

ASSET MANAGEMENT FOR REGULATED ENTERPRISE
UNDER CONDITIONS OF UNCERTAIN PRICE CHANGE:
THE CASE OF THE PROPERTY-CASUALTY COMPANY

by

James E. Walter

Working Paper No. 6-78

RODNEY L. WHITE CENTER
FOR FINANCIAL RESEARCH

University of Pennsylvania

The Wharton School

Philadelphia, Pa. 19104

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INTRODUCTION

This paper assesses the interaction among losses and expenses on insurance written, leverage employed and investment performance for a sample of 25 property-casualty companies during the decade ending 1976 and evaluates the impact of regulation and other factors upon internal profitability and market performance and risk. The period in question witnessed the concurrent emergence of double-digit inflation and adverse stock market behavior. In a single year, 1974, the property-casualty industry lost some 26% of its total surplus.¹

Industry Features

Property-casualty stock companies represent the intriguing case of profit-oriented enterprises whose normal conduct of business generates both investible funds and attendant liabilities. The liabilities incurred are short to intermediate term in character, but--unlike straight debt--are not precisely fixed in monetary units. Although the reserves established are actuarially grounded in actual loss experience, notable differences may exist between ex ante and ex post liabilities.

Profits accrue from three principal sources: (1) underwriting margin, that is, the difference between premiums earned and insurance losses and

¹"A Close Call," Forbes, April 15, 1976, p. 30.

expenses, (2) interest and dividend income, and (3) gains or losses on investments. The impact of unanticipated variations in underwriting margin, per dollar of net premiums earned, upon profitability, per dollar of net worth, is magnified by the leverage element inherent in the ratio of net premiums earned to net worth. The effect of interest and dividend income, per dollar of invested assets, upon return on equity in turn is accentuated by the step-up factor implicit in the ratio of total investments to net worth. The visible influence of unrealized gains or losses on investments upon earnings is minimized by the exclusion of unrealized gains or losses from periodic income and the valuation of non-equity investments at par or amortized cost.

Regulation by state insurance commissioners affects profitability through standards of solvency that must be maintained, restrictions on investments, and approval of premium rates. As evidenced by the NAIC Early Warning System, which assigns companies falling outside the acceptable range on four or more of eleven audit ratios to priority classification, regulation concerns itself with departures from the norm. More than half of the states continue to require prior approval of most or all premium rates. Delays in obtaining regulatory relief can be substantial.

State regulation--by providing antitrust immunity under the McCarran-Ferguson Act--may foster higher average underwriting margins than would prevail under a fully competitive environment. Indeed, prior studies [2,5] draw the analogy between the expansion of premium volume with positive underwriting margins and borrowing at negative or zero cost. Should this analogy be valid and should underwriting margins be uncorrelated with investment performance, incremental profitability per dollar of equity funds is limited only by solvency constraints and the ability to generate added

The Competitive Solution.

In the absence of regulatory or other barriers to competition, competitive forces should tend to equate the market values of property-casualty shares with the book values thereof [3]. For one thing, the assets held by property-casualty companies are readily marketable for the most part. For another, book values reasonably approximate the market values of the underlying assets over longer periods, provided no trend is inherent in nominal interest rates. The remaining condition is that unearned premium and loss reserves fairly reflect the expected value of claims.

Competitive equilibrium obtains when the return on equity capital equals the market return required by investors for assuming comparable risks. Any capitalized value of the anticipated earnings stream (as reflected in the market value of the company's stock) in excess of the current value of the assets contributed motivates the further injection of capital, which--under standard supply-demand assumptions--brings capitalized value into line with asset value.

To the end of evaluating the extent of departure from the competitive mold occasioned by regulation and--perhaps--other factors [cf. 4], the treatment that follows looks, first, into the internal growth and profitability and group characteristics of the sample of 25 property-casualty companies. Attention is then directed to the interactive effects of uncertain price change, and to the association between market and book values. Uncertain price change, it is hypothesized, may give rise to correlated underwriting and investment returns that belie the independence assumption made by certain other authors [2,5]. A further possibility raised implicitly by Schlarbaum [6] is that the regulatory environment may concurrently foster positive underwriting margins and inefficient investment practices; the latter offsetting the former.

The view taken, based upon the competitive outcome, is that the relation between stock value in the market place and book value reflects the net shareholder benefit attributable to the umbrella of regulation (including

... from anti-trust). The benefit derived in the form of higher rates

than might obtain under competition may be partly or wholly offset by regulation-induced volatility in profitability, interaction between loss and expense ratios and investment returns, and below-average investment performance.

The Sample

The sample itself consists of 18 stock companies whose primary business is property and casualty insurance, two firms whose principal emphasis is upon the reinsurance of property-casualty risks, and five life-oriented corporations that feature a mix of property-casualty and life business. The latter group includes two of the largest writers of property-casualty insurance.

The sample companies are almost evenly divided among those with net premiums written (1976) in excess of one billion dollars, those with net premiums written between \$500 million and one billion dollars, and those with net premiums written between \$100 million and \$500 million. Two firms had net premiums written of less than \$100 million. All told, the sample accounted for nearly two-fifths of the property-casualty premiums written in 1976.

Unless otherwise stipulated, the raw data are drawn from annual reports, Moody's Banking and Finance, Best's Insurance Reports--Property and Liability Insurance Edition, and Value Line.

INTERNAL GROWTH AND PROFITABILITY

Profitability per dollar of equity funds invested in the property-casualty business approximately equals

$$(1) \quad \bar{m} \cdot L_1 + i \cdot L_2 - \bar{T} / \bar{I} + g,$$

where m is the underwriting margin, defined as one minus the combined loss and expense ratio, i is the ratio of interest and dividend income to total investments, L_1 is the ratio of net premiums earned to net worth, L_2 is the ratio of total investments to net worth, T is the applicable corporate

tax rate, and g is the tax-adjusted ratio of realized and unrealized capital gains or losses to net worth. The internal growth factor is the same equation, adjusted for dividend payout, that is:

$$(2) \quad \bar{m} \cdot L_1 + i \cdot L_2 \frac{\bar{l} - \bar{T}}{\bar{l} - \bar{p}} + g,$$

where p is the dividend payout ratio.

Internal Growth

For the typical property-casualty company sampled, growth in net worth (book value per share) is largely explained by leveraged investment income. The median net investment income, taken as a ratio to total investments and averaged for the decade ending 1976, was 4.5% for 13 major companies. The corresponding figure for 1976 was 5.1%.

The applicable leverage factor (L_2), based upon the 1976 median for the sample exclusive of the five life-oriented companies, was 3.2. Given these values for i and L_2 , return on net worth attributable to investment income alone lies in the 14.4%-to-16.3% range for the average property-casualty company.

The leveraged underwriting margin is of secondary significance in accounting for growth in net worth. Combined loss and expense ratios, averaged over the decade, ranged from 90.7% to 104.4% for the sample firms. The group median was 98.4%, implying an underwriting margin of 1.6%. Of the eight companies whose average loss and expense ratios exceeded 100%, five belong to the life-oriented component of the sample.

The step-up fraction (L_1) for the underwriting margin, taken as the product of the median ratio of net premiums written to reserves (.84) for 1976 and the median ratio of reserves to net worth (2.73) for 1976, was

2.293 for the 20 sample companies whose business is principally non-life.²
The equivalent leverage factor for the life-oriented subgroup was 2.83.

For the property-casualty group, an underwriting margin of 1.6% augments return on net worth by some 3.7%. For the life-oriented group characterized by median underwriting losses of 1.4%, the negative contribution approximates 4.0%.

Tax-adjusted realized and unrealized gains and losses tend to diminish net worth. Despite a median market sensitivity of only .714, median annual losses (geometric mean) for the decade in question were -.81% [Table 17]. The range was from -3.68% to 3.71% for 16 sample companies.

In summary, elements of internal growth, based upon median values, are as follows:

<u>Item</u>	<u>Contribution to Growth in Net Worth</u>
(1) Investment Income $\sqrt{.045} \times 3.2\sqrt{A}$.1440
(2) Underwriting Margin $\sqrt{.016} \times 2.293\sqrt{B}$.0367
Subtotal	.1807
(3) Tax adjustment $\sqrt{.178}^C \times .1807\sqrt{}$	(.0322)
	.1485
(4) Dividend Payout $\sqrt{.30}^D \times .1485\sqrt{}$	(.0446)
Growth Rate before Realized and Unrealized Capital Gains	.1039
(5) After-tax Capital Gains Rate	(.0081)
Internal Growth Rate	.0958

- A. Median Ratio of Investments to Net Worth for 1976: 3.2;
B. Median Ratio of Net Premiums Written to Net Worth for 1976: 2.293;
C. Median Tax Rate for 1976: .178;
D. Median Dividend Payout Ratio [5-year average]: .30;
E. Median geometric mean of after-tax realized and unrealized gains,
divided by lagged net worth: (.81)%.

²The figure used for net worth is that based upon generally accepted accounting principles. Statutory net worth ignores deferred acquisition costs and deferred taxes. The 1976 median ratio of net worth (statutory) to net worth (GAAP) was .731 for 19 sample companies.

Table 1

Annual Capital Gains and Sensitivity Coefficient
for Sixteen Companies: 1966-76

Company	Number of Years	Tax-adjusted Realized and Unrealized Gain (Geometric Mean)	Regression Coefficient (DJIA)
Aetna	9	(1.47)%	.606
American General	8	3.71	.768
Chubb	9	(1.08)	.764
CNA	8	(3.54)	.731
Connecticut General	10	(1.59)	.334
Continental	9	.92	1.136
Crum & Forster	10	(3.49)	1.235
Employers Casualty	9	.74	.322
ERC	7	(.43)	.572
GEICO	8	1.53	1.400
General Reinsurance	10	(2.02)	.666
INA	10	(.53)	.573
NN	8	(1.16)	.697
Safeco	10	1.01	1.014
St. Paul	9	(3.68)	1.037
Travelers	10	.003	.344
Median		(.81)	.714

Growth and Systematic Risk

For the decade ending 1976, the median growth rate in book value per share was 9.6%, almost identical with the constructed figure above. The range was from -11.5% to 23.3%. In contrast, the median rate of appreciation in stock price was 6.2% for the sample companies, with the range from -9.7% to 22.5%. The DJIA grew at a mere .1% per annum.

Associated with superior growth in stock price was above-average systematic risk for the property-casualty group. Regressions of annual stock price relatives on the DJIA market relatives gave rise to mean and median beta values (regression coefficients) of 2.136 and 2.027 respectively. Regressions of book value relatives on the DJIA market relatives in turn yielded mean and median beta values of .972 and .899 respectively.

Interperiod variations in the rate of internal growth were heavily influenced by fluctuations in the underwriting margin and the common stock portfolio and by their positive covariance. Investment income tended to rise almost monotonically with asset growth. Non-equity investments, valued at par or amortized cost, had little impact.

Intradecade Changes

As evidenced by Table 2, two notable--and at least partly offsetting--changes have occurred in the risk posture of property-casualty companies during the four years ending 1976. One, ratios of common stocks held to net worth dropped sharply. The median value for 22 companies was 42.1% at the end of 1976, as compared with 85.3% and 82.2% for 1968 and 1972 respectively.

Two, leverage--as reflected in the ratio of net worth to total assets--increased markedly. Median values for 1976 ratios of net worth to total

Table 2

Ratios of Common Stock to Net Worth and Percentage Change in Net Worth to Total Assets, for 22 Property-Casualty Companies: Selected Dates

Company	Ratio of Common Stocks Held to Net Worth			1976 Ratio of Net Worth to Total Assets as a Per Cent of That for:	
	1968	1972	1976	1968	1972
	Aetna	68.5%*	76.1%*	34.6%	79.2%
American General Ins.	136.1	82.2	61.2	97.8	61.0
American Intl. Group	N.A.	98.0*	39.5	N.A.	90.6
Chubb	63.1	92.0	45.3	51.3	76.3
CNA	92.9	69.9	8.7	64.0	60.9
Connecticut General	61.9*	59.3*	27.5*	131.0	143.6
Continental	136.1	119.8	98.3	74.8	78.5
Crum & Forster	78.2*	93.8	70.7	52.4	67.3
Employers Casualty	56.4	48.0	34.6	84.7	80.5
ERC	83.6	70.8	44.0	48.9	58.7
GEICO	85.3	69.6	-	50.0	49.2
General Reinsurance	88.7	86.3	58.7	74.6	85.2
INA	103.4*	88.0	39.6	34.0	45.7
Mission Equities	N.A.	56.2	41.1	116.1	71.5
NN	109.3*	77.7	38.4	66.4	60.6
Ohio Casualty	81.4	55.4*	43.2	76.0	83.3
Republic Financial	N.A.	79.5*	42.1	84.0	76.3
Safeco	46.0	86.1	67.9	64.2	86.2
St. Paul	88.3	119.6	55.9	55.2	60.5
Travelers	61.7	59.5	14.5	85.2	81.2
U.S. F. & G.	105.5	135.9	119.2	59.3	64.9
Western Casualty	109.4	94.9	27.9	133.1	97.6
Median	85.3%	82.2%	42.1%	75.4%	76.3%

*Preferred stock not separately identified.

assets--increased markedly. Median values for 1976 ratios of net worth to total assets, expressed as a percentage of the corresponding ratios for 1968 and 1972, were respectively 75.4% and 76.3%.

The fact that systematic risk, based upon weekly and monthly stock price relatives, tended to rise between the end of 1971 and mid-1977, may suggest that leverage is a more powerful factor affecting risk than the proportion of stock in the investment portfolio. Mean and median values for weekly and monthly betas of the sample property-casualty companies are given below for the two dates:³

<u>Price Relative (Interval)</u>	<u>Beta Values for:</u>			
	<u>December, 1971</u>		<u>June, 1977</u>	
	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>
Weekly	1.165	1.055	1.369	1.410
Monthly	.988	1.010	1.224	1.230

UNCERTAIN PRICE CHANGE

Interperiod variation in underwriting margin is heavily dependent upon the magnitude of unanticipated price change. Rate adjustments, based upon accumulative historical evidence, often require prior regulatory approval before implementation. Lags also exist between the collection of loss and expense data and their reflection in new rates, between the receipt of premiums and occurrence of losses, and between the incidence of the accident and the date of settlement. Further delays are attributable to staggered renewals.

Should--as is likely to be the case--stock values be adversely affected by inflation, the separation principle will fail to hold between debt incurred through net premiums written and the equity component of the

³Common Stock Risk Measures, Rodney L. White Center for Financial Research, The Wharton School.

property-casualty portfolio. Inferences drawn from direct comparisons with the capital market line hence may be suspect.

Initial Period Response and Rate of Adjustment

The regression of industry combined loss and expense ratios (C_t) on current-period price-change relatives (I_t) suggests noteworthy responsiveness to price change, as follows:

$$(3) \quad C_t = 1.3366I_t - .4064, \quad \bar{R}^2 = .725 \\ (2.8469) \quad (1.2238)$$

Parallel regressions for 20 sample companies feature a median regression coefficient of 1.08.

The before-tax impact of inflation-induced variations in loss and expense ratios on return on book value per share (ROB) is magnified by the underwriting leverage factor. Given the sample median of 2.293 for underwriting leverage and the median regression coefficient of 1.08, an increase in the rate of price-change from--say--6% to 8%, diminishes ROB by $2.293 \times 1.08 \times .02$ or 4.95%. Application of the industry coefficient (1.3366) elevates the negative impact on ROB to 6.13%.

Multiple regression coefficients for current and lagged price-change relatives, shown in Table 3, demonstrate that the direct association between C_t and I_{c-i} attenuates rapidly. Regression coefficients, generally positive for I_t and I_{t-1} , feature sign reversals for I_{t-2} . Comparisons of \bar{R}^2 for one-period, two-period and three-period regression models further reveal that I_{t-1} and I_{t-2} contribute relatively little to the explanation of C_t .

Table 3

Regressions of Combined Loss-Expense Ratios on Consumer
Price Relatives, 1977-1976

Company	Multiple Regression Coefficients for Consumer Price Relatives Lagged				
	No Lag	One period	Two- periods	\bar{R}^2	D-W
Chubb	1.384 (2.101)	.360 (.393)	-.536 (-.672)	.549	1.562
Continental	.569 (1.130)	.698 (.971)	-.107 (-.176)	.510	1.053
Crum & Forster	.605 (1.206)	.641 (.894)	-.436 (-.719)	.417	.834
Employers Casualty	-.191 (-.331)	1.742 (2.116)	-1.548 (-2.220)	.364	2.293
GEICO	.196 (.252)	3.353 (3.024)	-.148 (-.158)	.846	1.551
INA	.700 (1.693)	.734 (1.244)	-.441 (-.883)	.635	1.227
Mission Equities	.181 (.282)	1.471 (1.609)	-.901 (-1.163)	.381	1.617
NN	.591 (1.251)	.919 (1.515)	-.492 (-.859)	.683	.978
Ohio Casualty	.369 (.827)	1.085 (1.706)	-.366 (-.679)	.621	1.145
Republic Financial	.641 (.689)	1.552 (1.335)	-1.039 (-.925)	.500	1.269
Safeco	2.258 (6.423)	.170 (.338)	-.536 (-1.263)	.914	2.477
St. Paul	.591 (.921)	1.258 (1.374)	-1.269 (-1.637)	.459	.850
U.S.F. & G.	.173 (.709)	1.377 (3.944)	-.937 (-3.167)	.833	2.740

Continued on next page

Table 3--Continued

Company	Multiple Regression Coefficients for Consumer Price Relatives Lagged			\bar{R}^2	D-W
	No Lag	One- Period	Two Periods		
Western Casualty					
ERC	.974 (2.291)	.711 (1.339)	-.057 (-.111)	.811	2.365
General Reinsurance	.804 (2.197)	.023 (.043)	-.122 (-.275)	.481	1.218
Aetna	.079 (.166)	1.040 (1.533)	-1.500 (-2.610)	.447	1.736
CNA	4.543 (7.158)	-2.792 (-3.428)	2.946 (3.834)	.891	1.778
Connecticut General	-.209 (-.452)	1.988 (3.019)	-1.702 (-3.052)	.596	2.122
Travelers	.758 (1.608)	.690 (1.025)	-.327 (-.573)	.587	.964
Industry	.883 (1.854)	.747 (1.221)	-.371 (-.644)	.732	.774

* \bar{F} - statistic in parentheses.

Relation to Portfolio Values

Interperiod variation in ROB is accentuated by a negative association between common stock values and inflation. The regression of DJIA relatives ($R_{(DJ)}$) on price-change relatives (I) shows:

$$(4) \quad R_{(DJ)}_t = 2.9857 - 1.8729I_t, \quad \bar{R}^2 = .176$$

(2.67) (-1.77)

Losses on equity investments of property-casualty companies thus are likely to occur jointly with above-normal combined loss and expense ratios (or below-par underwriting margins). Specifically, the correlation coefficient for $R_{(DJ)}$ and the industry combined ratio is -.49.

The inflation factor also operates on bonds and other fixed income investments held in property - casualty portfolios. Although accounting conventions confine attention to amortized cost, the market values of such assets vary inversely with nominal interest rates. The latter in turn reflect inflation expectations. For the decade ending 1976, the correlation coefficient for yields on Aaa bonds and price-change relatives is .66.

In brief, the visible variance (V_v) of ROB is roughly approximated by

$$(5) \quad V_v = L_m^2 \sigma_m^2 + L_s^2 \sigma_s^2 + 2L_m L_s \sigma_{ms},$$

where L_m is the ratio of net premiums earned to net worth, L_s is the ratio of common stock holding to net worth, σ_m^2 is the variance of the underwriting margin, σ_s^2 is the variance of the return on common stocks, and σ_{ms} is the covariance between m and s. Assessment of total variance (V_T) entails the inclusion of the bond variance term (σ_b^2) and two covariance terms (σ_{mb} and σ_{sb}); that is

$$(6) \quad V_T = V_v + L_b^2 \sigma_b^2 + 2L_m L_b \sigma_{mb} + 2L_s L_b \sigma_{sb},$$

where L_b is the ratio of fixed income investments to net worth. The covariance terms equal the products of the correlation coefficient and the respective standard deviations, e.g., $\sigma_{mb} = \sigma_m \cdot \sigma_b \cdot r_{mb}$.

For the one company (Safeco) which reported stockholders' equity at (1) cost, (2) mixed cost and market and (3) market, both the standard deviations of ROB and the corresponding book beta values suggest notable divergence between V_v and V_t . The figures for the decade ending 1976 are:

<u>Equity Valuation Method</u>	<u>Standard Deviation</u>	<u>Book Beta Value</u>
1) Cost	5.24%	.397
2) Mixed Cost-Market	6.19	.733
3) Market	26.93	1.432

Our own estimates, based upon median values and industry data for the same period come to 12.33% for $\sqrt{V_v}$ and 20.69% for $\sqrt{V_t}$. Interdependence, attributable principally to the inflation factor, accounts for more than one-fourth of $\sqrt{V_t}$.

MARKET VERSUS BOOK VALUE

The dual leverage aspect of the property-casualty business, taken together with the negative interest (or positive underwriting margin) factor, supports the notion that property-casualty underwriting has value in excess of the net assets invested. That the market has concurred is evident from tendency shown by the sample companies for ratios of stock price to book value per share to exceed one for the decade as a whole.⁴ Their decade median was 1.36.

⁴The presumption in using unadjusted book value as a measure of net asset value is that biases in allocations to insurance reserves are offset by those inherent in the valuation of non-equity investments at cost.

The fact that the median price-to-book ratio had dropped to .90 by 1976 may indicate temporarily changed investor expectations due to adverse performance in recent years. The lower ratio may also reflect investor beliefs that the barriers to price competition which permitted excess profitability in the past are transitory in character and that the inflation factor has become increasingly relevant.

As might be expected, the regression results described below are consistent with the proposition that appreciation in stock price is significantly related to growth in net worth. The connection between external (market) betas and internal (book) betas is less apparent. The price-to-book ratio appears to be influenced more by growth in book value than by internal beta values.

Appreciation in Stock Price

The longer-period appreciation in stock price tends to be associated closely with longer-run growth in book value per share. The cross-section regression of 10-year rates of appreciation in stock prices on 10-year growth rates in book value for 25 companies, given below, features a regression coefficient that approaches .8.

$$(7) \quad G_{(P)} = .0013 + .7930 G_{(B)} , \quad \bar{R}^2 = .625 \\ \quad \quad \quad (.093) \quad (6.408)$$

where $G_{(P)}$ and $G_{(B)}$ are respectively the geometric mean growth rates in stock price and per-share book value (1966-76).

Beta Values

External and internal beta values are linked together, but much less closely than the association between decade growth rates. The cross-section regression that relates stock price betas $[\beta_{(P)}]$ to book value betas $[\beta_{(B)}]$ for 25 companies is:

$$(8) \quad \beta_{(P)} = 1.5283 + .6194 \beta_{(B)} , \quad \bar{R}^2 = .051 \\ \quad \quad \quad (3.32) \quad (1.52)$$

The beta values are based upon regressions of year-end price or book value relatives on corresponding DJIA relatives.

Whether the foregoing least squares equation measures the true interaction between market and book betas is open to question. For one thing, the \bar{R}^2 is deplorably low. For another, asset valuation procedures dampen interperiod variability in net worth. Had non-equity investments been recorded at market, net worth for the median firm would have been some 22% lower (before tax adjustment) than reported for 1975 and 1.7% higher (before tax adjustment) for 1976.

As illustrative of the potential impact of valuation procedures upon net worth, the eleven-year average deviation of stockholders' equity with securities valued at cost from that with securities valued at market (adjusted for taxes) was 15.3% for Safeco. Market exceeded cost in six years and fell below cost in five years.

The Price-to-Book Ratio

As evidenced by Table 4, which summarizes regression results for 18 companies, the price-to-book ratio shows mixed response to current period book relatives and generally positive response to book relatives lagged one period. In neither instance are the t-statistics and \bar{R}^2 impressive.

Cross-section regression analysis, based upon a sample of 20 companies, is more informative. Median price-to-book ratios (\bar{P}/\bar{B}) are positively associated with internal growth and internal betas. The t-statistic for the betas leaves their relevance in doubt. The regression equation is:⁵

$$(9) \quad \bar{P}/\bar{B} = .6495 + 6.2243G_B + .0838A_B, \quad \bar{R}^2 = .457$$

(2.61) (4.11) (.43)

⁵The corresponding equation, using growth in stock price (G_M) and market betas (β_M) is:

$$\bar{P}/\bar{B} = 1.1596 + 4.1361G_M - .0699\beta_M, \quad \bar{R}^2 = .176$$

(4.44) (2.45) (-.71)

Table 4

Linear Regression of Price-Book Ratios on Book Value Relatives:
10 Years Ending 1976

Company	Median Price to Book Ratio	Regression Coefficient		T-Statistic		\bar{R}^2	
		No Lag	1-Period Lag	No Lag	1-Period Lag	No Lag	1-Period Lag
CEICO	5.02	-1.827	.281	-1.399	.173	.097	.000
General Reinsurance	2.70	-2.102	.808	-.825	.296	.000	.000
Mission Equities	2.04	-.665	1.039	-.808	1.231	.000	.054
Safeco	1.86	1.787	3.774	1.265	2.371	.057	.340
Connecticut General	1.71	-1.072	-1.599	-1.012	-1.539	.003	.146
Ohio Casualty	1.54	1.270	-.109	1.289	-.097	.069	.000
St. Paul	1.43	-.731	-.142	-1.450	-.237	.109	.000
Travelers	1.43	-.101	.632	-.157	2.075	.000	.293
ERC	1.41	.022	2.32	.014	1.638	.000	.251
Chubb	1.28	.311	.286	.423	.459	.000	.000
CNA	1.25	-.595	.159	-1.443	.517	.134	.000
American General	1.18	-.710	.406	-1.106	.744	.022	.000
U.S. F. & G.	1.11	-.426	-.374	-1.712	-1.366	.162	.088
Aetna	1.11	-.170	.796	-.182	1.216	.000	.051
INA	.95	.179	.322	.589	1.018	.000	.005
Continental	.88	-.262	-.011	-1.185	-.040	.043	.000
Crum & Forster	.83	.015	.116	.042	.433	.000	.000
Republic Financial	.78	1.166	1.008	1.348	1.008	.120	.084

Cross-section regression analysis that relates price-to-book ratios at the end of 1976 to the same independent variables as before produces a conceptually more plausible sign for the beta coefficient. The regression equation is:⁶

$$(10) \quad (P/B)_{76} = 1.0517 + 2.0752G_B - .1959\beta_B, \quad \bar{R}^2 = .024$$

$$\quad \quad \quad (4.17) \quad (1.35) \quad (-.98)$$

Interpretation of these cross-section regression equations is interesting. Equation (7), with median price-to-book as the dependent variable, indicates that price equals book value per share for the typical firm with a median internal beta of .899 when G_B is 4.42%. The implied total return to achieve parity (obtained by dividing 4.42% by one minus the dividend payout ratio) is 6.32%.

The positive sign associated with the regression coefficient for the internal beta may reflect an option-like characteristic of property-casualty common stocks. Not only do such stocks have the present value of the expected income stream as an element of value, but they also afford investors a chance at higher returns through fluctuating asset (stock) and claim values. The low t-statistic precludes our making this point strenuously.

Equation (8), with 1976 price-to-book as the dependent variable, features more conventional signs. Parity of stock price with book value per share for the standard company with median beta of .899 is attained when G_B is 6.00%. The implied total return is 8.57%.

⁶The corresponding equation with growth in stock price (G_M) and market betas (β_M) as in dependent variables is:

$$(P/B)_{76} = 1.1937 + 3.3007G_M - .1819\beta_M, \quad \bar{R}^2 = .385$$

$$\quad \quad \quad (6.99) \quad (2.99) \quad (-2.81)$$

The negative sign associated with the beta coefficient is consistent with risk aversion on the part of investors. The shift in sign from the former regression equation suggests a reassessment of risks in the light of adverse stock market performance and positive correlation between underwriting margin and portfolio performance.

Regressions of price-to-book ratios on internal growth, adjusted for five-year average dividend payout (p) and internal betas, yield roughly comparable results. The equation featuring median price-to-book ratios as the dependent variable is:

$$(11) \quad (\bar{P}/\bar{B}) = .5112 + 4.8877 \left(\frac{G_B}{(1-p)} \right) + .1474 \beta_B, \quad \bar{R}^2 = .281$$

(1.55) (2.94) (.66)

That with 1976 price-to-book ratios as the dependent variable is:

$$(12) \quad (P/B)_{76} = 1.0825 + 1.0285 \left(\frac{G_B}{(1-p)} \right) - .1686 \beta_B, \quad \bar{R}^2 = .000$$

(3.59) (.68) (-.82)

Total return figures necessary to equate (\bar{P}/\bar{B}) and $(P/B)_{76}$ with one are respectively 7.28% and 11.97%.

The foregoing regression models bear some resemblance to the Litzenberger-Rao model adopted by Foster [1] in his analysis of valuation parameters for property-liability companies. Our supposition, based upon the proposition that price should equal book value under fully competitive circumstances, is that the required rate of return can be estimated by setting the price-to-book ratio equal to one and solving the regression equation. Our choice of independent variables in turn presumes that investors base their earning expectations on the growth rate in book value per share, which encompasses unrealized appreciation in stock values, with due allowance for dividend payout.

SUMMARY AND CONCLUSIONS

State regulation of property-casualty companies has not been unduly restrictive. Despite adverse underwriting and investment experience in 1974 and 1975, book value per share for the median company grew at an annual rate of 9.6% during the decade ending 1976. The stock price for the median firm in turn appreciated at a yearly rate of 6.2%, in sharp contrast with the .1% rate of change in the DJIA.

The key elements of internal growth and profitability were leveraged investment income and--to a much smaller degree--leveraged underwriting margin. Less than effective asset management occasioned realized and unrealized capital gains (after tax) at a negative annual rate of -.81% for the median company.

Although of limited duration, delays in obtaining rate relief due to the regulatory process and other considerations resulted in unexpectedly high loss and expense ratios during 1974 in particular, at the very time that inflation was adversely affecting the stock market. The consequence was a notable reduction in the holding of common stock by property-casualty companies, not to mention augmented leverage.

The price-to-book relationship, hypothesized to be a valid measure of the excess value created by state regulation and anti-trust exemption, is significantly influenced by the growth rate in book value per share. The role of the internal (book) beta is, however, much less clearly established. Mediocre ~~t~~-statistics and R^2 notwithstanding, regression equations that relate price-to-book to internal growth and risk for the sample companies give plausible estimates of the return on book required to achieve parity

between share price and book value. The dividend adjusted range for the entire decade is 6.32% to 7.28%; that for 1976 is 8.57% to 11.97%.

For most of the decade ending 1976, the market apparently concurred with the proposition that the benefits of state regulation outweigh its demerits. The sharply lower ratio of price to book value observed at the end of 1976 may indicate that investors were no longer certain as to the net benefits.

Appendix A

Selected Statistics for Twenty-Five Property-Casualty Companies

Company	Price / Median	Book 1976	Book Growth	Book Beta	Capital		Dividend Payout	Price Growth	Price Beta
					Gains Beta	Beta			
Mission Equities	2.04	.92	.233	1.727		.156	.1799	5.224	
American Financial	2.10	1.16	.195	1.951		.065	.2252	2.442	
General Reinsurance	2.70	2.47	.152	.819	.666	.051	.1718	1.723	
Ohio Casualty	1.54	1.39	.149	.464		.295	.1278	.609	
Safeco	1.86	1.22	.146	.733	1.014	.309	.1093	1.566	
Travelers	1.43	.89	.135	.722	.344	.329	.0129	2.253	
Connecticut General	1.71	1.17	.113	.662	.334	.166	.0555	2.081	
Republic Financial	.78	.68	.125	1.133		.306	.1487	4.309	
Employers Casualty	.76	.84	.097	.483	.322	.247	.1160	3.436	
Western Casualty	.86	.86	.096	.566		.192	.0626	2.829	
ERC	1.41	.71	.093	.980	.572	.205	(.0267)	3.209	
Aetna	1.11	.90	.082	.677	.606	.442	.0408	1.949	
Chubb	1.28	1.26	.044	1.102	.764	.523	.0974	.863	
St. Paul	1.43	1.42	.058	1.185	1.037	.245	.0613	1.507	
American General	1.18	.71	.072	2.057	.768	.247	(.0123)	2.027	
Continental	.88	.89	.037	1.452	1.136	.576	.0571	1.545	
U.S. F. & G.	1.11	.81	.041	1.193		.706	.0519	1.843	
Crum & Forster	.83	.90	.040	.899	1.235	.500	.1047	1.390	
INA	.95	.95	.025	.849	.573	.573	.0089	1.555	
NN	.83	.86	.006	1.013	.697	.811	.0443	3.078	
Statesman	N.A.	.67	.1005	(.122)			.0397	(.652)	
American International	4.10	2.36	.1391	1.236			.0988	2.317	
Colonial Penn	2.93	2.17	.1475	.094			.1256	2.211	
GEICO	5.02	4.41	(.0903)	.476	1.400		(.0972)	2.404	
CNA	1.25	1.25	(.1152)	2.178	.731		(.0894)	1.682	

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