AN ILLUSTRATION OF THE IMPACT OF INFLATION ON INSURANCE COMPANY OPERATIONS

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As interest rates have risen, so has the level of attention that regulators and other monitors of the insurance industry have paid to the concept of total return in the insurance industry. In determining total return, income from both underwriting and investments is considered. By shifting attention to total return, industry commentators have generally inferred that since investment income is growing as a result of higher yields, underwriting profit margins can be reduced, eliminated, or, in some cases, converted to losses, while total returns are kept constant. In all of this analysis, little attention has been paid to inflation, which is the cause of higher interest rates, or to the impact that inflation has on insurance operations.

Irving Fisher, in 1896, first presented the theory that interest rates are related to inflation. The relationship, known as the Fisher effect, is illustrated by the following formula: (Fisher)

(1) $R = M + \emptyset + E(\Delta P/P)$

R = market interest rates (nominal interest rate)

M = marginal productivity of capital (real interest rate)

$\emptyset$ = risk premium

$E(\Delta P/P)$ = expected inflation rate

Numerous studies have discussed, disputed, and tried to quantify the Fisher effect. The general consensus is: (Fama, Peldstein, Ibbotson, Moll)

1) although the effect is often contradicted by short term results, the long term effect is real and constant;

2) the accuracy of indices attempting to measure inflation has been, at times, sorely inadequate;

3) recent advances in inflation indexation have led to much more accurate analysis.

The most appropriate study for this reprt is an analysis by William Gibson in 1972. (Gibson) By fitting a regression line to data on government security yields and inflation expectations (as measured by a consensus of leading experts and policy makers), for the period 1959-70, Gibson both confirmed and quantified the Fisher effect. For short term maturities (six to twelve months), the correspondence between interest rates and inflation was almost exact. A one percent increase in the expected rate of inflation increased the interest rates by between 0.93% and 1.10%.

The advantage of dealing with U. S. government securities is that the risk premium is negligible. Thus, the intercept of the regression line (expected inflation is zero) represents the marginal prdductivity of capital in equation (1), or the real interest rate. For short term securities this varied from 1.90% to 2.50%.

The practical application of this study by Gibson is the fact that, however the nominal interest rates of risk free securities vary, the inflation rate is approximately 2% below this rate. We now have a direct relationship between interest rates and inflation, and can study the joint effect of both higher interest rates and higher inflation on insurance operations.

The general impact of higher interest rates on insurance

company operations has been well documented, (Bailey, Balcarek, Cooper, Goddard, NAIC) As interest rates rise, investable assets produce a greater return, increasing the total company return, unless this effect is offset by lower underwriting gains. The effect of inflation on insurance companies is that the renewal of the same number of exposures in future years generates higher written premiums. In the long run, insurance costs will keep pace with the rate of inflation, even though in some years insurance will exceed or lag the overall inflation rate. In this study, the long run impact of the overall rate of inflation is used.

In order to analyze the joint effect of inflation and high interest rates on insurance company operations, a model insurance company is utilized. This model company invests its entire portfolio in short term government securities, which yield 2% above the rate of inflation. Therefore, the company is not accepting any investment risk. Since all investment income is produced from interest on these securities, the regular corporate tax rate of 48% will apply to all income, both investment income and underwriting income. No income will be produced by long term capital gains or intercompany dividends, which would qualify for a lower tax rate. (The corporate tax rate is now 46%, but this change has only a minor impact on results, as can be seen in the Appendix.) Also, since all investable assets are in short term securities, each year the company will be able to reinvest the entire portfolio at the current interest rates.

In many previous studies, the return on equity is determined by dividing the net income by surplus plus equity

in the unearned premium reserve. (Goddard, Ferrari, NAIC) In this model no adjustment is made for the equity in the unearned premium reserve, and return on equity is calculated by dividing net income by surplus. This change is made to simplify the determination of the effect of inflation on the company's operations.

To establish a benchmark rate of return during a period of no inflation, a 5% underwriting profit margin is assumed while interest rates are 2%. The 5% underwriting gain is used solely for comparative purposes. Nothing in this study measures the adequacy or the appropriateness of this level.

If the model company chose to retain the entire amount of net income by not paying shareholders dividends, and used the income to increase surplus, net written premium could be increased by the same percentage as the return on equity (calculated as described above) and the premium to surplus ratio would remain constant. Thus the company would not assume any more (or less) risk in relation to its capacity. The company would utilize its entire net income to fund growth in insurance operations.

Since this return on equity was calculated for a zero inflation rate, the model company will increase written premium by increasing the number of exposures written. It is assumed that, with no inflation, the average premium on each exposure does not change. This calculation is used to determine the benchmark rate of return.

During inflation, it is assumed that the average premium per exposure increases in line with the inflation rate. Therefore, to maintain the same real growth in exposures

that would be achieved for no inflation, the written premium must increase by the compound effect of the inflation rate times the benchmark rate of return. The company would write the same number of exposures that it would have under no inflation, but each exposure generates an inflated premium. In order to maintain this growth rate without increasing the premium to surplus ratio, the rate of return on equity must increase as inflation increases.

The higher rate of interest that accompanies inflation contributes to the revised rate of return. The difference between the target rate of return and investment income must be produced by underwriting results. Therefore, the underwriting profit margin needed to achieve the same real rate of return as the benchmark calculation indicated can be determined.

Exhibit I illustrates this calculation. The ratios of investable assets to surplus, and net written and net earned premiums to surplus typify the insurance industry position in 1976 as profiled in Best's Aggregates and Averages for all stock companies. Given the highly leveraged position of investable assets 327% of surplus, net written premium 187% of surplus, and net earned premium 178% of surplus, the growth rate that would maintain the constant premium to surplus ratio if the entire net income were added to surplus would be 8.03%.

The second and third columns are calculated, from the bottom up, to determine the underwriting profit margin necessary to produce the same real growth in exposures written

as was achieved under the no inflation assumption and a 5% underwriting profit margin. The growth rate (and the return on equity) is determined by the following calculation:

(2) $(1 + I) \times (1 + B) - 1 = G_i$

I = inflation rate

B = benchmark growth rate (or return on equity) under no inflation

G_i = equivalent growth rate (or return on equity) under inflation rate i

The investment gain is determined, as before, by multiplying the interest rate times the investable assets. The necessary underwriting profit margin is calculated by working up the column. When interest rates go to 8%, with inflation increasing to 6%, in Exhibit I the same real growth rate would be a 14.51% nominal growth rate. To maintain the same premium to surplus ratio would require an underwriting profit margin of 0.98%. As interest rates rise to 14%, with inflation at 12%, the required underwriting profit margin becomes a negative 3.04%.

Therefore, under the industry position of 1976, as interest rates rise this model company can reduce the underwriting profit margins to maintain the same real return on equity. However, the industry was highly leveraged at the end of 1976 as a result of several consecutive years of heavy underwriting losses. A more typical situation may be a less leveraged position. The results depend heavily on initial financial position.

Exhibit II illustrates the same model company with the ratios of investable assets to surplus of 272%, net written

premium to surplus to 160%, and net earned premium to surplus of 153%. This typifies the industry position in 1970. The initial, no inflation, return is 6.81%. The same real rate of return is achieved for 8% interest rate with a 2.39% underwriting profit margin. For a 14% interest rate the underwriting profit margin is a negative 0.22%. With this less leveraged position, increases in the interest rates do not reduce necessary underwriting profit margins as much.

Exhibit III illustrates the same calculation on a model company representing the industry as of 1960. For this situation the underwriting profit margin needed to maintain the same real growth rate as achieved under no inflation and a 5% underwriting profit margin decreases very little as interest rates rise. With interest rates of 8%, the underwriting profit margin should be 4.49%. With interest rates of 14%, the underwriting profit margin should be 3.99%.

The purpose of this analysis is to document the relationship between interest rates and inflation rates and to illustrate that measurements of total return should not ignore the effect of inflation. This simplified model equates low interest rates and a 5% underwriting profit margin with the equivalent real rates of return, or growth, under higher interest, and inflation, rates. Depending on the actual (or desirable) leverage position of the insurance industry or company, reductions in underwriting profit margins can be made as interest rates rise. However, the effect is neither as simple, nor as great, as many analysts have proposed.

Exhibit I

Industry 1976

Investable assets	327			
Surplus	100			
Net written premium	187			
Net earned premium	178			
Interest rate		2%	8%	14%
Inflation rate		0%	6%	12%
Underwriting profit margin		5%	0.98%	(3.04%)
Underwriting gain		8.90	1.74	(5.41)
Investment gain		6.54	26.16	45.78
Gain before taxes		15.44	27.90	40.37
Net income		8.03	14.51	20.99
Return on equity or growth rate*		8.03%	14.51%	20.99%

*(1 + Return on equity) x (1 + Inflation rate) - 1

Exhibit II

Industry 1970

Investable assets	272			
Surplus	100			
Net written premium	160			
Net earned premium	153			
Interest rate		2%	8%	14%
Inflation rate		0%	6%	12%
Underwriting profit margin		5%	2.39%	(0.22%)
Underwriting gain		7.65	3.66	(0.33)
Investment gain		5.44	21.76	38.08
Gain before taxes		13.09	25.42	37.75
Net income		6.81	13.22	19.63
Return on equity or growth rate		6.81%	13.22%	19.63%

Exhibit III

Industry 1960

Investable assets	211			
Surplus	100			
Net written premium	111			
Net earned premium	108			
Interest rate		2%	8%	14%
Inflation rate		0%	6%	12%
Underwriting profit margin		5%	4.49%	3.99%
Underwriting gain		5.40	4.85	4.31
Investment gain		4.22	16.88	29.54
Gain before taxes		9.62	21.73	33.85
Net income		5.00	11.30	17.60
Return on equity or growth rate		5.00%	11.30%	17.60%

Appendix

The calculations involved in the model company illustration can be depicted algebraically as follows:

$$\frac{\frac{S((1+B)(1+I)-1)}{1-T} - A(I+M)}{EP} = U$$

S = surplus

B = benchmark rate of return = $\frac{(A \times M + EP \times .05) \times (1-T)}{S}$

I = inflation rate

T = tax rate

A = investable assets

M = real interest rate

EP= earned premium

U = underwriting profit margin

$$\frac{\frac{S(B+IxB+I)}{1-T} - A(I+M)}{EP} = U$$

$$\frac{S\left[\frac{(AxM+EPx.05)x(1-T)}{S} + Ix\frac{(AxM+EPx.05)x(1-T)}{S} + I\right] - A(I+M)}{\frac{1-T}{EP}} = U$$

$$\frac{AxM+EPx.05+IxAxM+IxEPx.05 + \frac{IxS}{1-T} - AxI - AxM}{EP} = U$$

$$\frac{.05xEP(1+I)+\frac{IxS}{1-T}-IxA(1-M)}{EP} = U$$

$$.05(1+I) + \frac{1}{1-T}I\frac{S}{EP} - (1-M)I\frac{A}{EP} = U$$

For this model T = .48 and M = .02, yielding

$$.05(1+I) + \frac{1}{.52}I\frac{S}{EP} - .98I\frac{A}{EP} = U$$

By putting the relationship in this format it can be seen that the underwriting profit margin equivalent to a 5% margin with no inflation:

1. increases as the ratio of surplus to earned premium increases;
2. increases as the tax rate increases;
3. decreases as the ratio of assets to earned premium increases;
4. and increases as the real interest rate increases.

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