TITLE: A STRATEGY FOR PROPERTY-LIABILITY INSURERS IN INFLATIONARY TIMES

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# INTRODUCTION

Analysis of economic data indicates that inflation has both increased and become more variable over the last fifteen years. Inflation has a considerable effect on insurance profitability by impacting both components of insurance operations, underwriting and investments. Since the elimination of inflation in the near future is extremely unlikely, the insurance industry must decide whether to continue to accept the risk of uncertain inflation or whether to protect against changes in inflation. This paper presents a strategy for inflation immunization for the property-liability insurance industry and measures the cost of this strategy.

The first section of this paper discusses the history of inflation in this country since 1926. The next section analyzes the correlation of each of the components of insurance operations with inflation. The third section expands on the correlation of insurance investment returns with inflation by examining returns on long term bonds, common stocks, and Treasury bills. Section four develops the inflation immunization strategy for the insurance industry. In section five, portfolio theory is introduced to develop an investment stategy that minimizes the effect of inflation on total

insurance operations without diminishing the expected profitability. Section six updates the inflation immunization determination with data through the end of 1979. Section seven summarizes the results and provides conclusions. The method of determining the data and the sources are discussed in Appendix I. The data are presented in Appendix II, and summary statistics are shown in Appendix III.

## SECTION 1 - INFLATION

Recent economic conditions have made the current rate of inflation a subject of common knowledge. A greater perception of the situation can be obtained by viewing the inflation rate over an extended period of time. Figure 1 illustrates the change in Consumer Price Index during each year (December to December) for the period 1926 to 1979. This graph indicates that wide swings in the rate of inflation are not uncommon. Actually, the relative price stability of the 1950s is more unusual than the extreme fluctuations of the 1970s.

The deficiencies of the Consumer Price Index (CPI) as an accurate measure of the true inflation rate are widely recognized, but no superior all-purpose inflation index is available. The CPI is a monthly statistical

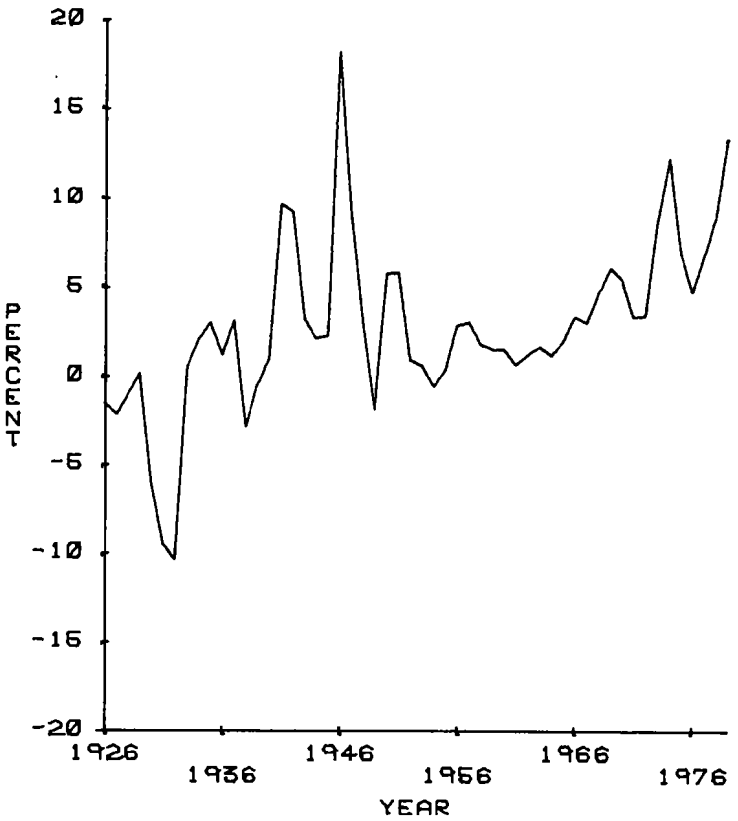


FIGURE 1
INFLATION

measure of a market basket of items commonly purchased by urban workers. Measurement of certain items is lagged due to data collection procedures. The validity of the composite market basket for other segments of society, such as the retired or rural residents, is suspect. Norton Masterson [5] compiled a Claim Cost Index for property-liability insurers that is a more accurate representation of inflation for insurers than the CPI. The CPI is used in this paper for lack of a better index to correlate not only with insurance underwriting, but also with investment returns.

Returning to Figure 1, it can been seen that prices declined significantly during the years 1930 to 1932, the onset of the Great Depression. Price changes then fluctuated in the range of plus to minus 3.0 percent until the beginning of World War II, and then increased significantly. Price controls instituted in 1942 restrained the rate of inflation until removed in 1946 when the inflation rate hit an as yet unsurpassed 18.2 percent. The ensuing period of relative price stability lasted until the late 1960s. Price controls during the period 1971 to 1973 again restrained the inflation rate until controls were lifted.

The change in prices in a price control period are not indicative of the true rate of inflation, according to Eugene Fama [2]. Fama contends that price controls substitute nonmonetary costs, such as waiting in line, shortages, and inconvenience, for monetary costs. Removal of controls then allows monetary costs, which are measured by the CPI and other price indexes, to catch up with the true cost of goods and services. This theory explains much of the variation in the rate of inflation around price control periods. However, the CPI still represents a measure of the cost of items to insurers for claims and, indirectly, wages, and for investors in determining interest rates and required rates of return. If the prior inflation spikes of 1946 and 1974, which can be explained by the lifting of price controls, are eliminated, the inflation rate of 1979, which has no such explanation, becomes an uncomfortable, uncomparable level.

## SECTION 2 - COMPONENTS OF INSURANCE RISK

Insurance profitability is derived from the combination of two separate components, underwriting and investments. Underwriting profitability depends upon the adequacy of rate levels, competition, and catastrophe experience. Inflation affects underwriting

profitability since, for those lines in which the price is not a function of the amount of coverage provided, rate level adjustments must continually be made to maintain adequate rates. Use of past data and delays, both internal and regulatory induced, tend to produce inadequate rate levels under inflation. Automobile insurance is a prime example of this problem. For lines in which the insurance premium is a function of coverage and the coverage increases in line with inflation, the rate lag is less of a problem. Examples of this situation are inflation-adjusted Homeowners policies and business policies rated on the value of wages or sales.

The statutory underwriting profit margin for stock property-liability insurers during the period 1926 to 1979 is depicted in Figure 2, along with the change in the CPI each year. A pronounced negative relationship between the inflation rate and the underwriting profit margin is apparent by observing the extreme values. High underwriting profitability occurs in 1938, when price levels dropped. Underwriting profitability first reduced in 1942 after inflation increased, and then increased as inflation reduced in 1943. Underwriting profitability was high in 1948 and 1949 as inflation reduced. The pattern continued through the 1960s and 1970s with underwriting losses slightly lagging the

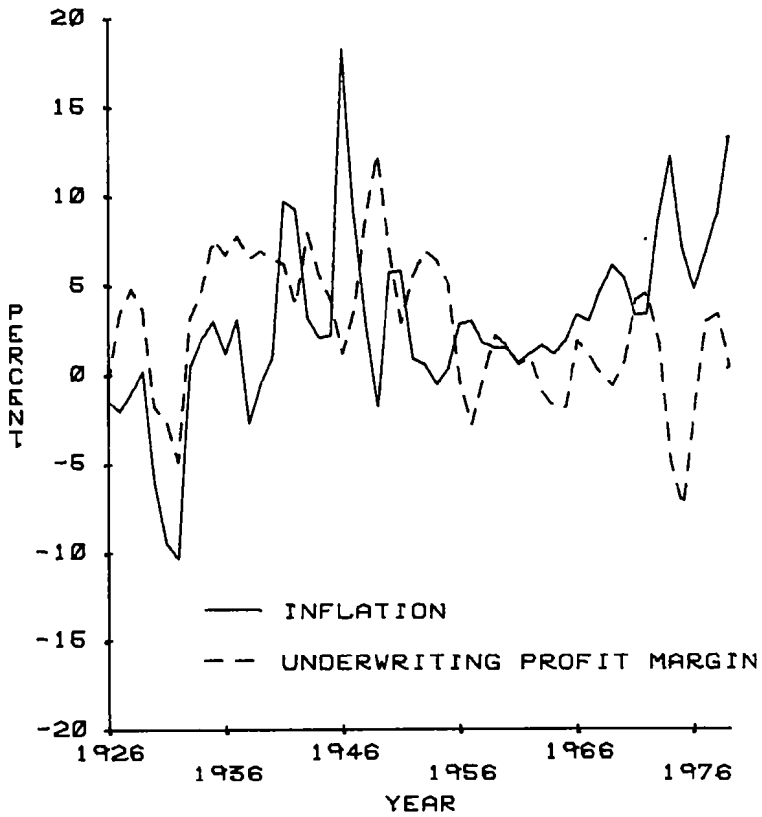


FIGURE 2

INFLATION AND UNDERWRITING PROFIT MARGIN

inflation spurt in 1974 and reduction in 1976.

The pre-1933 period does not conform with the negative relationship outlined above. Underwriting profitability actually declined in 1930, 1931, and 1932 as price levels dropped substantially. One possible explanation for this atypical correspondence is the pervasive effect of the Depression. Despite price level reductions, economic conditions were so poor that insurance premium receipts declined, causing expense ratios to climb. Loss ratios jumped for Fire Insurance, Accident and Health, Workers' Compensation, and most substantially for Fidelity and Surety [1]. Depressed economic conditions undoubtedly led to increased losses in part from moral hazard, and likely would again in similar circumstances. However, since this paper develops a stategy for dealing with inflation, the deflationary period up through 1932 will not be utilized in developing the statistical relationships used in this model. The usefulness of this model will thus be restricted to inflationary conditions and would not necessarily apply to deflationary situations.

For the period 1933 to 1979, the relationship between underwriting profit margin and inflation can be expressed as:

$$UPM_t = 4.29 - .331\ INF_t + e_t$$

$$T = -2.498 \text{ significant at the 1.0\% level}$$

$$R^2 = .122$$

where UPM = underwritng profit margin (statutory)

INF = inflation rate (change in the CPI)

e = error term

Later in this paper, other variables will be introduced and incorporated in the analysis. For various reasons, the data on some of these variables are either not valid or not available prior to 1951 or after 1976. To simplify the presentation by using the same time period for all segments of the analysis, the period 1951 to 1976 will be used initially to illustrate the methodology. Section six updates the portion of this analysis through 1979 for the variables for which the data are available. For the common period 1951 to 1976, the relationship between underwriting profit margin and inflation was:

$$UPM_t = 2.96 - .617\ INF_t + e_t$$

$$T = -3.029 \text{ significant at the 0.5\% level}$$

$$R^2 = .277$$

The significant negative relationship confirms the expected and observed negative correlation between

underwriting profitability and inflation. The amount of variation in underwriting profitability that is explained by inflation ($R^2$ = .122 and .277) is not high, as many other factors impact insurance underwriting profitability. However, inflation does significantly affect underwriting profit margins.

The other component of insurance profitability is the investment area. Investment profit or loss for property-liability insurers is the total of investment income (dividends or interest), realized capital gains or losses for bonds and real estate, and both realized and unrealized capital gains and losses for stock. Unrealized capital gains or losses on bonds are not a factor in statutory investment profit or loss for insurers.

Inflation would tend to increase interest rates on bonds, increasing investment returns. The loss in value on outstanding bonds that occurs as inflation increases, although a consideration in overall financial planning for insurers, does not affect statutory accounting results if the loss is not realized. Variations in market values of stocks as affected by inflation would flow directly into overall insurance profitability.

The insurance investment return can be calculated by dividing the investment profit or loss including investment income for each year by the mean investable assets of stock insurers during the year. Some admitted assets for the insurance industry, such as premium balances, do not produce investment income. Investable assets for the industry have been approximated by multiplying total admitted assets by .90. Insurance investment return for stock property-liability insurers during the period 1926 to 1979 is shown in Figure 3, with the change in CPI again included. Substantial variation in insurance investment return is evident, but the tendency of the rate of return to peak at inflation lows and hit a bottom at inflation peaks can be observed.

Regressing insurance investment returns against inflation in the same manner as done for underwriting profit margins yields:

1933 - 1979

$$IIR_t = 6.17 - .333\ INF_t + e_t$$

$T = -2.019$ significant at the 5.0% level

$R^2 = .083$

1951 - 1976

$$IIR_t = 7.81 - .817\ INF_t + e_t$$

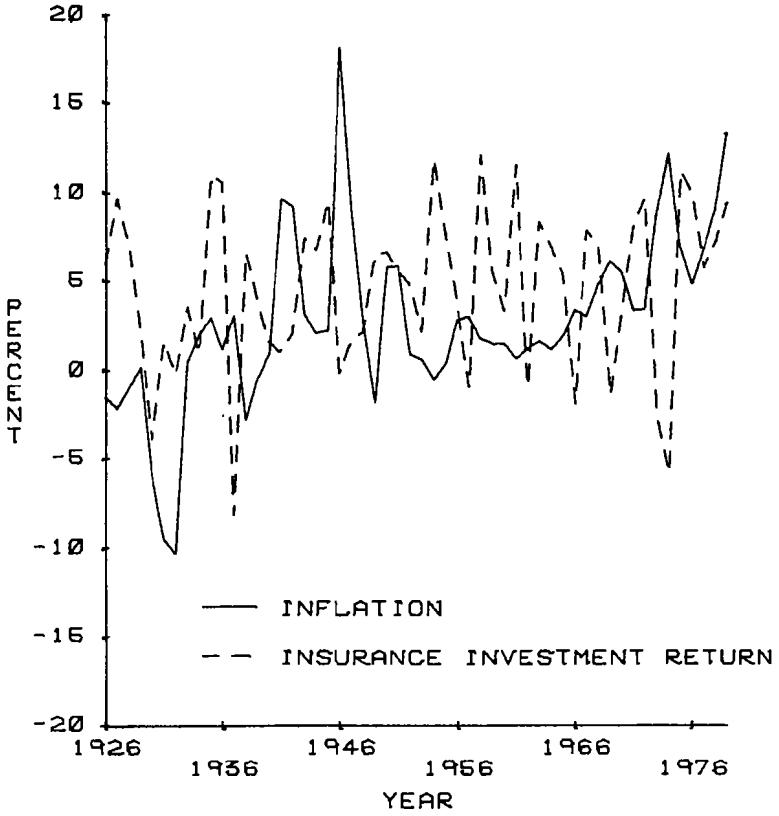


FIGURE 3

INFLATION AND INSURANCE INVESTMENT RETURN

T = -2.646 significant at the 1.0% level

$R^2$ = .226

where IIR = insurance investment return on mean investable assets

Thus, inflation is significantly negatively correlated with both insurance underwriting and insurance investment return. With both components of insurance operating results impacted adversely by inflation, inflation presents a severe threat to insurers. However, insurers are not forced to accept this situation. The next section will analyze the investment returns of several investment alternatives to expand on the relationship between insurance investment returns and inflation.

## SECTION 3 - INVESTMENT RETURNS ON ALTERNATIVE INVESTMENTS

The insurance investment return determined in the prior section is the average return of various investments. Insurers' assets consist of government and municipal bonds, corporate bonds, common and preferred stock, real estate, and other investments, as well as some non-income earning assets. The composition of

stock insurers' investment portfolios has changed over time. This section isolates the effect of inflation on the investment returns of four different investments: long term government bonds, long term corporate bonds, common stocks, and Treasury bills. The returns include both interest income and changes in market value during the year. Insurance accounting would not include changes in market value for the long term bonds unless the bonds were sold. Thus, the returns on the long term bonds are not exactly comparable to the statutory accounting conventions of the insurance industry, but do reflect the actual financial effects of long term bond investment. The method of determination of the rates of return and the sources of these data are discussed in Appendix I.

Figure 4 illustrates the investment return on long term government bonds during the period 1926 to 1976. Figure 5 illustrates the return on long term corporate bonds. Figure 6 shows the return on common stocks during the period 1926 to 1979. Figure 7 indicates the return on U. S. Treasury bills during that same period. The inflation rate is also included on each figure. The regression equations for each relationship are shown in Table 1.

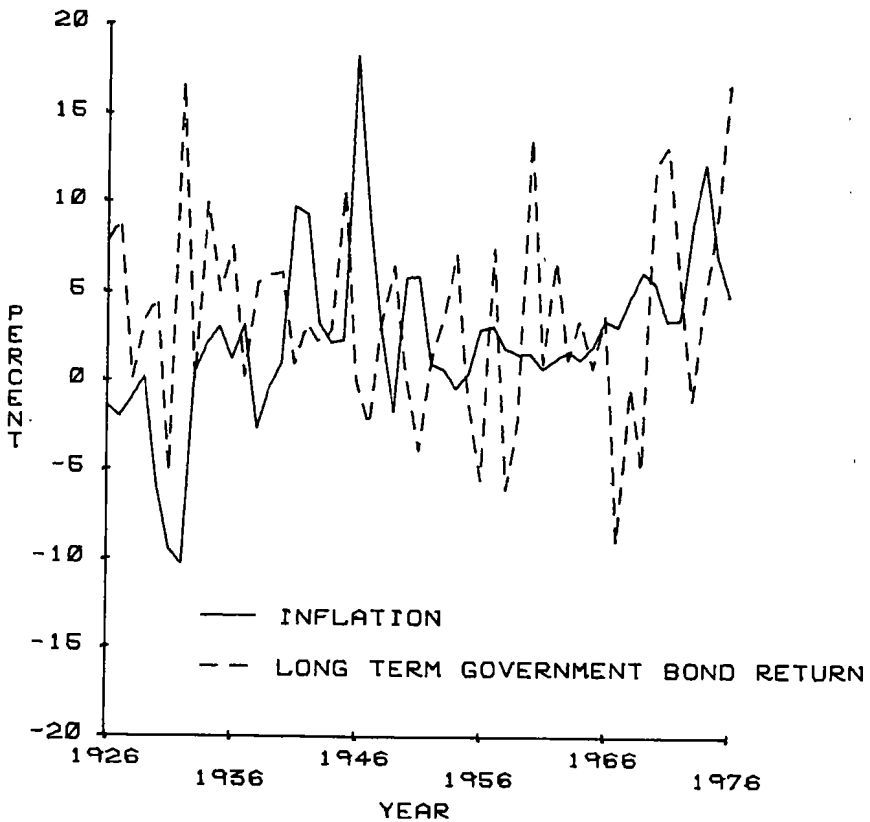


FIGURE 4

INFLATION AND LONG TERM GOVERNMENT BOND RETURN

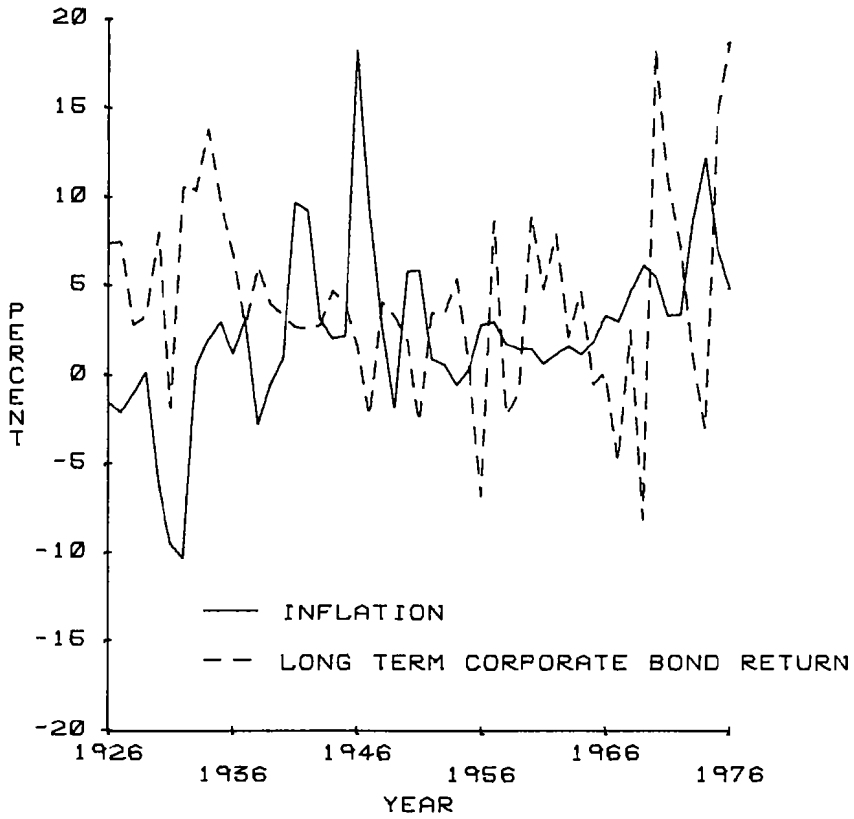


FIGURE 5

INFLATION AND LONG TERM CORPORATE BOND RETURN

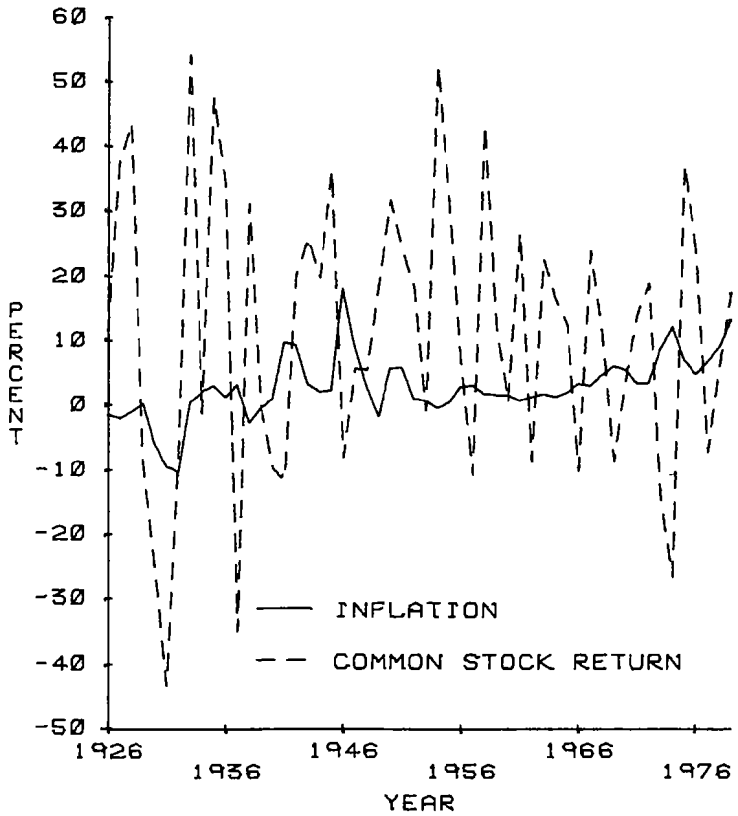


FIGURE 6

INFLATION AND COMMON STOCK RETURN

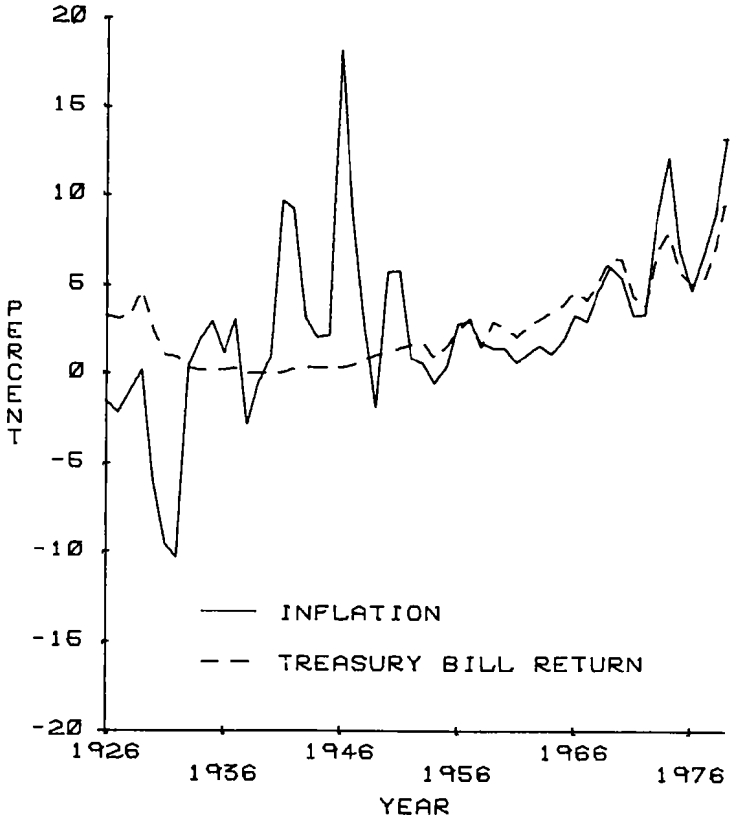


FIGURE 7

INFLATION AND TREASURY BILL RETURN

Table 1

Regression Coefficients

1951 - 1976

$LTG_t = 2.63 + .095\ INF_t + e_t$

$T = .205$ not significant

$R^2 = .002$

$LTC_t = 3.93 - .084\ INF_t + e_t$

$T = -.171$ not significant

$R^2 = .001$

$CS_t = 22.73 - 3.114\ INF_t + e_t$

$T = -2.675$ significant at the 1.0% level

$R^2 = .230$

$TB_t = 1.87 + .556\ INF_t + e_t$

$T = 7.594$ significant at the 0.5% level

$R^2 = .706$

where LTG = long term government bond returns

LTC = long term corporate bond returns

CS = common stock returns

TB = Treasury bill returns

Investment returns on long term government bonds and long term corporate bonds are not significantly correlated with inflation. However, common stock returns are significantly negatively correlated with inflation to the point that a 1 percent higher inflation

rate reduces common stock returns by more than 3 percent. The amount of variation explained by inflation is low ($R^2$ = .230) as many other factors affect stock prices.

Returns on Treasury bills, which are short term (1 to 3 month) investments, are highly positively correlated with inflation. This relationship is expected and is explained by Fisher [3] and Fama [2] among others. For high inflation rates investors demand a high interest rate to compensate for the loss of spending power. Prior to 1951, short term interest rates were intentionally held down by the Federal Reserve to accomodate government financing of social programs and war debt. The Accord of 1951 supposedly ended the artificial suppression of short term interest rates. Experience prior to 1951, as can be seen from Figure 7, does not indicate any relationship between inflation and Treasury bill returns.

## SECTION 4 - INFLATION IMMUNIZATION

Insurance underwriting profit margins and current investment returns are both negatively correlated with the rate of inflation. Returns on Treasury bills are positively correlated with inflation. These opposite

relationships can be utilized to immunize an insurer against the effect of inflation by properly structuring the investment portfolio. The adverse effects of inflation on underwriting and current investment returns can be offset by the beneficial effect of inflation on Treasury bill returns.

Since the assets of an insurer generally exceed the annual earned premium, the effect of a change in investment return has a greater impact on overall operating profitability than a similar change in underwriting profit margin. The leverage of total assets to earned premium varies over time. In 1979 the mean investable asset value over the year was 1.89 times the earned premium for the year for stock insurers [1]. This leverage factor is incorporated in the inflation immunization calculation.

In order to immunize an insurer from the effect of inflation, an investment portfolio must be chosen such that the impact of inflation on investment return offsets the effect of inflation on underwriting profit margin. The calculation involved in this determination is:

$$RUPM + RTB(L)(X) + RIIR(L)(1-X) = 0.0 \quad (1)$$

where RUPM = regression coefficient for the effect of inflation on underwriting profit margins

RTB = regression coefficient for the effect of inflation on Treasury bill returns

RIIR = regression coefficient for the effect of inflation on insurance investment returns

L = leverage ratio (admitted assets/earned premium)

X = portion of assets to be invested in Treasury bills

Inputting the regression coefficients calculated from the period 1951 to 1976 and the 1979 leverage ratio into equation 1 yields:

$$-.617 + .556(1.89)X - .817(1.89)(1-X) = 0$$

$$X = .833$$

The inflation immunized investment portfolio for the stock insurance industry as of the end of 1979, based on relationships calculated on 1951 to 1976 data, would involve investing 83.3 percent of investable assets in Treasury bills and leaving the remaining 16.7 percent of investable assets distributed as currently invested. Insurance operating results would continue to

fluctuate, but variations would be independent of the rate of inflation. Insurers would be immunized against the effects of inflation.

Immunization is not costless. Risky investments, in order to induce investment, are required to produce a higher expected return. Treasury bills, as a less risky investment than common stocks, produce a lower return in the long run. For the period 1951 to 1976, Treasury bills generated a mean annual return of 3.7 percent, compared with 12.3 percent for common stocks and 5.1 percent for insurance investment returns. If insurers had maintained 83.3 percent of assets in Treasury bills during this period, the inflation immunized investment return would have been 4.0 percent. Based on the 1979 leverage ratio, this 1.1 percent reduction in insurance investment returns would be equivalent to a 2.1 percent reduction in underwriting profit margin.

## SECTION 5 - PORTFOLIO THEORY

If the cost of inflation immunization is considered too high a price to pay to eliminate the effect of inflation on insurance company profitability, an alternative method is available to minimize the effect of inflation while still achieving the desired target

rate of return. Mean-variance analysis is based on the premise that an investor given the option of different investment opportunities with equivalent expected returns will prefer the alternative with the lowest variance. Portfolio theory provides a method for determining the optimal investment mix to produce the lowest variance for a given expected rate of return [4]. The inputs required for this procedure are the expected return and variance for each investment option and the covariance between each pair of investments. Since the variance of total operating profitability is to be minimized, insurance underwriting is treated as an investment alternative, but the amount of premium is constrained.

The following terms will be used in this analysis:

$E(r_i)$ = expected return on investment i

$X_i$ = proportion of the portfolio invested in i

$S_i$ = standard deviation of investment i

Cov(i,j) = covariance between investments i and j

The objective of this determination is to minimize the variance of insurance profitability related to inflation. Therefore, the covariances between investments are determined by multiplying each of the regression coefficients for the investment option

related to inflation by the variance of the rate of inflation, for example:

$$Cov(TB,CS) = (RTB)(RCS)(S^2_{INF})$$

The investment alternatives used in this example are insurance underwriting, long term government bonds, Treasury bills, long term corporate bonds, and common stocks. The expected returns, variances, and covariances are determined from the period 1951 to 1976. The leverage ratio for 1979 is utilized. The minimum variance investment mix is determined by solving the following equations:

Minimize:

$$\sum_i \sum_j X_i X_j Cov(i,j) \qquad (2)$$

Subject to:

$$\sum_i X_i E(r_i) = (5.086)(1.89) = 9.61 \qquad (3)$$

$$X_1 = 1.0 \qquad (4)$$

$$X_2 + X_3 + X_4 + X_5 = 1.89 \qquad (5)$$

$$X_2, X_3, X_4, X_5 \geq 0.0 \qquad (6)$$

1 = UPM, 2 = LTG, 3 = TB, 4 = LTC, 5 = CS

Equation 2 indicates that the variance of the portfolio is to be minimized. Equation 3 requires the return on the portfolio from investments in long term government bonds, Treasury bills, long term corporate bonds, and common stocks to equal the target rate of return (the mean insurance investment return over the period) times the leverage factor. Equation 4 constrains earned premium to its current proportion. Equation 5 requires the investments to sum to the leverage factor. Equation 6 restricts investment to positive values.

The above series of equations can be solved by quadratic programming. The solution to this system of equations is:

$$X_1 = 1.000$$
$$X_2 = 0.000$$
$$X_3 = 1.592$$
$$X_4 = 0.000$$
$$X_5 = 0.298$$

The minimum variance portfolio involves investing 84.2 percent of investable assets in Treasury bills and 15.8 percent of investable assets in common stock. No long term bonds are included in this inflation minimization portfolio.

## SECTION 6 - UPDATE

The regression coefficients of inflation related to profit margins, insurance investment returns, and common stock returns change considerably when the experience through 1979 is included. The regression coefficient of inflation related to Treasury bill returns does not alter significantly for the updated period. Data are not available to extend the long term government and corporate bond returns through 1979.

Substituting into equation 1 the regression coefficients for the period 1951 to 1979 (shown in Appendix III) yields:

$$-.341 + .578(1.89)X - .351(1.89)(1-X)$$

$$X = .572$$

The inflation immunized portfolio based on this more recent experience involves investing 57.2 percent of investable assets in Treasury bills and leaving 42.8 percent of investable assets as currently allocated. For the period 1951 to 1979, this investment portfolio would have yielded a 4.6 percent return, reduced from the actual 5.3 percent return on insurance investments. This decline of .7 percent would be equivalent to a 1.3

percent reduction in underwriting profit margin, based on the 1979 leverage ratio.

## SECTION 7 - SUMMARY AND CONCLUSIONS

Since historically both underwriting profit margins and investment returns have been negatively correlated with inflation, total insurance operating results have fluctuated significantly as the rate of inflation has changed. Short term bond investments, however, are positively correlated with inflation. By properly structuring an insurer's investment portfolio, the effect of inflation on operating results can be eliminated. Depending on the period from which the data are based, the inflation immunized investment portfolio requires between 57.2 percent and 83.3 percent of investable assets being invested in short term bonds. This investment strategy would reduce investment returns by between .7 and 1.1 percent.

Alternatively, insurers could minimize the impact of inflation on operating results by restructuring the investment portfolio to achieve a target rate of return with minimum inflation induced variation. Based on the data from the period 1951 to 1976, this inflation minimization portfolio would involve investment in only

short term bonds (84.2 percent) and common stocks (15.8 percent).

Additional investment alternatives not considered in this paper could also produce the desired effect of offsetting the impact of inflation on underwriting profit margins and common stock returns. Commodity prices and put options (which are the right to sell a stock at a given price) are also likely to be positively correlated with the inflation rate. An inflation immunized portfolio may include investment in these and other alternatives. The important consideration for insurers is to offset the impact of inflation on underwriting profitability with investment returns. Insurance operating results can be more stable in relation to inflation. Insurers can learn to cope with inflation.

## APPENDIX I - DATA SOURCES

The three reference sources for obtaining or deriving the data used in this paper are:

1. Best's Aggregates and Averages Property-Casualty (Oldwick, New Jersey: A. M. Best Company, 1980)

2. Ibbotson, Roger G. and Rex A. Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1976) and the Future (1977-2000) (Charlottesville, Va.: Financial Analysts Research Foundation, 1977)

3. Standard and Poor's Trade and Security Statistics (Orange, Conn.: Standard and Poor's Corp., 1978, 1980)

The individual values were determined as follows:

1. Inflation: the change in Consumer Price Index from December to December (Source 2).

2. Underwriting profit margin: statutory underwriting profit margin for stock insurers (Source 1).

3. Insurance investment returns: statutory investment profit or loss including investment income as a percent of mean investable assets, with investable assets considered to be 90 percent of admitted assets (Source 1).

4. Long term government bond returns: total returns from interest and capital gains or losses on a 20 year term bond portfolio of U.S. Government bonds (Source 2).

5. Long term corporate bond returns: total returns from interest and capital gains or losses on the Salomon Brothers High Grade Long Term Corporate Bond Index and Standard and Poor's High Grade Corporate Composite yield data for 20 year maturities (Source 2).

6. Common stock returns: total returns from dividends and capital gains or losses based on the Standard and Poor's Composite Index (Source 2 for 1926-1976; Source 3 for 1977-1979).

7. Treasury bills: holding period returns on shortest term bills not less than one month to maturity held for one month (Source 2 for 1926-1976) and average yield on new issues of three month bills (Source 3 for 1977-1979).

## APPENDIX II

### DATA

| Year | Inflation | Underwriting Profit Margin | Insurance Investment Return | Long Term Government Bond Return |
|---|---|---|---|---|
| 1926 | -1.49 | -.60 | 6.00 | 7.77 |
| 1927 | -2.08 | 3.40 | 9.71 | 8.93 |
| 1928 | -.97 | 4.80 | 7.19 | .10 |
| 1929 | .19 | 3.70 | 2.26 | 3.42 |
| 1930 | -6.03 | -1.90 | -3.93 | 4.66 |
| 1931 | -9.52 | -2.70 | 1.70 | -5.31 |
| 1932 | -10.30 | -4.90 | -.26 | 16.84 |
| 1933 | .51 | 3.20 | 3.58 | -.08 |
| 1934 | 2.03 | 4.70 | .88 | 10.02 |
| 1935 | 2.99 | 7.60 | 11.09 | 4.98 |
| 1936 | 1.21 | 6.70 | 10.62 | 7.51 |
| 1937 | 3.10 | 7.70 | -8.15 | .23 |
| 1938 | -2.78 | 6.50 | 6.67 | 5.53 |
| 1939 | -.48 | 6.90 | 3.82 | 5.94 |
| 1940 | .96 | 6.50 | 1.54 | 6.09 |
| 1941 | 9.72 | 6.20 | 1.00 | .93 |
| 1942 | 9.29 | 3.90 | 2.04 | 3.22 |
| 1943 | 3.16 | 7.90 | 7.52 | 2.08 |
| 1944 | 2.11 | 5.60 | 6.82 | 2.81 |
| 1945 | 2.25 | 4.20 | 9.62 | 10.73 |
| 1946 | 18.17 | 1.20 | -.20 | -.10 |
| 1947 | 9.01 | 3.70 | 1.71 | -2.63 |
| 1948 | 2.71 | 8.80 | 2.14 | 3.40 |
| 1949 | -1.80 | 12.40 | 6.59 | 6.45 |
| 1950 | 5.79 | 7.00 | 6.64 | .06 |
| 1951 | 5.87 | 2.90 | 5.48 | -3.94 |
| 1952 | .88 | 5.60 | 4.77 | 1.16 |
| 1953 | .62 | 6.90 | 2.16 | 3.63 |
| 1954 | -.50 | 6.40 | 11.92 | 7.19 |
| 1955 | .37 | 5.10 | 7.71 | -1.30 |
| 1956 | 2.86 | -.50 | 3.68 | -5.59 |
| 1957 | 3.02 | -2.90 | -1.03 | 7.45 |
| 1958 | 1.76 | 0.00 | 12.11 | -6.10 |
| 1959 | 1.50 | 2.20 | 5.41 | -2.26 |
| 1960 | 1.48 | 1.60 | 3.27 | 13.78 |
| 1961 | .67 | .60 | 11.58 | .97 |
| 1962 | 1.22 | 1.00 | -1.00 | 6.89 |
| 1963 | 1.65 | -1.00 | 8.37 | 1.21 |
| 1964 | 1.19 | -1.90 | 6.95 | 3.51 |
| 1965 | 1.92 | -1.90 | 5.31 | .71 |
| 1966 | 3.35 | 1.90 | -1.97 | 3.65 |

| Year | Inflation | Underwriting Profit Margin | Insurance Investment Return | Long Term Government Bond Return |
|---|---|---|---|---|
| 1967 | 3.04 | 1.10 | 7.85 | -9.19 |
| 1968 | 4.72 | 0.00 | 7.04 | -.26 |
| 1969 | 6.11 | -.60 | -1.44 | -5.08 |
| 1970 | 5.49 | .70 | 3.44 | 12.10 |
| 1971 | 3.36 | 4.20 | 8.25 | 13.23 |
| 1972 | 3.41 | 4.60 | 9.74 | 5.68 |
| 1973 | 8.80 | 1.80 | -2.66 | -1.11 |
| 1974 | 12.20 | -5.00 | -5.90 | 4.35 |
| 1975 | 7.01 | -7.50 | 11.22 | 9.19 |
| 1976 | 4.81 | -2.00 | 9.95 | 16.75 |
| 1977 | 6.77 | 3.00 | 5.72 | NA |
| 1978 | 9.03 | 3.40 | 7.22 | NA |
| 1979 | 13.31 | .40 | 9.43 | NA |

| Year | Long Term Corporate Bond Return | Common Stock Return | Treasury Bill Return |
|---|---|---|---|
| 1926 | 7.37 | 11.62 | 3.27 |
| 1927 | 7.44 | 37.49 | 3.12 |
| 1928 | 2.84 | 43.61 | 3.24 |
| 1929 | 3.27 | -8.42 | 4.75 |
| 1930 | 7.98 | -24.90 | 2.41 |
| 1931 | -1.85 | -43.34 | 1.07 |
| 1932 | 10.82 | -8.19 | .96 |
| 1933 | 10.38 | 53.99 | .30 |
| 1934 | 13.84 | -1.44 | .16 |
| 1935 | 9.61 | 47.67 | .17 |
| 1936 | 6.74 | 33.92 | .18 |
| 1937 | 2.75 | -35.03 | .31 |
| 1938 | 6.13 | 31.12 | -.02 |
| 1939 | 3.97 | -.41 | .02 |
| 1940 | 3.39 | -9.78 | 0.00 |
| 1941 | 2.73 | -11.59 | .06 |
| 1942 | 2.60 | 20.34 | .27 |
| 1943 | 2.83 | 25.90 | .35 |
| 1944 | 4.73 | 19.75 | .33 |
| 1945 | 4.08 | 36.44 | .33 |
| 1946 | 1.72 | -8.07 | .35 |
| 1947 | -2.34 | 5.71 | .50 |
| 1948 | 4.14 | 5.50 | .81 |
| 1949 | 3.31 | 18.79 | 1.10 |
| 1950 | 2.12 | 31.71 | 1.20 |
| 1951 | -2.69 | 24.02 | 1.49 |
| 1952 | 3.52 | 18.37 | 1.66 |
| 1953 | 3.41 | -.99 | 1.82 |

| Year | Long Term Corporate Bond Return | Common Stock Return | Treasury Bill Return |
|---|---|---|---|
| 1954 | 5.39 | 52.62 | .86 |
| 1955 | .48 | 31.56 | 1.57 |
| 1956 | -6.81 | 6.56 | 2.46 |
| 1957 | 8.71 | -10.78 | 3.14 |
| 1958 | -2.22 | 43.36 | 1.54 |
| 1959 | -.97 | 11.95 | 2.95 |
| 1960 | 9.07 | .47 | 2.66 |
| 1961 | 4.82 | 26.89 | 2.13 |
| 1962 | 7.95 | -8.73 | 2.73 |
| 1963 | 2.19 | 22.80 | 3.12 |
| 1964 | 4.77 | 16.48 | 3.54 |
| 1965 | -.46 | 12.45 | 3.93 |
| 1966 | .20 | -10.06 | 4.76 |
| 1967 | -4.95 | 23.98 | 4.21 |
| 1968 | 2.57 | 11.06 | 5.21 |
| 1969 | -8.09 | -8.50 | 6.58 |
| 1970 | 18.37 | 4.01 | 6.53 |
| 1971 | 11.01 | 14.31 | 4.39 |
| 1972 | 7.26 | 18.98 | 3.84 |
| 1973 | 1.14 | -14.66 | 6.93 |
| 1974 | -3.06 | -26.48 | 8.00 |
| 1975 | 14.64 | 37.20 | 5.80 |
| 1976 | 18.65 | 23.84 | 5.08 |
| 1977 | NA | -7.17 | 5.27 |
| 1978 | NA | 6.39 | 7.22 |
| 1979 | NA | 18.19 | 10.04 |

## APPENDIX III

### SUMMARY STATISTICS

| | 1933-1979 | | 1951-1976 | | 1951-1979 | |
|---|---|---|---|---|---|---|
| Variable | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation |
| INF | 3.91 | 4.11 | 3.34 | 2.92 | 4.00 | 3.50 |
| UPM | 3.00 | 3.90 | 0.90 | 3.42 | 1.04 | 3.29 |
| IIR | 4.87 | 4.74 | 5.09 | 5.01 | 5.33 | 4.82 |
| LTG | 3.27* | 5.58* | 2.95 | 6.64 | NA | NA |
| LTC | 4.04* | 5.83* | 3.65 | 6.98 | NA | NA |
| CS | 12.82 | 20.15 | 12.34 | 18.94 | 11.66 | 18.33 |
| TB | 2.68 | 2.56 | 3.73 | 1.93 | 4.12 | 2.26 |

* 1933-1976

### REGRESSION COEFFICIENTS

$$Variable_t = a + b\ INF_t + e_t$$

| Variable | a | b | T | $R^2$ |
|---|---|---|---|---|
| 1933-1979 | | | | |
| UPM | 4.29 | -.331 | -2.498** | .122 |
| IIR | 6.17 | -.333 | -2.019* | .083 |
| CS | 19.58 | -1.728 | -2.526** | .124 |
| 1933-1976 | | | | |
| LTG | 4.08 | -.230 | -1.050 | .026 |
| LTC | 4.89 | -.241 | -1.054 | .026 |
| 1951-1976 | | | | |
| UPM | 2.96 | -.617 | -3.029*** | .277 |
| IIR | 7.81 | -.817 | -2.646** | .226 |
| LTG | 2.63 | .095 | .205 | .002 |
| LTC | 3.93 | -.084 | -.171 | .001 |
| CS | 22.73 | -3.114 | -2.675** | .230 |
| TB | 1.87 | .556 | 7.594*** | .706 |
| 1951-1979 | | | | |
| UPM | 2.40 | -.341 | -2.028* | .132 |
| IIR | 6.74 | -.351 | -1.372 | .065 |
| CS | 19.70 | -2.012 | -2.164* | .148 |
| TB | 1.81 | .578 | 10.540*** | .804 |

* = significant at the 5.0% level
** = significant at the 1.0% level
*** = significant at the 0.5% level

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