Investigating the dynamic impact of firm-specific and macroeconomic drivers on profitability of general insurance companies in Bangladesh

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Abstract

This paper aims to investigate the relationship between profitability measured with ROE along with EPS and several industry-specific factors such as underwriting risk, reinsurance dependence, solvency margin, leverage, liquidity risk, premium growth, size of the company, tangibility of assets as well as macroeconomic factors such as GDP growth, inflation, and stock market development of the general insurance companies of Bangladesh based on the sample of 7 insurance companies for the period of 2010-2019. For the analyses, several econometric models have been adopted to estimate the coefficients such as Pooled OLS, Cross-sectional GLS, Fixed-effect, Random-effect, and One-step GMM approach. Moreover, diagnostic tests have also been conducted to examine the validity of the models such as model specification tests, heteroskedasticity tests, multicollinearity tests, autocorrelation tests, and unit-root tests. According to the computed coefficients, none of the macroeconomic variables utilized in the model affects profitability, except inflation, which positively affects ROE. Underwriting risk and size are found to negatively affect ROE but positively affect EPS. Between the two measures of profitability, only the EPS is affected by premium growth. Except for Fixed-effect, reinsurance dependence has a large positive influence on EPS and ROE. In contrast, liquidity and leverage have a positive impact on ROE. The tangibility of assets negatively affects both EPS and ROE where EPS is significant and ROE is insignificant only under fixed effect. Aside from premium growth, underwriting risk and solvency margin have a positive impact on EPS. Finally, using the GMM technique, we find that no lag variables are significant, indicating no profitability persistence. However, the model fits the data well for predicting EPS and ROE as profitability measures explaining 89.38 percent of EPS variation and 80.38 percent of ROE variation using Pooled OLS.

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Introduction

After independence, Bangladesh’s insurance sector began with two nationalized insurance companies, one Life and one General, and one foreign insurance company. Private sector insurance companies began to enter the industry in the mid-1980s, and it grew. At present, there are 47 general insurance and 33 life insurance companies in Bangladesh. Though insurance is a famous risk management tool for shifting a risk across many people's shoulders, it is not popular in our country due to the absence of awareness and understanding among our country's people. As a result, Bangladesh holds the 68th position in the global insurance industry, and the penetration rate is only 0.55% of GDP. On the other hand, in neighboring countries like India, Sri Lanka, and Vietnam, penetration rates are 4%, 1.25%, 2.25%, respectively (PwC.com, 2019). Despite the bleak picture painted by the current situation and figures, life premium earnings amounted to around BDT 96 billion, while the general sector's turnover was around BDT 47 billion. Now the question is, “What are the drivers of the growth of this industry?”
The objective of the study is to determine the predictive relationship between general insurance company profitability and industry-specific factors such as underwriting risk, reinsurance dependence, solvency margin, liquidity risk, leverage, the tangibility of assets, premium growth, and size, as well as macroeconomic factors, including inflation, GDP growth, and stock market development using econometric modeling.

In Bangladesh, only Hasan, Islam, and Wahid (2018) considered the effect of micro and macro-economic profitability determinants measured by ROA and ROE although their main focus was on macro-economic determinants. Hasan, Islam, and Wahid (2018) conducted the most recent and only study considering 32 companies to investigate the macroeconomic drivers of profitability of the Bangladesh general insurance business from 2009 to 2015, yielding 224-panel observations. They found that only the interest rate is statistically significant in explaining general insurance companies' profitability followed by the loss ratio, size, age, the tangibility of assets, managerial competency index, and solvency margin, among other industry-specific criteria, are also statistically significant in explaining the profitability of Bangladesh's general insurance market.

Siddiqua et al. (2017) evaluated the performance of private general insurance companies in Bangladesh through growth rate and trend equation analysis during 2012-2014. The authors conducted the analysis incorporating seven variables namely net premium, total insurance policy, profit after tax, investment, earnings per share, total asset, return on assets. They discovered that the general insurance industry in Bangladesh has a very bright future by looking at the positive results from five insurance companies over three years.

The next segments of this paper consist of Literature review, Data with Methods, Empirical Discussions and Conclusions with policy recommendations.

Literature Review

There are few papers on insurance performance, and the vast bulk of financial performance publications are focused on banks. The majority of research on performance in the insurance business was undertaken after 2000.

Theoretical Background and Hypothesis Development

Adams and Buckle (2003) conducted a panel data analysis based on a sample of 47 insurance companies from 1993 to 1997. They found that leverage, liquidity, and underwriting risk are statistically significant in explaining the Bermuda-based insurance company profitability. The results showed that leverage and underwriting risk have a positive impact, whereas liquidity has a negative effect on profitability.

Shiu (2004) incorporated 12 explanatory variables forming a panel data set from 1986 to 1999 and concluded that the UK general insurance business profitability is positively affected by the interest rate, solvency margin, return on equity, and liquidity. In contrast, profitability is inversely affected by reinsurance dependence and inflation. Malik (2011) conducted a study including 35 Pakistani insurance companies to explore the impacts of industry-specific factors on profitability from 2005 to 2009. In the study, he found that profitability is positively affected by the volume of capital, and the size of the company. On the contrary, Leverage and loss ratio inversely affect profitability, measured by ROA. Ćurak et al. (2011) also conducted a panel data analysis in this field. They found that size, underwriting risk, inflation, and equity returns are statistically significant in measuring the Croatian composite insurance company profitability (ROA). Almajali et al. (2012) measured the profitability of the insurance business (2002-2007) considering return on assets based on a sample of 25 insurance companies. The study results showed that the management competence index, liquidity, company size, and leverage are statistically significant and have a positive effect on Jordanian insurance companies' profitability. Pervan et al. (2012) employed a dynamic panel model with a GMM estimator to explore the consistency of Bosnia-Herzegovina insurance business profitability (2005-2010), which reveals loss ratio has a negative impact on profitability. However, past performance, age, and market share are positively correlated with profitability. Sambasivam and Ayele (2013) conducted a panel data analysis from 2003 to 2011 on a sample of nine listed insurance companies. He discovered that the growth, leverage, liquidity capital volume, and size are the significant drivers of profitability, which are positively related. In contrast, profitability is negatively affected by leverage and liquidity ratio. The industry-specific factors such as growth, leverage, liquidity, the tangibility of assets, and size are the significant determinants of general insurance company profitability (Boadi, Antwi, and Larcey, 2013). Doğan (2013) found that company size significantly positively affects the Profitability of Istanbul Stock Exchange-listed insurance companies. In contrast, the loss ratio, leverage, liquidity, and company age significantly and negatively impact profitability. According to Mehari and Aemiro (2013), the company size, tangibility of assets, and leverage are statistically significant and positively influence the return on assets of Ethiopian insurance companies. On the other hand, the loss ratio has a negative impact on ROA. Burca and Battrica (2014) conducted a panel data analysis based on a sample of 21 insurance companies during 2008-2012. They concluded that leverage, premium growth, retained risk, company size, solvency margin, and underwriting risk are statistically significant. Among these, underwriting risk, premium growth, and leverage inversely affect the return on assets, whereas company size, solvency margin and, retained risk positively impact the ROA of Romanian insurance companies. According to (Chen-Ying Lee, 2014), The size of the company, leverage, underwriting risk, premium growth, and solvency margin as significant drivers of general insurance company profitability. Öner Kaya (2015) announced the company size, age, premium growth, liquidity, and loss ratio as the significant drivers of profitability considering 24 General insurance companies in Turkey during 2006-2013.
Ullah et al. (2016) were the first to look into the factors (only industry-specific) that affect the profitability of the Bangladeshi general insurance business. He conducted a panel data analysis from 2004 to 2014 that included eight different insurance firms. Underwriting risk and size, according to the study, are statistically significant, and they inversely affect the return on assets. The expense ratio, GDP growth, and solvency margin, on the other hand, positively affect ROA. Siddiqua et al. (2017) evaluated the performance of private general insurance companies in Bangladesh through growth rate and trend equation analysis during 2012-2014. The authors conducted the analysis incorporating seven variables namely net premium, total insurance policy, profit after tax, investment, earnings per share, total asset, return on assets. They discovered that the general insurance industry in Bangladesh has a very bright future by looking at the positive results from five insurance companies over three years. So far, no studies in Bangladesh have attempted to investigate the macroeconomic factors that have an impact on the insurance business profitability. However, macroeconomic considerations might affect the insurance business profitability (Burca and Batrinca 2014). Therefore, Hasan, Islam, and Wahid (2018) conducted the most recent and only study considering 32 companies to investigate the macroeconomic drivers of profitability of the Bangladeshi general insurance business from 2009 to 2015, yielding 224-panel observations. They found that only the interest rate is statistically significant in explaining general insurance companies’ profitability. The loss ratio, size, age, the tangibility of assets, managerial competency index, and solvency margin, among other industry-specific criteria, are statistically significant in explaining the profitability of Bangladesh’s general insurance market. As a result, they conclude that interest rates and industry-specific factors are predictors of the performance of Bangladeshi general insurance businesses. In Bangladesh, only Hasan, Islam, and Wahid (2018) considered the effect of micro and macro-economic profitability determinants measured by ROA and ROE. But their main focus was on macro-economic determinants. Observing the above-mentioned literatures, there have been only two research investigations in Bangladesh examining the impact on general insurance company profitability, considering either industry-specific factors or only macroeconomic factors. Hence, this study aims to fill the literature gaps, focusing on profitability's both the industry-specific and macro-economic determinants. It will be the first research measuring profitability with EPS along with ROE of the Bangladeshi general insurance business. Besides, the study employs a dynamic model that will aid in observing the persistence of profitability in Bangladesh’s general insurance sector, making it a significant contribution to the literature of studies analyzing the determinants of insurance company profitability.

So, depending on the literature gaps, following hypotheses are constructed to demonstrate the impact of industry-specific factors along with macroeconomic factors of Bangladeshi general insurance business profitability:

H1: With regard to the EPS, industry-specific as well as macroeconomic forces have a considerable impact on it.
H2: With regard to the ROE, industry-specific as well as macroeconomic forces have a considerable impact on it.

The next segments of this paper consist of Data with Methods, Empirical Discussions and Conclusions with policy recommendations.

Research and Methodology

This is an explanatory study aimed at determining the relationship between the profitability of general insurance businesses and industry-specific factors along with macroeconomic factors. This paper relies solely on secondary data collected from 7 Bangladeshi general insurance companies during the last ten years, beginning in 2010. In a non-probabilistic approach, convenience sampling is used. So, this has become a panel data set with a total of 70 observations.

The empirical determinants of profitability of general insurance companies based on previous literatures are presented below:

| Table 1: A description of the variables that make up the model |
|-------------------------------------------------------------|
| **Explained Variables** | **Notation** | **Measurement Method** | **Expected Impact** |
| Earnings Per Share | EPS | Earnings available for common stockholders to Common Stocks outstanding | n/a |
| Return on Equity | ROE | Net Income to Total Equity | n/a |
| **Explanatory Variables, \( \Sigma X \)** | | | |
| Underwriting Risk | UR | Claim Incurred to Premium Earned | Negative |
| Reinsurance Dependence | RND | Premium Ceded to Total Assets | Negative |
| Solvency Margin | SM | Net Assets to Net Written Premium | Positive |
| Liquidity Risk | LQ | Current Assets to Current Liability | No Prior Expectation |
| Premium Growth | PMG | \((P/P_{t-1})-1\) | Positive |
| Tangibility of Assets | TNA | Fixed assets to Total assets | No Prior Expectation |
| Leverage | LV | Total Liability to Total Assets | Positive/Negative |
| Size | SZ | Natural log of Total Assets | No Prior Expectation |
| GDP Growth | GDP | \((GDP/GDP_{t-1})-1\) | Positive |
| Inflation | INF | \((CPI/CPI_{t-1})-1\) | Negative |
| Stock Market Development | DSEX | Index of Dhaka Stock Exchange | Positive |

Source: Authors’ contribution
Following empirical models have been constructed to estimate the impact of industry-specific factors along with macroeconomic factors on insurance company profitability:

\[ \text{EPS}_{it} = \alpha_i + \sum_{k=1}^{11} \beta_{ik} X_{itk} + u_{it} \]  

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\[ \text{ROE}_{it} = \alpha_i + \sum_{k=1}^{11} \beta_{ik} X_{itk} + u_{it} \]  

\[ \text{ROE}_{it} = \alpha_i + \sum_{k=1}^{11} \beta_{ik} X_{itk} + u_{it} \]  

\[ \text{EPS}_{it} = \alpha_i + \gamma \text{EPS}_{it-1} + \sum_{k=1}^{11} \beta_{ik} X_{itk} + u_{it} \]  

\[ \text{ROE}_{it} = \alpha_i + \gamma \text{ROE}_{it-1} + \sum_{k=1}^{11} \beta_{ik} X_{itk} + u_{it} \]  

Here, \( \alpha_i, \alpha_i, \alpha_i \) = Constant for Pooled OLS, Fixed Effect, and Random Effect method respectively.

\[ \sum X \] = all explanatory variables representing industry-specific along with macroeconomic factors adopted in the model. \( \beta \) = coefficient of the explanatory variable; \( u_t \) = error term of the model or error term within the entity; \( \varepsilon_t \) = error term between the entity; \( \gamma \) = coefficient of lagged dependent variable, i.e., \( \text{EPS}_{it-1}, \text{ROE}_{it-1} \); \( \text{EPS}_{it-1} \) = One year lagged EPS; \( \text{ROE}_{it-1} \) = One year lagged ROE.

To estimate the coefficients, Pooled OLS and GLS methods will be applied to equations 1 and 4 followed by the application of Fixed Effect to equations 2 and 5. Equations 3 and 6 will be used for Random Effect and The last two equations will be used to incorporate the one-step GMM approach.

When the Fixed effect is applied, it assumes that the constant will not vary over time. It also assumes that inside every entity, there are some factors (i.e., managerial efficiency) that will affect the industry-specific factors. Eventually, the outcome will be biased. In this way, the correlation between the error term of the entity and the explanatory variable is assumed to exist. In contrast, The random effect technique assumes that variation amongst entities (general insurance enterprises) is random. Besides, it has no correlation with the regressors. In order to control the endogeneity problem, the one-step GMM is used to estimate the coefficients because endogeneity causes biased and inefficient estimates of regression coefficient.

**Findings and Discussions**

A closer look at the following data reveals that the standard deviation of the variables is low and the gaps in ranges are smaller too.

| Table 2: Descriptive Statistics |
|-------------------------------|
| Variables                  | Mean | Median | Standard Deviation | Minimum | Maximum |
| EPS                         | 3.96 | 2.14   | 4.52               | 1.16    | 29.81   |
| ROE                         | 0.11 | 0.09   | 0.11               | 0.02    | 0.75    |
| Underwriting Risk           | 0.27 | 0.23   | 0.17               | 0.05    | 0.82    |
| Reinsurance Dependence      | 0.29 | 0.25   | 0.20               | 0.05    | 1.17    |
| Solvency Margin             | 3.05 | 2.75   | 1.31               | 0.81    | 5.50    |
| Size                        | 12.24| 8.30   | 6.37               | 6.00    | 22.27   |
| Premium Growth              | 0.16 | 0.12   | 0.20               | -0.19   | 0.94    |
| Liquidity Risk              | 2.34 | 1.83   | 1.34               | 0.90    | 6.70    |
| Leverage Ratio              | 0.36 | 0.35   | 0.12               | 0.20    | 0.82    |
| Tangibility of Assets       | 0.20 | 0.09   | 0.25               | 0.01    | 0.85    |
| GDP                         | 0.07 | 0.07   | 0.01               | 0.06    | 0.08    |
| Inflation                   | 0.07 | 0.06   | 0.02               | 0.06    | 0.11    |
| DSEX                        | 0.10 | -0.03  | 0.37               | -0.24   | 1.14    |

**Source:** Authors’ contribution
According to the output given in the following table no. 3, the coefficients of multiple performance factors (ratios) of the sample insurance companies explaining the changes in EPS as per the first three equations have been shown. Various methods to analyze panel data have been applied in this regard. The output of the estimators shows that Underwriting risk, reinsurance dependence, solvency margin, premium growth, and size are statistically significant at a 5% significance level and have a positive impact on earnings per share in Pooled OLS, GLS, and Random Effect approach which is also found by Adams and Buckle (2003). When we apply the Fixed Effect, reinsurance dependence, tangibility of assets, leverage, and size are found statistically significant in which only tangibility of assets has a negative impact on earnings per share which is also espoused by Malik (2011). It is noteworthy that size and reinsurance dependence are statistically significant in all methods in which reinsurance dependence is significant at 10% level and size is significant at 5% level of significance also found by Boadi, Antwi, and Larney, (2013), Sambasivam and Ayele (2013), Mehari and Aemiro (2013), Burca and Batrinca (2014) and Öner Kaya (2015).

The Chi-square values of 530.08 and 429.11 infer the overall significance of the model under GLS and Random-effect. Thus, as per the chi-square values, all the explanatory variables are jointly responsible for changes in EPS. Similarly, the F-ratios of 39.02 and 7.04 under pooled OLS and Fixed-effect, respectively prove the overall significance of the models in explaining changes in earnings per share. In addition, the R² value of 0.8938 and 0.6326 obtained using Pooled OLS and Fixed-effect method, respectively tells us that about 89.38% and 63.26% variation in EPS are explained by the model. The rho-value, intra-class correlation coefficient, of 0.9960 obtained under the Fixed-effect method depicts that panel differences account for 99.60% of EPS variation.

| Table 3: Summary of The output of Estimated Coefficients of models based on equation 01, 02 and 03 |
| Explained Variable (EPS) | Estimation of Models |
| | Pooled OLS | GLS | Fixed Effect | Random Effect |
| Explanatory Variables | | | |
| Underwriting Risk | 5.7322*** | 5.7322*** | -0.1643 | 5.7322*** |
| Reinsurance Dependence | 9.8447*** | 9.8447*** | 3.5215*** | 9.8447*** |
| Solvency Margin | 0.4276** | 0.4276** | -0.0959 | 0.4276** |
| Liquidity Risk | -0.1813 | -0.1813 | -0.1782 | -0.1813 |
| Premium Growth | 2.4871** | 2.4871** | 0.3344 | 2.4871** |
| Tangibility of Assets | -0.2490 | -0.2490 | -4.9727*** | -0.2490 |
| Leverage Ratio | -1.5357 | -1.5357 | 2.7774** | -1.5357 |
| Size | 0.0665** | 0.0665** | 1.4276** | 0.0665** |
| GDP | 19.8863 | 19.8863 | -59.8226 | 19.8863 |
| Inflation | -17.3394 | -17.3394 | -0.1423 | -17.3394 |
| DSEX | -0.2949 | -0.2949 | -0.6500 | -0.2949 |
| Constant | -1.4917 | -1.4917 | -14.5785*** | -1.4917 |
| Observations | 63 | 63 | 63 | 63 |
| R² | 0.8938 | 0.6326 | | |
| F | 39.0106 | 7.0424 | | |
| chi² | 530.0846 | 429.1161 | | |
| sigma_e | 0.6121 | 0.6121 | | |
| sigma_u | 9.6980 | 0.0000 | | |
| rho | 0.9960 | 0.0000 | | |

Note: *, **, *** indicate the level of significance at 10%, 5% and 1% respectively.

Source: Authors’ Contribution based on STATA

The coefficients of several performance factors (ratios) of the sample insurance businesses explaining variations in ROE are shown in Table 4. Almost all explanatory variables except premium growth, GDP, and DSEX are statistically significant in explaining changes in ROE using Pooled OLS, GLS, and Random Effect techniques. Using Fixed Effect, we found underwriting risk, reinsurance dependence, random, and leverage to be significant. Underwriting risk, asset tangibility, and size all negatively affect ROE. Also, using Pooled OLS and Random Effects, Inflation is statistically significant at 10% which is also espoused by Almajali et al. (2012), Sambasivam and Ayele (2013), Mehari and Aemiro (2013), Chen-Ying Lee (2014), Ullah et al. (2016).

The Chi-square values of 258.16 and 208.98 infer that all explanatory variables contribute to variations in ROE. F-ratios of 19 and 16.30 for pooled OLS and Fixed-effect models respectively show their significance in explaining variations in return on equity. It also shows us that the model explains around 80.38 percent of the variation in ROE using Pooled OLS and 79.93 percent using the Fixed-effect approach. The intra-class correlation coefficient (rho) = 0.9255 shows that panel differences account for 92.55 percent of ROE variation.
Table 4: Summary of the output of Estimated Coefficients of models based on equation 04, 05 and 06

| Explained Variable (ROE) | Estimation of Models |
|--------------------------|----------------------|
|                          | Pooled OLS | GLS | Fixed Effect | Random Effect |
| Underwriting Risk        | -0.3126**  | -0.3126** | -0.1888*** | -0.3126** |
| Reinsurance Dependence   | 0.1752**   | 0.1752** | 0.4170***  | 0.1752** |
| Solvency Margin          | 0.0181**   | 0.0181** | 0.0200     | 0.0181** |
| Liquidity Risk           | 0.0390**   | 0.0390** | 0.0413**   | 0.0390** |
| Premium Growth           | -0.0387    | -0.0387  | 0.0421     | -0.0387 |
| Tangibility of Assets    | -0.0730**  | -0.0730** | -0.0740    | -0.0730** |
| Leverage Ratio           | 0.7310**   | 0.7310** | 0.6617**   | 0.7310** |
| Size                     | -0.0038**  | -0.0038** | 0.0128     | -0.0038** |
| GDP                      | -2.2334    | -2.2334  | -2.7491    | -2.2334 |
| Inflation                | 1.8113**   | 1.1813** | 0.9249     | 1.1813** |
| DSEX                     | -0.0090    | -0.0090  | -0.0242    | -0.0090 |
| Constant                 | -0.2787**  | -0.2787** | -0.5646**  | -0.2787** |

| Observations | 63 | 63 | 63 | 63 |
|--------------|----|----|----|----|
| R²           | 0.8038 | 0.7993 |
| F            | 18.9985 | 16.2968 |

\[ \chi^2 = 258.1561 \quad 208.9835 \]
\[ \text{sigma}_e = 0.0419 \quad 0.0419 \]
\[ \text{sigma}_u = 0.1476 \quad 0.0000 \]
\[ \rho = 0.9255 \quad 0.0000 \]

Note: *, **, *** indicate the level of significance at 10%, 5% and 1% respectively.

Source: Authors' Contribution based on STATA

In the following table 05, the output of the Hausman test was used to determine if the Random-effect or Fixed-effect model should be used. Fixed-effect models using EPS as dependent variable is appropriate. On the other hand, for the model using ROE as the dependent variable, Random-effect is appropriate at 5% significance level and Fixed-effect is appropriate at 10% significance level.

Table 5: Summary of the output of the Hausman Test

| Models | EPS | ROE |
|--------|-----|-----|
| chi2   | 30.47 | 11.92 |
| p-value| 0.00 | .0637 |

H₀: Random Effect is better than Fixed Effect for the model.

Source: Authors' Contribution based on STATA

In table 06, the output of the BP-LM test was used to determine if the Pooled OLS or Random-effect model should be used. According to the following chi-square and p-values, the null hypothesis cannot be rejected. Hence, we can conclude that Pooled OLS and GLS are better than the Random-effect model.

Table 6: Summary of the output of BP-LM Test

| Models | EPS | ROE |
|--------|-----|-----|
| chi2   | 0   | 0   |
| p-value| 1   | 1   |

H₀: Pooled OLS is better than Random Effect for the model.

Source: Authors' Contribution based on STATA

The following chi2 and corresponding p-values presented in table 7 indicate that the null hypothesis of holding constant error variance across the panels can be rejected for the two Fixed-effect models. Hence, we can conclude that both of the Fixed-effect models suffer from the heteroskedasticity problem.

Table 7: Summary of Wald test for Heteroskedasticity in Fixed effect

| Models | EPS | ROE |
|--------|-----|-----|
| chi2   | 101.74 | 15.80 |
| p-value| 0.00 | 0.0270 |

H₀: Sigma(i)^2 = sigma^2 for all i

Source: Authors' Contribution based on STATA

The F-ratios and corresponding p-values in table 8 indicate that the two models have a 1st order autocorrelation problem.
Table 8: Summary of the output of Wooldridge Test for Autocorrelation

| Models | EPS   | ROE   |
|--------|-------|-------|
| F      | 83.64 | 21.33 |
| p-value| 0.0001| 0.0036|

*H₀: No first-order autocorrelation*

**Source:** Authors’ Contribution based on STATA

The F-ratios and corresponding p-values in Table 9 indicate that both models suffer from omitted variable bias.

Table 9: Summary of the Ramsey RESET Test for Model Specification

| Models | EPS   | ROE   |
|--------|-------|-------|
| F      | 20.09 | 31.20 |
| p-value| 0.00  | 0.00  |

*H₀: Model has no omitted variables*

**Source:** Authors’ Contribution based on STATA

The F-ratios and corresponding p-values in Table 10 indicate that none of the models have constant error variance. Hence, we can conclude that the models suffer from the heteroskedasticity problem.

Table 10: Summary of Test for Heteroskedasticity in Pooled OLS

| Models | EPS   | ROE   |
|--------|-------|-------|
| F      | 17.05 | 40.86 |
| p-value| 0.00  | 0.00  |

*H₀: Constant variance*

**Source:** Authors’ Contribution based on STATA

There is no collinearity or multicollinearity problem in the model as the mean VIF is less than 5 shown in Table 12. It can also be seen from the following correlation matrix.

Table 11: Correlation Matrix

| Variables | UR   | RND  | SM   | LQ   | PMG  | TNA  | LV   | SZ   | GDP  | INF  | DSEX |
|-----------|------|------|------|------|------|------|------|------|------|------|------|
| UR        | 1    |      |      |      |      |      |      |      |      |      |      |
| RND       | 0.52 | 1    |      |      |      |      |      |      |      |      |      |
| SM        | -0.23| -0.63| 1    |      |      |      |      |      |      |      |      |
| LQ        | 0.30 | 0.46 | -0.55| 1    |      |      |      |      |      |      |      |
| PMG       | 0.50 | 0.39 | -0.09| 0.08 | 1    |      |      |      |      |      |      |
| TNA       | -0.30| -0.11| 0.31 | -0.23| -0.19| 1    |      |      |      |      |      |
| LV        | 0.52 | 0.54 | -0.20| 0.24 | 0.24 | -0.32| 1    |      |      |      |      |
| SZ        | 0.36 | 0.23 | -0.17| 0.53 | 0.10 | -0.38| 0.40 | 1    |      |      |      |
| GDP       | 0.07 | -0.15| -0.10| 0.06 | -0.25| -0.04| 0.00 | 0.04 | 1    |      |      |
| INF       | -0.09| 0.12 | 0.05 | -0.06| 0.17 | 0.02 | 0.05 | -0.03| -0.55| 1    |      |
| DSEX      | 0.07 | 0.17 | -0.01| 0.03 | 0.16 | 0.02 | 0.07 | -0.02| -0.44| 0.17 | 1    |

**Source:** Authors’ contribution
Table 12: Variance Inflation Factor

| Variables                | VIF  | 1/VIF |
|--------------------------|------|-------|
| Size                     | 3.86 | 0.2589|
| Liquidity Risk           | 2.81 | 0.3557|
| Reinsurance Dependence   | 2.17 | 0.4613|
| Solvency Margin          | 2.09 | 0.4774|
| GDP                      | 2.05 | 0.4884|
| Tangibility of Assets    | 1.94 | 0.5165|
| Underwriting Risk        | 1.84 | 0.5429|
| Inflation                | 1.64 | 0.6113|
| Leverage Ratio           | 1.61 | 0.6209|
| DSEX                     | 1.49 | 0.6707|
| Premium Growth           | 1.29 | 0.7760|
| Mean VIF                 | 2.07 |       |

**Source:** Authors’ contribution

In the following table, the LLC Unit Root test’s output is given for all the dependent and independent variables. The output shows that other than the EPS, all the variables contain stationary series. However, at the first test, GDP and DSEX were also found non-stationary. That’s why we have taken the first difference of these two variables and now they are stationary. But EPS were not stationary even after taking the second difference. Therefore, the two variables namely GDP and DSEX are used in the model taking the first difference and EPS is used in its original form.

Table 13: Summary of the output of LLC Unit-root Test

| Variables                | Adjusted t-value | P-value | Results     |
|--------------------------|------------------|---------|-------------|
| EPS                      | 29.01            | 1.00    | Non-stationary |
| ROE                      | -27.53           | 0.00    | Stationary  |
| Underwriting Risk        | -3.41            | 0.0003  | Stationary  |
| Reinsurance Dependence   | -4.12            | 0.00    | Stationary  |
| Solvency Margin          | -16.43           | 0.00    | Stationary  |
| Size                     | -38.30           | 0.00    | Stationary  |
| Premium Growth           | -7.31            | 0.00    | Stationary  |
| Liquidity Risk           | -3.17            | 0.0008  | Stationary  |
| Leverage Ratio           | -11.70           | 0.00    | Stationary  |
| Tangibility of Assets    | -5.37            | 0.00    | Stationary  |
| GDP                      | -5.75            | 0.00    | Stationary  |
| Inflation                | -15.03           | 0.00    | Stationary  |
| DSEX                     | -5.29            | 0.1736  | Stationary  |

**H0:** Panels are non-stationary

**Source:** Authors’ contribution

We have adopted two econometric models, with a one-year lag, to analyze the persistency of profitability as measured by EPS, and ROE. These coefficients show that none of the two lag variables are statistically significant. DSEX does not affect any of the two dependent variables whereas reinsurance dependence affects them statistically. The tangibility of assets, GDP, leverage, and size are found to be statistically significant in explaining variations in EPS also espoused by Hasan, Islam, and Wahid (2018), Burca and Batrinca (2014). The first two have a negative impact on EPS whereas the latter two have a favorable impact. Underwriting risk, liquidity, leverage, and inflation are statistically significant in determining ROE, with only the first having a negative impact also found by Hasan, Islam, and Wahid (2018), Burca and Batrinca (2014), Pervan et al. (2012). However, the chi-square values of the following two models reveal that all economic variables jointly explain the variation in EPS, and ROE.
Table 14: Summary of the output of GMM Approach of two Models based on equation 07 and 08

Note: *, **, *** indicate the level of significance at 10%, 5% and 1% respectively.

| Variables                          | EPS   | ROE   |
|------------------------------------|-------|-------|
| L. Earnings Per Share [one year lag] | 0.0334| 0.1116|
| L. Return on Equity [one year lag]  |        |       |
| Underwriting Risk                  | -0.9897| -0.1891* |
| Reinsurance Dependence             | 4.5273**| 0.3497** |
| Solvency Margin                    | -0.1637| 0.0052 |
| Liquidity Risk                     | 0.0001| 0.0445** |
| Premium Growth                     | 0.2267| 0.0532 |
| Tangibility of Assets              | -5.8801**| -0.0325 |
| Leverage Ratio                     | 2.0716*| 0.6410** |
| Size                               | 1.2872**| 0.0071 |
| GDP                                | -62.2561**| -2.2196 |
| Inflation                          | -2.9931| 0.9660* |
| DSEX                               | -0.4779| -0.0134 |
| Constant                           | -12.5767**| -0.4559** |
| Observations                       | 56    | 56    |
| chi²                               | 88.1689| 191.4636 |

Source: Authors’ Contribution based on STATA

Conclusions

The objective of the study was to determine the relationship between general insurance company profitability and several economic variables, using a sample of seven insurance companies in Bangladesh from 2010 to 2019. The estimated coefficients reveal that the macroeconomic variables used in the model have no impact on profitability, except only inflation positively affecting the ROE. Underwriting risk and size are found to have a significant negative impact on ROE but a significant positive impact on EPS. Between the two measures of profitability, only the EPS is affected by premium growth. Reinsurance dependence has a significant positive impact in affecting both EPS and ROE, and so does the solvency margin except Fixed-effect. When we apply the Fixed-effect, it is found that tangibility of assets has a significant negative impact on EPS. Moreover, liquidity has no impact on EPS. On the other hand, Liquidity and leverage are found to have a significant positive impact on ROE (under all methods). Finally, when we apply the GMM approach, it is found that reinsurance dependence is the only variable affecting both the measures of profitability, whereas DSEX is the only variable having no impact on profitability. In addition, ROE is negatively affected by underwriting risk and positively affected by inflation (significant at 10%), leverage, and liquidity. EPS is positively affected by the leverage (significant at 10%), and size but negatively affected by the tangibility of assets and GDP. None of the lag variables is found significant under this approach divulging that there is no persistence of profitability. To conclude, for predicting EPS and ROE as measures of profitability, the model is a good fit as 89.38% variation in EPS and 80.38% variation in ROE are explained by the model under Pooled OLS approach. In future studies, larger panel datasets and additional performance indicators including dummy variables could be used to enhance the model for better prediction of profitability.

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