Recent Evidence on Insurance Stock Interest Rate Sensitivity

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Abstract

A number of researchers analyzed the relationship between stock returns and interest rate risk for financial institutions with mixed results. The assets and liabilities holdings of insurance companies are regulated to reduce interest rate risk to policyholders, but not stockholders. Given the recent increase in the number of stock companies and the recent volatility in financial stocks, this paper reexamines the direction and characteristics of the relationship between interest rate risk and stock returns with more recent evidence. Our results have important policy implications for stock investors in insurance companies.

I. Introduction

Insurance companies face several risks ranging from traditional insurance risk, asset risk, legal risk, and interest rate risk. Interest rate risk is the risk from changes in interest rates that affect firm value. The extent of exposure to interest rate risk is vitally important to individual investors (for the purpose of hedging and performance measures) and regulators (for the purpose of assessing systematic risk).

Insurance companies as financial intermediaries hold financial assets. These companies issue contingent claims and use premiums to invest in a variety of assets. Insurers' liabilities are measured by policy reserves while insurers' assets are mainly comprised of bonds and stocks.

The economic value of a financial asset or liability is the discounted value of its future cash flows. Thus, if interest rates increase, the economic value of future cash flows will decrease and vice versa. The direction and magnitude of the movement in values of both the assets and the liabilities, according to this principle, will be the same if the duration of assets and liabilities are perfectly matched then there would be no effect from changes in interest rates. The problem, however, is that asset and liability values will generally not move by the same amount in response to a particular change in interest rate. If they do not move proportionately, the net worth of an insurer will change over time.

Moreover, the liabilities of insurers, reserves, computed as the expected discounted claims, is subject to interest rate risk through the variation in the discounting term and indirectly through the variation in expected outstanding claims due to the inflation rate. If the value of policyholders' surplus decreases then the degree of leverage increases and the cost of capital will increase. Another implication of the increase in leverage is the increased likelihood of default.

A large number of studies analyzed the impact of interest rate risk on stock returns of financial institutions most notable banks as prime candidates for exposure to interest rate risk given their function of asset transformation. Assessment of the magnitude of interest rate risk

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will be useful for regulators and company risk managers. Regulators emphasizing solvency of the insurance industry, are concerned with the different risk exposures that may affect the financial health of insurance companies. There are minimum capital requirements for insurance risk, asset risk, business risk, and interest rate risk. These risk based capital requirements are to protect policyholders' future claims and not to insulate shareholders investment from volatility in the financial markets. Insurance companies risk managers would be interested in measuring and controlling interest rate risk. Shareholders/investors have a vested interest in the value of their investment other than systematic risk.

The propensity to be exposed to interest rate risk is affected by macroeconomic conditions and industry trends. The last decade was marked by a major financial crisis and a higher volatility in interest rates. In the life insurance industry, there has been an unprecedented growth in asset accumulation products such as variable annuities with interest guarantees such as equity indexed annuities. These factors make earnings of insurance companies more volatile as a higher proportion of insurance business is linked to equity markets.

This paper will add to the literature by having more companies included in the study as the number of publicly traded insurance companies increased in recent years. Our study will use more recent data compared to other studies that examined the sensitivity of insurance returns to interest rate risk. Our study covers a more recent time span. Also, the increased use of financial derivatives to hedge interest rate risk as well as other types of risk started to be significantly employed by large insurance companies managers may have contributed to the reduction of exposure to interest rate risk in the insurance sector. We collected monthly stock returns for insurance companies, measures of market index and 90-day Treasury bills and 20–year Treasury bonds change in yields as measures of interest rate covering the most recent 10 years.

II. Literature Review

The effect of interest rate risk has been extensively investigated for financial institutions, mainly financial depositories. A handful of studies focused on insurance companies' equity returns and interest rate risk. In the banking literature, empirical studies show that the relationship between equity returns and interest rate risk is generally significant and negative. Flannery and James (1984) find that bank and savings and loans stock returns are sensitive to interest rates of U.S. government securities and the sensitivity varies according to maturity mismatch between assets and liabilities; Bae (1990) finds that the negative interest rate sensitivity is greater for savings and loans, insurance companies, and commercial banks using a medium-term interest index. Fraser, Madura, and Weigand (2002) analyzing the impact of real estate on insurance stock returns included a long-term measure of interest rate. The authors found that interest rate sensitivity is greatest for health insurance companies. The most recent study of interest rate risk in the banking industry (2009) reaffirms the findings of previous studies. Notably this latter study finds a negative and significant relationship between stock returns and measures of interest rate risk.

Recent studies in insurance show that interest rate risk affects stock returns. Brewer et al., (2007) using a sample of 60 life insurance companies covering the period from January 1972 through December 2000 find evidence that stock returns of life insurance companies are affected by changes in interest rates. The study by Carson, Elyasiani, and Mansur (2008) includes three

segments of the insurance industry: life, accident and health, and property and casualty and finds significant interest rate sensitivity to changes in interest rates in the three segments of the insurance industry. The most recent study by Elyasiani, Mansur, and Wetmore (2010) analyze the real estate risk effect on financial institutions stock returns covering banks, S&Ls, and life insurance companies. The authors find a positive and significant of the 10-year Treasury rate on monthly stock returns of life insurance companies. The above studies used a GARCH model to study the impact of interest rate volatility on insurance stock returns.

III. Methodology

a. Sample Selection

The stock return data is monthly returns from the CRSP database covering the period from January 2000 to December 2009. To be included in our sample, a firm must be in the industry defined by SIC codes 6311 (Life insurance), 6321 (Accident & Health), and 6331(Property & Casualty) excluding reinsurance companies. Descriptive statistics of insurance companies by SIC codes are reported in Table 1. Second a company must have stock returns covering the entire 10-year period. The continuous trading requirement is designed to eliminate any bias due to infrequent trading and may introduce survivorship bias. Sixty one companies met these criteria resulting in 7320 observations.

The focus of our analysis is the sensitivity of insurance stock returns to interest rate risk. In the literature, there is no consensus on how to measure the interest rate risk. Some researchers have used short term rate others used long term rates with mixed results. Many insurance companies liabilities and assets are of long-term nature. Two series of interest rates long-term and short-term interest rates are used in this paper. The long-term return is the yield on 20-year government bonds constant maturity. The short-term rate is the 3-month U.S Treasury rate. Both rates are from FRED II database from the web site of the Federal Reserve Bank of St Louis. According to the market efficiency hypothesis, the level of interest rate will have no bearing on stock returns but unanticipated changes would affect equity returns.

For this study, first difference of monthly holding period returns for both short-term and long-term interest rates are used as proxy for innovations in interest rates that affect stock returns and not levels of interest rates. Alternatively, we used the residuals from regression analysis of the level of interest rate against the market index as a measure of interest rate surprises. Using this measure produced quantitatively similar results and therefore are not reported. The change in the short-term and long-term interest rate is used separately and then the spread between the two measures is used as measure of maturity risk premium since the short term interest rate measured by the 3 month US T-bills is often used as proxy for the difference in time horizon. The purpose of using three different measures is to determine whether the relationship is relatively stronger for any of the maturity classification and whether the maturity risk premium is priced by the market.

Two measures of market returns are used for the study: CRSP value weighted total returns and S&P500 Composite index to test whether our results are sensitive to choice of the proxy for the market index.

b. Estimation

Following Flannery and James (1984) the two-factor model with a market factor and interest rate factor is applied to the data set:

$R_{i,t} = \alpha_{it} + \beta_{i,m}R_{m,t} + \beta_{iI}\Delta I_{it} + \varepsilon_{i,t}$

Where,

$R_{i,t}$ = return of company i at time t (last trading day of each month),

$R_{m,t}$ = market index at time t, (last trading day of each month) and ;

ΔI_{it} = change in interest rate.

The coefficients α_{it} and $\beta_{i,m}$are analogous to the CAPM model and β_{iI} measures interest rate risk. When estimating a panel data specifications about the error term must be made. Initial tests for the fixed and random effect models were inconclusive. We opted for autoregressive model where the error term is modeled as given the time series nature of our data set. The monthly returns over a ten year period were tested for serial correlation. The results confirm significant first order correlation. For this reason, the estimation procedure uses the following specification for the error term:

$\varepsilon_{i,t} = \rho_i\varepsilon_{i,t-1} + u_{it}$

The ρ measures the serial correlation between the error terms. Controlling for this effect gave us a better fit for a data.

IV. Results

Table 2 reports summary statistics for the variables used in the study. The average monthly return of insurance stocks (1.06 percent compounded to average annualized returns of 13.5 percent) is higher than the S&P 500 Composite or the CRSP market return. The insurance stock returns exhibit a much higher variability than market returns as shown by the much wider range of stock returns.

Table 3 provides estimates of the interest rate sensitivity of insurance stock returns using time-series cross section balanced data. The first panel of Table 3 report results using the CRSP value weighted as proxy for the market index while panel B uses the S&P 500 monthly returns. The results show remarkable similarity between the different models. First, the systematic risk of insurance stocks as measured by $\beta_{i,m}$ is less than one implying that insurance stocks even though positively correlated to the market index has below average systematic risk. For the general investor, adding insurance sector to their investment portfolio would have with diversification.

We find that both the short-term and long-term interest rates have an inverse relationship with the monthly stock returns of insurance companies. Comparing our results to previous studies focusing on insurance sector, our results show a significant and negative impact of changes in interest rate on insurance stock but in terms of magnitude our coefficients are much lower than previous insurance studies. Brewer et al., (2007) find a beta coefficient ranging between 0.123 and 0.494 depending on their model specification for life insurance companies. Carson et al., (2008) find a beta 0.879 for life insurance, 0.132 for accident and health and 0.198 for property liability companies. Our results show a negative and significant interest rate sensitivity beta of 0.012 for long-term rate. A possible explanation is the use of futures and

options to hedge by insurance companies that has proved to be effective in reducing interest rate risk. The change in short-term interest is not statistically significant but the maturity spread significant and has a negative sign. This reinforces the previous finding on long term interest rates. The rationale for including the maturity spread is to measure the relative strength compared to short-term interest rate to stockholders.

Our results are comparable to previous studies with respect to systematic risk. Using the S&P 500 Composite Index as proxy of market portfolio, our beta coefficient is very similar to previous studies (0.765 (Brewer et al., 2007), 0.714 (Carson et al., 2008) for life insurance and 0.866 accident and health and 0.508 for property insurance). The market risk of insurance companies has remained about the same over the past two decades. No noticeable changes are detected. Last but not least the intercept in all models is significant implying the omission of other factors determining the return generating process such as the exchange rate changes as the insurance business has become global and real estate holdings.

V. Conclusion

Exposure to interest rate risk in the insurance industry has been important to regulators, managers, and investors. Regulators objective has been to protect policyholders against insurance industry's financial distress. For the insurance industry, there is a mandatory capital requirement for interest rate risk. To reduce their exposure to interest rate risk insurance companies managers have relied on asset liability management. As reported by Cummins, Phillips and Smith (2001) insurance companies increasingly are using derivatives to hedge noninsurance risk including interest rate risk.

We have investigated the effects of interest risk on insurance stock returns. The findings provide evidence of significant sensitivity of equity returns to surprises in long-term interest rate. Despite the attempt by insurance companies to hedge their interest rate risk, we find that stockholders remain exposed to changes in long-term interest rate and changes in the maturity spread. The focus of insurance companies' management and regulators has been on reducing the long-term interest rate risk to policyholders. One implication for insurance companies is to further focus on reducing interest rate risk to stockholders. The existence of interest rate risk for stockholders increases the cost of capital for insurance companies. An increase in the cost of capital will be passed on to policyholders in the form of higher premiums. There is more room for active hedging policies especially of long term interest rate risk by incorporating best practices for hedging with financial derivatives.

Table 1 Descriptive Statistics by Industry, Monthly Stock Returns from January 2000 through December 2009

	Life Insurance SIC= 6311	Accident & Health SIC =6321	Property and Liability SIC=6331
Number of Companies	43	12	108
Average Monthly Return	0.0084	0.0040	0.0076
Minimum Return	-0.7608	-0.7837	-0.8348
Maximum Return	1.5085	0.9091	2.4498
Number of Observations	3925	2075	9713

Table 2 Descriptive Statistics

Variable	Mean	Std Dev	Min	Max
Monthly Returns	0.0106	0.1115	-0.8342	2.4497
CRSP Index	0.0014	0.0488	-0.1847	0.1093
S&P 500	-0.0012	0.0463	-0.1694	0.0967
Long-term Rate	0.0503	0.0006	0.0318	0.0686
Short-term Rate	0.0276	0.0017	0.0003	0.0636
Spread	0.0227	0.0015	-0.0038	0.0442

Table 3 Panel Data Results, N= 61 Companies, T= 120 Monthly Returns

Variable	Coefficient	t-Statistics	Significance
Panel A: Model using CRSP Value Weighted Total Returns			
Intercept	0.0078	5.94	0.0001
Market Index	0.7617	27.88	0.0001
Long-term Rate	-0.0158	-2.52	0.0119
Intercept	0.0076	5.68	0.0001
Market Index	0.7578	27.00	0.0001
Short-term Rate	-0.0211	-1.53	0.1255
Intercept	0.0074	5.61	0.0001
Market Index	0.7708	27.47	0.0001
Spread	-0.0152	-2.40	0.0163
Short-term Rate	-0.0226	-2.85	0.0043
Panel B: Model using S&P500			
Intercept	0.0095	7.19	0.0001
Market	0.8359	28.35	0.0001
Long-term Rate	-0.0137	-2.13	0.0329
Intercept	0.0093	6.93	0.0001
Market Index	0.8336	27.64	0.0001
Short-term Rate	-0.0080	-1.39	0.1638
Intercept	0.0092	6.90	0.0001
Market Index	0.8446	27.94	0.0001
Spread	-0.0131	-2.03	0.0427
Short-term Rate	-0.0200	-2.48	0.0026

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