

Corporate Governance and Performance of Non-Life Insurance Companies: A Three-Layer Efficiency Analysis Using System GMM

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Abstract

Purpose: The purpose of this study is to investigate the influence of board size, board independence, ownership concentration, gender diversity, and meeting frequency on the financial performance of non-life insurance companies in three distinct efficiency dimensions. In addition, it investigates the influence of the composite corporate governance index, constructed using principal component analysis, on different dimensions of firm performance.

Design/methodology/approach: In this study, balanced panel data have been collected from nineteen non-life insurance companies over seven years, resulting in 133 firm-year observations. Then, the researchers applied a two-step system GMM estimator with Windmeijer (2005) finite-sample standard error corrections. Here, two separate models are estimated to examine the effects of individual governance variables and the composite governance index to compare the impact of individual governance mechanisms and the overall governance structure on three layers of efficiency, namely operational, underwriting, and overall profitability, respectively.

Findings: Board size has a different impact on different performance layers. It improves operational efficiency and underwriting margin but reduces the profit margin and return on assets. Independent boards worsen the two operational ratios and reduce the profit margin and ROA while improving the underwriting margin. Even though increasing ownership concentration improves the operational ratio, it reduces the firm's value by reducing ROA. Gender diversity improves the profit margin but also increases the loss ratio. Results show that frequent meetings hamper the operational and underwriting margin efficiency but improve the profit margin. The Composite Governance Index improves all five performance indicators simultaneously, supporting the concept of governance bundling complementarity.

Practical implications: Regulators should design frameworks for specific efficiency layers, also give priority to gender diversity to boost underwriting performance, and carefully consider the operational cost of governance complexity.

Originality/value: This study integrates a three-layer insurance efficiency framework with GMM and PCA-based governance index. This produces two novel contributions: coherent governance efficiency and the multilayer investigation.

Keywords: Corporate governance, Non-life insurance, System GMM, Board diversity, Governance complexity, Principal component analysis, Underwriting efficiency

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DOI: <https://doi.org/10.67120/jkkniubr.v2.i1.a25>

1. Introduction

To provide financial security for households and businesses, insurance companies thrive to be financially sound and maintain a strong corporate governance system. Because the failure of an insurance company will not only hamper shareholders' profit, eventually, it will also have a negative impact on policyholders, business firms, and the whole economy. In 2023, non-life insurance companies' premiums reached approximately USD 7.1 trillion globally (Swiss Re, 2024), a figure that highlights the significance of strong governance in insurance companies. That is why regulatory bodies, policymakers, and researchers place special emphasis on the good governance of insurance companies. Specifically, the financial crisis that happened between 2008 and 2009 showed that weak governance in financial institutions can exacerbate economic shocks (Kirkpatrick, 2009). Consequently, two leading regulators, such as the International Association of Insurance Supervisors (IAIS, 2024) and European authorities (EIOPA, 2020), have incorporated the importance of board-based corporate governance and independent directors in the insurance sector as a key component of their supervisory frameworks.

Because of a high degree of information asymmetry and the need for expertise in underwriting, reserving, and claim management in the insurance sector, the relation between board composition and insurance performance remains complex (Eling and Marek, 2014; Akerlof, 1970). Primarily, the insurance business performances are multidimensional, with governance influencing claims efficiency, underwriting profitability, and asset productivity in distinct ways (Abdoush, 2017). Despite this complexity, several existing studies have utilized only single performance indicators and static estimators, without addressing the endogeneity between corporate governance and firm performance (Hardwick, Adams, and Zou, 2011; Boubakri, 2011; Wintoki, Linck, and Netter, 2012; Moniruzzaman et al., 2025; Saeed et al., 2025; Datta, 2018). None, to our knowledge, has looked at governance as a combined setup using PCA methods in line with governance bundling theory (Rediker and Seth, 1995). Therefore, the study is based on the following research questions: RQ1: How do individual corporate governance mechanisms affect the operational, underwriting, and overall financial performance of non-life insurance companies in Bangladesh? RQ2: Does a PCA-based composite governance index exert effects on insurance performance that differ from those of individual governance variables, and if so, in what direction across the three efficiency layers? RQ3: Do firm-level characteristics like size and age moderate or complement the governance-performance relationship across efficiency layers?

This study fills these gaps using a two-step system GMM on a balanced panel of nineteen non-life insurance companies over seven years, where performance is examined with three efficiency layers through five indicators. Unlike the previous studies, this study estimates the governance effects under both individual variables and PCA composite specification.

Here, Section 2 represents the theoretical foundation; Section 3 reviews the empirical literature and states the hypotheses of the study; Section 4 explains the data and methodology; Sections 5 and 6 represent and discuss the findings of the study; finally, Sections 7 and 8 summarize contributions and draw conclusions, respectively.

2. Theoretical Framework

This study is conducted based on multiple theories, and rather than depending on a single framework, these theories will help to explain insurance governance and performance.

The first theory is agency theory (Jensen and Meckling, 1976). At the time when ownership and control of the firm are separated, the manager may act in their own interest unless the managers are properly monitored. The board carries out this supervisory work. However, when the board size becomes large, it may suffer from free-rider problems (Jensen, 1993), reducing monitoring effort. Mainly, in insurance firms, weak oversight can lead to issues like higher claims, rising costs, and poor pricing, affecting operational efficiency ratios.

Having independent directors on the board is considered a means of good corporate governance. However, according to Akerlof (1970), the problem lies in the information gap, which means that when one party has specialized knowledge over the other party, at that time, improved monitoring becomes difficult. They can review general finances but not core insurance judgments. Signalling theory presented by Spence (1973) states that board independence signals quality, but it increases the cost of the firm, which reduces the profit margin.

At the time when the ownership of a firm is concentrated, the main problem changes. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999, 2000) showed that the main conflict shifts from managers versus shareholders to controlling shareholders versus minority investors. At that time, controlling owners may use the firm for personal benefit through unfair pricing or related-party deals. This is called "tunnelling," which harms every efficiency layer (Johnson et al., 2000).

According to Hambrick & Mason (1984), their Echelons theory posits that a diversified board affects the decisions of the firm. Specifically, gender-diversified boards are more risk-averse (Wiseman & Gomez-Mejia, 1998). They create a capital buffer for security, settle claims quickly, and ensure pricing adequacy. March & Simon (1958) have stated that frequent meetings reduce managerial attention and waste their time. Vafeas (1999) pointed out that the relationship works both ways- poor performance also increases meetings, which, in turn, further exacerbates the problem.

Risk diversification propositions of Markowitz's (1952) portfolio theory state that large insurance companies can ensure better efficiency. In contrast, Hannan & Freeman (1977) have stated that older firms may become less efficient because of their accumulated liabilities and rigid cost structures. Finally, Governance Configuration Theory (Rediker & Seth, 1995; Milgrom & Roberts, 1995; Aguilera et al., 2008) states that when different governance mechanisms operate together, their combined effect cannot be explained by any single governance variable. That means, while certain governance mechanisms may increase profitability, they can simultaneously reduce operational efficiency. Therefore, to understand the true impact of governance, all systems must be considered together.

3. Literature Review and Hypotheses Development

3.1 Board Size

When the number of board members is larger than necessary, that can create a collective action problem. In that situation, individual directors feel less responsible; as a result, personal accountability and oversight regarding decisions diminish (Jensen, 1993). According to Hardwick, Adams & Zou (2011); Shafique, Hussain & Hassan (2021), in insurance companies, weaker supervision can be the reason for poorer operational performance, reflected in higher combined ratios. This weak supervision can also affect underwriting discipline (Cheng, 2008). According to his study, when effective board supervision diminishes, in highly competitive markets, management sometimes gives more emphasis on increasing business volume over profitability. Yermack, (1996) and Guest, (2009) find in their study that due to slow decision-making and differences of opinion, a company can retain excessive capital, and that may reduce asset returns and overall profitability. Dandago & Gugong, (2016) also reports the negative relation between large board size and firms' profitability (return on assets).

H1a–b: Board size is positively associated with the loss ratio and partial combined ratio.

H1c: Board size is negatively associated with underwriting profit margin.

H1d: Board size is negatively associated with profit margin and return on assets.

3.2 Board Independence

Independent directors brought the issues of financial discipline and reputation to the board's serious attention, but they often lack the technical expertise required to thoroughly evaluate actuarial assumptions and claims decisions within insurance companies (Akerlof, 1970). As a result, relative leniency might be observed in the settlement of claims. According to Eling & Marek (2014) and Boubakri (2011), independent boards may support quicker, less-disputed claim settlements, which can increase the loss ratio. However, according to Adams, Hermalin & Weisbach, (2010); Bhagat & Bolton, (2019); Hardwick et al., (2011), independent boards are effective in expense control, monitoring asset allocation, and ensuring proper pricing. These things help improve the expense efficiency and underwriting margins for the insurance companies. On the other side, maintaining strong corporate governance requires additional audits, compliance measures, and conservative reserving policies, which can reduce net profit margins due to higher costs (Cornett, McNutt & Tehranian, 2010). However, more efficient asset management under the supervision of independent directors increases Return on Assets (ROA), which offsets a portion of this negative impact (Adams & Mehran, 2012).

H2a: Board independence is positively associated with the loss ratio.

H2b–c: Board independence is negatively associated with the partial combined ratio and positively with underwriting profit margin.

H2d–e: Board independence is negatively associated with profit margin and positively with return on assets.

3.3 Ownership Concentration

Concentrated ownership can create a different governance problem altogether. La Porta et al. (1999, 2000) show in their study that such controlling shareholders often use the organization's assets and operations for their own personal interests. This may include

providing insurance to affiliated entities at premiums below market value, settling claims from related parties generously, or extracting personal benefits from the firm's assets through excessive service fees and contracts (Johnson et al., 2000). Claessens & Yurtoglu, (2013) and Shleifer & Vishny, (1997) found in their study that such practices weaken the efficiency and decrease the profitability, also reducing the underwriting margins through higher costs and resource diversion. However, Hasan et al. (2024) found no significant relationship between directors' ownership and the company's performance in their study.

H3a: Ownership concentration is positively associated with the loss ratio and partial combined ratio.

H3b–c: Ownership concentration is negatively associated with underwriting profit margin, profit margin, and return on assets.

3.4 Board Diversity

Research on gender-diverse boards typically reveals two characteristics. According to Wiseman & Gomez-Mejia, (1998) and Adams & Ferreira, (2009), boards with diversified genders, more specifically, women directors are generally more risk-averse and stakeholder-oriented. As a result, they support the rapid and generous settlement of claims and conservative reserving, which can increase the loss ratio. However, Post & Byron (2015) and Adams & Ferreira (2009) stated that women directors enforce stronger price discipline, resulting in a decrease in underpricing and an increase in underwriting performance. According to Kanter (1977), when female representation reaches a critical level, only then is this type of effect clearly visible. Gull et al., (2018), Brahma et al., (2021), and Sila et al., (2016) found in their study that diversified boards reduce earnings management, increase expense control, which enhances profit margin, improve operational efficiency, and improve financial reporting. However, high capital preservation and conservative investment policies due to excessive caution, income grows at a slower pace relative to assets, which can result in a decline in ROA (Bernile et al. 2018).

H4a: Gender diversity is positively associated with the loss ratio.

H4b–c: Gender diversity is negatively associated with the partial combined ratio and positively with underwriting profit margin and profit margin.

H4d: Gender diversity is negatively associated with return on assets.

3.5 Board Meeting Frequency

Board meetings are generally considered an indicator of involvement in corporate governance. Research shows that meeting frequency is related to the firm's performance, which means that when performance is poor, the board holds more meetings. This creates a self-reinforcing process in which reactive governance can exacerbate problems rather than resolve them (Vafeas, 1999). Each meeting increases costs, which increases the expense ratio. Approving claims quickly during crisis meetings can increase the settlement rate. Frequent changes in strategy disrupt pricing consistency, thereby weakening margin management (Brick & Chidambaran, 2010; Ntim & Osei, 2011).

H5a: Meeting frequency is positively associated with the loss ratio and partial combined ratio.

H5b–c: Meeting frequency is negatively associated with underwriting profit margin, profit margin, and return on assets.

3.6 Composite Governance Index

Individual variables of corporate governance show only parts of the overall picture; in reality, however, governance is a configuration—that is, an integrated package of various mechanisms that interact with one another, reinforcing or sometimes even cancelling each other out (Rediker & Seth, 1995; Milgrom & Roberts, 1995). A PCA-based composite index identifies the primary underlying dimension common to governance variables, rather than isolating their individual effects (Gompers, Ishii & Metrick, 2003). Aguilera et al (2008) stated that effective governance depends on the whole configuration. In reality, it can be seen that stronger governance can increase efficiency and margins through better enforcement, but it may also increase coordination costs and harm operational ratios because of their complexity (Renders et al., 2010; Ntim & Soobaroyen, 2013).

H6a–b: The composite index is negatively associated with the partial combined ratio and the loss ratio.

H6c–e: The composite index is positively associated with underwriting profit margin, profit margin, and return on assets.

3.7 Control Variables: Firm Size and Firm Age

Firm size, mainly measured by the natural logarithm of total assets, improves the performance in two ways. According to Markowitz (1952), risk pooling theory, in a large insurance portfolio, risk is more widely dispersed; as a result, the loss volatility reduces and improves cost efficiency. Secondly, economies of scale allow administrative, distribution, and compliance costs to be spread across a larger premium base, which increases underwriting margins. Cummins & Nini (2002) and Alhassan & Biekpe (2016) stated that big firms benefit from better investment opportunities, which improves their profitability. These facilities strengthen the quality of governance rather than replacing it, which means if firms invest in strong governance infrastructure, they can perform well in both respects, which is consistent with the institutional complementarity thesis (Hall & Soskice, 2001).

H7a: Firm size is negatively associated with the loss ratio and partial combined ratio.

H7b: Firm size is positively associated with underwriting profit margin, profit margin, and return on assets.

According to Cummins & Outreville (1987), Hannan & Freeman (1977), firm age exerts an effect opposite to that of size. According to them, older firms face legacy-related inefficiencies; they also said outdated pricing, historical claims, and structural inertia increase the costs of the companies and reduce responsiveness. These problems weaken the operational efficiency, reduce the profitability, and increase regulatory costs (Eling & Marek, 2014; Mwangi & Murigu, 2015). Moniruzzaman et al, (2025) also identified in their study that firm age has a negative impact on a company's overall performance.

H8a: Firm age is positively associated with the loss ratio and partial combined ratio.

H8b: Firm age is negatively associated with underwriting profit margin.

H8c: Firm age is negatively associated with profit margin and return on assets.

4. Data and Methodology

4.1 Sample

This study focuses only on non-life insurance companies in Bangladesh. The first reason behind that loss ratio and partial combined ratio are the most suitable for measuring the performance of non-life insurance; life insurance generally depends on reserves, surrender values, and mortality assumptions, which cannot properly accommodate these ratios (Cummins & Outreville, 1987; Eling & Marek, 2014). Moreover, combining both life and non-life companies would create comparability issues due to differences in performance measures, which could affect the reliability of the GMM analysis. Another significant reason is that the impact of governance in non-life insurance becomes quickly apparent through claims settlement, because maximum claims are being settled within a few months. But in the case of life insurance, the impact of today's governance decisions may only become apparent many years later, falling outside the seven-year time frame of this study.

In this study, nineteen non-life insurance company observed over seven years, producing a balanced panel data set of 133 firm-year observations. These data were collected through annual reports and company websites. The study purposefully includes only firms with continuous operations and adequate governance disclosures.

This study focuses on analyzing the dynamic impact of the previous governance framework provided by IDRA on business performance, where the updated corporate governance guideline was released in 2023. Thereby, the time period of 2017-2023 reflects the current scenario of the connection between corporate governance and insurance performance.

4.2 Variable Measurement

This method analyses the performance of insurance companies through a multilayer model, which starts from operational efficiency, then underwriting efficiency, and finally total profitability, clearly considering different levels of performance.

- Operational efficiency: Loss Ratio and Partial Combined Ratio
- Underwriting profitability: Underwriting Profit Margin
- Overall profitability: Profit Margin and Return on Assets

Table 1 sets out all variable definitions alongside their expected directional relationships.

Table 1: Variable Definitions and Measurement

Variable	Measurement
Dependent variables	
Loss ratio (LR)	Net claim payments / Net premium income
Partial combined ratio (PCR)	(Net claims – UW profit) / Net premium income
Underwriter profit margin (UWM)	UW profit / Net premium income
Profit margin (PM)	Net profit / Net earned premium income
Return on assets (ROA)	Net income / Total assets
Governance variables	
Board size (BS)	Total directors on board
Board independence (BI)	Non-executive/Total directors
Ownership concentration (OC)	Top shareholder shares / Total shares
Board diversity (BD)	Female / Total directors
Board Meeting frequency (BM)	Board meetings per year
Control variables	
Firm size (FS)	Ln (Total assets)
Firm age (AGE)	Years since commencement

4.3 Estimation Methodology

A major challenge arises when attempting to measure the relationship between corporate governance and the performance of insurance companies: the endogeneity problem. Calculating using Fixed Effects or Random Effects fails to capture the relationship between these two aspects, resulting in erroneous and biased findings (Wintoki, Linck, and Netter, 2012). The two-step system GMM estimator of Arellano and Bover (1995) and Blundell and Bond (1998) resolves this issue, it solves this issue by using lagged data as a tool. The model is:

$$Y_{it} = \alpha + \rho Y_{i,t-1} + \beta GOV_{it} + \gamma CON_{it} + \mu_i + \varepsilon_{it}$$

Where, Y_{it} is one of the five performance indicators for firm i in year t , $Y_{i,t-1}$ captures performance persistence, GOV_{it} is the vector of governance variables, CON_{it} contains the control variables, μ_i absorbs time-invariant firm heterogeneity, and ε_{it} is the idiosyncratic error. Two-step estimation offers greater efficiency compared to one-step estimation, but it is known to produce downward-biased standard errors in finite samples. For this reason, Windmeijer's (2005) finite-sample correction is applied to ensure reliable inference. The validity of the instruments is evaluated through the Hansen test of overidentifying restrictions,

while the Arellano-Bond AR (2) test is used to confirm the absence of second-order serial correlation.

5. Results

5.1 Pre-estimation

Here, the descriptive statistics presented in Table 2 are mainly based on 133 observations. First of all, the statistics show that on average, these firms are profitable. The mean ROA is 5.2%, which is moderate in level. The loss ratio or LR averages 23.1%. This means that companies spend a manageable portion of their earned premiums on paying claims. Here, the result also shows that the Partial Combined Ratio and Loss Ratio have high standard deviations, indicating differences in firms' efficiency. The result also shows that boards are moderately structured. The average board has 13 members, and the firms hold around seven board meetings each year. Board autonomy and gender diversity are somewhat noticeable, but not overwhelming, which shows room for improvement in governance practices. The distribution test shows that Loss Ratio and Partial Combined ratio are highly skewed to the right side.

Table 2: Descriptive Statistics

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Obs.
PCR	-0.014	-0.041	1.807	-0.82	0.264	2.343	19.246	133
LR	0.231	0.205	1.906	-0.511	0.23	3.395	25.108	133
UPM	0.245	0.227	0.777	-0.018	0.135	0.901	4.475	133
PM	0.275	0.241	0.913	0.017	0.17	1.966	7.59	133
ROA	0.052	0.047	0.14	0.008	0.02	0.932	4.701	133
BS	12.774	12	21	5	3.607	0.074	2.003	133
BI	0.204	0.2	0.4	0.056	0.061	0.583	4.37	133
OC	0.167	0.144	0.874	0	0.145	2.009	9.21	133
BD	0.246	0.214	0.556	0	0.131	0.294	2.04	133
BM	7.173	6	16	4	3.066	1.276	3.917	133
AGE	26.947	26	39	8	7.86	-0.221	1.917	133
FS	7.487	7.418	9.612	6.267	0.658	1.135	4.762	133

Here, Table 3 depicts the correlation matrix showing the relationship between corporate governance and institutional characteristics of the insurance companies. First of all, Board Size (BS) and Board Independence (BI) have a strong negative correlation of -0.628, suggesting that larger boards tend to have fewer independent directors. Board Diversity (BD) is moderately negatively correlated with BI (-0.385), and has a weak negative connection to Ownership Concentration (OC) (-0.215), and a weak positive relation with Firm Size (FS) (0.18). Ownership Concentration is weakly correlated with BS (-0.296) and has a slight positive association with BI (0.18), whereas Board Meetings (BM) and Company Age (AGE) show relatively weak correlations with other variables. FS is weakly and positively correlated with BD (0.18) and BM (0.157), but slightly negatively with BS (-0.104). In general, most of the correlations are below 0.3, which indicates the absence of serious multicollinearity, except for the relationship between BS and BI. This relationship should be considered carefully if both variables are included in the same model. Here, the maximum value of Variance Inflation Factor (VIF) is 1.9628, which indicates that multicollinearity is not a concern in the model.

Table 3: Correlation Analysis and VIF

	BS	BI	OC	BD	BM	AGE	FS	VIF
BS	1							1.7652
BI	-0.628	1						1.9628
OC	-0.296	0.18	1					1.1610
BD	0.235	-0.385	-0.215	1				1.2844
BM	0.107	-0.159	0.021	0.128	1			1.1133
AGE	0.086	-0.166	0.145	0.006	-0.176	1		1.1280
FS	-0.104	0.077	0.054	0.18	0.157	0.04	1	1.0993

Note: BS = Board Size, BI = Board Independence, OC = Ownership Concentration, BD = Board Diversity, BM = Board Meeting, AGE, FS = Firm Size.

In Table 4, the Panel unit root tests were conducted by using the Fisher-type ADF and Hadri LM tests. The Fisher ADF results show that at the 1% significance level ($p < 0.001$) the null hypothesis of a unit root is rejected, and this is for all variables, which confirms stationarity. The Hadri LM test supports this statement. Therefore, all variables are stationary in level, which means there is no unit root problems, which supports the use of the variables in the subsequent System GMM estimation.

Table 4: Stationarity Test

Variable	Fisher X ²	Fisher P	ADF decision	Hadri LM	P value	Hadri Decision
PCR	197.95	<0.001***	Stationary	-3.915	0.9999	Stationary
LR	134.2	<0.001***	Stationary	-3.85	0.9999	Stationary
UPM	184.39	<0.001***	Stationary	-3.844	0.9999	Stationary
PM	148.07	<0.001***	Stationary	-3.854	0.9999	Stationary
ROA	260.22	<0.001***	Stationary	-3.745	0.9999	Stationary
BS	100.53	<0.001***	Stationary	-4.145	0.9999	Stationary
BI	267.74	<0.001***	Stationary	-4.145	0.9999	Stationary
OC	346.19	<0.001***	Stationary	-3.798	0.9999	Stationary
BD	154.83	<0.001***	Stationary	-3.889	0.9999	Stationary
BM	85.9	<0.001***	Stationary	-3.93	0.9999	Stationary
AGE	654.56	<0.001***	Stationary	-3.084	0.9999	Stationary
FS	125.81	<0.001***	Stationary	-3.304	0.9995	Stationary

Note: PCR = Partial Combined Ratio, LR = Loss Ratio, UPM = Underwriter Profit Margin, PM = Profit Margin, ROA = Return on Assets, BS = Board Size, BI = Board Independence, OC = Ownership Concentration, BD = Board Diversity, BM = Board Meeting, AGE, FS = Firm Size. *** represents a significance level of 1 percent.

5.2 Individual Governance Variables

Table 5 presents GMM results for the impact of individual governance variables on insurance performance. Board size shows mixed effects on firm performance. Results show that a large board improves operational efficiency significantly by reducing the partial combined ratio by -0.0214 ($p < 0.05$) and improves underwriting efficiency by increasing underwriting profit margin by +0.0292 ($p < 0.01$). However, it reduces the profit margin by -0.0142 ($p < 0.01$), and ROA by -0.0017 ($p < 0.01$), while its effect on the loss ratio is not significant. The results indicate that the free-rider mechanism impacts profit margins and ROA—meaning that larger boards lead to a

slight decline in overall profitability. However, a significant increase in underwriting margins suggests that the oversight and expense discipline exercised by outside directors enhance efficiency in underwriting operations, thereby partially offsetting the negative effects of free-riding.

Board independence increases PCR and loss ratio by +1.5214 ($p < 0.01$) and +4.6505 ($p < 0.05$), which indicates higher operating costs and claim payments. However, it improves the underwriting margin by +0.7785 ($p < 0.05$), suggesting better pricing discipline. Finally, it reduces the profit margin by -0.4901 ($p < 0.01$) and ROA by -0.1311 ($p < 0.01$), which reflects the additional governance costs arising from the board's independence.

The results show that the partial combined ratio and loss ratio decrease significantly by -0.4299 ($p < 0.10$), and -0.6170 ($p < 0.05$). However, ROA decreased significantly by -0.0196 (0.05); however, ROA decreased significantly by -0.0196 (0.05), while the underwriting profit margin and profit margin are not significant. Overall, the results suggest that concentrated ownership enhances operational control but does not improve the overall financial performance of the company.

Board diversity shows mixed results on firm performance. It significantly increases the loss ratio by +4.1754 ($p < 0.01$) and also significantly increases the profit margin by +0.2046 ($p < 0.01$), while its effects on the partial combined ratio, underwriting profit margin, and ROA are not significant. Overall, gender diversity on the board improves profit margins and has a positive (though not significant) impact on underwriting margins. However, it significantly increases the loss ratio, suggesting that diverse boards may adopt a relatively more generous approach to claim settlements in order to protect stakeholders' interests.

Meeting frequency produces mixed result. The PCR increases significantly by +0.0404 ($p < 0.01$), and the underwriting profit margin decreases by -0.0059 ($p < 0.05$). Although the profit margin improves significantly by +0.0177 ($p < 0.01$) indicating greater profitability results from frequent board meeting.

Table 5: GMM regression for the impact of individual governance variables

Variable	Operational Efficiency		Underwriter Efficiency	Overall Efficiency	
	PCR	LR	UPM	PM	ROA
L.PCR	+0.2885*** (0.0502)	—	—	—	—
L.LR	—	-0.2595** (0.1090)	—	—	—
L.UPM	—	—	+0.4553*** (0.1131)	—	—
L.PM	—	—	—	+0.2990*** (0.0606)	—
L.ROA	—	—	—	—	+0.6215*** (0.0534)
BS	-0.0214** (0.0091)	+0.0066 (0.0214)	+0.0292*** (0.0108)	-0.0142*** (0.0037)	-0.0017*** (0.0005)
BI	+1.5214*** (0.5361)	+4.6505** (2.2848)	+0.7785** (0.3614)	-0.4901*** (0.1785)	-0.1311*** (0.0187)
OC	-0.4299* (0.2297)	-0.6170** (0.2603)	+0.5394 (0.3922)	-0.1210 (0.0978)	-0.0196** (0.0083)
BD	+0.1872 (0.2039)	+4.1754*** (1.4127)	+0.2893 (0.1779)	+0.2046*** (0.0603)	-0.0131 (0.0124)
BM	+0.0404*** (0.0084)	+0.0406 (0.0262)	-0.0059** (0.0028)	+0.0177*** (0.0031)	-0.0004 (0.0004)
AGE	+0.8432** (0.3488)	+0.3682 (0.6135)	-0.0724 (0.0941)	+0.0104 (0.0242)	-0.0210** (0.0083)
FS	-0.4804*** (0.0954)	-0.9184** (0.4199)	+0.0701*** (0.0199)	-0.0445 (0.0279)	+0.0063 (0.0069)
c	+0.5099 (0.8412)	+3.6537* (2.1103)	-0.8102* (0.4586)	+0.5976** (0.2327)	+0.0991* (0.0547)
Hansen	11.51 (0.24)	3.66 (0.723)	8.61 (0.377)	11.07 (0.271)	8.13 (0.521)
AR (1)	-1.19 (0.235)	-1.96 (0.050)	-1.44 (0.149)	-1.77 (0.077)	-1.75 (0.08)
AR (2)	0.84 (0.401)	1.32 (0.186)	-0.04 (0.967)	-0.94 (0.345)	-0.95 (0.34)
Wald Test	141.38 (0.001)	30.65 (0.001)	12023.01 (0.00)	16774.73(0.001)	25859.7(0.00)

5.3 Composite Governance Index

In Table 6, the PCA-based composite governance index shows an internally coherent result. It reduces the partial combined ratio by 0.0200 ($p < 0.01$) and the loss ratio by 0.0106 ($p < 0.05$) significantly, which indicates better operational efficiency. Also, the result shows that the index significantly improves underwriting profit margin by 0.0135 ($p < 0.01$), the profit margin by 0.0166 ($p < 0.05$), and return on assets by 0.0017 ($p < 0.01$), which shows the higher profitability and better financial performance. In other words, the greater the density of governance infrastructure, the more efficiency increases across all five indicators. Rather than a governance complexity paradox, the composite index reveals a coherent governance efficiency thesis: a robust and integrated governance system reduces the Partial Combined Ratio and Loss Ratio, while increasing the Underwriting Margin, Profit Margin, and ROA, which

suggests that various governance systems complement each other and enhance the organization's overall efficiency without incurring additional costs.

Table 6: GMM results for the PCA-based Governance index

Variable	Operational Efficiency		Underwriter Efficiency	Overall Efficiency	
	PCR	LR	UPM	PM	ROA
L.PCR	+0.3926*** (0.0596)	—	—	—	—
L.LR	—	+0.1734*** (0.0163)	—	—	—
L.UPM	—	—	+0.5414*** (0.0697)	—	—
L.PM	—	—	—	+0.0688** (0.0290)	—
L.ROA	—	—	—	—	+0.7140*** (0.0527)
PCA_CGI	-0.0200*** (0.0067)	-0.0106** (0.0044)	+0.0135*** (0.0025)	+0.0166** (0.0080)	+0.0017*** (0.0005)
AGE	+0.0866*** (0.0303)	+0.1406* (0.0838)	-0.0197 (0.0722)	-0.2722*** (0.0460)	-0.0057*** (0.0017)
FS	-0.0335* (0.0180)	-0.0000 (0.0159)	+0.0596*** (0.0089)	+0.0934*** (0.0214)	-0.0010 (0.0008)
c	-0.0594 (0.2297)	-0.2848 (0.3415)	-0.2738 (0.2666)	+0.4135** (0.1705)	+0.0404*** (0.0108)
Hansen	7.04 (0.795)	13.00 (0.293)	13.91 (0.238)	12.15 (0.353)	6.94 (0.435)
AR(1)	-1.21 (0.226)	-1.33 (0.183)	-1.47 (0.142)	-1.41 (0.159)	-1.62 (0.105)
AR(2)	0.81 (0.418)	0.73 (0.464)	-0.52 (0.603)	-1.22 (0.224)	-0.99 (0.321)
Wald χ^2	3843.31	1023.48	3325.01	534.67	6478.81

Note: Values in parentheses show the standard error for variables and P value for the diagnostic test, respectively. ***, ** and* represent significance levels at 1 percent, 5 percent, and 10 percent, respectively. PCR = Partial Combined Ratio, LR = Loss Ratio, UPM = Underwriter Profit Margin, PM = Profit Margin, ROA = Return on Assets, PCA_CGI = PCA based Corporate Governance Index, Age, FS = Firm Size.

5.4 Control Variable Results

Firm age (in years) shows negative effects in the individual model. Results in Table 5 show that older firms have a higher partial combined ratio (PCR) +0.8432 ($p < 0.05$), and lower return on assets -0.0210 ($p < 0.05$), indicating weaker operational efficiency and financial performance. The result also shows that firm age has no significant effect on loss ratio, underwriting margin, and profit margin. The results of the composite governance index in Table 6 show that older firms increase PCR by +0.0866 ($p < 0.01$), increase loss ratio by +0.1406 ($p < 0.1$), reduce profit margin by -0.2722 ($p < 0.01$), and reduce ROA by -0.0057 ($p < 0.01$), which also indicates weaker operational efficiency and financial performance. Overall, the results show older firms appear

to face some efficiency challenges and provide only partial support for the liability of aging theory.

The result shows that Firm size generally has a positive impact on firm performance, though the results differ between the two models shown in Tables 5 and 6. In the individual model, firm size improves operational efficiency by reducing the partial combined ratio by -0.4804 ($p < 0.01$) and the loss ratio by -0.9184 ($p < 0.05$). The result also shows that firm size increases the underwriting margin significantly by +0.0701 (0.01), and there is no significant relation between firm size, profit margin, and return on assets. In the composite model, firm size has a significant but small effect on operational efficiency, where it reduces the partial combined ratio by -0.0335 ($p < 0.10$), and also shows a positive and significant relation with underwriting profit margin and profit margin by +0.0596 ($p < 0.01$), and +0.0934 ($p < 0.01$), respectively. These results indicate that the underwriting and profit margins of large firms improve further through governance complementarity (Hall and Soskice, 2001). In contrast, the improvement in the operational ratio within the individual model is primarily driven by economies of scale, which are independent of the governance structure.

5.5 Diagnostic Validity

Three diagnostic tests confirm that the GMM estimator is working correctly. First, across all ten specifications, the Hansen test p-values vary from 0.238 to 0.795; this result indicates the validity of the instrument set, and that it is not over-fitted. The second diagnostic test, AR (1) shows mostly insignificant P-values, and AR (2) reports all insignificant P-values, confirming that second-order serial correlation is absent and validating the moment conditions on which the estimator relies. Moreover, across all models, the lagged performance variables are statistically significant, indicating that performance persistence is real and, therefore, the use of a dynamic model is justified. Furthermore, this paper includes OLS and fixed effect estimates in the appendix (A1 and A2) for robustness.

6. Discussion

6.1 Individual Governance Variables

Board size shows a counterintuitive pattern. Large boards improve operational and underwriting efficiency by decreasing the partial combined ratio and underwriting profit margin, which suggests that large boards ensure collective monitoring benefits at the operational and underwriting layers. However, the results also show that a large board reduces profit margin and return on assets. This mixed result supports Jensen (1993), free riding reduces individual accountability, which can hurt the overall profitability, but more directors can improve operational control and monitoring.

The consequences of board independence are somewhat subtle and complex. It increases the PCR and loss ratio; the result of the loss ratio shows that the claim settlement rate increased significantly with the rise in independent directors, which is consistent with the predictions of Information Asymmetry Theory (Akerlof, 1970). An independent board increases the underwriting profit margin by enforcing better pricing discipline. However, the result shows that an independent board decreases the profit margin and return on assets. This negative ROA result indicates that the additional governance infrastructure costs required to

maintain an independent board (such as those for audits, compliance systems, and conservative reserving) outweigh the benefits of asset management expected under Stewardship Theory (Davis, Schoorman & Donaldson, 1997).

Ownership Concentration shows both positive and negative effects. The result shows concentrated ownership improves the operational efficiency by decreasing the PCR and LR; this indicates that large or influential shareholders exercise strict oversight over operational activities and claims management to safeguard the value of the organization's assets. On the other side, ownership concentration reduces the return on assets significantly. In other words, even though operational efficiency increases, overall profitability decline. These findings support Alignment Hypothesis (Demsetz & Lehn, 1985) partially. On the one hand, ownership concentration enhances operational efficiency through rigorous monitoring. On the other hand, according to Principal–Principal Agency Theory (La Porta et al., 1999, 2000), controlling shareholders can extract value from the firm's profits and asset returns through "tunnelling" (the transfer of corporate assets or benefits for their own interests)—a concept also consistent with the theory proposed by Johnson et al. (2000).

Regarding gender diversity, the high and positive coefficient of the loss ratio warrants special attention; on the other hand, it has a positive but insignificant effect on underwriting profit margin. These are not contradictory results. They reflect two distinct governance orientations operating simultaneously: risk-averse pricing enforcement (which protects the underwriting margin) and stakeholder-sensitive claims settlement (which raises the settlement rate). Post and Byron (2015) and Adams and Ferreira (2009) documented these patterns; Kanter (1977) explains the social dynamics through which a sufficient threshold of female representation shifts the settlement culture. The effects on ROA and the underwriting margin are statistically insignificant. The most important and statistically significant result is the substantial increase in the loss ratio, and at the same time, a significant improvement in the profit margin. This indicates that boards with gender diversity are more inclined to settle claims, which leads to an increase in the loss ratio; however, they simultaneously manage to maintain healthy profit margins through other governance practices and decisions.

Board Meeting Frequency shows mixed results. Frequent meetings increase the partial combined ratio and reduce the underwriting profit margin significantly, indicating a decline in operational efficiency and weak underwriting performance. However, the profit margin increases significantly explaining the power of board meeting frequency on influencing overall profit composition. Thereby, regular and frequent board meeting put emphasis on enterprise-wide financial performance than to operational underwriting efficiency, consistent with Agency theory's prediction that active boards pursue quality strategic decision at the cost of governance overhead (Jensen and Meckling, 1976; Ntim and Osei, 2011).

6.2 Governance Complexity

The composite index findings reveal something that individual variable analysis cannot: governance configurations carry costs at the operational layer that the individual coefficients distribute invisibly across their separate effects. The results show that the PCA index reduces the partial combined ratio and loss ratio, and simultaneously increases the underwriting profit

margin, profit margin, and return on assets, which suggests that various governance systems complement each other and enhance the organization's overall efficiency without incurring additional costs. Rediker and Seth (1995) and Milgrom and Roberts (1995) argued that governance mechanisms interact in ways that make their joint effect qualitatively different from the sum of individual contributions. This is a direct empirical manifestation of that argument. These results provide further strong evidence in support of using the Composite Governance Index (Ntim and Soobaroyen, 2013; Brown and Caylor, 2006) by showing that higher composite scores improve all five performance measures at the same time. These results indicate that when various governance mechanisms are effectively implemented together, they complement each other and enhance the organization's overall performance rather than creating extra complexity.

6.3 Control Variables

Results from individual governance variables show that firm age increases the partial combined ratio and decreases the return on assets significantly, which is consistent with the Liability of Aging Theory. However, the impact of firm age on loss ratio, underwriting profit margin, and profit margin is not significant. Here, the impact of structural inertia and the legacy portfolio increases the PCR and reduces the ROA, indicating a deterioration in operational efficiency. On the other side, the composite governance specification shows that firm age increases the partial combined ratio and loss ratio. Results also show it decreases the profit margin and return on assets significantly.

In the case of individual governance variables, firm size shows a negative and significant relation with the partial combined ratio and loss ratio. On the other side, it increases the underwriting profit margin significantly. However, firm size reduces the profit margin and increases the return on assets, but the results are not significant. The results indicate strong support for the Scale Economy Theory regarding the variables representing firm size and operational efficiency in underwriting.

However, under the composite governance model result shows, large firms achieve operational efficiency by reducing the partial combined ratio, and achieve underwriting and overall efficiency by increasing the underwriting profit margin and profit margin significantly. This supports the Governance Complementarity Theory (Hall & Soskice, 2001). In other words, large institutions with strong governance systems can gain greater advantages in terms of underwriting and profitability.

7. Research Contributions

This study contributes to the insurance governance literature in two ways. First of all, a three-layer performance framework (operational, underwriting, and overall efficiency) is used to show that the governance effects are layer-specific. A governance mechanism may improve one efficiency layer and harm another; a single performance measure cannot capture this type of relationship. Therefore, this three-layer framework has been proposed as a benchmark for future research on financial sector governance.

Secondly, PCA results show that high governance density simultaneously improves all five performance indicators of the organization. This result is more consistent with Governance

Bundling Complementarity (Rediker & Seth, 1995) than with the Governance Complexity Paradox. Past research on insurance governance has not yielded evidence of such simultaneous, continuous improvement across five performance levels. Therefore, this study makes a significant and novel contribution that goes beyond the results of individual performance indicators.

8. Conclusion

The study aimed to examine the impact of corporate governance on insurance companies' performance in three efficiency layers with methodological rigor, so that not only associations but also actual causal mechanisms can be identified. Here, the researchers applied a two-step system GMM with Windmeijer-corrected standard errors; this method was applied on both individual variables and PCA-based composite specifications. Four vital findings from this study are given below; the significance of which is not limited to academic research alone, but is also relevant to practical policy and managerial decision-making.

Board size has a different impact on different efficiency layers. Large boards improve operational and underwriting margin efficiency by decreasing Partial Combined Ratio (PCR) and increasing the underwriting profit margin. But at the same time, it reduces the profit margin and returns on asset. Therefore, simply recommending a reduction in board size is not appropriate. Instead, governance reforms should be determined based on which level of performance either operational, underwriting, or overall, is targeted for improvement. The impact of ownership concentration presents a two-fold picture. On one hand, it enhances operational efficiency by reducing the PCR and Loss Ratio (LR) through rigorous oversight. On the other hand, it reduces the return on assets, which reduces the overall value of the organization. Therefore, instead of viewing ownership concentration as entirely detrimental, regulatory bodies should adopt policies that consider both its operational advantages and its overall adverse effects. Meeting frequency primarily compromises operational efficiency and underwriting efficiency by increasing PCR and decreasing UPM. However, the profit margin increases slightly, indicating performance improvement due to the increased number of meetings. Thus, the findings confirm that more governance activity (such as holding more meetings) reflect good governance at the cost of governance overhead. Gender diversity and board independence have both shown mixed results across various performance levels. A diversified board indicates operational inefficiency by increasing the loss ratio; in other words, the claim settlement rate has increased. At the same time, it increases the profit margin significantly. Moreover, although there is a positive impact on the Underwriting Margin (UWM), it is not statistically significant. On the other hand, Board Independence also indicates operational inefficiency by an increase in the PCR and LR. An independent board reduces the profit margin and ROA, but improves Underwriting Margin. This indicates that the additional costs associated with governance infrastructure (such as expenses for audits, compliance, and oversight) outweigh the benefits of pricing discipline achieved through an independent board, thereby undermining overall profitability. Understanding which efficiency layer a governance mechanism is actually reaching matters enormously for how it should be assessed.

Governance codes that set single targets without specifying which performance dimension they are intended to move are at best incomplete and at worst counterproductive.

The results of the Composite Governance Index represent the most significant and distinctive finding of this study. The results of PCA show that the higher the governance density, the more all five performance indicators of the organization improve simultaneously, which supports the idea that different governance mechanisms work better together. The theory is directly applicable to the formulation of a governance code by the supervisory body and the interpretation of results from the PCA-based governance index.

The control variable firm-age increases the PCR and reduces ROA, which is consistent with the Liability of Aging Theory. The result from the PCA-based governance index shows that old firms increase the loss ratio and reduce the profit margin. Firm size improves the operational ratio and underwriting margin through economies of scale. Under the Composite Specification, both the underwriting margin and the profit margin of large firms increase significantly.

Future researchers could expand this study by conducting it on a larger scale. Instead of focusing on one country and one type of insurance company, the research could be conducted across various countries and various types of insurance companies. The index used in the research could also be improved by adding more factors, such as ESG governance, risk committee structures, and executive remuneration systems. These topics have not been studied enough (IAIS, 2024; Swiss Re, 2024), but they may have a strong effect on insurance performance.

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Appendix: A1: Pooled OLS and Fixed Effect models for the impact of individual governance variables

Static	Operational Efficiency				Underwriter Efficiency		Overall Efficiency			
Variable	PCR		LR		UPM		PM		ROA	
Model	POLS	FEM	POLS	FEM	POLS	FEM	POLS	FEM	POLS	FEM
BS	-0.013	0.00	-0.0**	0.00	-0.0018	-0.0006	-0.0142***	0.0000	-0.0017***	-0.002**
BI	-0.7033	0.2516	-1.2091***	0.1312	-0.5057**	-0.1204	-1.0887***	0.0586	-0.1534***	-0.0479
OC	-0.0394	0.0310	-0.1278	-0.0052	-0.0884	-0.0361	-0.0024	-0.0009	-0.0282**	-0.0194
BD	-0.676***	-0.3247	-0.3992**	-0.2485	0.2767***	0.0763	0.1112	0.1631	0.0057	0.0433*
BM	-0.0119	0.0137	-0.0155**	0.0057	-0.0036	-0.0080	0.0186***	-0.012**	0.0006	-0.0011
AGE	0.0429	-0.6235	-0.0721	-0.0316	-0.115***	0.592***	-0.0144	0.0778	-0.0070	-0.073**
FS	-0.0351	0.1660	0.0234	0.0006	0.0584***	-0.165**	0.0488**	-0.0236	-0.0012	0.0312**
c	0.6773*	—	0.9561**	—	0.2788	—	0.2000	—	0.1354***	—
R ²	0.1744	0.0861	0.1161	0.0155	0.3364	0.1826	0.3202	0.0847	0.2044	0.1261
F Stat	3.771	1.439	2.346	0.241	9.053	3.415	8.411	1.415	4.587	2.206
P value	0.001***	0.1972	0.0277**	0.9741	0.001***	0.003***	0.001***	0.2067	0.001***	0.0393**

Appendix: A2: Pooled OLS and Fixed Effect models for the impact of the PCA-based Governance index

Static	Operational Efficiency				Underwriter Efficiency		Overall Efficiency			
Variable	PCR		LR		UPM		PM		ROA	
Model	POLS	FEM	POLS	FEM	POLS	FEM	POLS	FEM	POLS	FEM
BS	-0.045***	-0.0188	-0.0137	-0.0104	+0.032***	0.0084	+0.0273***	0.0026	+0.0041***	0.0014
BI	(0.0154)	(0.032)	(0.0140)	(0.0289)	(0.0070)	(0.0143)	(0.0097)	(0.0128)	(0.0012)	(0.0022)
OC	0.0036	-0.0196	-0.0008	-0.0010	-0.005***	+0.019**	-0.0018	-0.0008	-0.0004*	-0.0022*
BD	(0.0028)	(0.016)	(0.0026)	(0.0150)	(0.0013)	(0.0074)	(0.0018)	(0.0067)	(0.0002)	(0.0012)
BM	-0.071**	0.0724	-0.0005	-0.0150	+0.070***	-0.0873	+0.0689***	0.0266	-0.0004	+0.028**
AGE	(0.0337)	(0.167)	(0.0307)	(0.1519)	(0.0153)	(0.0751)	(0.0213)	(0.0674)	(0.0026)	(0.0118)
FS	0.4170	—	0.2569	—	-0.1601	—	-0.1920	—	+0.0655***	—
c	(0.2611)	—	(0.2380)	—	(0.1189)	—	(0.1651)	—	(0.0199)	—
R ²	0.0977	0.0315	0.0084	0.0026	0.2793	0.0934	0.1266	0.0032	0.1036	0.0481
F Stat	4.654	1.203	0.365	0.095	16.668	3.811	6.230	0.119	4.968	1.869
P value	0.004***	0.3120	0.7790	0.9630	0.001***	0.012**	<0.001***	0.9480	0.003***	0.1390