The International Journal of Business and Finance Research
Vol. 13, No. 1, 2019, pp. 63-72
ISSN: 1931-0269 (print)
ISSN: 2157-0698 (online)

IBFR
www.theIBFR.com

RISK AND RETURN DETERMINANTS OF US INSURERS

Li Zhang, St. Cloud State University
Norma Nielson, University of Calgary
Joseph Haley, St. Cloud State University

ABSTRACT

This paper identifies the risk and risk-adjusted return determinants of US insurers. We find that the significant firm-specific determinants for risk and risk-adjusted return vary slightly for the risk proxy and risk-adjusted return proxy used, and the types of insurers. We find that in general, profitability, leverage, types of management compensation are significantly related to both total risk and systematic risk; in addition, size is positively related to systematic risk. Profitability and incentive pay are significant determinants for total-risk-adjusted return. Size is significantly negatively related to systematic-risk-adjusted return. In addition to size, profitability and leverage are significant determinants for systematic-risk-adjusted return for Life insurers.

JEL: G22

KEYWORDS: Firm-Specific Risk Determinants, Firm-Specific Risk-Adjusted-Return Determinants, Insurance Industry, Executive Compensation, Stock Exchange

INTRODUCTION

Firms' risk determinants have been widely studied. Many studies focused on identifying the determinants of systematic risk (e.g., Iqbal and Shah, 2012, Voulgaris and Rizonaki, 2011, Lee and Jang, 2007, and Huffman, 1989); while others examined the determinants of both systematic and total risk (e.g., Eling and Marek, 2012, and Borde, Chambliss and Madura, 1994). The majority of these studies examined non-insurer's risk determinants. Only a few researchers have studied the determinants of insurers' systematic risk and total risk (e.g., Eling and Marek, 2012, and Borde, Chambliss and Madura, 1994); few have studied the determinants of insurer's risk-adjusted return. Risk studies for insurers heavily focused on identifying firm-specific factors that help predict insurer's financial distress and insolvency. (e.g., Zhang and Nielson, 2015, Sharpe and Stadnik, 2007, Brockett et al, 2006, Chen and Wong, 2004, Baranoff, Sager, and Shively, 2000, Carson and Hoyt, 2000, and Carson and Hoyt, 1995)

Equally important are the insurer's risk and performance as reflected in the stock price volatility, systematic risk, and risk-adjusted return. Traditional finance theory asserts that only systematic risk is compensated with risk premium. However, not all investors can completely diversify risk and obtain full information at low/zero cost; this fact, combined with the indivisibility of investment units, means that total risk is still pertinent to stock returns. Harrington (1983) found that US Life insurers' mean return was significantly related to measures of unsystematic risk, indicating that unsystematic risk was rewarded within the insurance industry. Cummins and Harrington's (1988) empirical results showed that unsystematic risk was significantly related to US property and liability insurers' returns during the period 1970-1980.

The purpose of this paper is to study how insurers' firm-specific financial features and executive compensation structures are related to firms' risk level and risk-adjusted return, while controlling for the major stock exchange listed and the types of insurance business. Our paper supplements the previous risk identification literature for US insurers that typically focused on insolvency prediction by extending the study scope to examining factors influencing insurer's risk level and risk-adjusted return. The remainder of the paper is organized as follows: next section provides a brief literature review, followed by methodology and data, and empirical results sections. The conclusions appear in the final section.

LITERATURE REVIEW

Managerial decisions about operation, growth, financing and executive compensation, as well as the major line of insurance business, influence an insurer's overall performance and how its return interacts with the market return. This implies that firm-specific variables can explain a significant share of variations in risk and return. Many key aspects of a firm's financial features have been found being related to firm risk and/or to stock performance in prior studies. (e.g., Eling and Marek, 2012, Dong, Wang, and Xie, 2010, Baranoff, Sager and Shively, 2000, Carson and Hoyt, 1995, and Borde, Chambliss and Madura, 1994). The major stock exchange on which an insurer is traded may be related to return volatility. Dodd (2012) found that firms on the smaller over-the-counter market exhibited more problems with thin trading. Borde, Chambliss and Madura (1994) studied how the firm-specific financial factors affect insurers' risk measured by the standard deviation of stock return and Beta over a four-year period. Based on the sample of US insurers during the period 1988-1991, they found that factors influencing insurers' risk are conditioned on the proxy used to measure risk and the type of insurer assessed. They found a positive relationship between leverage and risk in the entire sample and in the Life/Health insurer sub-sample, but negative for Property/Casualty insurer sub-sample. Liquidity was related to risk, but its effect on systematic risk and total risk was not consistent. Growth in premium was found to be positively related to total risk for the entire sample and for the P/C insurer sub-sample.

Eling and Marek (2012) studied the role of firm-specific and environmental factors in the risk level of European insurers during the period 1997-2010. Their risk measures were stock return volatility and Beta. They found that the market-based UK corporate governance system exhibited a higher level of risk, while the control-based regime model in Germany exhibited lower risk. They also found that the significant risk determinants vary with the risk proxy used and the types of insurance business. In general, they found that liquidity is negatively related to total risk, but not systematic risk; and that size is positively related to both systematic risk and total risk. In other industries, the relationship between firm-specific factors and risk measures based on stock return is widely examined. For example, Lee and Jang (2007) found that US airlines' Betas were positively related to debt leverage and size, while negatively related to profitability, growth and safety during the period 1997-2002. Voulgaris and Rizonaki (2011) analyzed the effect of operating and financial features such as profitability, liquidity, dividend payout, size and growth on systematic risk (Beta) for Greek listed firms after Greece's entrance into the European Monetary Union. They found that the degrees of financial and operating advantage, the interest coverage ratio, the growth in total assets and dividend payout ratio helped explain variations in Beta.

The effects of firm-specific characteristics on the risk-adjusted return for US insurers has been rarely studied, even though risk-adjusted return measures, e.g., Sharpe ratio and Treynor ratio, are widely used in the portfolio performance evaluation literature and in industry practice to measure how well an investment has compensated its investors given its level of risk. (e.g., Bodie, Kane and Marcus, 2005, Reilly and Norton, 2003, Sharpe, Alexander and Bailey, 1999, Sharpe, 1994, Alexander and Francis, 1986, Sharpe, 1966, and Treynor, 1965) The Sharpe ratio, developed by Nobel laureate William F. Sharpe (Sharpe, 1966), is the ratio of the return earned in excess of the risk-free rate to the standard deviation of the stock returns. In other words, the Sharpe ratio is a risk-adjusted measure of return based on total risk. The Sharpe ratio indicates whether the stock's returns are due to good management or result from excess risk. The Treynor ratio, developed by Jack Treynor (Treynor, 1965), measures return earned in excess of the risk-free rate per unit of market risk. In other words, the Treynor ratio is a risk-adjusted measure of return based on systematic risk. For both ratios, a higher numerical value indicates a better risk-adjusted return. Both ratios measure how well an investment has compensated investors given its level of risk.

METHODOLOGY AND DATA

Based on above review, the two traditional risk measures (standard deviation of stock return and CAPM Beta) and two risk-adjusted return measures (Sharpe ratio and Treynor ratio) are employed as dependent variables. The risk determinants considered as independent variables in the empirical models are discussed below. The overall profitability is measured by return on equity. If high profitability is due to superior operating performance, a company with strong profitability improves its financial stability thereby inducing less uncertainty and investor doubt (Gu and Kim, 2002). Hence, we expect insurers with high profitability exhibit lower risk and higher risk-adjusted return (operating efficiency hypothesis). Leverage is measured by liability-to-asset ratio. High leverage reduces a company's ability to meet future obligations and magnifies that insurer's returns or losses. Hence, increases the risk level (Shim, 2010, and Lee and Jang, 2007). Meanwhile, high leverage is likely related to more growth opportunity and may result in higher profitability. If such higher profitability is sufficient to compensate for higher risk, leverage should be positively related to risk-adjusted return.

Liquidity is measured by current ratio. More liquid firms have a better cushion against risk, thus we expect a negative relationship between liquidity and risk (Moyer and Chatfield, 1983). However, high liquidity may suggest inefficient use of capital, since highly liquid assets, such as cash, usually generate lower returns. If the benefit of lower risk is outweighed by the downside of lower return, the risk-adjusted return will be negatively related to liquidity; otherwise, positively related to liquidity. Business growth is measured by the percentage change in net premium earned. Firms with higher business growth exhibit a higher level of underwriting risk, especially if the high growth is due to lower underwriting discipline. Prior research has observed a positive relationship between business growth and risk (Miles, 1986). However, if high premium income improves cash-flow performance and if the cash-flows are invested well, insurers' return could be improved to overcome the increased risk; hence, business growth can be positively related to the risk-adjusted return. (Pottier and Sommer, 1999)

The common logarithm of assets is used as the proxy for insurer size. Because of possible economies of scale, less volatile claim costs, and a stronger ability to raise capital, large insurers are expected to have lower risk (Titman and Wessels, 1988). For these same reasons, large firms are expected to have higher risk-adjusted return. According to agency theory, compensation based on performance and deferred compensation may encourage management to pursue a more sustainable operating strategy that results in optimal risk taking and improved risk-adjusted return. On the other hand, management compensation in stock options could increase the risk-taking incentive, thereby increasing the underlying stock return volatility (Low, 2009, Chen, Steiner and Whyte, 2006, and Grace, 2004). The increased risk may or may not lead to improved risk-adjusted return ratio. Performance-based compensation, deferred compensation and stock options are expressed as percentages of total compensation. (Our definition of performance-based compensation includes items such as bonus, long term incentive plan payout, restricted stock granted, etc., but excludes options.) The differences across New York Stock Exchange (NYSE) and other stock exchanges may also influence stock volatility. Insurers listed on NYSE receive more attention from analysts, which results in lower stock volatility. Our regression models control for the major stock exchange on which the insurer is traded. The different lines of insurance business have substantially different profiles with regard to the predictability of losses, the duration of the risks insured, and how investment vehicles are used to manage and hedge the insurance risks. A dummy variable is used in models applied to the entire sample in order to control for the risk differentials between Life insurers and Property/Casualty insurers.

Our sample includes Life insurers with North American Industry Classification System (NAICS) code 524113, and Property/Casualty insurers with NAICS code 524126. Accounting data/variables over the period 1992-2011 were retrieved from Compustat. Stock return, standard deviation of stock returns, and Beta were drawn from Center for Research in Security Prices (CRSP). Merging the data from Compustat and CRSP produced a sample of 722 insurer-year listwise observations, 156 observations for Life insurers and 566 for property and casualty insurers. (The numbers of observations in models with different dependent variables are not the same and differ from the reported 722 listwise observations in table 1, due to the missing data in some dependent variables. For example, if an observation's standard deviation of stock return value is missing but beta value is available, this observation is not included in table 1, but still in systematic risk measure regression model.) Due to the 20-year sample period, we use a time-fixed effects OLS regression method to test the following empirical models: The model for the entire sample is as follow:

$$Dependent\ variable = \alpha_0 + \alpha \bullet X \ + \mu \bullet exchange\ listed + \theta \bullet type\ of\ insurer \qquad (1)$$

The model for sub-samples of each type of insurer is as follow:

$$Dependent\ variable = \alpha_0 + \alpha \bullet X \ + \mu \bullet exchange\ listed \qquad (2)$$

Four dependent variables are tested separately. X is the vector of the independent variables as discussed above.

We also tested our empirical models based OLS regression. Even though the results from both regressions are similar, time-fixed effects OLS regression surpasses OLS regression in many ways: firstly, many year dummies in time-fixed effects OLS regressions are statistically significant and the adjusted R-squares are improved. Time-fixed effects regression captures the temporal difference resulting from the long sample period. Secondly, more independent variables become statistically significant.

EMPIRICAL RESULTS

Table 1 provides variable means and the one-way ANOVA F-test results of the study sample. Based on univariate one-way ANOVA test, Life and P/C insurers are significantly different in the following aspects: On average, Life insurers have higher CAPM Beta, Liability-to-Asset Ratio, Current ratio, size, Incentive Pay Ratio, and Option Granted Ratio. More Life insurers are listed on NYSE. Meanwhile, P/C insurers have higher Net Premium Earned Growth Rate. We observe no significant differences in Standard Deviation of Stock Return, Sharpe Ratio, Treynor Ratio, Return on Equity, and Deferred Compensation Ratio between the insurance industries.

Tables 2 through 4 report firm-specific variables' effects for the combined P/C and Life insurers sample, P/C insurers only sample, and Life insurers only sample respectively. The F-tests show that the regressions are significant for all models. Our models explain between 46.5% and 78.7% of variation in stock return volatility, 31.5%-67.2% in Beta, 50.3%-61.3% in Sharpe ratio, and 28.5%-37.8% in Treynor ratio. All four models explain a significant portion of the variation in the dependent variables across insurers. The time-fixed effects regression models include 19 year dummies in total, many of which are statistically significant. Estimates of the time dummy variables are not reported due to the space limitations. These results are available upon request. Variance Inflation Factors (VIF) values are reported. We observe no variables with VIF higher than the problematic value of 10.

Table 1: Variable Means For P/C and Life Insurers with Univariate One-Way ANOVA Test Results

Variable	Types	Mean	ANOVA F-Test Sig
Standard Deviation of Stock Return	P/C	0.0223	0.939
	Life	0.0222	
CAPM Beta	P/C	0.9399	0.000***
	Life	1.1455	
Sharpe Ratio	P/C	5.9211	0.442
	Life	7.0054	
Treynor Ratio	P/C	0.1251	0.602
	Life	0.0971	
Return on Equity	P/C	0.0815	0.418
	Life	0.1000	
Liability-to-Asset Ratio	P/C	0.7489	0.000***
	Life	0.8918	
Current Ratio	P/C	15.1577	0.000***
	Life	30.2625	
NPE Growth Rate	P/C	0.0996	0.005***
	Life	0.0400	
Size	P/C	4.0536	0.000***
	Life	4.5518	
Incentive Pay Ratio	P/C	0.2520	0.062*
	Life	0.2886	
Deferred Compensation Ratio	P/C	0.0617	0.108
	Life	0.0511	
Option Granted Ratio	P/C	0.1653	0.019**
	Life	0.2111	
NYSE	P/C	0.77	0.000***
	Life	0.92	

*(P/C Insurers N=566, Life Insurers N=166). Table 1 provides variable means and the one-way ANOVA F-test results of the P/C and Life insurers. ***Significant at 1%, **Significant at 5%, *Significant at 10%*

Return on equity (ROE) is negatively related to both standard deviation of stock return (total risk) and CAPM Beta (systematic risk); ROE is positively related to Sharpe Ratio (total-risk-adjusted return) for all three samples; and ROE is positively related Treynor Ratio (systematic-risk-adjusted return) only for the Life insurer sample. Our finding supports the operating efficiency hypothesis that insurers' high profitability is due to superior operating performance, which improves its financial stability thereby reduces the risk, and provides better risk-adjusted return.

Insurers' liability-to-asset ratio is positively related to standard deviation of stock return and CAPM Beta for the full insurer sample and for P/C insurer sample; however, it is not significant for Life insurer sample when examined separately. This result confirms the hypothesis that leverage increases insurers' risk level. Liability-to-asset ratio is only significantly positively related to Life insurers' Treynor ratio, which is the measure for systematic-risk-adjusted return; this may suggest Life insurers' high profitability resulting from high leverage is sufficient to compensate the systematic risk.

Table 2: The Effects of Firm-Specific Variables—All Insurers Sample (P/C and Life Insurers)

	Standard Deviation of Stock Return			**CAPM Beta**			**Sharpe Ratio**			**Treynor Ratio**		
	Coef.	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**
Constant		0.79			0.02			0.00			0.00	
Return On Equity	-0.188***	0.00	1.096	-0.309***	0.00	1.093	0.049*	0.07	1.096	0.035	0.29	1.096
Liability-to-Asset Ratio	0.214***	0.00	1.738	0.065*	0.10	1.739	-0.023	0.49	1.746	-0.005	0.90	1.750
Current Ratio	0.002	0.94	1.074	-0.003	0.92	1.078	-0.018	0.51	1.074	-0.020	0.54	1.078
Net Premium Earned Growth Rate	-0.024	0.40	1.130	-0.003	0.93	1.137	0.007	0.81	1.126	0.026	0.43	1.128
Size	-0.036	0.32	1.941	0.148***	0.00	1.950	-0.045	0.21	1.942	-0.076*	0.08	1.937
Incentive Pay Ratio	0.076*	0.07	2.619	0.201***	0.00	2.623	0.110***	0.01	2.598	0.043	0.39	2.632
Deferred Compensation Ratio	0.055*	0.05	1.157	0.045	0.16	1.162	0.005	0.86	1.154	0.044	0.20	1.156
Option Granted Ratio	0.083*	0.06	2.839	0.289***	0.00	2.852	0.032	0.46	2.833	0.001	0.99	2.877
NYSE	-0.117***	0.00	1.270	0.087***	0.01	1.260	0.021	0.46	1.273	-0.041	0.25	1.268
Life	-0.026	0.39	1.325	0.089***	0.01	1.336	0.034	0.25	1.329	0.011	0.76	1.338
	N=735			N=745			N=730			N=726		
	Adjusted R Square=0.504			Adjusted R Square=0.351			Adjusted R Square=0.519			Adjusted R Square=0.285		
	F=26.683 Sig.=0.000			F=14.897 Sig.=0.000			F=28.110 Sig.=0.000			F=10.964 Sig.=0.000		

*Tables 2 shows the regression estimates of the equation "Dependent variable=constant+α•X +μ•exchange listed + θ•type of insurer" for the combined P/C and Life insurers sample. The four dependent variables tested separately are standard deviation of stock return, CAPM Beta, Sharpe Ratio and Treynor Ratio. X is the vector of the independent variables as listed in the first column. Standardized coefficients are reported. *** Significant at 1%, **Significant at 5%, *Significant at 10%*

Table 3: The Effects of Firm-Specific Variables—P/C Insurers Only Sample

	Standard Deviation of Stock Return			**CAPM Beta**			**Sharpe Ratio**			**Treynor Ratio**		
	Coef.	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**	**Coef.**	**Sig.**	**VIF**
Constant		.79			.03			.00			.000	
Return On Equity	-0.208***	0.00	1.098	-0.355***	0.00	1.096	0.055*	0.08	1.098	0.032	0.39	1.099
Liability-to-Asset Ratio	0.223***	0.00	1.393	0.083**	0.04	1.396	-0.025	0.48	1.401	-0.010	0.82	1.402
Current Ratio	0.026	0.41	1.053	0.020	0.57	1.054	-0.022	0.46	1.054	-0.039	0.28	1.050
Net Premium Earned Growth Rate	-0.039	0.25	1.198	-0.004	0.92	1.211	0.005	0.88	1.193	0.015	0.70	1.196
Size	-0.062	0.12	1.676	0.111**	0.01	1.677	-0.047	0.22	1.681	-0.070	0.12	1.683
Incentive Pay Ratio	0.119**	0.02	2.758	0.258***	0.00	2.750	0.108**	0.03	2.738	0.018	0.76	2.747
Deferred Compensation Ratio	0.068**	0.04	1.161	0.043	0.24	1.164	0.001	0.98	1.157	0.043	0.26	1.158
Option Granted Ratio	0.121**	0.02	2.921	0.353***	0.00	2.934	0.013	0.80	2.909	-0.036	0.55	2.918
NYSE	-0.107***	0.00	1.230	0.119***	0.00	1.221	0.018	0.58	1.232	-0.053	0.18	1.230
	N=577			N=583			N=573			N=569		
	Adjusted R Square=0.465			Adjusted R Square=0.315			Adjusted R Square=0.503			Adjusted R Square=0.296		
	F=18.915 Sig.=0.000			F=10.567 Sig.=0.000			F=21.652 Sig.=0.000			F=9.550 Sig.=0.000		

*Tables 3 shows the regression estimates of the equation "Dependent variable=constant+α•X +μ•exchange listed" for P/C insurers sample. The four dependent variables tested separately are standard deviation of stock return, CAPM Beta, Sharpe Ratio and Treynor Ratio. X is the vector of the independent variables as listed in the first column. Standardized coefficients are reported. *** Significant at 1%, **Significant at 5%, *Significant at 10%*

Table 4: The Effects of Firm-Specific Variables—Life Insurers Only Sample

	Standard Deviation of stock return			CAPM Beta			Sharpe Ratio			Treynor Ratio		
	Coef.	Sig.	VIF	Coef.	Sig.	VIF	Coef.	Sig.	VIF	Coef.	Sig.	VIF
Constant		0.97			0.20			0.60			0.53	
Return On Equity	-0.249***	0.00	1.852	-0.207***	0.00	1.821	0.128*	0.06	1.850	0.196**	0.02	1.852
Liability to Asset Ratio	0.079	0.24	3.268	0.077	0.34	3.161	0.059	0.51	3.264	0.242**	0.03	3.167
Current Ratio	0.003	0.94	1.386	-0.008	0.88	1.402	-0.022	0.71	1.387	-0.085	0.26	1.424
Net Premium Earned Growth Rate	-0.029	0.45	1.107	-0.054	0.26	1.104	-0.002	0.96	1.110	0.096	0.15	1.107
Size	0.023	0.77	4.644	0.153	0.11	4.494	-0.055	0.61	4.640	-0.326**	0.02	4.487
Incentive Pay Ratio	-0.010	0.90	4.382	0.138	0.15	4.556	0.089	0.39	4.285	0.131	0.33	4.408
Deferred Compensation Ratio	0.009	0.85	1.566	0.104*	0.07	1.564	-0.023	0.71	1.565	-0.047	0.55	1.554
Option Granted Ratio	0.063	0.40	4.135	0.282***	0.00	4.283	0.018	0.86	4.168	0.061	0.64	4.286
NYSE	-0.048	0.39	2.290	0.066	0.33	2.270	0.028	0.72	2.289	0.084	0.37	2.161
	N=158			N=162			N=157			N=157		
	Adjusted R Square=0.787			Adjusted R Square=0.672			Adjusted R Square=0.613			Adjusted R Square=0.378		
	F= 21.681 Sig.= 0.000			F=12.806 Sig.= 0.000			F=9.819 Sig.= 0.000			F=4.386 Sig.= 0.000		

Current ratio and net premium earned growth rate are not significant for any dependent variables for either the entire sample or any of the subsamples. Size is significantly positively related to CAPM Beta for the all insurer sample and for the P/C insurer sample. Conversely, size is significantly negatively related to Treynor ratio for the all insurer sample and for the Life insurer sample. The results indicate that size has no impact on total risk, but does have an impact on systematic risk. Large insurers exhibit higher systematic risk and lower systematic-risk-adjusted return, which differs from our expectation. The positive relationship between size and systematic risk is also found in Lee and Jang's (2007) study with US airline industry, and Eling and Marek's (2012) study with UK and German insurers.

Three compensation ratios--incentive pay ratio, deferred compensation ratio and options granted ratio--are significantly positively related to standard deviation of stock return for the all insurer sample and for the P/C insurer sample. Incentive pay and option granted are significantly positively related to CAPM Beta for the all insurer sample and for the P/C insurer sample. Deferred compensation and option granted are significantly positively related to CAPM Beta for the Life insurer sample. The positive impact of options granted on both total and systematic risk is as expected, i.e., that stock options increase management's risk-taking incentive. Of the three compensation ratios, only incentive pay is significantly positive related to Sharpe ratio (which is the measure for total-risk-adjusted return) for all insurer sample and P/C insurer sample. This finding is consistent with our expectation that incentive pay encourages optimal risk taking, hence, helps to improve the total-risk-adjusted return.

The coefficient for NYSE is significantly negative for standard deviation of stock return model and significant positive for CAPM Beta model for all insurer sample and P/C insurer sample; and is not significant for Sharpe ratio and Treynor Ratio models. The finding indicates that insurers traded on NYSE exhibit lower stock volatility and high systematic risk, while the listing exchange has no impact on risk-adjusted return. In the entire sample model, the coefficient for Life insurers is positive for CAPM Beta model. The positive coefficients indicate that, when compared to P/C insurers, Life insurers exhibit higher systematic risk. This confirms our earlier univariate one-way ANOVA test result.

CONCLUSIONS

The paper identifies the risk and risk-adjusted return determinants of US insurers. We adopt standard deviation of stock return as the measure for total risk, and CAPM Beta as the measure of systematic risk; total-risk-adjusted return is measured by Sharpe ratio and systematic-risk-adjusted return is measured by Treynor ratio. Based on the sample observed for the period 1992-2011, we find that the significant firm-specific determinants for risk and risk-adjusted return vary slightly depending on the risk proxy and risk-adjusted return proxy used as well as the types of insurers. Overall, we find that total risk is negatively related to return on equity (profitability) and positively related to liability-to-asset ratio (leverage) and toincentive pay, deferred compensation and options granted. Meanwhile these factors' impact on Life insurers' total risk is not as significant. Systematic risk is negatively related to return on equity (profitability) and positively related to the liability-to-asset ratio (leverage), size, incentive pay, and option granted. Similar to their effects on total risk for Life insurers, these factors' impact on Life insurers' systematic risk is less significant. The authors concede that the low level of statistical significance may be due to the smaller sample size for Life insurers. The Sharpe ratio is positively related to return on equity and incentive pay. The Treynor ratio is negatively related to size for the all-insurer sample and the Life insurer sample; in addition, it is positively related to return on equity, and the liability-to-asset ratio for the Life insurer sample. Moreover, insurers traded on NYSE exhibit lower total risk and high systematic risk. Life insurers exhibit higher systematic risk.

Our findings provide useful insights regarding the risk and risk-adjusted return determinants that are under management's control and should be of interest to management, investors and regulators. With the understanding of how financial factors are related to risk (both systematic risk and total risk) and risk-adjusted return, managers are able to use market-based information to make operating, underwriting and investment decisions. Investors and regulators should be able to look into the risk and risk-adjusted reward issues in more depth and hopefully make better investment decisions and provide better regulatory surveillance.

REFERENCES

Alexander, G. J. and J. C. Francis (1986) *Portfolio Analysis*, 3rd ed, Englewood Cliffs

Baranoff, E. G., T. W. Sager, and T. S. Shively (2000) "A Semiparametric Stochastic Spline Model as a Managerial Tool for Potential Insolvency", *Journal of Risk and Insurance*, vol. 67(3), p. 369-396

Bodie, Z., A. Kane, and A. Marcus (2005) *Investment,* 10th ed, Boston et al.

Borde, S. F., K. Chambliss, and J. Madura (1994) "Explaining Variation in Risk Across Insurance Companies", *Journal of Financial Services Research*, vol. 8, p. 177-191

Brockett, L. P., L. L. Golden, J. Jang, and C. Yang (2006) "A Comparison of Neural Networks, Statistical Methods, and Variable Choice for Life Insurers' Financial Distress Prediction", *Journal of Risk and Insurance*, vol. 73(3), p. 397-419

Carson, J. M. and R. E. Hoyt (2000) "Evaluating the Risk of Life Insurer Insolvency: Implications from the US for the European Union"*, Journal of Multinational Financial Management*, vol. 10(3-4), p. 297-314

Carson, J. M. and R. E. Hoyt, (1995) "Life Insurer Financial Distress: Classification Models and Empirical Evidence", *Journal of Risk and Insurance*, vol. 62(4), p. 764-775

Chen, C. R., T. L. Steiner, and A. Whyte (2006) "Does Stock Option-Based Executive Compensation Induce Risk-Taking? An Analysis of the Banking Industry", *Journal of Banking and Finance*, vol. 30(2), p. 915-945

Chen, R. and K. Wong (2004) "The Determinants of Financial Health of Asian Insurance Companies", *Journal of Risk and Insurance*, vol. 71(3), p. 469-499

Cummins, D. J. and S. E. Harrington (1988) "The Relationship Between Risk and Return: Evidence for Property-Liability Insurance Stocks", *Journal of Risk and Insurance*, vol. 55(1), p. 15-31

Dodd, R. (2012) *Markets: Exchange or Over-the-Counter,* accessed online October 8, 2018 at International Monetary Fund Website: www.imf.org/external/pubs/ft/fandd/basics/markets.htm

Dong, Z., C. Wang, and F. Xie (2010) "Do Executive Stock Options Induce Excessive Risk Taking?", *Journal of Banking of Banking & Finance*, vol. 34, p. 2518-2529

Eling, M. and S. Marek (2012) "Internal and External Drivers for Risk Taking in UK and German Insurance Market", *International Journal of Banking, Accounting and Finance*, vol. 4(1), p. 48-76

Grace, E. (2004) "Contracting Incentives and Compensation for Property-Liability Insurer Executives", *Journal of Risk and Insurance*, vol. 71(4), p. 285-307

Gu, Z. and H. Kim (2002) "Determinants of Restaurant Systematic Risk: a Reexamination", *the Journal of Hospitality Financial Management,* vol. 10(1), p. 1-13

Harrington, S. E. (1983) "The Relationship Between Risk and Return: Evidence for Life Insurance Stocks", *Journal of Risk and Insurance*, vol. 50(4), p. 587-610

Huffman, S. P. (1989) "The Impact of the Degrees of Operating and Financial Leverage on the Systematic Risk of Common Stocks: Another Look", *Quarterly Journal of Business and Economics*, vol. 28(1), p. 83-100

Iqbal, M. J. and S. Z. A. Shah (2012) "Determinants of Systematic Risk", *The Journal of Commerce,* vol. 4(1), p. 47-56

Lee, J., and S. Jang (2007) "The Systematic-Risk Determinants of the US Airline Industry", *Tourism Management*, vol. 28, p. 434-442

Low, A. (2009) "Managerial Risk-taking Behavior and Equity-Based Compensation", *Journal of Financial Economics,* vol. 92(3), p. 470-490

Miles, J. A. (1986) "Growth Options and the Real Determinants of Systematic Risk", *Journal of Business Finance and Accounting*, vol. 13(1), p. 95-105

Moyer, C. R. and R. Chatfield (1983) "Market Power and Systematic Risk", *Journal of Economics and Business*, vol. 35(1), p. 123-130

Pottier, S. W. and D. W. Sommer (1999) "Property-Liability Insurer Financial Strength Ratings: Differences Across Rating Agencies", *Journal of Risk and Insurance,* vol. 66(4), p. 621-642

Reilly, F. K. and E. A. Norton (2003) *Investments,* 6th ed, Mason

Sharpe, W. F. (1966) "Mutual Fund Performance", *Journal of Business*, vol. 39(1), p. 119-128

Sharpe, W. F. (1994) "The Sharpe Ratio", *Journal of Portfolio Management*, vol. 21(Fall), p. 49-58.

Sharpe, W. F., G. J. Alexander, and J. V. Bailey (1999) *Investments*, 6^{th} ed, Upper Saddle River

Sharpe, G. I. and A. Stadnik (2007) "Financial Distress in Australian General Insurers", *Journal of Risk and Insurance*, vol. 74(2), p. 377-399

Shim, J. (2010) "Capital-Based Regulation, Portfolio Risk and Capital Determination: Empirical Evidence from the US Property-Liability Insurers", *Journal of Banking & Finance*, vol. 34, p. 2450-2461.

Titman, S. and R. Wessels (1988) "The Determinants of Capital Structure Choice", *The Journal of Finance*, vol. 43(1), p. 1-19

Treynor, J. L. (1965) "How to Rate Management of Investments Funds", *Harvard Business Review*, vol. 43, p. 63-75

Voulgaris, F. and A. Rizonaki (2011) "On the Relationship Between Systematic Risk and Financial and Operating Risk: the Case of the Greek Listed Firms", *Global Business and Economics Review*, vol. 13, p. 204-221

Zhang, L. and N. Nielson (2015) "Solvency Analysis and Predication in Property-Casualty Insurance: Incorporating Economic and Market Predictors", *Journal of Risk and Insurance*, vol. 82(1), p. 97-124

BIOGRAPHY

Li Zhang is Associate Professor of Finance, Insurance, Real Estate at Herberger Business School, St. Cloud State University. She teaches finance and insurance classes. Her research appears in Journals such as *Journal of Risk and Insurance*, *Journal of Insurance Issues*, and *Risk Management and Insurance Review*.

Norma Nielson is a Professor of Insurance and Risk Management at the Haskayne School of Business, University of Calgary where she held the Chair in Insurance and Risk Management for twenty-one years until her retirement in 2018.

Joe Haley earned his Ph.D. in economics from the University of Nebraska. He is the Finance, Insurance, Real Estate Department Chairperson and teaches finance and insurance classes at Herberger Business School, St. Cloud State University. He's published in *The Journal of Risk and Insurance, Risk Management & Insurance Review, Journal of Insurance Issues, and Algorithmic Finance*.