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Author(s): Roger M. Shelor, Dwight C. Anderson and Mark L. Cross

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Roger M. Shelor
Dwight C. Anderson
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ABSTRACT

The October 17, 1989, California (Loma Prieta) earthquake led to substantial loss payments by insurers. This article is motivated by two opposing hypotheses regarding such catastrophic losses: that the rapid depletion of surplus accounts fostered by catastrophic events causes investors to discount insurance firm stock values, and that insurers benefit from an isolated catastrophic event because of subsequent increased demand. The latter hypothesis is supported by our results, which show that property-liability insurer stock values increased after the earthquake.

Market Reactions to Legislation and Catastrophic Loss

Catastrophic losses are a major concern in the property-liability insurance industry, because earthquakes and other natural disasters create special problems for insurers. Although the probability of catastrophic loss is very small, its impact on insurance firms covering the losses is substantial. For example, insurers are expected to pay billions of dollars for damages caused by the California earthquake of October 17, 1989.[1]

A number of studies have examined the impact of large losses and the impact of legislation on insurers' stock values. Sprecher and Pertl (1983) and Davidson, Chandy, and Cross (1987) find that large losses have a negative impact on stock prices. Fields and Janjigian (1989) find that the 1986 Chernobyl reactor accident had a significant negative impact on the

* Roger M. Shelor is Assistant Professor of Finance, Dwight C. Anderson is Associate Professor of Finance, and Mark L. Cross is Associate Professor of Finance and Insurance, all in the Department of Economics and Finance, Louisiana Tech University. This article benefited from the helpful suggestions of two anonymous reviewers, an associate editor, and the comments of J. David Cummins and Travis S. Pritchett.

[1] Quake Insurance Claims Might Total Nearly $1 Billion: Rates Heading Up, *Wall Street Journal*, October 30, 1989; Insurance Firms Expected to Pay Billions of Dollars, *Wall Street Journal*, October 19, 1989.

security prices of U.S. electric utilities. Hill and Schneeweis (1983), Bowen, Castanias, and Daley (1983), and Spudeck and Moyer (1989) find that many electric utility firms experienced decreased stock prices and increased risk following the 1979 Three Mile Island incident.

The impact of legislation on insurance firm value has also been documented. Fields, Ghosh, Kidwell, and Klein's (1990) examination of the impact of California Proposition 103—which imposed constraints on insurers' ability to raise rates—found that insurance firms' stock values reacted negatively several days before and after passage of the Proposition.

With the exception of a study by Walker (1988), there are no analyses of the impact of catastrophic losses on insurance firm value. This question is motivated by notable natural disasters involving large property losses, such as Hurricane Hugo in September 1989 and the October 1989 California (Loma Prieta) earthquake. We chose the earthquake for study because anticipation of the hurricane may have caused an information leakage effect. The timing of the earthquake could not have been anticipated. Its occurrence sent new, relevant information to the marketplace in short order.

Hypotheses

Two opposing hypotheses motivate this study. First, rapid depletion of surplus accounts following a catastrophe may cause investors to discount property-liability insurer stock values, depending on the actual or implied loss exposure of individual insurers. Reinsurance, which serves to spread catastrophic losses across many insurers, might lessen the depletion of surplus accounts for some firms following the earthquake.

The second hypothesis is that insurers benefit from an isolated catastrophic event because of subsequent increased consumer or institutional demand, including increases in coverage required and additional premium earnings. This should affect stock prices positively, especially if much of the property damaged in a catastrophe had not been insured, as was the case in California at the time of the Loma Prieta earthquake. A significant portion of the earthquake loss was not covered, because high earthquake insurance rates and low perceived risk discouraged many property owners from carrying coverage. Only about 30 percent of California homes and businesses had earthquake insurance to cover the losses.[2] If the second hypothesis predominates, stock price increases should be especially pronounced for companies that write large amounts of insurance in California. The expectation is that additional earnings from increased demand will more than offset the losses.

Hypothesis two is at odds with the results of previous studies cited above, which indicate that losses have a negative impact on firm value. The losses reported in earlier studies may have been caused by an erosion of consumer

[2] Quake Insurance Claims Might Total Nearly $1 Billion: Rates Heading Up, *Wall Street Journal*, October 30, 1989.

confidence in the safety or value of a firm's product or service that lessened demand. That is, a particularly large loss (fire, airplane crash, etc.) may have had a negative effect on consumer demand for the product or service, leading to depressed stock prices. In the case of the accidents at the Chernobyl and Three Mile Island nuclear reactors, Fields and Janjigian (1989) and Spudeck and Moyer (1989) attributed the negative market reaction to uncertainties about nuclear generator safety.

Data and Methodology

Two samples are selected from property-liability and multiple line firms that were publicly traded in 1989 and that filed disclosure statements with the Securities and Exchange Commission. Daily return data are obtained from several sources, including the University of Chicago's Center for Research in Security Prices, the *Wall Street Journal,* and the *Dow Jones News Retrieval* service. Earthquake premium volume for 1988 is obtained from the 1989 edition of *Best's Aggregates and Averages.*

Forty-seven firms with primary Standard Industrial Classification (SIC) codes as property-liability companies comprise one sample. Thirty-two insurers with both primary and secondary property-liability and life-health SIC codes are classified in our second sample as multiple line.[3]

We performed two types of analyses: First, we used daily return data to study the impact of the earthquake on insurance firm value. Second, using a multiple regression cross-sectional analysis technique, we examined the relationship between the amount of total earthquake and California net premiums written and the stock price reaction.

Information Content of the Earthquake

The market model is used to measure stock price reaction to the earthquake. The unexpected portion of the daily return is calculated individually and collectively for each sample. The sign, magnitude, and statistical significance of the excess returns for the entire sample indicate whether there is a market response to earthquake-related information. The event study methodology thus constitutes a joint test of the hypotheses and the market model.

When security returns follow a bivariate normal distribution, the expected rate of return may be expressed in terms of raw return, as in the market model

$$R_{j,t} = a_j + B_j(R_{m,t}) + e_{j,t}, \qquad (1)$$

[3] We addressed the thin trading issue by eliminating firms that had insufficient trading activity to calculate reliable beta estimates. This screen did not reduce the sample size significantly; only four firms were eliminated.

where $R_{j,t}$ = the daily return for security j at day t, calculated as $R_{j,t} = \ln[(Price_{t+1} + Dividend)/Price_t]$,[4]

$R_{m,t}$ = the natural log of the market return on day t where the Center for Research in Security Prices New York Stock Exchange/American Stock Exchange equal-weighted index is used as a market proxy,

a_j = a coefficient that represents the return of security j, which is independent of the market,

B_j = a constant, which is a measure of the change in $R_{j,t}$ given a change in $R_{m,t}$, and

$e_{j,t}$ = the abnormal performance of the j^{th} security on day t.

The expected daily return for each security is computed by observing market behavior over a 200-trading-day interval prior to the earthquake. A regression of security and market returns is used to estimate the parameters a_j and B_j, which become estimates of the return characteristics of the event period. The abnormal return is the difference between observed and predicted returns, and the cumulative abnormal return is the cumulative sum of the average abnormal returns.

A test for risk stability between the parameter estimation and event period is conducted. Hurricane Hugo, which struck during the estimation period, could have caused a beta shift for insurance companies, but no such shift was detected.[5] Beta is generally stable over the estimation and event periods, implying that the results are not attributable to a risk shift for insurance companies. Hurricane Hugo's occurrence a month before the earthquake did not affect beta values enough to distort the earthquake's impact on insurance firms.

Following Brown and Warner's (1985) procedure, we test for a relationship between earthquake-related information and return responses. For each sample, the statistical hypothesis is that the mean excess return of each day in the event period (days 0 to 15) is zero. Day 0 is the first trading day after the earthquake.[6] Stock reactions for the 15 days after the earthquake are reported. After this time, it appeared from the articles in the press that almost all relevant information about the earthquake had been disseminated.[7]

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[4] $R_{j,t}$ is a continuously compounded return. The use of log-transformed returns improves the normality of the return distribution and eliminates negative values. The log transformation on the market proxy improves the normality of the market return distribution.

[5] The estimation period beta for all firms was 0.33, for property-liability firms 0.24, and for multiple line firms 0.46. The event period beta for all firms and for property-liability firms was 0.49 and for multiple line firms 0.48. The t-test for differences in beta indicated no significant difference at the 0.05 significance level.

[6] Because the earthquake occurred at 5:00 p.m. Pacific Standard Time on October 17, 1989—three hours after the east coast markets had closed—the day after the earthquake, October 18, was the first day the markets had an opportunity to respond.

[7] The Earthquake's Toll in 8 Counties, *New York Times*, October 21, 1989; From Homes to Hospitals, Dimension of Loss Emerges, *New York Times*, October 26, 1989; Insurance Firms

Both generalized least squares (GLS) and nongeneralized least squares (NGL) tests are used for estimation. These methods represent two different approaches to account for cross-sectional dependencies. The GLS test uses the covariance in weighting the mean excess return; the NGL test handles the covariances by aggregating the firms into a portfolio. The NGL test ignores the correlations among abnormal returns when assigning weights to the sample securities. If dependencies among abnormal returns exist, the GLS test is more sensitive to misspecifications in the abnormal return model.[8] For analysis of contemporaneous returns, especially with samples exhibiting a large industry concentration, the NGL test is preferred to a GLS test if there are dependencies.

The NGL test used is the modified weighted least squares (MWLS) approach suggested by Chandra and Balachandran (1990). This approach weights the abnormal returns in inverse proportion to their variances. If no systematic relationship is assumed between the mean and variance of abnormal returns, the MWLS test appears to be the best test.[9]

Conventional parametric tests assume that the sample is from a normal population. Brown and Warner (1985) report that, even though daily returns are not normally distributed, nonnormality is less evident for cross-sectional mean excess returns. The statistical characteristics of both daily returns and excess returns and the specification of parametric and nonparametric test statistics are examined using the MWLS results.[10]

Expected to Pay Billions of Dollars, *Wall Street Journal,* October 19, 1989; Companies in the Bay Area Assess Earthquake Damage, *Wall Street Journal,* October 19, 1989; Insurers and Builders' Stock Rose in Wake of Earthquake, *Wall Street Journal,* October 19, 1989; Quake Boosts Insurance Stocks, *USA Today,* October 19, 1989.

[8] See Brown and Warner (1980, 1985) and Collins and Dent (1984) for examples of how the abnormal return model has been employed.

[9] The results obtained using the GLS test are similar and thus are not reported, although they are available from the authors by request. The GLS technique was found to be sufficiently robust to handle industry and event clustering. Either there is a lack of dependency among excess returns (as indicated by the low Durbin-Watson statistic), or the abnormal return model is not misspecified, or the risk-adjusted event methodology analysis is sufficiently robust to provide meaningful results regardless of return dependency or model misspecification (see Henderson, 1990).

[10] Several tests were conducted for actual and excess returns to determine the robustness of the methodology with regard to autocorrelation, heteroscedasticity, and nonnormality. The Durbin-Watson test results indicate that autocorrelation is minimal for both actual and excess returns. Heteroscedasticity, as measured by the F-test, does not appear to be a major problem in the excess returns; only 21 percent have nonconstant variance. The tests for skewness and kurtosis are significant. These results are consistent with previous studies (see Brown and Warner, 1985). The Kolmogorov-Smirnov results indicate that daily actual returns are nonnormal, which is consistent with earlier findings (see Scholes and Williams, 1977). The Kolmogorov-Smirnov test of the excess returns indicates they are reasonably normally distributed. The skewness and kurtosis statistics that suggested the excess returns were nonnormal are inconsistent with the Kolmogorov-Smirnov results. The Shapiro and Wilk (1965) analysis indicates that excess returns are reasonably normally distributed.

The MWLS regression model produces heteroscedastic, skewed excess returns that are approximately normal. Brown and Warner (1985) and Berry, Gallinger, and Henderson (1990) demonstrate that although excess returns are heteroscedastic, nonparametric statistics reject significance too seldom when abnormal excess returns are present. The student t-test is used to establish the significance of abnormal returns. The test statistic suggested by Brown, Harlow, and Tinic (1988) used to test cumulative abnormal return (CAR) significance is

$$[\text{T-stat}]_t = [CAR_t] \div [var(CAR_t)]^{1/2},\ t = 1, \ldots, +15.$$

To address the problem of correlation across event days of the abnormal returns, the variance in the CAR test statistic above is calculated as

$$var(CAR_t) = \sum_{\tau=1}^{t} var\ (AR_\tau) + 2(t-1)\ cov(AR_t,\ AR_{t+1}),$$

where the variance and covariance terms are calculated using the abnormal returns from the market model. A binomial test of the percent positive excess returns and percent positive cumulative excess returns is also used to determine the significance of the abnormal returns.

Market Response and California Involvement

Cross-sectional analysis is used to measure the relationship between the market response and the proportion of California or earthquake exposure. This relationship is measured in two ways. Equation (2) is used to examine the participation of insurers that write earthquake insurance and that operate in the California market. These are represented by dummy variables as predictors. The two-day (0 to 1) CAR is the dependent measure. The second cross-sectional analysis (see equation [3]) uses a regression of two-day CAR and two independent variables. These variables are the ratios of the firm's earthquake net premiums written to total net premiums written and its California net premiums written to total net premiums written. Net premiums written represents the insurer's marketing strength, or sales.[11] Stock prices should react according to the firm's concentration in the earthquake insurance line and the proportion of its total business that is written in California.

$$CAR_{0\ \text{to}\ 1} = \alpha_0 + \alpha_1\ DQUAKE + \alpha_2\ DCAL + e_i, \text{ and} \tag{2}$$

$$CAR_{0\ \text{to}\ 1} = \alpha_0 + \alpha_1 w_1 + \alpha_2 w_2 + e_i, \tag{3}$$

[11] Direct business written is an appropriate measure of an insurance firm's true marketing strength. Since this information is not readily available, the authors used net premiums written as a proxy for marketing strength (sales). Net premiums written are net of any reinsurance in which the firm is involved.

where $CAR_{0 \text{ to } 1}$ = cumulative abnormal returns over the event period 0 to 1,

α_0 = intercept,

α_1, α_2 = constants, measure of change in a security return given a change in the market,

DQUAKE = 0 if a firm writes no earthquake insurance and 1 if a firm does write earthquake insurance,

DCAL = 0 if a firm writes no insurance in California and 1 if a firm does write insurance in California,

e_i = the error term with zero mean and constant variance,

w_1 = the dollar amount of total earthquake net premiums written by a firm as a percentage of the firm's total net premiums written,

w_2 = the dollar amount of a firm's California net premiums written as a percentage of the firm's total net premiums written.

Results: A Positive Market Response

The study provides evidence that the Loma Prieta earthquake had a positive impact on insurance firm value. Table 1 presents the abnormal returns and cumulative abnormal returns following the earthquake. We found statistically significant positive abnormal returns for day 1 for the property-liability and multiple line samples and for days 1 and day 2 for all firms combined (see Table 1). The cumulative abnormal returns, however, are not significant. The short delay in market response to the earthquake may be attributable to uncertainty about expected losses, the degree to which damaged property was insured, the status of surplus accounts, and effects on the demand for insurance. Investors perhaps needed a short amount of time to assess the earthquake's property damage and its impact on future earnings and wealth.

For both the sample of all firms and the property-liability sample, a nonparametric normal approximation of the binomial test yields significant levels of probability for day 1 for firms having positive abnormal returns during the test period. This supports the t-test findings reported earlier in Table 1.

We attribute the positive market response to investor expectations of higher demand for property-liability insurance, including earthquake coverage. A large amount of the earthquake loss (approximately 70 percent) was not insured, a fact that might encourage property owners to seek such coverage.[12] Those who had once maintained such coverage and then dropped it would be encouraged to reinstate it. The increased demand for insurance might not be limited to California or to earthquake insurance.

[12] Few Homeowners Covered for Earthquake, *USA Today*, October 19, 1989.

Table 1
Abnormal Returns (AR) and Cumulative Abnormal Returns (CAR) by Types of Insurers Using Modified Weighted Least Squares Test

		All Property-Liability and Multiple Line (n = 79)				All Property-Liability (n = 47)				All Multiple Line (n = 32)			
Date	Day	AR	Positive AR (%)	CAR	Positive CAR (%)	AR	Positive AR (%)	CAR	Positive CAR (%)	AR	Positive AR (%)	CAR	Positive CARs (%)
Oct 18	0	0.34	50.0	0.34	50.0	0.17	54.4	0.17	54.4	0.57	58.1	0.57	58.1
Oct 19	1	1.38*	64.5*	1.72	60.5	1.66*	68.9*	1.83	55.6	0.99*	58.1	1.56	67.7
Oct 20	2	0.48*	61.0	2.20	67.5*	0.37	57.8	2.20	62.2	0.62	65.6	2.18	75.0*
Oct 23	3	–0.11	44.2	2.09	71.4*	–0.03	44.4	2.17	68.9*	–0.22	43.8	1.96	75.0*
Oct 24	4	–0.42	36.4*	1.67	59.7	–0.39	33.3*	1.78	60.0	–0.46	40.6	1.50	59.4
Oct 25	5	0.01	56.0	1.68	60.0	–0.11	48.9	1.67	57.8	0.19	66.7	1.69	63.3
Oct 26	6	0.45*	58.1	2.13	63.5*	0.27	52.3	1.94	56.8	0.69*	66.7	2.38	73.3*
Oct 27	7	–0.10	40.0	2.03	56.0	0.05	38.6	1.99	52.3	–0.32	41.9	2.06	61.3
Oct 30	8	–0.19	40.3	1.84	55.8	–0.40	40.0	1.59	53.3	0.08	40.6	2.14	59.4
Oct 31	9	0.06	46.8	1.90	54.5	–0.07	44.4	1.52	51.1	0.26	50.0	2.40	59.4
Nov 1	10	0.57*	53.2	2.47	55.8	0.56	46.7	2.08	53.3	0.58	62.5	2.98	59.4
Nov 2	11	0.29	57.1	2.76	58.4	0.13	53.3	2.21	55.6	0.52*	62.5	3.50	62.5
Nov 3	12	0.24	48.0	3.00	54.7	0.44	47.7	2.65	50.0	–0.02	48.4	3.48	61.3
Nov 6	13	–0.40	52.7	2.60	55.4	–0.73	50.0	1.92	47.7	0.06	56.7	3.54	66.7
Nov 7	14	–0.48*	38.7	2.12	54.7	–0.25	38.6	1.67	45.5	–0.78*	38.7	2.76	66.7
Nov 8	15	–0.12	48.7	2.00	57.9	0.12	50.0	1.79	52.3	–0.45	46.9	2.31	65.6

* $p < .05$

Other earthquake-prone areas could experience increased demand for insurance resulting from a heightened awareness of the potential damage. Prediction of a December 1990 earthquake in Missouri, for example, was enough to increase demand for property-liability coverage.[13]

Increased demand might also result from mortgage lenders requiring added coverage for their loan collateral. Palm et al. (1983) address the likely reaction of California mortgage bankers to major earthquake property damage. The demand for other lines of insurance, such as homeowners' and automobile physical damage, which cover earthquake losses either directly or through endorsement, might also increase. Commercial insurance lines covering differences in conditions, business interruption, and fire might also see new demand after an earthquake.[14]

The primary stock price response occurred on day 1 (the second day after the earthquake). Many insurers experienced a short-lived increase in their stock values. Details of damage and loss assessment were widely reported for several days following the earthquake.[15]

Cross-sectional analysis indicates that the amount of insurance written in California had little impact on stock price reaction. The coefficients for α_1 and α_2 are not significant (see Table 2). Neither the fact that a firm writes earthquake insurance or any insurance in California nor the proportion of earthquake or California insurance it writes significantly impacted the market response. In fact, the negative coefficients shown in Table 2, although not significant, imply that insurers writing insurance in California had slightly less reaction to the earthquake than insurers not writing in California.

Why this reaction? First, investors might expect the increased demand for insurance in California (especially earthquake coverage) to be partially offset by the earthquake-related losses in California. Firms outside California could enjoy increased demand and suffer little, if any, earthquake losses.[16] California firms, of course, might experience a greater increase in demand than those outside California. Potential customers are closer to

[13] In Quake Zone, A Forecast Sets Off Tremors, *New York Times*, December 1, 1990; For Quake that Wasn't, *New York Times*, December 14, 1990; Will the Earth Move on December 3? Midwest Rattled by Prediction, *Wall Street Journal*, September 18, 1990; Midwest Shakes, Rattles, Rolls, but May Really Boogie on December 3, *Wall Street Journal*, September 27, 1990.

[14] Insurers' and Builders' Stock Rose in Wake of Earthquake, *Wall Street Journal*, October 19, 1989; and Quake Boosts Insurance Stocks, *USA Today*, October 19, 1989. The impact on demand was addressed in statements by representatives of various property-liability companies and other experts in the field (Richard Griebel, Transamerica; Jonna Bolin, Aetna; Gloria Vogel, Bear, Stearns & Co.; see also In Quake Zone, A Forecast Sets Off Tremors, *New York Times*, December 1, 1990).

[15] Few Homeowners Covered for Earthquake, *USA Today*, October 19, 1989; Insurance Firms Expected to Pay Billions of Dollars, *Wall Street Journal*, October 19, 1989.

[16] Some firms that do not directly write insurance in California might suffer some earthquake losses through their reinsurance contracts with firms that do.

Table 2
Cross-Sectional Regression Results

$$CAR_{0\ \text{to}\ 1} = \underset{(3.168)}{0.019} \underset{(-0.506)}{-0.005}\ DQUAKE \underset{(-0.601)}{-0.005}\ DCAL + e_i$$

where DQUAKE = 0 if no earthquake insurance premium is written and 1 if earthquake insurance is written, and
DCAL = 0 if no California insurance premium is written and 1 if California insurance is written.

$$CAR_{0\ \text{to}\ 1} = \underset{(3.430)}{0.0172} \underset{(-0.648)}{-8.3713}\ (w_1) \underset{(-0.501)}{-0.097}\ (w_2) + e_i$$

where w_1 = the dollar amount of total earthquake net premiums written by a firm as a percentage of the firm's total net premiums written, and
w_2 = the dollar amount of a firm's California net premiums written as a percentage of the firm's total net premiums written.

Numbers in parentheses represent t-statistics.

the loss site, giving the event greater impact on their buying behavior. However, the net effect would be a smaller positive response for California firms than for firms not writing insurance in California.

Another explanation relates to the availability of and demand for reinsurance. California insurers suffering earthquake losses may experience reinsurance premium increases and reduced availability of such protection.[17] These extra costs would further offset the benefits of increased demand, thereby reducing California insurer stock price response compared to prices of firms not writing business in California.

Conclusions

The Loma Prieta earthquake resulted in a significantly positive stock price response for property-liability and multiple line insurers. Investors' expectations of higher demand for insurance apparently more than offset the potential earthquake losses. The amount of insurance a firm wrote in California had little impact on the stock price response. Investors' expectations were for increased demand for all insurers and not just for those close to the damaged area.

[17] Quake Insurance Claims Might Total Nearly $1 Billion: Rates Heading Up, *Wall Street Journal,* October 30, 1989; Insurance Firms Expected to Pay Billions of Dollars, *Wall Street Journal,* October 19, 1989.

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Appendix
Firms in the Sample

Property-Liability Firms

Alfa Corporation
American General Corporation
American Indemnity Financial
American International Group
American Reliance Group Inc.
Argonaut Group Inc.
Belvedere Corporation
Berkshire Hathaway Inc.
Capitol Transamerica Corporation
Chandler Insurance Company Ltd.
Chubb Corporation
Citizens Security Group Inc.
Condor Services Inc.
Donegal Group Inc.
Employers Casualty Company
First Central Financial Corporation
Frontier Insurance Group Inc.
Geico Corporation
Hanover Insurance Company
Harleysville Group Inc.
Hartford Steam Boiler Inspection
Home Group Inc.
Home Insurance Company
Markel Corporation
Merchants Group Inc.
Meridian Insurance Group Inc.
National Re Corporation
Navigators Groups Inc.
New York Marine & General Insurance
Niagara Exchange Corporation
North East Insurance Company
Ohio Casualty Corporation
Orion Capital Corporation
Pan Atlantic
Phoenix Re Corporation
RE Capital Corporation
Regency Equities Corporation
RLI Corporation
Seibels Bruce Group Inc.
Trenwick Group Inc.
20th Century Industries
Unicare Financial Corporation
United Coasts Corporation
United Fire & Casualty Company
W. R. Berkley Corporation
Warwick Insurance Managers Inc.
Zenith International Insurance Company

Multiple Line Firms

Accel International Corporation
Aetna Life & Casualty Company
Amcore Financial
Atlantic American Corporation
Capital Holding Corporation
Cigna Corporation
Cincinnati Financial Corporation
CNA Financial Corporation
Continental Corporation
EMC Insurance Group Inc.
Foremost Corp of America
Fremont General Corporation
Gainsco Inc.
General Re Corporation
Hilb Rogal & Hamilton Company
ITT Corporation
Kemper Corporation
Lincoln National Corporation
Midland Company
Milwaukee Insurance Group Inc.
Motor Club of America
Piedmont Management Company Inc.
Reliance Group Holdings Inc.
Safeco Corporation
Selective Insurance Group Inc.
St. Paul Companies Inc.
Statesman Group Inc.
Transamerica Corporation
Travelers Corporation
U.S. Facilities Corporation
USF&G Corporation
Worico