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ASSET PRICING MODELS FOR VIETNAMESE NON-LIFE INSURANCE COMPANIES

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ABSTRACT

This paper aims to perform an extensive asset pricing analysis for the Vietnamese non-life insurance industry between 2008 and 2023. We document that well-known asset pricing models, such as the three-factor and five-factor models developed by Fama and French (1993, 2015), are unable to explain adequately the returns of non-life insurance stocks. Therefore, based on the results of Ammar et al. (2018) and He et al. (2021), we built a five-factor asset pricing model adapted to the Vietnamese non-life insurance industry. Empirical evidence shows that this model is better than other models in explaining the cross-section of non-life insurance stock returns. Significant factors are the excess market return, the size factor, the price-to-earnings ratio, the return on equity, and the reimbursement rate.

Keywords: equity returns, Fama-French, insurance, asset pricing, stock market

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INTRODUCTION

Asset pricing models play an essential role in modern finance, as they are designed to capture the cross-sectional variation in equity returns. However, financial institutions, such as commercial banks, insurance, and securities companies, are typically excluded from asset pricing analysis. According to Fama and French (1993), financial institutions' financial leverage is usually very high because of their business operations. Furthermore, their handling of accounting items is considerably different from that of nonfinancial firms (Prokopjeva et al., 2020). Hence, it is irrational to include both nonfinancial and financial firms in asset pricing tests. Although financial institutions account for approximately 30% of the total capitalization in the global stock market (Adrian et al., 2015), only a few studies have investigated asset pricing in the financial sector. Even among financial firms, significant differences exist among banks, insurers, and securities companies.

In this article, we argue that non-life insurance companies differ from other financial institutions for several reasons. First, they are frequently faced with particular risks, such as catastrophes (Ammar et al., 2018). Second, since customers must pay insurance premiums before an insured event occurs, reputation and compensation promises are the foundation of the insurance business. Third, to guarantee the benefits to policyholders, state management agencies strictly monitor the operations of insurance companies. Finally, because policyholder liabilities make up a high proportion of their total liabilities, their costs of debt are implicit. The accounting treatment of sales and costs for insurers is considerably different from that of other financial firms, increasing the complexity and opacity of valuations. Consequently, non-life insurers deserve a unique asset pricing model that captures the source of risk-driving stock returns.

This study examines asset pricing models for the non-life insurance industry in Vietnam. Non-life insurers are essential financial intermediaries, contributing approximately 4% of Vietnamese GDP. Thanks to collecting premiums from numerous outstanding insurance policies, insurers raise a large amount of funds and then invest in financial markets. At the end of 2022, the size of insurance investment was more than $27 billion (Department of the Insurance Supervisory Authority, 2023), making insurers the second-largest financial institution in Vietnam. Despite the economic importance of non-life insurance firms in Vietnam, the risk exposure to their equity returns has not been investigated. Several studies have used asset pricing models for Vietnamese-listed firms, such as Vo et al. (2020) and Huang et al. (2023). To the best of our knowledge, this is the first study to examine asset pricing models in the Vietnamese insurance industry.

To build our asset pricing models, we assumed a well-diversified portfolio of the non-life insurance industry that precludes arbitrage opportunities. Based on the unique characteristics of non-life insurers, we adopted a five-factor asset pricing model to calculate the cost of capital for Vietnamese listed insurance companies. The five-factor asset pricing model considers the excess market return, size factor, price-to-earnings ratio, return on equity, and reimbursement rate. Consequently, we evaluated this five-factor model's performance against three well-known asset pricing models: CAPM, the Fama-French three-factor, and five-factor models. The data sample included all non-life insurers listed on the Vietnamese stock market from 2008 to 2022.

The remainder of this paper is organized as follows. A brief literature review is presented in the next section. Section 3 presents the data and methodology. Sections 4 and 5 present the empirical results and conclusions, respectively.

LITERATURE REVIEW

CAPM, which is regarded as the origin of asset pricing, was developed by Sharpe (1964) with the aim of determining the risk-return relation of an asset. CAPM continues to be frequently applied to assess portfolio performance and the cost of equity. The beta coefficient in CAPM represents risk. A higher absolute beta value indicates a greater degree of market risk. Although CAPM is considered a powerful asset pricing model for the US market before 1963, it cannot explain several stock return patterns in the US after 1963 (Fama and French, 1993). Therefore, two mimic factors for market capitalization and the book-to-market (B/M) ratio were added to it, leading to the Fama-French three-factor (FF 3-factor) model. The FF 3-factor model outperforms CAPM in both developed and emerging markets (Fama and French, 1993, 1996; Grauer and Janmaat, 2010; Tauscher and Wallmeier, 2015; Mishra and O'Brien, 2019; Hollstein and Prokopczuk, 2022). By adding common risk factors for profitability and investment, Fama and French (2015) expanded their asset pricing model to five factors. Consequently, many studies document that the Fama-French five-factor (FF 5-factor) provides a better description of stock returns than the FF 3-factor (Fama and French, 2017, 2020; Chen and Gao, 2020; Singh et al., 2022; Diallo et al., 2023).

Notably, Fama and French (1993) excluded financial institutions such as banks, insurers, and securities companies from their data sample. They argued that financial institutions face high default risk due to their high financial leverage. Following Fama and French (1993), the asset pricing literature mainly focuses on nonfinancial firms. Very few studies have used asset pricing models for financial institutions. Examining US commercial banks, Gandhi and Lustig (2015) pointed out that size is a significant component of bank returns. Since the US government protects large banks, their default risk and expected stock returns are lower than those of small banks. Adrian et al. (2015) estimated the cost of capital for all financial firms listed in the US between 1980 and 2013, created a profitability factor based on return on equity (ROE), and then found a profitability factor in the component of bank equity returns. Yang et al. (2021) stated that bank stock returns in the US market are explained by market return, size, and profitability factors. According to Venmans (2021), US bank stocks with higher financial leverage provide higher risk-adjusted returns. Feijoo and Viale (2023) tested some asset pricing models by considering a data sample of US commercial banks. Their empirical results show that the FF 5-factor outperforms the FF 3-factor and CAPM.

Cummins and Harrington (1988) ran CAPM for property-liability insurance stocks in the US from 1970-1983. The risk-return relationship is only adequately captured by CAPM in 1980-1983, whereas this relationship is strongly inconsistent with CAPM in other periods. The FF 3-factor for property-liability insurers was performed by Cummins and Phillips (2005). They found that all three factors (market, size, and book-to-market) are significant explanatory variables for insurance stock returns. The risk premium for market capitalization and the B/M ratio also exist in the non-life insurance industry. Examining all insurers traded in the US equity market from 1991 to 2001, Carson et al. (2007) found a statistically significant market beta for property and casualty insurers at 0.508. According to Ammar et al. (2018), because insurers can immediately change their capital structure to achieve the target profit ratio, ROE is an essential variable. Ammar et al. (2018) built a five-factor model: market return, ROE and B/M ratios, short-term reversal, and the difference between the insurance sector and the entire market. They demonstrated that this five-factor model successfully explains the stock returns of property liability insurers during 1988-2015. Barinov et al. (2020) evaluated the performance of the FF 5-factor and CAPM for the insurance industry by employing the GRS test of Gibbons et al. (1989). Because of the significant alphas, the FF 5-factor is rejected. Although the GRS test does not reject CAPM, it cannot fully capture the variation in insurance stock returns. Based on financial data of nearly 50 public insurance stocks in the US, He et al. (2021) employed asset pricing tests. Adding the size and market-to-book factors slightly increased R^2, from 0.44 0.45. The size factor was statistically insignificant, whereas the market-to-book factor was significant only at the 10% level. They also pointed out the significance of the factor based on the reimbursement rate because reimbursement is the largest cost of non-life insurers.

To the best of our knowledge, there is no empirical research on asset pricing models for the Vietnamese non-life insurance industry. Although several studies employ asset pricing models in Vietnam, their data samples include only nonfinancial listed firms. According to Fang et al. (2017), the FF 3-factor has more explanatory power than CAPM from 2007 to 2014. Examining Vietnamese nonfinancial listed firms between 2007 and 2018, Vo et al. (2020) reported the superior performance of the FF 3-factor compared to CAPM. However, the FF 3-factor model cannot explain abnormal stock returns associated with idiosyncratic risk. Ryan et al. (2021) stated that the FF 5-factor is better than the FF 3-factor in explaining Vietnamese stock returns. ROE should be used to create the profitability factor rather than operating profit. An intensive evaluation of the factors and anomalies in Vietnam was conducted by Huang et al. (2023). They found that both market and size factors are relevant to Vietnamese stock returns. Remarkably, the price-to-earnings (P/E) factor outperformed the original value factor based on the B/M ratio, as suggested by Fama and French (1993).

DATA

The database used includes all traded Vietnamese non-life insurers. Although the Vietnamese stock market was established in 2000, only five insurance companies enlisted in it between 2000 and 2005. During 2006-2007, many financial institutions, including insurers, were listed. Therefore, the sample period spans from 2008 to 2023. While stock price data were collected from Datastream, financial statements were obtained from the Worldscope database. Insurers with missing financial data have been omitted from the data sample. The collected prices were the closing prices or stock prices at the end of trading days. They were adjusted for dividends, stock splits, or similar corporate actions using DataStream. The monthly return for each stock was calculated as follows:

$$r_{it} = \frac{P_t - P_{t-1}}{P_{t-1}}$$

where r_{it} is the return on stock i in month t and P_t is the adjusted closing price of stock i in month t.

Following the literature on asset pricing models in Vietnam (Ryan et al., 2021; Trung, 2022; Huang et al., 2023), the interbank offer rate was considered the riskless rate. Data were collected from the Vietnamese State Bank. In several studies, the U.S. Treasury Bill has been used as a risk-free asset for emerging markets. However, because the inflation rate in Vietnam is much higher than that in the US, the yield on the US T-Bill might not be enough to compensate for Vietnamese inflation (Nguyen and Nguyen, 2024). The VNAllshare Index, representing the variation in all stocks listed on the Vietnamese Stock Exchange, was considered the market portfolio. Data from the VNAllshare Index were also obtained from Datastream.

METHODOLOGY

Construction of portfolios

Four asset pricing models have been evaluated in this study: CAPM, FF 3-factor and 5-factor models, and a five-factor asset pricing model adapted to the Vietnamese insurance industry. First, as Ammar et al. (2018) suggested, all sample insurance stocks are grouped into six portfolios based on their market capitalization and B/M ratio. These six portfolios were used as tested assets. The weighted average return was computed based on capitalization [1]. Table 1 displays the excess return for each portfolio, which equals its return minus the riskless rate. The smaller the market capitalization, the higher the average return, indicating a size effect among Vietnamese insurers. Similarly, because high-B/M insurance stocks generate a higher average return than low-B/M insurance stocks, the value effect is confirmed. Therefore, the impact of size and value exist in the Vietnamese non-life insurance industry, consistent with evidence documented in the US (Ammar et al., 2018; Barinov et al., 2020).

Table 1: Average monthly returns of tested portfolios

		B/M		
	Size	Low	Medium	High
Average monthly returns	Big	0.57%	0.724%	1.029%
	Small	0.824%	1.134%	1.367%

Source: author's work.

Second, we ran time-series regressions of the excess returns against asset pricing factors. The CAPM model:

$$R_{i,t} = \alpha_i + \beta_{i,RM} * R_{m,t} + \varepsilon_{i,t}$$

where $R_{i,t}$ is the excess return of portfolio i and $R_{m,t}$ is the excess return of the market portfolio. $\varepsilon_{i,t}$ is the return associated with portfolio i's idiosyncratic risk.

The FF 3-factor model:

$$R_{i,t} = \alpha_i + \beta_{i,RM} * R_{m,t} + \beta_{i,SMB} * SMB_t + \beta_{i,HML} * HML_t + \varepsilon_{i,t}$$

The FF 5-factor model:

$$R_{i,t} = \alpha_i + \beta_{i,RM} * R_{m,t} + \beta_{i,SMB} * SMB_t + \beta_{i,HML} * HML_t + \beta_{i,RMW} * RMW_t + \beta_{i,CMA} * CMA_t + \varepsilon_{i,t}$$

According to Fama and French (2015), four mimic factors were created. SMB is the return differential between a small and large return portfolio. HML is the return differential between stocks with high and low B/M ratios. RMW is the mimic factor of stocks with robust and weak operating profits. CMA is a zero-investment portfolio of stocks with conservative and aggressive investments.

The five-factor model adapted to the Vietnamese insurance industry was built as follows: Since market premium and size premium are significant factors in explaining Vietnamese stock returns (Vo et al., 2020; Ryan et al., 2021), we retained these two factors. Huang et al. (2023) reported that the P/E factor outperforms the B/M factor; thus, the mimic factor of stocks with high and low P/E ratios was added. As suggested by Ammar et al. (2018) and He et al. (2021), we created specific factors for the non-life insurance industry. The fourth and fifth factors are the zero-investment insurance portfolios based on the ROE and reimbursement rate (REI).

$$R_{i,t} = \alpha_i + \beta_{i,RM} * R_{m,t} + \beta_{i,SMB} * SMB_t + \beta_{i,PE} * PE_t + \beta_{i,ROE} * ROE_t + \beta_{i,REI} * REI_t + \varepsilon_{i,t}$$

Then, the assumptions of regression models were tested. The Durbin–Watson test was used to detect autocorrelation. Since the Durbin-Watson statistics are close to 2 (at approximately 1.85); serial correlation does not exist. The Breusch–Pagan test was used to check the heteroscedasticity. Due to the presence of heteroscedasticity in several regressions, robust

[1] The ratio between the stock capitalization and total capitalization of the portfolio is utilized as a weigh when estimating weighted average return

standard errors are applied following White (1980).

Finally, we employed Gibbons et al.' s(1989) GRS statistic to test whether the regression alphas (α) across a set of tested portfolios are jointly equal to zero. According to Gibbons et al. (1989) and Fama and French (1993), the alphas in asset pricing models are considered pricing errors, which should be equal to zero. The lower the absolute value of the alphas, the better the model. We also regressed each factor to other factors, as suggested by Barillas and Shanken (2017). A factor would be statistically insignificant if its intercept is distinguishable from zero. The results of the asset pricing models, GRS, and redundancy tests are presented in the next section.

Table 2 presents the summary statistics of the eight explanatory factors. The positive means of all the factors suggest a rational risk premium. The zero-investment portfolio based on ROE yields the highest average return of 0.96% per month, while the lowest monthly mean is the market return, at only 0.364%. As shown in Table 3, the correlation between HML and PE is the highest, at 0.824. However, HML is used in the Fama-French models, whereas PE is used for the adapted model. All other correlations are less than 0.7, raising no concerns for multicollinearity as suggested by Gilles and Takashi (2021).

Table 2: Summary statistics for factors

	R_m	SMB	HML	RMW	CMA	PE	ROE	REI
Mean (%)	0.364	0.808	0.552	0.692	0.564	0.616	0.96	0.852
Standard deviation (%)	1.650	2.538	1.997	1.676	1.587	1.703	1.788	1.902
Min (%)	-6.745	-6.961	-6.441	-7.219	-7.519	-6.814	-6.830	-7.015
Max (%)	7.461	9.275	4.478	9.613	7.573	5.526	10.423	9.925

Source: author's work.

Table 3: Correlations among factors

	R_m	SMB	HML	RMW	CMA	PE	ROE	REI
R_m	1	-0.041	0.087	-0.055	-0.144	-0.105	0.122	0.184
SMB	-	1	0.267	-0.470	0.120	-0.439	-0.108	-0.187
HML	-	-	1	-0.300	0.399	0.824	0.246	0.091
RMW	-	-	-	1	-0.245	0.483	0.675	0.584
CMA	-	-	-	-	1	-0.165	0.321	0.269
PE	-	-	-	-	-	1	0.289	0.177
ROE	-	-	-	-	-	-	1	0.524
REI	-	-	-	-	-	-	-	1

Source: author's work.

RESULTS

Results of CAPM and Fama-French multifactor models

The statistical perspective indicates that CAPM is unable to account for portfolio return variance. Table 4 illustrates that in four of the six regressions, the market premium is an irrelevant explanatory variable at the 5% level. As discussed in the methodology, the lower the absolute value of the alphas, the better the model.

Table 4: Results of CAPM

		B/M		
	Size	Low	Medium	High
α (%)	Big	-0.435***	-0.183	-0.092
	Small	0.071	0.164	0.249**
β_{RM}	Big	0.178	0.534*	0.652**
	Small	0.484	0.491*	0.683**
Adj.R^2	Big	0.107	0.201	0.199
	Small	0.144	0.154	0.165

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Because of the heteroscedasticity, robust standard errors are estimated following White (1980).

Source: author's work.

However, the intercepts of both Big-Low-B/M and Small-High-B/M are statistically different from zero. CAPM cannot rationally explain insurance stock returns. The high-small portfolio yields substantially higher average returns than the high-big portfolio, but their estimated betas are almost equal, at 0.683 and 0.652, respectively. Consequently, beta may be an inadequate risk measure that cannot fully explain the size effect. The average adjusted R^2 over the six regressions is relatively low at only 0.161.

Table 5: Results of the FF 3-factor model

		B/M		
	Size	Low	Medium	High
α (%)	Big	-0.287**	-0.126	0.138
	Small	0.053	0.114	0.189*
β_{RM}	Big	0.214**	0.384**	0.478***
	Small	0.419**	0.474***	0.528***
β_{SMB}	Big	0.081**	0.107**	0.114**
	Small	0.134***	0.189***	0.217***
β_{HML}	Big	0.166**	0.141**	0.204***
	Small	0.194**	0.234**	0.361***
Adj.R^2	Big	0.262	0.298	0.314
	Small	0.384	0.415	0.484

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Because of the heteroscedasticity, robust standard errors are estimated following White (1980).

Source: author's work.

As shown in Table 5, the FF 3-factor model explains the excess returns of the tested portfolios more accurately than the CAPM model. The FF 3-factor model's average absolute value of alphas is approximately 0.151%, a significant decrease from the CAPM figure of 0.2%. The average adjusted R^2 is 0.359, which is twice as high as the average adjusted R^2 of the CAPM. Market, size, and value factors are significant explanatory variables in all regressions. The intercepts of all the regressions are identical to zero, except for Big-Low-M/B. The SMB slopes (βSMB) of the small portfolios are higher than those of the big portfolios, leading to a rational explanation of the size premium. See Table 1.

Similarly, the value effect is explained by an increase in the HML slope (βHML) from low-B/M to high-B/M.). Consequently, the explanatory power of CAPM is significantly increased by including the SMB and HML factors. This is consistent with Khoa and Huynh (2023), who documented that the FF 3-factor model provides a superior explanation for CAPM in Vietnam.

Table 6 provides a summary of the FF 5-factor regression results. The average adjusted R^2 values for both FF 3-factor and 5-factor models are nearly the same. The 3-factor model beats the FF 5-factor model in terms of explanatory power. At a significance level of 5%, the alphas of Big-Low-

B/M and Small-High-B/M are distinguishable from zero. While the profitability factor is significant in four out of the six regressions, the investment factor is significant in only two.

Table 6: Results of the FF 5-factor model

		B/M		
	Size	**Low**	**Medium**	**High**
α (%)	Big	-0.348***	-0.143	0.141
	Small	0.068	0.121	0.213**
β_{RM}	Big	0.178**	0.369**	0.425***
	Small	0.392**	0.418***	0.467***
β_{SMB}	Big	0.112**	0.092**	0.119**
	Small	0.126***	0.171***	0.205***
β_{HML}	Big	0.172**	0.196**	0.227***
	Small	0.165**	0.214**	0.308***
β_{RMW}	Big	-0.136**	-0.051	0.149**
	Small	0.006	0.152**	0.184***
β_{CMA}	Big	-0.021	0.086	0.098**
	Small	0.037	0.057	0.162**
Adj.R^2	Big	0.269	0.303	0.308
	Small	0.388	0.401	0.492

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Because of the heteroscedasticity, robust standard errors are estimated following White (1980).

Source: author's work.

Results of the adapted five-factor model

Table 7 presents the results of the five-factor model. The adapted five-factor model outperforms the Fama-French multifactor models in terms of pricing insurance stock returns. The five-factor regressions have an average adjusted R^2 of 0.41, which is relatively higher than the value for the FF 3-factor regressions (0.36). Table 7 indicates that all alphas are indistinguishable from zero, suggesting an ideal asset pricing model with no pricing error. All the explanatory factors are significant at the 5% level.

Table 7: Results of the adapted five-factor model

		B/M		
	Size	**Low**	**Medium**	**High**
α (%)	Big	-0.112	-0.092	0.023
	Small	-0.053	0.041	0.072
β_{RM}	Big	0.192**	0.351**	0.411***
	Small	0.371**	0.393***	0.438***
β_{SMB}	Big	0.097**	0.121**	0.134**
	Small	0.105***	0.163***	0.228***
β_{PE}	Big	0.208***	0.231***	0.244***
	Small	0.184***	0.228***	0.329***
β_{ROE}	Big	-0.183**	-0.152**	0.197**
	Small	0.147**	0.238***	0.284***
β_{REI}	Big	-0.162**	-0.147**	0.178***
	Small	0.184**	0.246***	0.364***
Adj.R^2	Big	0.296	0.337	0.339
	Small	0.453	0.461	0.566

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Because of the heteroscedasticity, robust standard errors are estimated following White (1980).

Source: author's work.

DISCUSSION

While CAPM cannot fully explain the returns of non-life insurance stocks, adding the SMB and HML factors enhances the explanatory power of asset pricing models. However, according to Table 6, the FF-5 factor performs dismally within the Vietnamese insurance industry, consistent with the results found for the US insurance industry (Barinov et al., 2020). In contrast, the adapted five-factor model beats other models in capturing the cross-section of non-life insurance stock returns. Consistent with Huang et al. (2023), the PE factor outperforms the original HML factor with significant estimated coefficients. Owing to the SMB and PE slopes, the adapted model can explain the size and value premiums in the Vietnamese non-life insurance industry. The loadings of ROE increase for high B/M insurers (from -0.183 to 0.197) and decrease for larger insurers (from 0.284 to 0.197). Similarly, the REI loadings rise for high B/M insurers (from -0.162 to 0.178) and decline for bigger insurers (from 0.364 to 0.178). Therefore, the inclusion of unique insurance factors enhances the performance of insurers' asset pricing models.

We also performed asset pricing tests to evaluate the explanatory power of alternative models. According to Fama and French (2020), the alpha in a perfect asset pricing model should be zero in the time-series regression for all portfolio returns. Therefore, to test whether all alphas are jointly equal to zero, the Gibbons et al. (1989) GRS statistic was employed. A lower GRS statistic implies a better asset pricing model. The average absolute values of the alphas and the GRS statistics are outlined in Table 8.

Table 8: The average absolute value of alphas and GRS statistics of asset pricing models

	CAPM	FF 3-factor	FF 5-factor	Adapted 5-factor
$A(\alpha_i)(\%)$	0.199	0.151	0.172	0.065
GRS statistic	4.61	3.32	3.98	1.54

Note: $A(\alpha_i)$ is the average absolute value of the estimated alpha (α_i) for each model

Source: author's work.

Table 8 shows that the adapted five-factor model does the best job of capturing the variation in Vietnamese insurance stock returns. The average absolute value of alphas is close to zero, at only 0.065%, whereas the values of other models are higher than 0.15%. The GRS statistic of the adapted model is also the lowest, at only 1.54. Hence, the null hypothesis that the alpha values are jointly zero is accepted. Meanwhile, due to GRS statistics being higher than 3, the CAPM and Fama-French multifactor models are rejected, according to Gilles and Takashi (2021).

In addition, the redundancy tests of Barillas and Shanken (2017) were performed to determine the important explanatory factors. We determined the significance of the regression intercept after regressing each factor on the other factors. A significant intercept implies that this factor is relevant for explaining Vietnamese insurance stock returns. Table 9 presents the results of the redundancy tests.

Table 9: Results of redundancy tests for explanatory factors

	R_m-R_f	SMB	HML	RMW	CMA	PE	ROE	REI
Intercept (%)	0.173**	0.321***	0.164*	0.238**	0.124	0.241**	0.169***	0.338***
	(2.515)	(4.916)	(1.925)	(2.834)	(1.148)	(2.926)	(5.138)	(4.722)

Note: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. t-statistics are in parentheses.

Source: author's work.

As shown in Table 9, the intercept of the investment factor is insignificant, with a low statistic of only 1.148. Consequently, the investment factor is irrelevant to insurance stock returns, as discussed in Section 4.1. With a t-statistic of 1.925, the value (HML) factor intercept was considered marginally significant at the 10% level. Because the t-statistics are higher than 2, the intercepts of the market premium, profitability, and PE factors are significant at the 5% level. Thus, they appear to be highly relevant to insurance stocks. The intercepts of the size, ROE, and REI factors are statistically significant at the 1% level, with very high t-statistics. This demonstrates that these are essential factors that capture much of the movement of Vietnamese insurers. Due to unique characteristics, insurance stocks are exposed to specific risks that are different from nonfinancial firms. Since disaster loss is the fundamental risk in the insurance business, the reimbursement rate (REI) and return on equity (ROE) are significant price factors, which is in line with the US results of Ammar et al. (2018). Their insurance-specific factors also outperformed the Fama-French factors in the US from 1988 to 2015. Similarly, Barinov et al. (2020) and He et al. (2021) reported disappointing performance of the FF 5-factor model in the US insurance industry.

CONCLUSION

Although asset pricing models are comprehensively tested for nonfinancial firms, the number of studies examining financial institutions, especially insurance, is limited. This study contributes to the literature on asset pricing for insurance by comparing four models: CAPM, the Fama-French three-factor, the five-factor, and an adapted five-factor model. The data sample included all non-life insurance companies listed on the Vietnamese stock market. The findings reveal that CAPM cannot adequately explain insurance stock returns. Owing to the addition of the size and value factors, the Fama-French three-factor model outperforms CAPM. Meanwhile, since the investment factor is irrelevant to Vietnamese stock returns, the Fama-French five-factor model performs dismally. As and insurance company can immediately change its capital structure to achieve the target profit ratio, ROE is an essential variable for insurance stocks. Furthermore, reimbursement is the largest cost for non-life insurers, and we created a mimic factor based on the reimbursement rate. By including these two factors, we built a model that adapts to the unique characteristics of non-life insurers. This adapted five-factor model outperformed the other models in terms of GRS and redundancy tests. In conclusion, a five-factor model, including the excess market return, size factor, price-to-earnings ratio, return on equity, and reimbursement rate is the most suitable asset pricing model for estimating the cost of capital for Vietnamese insurers.

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