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INVESTMENT POLICY IN A CHANGING ECONOMY

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1. Definition of Policy

   (a) Role of the actuary, plan sponsor, investment advisor
   (b) How is the liability structure recognized?

2. Trends and New Directions

   (a) Impact of ERISA on pension plans
   (b) Are there inflation hedges? Are they needed?

3. Life Company Equity Holding and Surplus

MR. DONALD D. CODY: The approach outlined in the following discussion note developed out of a dialogue between our investment officers and operating management in searching for a common stock policy which, on the one hand, would optimize long-range investment returns and, on the other hand, would be in keeping with the level of surplus needed to sustain corporate vitality. Common stocks are generally recognized as having greater long-range investment return than bonds, provided they are purchased at proper times and provided they are sold only at a time of the company's own choosing, without compulsion to meet liquidity needs or to protect a minimum surplus position. Additionally, their marketability makes them readily available for liquidity needs.

Discussion Note -

COMMON STOCK POLICY RELATED TO COMPANY STATUTORY SURPLUS

There appears to be a high probability of extremely variable stock markets in the foreseeable future as a result of inflation, reactive monetary and fiscal controls, and an uncertain economic environment. Events of the past few years have underlined the sensitivity of company surplus to market values of common stocks. For several years I have worked over a rational framework for relating buy, hold, and sell common stock policy to surplus objectives of a life insurance company. Such policy must call on scenario building, using relationship of stock markets and their variations to the economic environment and the company's toleration of downside surplus variation. Precise definition of policy is impossible, but a structure for rational action does appear feasible.

Appropriateness of Common Stocks

Common stocks are generally recognized as having greater long-range investment return than bonds, provided they are purchased at proper times and provided they are sold entirely at a time of the company's choosing without compulsion to meet liquidity needs or to protect a minimum surplus position. Investment returns on stocks consist of a low return in dividends plus value appreciation. Common stocks should not be purchased indefinitely in a rising market because as expected appreciation is realized they become an excessive percentage of surplus and in all probability will be sold at least in degree in a falling market.

The rational structure to be developed apparently leads to buying in a falling market and selling in a rising market, which historically differs in some degree from actual stock policy.

It should be noted that common and preferred stocks have utility beyond considerations of investment return. For instance, their marketability makes them readily available for liquidity needs, standing in preference priority behind cash, short terms, adjustment of commitment schedules, bank loans, and public bonds.

Value of Common Stocks versus Bonds

Common stocks should be bought and held only when they have potential investment return superior to yield on bonds, including risk recognition. Investment analysts measure this superiority in various ways, a common approach being the present value of dividend flow, such as the following:

n = period of years used for evaluation

j = current long-term government bond yield plus risk factor for common stocks (e.g., 8.5% + 3.5%)

g = GNP gorwth rate in current dollars over n years (e.g., 8%, composed of 4% real GNP + 4% inflation) = rate of growth in corporate earnings

P = Breakeven common stock price index

P_c = Current common stock price index (e.g., Standard and Poor's Composite)

E_c = Current earnings on price index

D_c = Current dividends on price index

$\frac{P_c}{E_c}$ = Price-earnings ratio on price index

$\frac{P}{E_c}$ = Breakeven earnings ratio

$\frac{D_c}{E_c}$ = Dividend ratio (e.g., 45%)

Then, for breakeven with bonds:

$$P = P\,\frac{(1+g)^n}{(1+j)^n} + D_c\left[\frac{1+g}{1+j} + \left(\frac{1+g}{1+j}\right)^2 + \cdots + \left(\frac{1+g}{1+j}\right)^n\right]$$

If $v = \frac{1+g}{1+j}$

$$P = Pv^n + D_c\,(1+g)\,\frac{1-v^n}{j-g}$$

so that

$$\frac{P}{E_c} = \frac{D_c}{E_c}\cdot\frac{1+g}{j-g} \qquad (1)$$

If $\frac{D_c}{E_c} = 45\%$, $j = 12\%$, and $g = 8\%$, then $\frac{P}{E_c} = .45 \cdot \frac{1.08}{.12-.08} = 12.2$

The judgment on the values illustrated is that where P_c/E_c is below 12.2, stocks are superior to bonds in potential long-range return. Additionally, Federal Income Tax effects enhance the attractiveness of stocks to life insurance companies in most situations.

Different economists will assign different values to j, g, and D_c/E_c according to their econometric expectations. Breakeven estimates, therefore, are usually expressed as a range by investment managers. The rationalizations to follow will assume that breakeven judgments as to buy, hold, or sell are considerations which override buy and hold actions indicated by surplus considerations but do not override sell actions indicated by surplus considerations.

Common Stock Policy Indicated by Surplus Size

The rational framework to be used assumes that the company has statutory surplus objectives involving corporate long-range projections of net income based on a range of economic scenarios including plans for policyholder dividend scales, products, markets, systems, and the like, and reflecting insurance and investment risk needs.

Let $s = S/A$ = ratio of surplus to assets, and $X = M/S$ = ratio of market value of common stocks to surplus; where S = statutory surplus (including MSVR)
A = admitted assets
M = market value of common stocks

Also let

m = estimated maximum percentage fall in stock market at P_c/E_c (See Table 1 for a definition selected for illustration)

s_o = minimum acceptable level of s in corporate surplus policy

The corporate policy for s_o can take many forms; the formula used here establishes s_o as a function of s:

$$s_o = .8s \qquad \text{and} \qquad s \not< 5\% \tag{2}$$

In practice, there ought to be a further restriction on maximum surplus, excluding MSVR. The maximum acceptable value of $X = X_o$ to assure the s_o requirement is as follows:

$$S - X_o mS = s_o A$$

so that

$$X_o = \left(1 - \frac{s_o}{s}\right)\frac{1}{m} \tag{3}$$

where m is defined in Table 1 for illustration together with corresponding values of X_o consistent with (2).

The estimated maximum fall in stock market values (m) for the current P_c/E_c is an imperfect index since the market moves irregularly in the short run relative to P_c/E_c. Also, for a particular level of P_c/E_c, m probably should also be a function of other variables, such as current bond yields. However, there appears to be rough correlation in the long run and (3) has rationality as a guideline. If use of P_c/E_c is contrary to the instincts of company investment analysts, some other definition of m of their choosing can be used (e.g., a flat 50%, or a variable between 25% and 50% related to downside market fall possible in the next few years or so based on a pessimistic though rational economic view).

Table 1

Illustrative Values of X_o

$\frac{P_c}{E_c}$	m	s = 4%	s = 4.5%	s = 5% and over
Below 8	.250	0%	44%	80%
8	.275	0	40	73
9	.300	0	37	67
10	.325	0	34	62
11	.350	0	32	57
12	.375	0	30	53
13	.400	0	28	50
14	.425	0	26	47
15	.450	0	25	44
16	.475	0	23	42
Over 16	.500	0	22	40

It is evident that, on these criteria, a company with a surplus ratio of 4% or so could hold little, if any, common stock.

Net Hold, Buy, and Sell Policy

The net hold, buy, and sell policy may be defined as follows in this rational framework, where X_1 is appropriately chosen, $X_1 < X_0$:

$X > X_0$	Sell net to make $X = X_0$
$X_1 \leq X \leq X_0$	No net buying or selling
$X < X_1$	Buy net to make $X = X_1$

It is evident that the size of $X_0 - X_1$ must be chosen by scenario testing to produce appropriate results. Evidently, if $X_1 = X_0$ there is no purpose in holding stocks at all since realized and unrealized capital gains and losses would be so small that the investment return would be close to the dividend rate. On the other hand, if $X_0 - X_1$ is large, the stock policy would be essentially a net hold policy. For each realistic econometric scenario there appears to be at least one optimal value of X_0. For illustration, suppose

$$X_1 = (X_0 - 15)\% \tag{4}$$

with the following scenario:

Assumptions of Scenario

(a) P_c/E_c is the basic scenario assumption.

(b) The stock market moves relative to P_c/E_c with additional growth of 5% with increasing P_c/E_c and 2.5% with decreasing or constant P_c/E_c.

(There is no intention here to indicate that this relationship is typical econometrically.)

(c) Assets grow at 4%.

(d) Surplus grows annually by common stock appreciation plus net income after dividends (and other surplus changes) equal to $10 million to $15 million as shown in Table 2.

Outline of Net Buy, Hold, and Sell Actions

Table 2 shows the actions resulting from application of relationships (2), (3), and (4) to the above scenario, assuming for simplicity that actions occur at year-end.

Table 2

Illustration of Rule in Action
($ figures in millions)

End of Year	P_c/E_c	Dow	A	Δ S Before Stocks	S	M	s	X_o	X_1	X	Adjusted M	Adjusted X	Action
0	10	800	$3000	$ -	$165	$102	5.5%	62%	47%	62%	$102	62%	Hold
1	11	925	3120	10	191	118	6.1	57	42	62	109	57	Sell $9
2	12	1060	3245	11	218	125	6.7	53	38	57	115	53	Sell $10
3	14	1295	3375	11	254	140	7.5	47	32	55	119	47	Sell $21
4	16	1555	3510	12	290	143	8.3	42	27	49	122	42	Sell $21
5	14	1395	3650	12	289	109	7.9	47	32	38	109	38	Hold
6	12	1225	3795	13	289	96	7.6	53	38	33	110	38	Buy $14
7	11	1150	3950	13	295	103	7.5	57	42	35	124	42	Buy $21
8	10	1075	4105	14	301	116	7.3	62	47	39	141	47	Buy $25
9	10	1100	4270	14	318	144	7.4	62	47	45	149	47	Buy $5
10	11	1270	4440	15	356	172	8.0	53	38	48	172	48	Hold

If $102 millions of stock were held through this period with no net buying or selling, at the end of ten years the stock would be worth $162 million, equivalent to 4.7% appreciation per year. With the above actions of Table 2, the original $102 million is worth $172 million in stock plus $7 million in net sales and excess interest (at 3.5% after F.I.T.) on net sales, for a total value of $179 million, equivalent to 5.8% appreciation per year.

Obviously, other rules and other action sequences could give better or worse results and each company must necessarily develop its own strategy. In any event, some policy for common stocks, reflecting the joint planning of financial officers, investment officers, and insurance operations officers, is necessary to provide optimum investment return from common stocks consistent with protection of surplus in recurrent bear markets. In summary, the rational framework suggested indicates the following actions as to net buying, holding, and selling of common stocks:

1. Buy net, subject to value of stocks relative to bonds, where $X < X_1$, so that X becomes equal to X_1

2. Sell net where $X > X_0$, so that X becomes equal to X_0

3. Hold net, subject to value of stocks relative to bonds, where $X_1 \leq X \leq X_0$

Action 1 will generally occur in falling markets while Action 2 will generally occur in rising markets.

The intent here is to show that a rational structure appears feasible for relating common stock policy firmly to corporate surplus policy. The relationships (1) to (4) are deliberately simplified to enable easy illustration. If such a structure for policy making is adopted, each company must necessarily develop their own relationships based on their goals and views of the future. Also, specific formulation for month-to-month action plans in the real investment world must be developed.

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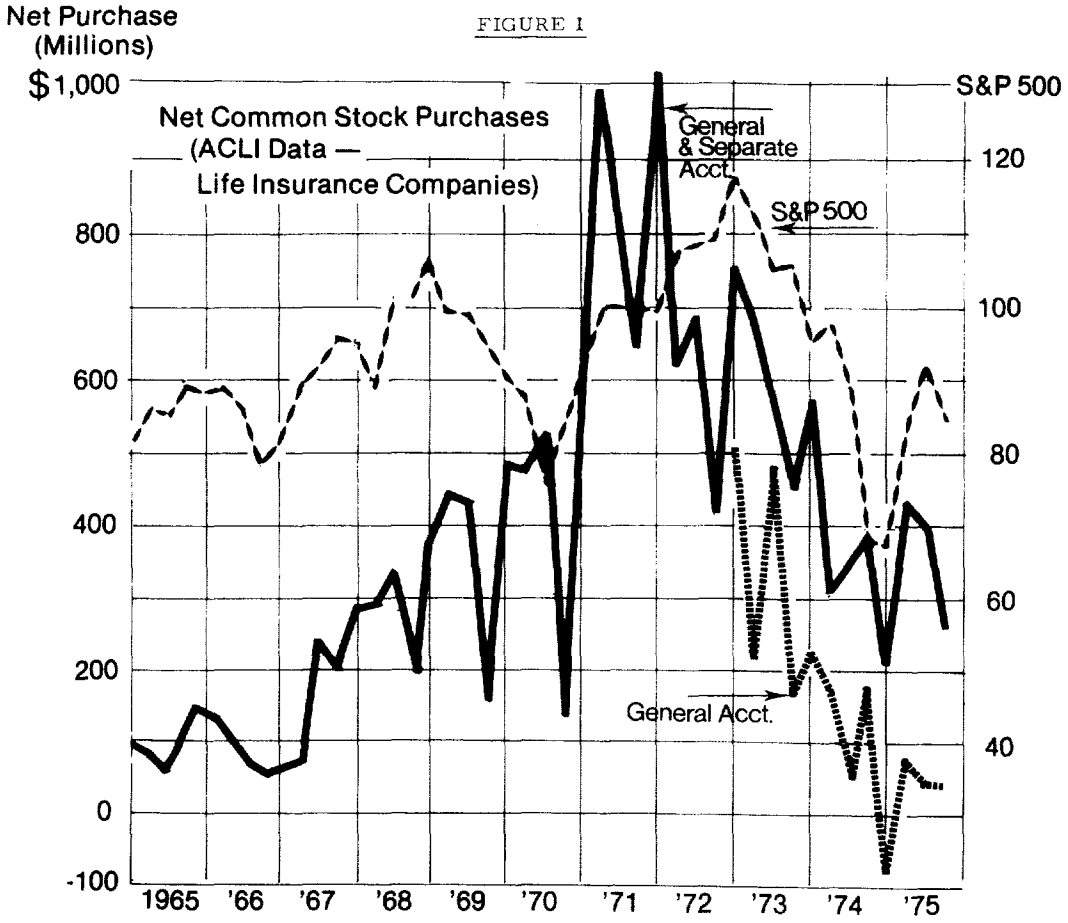
Figure 1 provides industry data available from published Institute of Life Insurance statistics, which do not distinguish General Account from Separate Account activity in 1972 and earlier. Analysis of earlier data does, however, permit estimation of a breakdown of General Account and Separate Account data for the earlier period. It appears that net purchases for the General Account over the whole 1965-1975 period follow a dollar cost averaging pattern, except that in bear markets net purchases fall off, sometimes sharply, and in bull markets net purchases increase, sometimes sharply. This pattern persists even after indexing for market values and for a scale factor.

One concludes that the industry sometimes handles common stocks in the General Account like a trading account, without the facility of short sales and buying on margin usually associated with a trading account. A purpose of the suggested rational structure is to preserve the investment nature of the General Account common stock portfolio and to avoid the historical tendency to change its nature to a trading posture in long or sharp bear and bull markets to the detriment of corporate surplus and long-range investment return.

The rational structure suggested by the discussion note involves a "ruin theory" approach which establishes a maximum downside loss of surplus in a possible bear market fall.

FIGURE I


Net Purchase
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Net Common Stock Purchases
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MR. WILLIAM A. DREHER: To what extent have you examined the impact of an options selling strategy upon surplus objectives and maximum permissible equity holding ratios?

MR. CODY: Our investment people have not yet begun to use options, and I cannot give you the answer. It might very well affect this theory. It also might result in a decision not to hold stocks in your general account because, obviously, using options on a protective basis will cut into your investment return.

MR. IRWIN T. VANDERHOOF: Where did you get that nice table of m's? If I were really sure that a maximum 25% of loss is the worst that could happen to me under some circumstances, I would feel greatly comforted.

MR. CODY: This was more of an observation than a statistical research job. I did notice that, in the short run, one sometimes observes an opposite action. In the long run, I think that it appeared sound. Our economists did point out that probably the function differs, depending upon the going level of bond ratio and bond yields. In other words, in a time like the great depression, it would be a very different function. I am not selling this particular relationship. The very effect of establishing this kind of structure will cause you to watch the relationship of your common stocks to your surplus and make your investment management aware of a ruin theory result.

MR. CHARLES L. TROWBRIDGE: I am very interested in this particular solution to the general problem of trying to stay in the common stock market without too much accounting risk to your surplus. My company has been using a different approach to it lately. We have been doing a lot of our equity investing by buying convertible preferred stock and convertible bonds. This has the effect of leaving you on part of the equity risk, and at the same time getting off the accounting risk because convertible bonds and convertible preferred stock generally do not have to be valued at market. Does anyone want to comment on whether that is an effective way to do some of the same thing?

MR. ALLAN B. ROBY: I would just comment that it may not be an effective strategy for long. There is a lot of pressure to force life companies to value these assets at market.

MR. MALCOLM R. REYNOLDS: I presume when you are talking about the surplus position to which you would relate your equity holdings, you meant surplus in the broad sense. It seems to me that what might happen to a company would be that in times of declining stock values, surplus in the broad sense is also declining, thereby forcing you out of stocks using your formula and having the reverse effect of what you are hoping to do, i.e., to buy when the market is low and sell when it is high.

MR. CODY: Yes, you are quite right. With these particular equations you get into a catastrophe situation when your surplus really falls off. If you are using this in the long run, you do not get yourself into that except under extreme catastrophe conditions. We have not allowed for more than a 50% fall in the market, and that is about the amount of the fall in the recent episode. There is a lot more work that has to be done on this. To be more specific, in my example I used statutory surplus plus MSVR and I have not extended it to GAAP thinking. It seems to me the statutory position is paramount because of its direct impact on the basic business of the company.

MR. ROBY: What was the reaction of your investment people when you developed this method? Have they bought it, and are they using it?

MR. CODY: That is a very interesting question. They have bought the approach. We are in the process of developing a formulated surplus policy which will consist of 15 or 16 different items and something like this will be one of them. What our investment people say is that they do not like to be forced. They certainly have not bought this as a law; however, I think they have bought it as a concept. Once it is bought as a concept, it automatically works, whether it is a law or not. I think the great problem is that the advice you get on the purchase of stocks comes from people who are normally giving advice on funds without liquidity requirements and without corporate constraints and you must have this kind of consideration before you at all times.

MR. DREHER: It may be helpful to identify the relationships between the various parties-at-interest in a pension plan because those relationships have had a powerful impact upon the proper organization of the planning process and on the conclusions reached. ERISA requires that a plan sponsor and all other fiduciaries and parties-at-interest act in the sole interest of plan participants and beneficiaries. The plan sponsor, which ultimately means the board of directors, has primary responsibility for choosing investment policies and the actuarial basis which will determine the measurement of a plan's liabilities and current pension costs. These decisions require an integration of investment and actuarial planning. The actuarial basis must anticipate long-term events affecting our plans, including the probable results from the investment policy. The investment policy must take into account the plan's actuarial basis, since the actuary's forecasts influence the company's contributions, projected benefit payments out of the pension fund, and the plan's long-term investment requirements. All of these planning and operational decisions require forecasts of the future economic environment and must satisfy legal and accounting requirements.

An important point to recognize is that the pension fund exists in the same economic universe as the sponsoring corporation. Corporate financial planning decisions, for example, assumptions about the cost of capital, the acceptable return on our investments, and similar decisions being made by other corporations, will ultimately affect the growth of national and individual pension fund assets, since U.S. pension funds collectively own a majority of all corporate bonds and about 15% of U.S. common stocks. This emphasizes the importance of having consistent economic and financial assumptions in examining both the asset and liability aspects of the pension fund balance sheet. It is also necessary to take a dynamic view of the future and to recognize that work forces will change, either through the growth or restructuring of the sponsor's business, and that benefit plan provisions will be modified in the future as a result of collective bargaining or management's unilateral actions.

The objectives of an ideal pension fund investment policy might be characterized as:

Maximize the security of employee pension expectations.

Maximize long-term total investment performance.

Maximize short-term variability: in market values and investment performance.

Minimize long-term pension costs.

Minimize variations in year-to-year pension expense and funding.

Discharge ERISA's fiduciary standards and diversification requirements.

Satisfy common sense and be comfortably acceptable to management and the Board of Directors.

Obviously, the idealized criteria identified above are not internally consistent. To cite only a few examples:

A short-term focus on employee security might suggest a major concentration in fixed-income investments, but this policy could deprive the fund of future investment opportunities through common stock growth and, ultimately, have an adverse impact on employees if it impaired the sponsor's ability to finance future cost-of-living increases or other plan improvements without increasing percent-of-payroll pension costs.

Optimizing long-term investment performance requires a willingness to take investment risk, and, therefore, accept a greater degree of short-term variability in market values. This result could lead to greater year-to-year fluctuations in pension costs, even though the long-term trend shows those costs declining.

Clearly, the object should be to select an investment policy which optimizes the achievement of all these theoretical objectives. It is equally evident that there is no single solution and that any decisions taken today must be regularly reviewed to determine their continued suitability. Policy changes that reflect changing circumstances or new insights are to be expected.

A recognition of an obligation to act in the interest of plan participants might seem at first to require an extremely conservative investment policy, but it must be borne in mind that a pension plan is a long-term financial institution capable of absorbing the volatility inherent in common stock investments and that favorable long-term investment performance will increase the sponsor's ability to fund future plan improvements, thus benefiting employees. Furthermore, the existence under ERISA of the Pension Benefit Guaranty Corporation provides for the first time a federal guarantee that a plan's benefit obligations will ultimately be satisfied, even if the sponsor's fortunes decline and the plan is ultimately terminated. Other important considerations are:

1. Expected annual contributions should be compared with projected annual benefit payments to determine future liquidity requirements.

2. ERISA now requires that the market value of common stocks, subject to suitable averaging, be reflected in annual pension costs and trust fund contributions.

3. The volatility of common stock values has been approximately three times greater than the comparable variability of fixed-income securities.

4. Good-quality corporate bonds are now yielding around 8½% to 9%.

For many years, the typical pension fund's investment policy has been equity-oriented without specific limitations. This equity-oriented policy through 1972 was serving well and, in fact, may be the policy which, if continued over time, would produce the highest total return on pension fund assets. However, the experiences of 1973 and 1974, when the Standard and Poor's 500 Stock Index fell 45% and the typical pension fund's equity portfolio did even worse, raise fundamental questions about the unmodified continuation of such policies.

In making long-range planning decisions, it is important to avoid overemphasizing the recent past, whether it has been favorable or unfavorable. A review of the last decade's investment performance shows that investment results were disappointing for all investors. Not only were absolute rates of return low, but equity investors received little or no premium over the rate of return provided by long-term bonds. Furthermore, the rate of inflation exceeded the gross rate of return on both bonds and stocks, resulting in negative real rates of return. A continuation of this experience would destroy our nation's capital structure and is not a credible reference point for determining future investment policy. If the future were to duplicate that decade ending in 1974, we could only predict one conclusion: our economy would collapse and neither our pension funds nor our corporations would survive. If the lessons of history are any guide to the future, it would appear that the 1973-1975 investment experience is an event that occurs only once in 40 or 50 years. This interpretation is consistent with the conclusions of economic historians who have studied long-term economic cycles and identified a recurring pattern of interest rate and commodity price cycles lasting 45 to 55 years.

Assuming the continued strength of our nation and the ability of the U.S.A. economy to produce goods and services at a reasonable profit and to assure capital formation in amounts necessary to sustain this economic growth, future investment results will give investors a positive real rate of return. Inflation will still be with us, but the bond investor will have a total investment return, including coupons and changes in capital value, that exceeds the rate of inflation, on average and over the long term, by 2% to 3%. Common stock investors, also over the longer term, will receive a total investment return that exceeds the bond investor's return by 3% to 5%. This equity risk premium will be a compensation for the greater volatility of common stock market values and a recognition of its corollary: over shorter time periods, which can extend for several years, equity returns may fall significantly below bond returns. The history of our financial markets supports these long-range relationships between inflation, the returns on bonds, and the returns on stocks. Looking at the last 56 years, we see that the inflation rate averaged 1.9% and the total return on bonds was 3.7% per year, thus producing a real rate of return of 1.8%. The common stocks, as measured by the Standard and Poor's 500 Stock Index, produced a total return, including capital appreciation and dividends, of 8.7% over the same period. This gave investors a real rate of return of 6.8% and an equity risk premium of 5.0%.

After examining past data and assessing them in the light of ERISA's requirements and the uncertainties associated with any forecast of the future economic and investment environment, I suggest four concepts for your consideration:

1. Prudent investment behavior argues against extreme actions, including, for example, the avoidance of both excessive risk-taking in the investment policy and excessive conservatism in that policy.

2. Different types and styles of investment management, both equity and fixed income, can be evaluated and selected to participate in the pension management structure.

3. The plan sponsor should structure its relationships with investment managers so as to effectively delegate investment responsibility, thereby (a) providing some degree of protection for the Board of Directors and the corporate officers responsible for pension matters, and (b) assuring a full and proper delegation of investment responsibility to qualified investment managers.

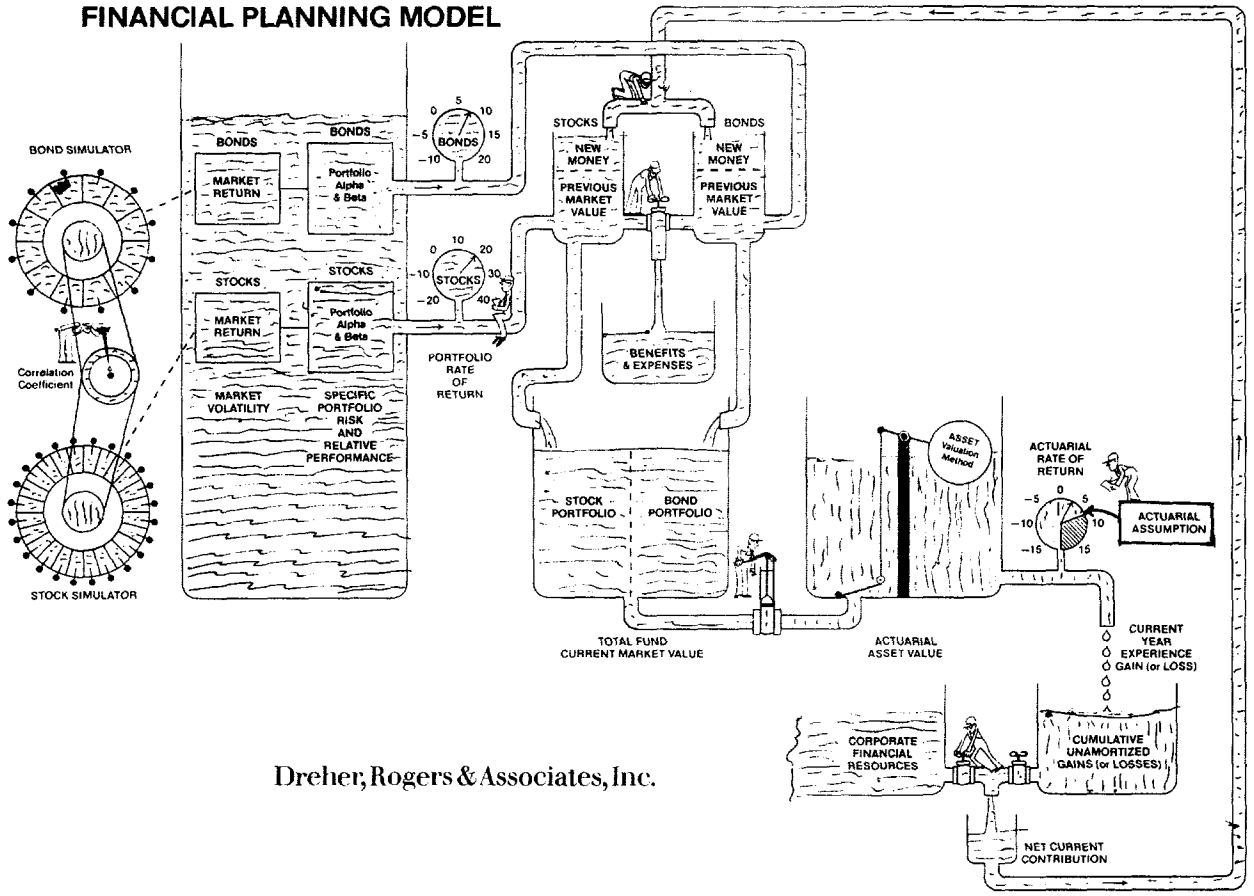
4. An emphasis on flexibility, including a regular review of investment policy judgments, will help reduce the risk of assuming that today's conditions will persist indefinitely, since one of the major lessons of history is that today's certainty can become tomorrow's failure.

Our firm's pension planning activities find their mathematical reflection in a series of simulations of the future growth of a client's pension fund under a variety of assumptions about the future investment environment and the translation of investment results into adjustments to pension costs. The financial planning model is illustrated in Figure 2.

The model simulates the short-term investment performance in both the bond and stock markets, taking into account both the expected performance on bonds and stocks as well as the volatility of short-term investment performance. These forecasts of the market rate of return on different classes of assets were adjusted to reflect the particular characteristics of the portfolio and the expenses of security transactions and fees for investment. The resultant portfolio rates of return were used to derive the year-to-year growth of the pension fund taking into account the previous market value of the bond and stock portfolios, the amounts of money being added to each portfolio as a result of company contributions and the disbursements to cover benefit payments and expenses. The resulting pension fund market value was then translated into an actuarial asset value, using one of many asset valuation methods to smooth out the peaks and valleys in the year-to-year market value of the portfolio. The actuarial asset value was then compared with the expected return on the portfolio, as defined by the investment return assumption, to identify each year's experience gain or loss. A fraction of the accumulated gains and losses adjust the basic contributions derived from the plan's actuarial basis to produce a net annual contribution into the fund. It is important to recognize that a forecasting model is only as valuable as the assumptions which are built into the exercise and the thoughtfulness with which results are interpreted.

PENSION FUND

FINANCIAL PLANNING MODEL



Dreher, Rogers & Associates, Inc.

In choosing assumptions for the simulations, we not only study past performance, but seek out the current opinions of investment managers and professional economists. In a series of interviews, we gather opinions about short- and long-term expectations for rates of return in the bond and stock markets. In late 1975 and early 1976, long-range estimates, which presumed an inflation rate of 4% to 6%, indicate that total annual return on stocks may fall in the range of 10% to 15% and on bonds, in the range of 7% to 9%. The shorter-term situation indicates prospects for somewhat higher total returns on both classes of assets, 13-15% and 8-9%, respectively. To illustrate the use of our financial planning model, we ran a series of simulations based upon a total return expectation of 10% for stocks and 7% for bonds. This particular simulation was the median simulation, i.e., half of the simulations produced a higher 20-year total investment performance and half produced a lower 20-year total investment performance. The amount of contribution during the 20 years totaled $720 million. (The pension costs were actually computed as a percent of payroll and the dollar amount of pension cost may be expected to rise over time as payrolls increase.) For the sake of simplicity, we have characterized the results of this simulation as producing an average annual cost of $36 million. The first major point to be noted is that market fluctuations, even after being smoothed by means of a five-year trailing average technique, are very likely to result in pension costs that do not remain absolutely stable as a percent of payroll. To illustrate the impact of using the five-year trailing average technique, the pension cost that would result if the market value of the fund was used as the actuarial asset value would be considerably more variable. However, it should also be noted that the actual dollars contributed over the 20 years would, on average, be lower - that is, $33 million per year rather than $36 million per year. Thus, we see one example of the trade-offs represented by the choice of an actuarial basis: in order to have a smoother pattern of annual costs, one must be willing to accept the other side of that coin - namely, the plan sponsor probably will be putting a larger total number of dollars into the pension fund.

The previous examples illustrated pension costs on the assumption that investment results for the next 20 years fall in the middle of the expected range. Based upon the past volatility of the stock and bond markets, there is one chance in ten that the 20-year investment performance emerging from an investment policy with a 75% commitment to stocks will be 6.4% or lower. The simulations indicate that the sponsor's pension costs would rise from an average of $36 million per year to $48 million per year or higher if that were to occur. In other words, there's one chance in ten that contributions may be a third or more larger than anticipated. In response to that risk, one naturally thinks of shifting investment policy toward a greater emphasis on bonds. A defensive investment policy, in the long run, is no protection against unsatisfactory performance in the capital markets. If the portfolio included only 25% in stocks, the expected investment return would be lower. This would increase contributions to an average of $42 million over the next 20 years, $6 million a year (or about 1/6th) above the contributions under a 75% stock policy. Furthermore, if performance is sour, contributions will increase, although by not quite so much. Nevertheless, there would be one chance in ten that contributions would average $51 million per year or more over the next 20 years. This would represent an increase of $9 million per year or about 20% over the expected contributions associated with a 25% stock investment policy. We thus conclude that there is an advantage, albeit a small one, in having an emphasis on

stocks, even if the 20-year record is unsatisfactory. Another conclusion to be drawn from this analysis is that pension costs are going to be essentially the same if long-term investment performance is unsatisfactory, regardless of the investment policy followed.

Having identified a marginal advantage through a heavy stock investment policy under conditions of unsatisfactory investment performance, examine for a moment the opportunity for a material reduction in costs if investment performance is above expectations. Our simulations indicate that there is one chance in ten that 20-year average pension costs will be $16 million or lower. This $20 million drop represents a 55% reduction from the expected pension costs. Let me illustrate now the impact of favorable performance with a more defensive policy. If only 25% of the portfolio is invested in stocks, there is one chance in ten that the average contributions over the next 20 years will be $31 million or lower. This $11 million reduction would represent 25% of the expected contributions and is about equal to the increase in average contributions that will occur if investment results fall to the 10th percentile on the down side. If actual results fall at the median, a major commitment to common stocks cause costs to average $6 million lower. If long-term investment performance is unsatisfactory, this difference narrows, but still favors the heavy common stock commitment. If investment results are particularly good, and resemble the conditions from 1949 through 1968, pension costs will be $15 million per year lower if an average of 75% of the portfolio is committed to common stocks.

I want to close with two notes of caution:

1. The conclusions reached depend enormously on the underlying capital market assumptions and it is important to test alternative scenarios, keeping well in mind the potential for significant adverse developments in today's complex and uncertain world.

2. Even after the basic asset mix is selected, investment managers should be given discretion to change portfolio composition in response to their judgments about the short-term relative attractiveness of different classes of assets, since short-term rates of return may vary significantly from those expected under longer-term equilibrium conditions.

MR. BARNET N. BERIN: I would like to suggest that the problem is even more complicated than Mr. Dreher has described, and I think he is well aware of this. We saw the asset side simulated, we did not see the array of possible results, we saw the median results and we saw a comment or two about more favorable results than a median. I would be more interested in seeing the less favorable results and the array. But even more important, a whole other aspect was omitted, and that is the liability side. For example, the benefit formula is clearly variable in time, the choice of the funding method depends upon the financial forecast, and the treatment of deviations is important. All of these suggest that the liability side too can be simulated and you end up with a frequency distribution or hundreds of simulations on the liability side and hundreds on the asset side, each of which interrelate. Consider one particular liability assumption generating a gain or a loss, in turn affecting the contribution on the asset side, which then should be plugged into the simulation. The relevant point is that if someone wants this kind of a study he has to realize that there's another side of the equation, a very formidable side, and that the results are very complex and very numerous.

MR. DREHER: That's a sound point. There's a very real constraint not just in time and money, but in the consultant's ability and the client's ability to absorb variations. One is constantly making practical judgments as to how much sophistication and what number of dimensions one explores. The particular pattern of numbers we have been using did look at both the favorable and unfavorable cases. The underlying actuarial basis for this particular plan did include estimates as to the long-range impact of collective bargaining on future plan amendments and it did take into account some of the dynamics of the work force. In order to add this dimension of uncertainty in its fullest theoretical sense and the impact on contributions of short-term events, not just in the investment markets, but with respect to other assumptions, one would have to simulate variable patterns of future salary changes and their impact on the liability. We have had to make simplifying assumptions but they are a function in part of the limitations of data and the limitations of mind, capacity, and patience.

MR. ROBY: I agree with Mr. Berin that liability management is really the key problem. The investment decision depends so heavily on the liability structure that it is very easy to lose sight of the major game you are playing. In a way this implies full projection methods as being the only appropriate methods for pension plans. And, I understand, they are not allowed by the IRS, so we have a bit of a dilemma.

MR. IRWIN T. VANDERHOOF: I'm going to talk about assets in terms of the factors which create inflation and the effect inflation has on interest rates and common stocks. Inflation and common stock management are the most pressing problems of asset management right now, and we need to know somewhat more about them.

The first question is: What causes inflation? I have some material that has not been published yet which essentially examines inflation in about nine countries, including the United States. It is a very simple relationship we are testing: the money supply, divided by the real gross national product, is compared to the rate of inflation. In the United States, this simple relationship explains about 99% of the inflation that has occurred over the last fifteen years, on an annual basis. From that we can learn that inflation is created or abetted by governments. It does not occur because of actions of Arabs alone; it does not occur because of actions of greedy corporations or unions; it is something that the government creates. Since the government creates it, prediction of the levels of inflation over the long term is not possible. Inflation in 1977 will be determined largely by the actions of the federal reserve and the federal government in the late part of 1976 and during the year 1977, and it can be 20% or 2%, depending upon those actions. Now, if that is true of inflation, then we have a problem as to the effect on interest rates.

Table 3 shows the effects of inflation on interest rates for a variety of countries. You can see the R^2's, which essentially say that in all of those countries at least 75% of the changes in interest rates are explainable in terms of a lagged series of inflation rates. In the case of the United States, one can see that 99.2% of the changes in interest rates over a 15-year period are explained simply in terms of varying inflation in periods prior to the period for which the interest rate is examined. This means the government controls inflation, and inflation is the prime determinant of interest rates.

Table 3

Test of $(CPI_2)/(CPI_1) = (M_2T_2)/(M_1/T_1)$ period 1959-1973

Country	Portion of Change in Left Term Explained by Right Term	Significance Measure	Autocorrelation Measure
	R^2	F	D - W
Belgium	93.34%	238	1.1
Canada	92.03	196	1.0
France	84.26	91	0.3
Germany	96.93	537	1.4
Italy	94.81	238	0.3
Japan	97.53	631	0.9
Netherlands	96.54	474	1.1
Switzerland	95.40	353	1.3
United Kingdom	74.76	50	0.4
United States of America	99.22	2047	1.6

Table 4

Regressions with 15 Observations from 1959-1973
(t- Statistic in Parentheses)

ANNUAL DATA

Type of Security	R^2 Unadjusted	R^2 Adjusted	Coefficients PCDIFF (t)	Coefficients Constant	Durbin Watson	F Value
3 Mos. Treas. Bills (U.S. Govt.)	89.18%	88.35%	73.423 (t = 10.4)	2.2031 (t = 9.0)	1.12	107.14
3-5 Yr. Issues (U.S. Govt.)	94.48%	94.06%	66.183 (t = 14.9)	3.1363 (t = 20.5)	2.02	222.57
Taxable Bonds 10-Year Call (U.S. Govt.)	94.88%	94.48%	49.879 (t = 15.5)	3.4370 (t = 31.1)	1.92	240.69
Prime Commercial Paper 4-6 Mos.	91.33%	90.67%	85.654 (t = 11.7)	2.5607 (t = 10.2)	1.37	137.01
Moody's AAA Bonds	87.68%	86.73%	70.959 (t = 1.48)	3.5593 (t = 14.0)	1.48	92.51

Table 4 is for the United States only. It shows the effects of inflation on a variety of interest rates for various types of securities. One can see that for treasury bills 90%, and for 3-5-year government issues 95%, of the change in interest rates is directly caused by inflation. This differs from Figure 3 in that this chart relates inflation in the current period to interest rates in the current period. It is saying two things: 1) inflation controls interest rates; and 2) the public is able to make an unbiased, reasonably correct assessment of the ongoing inflation and reflect them directly into the interest rates existing at the same period. That means one does not need to worry about the past five years' inflation, that interest rates and inflation are essentially concurrent. It means the investing public is correctly assessing the current level of inflation and requiring that something like that level of inflation be put directly into the yields on fixed-dollar securities. Therefore, inflation goes directly into interest rates and moves along with it on a rather prompt basis.

The next question is: How does inflation affect common stocks? We are still going through a period when people are talking about common stocks as inflation hedges. Table 5 is taken from a paper in the Financial Analysts Journal called "Inflation, Inflation Hedges and Common Stocks," in May-June of 1970. This is an examination of the performance of various common stock averages during various inflationary periods that occurred between 1937 and 1970. One can see in the lower right-hand corner, the real return in excess of normal on common stocks during the sum of all those inflationary periods. Essentially, during inflationary periods one is having a negative return on common stocks on a real basis and one is not receiving the overall normal return that you would expect on common stocks during any period of time. During an inflationary period, where interest rates are affected very rapidly by the inflation, common stocks provide the worst investment medium possible. We have seen in recent years even more extreme examples than those provided in this illustration.

The last point I would like to discuss is the general question of common stocks as an investment medium. There are a variety of studies on this subject. If you want to read something really complex and sophisticated, look at "A Closer Look at the Implications of a Stable Paretian Hypothesis" from The Review of Economics and Statistics, May 1975. This follows in a long line of papers that are trying to determine what kind of a game we are operating in when we invest in common stocks. It started with a man named Bernoit Mandelbrot, about 1962, who tried to study the movements of common stocks and determine whether the movements in a portfolio would follow a normal distribution - in other words, whether there would be a mean one could use as an expected value and whether there is a distribution of risk which one could use for projections. Mandelbrot's conclusion at the time was that the risk measure did not exist.

There have been a variety of published studies along these lines subsequent to that. Fama's work is the best known. We did some studies of this at the Equitable, first concerning published data on the movements of the New York Stock Exchange index over a 100-year period and also on some of our internal accounts. We were trying to see whether the movements of the value of the portfolio were consistent with the idea that there was a nice normal curve that had an expected value and for which there was a risk measurement. The studies are not conclusive. It is impossible so far to draw from them the conclusion that common stocks do have a risk measurement; that is, no amount of information about the past movements of common stocks or common stock portfolios gives you a rational basis for decision as to what the risks of

Table 5

Market Indicators as Inflation Hedges Assuming Market Specified Normal Rates of Return

September 1937 to December 1968

Market Indicators	Nominal Return	Real Return	Net Return: Real Return Minus 8.2	Est. Normal Returns	Net Returns: Real Returns Minus Est. Normal	Amount of Inflation During Period
I. 3/31/41 to 6/30/43	(r)	(r′)		(k)	(r′- k)	
D-J Industrials	12.8	2.7	-5.5	6.9	-4.2	
S&P 425 Industrials	17.6	7.1	-1.1	7.9	-0.8	
S&P Utilities	6.5	-3.1	-11.3	6.1	-9.2	9.8
S&P Rails	21.3	10.5	2.3	6.4	4.1	
S&P 500 Stocks	16.6	6.2	-2.0	7.4	-1.2	
II. 3/31/46 to 9/30/48						
D-J Industrials	0.2	-11.0	-19.2	6.9	-17.9	
S&P 425 Industrials	-0.7	-11.7	-19.9	7.9	-19.6	
S&P Utilities	-5.8	-16.3	-24.5	6.1	-22.4	12.5
S&P Rails	-6.0	-16.4	-24.6	6.4	-22.8	
S&P 500 Stocks	-1.5	-12.5	-20.7	7.4	-19.9	
III. 3/31/50 to 10/31/51						
D-J Industrials	24.9	16.9	8.7	6.9	10.0	
S&P 425 Industrials	31.5	23.1	14.9	7.9	15.2	
S&P Utilities	8.5	1.5	-6.7	6.1	-4.6	6.9
S&P Rails	30.1	21.8	13.6	6.4	15.4	
S&P 500 Stocks	28.4	20.2	12.0	7.4	12.8	

Table 5 (Continued)

	(r)	(r′)		(k)	(r′ - k)	
IV. 3/31/56 to 3/31/58						
D-J Industrials	-2.1	-5.6	-13.8	6.9	-12.5	
S&P 425 Industrials	-6.2	-9.5	-17.7	7.9	-17.4	
S&P Utilities	7.2	3.4	-4.8	6.1	-2.7	3.7
S&P Rails	-16.0	-19.0	-27.2	6.4	-25.4	
S&P 500 Stocks	-3.1	-6.5	-14.7	7.4	-13.9	
V. 12/31/65 to 12/31/67						
D-J Industrials	2.4	-1.2	-9.4	6.9	-8.1	
S&P 425 Industrials	7.7	3.9	-4.3	7.9	-4.0	
S&P Utilities	1.2	-2.4	-10.6	6.1	-8.5	3.7
S&P Rails	6.2	2.5	-5.7	6.4	-3.9	
S&P 500 Stocks	7.1	3.3	-4.9	7.4	-4.1	
Weighted Average*						
D-J Industrials	6.6	-0.6	-8.8	6.9	-7.5	
S&P 425 Industrials	9.0	1.7	-6.5	7.9	-6.2	
S&P Utilities	2.9	-4.0	-12.2	6.1	-10.1	7.3
S&P Rails	6.3	-0.8	-9.0	6.4	-7.2	
S&P 500 Stocks	8.6	1.3	-6.9	7.4	-6.1	

*Weights are equal to number of months in each inflationary period.

Source: "Inflation, Inflation Hedges, and Common Stock," Financial Analysts Journal, May-June, 1970.

variation in return will be in the future. Now, if this is asserted, there must be a plausible reason for assuming that no risk measurement exists, that no prediction about the risk in common stocks can be made. There is a plausible reason for making this assertion. If common stocks are greatly affected by inflation and inflation is going to be greatly affected by the next administration, and the next administration is at present unknown, then there is a plausible reason for believing that the risks in common stocks cannot in fact be quantified. It is very easy to put forth a scenario which says that a very liberal administration will be elected, that there will be controls on prices, but no controls on wages. We have seen something similar to that in England. Under those circumstances, common stocks do get entirely out of step with the yields on bonds and would have a disastrous return on a common stock portfolio. What I am saying is that inflation, our primary concern at the moment, is unknowable because it is created or abetted by actions of the federal government, which are actions of men, and are not subject to predictions in terms of statistical results of the past carried on into the future. Inflation has an immense effect on interest rates on both short- and long-term securities and is reflected in the yields on those securities almost immediately, and inflation at an increasing pace has a disastrous effect on common stocks. In other words, the position is the same as if you go to Las Vegas - do not gamble with what you cannot afford to lose.

MR. ROBY: In your testing of stock returns, did you ever consider the log normal distribution?

MR. VANDERHOOF: We were basically working with log normal distributions where, if stock returns on individual securities follow any kind of a rational pattern, then the movements of portfolios should, according to the central limit theorem, follow a log normal distribution, and it does not quite fit. There is a key variable in this general Paretian distribution, which is supposed to be 2 for a normal curve, or a log normal curve in this case. It does not work out to 2. We have developed values for it around 1.8. Well, 1.8 is statistically far enough from 2 so that we can say that the true value cannot be 2. Once you say it is 1.8, then you are essentially saying no amount of information about the past tells you the level of risk that will be occurring in the future. Mr. Dreher just pointed out that one gets paid for the risk of common stocks. One clearly is paid for the risk, but it is not possible to draw a clear relationship between the additional amount one is being paid and how much risk is involved. This is not something which necessarily says one cannot invest in common stocks, but says that an investment in common stocks is like many fields in human relationships, it is something you have to have faith in. Mr. Dreher says he has faith that the capital markets are not going to collapse, that we are not going to have a socialist government. Well, that is an article of faith which may be correct, but it is not something where there is a basis for saying we can make a rational analysis of a level of risk based upon past experience.

MR. ROBY: We have been talking a lot today about common stocks, but I have not heard anyone really make the point that most studies show the superior return on common stocks is due to dividend income, not capital appreciation. The latest major study has just been published by Ibbotson and Sinquefield in the University of Chicago's Journal of Business (January). This is a study of common stock returns from 1926-1974. They concluded that the average geometric annual rate of return on common stocks was 8½%, 5% due to dividend yield, and 3½% due to capital appreciation. I think it is important in any work dealing with common stocks to recognize that history tells us that a stock's value really is determined by dividend income.