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Announcements of asset-quality problems and contagion effects in the life insurance industry*

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We investigate contagion effects in the stock returns of life insurance companies at the time of announcements by First Executive and Travelers of significant problems in their investment portfolios. We first demonstrate that investments in junk bonds or commercial mortgages are important for the shareholder wealth effects of other life insurance companies. We then directly link the shareholder wealth effects to characteristics of firms' customers. Our evidence shows that effects on shareholder wealth are larger for companies with significant junk bond/commercial mortgage assets and readily mobile customers as represented by guaranteed investment contracts (GICs).

Key words: Contagion; Writedown; Disintermediation; Life insurance
JEL classification: G14; G22

1. Introduction

Before 1990, the U.S. life insurance industry enjoyed an unparalleled reputation for financial stability, and life insurance products generally were regarded as conservative investments. During 1990, these perceptions changed rapidly as the public discovered that asset-quality problems plaguing thrifts and commercial banks during the late 1980s – investments in below-investment-grade ('junk') bonds and commercial real estate – also affected life insurance.

Two events highlighted the industry's emerging financial difficulties. In January 1990, First Executive, the sixteenth largest U.S. life insurance holding

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company, with more than $18 billion in assets, announced that it was writing down the value of its bond portfolio by $515 million. In October, Travelers, the seventh largest life insurance firm, with more than $36 billion in assets, announced that it was reserving $650 million for anticipated losses in its commercial real estate portfolio.

The stock market's reaction to these announcements was decidedly negative. First Executive's share price fell 42% on its announcement date and another 15% the next day. Similarly, Travelers's share price fell 21% on its announcement date and another 14% over the next two days. More interestingly, the prices of other insurance stocks were also adversely affected.

The broad declines in the value of insurance stocks following each writedown announcement are puzzling, for several reasons. First, if the market is semi-strong-form efficient and the market value of a firm's assets is public information, the market should be indifferent to changes in the book value of those assets.[1] As public information about the market value of insurance company assets is substantial, the post-announcement behavior of insurance stock prices is anomalous.

Second, the declines in First Executive's and Travelers's stock prices are inconsistent with the empirical findings of Strong and Meyer (1987) that announcements of asset writedowns are associated with positive average excess returns. Commenting on these results, Thakor (1987) suggests that a writedown signals favorable information, such as management's willingness to tackle a firm's problems. This view is consistent with studies finding that bank stock prices react positively to announcements of increased loan-loss reserves [Musumeci and Sinkey (1990), Madura and McDaniel (1989)]. Thus, the factors that account for the declines in insurance company stock prices must (1) be sufficiently important to more than offset the positive signaling effects at First Executive and Travelers, and (2) explain the decline in the share prices of other insurance stocks (on which the signaling theory is silent).

We suggest that the critical factor influencing insurance company stock prices was the anticipated response of policyholders. Policyholders are less informed than stock market investors about the financial condition of individual institutions because net returns to information are lower, as we describe in section 3. We believe that the announcements signaled higher returns to information, which led policyholders to assess risk-adjusted policy returns more thoroughly. If equity investors anticipated that this would lead to disintermediation at weaker companies funded with liquid liabilities, then the stock returns of these companies would be adversely affected.

[1]In regulated industries such as insurance, accounting changes can affect shareholder wealth because regulators are concerned with accounting net worth; however, First Executive and Travelers took writedowns only at the holding company level. Financial results for their insurance subsidiaries, which are reported according to statutory accounting principles, were unaffected by the announced writedowns.

Our policyholder-response hypothesis implies that the effect of First Executive's and Travelers's announcements on insurance company stock returns varies with the composition of each company's assets and liabilities. We outline and test this hypothesis and three alternative hypotheses implying that the reaction of an individual firm's stock returns is either independent of its liabilities, or independent of both its assets and its liabilities. Our findings provide strong support only for the policyholder-response hypothesis.

The outline of our study is as follows. In section 2, we very briefly describe how recent developments in the life insurance industry have combined to increase the risk of disintermediation. In section 3, we discuss the policyholder-response hypothesis in more detail and outline the alternative hypotheses about the effects of First Executive's and Travelers's announcements on insurance company stock returns. In section 4, we describe our methods and data. Section 5 presents our results, and in section 6 our summary and conclusions are given.

2. Background

During the 1980s, life insurance products shifted markedly from insurance contracts to investment contracts. Although life insurance generally has had an investment component (the exception is term life), its main function has been to offer protection against the financial risk of early death. Similarly, annuities have offered protection against the risk of outliving other forms of income. By contrast, the products that accounted for much of the industry's growth during the 1980s offer little protection against mortality risk. Instead, these products are marketed on the basis of their investment attributes – competitive returns and high liquidity.

Among the most popular products are guaranteed investment contracts (GICs). GICs are pension investment contracts paying a fixed return over a fixed maturity. These debt-like features represent a radical departure from earlier generations of pension investment contracts (primarily variable-rate, indefinite-maturity instruments). GICs, with an average maturity of approximately four years, offer greater liquidity than traditional insurance products.

Individual savings products also offer greater liquidity to policyholders. Among the most popular are single-premium deferred annuities. These annuities are attractive because of their tax-favored status – investment earnings are not taxed until they are withdrawn – and because of their relatively modest surrender charges.

The appeal of these new products is reflected in the changing composition of the industry's liability portfolio during the 1980s. From 1980 to 1990, life insurance policy reserves declined from 51% to 29% of total policy reserves, whereas annuity and pension reserves increased from 46% to 68%. These more liquid liabilities increased the exposure of individual companies to disintermediation risk.

3. Theory and alternative hypotheses

Announcements of asset-quality problems by insurance companies can affect their share prices in one of four ways. First, if the announcements disclose no new information, and if they have no impact on how policyholders use information to evaluate credit risk, they will have no effect on insurance company share prices. This is the *irrelevance hypothesis*. Second, if the announcements convey unfavorable information about the quality of insurance company assets, they will cause insurance companies' share prices to decline in relation to their holdings of problem assets. This is the *asset-information hypothesis*. Third, if the announcements affect the way policyholders use publicly available information to evaluate credit risk, they will cause share prices to decline for firms that have significant exposure to problem assets and offer liquid liabilities. This is the *policyholder-response hypothesis*. Finally, if the announcements weaken policyholder confidence in all life insurance companies, they will cause share prices to decline independent of company asset or liability structure. This is the *bank-run hypothesis*.[2]

The irrelevance and asset-information hypotheses pertain to the information content of First Executive's and Travelers's announcements. Each is plausible; before the announcements, publicly available information included a detailed description of each company's bond and mortgage holdings, secondary-market prices for junk bonds, and survey measures of commercial real estate prices. On the other hand, investors may have had difficulty assessing mortgage-loan values in a declining real estate market in which transactions were infrequent. Consequently, new information about the true condition of the commercial real estate market may have been disclosed in Travelers's announcement.

The policyholder-response hypothesis pertains to how policyholders used information to evaluate credit risk before and after First Executive's and Travelers's announcements. Information is costly to collect and evaluate even when it is publicly available. The policyholder-response hypothesis asserts that, before the announcements, the incentives for policyholders to become privately informed about the financial condition of life insurance companies with histories of financial stability was small. Policyholders, as senior claimants, suffer losses only in the event of firm insolvency, which usually is presaged by adverse public announcements. Returns to monitoring are particularly low for holders of fixed-rate liabilities that are backed by assets of the same maturity [Mayers and Smith (1981)]. The announcements motivated policyholders to acquire additional information that would enable them to differentiate strong companies from weak companies. Insurance company stock returns were affected because

[2]These hypotheses are not mutually exclusive; in particular, asset-information effects can exist alongside policyholder-response or bank-run effects. In our discussion, we assume that share-price response is attributable primarily to one of the four hypotheses.

investors anticipated that policyholders gradually would withdraw liquid liabilities from weak companies.

We stress that the policyholder-response hypothesis is perfectly consistent with the efficient-markets hypothesis that all publicly available information is incorporated into stock prices. Shareholders, as residual claimants, are affected by marginal changes in firm value; consequently, the returns to becoming privately informed generally are greater for shareholders than for policyholders. Furthermore, only the marginal shareholder need be informed for information to be impounded into stock prices for all shareholders. Thus, stock prices often impound more information than is used by each of a firm's creditors. In these situations, public announcements may be of direct value to policyholders and creditors but not to shareholders.

The bank-run hypothesis also pertains to how policyholders evaluated credit risk following First Executive's and Travelers's announcements; however, it asserts that the announcements were expected to cause withdrawals by a broad range of policyholders who feared their insurance company's insolvency. This is how uninsured bank depositors often are assumed to react to adverse information about the banking industry. Underlying this model of depositor behavior are the assumptions that depositors are unable to identify financially troubled banks, and that they withdraw funds primarily in the self-fulfilling belief that other depositors will withdraw first [Diamond and Dybvig (1983), Park (1991), Kaufman (1992)]. We speculate that the policyholder-response hypothesis is a more appropriate description of policyholder behavior following First Executive's and Travelers's announcements because the available firm-specific information was sufficient to identify financially troubled firms and because insurance policies cannot, in general, be withdrawn on demand without financial penalties.

4. Data and methods

Each hypothesis offers different predictions about the behavior of insurance company stock returns in response to the asset quality announcements. We use stock-return data, therefore, to test which hypothesis best describes the market's reaction.

4.1. Data

The primary reference for identifying the life insurance stock companies included in this study is Thomas Meakin's 'This Month in Stocks' column, which appears monthly in the *National Underwriter, Life/Health Edition.* We find Meakin's list of stocks to be highly reliable in that virtually all of the life and health companies listed have significant life and health operations. To determine

this, we use *Best's Insurance Reports, Life–Health Edition* to identify the major life insurance subsidiary of each of Meakin's stock companies. We then use the National Association of Insurance Commissioners (NAIC) database to identify other affiliated life companies and to extract balance-sheet data on all affiliates. Finally, for each of Meakin's stock companies, we compare the total assets of its life insurance affiliates with the company's consolidated assets to measure the significance of life insurance to the company's operations. For Meakin's list of companies, the minimum ratio of life insurance assets to consolidated assets is 44%.

The final number of stock companies included in our study is 54, including First Executive and Travelers. Collectively, their life insurance affiliates held $376 billion in assets, approximately 26% of total industry assets. Among the 54 stocks, 24 are traded on the New York Stock Exchange (NYSE) and 30 are traded over the counter. We obtain daily stock-return data from the CRSP database and annual balance sheet data from the NAIC database. The names of these companies and selected balance sheet data are shown in the appendix.

4.2. Event-study methods

We estimate excess returns for individual firms and for equal-weighted portfolios of firms over a two-day announcement window. To do so, we use the multivariate regression model that Cornett and Tehranian (1990) use to examine the effect of banking legislation on bank stock returns. This model measures excess returns by the coefficients of event-window dummy variables that are included in a system of market-model equations. The advantage of this approach is that we can test for abnormal returns while controlling for changes in the return-generating process.

We estimate a two-factor market model for individual firms and portfolios of firms using two years of daily return data (January 2, 1989 through December 31, 1990). For security i (or portfolio j), we estimate:

$$\begin{aligned} R_{it} = {} & b_0 + b_1 R_{NYSE,t} + b_2 R_{TBOND,t} + b_3 D_{FE} + b_4 D_{TR} \\ & + b_5 D_{Post\text{-}FE} + b_6 R_{NYSE,t} D_{Post\text{-}FE} + b_7 R_{TBOND,t} D_{Post\text{-}FE} \\ & + b_8 D_{Post\text{-}TR} + b_9 R_{NYSE,t} D_{Post\text{-}TR} + b_{10} R_{TBOND,t} D_{Post\text{-}TR}, \end{aligned} \tag{1}$$

where

R_{it} = return on security i (or portfolio j) on day t, $t = 1, 2, \ldots, 505$;
$R_{NYSE,t}$ = CRSP equally-weighted NYSE return on day t;
$R_{TBOND,t}$ = return on ten-year government bonds on day t;
D_{FE} = two-day event window dummy for First Executive's announcement;

D_{TR} = two-day event-window dummy for Travelers's announcement;
$D_{Post\text{-}FE}$ = post-event-window dummy for First Executive's announcement;
$D_{Post\text{-}TR}$ = post-event-window dummy for Travelers's announcement.

With this specification, the estimated parameters b_3 and b_4 measure average daily excess returns during First Executive's and Travelers's event windows, respectively. The event windows are days 0 and 1 in relation to the announcement dates. First Executive's announcement was released after the close of trading on Friday, January 19, so its announcement window is Monday, January 22 and Tuesday, January 23. Travelers's announcement was released during trading on Friday, October 5, so its announcement window is Friday, October 5 and Monday, October 8.[3]

Travelers made additional substantive disclosures during a meeting with securities analysts on Monday, October 8. The impact of these disclosures on investor expectations about asset quality and policyholder behavior are also of interest, so there is some justification for including a third day – Tuesday, October 9 – in the Travelers event window. Using a three-day event window does not qualitatively affect the results reported in section 5.

4.3. Hypothesis tests

For each announcement, the testing procedure involves two steps. First, we estimate and compare daily excess returns for portfolios of life insurance companies with high and low concentrations of risky assets. Second we estimate excess returns for individual companies, and regress these on selected balance sheet variables. In each step, First Executive and Travelers are excluded from the sample.

Step 1

For each event, the sample of 52 life insurance stocks is split into two portfolios: one containing companies whose life insurance subsidiaries have a greater concentration of risky assets – junk bonds for the First Executive announcement and commercial mortgages for the Travelers announcement – than the industry average, and the other containing companies whose life insurance subsidiaries invest less than the industry average in risky assets. We estimate eq. (1) for each of the resulting two pairs of portfolios using the method of seemingly unrelated regressions. Since the regressors are the same for

[3]From press accounts, both announcements surprised investors, and the stock returns for the instigating companies and other insurance companies confirm this. We find no significant excess returns on event days $t - 1$ – Friday, January 19 for First Executive and Thursday, October 4 for Travelers.

each portfolio, the seemingly unrelated regression estimates are identical to ordinary-least-squares estimates; however, using seemingly unrelated regressions permits us to test the restrictions that the excess returns for different portfolios are equal.

We use portfolio excess returns to distinguish among the four hypotheses outlined above. If excess returns on the high- and the low-risk asset portfolios are not significantly different from zero, the evidence favors the irrelevance hypothesis. If excess returns for both portfolios are significantly negative and of the same magnitude, the evidence favors the bank-run hypothesis. If excess returns are significantly negative only for the portfolio of companies whose life subsidiaries hold a high concentration of problem assets, the evidence is consistent with either the asset-information or the policyholder-response hypothesis.

Step 2

We design the second step to differentiate between the asset-information and the policyholder-response hypotheses. First, we estimate eq. (1) for each of the sample firms. Next, we regress the estimated average daily excess returns associated with each announcement (b_3 for First Executive and b_4 for Travelers) against balance-sheet variables. These variables, shown in the appendix, are constructed from the balance sheets of each company's life insurance subsidiaries and are expressed as a percentage of life insurance general account assets. They include the risky assets (junk bonds and commercial mortgages), GICs, and statutory capital.[4]

GICs are ideal for testing the policyholder-response hypothesis. They are a major source of funds for insurance companies, and their average maturity is about four years. Consequently, approximately 25% of a firm's GICs come up for renewal each year. Moreover, First Executive and Travelers were major issuers of GICs, so these firms' announcements were especially informative to GIC buyers. Statutory capital is included in the cross-section regressions because insurance regulators use this measure to determine a company's solvency; consequently, the response of policyholders to a company with high concentrations of problem assets is likely to vary with the firm's capitalization.

We estimate equations of the following form:

$$b_{3i} = c_0 + c_1 Junk_i + c_2 Junk_i * GIC_i + c_3 Junk_i * Capital_i \qquad (2)$$

[4]Statutory capital is the accounting measure of net worth reported in the financial statements that insurance companies file with state regulators. These financial statements are prepared in accordance with statutory accounting principles, which differ in certain respects from GAAP. Most insurance companies do not report GAAP financial data.

and

$$b_{4i} = d_0 + d_1 Mortgage_i + d_2 Mortgage_i * GIC_i + d_3 Mortgage_i * Capital_i, \quad (3)$$

where

b_{3i} = average daily excess return on the ith firm over First Executive's two-day announcement window estimated from eq. (1), $i = 1, 2, \ldots, 52$;
b_{4i} = average daily excess return on the ith firm over Travelers's two-day announcement window estimated from eq. (1);
$Junk_i$ = junk bonds as a percentage of assets;
$Mortgage_i$ = commercial mortgages as a percentage of assets;
GIC_i = GICs as a percentage of assets;
$Capital_i$ = statutory capital as a percentage of assets.

We use interaction terms between the risky assets and *GIC* and *Capital* because the policyholder-response hypothesis asserts that the combination of risky assets and investment-oriented liabilities adversely affects the share prices of firms subsequent to First Executive's and Travelers's announcements. The policyholder-response hypothesis predicts that the coefficients on the *GIC* interaction terms are negative ($c_2 < 0$, $d_2 < 0$) and that the coefficients on the *Capital* interaction terms are positive ($c_3 > 0$, $d_3 > 0$). By contrast, the asset-information hypothesis predicts that the coefficients on all the interaction terms are equal to zero ($c_2 = c_3 = d_2 = d_3 = 0$) and that the coefficients on the risky assets are negative ($c_1 < 0$, $d_1 < 0$).

It would be desirable to include other liability measures in eq. (2) and eq. (3), especially a measure of policy reserves for short-duration individual annuity products. Unfortunately, all policy reserves other than GIC reserves are aggregated on the statutory balance sheet. The policyholder-response hypothesis implies that the coefficients on the risky assets will be zero if all relevant liability measures are included in eq. (2) and eq. (3); however, with these other liability measures omitted, we expect negative coefficients on the risky assets ($c_1 < 0$, $d_1 < 0$) even with the inclusion of the interaction terms.

5. Results

5.1. First Executive's announcement

Table 1 provides estimates of cumulative two-day excess returns for the high-junk and low-junk life insurance stock portfolios over First Executive's

Table 1

Estimates of cumulative two-day excess returns for portfolios of 52 life insurance company stocks following the announcement in January 1990 that First Executive was writing down its junk-bond portfolio by $515 million.

Standard errors appear below each estimate. Portfolio excess returns are based on seemingly unrelated regression estimates of a two-factor market model using two years of daily return data (January 2, 1989 through December 31, 1990). The high-junk portfolio includes 20 life insurance companies in the sample with more than the industry average 7.3% of general account assets invested in below-investment-grade bonds. The low-junk portfolio includes the remaining 32 life insurance companies in the sample. Portfolio returns are equally-weighted averages of individual stock returns. The test statistic for the equality of portfolio excess returns associated with the high-junk and low-junk portfolios is significant at the probability level shown below the test statistic.

Portfolio	Number of companies	Cumulative two-day excess returns
High-junk	20	−3.72[a]
		(1.17)
Low-junk	32	−0.26
		(0.66)
F-statistic for equality of portfolio excess returns:		7.20
		0.0074

[a]Significant at the 0.01 level.

announcement window. The excess returns are based on seemingly unrelated regression estimates of eq. (1) over the full two-year sample period. The high-junk portfolio contains stocks of 20 companies whose life subsidiaries had more than 7.3% (the industry average) of their general account assets invested in below-investment-grade bonds at year-end 1990, whereas the low-junk portfolio contains stocks of 32 companies whose life subsidiaries had less than 7.3% of their general account assets invested in junk bonds. The average ratios of junk bonds to assets for companies in the high-junk and low-junk portfolios are 17% and 3%, respectively.

The excess returns associated with First Executive's announcement strongly favor the policyholder-response and asset-information hypotheses over both the irrelevance and the bank-run hypotheses. The cumulative two-day excess return for the portfolio of high-junk companies is −3.7%, significant at the 0.01 level. By contrast, the excess return for the portfolio of low-junk companies is approximately zero. The null hypothesis that the excess returns associated with the two portfolios are equal can be tested by means of an *F*-test. As shown by the *F*-statistic in table 1, we can reject the hypothesis of equal excess returns of the high-junk and low-junk portfolios using a 0.01 significance level.

Table 2 reports the results for cross-sectional regressions of average daily excess returns on selected balance-sheet variables for the 52 sample life insurance companies. Column 2 reports the ordinary-least-squares estimate of eq. (2) with junk bonds included as the sole explanatory variable. *Junk* is negative and

Table 2

Ordinary-least-squares regression results explaining average daily excess returns of 52 life insurance company stocks following the announcement in January 1990 that First Executive was writing down its junk-bond portfolio by $515 million.

The dependent variable for each regression is the average daily excess return estimated from a two-factor market model using two years of daily return data (January 2, 1989 through December 31, 1990). For each independent variable, the first row shows the coefficient estimate and the second row shows the White (1980) heteroskedastic-consistent standard error. The significance level of each regression is shown below the *F*-statistic.

Independent variables[a]	Coefficients on independent variables		
Constant	0.19	0.05	− 0.08
	(0.31)	(0.31)	(0.34)
Junk	− 11.8[b]	− 14.2[b]	− 13.5[b]
	(3.17)	(3.92)	(4.06)
*Junk * GIC*		− 105.9[c]	− 135.7[c]
		(46.6)	(60.7)
*Junk * Capital*		91.2[c]	94.0[c]
		(41.7)	(39.4)
GIC			3.0
			(2.86)
Adjusted-R^2	0.30	0.45	0.45
F-statistic	22.6	15.0	11.5
	0.0001	0.0001	0.0001

[a]*Junk* is the ratio of below-investment-grade bonds to general account assets. *GIC* is the ratio of guaranteed investment contracts to general account assets; guaranteed investment contracts are pension investment contracts that pay a fixed return over a fixed maturity. *Capital* is the ratio of statutory capital to general account assets; statutory capital is the accounting measure of net worth that insurance companies report to state regulators.

[b]Significant at the 0.01 level.

[c]Significant at the 0.05 level.

significant at the 0.01 level, and the adjusted-R^2 for this specification is 0.30, evidence that junk bonds explain a considerable amount of the variability in excess returns. The interpretation of the *Junk* coefficient, − 11.8, is that a one-percentage-point increase in the ratio of junk bonds to assets would have caused an additional 11.8-basis-point decline in a security's price for each day in the event window.

Column 3 reports the ordinary-least-squares estimate of the full specification of eq. (2), which, in addition to *Junk*, includes interaction terms between *Junk* and the variables *GIC* and *Capital*. In this specification, *Junk* remains significant at the 0.01 level, while the interaction terms have the expected signs and are significant at the 0.05 level. The adjusted-R^2 for this specification increases to 0.45. This regression provides evidence that, among companies holding junk bonds, the impact of the announcement was worse for companies with more

GIC liabilities and less capital, consistent with predictions of the policyholder-response hypothesis. For example, a company with a capital-to-asset ratio of 7% and no GICs outstanding would have experienced negative daily excess returns of 8 basis points for every 1% of its assets invested in junk bonds; by contrast, a company with the same capital ratio and GICs outstanding equal to 25% of its assets would have experienced negative daily excess returns of 35 basis points for every 1% of its assets invested in junk bonds. Thus, according to the estimates given in column 3, a company that had a capital-to-asset ratio of 7%, invested 15% of its assets in junk bonds, and funded 25% of its assets with GICs would have experienced a cumulative excess return of − 10.2% over the two-day announcement window.

As a further check on the policyholder-response hypothesis, we re-estimate eq. (2) with *GIC* included separately as well as through its interaction with *Junk*. If the market anticipates that policyholders will withdraw GIC deposits from companies with large GIC liabilities regardless of their asset composition, the coefficient on *GIC* should be negative. The results for this specification are reported in column 4. The coefficient on *GIC* is positive and statistically insignificant, while the coefficients on the remaining variables are of the same sign and statistical significance as reported in column 3. These results furnish additional evidence in favor of the policyholder-response hypothesis.

5.2. Travelers's announcement

Table 3 reports excess returns for high-mortgage and low-mortgage life insurance stock portfolios over Travelers's two-day announcement window. The 52 life companies again are split into two portfolios: a high-mortgage portfolio containing stocks of 15 companies whose life insurance subsidiaries have a commercial-mortgage-to-asset ratio in excess of the 19.7% industry-wide average and a low-mortgage portfolio containing stocks of the remaining 37 companies. On average, companies in the high-mortgage portfolio held 30% of their general-account assets in commercial mortgages, whereas companies in the low-mortgage portfolios held only 7% of their assets in commercial mortgages.

As with junk bonds, the market differentiates among life insurance companies with high rsus low asset concentrations in commercial mortgages. For the high-mortgage portfolio, the cumulative two-day excess return is − 4.4%, significant at the 0.01 level, while the excess return for the low-mortgage portfolio is not significantly different from zero. The null hypothesis that the excess returns associated with the two portfolios are equal again is tested with an *F*-test. As shown in the bottom of table 3, we can reject the hypothesis of equal excess returns for the high-mortgage and low-mortgage portfolios using a 0.01 significance level. As with First Executive's announcement, these portfolio results favor the asset-information and policyholder-response hypotheses over the irrelevance and bank-run hypotheses.

Table 3

Estimates of cumulative two-day excess returns for portfolios of 52 life insurance company stocks following the announcement in October 1990 that Travelers was adding $650 million in reserves against potential losses in its commercial real-estate portfolio.

Standard errors appear below each estimate. Portfolio excess returns are based upon seemingly unrelated regression estimates of a two-factor market model using two years of daily return data (January 2, 1989 through December 31, 1990). The high-mortgage portfolio includes 15 life insurance companies in the sample with more than the industry average 19.7% of general account assets invested in commercial mortgages. The low-mortgage portfolio includes the remaining 37 life insurance companies in the sample. Portfolio returns are equally-weighted averages of individual stock returns. The test statistic for the equality of portfolio excess returns associated with the high-mortgage and low-mortgage portfolios is significant at the probability level shown below the test statistic.

Portfolio	Number of companies	Cumulative two-day excess returns
High-mortgage	15	− 4.44[a] (0.80)
Low-mortgage	37	− 0.61 (0.80)
F-statistic for equality of portfolio excess returns:		9.1 0.0025

[a]Significant at the 0.01 level.

Table 4 reports the cross-sectional regression results for Travelers's announcement. Column 2 presents ordinary-least-squares estimates of eq. (3) with commercial mortgages included as the sole explanatory variable. Given the results from the portfolio regressions, the coefficient on *Mortgage* is surprisingly small and lacks statistical significance even at the 0.10 level (p-value = 0.11). The adjusted-R^2 for this regression is only 0.05. The value of the *Mortgage* coefficient, − 5.2, implies that a one-percentage-point increase in the ratio of commercial mortgages to assets would have caused an additional 5.2-basis-point decline in a security's price for each day in the event window.

Column 3 reports the results for the full specification of eq. (3), which, in addition to *Mortgage*, includes interaction terms between *Mortgage* and the variables *GIC* and *Capital*. Again, the coefficient on the *Mortgage* variable is small and lacks significance at even the 0.10 level (p-value = 0.11). The coefficients on the *Mortgage* * *GIC* and *Mortgage* * *Capital* interaction variables have the predicted signs, however, and are significant at the 0.10 level, with p-values of 0.07 and 0.06, respectively. Furthermore, the hypothesis that the coefficients on both interaction terms equal zero can be rejected at the 0.05 significance level. The adjusted-R^2 of this regression increases to 0.14. This specification implies that a company with no GICs outstanding and a capital-to-asset ratio of 7% would experience negative daily excess returns of 3 basis points for every 1% of

Table 4

Ordinary-least-squares regression results explaining average daily excess returns of 52 life insurance company stocks following the announcement in October 1990 that Travelers was adding $650 million in reserves against potential losses in its commercial real-estate portfolio.

The dependent variable for each regression is the average daily excess return estimated from a two-factor market model using two years of daily return data (January 2, 1989 through December 31, 1990). For each independent variable, the first row shows the coefficient estimate and the second row shows the White (1980) heteroskedastic-consistent standard error. The significance level of each regression is shown below the *F*-statistic.

Independent variables[a]	Coefficients on independent variables		
Constant	− 0.41	− 0.51	− 0.61
	(0.43)	(0.41)	(0.45)
Mortgage	− 4.94	− 5.20	− 4.50
	(3.05)	(3.18)	(4.0)
*Mortgage * GIC*		− 23.7[b]	− 39.8
		(12.8)	(25.9)
*Mortgage * Capital*		26.6[b]	25.2[b]
		(13.1)	(13.4)
GIC			4.34
			(5.0)
Adjusted-R^2	0.05	0.14	0.13
F-statistic	3.76	3.86	2.93
	0.058	0.015	0.030

[a]*Mortgage* is the ratio of commercial mortgages to general account assets. *GIC* is the ratio of guaranteed investment contracts to general account assets; guaranteed investment contracts are pension investment contracts that pay a fixed return over a fixed maturity. *Capital* is the ratio of statutory capital to general account assets; statutory capital is the accounting measure of net worth that insurance companies report to state regulators.

[b]Significant at the 0.10 level.

its assets invested in commercial mortgages, whereas a company with 7% capital and GICs outstanding equal to 30% of its assets would experience negative daily excess returns of 16 basis points for every 1% of its assets invested in commercial mortgages. Again, the estimated cross-sectional relationship lends support to the policyholder-response hypothesis since it implies that, among companies holding commercial mortgages, those with more GIC liabilities realized significantly larger negative excess returns.

In column 4, we report the results of adding *GIC* to the specification in column 3. The *GIC* variable is not significant and its inclusion provides no additional explanatory power. These results provide further evidence that it is the combination of liquid GIC liabilities and risky mortgage assets that leads to negative stockholder wealth effects following Travelers's announcement.

5.3. Regression diagnostics

To investigate the robustness of our results we perform several diagnostic tests. First, we add the log of the stock price to each of the specifications shown in tables 2 and 4. As Lang and Stulz (1992) note, spurious contagion effects potentially are observed simply because of bid–ask bounce and dealer–inventory effects. This would be the case if companies with large risky-asset or GIC concentrations tended to have low stock prices. This is not the case; the estimated coefficients on the log of the stock price are close to zero and statistically insignificant in all specifications.

Next, we examine the residuals from the regressions specified in column 3 of tables 2 and 4 to identify any outliers that might influence our results in favor of the policyholder-response hypothesis. In each case, there are several observations for which the studentized residual – the residual divided by the standard error of the residual – exceeds 2.0.

The fact that certain observations are influential does not imply that they should be excluded. It does suggest exploration of whether other factors might explain the estimated excess returns for those observations.

We consulted the Wall Street Journal Corporate Index to determine whether there are confounding corporate events affecting the outlying companies. For one firm, ICH, we found that there clearly is such an event: at the time of First Executive's announcement, ICH owned 20% of First Executive's stock. Consequently, the decline in ICH's share price reflects the decline in First Executive's share price in addition to the market's concern about the response of ICH's policyholders. To investigate whether the direct association between First Executive's and ICH's stock prices was responsible for the estimated policy-holder-response effects, we re-estimate eq. (2) omitting ICH from the sample. The results are not qualitatively different from those in table 2. Thus, the existence of policy-holder-response effects does not depend on the direct relationship between First Executive and ICH. For the remaining outlier observations, we discovered no confounding events.

6. Conclusion

This study examines the response of life insurance stocks to asset-writedown announcements by First Executive and Travelers. Our principal finding is that the response of an insurance company's stock price varies with the structure of its assets *and* liabilities. These results suggest that the primary significance of the writedown announcements to the market was their anticipated effect on policyholders' behavior. We cannot exclude the possibility that First Executive's and Travelers's announcements resulted in a revaluation of junk-bond and commercial-mortgage assets. However, the announcements almost certainly led to a revaluation of the income from the sales of new

policies and a revaluation of the withdrawal options granted to existing policyholders.

First Executive's and Travelers's own stock prices reacted strongly to each company's announcement. These extreme reactions are easily understood in light of the evidence on contagion effects. If investors were concerned about potential disintermediation at other companies, they were even more concerned about potential disintermediation at First Executive and Travelers. Those concerns appear to have been warranted. Throughout 1990, surrenders of policies at First Executive were high and sales of new policies were virtually zero. In April 1991, a full-scale run by policyholders led regulators to seize the company's life insurance subsidiaries. The situation at Travelers was not so extreme because of the size and diversity of the firm's insurance operations. Nonetheless, Travelers's operating earnings from group annuities declined from a gain of $117 million in 1990 to a loss of $42 million in 1991, and Travelers was effectively frozen out of the GIC market.

At the time of the announcements by First Executive and Travelers, policyholders were relatively uninformed about the financial condition of life insurance companies. As policyholders acquire more information, they, like investors, may come to regard announcements about individual companies as 'old news'. If they do, the contagion effects of similar announcements will be diminished. This is an interesting topic for future research.

Appendix

Balance-sheet data for life insurance subsidiaries of 54 publicly traded life insurance companies (year-end 1990, percentage of general account assets).

Company name	Junk bonds	Commercial mortgages	GICs[a]	Statutory capital[b]
Academy Insurance Group	0.8	1.0	0.0	16.8
Accel International Corporation	3.4	0.6	0.0	20.7
Aetna	2.4	41.3	26.6	5.6
Alfa Corporation	2.5	0.8	0.0	22.7
American Bankers	2.2	5.6	0.0	16.2
American Farmers Corporation	0.0	1.4	0.0	9.7
American General	2.9	18.1	0.0	12.7
American Heritage Corporation	5.4	2.7	0.0	11.1
American National Insurance	2.7	18.7	0.0	29.3
Amvestors Financial	43.3	0.3	0.0	4.8
Aon Corporation	2.5	3.3	13.4	17.7
Atlantic American Corporation	18.9	2.4	0.0	25.9
Broad Incorporated	16.2	12.0	18.1	6.0
Capital Holdings	2.2	27.2	40.2	8.1
Central Reserve	0.4	0.0	0.0	35.2
Cigna	7.7	37.9	0.0	5.8
Citizens Incorporated	0.3	3.5	0.0	9.8

Company name	Junk bonds	Commercial mortgages	GICs[a]	Statutory capital[b]
Colonial Companies	0.1	0.0	0.0	25.5
Conseco	5.0	4.3	0.0	8.8
Cotton States	4.8	10.7	0.0	21.5
Durham Corporation	2.2	10.4	0.0	14.6
Equitable & Iowa	13.5	13.3	0.0	12.0
First Capital	38.3	3.8	0.0	4.4
First Executive	61.1	0.2	21.9	5.8
Home Beneficial	2.8	47.5	2.6	29.9
ICH	12.3	1.4	20.5	15.0
Independent Insurance Group	1.6	27.1	0.0	13.1
Intercontinental	3.5	5.0	0.0	23.3
Jefferson-Pilot	2.7	13.7	0.0	24.4
Kansas City Life	1.2	19.5	0.0	10.8
Kemper	21.6	22.2	0.0	5.0
Kentucky Central	4.0	34.4	0.0	6.9
Laurentian Capital	3.3	9.4	0.0	13.1
Liberty Corporation	7.6	13.9	0.0	11.4
Lincoln National	3.8	17.6	8.8	8.2
Manhattan National	9.2	21.3	6.4	9.6
Monarch Corporation	11.5	7.9	0.0	13.1
National Western	6.8	6.2	0.0	3.6
NWNL Companies	14.9	33.4	23.8	6.4
Penn Treaty	1.3	0.0	0.0	22.5
Presidential Life	54.9	0.0	4.0	4.7
Protective Life	3.8	32.8	26.3	9.4
Provident Life	2.5	21.5	49.1	12.6
Reliance Group Holdings	31.9	0.0	0.0	6.2
Statesman Group	9.1	5.0	0.0	3.8
Torchmark	2.2	0.1	0.0	20.2
Transamerica	5.3	3.0	5.4	12.7
Travelers	2.7	36.5	24.7	8.3
United Companies Financial	7.4	26.3	0.0	5.6
United Insurance Companies	0.5	2.6	0.0	19.5
UNUM Corporation	3.1	23.3	14.8	10.8
USLICO	7.6	11.0	0.0	7.7
USLIFE Corporation	7.8	11.3	0.0	17.1
Washington National	8.3	24.3	1.8	11.9

Source: National Association of Insurance Commissioners (NAIC) database.

[a]GICs, or guaranteed investment contracts, are pension investment contracts that pay a fixed return over a fixed maturity

[b]Statutory capital is the accounting measure of net worth that insurance companies report to state regulators.

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