital (k) as the decision criterion for investment selection. In investment selection models, IRR is compared to k, and if IRR is equal to or greater than k the investment is selected. If IRR is lower than k the investment is rejected. The ROI concept is substituted for k because (1) it more closely represents the real operational decision criteria used by management and (2) k is difficult to measure accurately. The variables used in calculating k are included in the model and are involved in the calculation of ROI. The derivation of ROI is presented in a later section.

Basic Assumptions

There are four assumptions basic to the development of the EPS model. First, EPS growth is the key financial objective of management. It is assumed the EPS growth goal is related to wealth maximization in the following manner:

(1) wealth maximization means the long-run maximization of gains and dividends to stockholders
(2) stock prices and capital gains are directly related to future dividends
(3) future dividends depend on future EPS, given a specified payout ratio.

Thus, if the long-run EPS growth goal is obtained, dividends and capital gains will tend to be maximized in the long-run since they are functionally related; subsequently, wealth is maximized.

Second, the decision makers can determine a probability distribution of necessary growth rates of EPS which they find satisfactory and is acceptable to stockholders and others interested in the long-run performance of the firm. This variable, the desired growth rates of earnings per share, (R), is a sensitive expectational variable in the EPS growth model.

The values of R might be subjectively determined by analyzing (1) the past and expected future EPS performance of their firm, and/or (2) the past and expected performance of other firms which are perceived to be comparable. For example, a P&L management might decide that a range of 8 to 10 percent compounded growth rate in EPS was satisfactory and would provide a competitive edge over other firms in the industry. Investment projects would not be accepted by management unless they produced internal rates of return that would achieve the 8 to 10 percent EPS growth goal.

Third, a financial risk constraint is subjectively determined by management. After evaluating the business risk surrounding a firm's operations, management determines a probability distribution of the desired debt/asset (LR + UPR/Total Assets) ratio for n years. This decision is based on management's evaluation of the stability of cash flows and their ability to incur fixed financial obligations based on forecasted cash flows. Historical analysis might aid in determining the distribution of desired LR + UPR/asset ratio.

Fourth, earnings per share figures are adjusted for stock splits and stock dividends issued by the company.

for Finding Exact Rates of Return," *Journal of Business*, 39, No. 1, Part II, (January, 1966), pp. 111-118.

Variables Used in the Model

There are twenty-three variables in the EPS Growth Model:

1. R = the desired growth rates of earnings per share.
2. ROI = the necessary (annual) rate of return on new investments to achieve the desired growth rate of earnings per share (R).
3. DI = planned investment (alternatively defined as "new investments").
4. T = total tangible assets.
5. ROX = the average rate of return on total tangible assets for n years = $\frac{\text{net common stock earnings} + \text{interest (1-tax rate)}}{\text{total tangible assets.}}$
6. D = total debt.
7. TNW = net worth.
8. E = net common stock earnings.
9. CS = shares of common stock outstanding.
10. EPS = earnings per share.
11. P = percent of earnings retained.
12. DPS = yearly dividends per share.
13. PER = price/earnings ratio.
14. PCS = market price of common stock.
15. S = desired amount of net worth.
16. SAM = amount of new stock issued (in dollars).
17. DD = desired debt/asset ratio.
18. DAD = desired amount of total debt (in dollars).
19. DAM = amount of new debt issued (in dollars).
20. RAT = after tax rate of interest on all debt.
21. ARGEP = actual growth rate of earnings per share.
22. i = time period.
23. n = length of the planning period (years). This has been arbitrarily designated as 8 years in the model.

Flowchart

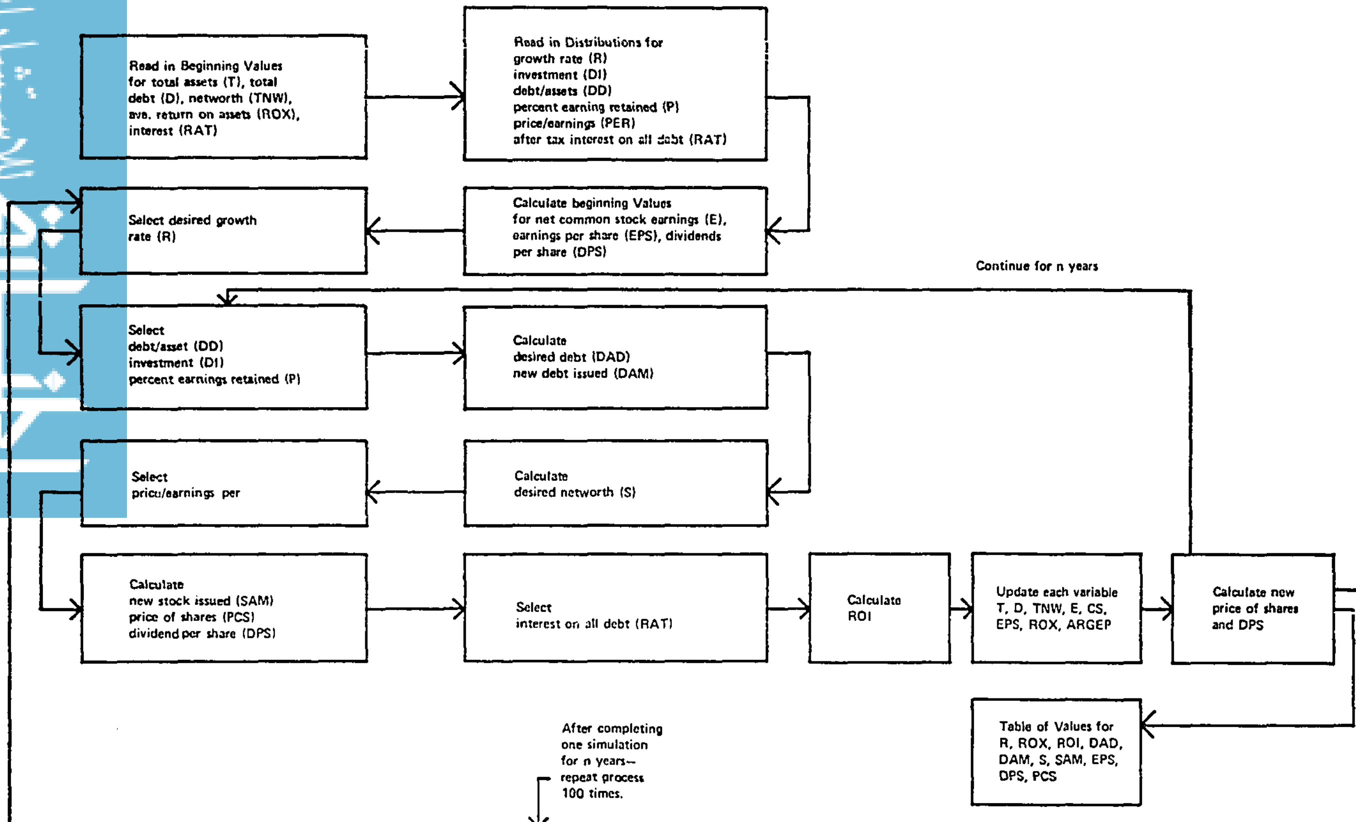
A flowchart of the model's operation is presented in Figure 2. A careful study of the flowchart provides substantial insight to the thought process involved in programming the EPS growth model. In the initial stages, the given input data are placed in storage. The next step is the storage of the distributions for each of the decision and state variables. The calculation of a beginning EPS and DPS is performed. The program then randomly selects values for the various variables and calculates the values of the specified financial variables. The ROI is calculated for each year and the variables are all updated one year. This process is repeated for seven years. The output data for a single simulation is completed and the process is repeated for 100 simulations. The output data are not shown in Figure 2 but are presented later.

Operation of the Model

The objectives of this section are: (1) to develop the assumptions underlying the necessary rate of return on new investments (ROI) equation; (2) to present the ROI equation; (3) to present examples of the input and output; and (4) to discuss applications of the model for insurance management.

EXHIBIT 2 Simulation Flowchart

FIGURE 2



Assumptions of ROI Equation

Five assumptions are basic to the development of the ROI formula in the model.

First, a continuous EPS growth function can be broken down into finite segments and each segment measured individually. The ROI equation is designed to attain the defined growth rate of EPS (R) in a single year.

Through an iterative process, the computer generates an EPS figure for each year during the planning period. A dynamic growth process is approximated by successive additions of yearly EPS data that produce the desired compounded growth.

Second, the necessary ROI determined by the model for the new investment is received each year over the project life. An investment (DI) made during a year (i) is assumed to generate an equal rate of return (ROI) each year during the project life so that the computer can verify that the desired EPS growth (R) is attained over the defined planning period. EPS growth will be continuous at the desired rate, R, if ROX on existing assets and ROI on new investments continue for the remainder of the planning period.

Third, depreciation recoveries are reinvested at the internal rate of return generated by the original project.

Fourth, the frequency distribution of investment (DI) to be undertaken each year is determined by management.

Fifth, stock price is a function of EPS and the price-earning multiple. As EPS rises, the stock price also rises by the multiple factor. Thus, stock price = (EPS) (PER).

ROI Equation

Given the preceding discussion and assumptions, it can be shown that the ROI equation is:

$$ROI_i = \frac{\left[(R+1)\frac{E_i}{CS_i}\right]\left[CS_i + \frac{SAM_i}{PCS_i}\right] - E_i + (RAT_i \cdot DAM_i)}{(P_i \cdot E_i + SAM_i + DAM_i)} \quad (1)$$

Equation 1 calculates, for each year, the annual rate of return on new investments required to achieve the desired growth rate of EPS.

Input and Output Data

An example of one simulation is presented in Figure 3, at the top of which are the given input variables. The randomly selected values for the six variables are shown in the time period columns. The output results of this simulation are presented in the lower half of Figure 3. Also, the variable names associated with each symbol are presented at the bottom of Figure 3.

The following observations emerge from Figure 3 that are of importance to management.

(1) The growth rate of EPS (R) is .097.

(2) The ratio of debt/assets (D/T) equals .70 in year 1. The randomly selected desired debt ratio (DD) is .61 in year 1. Thus the insurance company cannot take on any new debt (UPR + LR) in year 1, i.e., DAM equals zero. The cost of debt (RAT) is zero for all years.

(3) All financing occurs through the sale of common stock (SAM) or through retained earnings (S-SAM) in year 1.

(4) The new investment (DI) was $229 in year 1. It was financed by $177 in common stock and the remainder in retained earnings. The cost of the new stock was $141.62 per

Figure 3

SIMULATION OF INPUT AND OUTPUT DATA

SIMULATION 3

INPUT DATA

TIME PERIOD

VARIABLE	1	2	3	4	5	6	7	8	9
T	1603.								
D	1123.								
TNW	480.								
CS	23.								
ROX	0.08000								
R	0.09700								
DI	229.	228.	285.	273.	321.	335.	397.	394.	
DD	0.61	0.63	0.60	0.56	0.58	0.57	0.61	0.59	
P	0.48	0.50	0.46	0.46	0.43	0.46	0.48	0.48	
PER	25.40	21.80	24.20	22.40	19.90	19.10	21.05	17.60	
RAT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

OUTPUT DATA

TIME PERIOD

VARIABLE	1	2	3	4	5	6	7	8	9
T	1603.	1832.	2060.	2345.	2618.	2939.	3274.	3672.	4066.
D	1123.	1123.	1267.	1415.	1461.	1694.	1853.	2130.	2392.
TNW	480.	719.	793.	930.	1157.	1245.	1421.	1542.	1674.
CS	23.	24.	24.	25.	26.	26.	26.	26.	26.
ROX	0.08000	0.08051	0.07887	0.07720	0.07856	0.07677	0.07684	0.07517	0.07447
ROI	0.08411	0.06565	0.06520	0.09023	0.06215	0.07743	0.06144	0.06792	
DAD	1113.	1296.	1415.	1461.	1696.	1853.	2251.	2395.	
DAM	0.	144.	148.	46.	233.	159.	277.	262.	
S	719.	764.	930.	1157.	1243.	1421.	1421.	1671.	
SAM	177.	0.	62.	145.	0.	71.	0.	0.	
E	128.	147.	162.	181.	206.	226.	252.	276.	
EPS	5.58	6.08	6.70	7.35	8.06	8.84	9.70	10.64	
DPS	2.89	3.04	3.61	4.00	4.61	4.74	5.05	5.54	
PCS	141.62	132.55	162.10	164.60	160.41	168.90	204.20	187.29	
ARGEP	0.0	0.09055	0.10161	0.09700	0.09700	0.09700	0.09700	0.09700	

EXPLANATION OF VARIABLE NAMES

T=TOTAL ASSETS, D=LOSS RESERVES+UNRND PREM RES, TNW=POLICYHOLDERS SURPLUS, CS=COMMON STOCK, ROX=RETURN ON TOTAL ASSETS, R=EPS GROWTH RATE, DI=PORTFOLIO INVESTMENT, DD=(DESIRED LOSS RESRVS+UNRND PRM RESRVS)/TOTAL ASSETS, P=PERCENT OF EARNINGS RETAINED, PER=PRICE TO EARNINGS RATIO, RAT=AFTER TAX INTEREST RATE, DAD=DESIRED AMT OF LOSS RESRVS+UNRND PREM RES, DAM=AMT OF LOSS RESRVS+UNRND PREM RES ISSUED, S=DESIRED AMT OF NET WORTH, SAM=AMT OF COMMON STOCK ISSUED, E=NET COMMON STOCK EARNINGS, ARGEP=ACTUAL EPS GROWTH RATE.

share, (EPS × PER = 5.58 × 25.40). In year 1, 48 percent of EPS was retained (P).

5) The growth of EPS between year 1 and 2 was .0905 (ARGEP), which is less than the desired R of .097. The primary reason for ARGEP being less than R was the cost of using expensive equity financing. The return on the total assets

(ROX) did not produce the desired earnings because of these financing costs.

(6) Iterating through each year shows the overall random growth of new investment and the other variables. The new investment is generally financed by new debt (DAM) and retained earnings (S-SAM), except in years 1, 3, 4 and 6 when common stock (SAM) was sold. This lower cost financing through debt and retained earnings allows the firm to accept ROI on new investment (DI) that is lower than the return on the old assets (ROX). This occurs in all years except year 1 and 4 when large quantities of common stock were sold.

(7) This example shows the firm was able to achieve a 9.7 percent growth in EPS with relative ease. The primary reason for this accomplishment is the zero cost assigned to debt. If the cost of debt were to increase or if R was substantially greater than ROX, the ROI would have to be much higher in order to achieve the desired growth in EPS. Management must always determine if the new investments will produce returns greater than ROI throughout the planning period.

Figure 4 presents the means and standard deviations of the primary decision variables for each year. This output provides the decision maker information concerning the simulated results for each year and is most useful for sensitivity testing.

Several examples are cited to illustrate the use of the data in Figure 4 for management decision making purposes. The key decision variable ROI is presented in Figure 4. Management can easily determine the mean ROI's ranging from .055 to .097. A quick calculation reveals the mean of these eight values is .069, the mean ROI required to produce the desired growth rate of EPS. Also it is apparent the returns were relatively stable by observing the standard deviations for each year.

If management wished to determine the new debt issued in each year, it could study the row called DAM. For example, the 100 simulations of new debt issued in year 4 produced a mean of $149 and a standard deviation of $52. If management wished to observe the growth in net worth, it could study the rows S (surplus) and SAM (new common stock issued). The difference between these two variables is retained earnings, i.e., S-SAM = retained earnings. In this example net worth is a large number in each year.

Figure 4 also provides management with estimates of future EPS, DPS and price of the common stock (PCS) for the eight year planning period. For example, the price of the common stock in Figure 4 ranged from $121.18 in year 1 to $215.13 in year 8.

Figure 5 shows a cumulative distribution curve of ROI plotted from the 100 simulations that occurred in year 1. The vertical axis is the probability of ROI being achieved and the horizontal axis reflects ROI. For example, 95 percent of the time a return of .0674 will be required on new investment in order to achieve a .097 rate of growth of EPS for eight years. Moving down the cumulative distribution curve shows that 40 percent of the time a return of .0781 is required on new investment in order to achieve the 9.7 percent growth in EPS. A ROI frequency curve is presented for each year to provide management guidelines for analyzing the returns required on new investment and aid in evaluating the chances of achieving this goal.

Applications of the Model

The EPS growth model can be used in the financial decision-making of P&L companies in several ways. For example:

(1) To evaluate the combinations of new investments and existing assets

MEANS AND STANDARD DEVIATIONS OF OUTPUT VALUES OF ROX, ROI, DAD, DAM, S, SAM, EPS, DPS AND PCS
FOR 100 SIMULATIONS BY YEAR

YEAR	1	2	3	4	5	6	7	8
ROX MEAN	0.080	0.080	0.079	0.077	0.075	0.073	0.071	0.070
ROX SD	0.000	0.001	0.002	0.003	0.003	0.004	0.005	0.005
ROI MEAN	0.079	0.074	0.057	0.062	0.055	0.060	0.056	0.060
ROI SD	0.008	0.015	0.011	0.013	0.012	0.013	0.011	0.013
DAD MEAN	1102.	1233.	1394.	1552.	1758.	1953.	2192.	2432.
DAD SD	39.	42.	52.	66.	69.	80.	80.	93.
DAM MEAN	8.	88.	159.	149.	202.	190.	236.	230.
DAM SD	15.	38.	45.	52.	50.	60.	60.	66.
S MEAN	726.	819.	933.	1049.	1173.	1310.	1461.	1613.
S SD	38.	41.	51.	66.	68.	81.	81.	88.
SAM MEAN	186.	38.	40.	41.	37.	41.	45.	44.
SAM SD	39.	45.	47.	54.	52.	62.	59.	64.
EPS MEAN	5.576	5.950	6.537	7.084	7.676	8.320	9.018	9.775
EPS SD	0.034	0.102	0.145	0.228	0.327	0.441	0.573	0.723
DPS MEAN	2.962	3.152	3.506	3.728	4.096	4.397	4.798	5.232
DPS SD	0.120	0.160	0.143	0.199	0.252	0.285	0.310	0.403
PCS MEAN	121.185	131.055	141.995	157.122	166.318	185.667	198.666	215.139
PCS SD	11.822	13.627	14.718	16.319	17.266	20.864	20.434	26.193

Figure 4

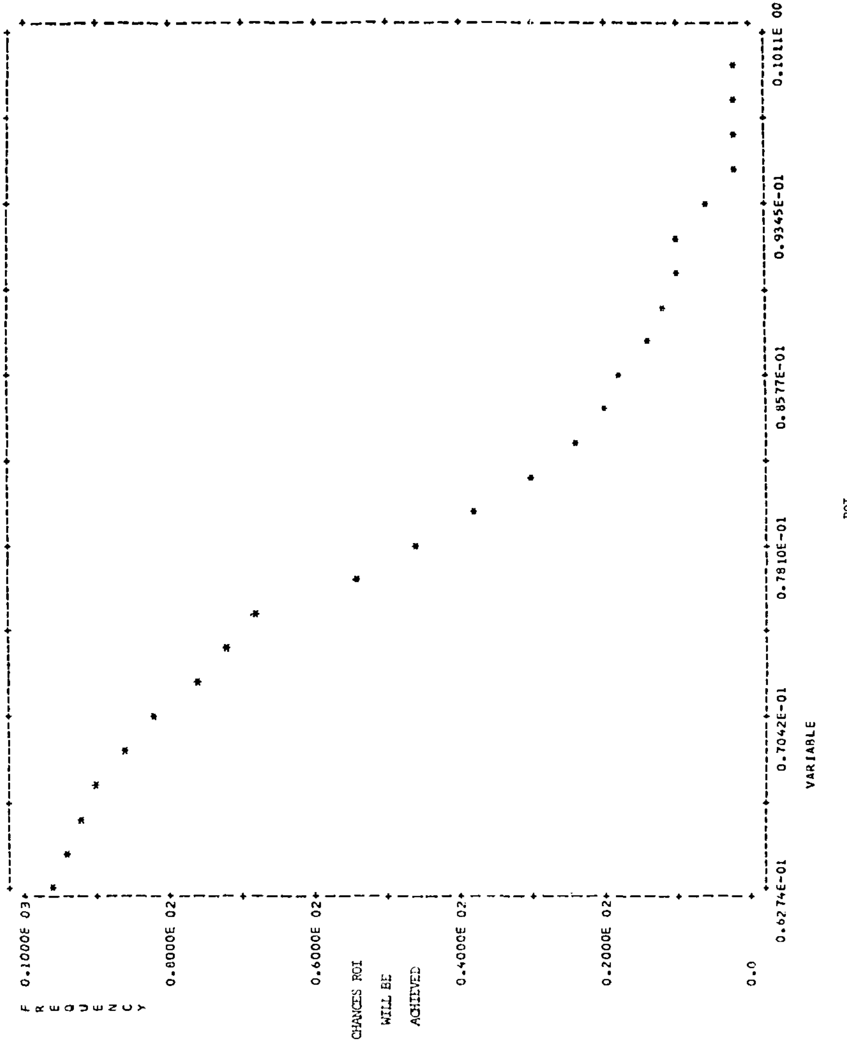
MEANS AND STANDARD DEVIATIONS OF OUTPUT VARIABLES FOR 8 YEARS

that will produce the desired growth rate of EPS for the planning period.

(2) To determine the level of insurance operation that will generate the debt required to finance new investments in order to attain management's desired EPS growth rate.

(3) To analyze the sensitivity of decision and state variables using various states of the economy and financial planning strategies. The sensitivity of the variables will depend on the values assigned to the parameters, i.e., it is not possible to generalize about the sensitivity of each variable.

Figure 5
ROI CUMULATIVE FREQUENCY CURVE
FOR YEAR 1



(4) To determine the probability of achieving the expected growth of EPS under different economic conditions and financial planning strategies.

(5) To understand the interrelationship among the variables and evaluate dependent and independent associations among variables and asset combinations.

(6) To analyze the dynamic process of corporate growth in each of the years in the planning period and determine potential financing or investment problems.

Conclusions

A picture of simulated future performance and growth is generated by the EPS growth model. Using management estimates the model provides decision makers probabilistic-oriented information for analyzing possible outcomes and for formulating judgments on proposed investments. The EPS growth model simulates values for the key decision variables in the investment-financing process. For example, the mean ROI a P&L company must obtain on new investment to achieve a desired growth rate of EPS; the relative amount of loss reserves and unearned premium reserves that must be generated to finance the assets which will produce the desired EPS growth objective; and the effect of investment and long-run financing plans on EPS, DPS and price of common stock.

Also, the EPS growth model can be useful in evaluating possible changes in a P&L company's financial condition, or changes in future market conditions. Hopefully, in the long-run, information of this type will improve the decision making process and the quality of management decisions.