PROFITABILITY IN THE PROPERTY AND LIABILITY INSURANCE INDUSTRY

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ABSTRACT

The purpose of this article is to determine how profitable property and liability insurance companies have been over the period 1953-1967. The technique used is based on a risk-return-trend analysis. Four random samples and one selected sample of insurance companies are compared with 622 major industrial corporations through the use of a risk-return-trend indifference plane. It was found that insurance companies earned profits on a par with those earned by the major industrials. Among insurance companies, automobile underwriters did considerably better than multiple-line or fire and allied line underwriters. The data indicated that within the insurance industry there are economies to scale in degree of specialization and size.

An important controversy exists over the size of property and liability insurance profits. The industry contends the profits in the past have been subnormal and that rates charged for coverage have been insufficient.[1] Critics contend that profits have been at least normal and that any adjustments to increase profits should be reflected in improved utilization of assets. Under most conditions, the question of past profits would be relatively unimportant. In the case of the insurance industry, however, the alleged lack of profits is being used as the rationale for rate increases. Thus, the study of insurance profits is important because the results can strongly affect consumer prices.

The purpose of this article is to present a profit study of the insurance industry centered around a risk-return-trend analysis. The study will show that insurance companies, on the average, are earning normal profits. The article is divided into three parts: (1) reasons why the question of insurance profits has been so difficult to unravel, (2) a theoretical framework for the risk-return-trend analysis, and (3) empirical results.

A Basis for Profit Comparison

Past studies of inter-corporate profits have been severely restricted because of the difficulty in getting comparable data. This is the direct result of the wide latitude allowed in accounting methods used by individual companies to determine their profits. Since accounts are based on original costs, it is rare that long term assets or even inventory reflect current value. The variations possible in adjusting historical costs, even within an industry, mean that profit comparisons based on book values require tedious reconstruc-

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[1] The industry position is best described in Arthur D. Little, Inc. "Prices and Profits in the Property and Liability Insurance Industry, A report to the American Insurance Association," 1968.

tion in order to approach equality. Past studies have generally relied on the averaging out of inter-corporate accounting differences, partially through the technique of grouping companies into industries.[2] Still the use of book values must be viewed as a temporary expedient to be used in anticipation of improved methods of accounting or analysis.

When insurance companies are compared to non-insurance companies, difficulties are increased because superimposed on book value distortions are three additional problems unique to insurance companies. These are:

1. Assets carried at market: Non-current assets of insurance companies which consist of securities of other corporations are carried at market; [3] whereas, in non-insurance companies these assets are carried at historical cost less depreciation (book value). Thus, insurance companies will show a deteriorating return on investment relative to non-insurance companies over time, provided fixed assets are either stable or increasing. Since over the last 8 years the economy has been expanding, one would expect an analysis of profit based on book values to show insurance companies relatively unprofitable.[4]

2. Liability accounts: Insurance company liabilities consist of unearned premiums and loss reserves which are each 45 percent of total liabilities. Unearned premiums are not future claims in the usual sense but rather represent revenues which will be allocated to future periods. By convention, this account is 35 percent to 40 percent overstated on the average.[5] Loss reserves are estimates for future claims payments. They are primarily short-term and represent non-interest bearing funds held by insurance companies for claimants. It is not correct to compare these liability accounts with the liability accounts of non-insurance companies.

3. Organizational structure: Organizationally, insurers are either stock corporations, mutuals or reciprocals. Mutuals and reciprocals issue no securities; still, they are extremely important, for they write approximately 37 percent of all premiums. In areas such as automobile insurance they are dominant. The 20 largest non-stock companies write 50 percent of all automobile premiums. As a result they must be included in a study of insurance profits.

As yet, there is no single technique which can overcome all of the difficulties in getting both insurance and non-insurance company data on a comparable basis. Nevertheless, the use of market values, rather than book values, to equalize the variations in valuation between companies offers the most promise, and that is the technique used in this study.

The use of market values requires three assumptions: the market in which the securities trade is competitive; there are no important discontinuities in the market; and purchasers are rational. These assumptions do not require a perfect market and seem to be generally met in the sample used here. It is suggested that the

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[2] Stigler, G.J., *Capital & Rates of Return in Manufacturing Industry,* Princeton University Press, 1963.

[3] Bonds are carried at amortized cost.

[4] Let A_{at} = long-term assets of insurance companies at time, t.

A_{bt} = long-term assets of non-insurance companies at time, t.

r = return; D = accumulated depreciation
Then r/A = ROI

Assume returns and initial assets for insurance and non-insurance companies are equal, so that $r_a = r_b$ and $A_{a_0} = A_{b_0}$. But $A_{bt} = A_{b_0} - D$ and $A_{at} = A_{b_0} - D$ only if the asset's economic life equals its accounting life. During inflationary periods, the economic life will always be higher which means that $ROI_a < ROI_b$

[5] Alfred M. Best Company. *Best's Insurance Reports, Fire and Casualty,* 1965 ed. Pages XIV-XV.

use of market values offers far greater chance of producing comparable data than is possible with accounting data.

With comparable data available, it is possible to evaluate the profitability of individual companies directly through the use of the return, risk, and trend.

Risk-Return-Trend Analysis

Return

"Return" as used here is a variation on the well-known return on investment (ROI), in which market values are substituted for book values. Let return on market be ROM, then:

$$\text{ROM} = \frac{\text{Cash payments to sec. holders} + \text{changes in market value of securities.}}{\text{Initial value of securities in the market.}} \quad (1)$$

For the investor in the securities of the firm, ROM measures his yield before taxes and transaction costs, based on a specified period of time.

Equation 1 can be expanded to reflect both the individual elements making up the equation and time.

Let:

MP = Market value of preferred stock
MC = Market value of common stock
I = Interest on long-term debt
D = Cash dividends paid preferred and common
r = Yield on long-term debt
TS = Treasury stock purchases
A = Net debt amortized
t = Time period in years. Date are at end of year.

$$\text{ROM}(t) = \frac{I(t) + D(t) + \text{TMV}(t) - \text{TMV}(t-1) + \text{TS}(t) + A(t)}{\text{TMV}(t-1)} \quad (t = 1,2,3,\ldots n) \quad (2)$$

Where: TMV = terminal market value $= \frac{I(t)}{r(t)} + \text{MP}(t) + \text{MC}(t)$

Amortization and treasury stock purchases are included in equation 2 under the assumption that only going concerns are analyzed. Thus changes between stocks and bonds is simply a readjustment in debt/equity which should leave the value of the firm unchanged.[6]

The equation, in using appreciation, also assumes that values are determined at one point in time and that the security holders liquidate their holdings once a year. Since this is customarily not the case, returns should be viewed as relative rather than absolute.

The interpretation of ROM is straightforward. It is the yield that the company makes available to its security holders. The larger the yield the more profitable the company. Coincidently, ROM is also the return on the market value of a company's assets. This will not normally be equivalent to the book value of assets, because market value includes such items as the value of management, intangibles, patents, diversification, monopoly position, and future expectations, all of which are excluded from book value.

Equation 2 can be used to compare non-insurance companies and stock insurance companies. To determine relative profits for non-stock insurance companies, a transformation is necessary. Since market value of a firm's outstanding securities

[6] The formula does not include current liabilities, which are not considered to be funds made available by investors. They are instead associated with current assets. In the actual computation of the numbers for ROM, certain substitutions were made for computational efficiency. I/r = long-term debt at book; amortization and treasury stock purchases were determined from book values. The result is that the return of highly levered firms will be slightly overstated relative to low levered firms.

TABLE 1

A Comparison of Market Value of Assets to Market Value of Securities Over 15 Years for Twenty Insurance Companies

	Market Value of Assets	*Market Value of Securities*
Mean	.111	.121
Standard Deviation	.117	.160
Coefficient of Variation	1.05	1.32

market value of assets and the market value of securities. Table 1 shows that this is the case.

An "F" test of the two variances at the .01 level of significance indicated that the two distributions came from the same population. Under the circumstances, the market value of assets can be substituted for the market value of securities without biasing the results.[7]

must equal the market value of its package of assets, and since insurance company assets are at market, there should be a substantial similarity between the

Assuming then that the market value of insurance assets equals the market value of insurance securities, equation (2) can be modified for insurance companies to:

$$ROM(t)_{ins} = \frac{D(t) + TS(t) + TMV(t) - TMV(t-1)}{TMV(t-1)} \quad (t = 1,2, \ldots . n) \quad (3)$$

TMV = terminal market value of assets, D(t) = dividends to stockholders or, in the case of mutuals and reciprocals, dividends to policyholders. Policyholders' dividends were included because (1) all the companies charged basic competitive rates, (2) all funds for expansion were supplied by policyholders, who like stockholders, should receive a return.

Risk

Annual or average ROM by itself means very little because it does not describe the variability of the return. Given two companies with equal returns, investors customarily prefer the firm with the smallest variation, since it will subject them to less loss if they are forced to sell during an adverse period.

Several techniques for measuring risk can be used. Markowitz suggests six, but selects the standard deviation as the best for portfolio purposes.[8] This technique creates a definite problem, however, when it is applied to equation 3 or any other time series ratio. The source of the problem is the relationship of the denominator to the numerator. A potential circularity is present which the use of the standard deviation may perpetuate. While several methods are possible to correct for this potential distortion, the one used here is to measure the standard error of the regression line.[9] Call this statistic the regression deviation (RD) [10], where:

$$RD = \sqrt{\sum_{i=1}^{n} e_i^2 \Big/ n} \quad (4)$$

Figure 1 shows how this statistic is measured.

Let rr' be the linear regression line fitted by the least squares method to the x data

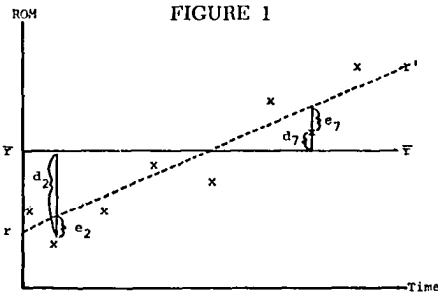
[7] This is a crucial point to the analysis and has been criticized by Hammond and others. While we recognize that other methods of arriving at assets are possible, we have resisted adjustments. Two areas where the use of assets could result in distortion are (1) if a company changed its unearned premium reserves, (2) if the quality and quantity of losses changed over time. The present trend among companies in these two areas is towards shorter premium periods and faster payment of claims. This should make our use of assets a conservative estimate of security value.

[8] Harry Markowitz, *Portfolio Selection*, Wiley, 1958, Chapter VIII.

[9] This statistic was used in evaluating risk by: Irving N. Fisher & George R. Hall, *Risk and the Aerospace Rate of Return*, RM-5440-PR, The Rand Corporation, December 1967.

[10] We have used n rather than n-1 because the returns are used to evaluate the past as a single point. Thus they are part of a probability distribution. This technique was also used by Markowitz (see footnote 8).

FIGURE 1



points and $\bar{r}$ represent the average ROM line. The equation for the standard deviation is:

$$S_{rom} = \sqrt{\frac{\sum_{i=1}^{n} d_i^2}{n}} \qquad (5)$$

whereas, the equation for the regression deviation is given in (4) above. Notice that the e_i's are the errors associated with the regression line.

The use of the RD statistic means that companies with steady increases or decreases in returns over time will have the same risk as companies with constant returns over time. This is reasonable. Risk should measure the variability from the expected return for the next year, not the variability of the expected value of the return for the period (15 years in our sample).

Trend

The use of the regression deviation as a measure of risk makes the trend of returns important. Assume two companies have identical risks and returns. One has returns trending up, the other down. Which is more profitable? If the holding period is unspecified, the firm with the increasing return is preferred to the firm with the decreasing return. Trend, then, is the slope of the ROM's over time, measured on the least square regression line. This is a simple rather than a compound growth rate. As a result, little significance should be attached to its absolute value.

The regression equations used for trend and risk are linear. As a result two problems exist:

(1) Linear equations may lack a preciseness of fit. This loss seems to be amply compensated for by the simplicity and consistency of the linear model. This is especially true considering that 732 equations were fitted in this study.

(2) The use of linear time series regression equations may result in certain statistical distortions. The most important is autocorrelation. The method used to determine risk was constructed purposely to reduce circularity in the ROM formulation, but it did not by itself guarantee any reduction in autocorrelation. This problem occurs commonly in time series, such as used here, where the "e_i's" are related. Where autocorrelation exists, minimizing the squared errors does not give the correct regression line. Fortunately, a test is available for autocorrelation, and in 93 percent of the sample companies, the hypothesis that autocorrelation exists at the .01 level of significance can be rejected.[11]

The three basic measures of profitability, risk-return-trend, have now been introduced. They must be combined so as to assign to every company in the sample a relative position.

Risk-Return-Trend Plane

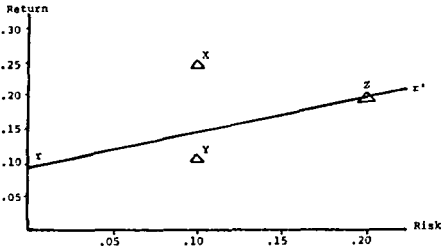
The basis for developing a relative profitability scale for the companies is to determine a risk-return-trend indifference plane. This plane can be developed from two lines, risk-return and trend-return indifference lines. A simple example should help to illustrate. Assume three

[11] The test used was the Durbin-Watson, d test. 100 companies were tested. J. Durbin and G. S. Watson, "Testing for Serial Correlation in Least Squares Regression," pts. I and II, *Biometrika*, 1950 and 1951.

firms, X, Y, Z have the following characteristics:

Firms	*Return*	*Risk*	*Trend*
X	.25	.10	.02
Y	.10	.10	.02
Z	.20	.20	−.01

FIGURE 2

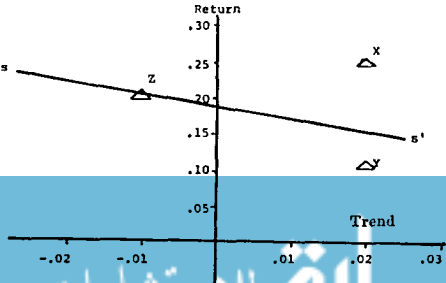


It will be helpful to examine Figure 2 and, for the moment, to ignore the line rr'. From the data, Firm X is obviously preferred to Firms Y and Z, but is Y preferred to Z? There is no way of knowing this unless a line can be established which indicates investor preferences for a trade-off between risk and return. One method of determining such a preference line is to plot the risks and returns for a large number of companies, and from them, determine a line which best fits the various points, using the least squares method. "rr'" is such a line. The line will divide the companies approximately into two groups—those which should be desirable to the investor, and those which should not. "rr'" is thus a risk-return indifference line. Extrapolating from the logic which states that X is preferred to Y, Z must also be preferred to Y; in fact, all points above rr' are preferred to all points below.

Referring to Figure 3, ss' is the trend-return indifference line determined by regressing trend on return for a large sample. X is again preferred to Z, which is preferred to Y. Notice that while Y is trending up in profits, Z is trending down, but its higher return is viewed as more important by the investor.

The risk-return and trend-return indifference lines can be plotted in three dimensions since return is common to both. The two lines will then form a plane which would be the risk-return-trend indifference plane. Investors would be indifferent to any firms which fell on the plane, and would prefer any firms above the plane (assuming return corresponds to the "Z" axis.)

FIGURE 3



Empirical Results

In order to evaluate insurance company risk-return-trends relative to non-insurance companies, it is necessary to have many observations. These observations form the data points for fitting a risk-return-trend indifference plane. For this, the COMPUSTAT tape was used.[12] The tape contains financial data for approximately 900 industrials, financial and transportation companies excepting banks, insurance and rails. For each of these companies, a ROM was calculated for the 15 year period, 1953-1967. From this, risk and trend for each company were then calculated. Because the tape is relatively new, and because of incomplete information and mergers, the final companies in the sample totaled 622.

Regressing risk and trend on ROM for

[12] The COMPUSTAT tape is produced by the Standard Statistics Company, Division of Standard & Poor's Corporation.

the 622 Industrials produced the indifference plane whose equation was: [13, 14]

$$\underset{(.0683)}{\text{ROM}} = \underset{}{.07588} + \underset{(.0202)}{.46213}\ \text{Risk} - \underset{(.1115)}{.37064}\ \text{Trend} \qquad (6)$$

Using equation 3, returns were calculated for four random and one selected sample of insurance companies. The random samples were stratified to reflect specific underwriting areas of mutual and stock automobile, fire and allied lines, and multiple-line. The selected sample included two groups: seven dominant multiple-line underwriters and eighteen specialty automobile underwriters. The seven multiple-line underwriters controlled approximately 30 percent of all insurance company assets whereas, the 18 automobile underwriters included almost every specialty company and as a group wrote 50 percent of all automobile premiums. The largest five companies in this group wrote approximately 40 percent of all auto insurance.

Ranking companies

To rank each of the 622 industrial and 110 insurance companies, individual ROM's were computed, using equation 6. This result was then substituted for ROM (computed) in:

$$Z = \text{ROM(actual)} - \text{ROM(Computed)} / 0.0683 \quad (7)$$

The value of Z is a uniform measure of the standard deviation and can be evaluated directly from the area under a normal curve N(0,1). Table 2 column 6 summarizes results when applied to insurance companies in various groups. The values for selective sample companies are given in the Appendix.

Interpreting the results

When the selected insurance companies were compared individually and in groups with the average profits earned by the 622 major industrial companies as measured by equation (6), the results indicated the following:

(1) The large dominant multiple-line underwriters have earned average profits over the last 15 years; whereas, the multiple-line underwriters as a group (based

[13] Both multiple and partial correlation coefficients are significant at the .01 level. r = .682.

[14] Insurance companies were not included in equation 6. The 100 + 622 companies were included in another plane. The results indicated that less variation in the positions of the insurance companies resulted, i.e. the high profit companies showed less relative profit and the low profit companies showed more relative profit.

TABLE 2

RELATIVE PROFITABILITY OF INSURANCE COMPANIES COMPARED WITH 622 MAJOR INDUSTRIAL COMPANIES OVER PERIOD 1953-1967

No. of Co.	*Type of Company*	*Random or Selective*	*Ave. Return*	*Ave. Risk*	*Percentile among Industrials**
20	Multiple Line	Random	12.8%	15.6%	40.3%
20	Fire and Allied	Random	10.4	8.2	41.7
20	Auto, Mutual	Random	13.3	9.0	59.7
25	Auto, Stock	Random	13.0	11.1	52.2
7	Large, Multiple Line	Selective	12.0	10.1	49.4
5	Large, Auto	Selective	14.3	6.8	68.8
3	Medium, Auto, Stock	Selective	31.7	17.3	98.6
5	Medium-Small, Auto, Mutual	Selective	15.7	6.2	72.1
5	Medium-Large, Auto, Reciprocal	Selective	21.6	6.3	82.9

* This column means that when the 622 industrials are arrayed, in the case of the random sample of Multiple line underwriters, 59.7 percent of the industrials would have superior and 40.2 percent would have inferior risk-return-trends. Grouping data in this method is not the intent of the study and is an expedient for general information. Precise positions of selected individual companies are noted in the Appendix.

on numbers of companies) have been less profitable.

(2) Fire insurance specialty companies have had slightly below average profits.

(3) Automobile underwriters earned slightly better than average profits, with mutuals doing better than stock companies. The selected specialty automobile underwriters did considerably better than the industry as a whole.

The results of this study are mixed. Certain segments of the industry have done quite well, profitwise. There appears to be a clevage in earnings between automobile underwriters and companies writing other lines. There also seems to be a profit division between large companies and medium and small companies writing multiple-line insurance.

The study suggests that there are two economies to scale. The first is an economy of size, and the second is an economy of specialization. The latter economy has only been documented in automobile but a secondary examination of other specialized groups such as factory mutuals tends to confirm this hypothesis.

Conclusion

The purpose of this article has been to construct an index of profitability which can be used to assess the relative profitability of insurance companies. Because of the distinctive characteristics of insurance companies, however, there is no direct way of comparing insurance and non-insurance companies. Thus, this study rests on a series of assumptions designed to minimize the distortion between different types of companies.

The technique used was a risk-return-trend analysis where return was measured as the market return which investors in the securities of a company would receive. In order to have a sufficiently large sample, the COMPUSTAT tape was utilized. From this, risk-return-trends for 622 major industrial companies were calculated. To these were added random samples of insurance companies.

It was found that certain segments of the insurance industry had better risk-return-trends than other segments of the industry. Also insurance companies had earnings on a par or exceeding those of a sample of 622 large industrial companies. The results indicated that there are economies available in insurance based on size and degree of specialization.

APPENDIX

INDIVIDUAL STATISTICS FOR INSURANCE COMPANIES WITHIN SELECTED GROUPS IN TABLE 2

Company	*Ave. Return*	*Ave. Risk*	*Trend*	*Percentile*
Large Multiple Line, Selected Sample				
Continental Cas.	.160	.150	−.013	61.8
U. S. Fidelity & Guarantee	.111	.047	−.001	58.7
St. Paul Fire & Marine	.098	.036	−.001	53.6
Ins. Co. of North America	.100	.061	−.003	48.6
Continental Ins. Co.	.152	.187	−.012	47.2
Home Ins. Co.	.083	.069	.003	35.4
Fund America	.133	.157	.003	40.5
Large, Auto, Selected Sample				
Allstate Ins. Co.	.234	.140	−.018	93.1
State Farm Mutual	.147	.030	−.003	80.8
Nationwide Mutual	.127	.089	−.010	58.3
Hartford Accident & Ind.	.103	.038	−.001	56.2
Travelers Ind.	.105	.043	.000	55.6
Medium, Auto, Stock, Selective Sample				
Government Employees	.223	.063	−.009	96.3
Safeco	.398	.312	−.048	99.8
Southern Farm Bureau	.329	.145	−.029	99.8

APPENDIX—*Continued.*

Company	*Ave. Return*	*Ave. Risk*	*Trend*	*Percentile*
Medium-Small, Auto Mutual, Selected Sample				
Am. Family Mut.	.093	.057	−.000	44.8
Empire Mutual	.204	.070	−.014	93.1
Merchants Mutual	.155	.022	−.004	85.1
Preferred Risk Mut.	.266	.133	−.034	98.1
State Auto Mutual	.071	.031	−.002	39.7
Medium-Large, Auto Reciprocal Selected Sample				
Calif. State Auto Association	.245	.048	.000	98.4
Detroit Auto Association	.146	.059	.000	73.9
Inter-ins. Exch. of Auto Club of South Calif.	.241	.076	−.006	97.4
Farmers Ins. Exch.	.099	.071	−.001	45.2
United Services Auto Association	.352	.063	−.021	100.0