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Cogent Business & Management

ISSN: 2331-1975 (Online) Journal homepage: www.tandfonline.com/journals/oabm20

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To cite this article: Sylvester Senyo Horvey (2025) Insurers risk-taking behaviour in an emerging economy: unpacking the linear and nonlinear effects of enterprise risk management and corporate governance, Cogent Business & Management, 12:1, 2514169, DOI: 10.1080/23311975.2025.2514169

To link to this article: https://doi.org/10.1080/23311975.2025.2514169

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Published online: 10 Jun 2025.

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COGENT BUSINESS & MANAGEMENT
2025, VOL. 12, NO. 1, 2514169
https://doi.org/10.1080/23311975.2025.2514169

BANKING & FINANCE | RESEARCH ARTICLE

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Insurers risk-taking behaviour in an emerging economy: unpacking the linear and nonlinear effects of enterprise risk management and corporate governance

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ABSTRACT

This study explores both the linear and nonlinear effects of corporate governance (CG) and enterprise risk management (ERM) on insurers' risk-taking preferences. This paper was analysed using the generalised method of moments and the dynamic panel threshold estimation techniques based on a sample of 33 insurance companies in Ghana between 2015 and 2021. The results from the linear regression show that ERM significantly and positively influences insurers' risk-taking, indicating that insurance companies with effective ERM programs are more inclined to assume higher risks. Additionally, the empirical findings indicate that risk-taking is negatively associated with gender diversity but positively influenced by board independence and size. The study further reveals nonlinearities between ERM, CG and risk-taking. The empirical evidence indicates that a strong ERM system enhances the risk-taking behaviour of insurers when it exceeds the threshold level and vice versa, implying a U-shaped relationship. Thus, an effective ERM program promotes better insurance risk-taking decisions. Also, the study presents a U-shaped relationship between board independence and insurers' risk-taking. Contrarily, board size, and gender diversity reveal a relationship with an inverted U-shape, implying that the board makes less risky decisions when they are large, gender diversified and there are more females on the board. Policy implications are provided.

ARTICLE HISTORY
Received 13 September 2024
Revised 26 May 2025
Accepted 27 May 2025

KEYWORDS
Insurance; corporate governance; risk-taking; enterprise risk management

SUBJECTS
Finance; Business, Management and Accounting; Economics

1. Introduction

The insurance industry stands as a bastion of unique and diverse operations within the financial landscape. Fundamentally, insurance distinguishes itself through its critical function in risk management, protecting against uncertainties, thereby assuming the risk of individuals and organisations. Moreover, insurance businesses operate in opaque and complex ways, relying on complex assumptions about issues like mortality rates, future costs, lapse rates and expected investment returns (Elamer et al., 2018). Unlike the banking industry, which generates income through interest on loans and is thus incentivised to sell risk, the insurance business assumes the risk originating from banks and makes investments to ensure long-term financial stability (Horvey & Odei-Mensah, 2025a). Additionally, the insurance industry assumes other risks that impact businesses and individuals aiming to mitigate the loss of assets or health. In such contexts, strong corporate governance (CG) and risk management systems, such as enterprise risk management (ERM), are essential due to their pivotal role in guiding risk management and risk-taking decisions. The relationship between ERM, CG and risk-taking has garnered much attention in the business and financial world. The significance of these factors has come under increased attention in the wake of global financial crises, which is mostly attributed to excessive risk-taking (Ding & Wei, 2023). The outbreak of COVID-19 has further underscored the need for businesses to strenghten their governance frameworks and embrace proactive risk management measures. No industry is immune to the consequences of poor risk management, as evidenced by economic downturns and extraordinary

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upheavals. As a result, businesses in a wide range of industries, including insurers, face increasing pressure to strengthen their risk management processes by implementing ERM and strong CG systems to ensure ethical and sustainable decision-making. Consequently, ERM was developed and has since become widely adopted to support an organisation's risk management procedures (Horvey & Odei-Mensah, 2023).

As a comprehensive framework for integrating robust risk management across an organisation, ERM provides a proactive and holistic approach to identifying, evaluating, managing, monitoring and communicating risks in an integrated manner throughout the organisation (Florio & Leoni, 2017). ERM places a strong emphasis on a comprehensive evaluation of risks and rewards, aiming to align risk-taking decisions with the broader strategic objectives of the organisation. By implementing ERM, organisations aim to improve their risk management procedures and promote a culture of risk awareness, reducing the adverse effects of risks on their business operations and financial performance (Hoyt & Liebenberg, 2011). This approach to risk management is considered more effective than the traditional risk management system, which takes a disaggregated approach to managing risks, often resulting in challenges such as duplication of resources and fragmented risk oversight (Horvey & Moloi, 2024). Given this, ERM was developed, which denotes a shift in managing risks from a restricted, fragmented approach to an integrated, continuous one ensuring the holistic management of risks (Horvey & Moloi, 2024). These benefits have the potential to influence firms' risk-taking behaviour. Consequently, the debate on ERM and risk-taking has attracted considerable scholarly interest. However, there is no clear consensus from the existing literature on how ERM influences risk-taking. Stulz (2015) and Smith and Stulz (1985) argue that companies with effective risk management systems are more inclined to take on more risk, whereas those with deficient risk management systems are more inclined to accept less risk. Thus, a holistic risk management approach enables companies to absorb a greater level of risk, which implies high risk-taking (González et al., 2020). This is because ERM includes mitigation strategies that help firms reduce downside risks. Contrarily, some scholars contend that companies with a robust ERM program are more likely to assume less risk and explain that their risk culture influences the amount of risk they are willing to accept, regardless of how effective the system is (Ellul & Yerramilli, 2013). Despite the intense discussion, empirical evidence to address this controversy remains elusive, creating a void in knowledge on how ERM predicts insurance risk-taking behaviour. From an empirical point of view, different studies have explored the nexus between ERM and performance (Saeidi et al., 2024; Horvey & Ankamah, 2020; Florio and Leoni, 2017; Hoyt & Liebenberg, 2011) and the determinants of ERM (Altuntas et al., 2011; Bohnert et al., 2019). Nevertheless, very little is known about how ERM influences firms' risk-taking behaviour. Given this, this paper aims to contribute to the literature by shedding light on the impact of ERM on insurers' risk-taking. More so, the arguments from scholars such as Stulz (2016) and González et al. (2020) suggest that the relationship may be nonlinear. This is affirmed by Florio and Leoni (2017), who present that a high level of ERM implementation defines a firm's decision to take risks. Similarly, Horvey & Odei-Mensah (2025b) argue that nonlinearities and thresholds exist in the dynamic relationship between ERM and risk-taking. Given this intellectual puzzle, this study further examines nonlinearities in the relationship by determining whether ERM enhances or reduces insurers' risk-taking behaviour at different levels.

Also, CG is essential in influencing how businesses behave and make decisions across various industries, including the insurance industry. Given insurers' responsibility for managing risks and safeguarding the interests of policyholders, effective CG systems are crucial for preserving the stability and financial health of insurance businesses as they directly affect insurers' overall profitability and stability. Further, strong governance procedures have been demonstrated to make organisations less vulnerable to corporate risk. Hence, they are able to engage in high-risk activities. Given this, the nexus between CG and insurance risk-taking has generated a great deal of attention among scholars, particularly within the banking industry (Aebi et al., 2012; Brogi & Lagasio, 2022; Hunjra et al., 2021; Laeven & Levine, 2009). However, few studies have sought to examine how CG influences insurers' risk-taking decisions, thereby leaving a gap in the literature. To the best of my knowledge, Eling and Marek (2014) and Elamer et al. (2018) are among the limited studies examining the relationship between CG and insurance risk-taking in the UK and German insurance markets, highlighting a dearth of empirical studies on this topic within the insurance industry, particularly in emerging economies. Considering this context is essential given that insurers, unlike banks, are more inclined to take higher risks, driven by the industry's specific

requirements, which demand a strong CG system. More so, insurers' risk profiles and risk appetite levels are significantly influenced by CG structures, suggesting the need for further examination. Another motivation for this study stems from the divergent results on the CG-risk-taking relationship, which may be attributed to the levels or strength of CG features. This complexity suggests a nonlinear association, where the effect of corporate governance systems on risk-taking behaviour might change based on the variations in the strengths or structure of CG mechanisms. Nevertheless, there appears to be a glaring gap in the literature, as no study seems to explore this intriguing relationship between CG and risk-taking. Therefore, this study contributes to the body of knowledge by shedding light on how CG influences insurers' risk-taking behaviour through linear and nonlinear lenses by considering the industry in Ghana.

The Ghanaian insurance industry is chosen for several reasons. The industry in Ghana has a very low insurance penetration (1.14%), which is below the average penetration rate in Africa (2%) and remains among the lowest in emerging markets. Again, the National Insurance Commission (NIC), the regulator of the insurance industry in Ghana, has highlighted several inefficiencies, such as underinsurance and underperformance of some insurance companies, which is attributed to poor risk management, CG and risk-taking choices. Akotey and Abor (2013) further argue that some insurers in Ghana manage risk reactively because they lack strong risk management frameworks and guidelines on risk appetite levels. As a result, the NIC, in 2014, developed reforms to its framework by adopting the risk-based supervision framework and the new solvency framework. Unlike developed economies with more matured frameworks such as Solvency II and other advanced regulations, Ghana, in 2015, implemented the new solvency framework, which required a minimum capital requirement of fifteen million Cedis (NIC, 2015). The purpose was to strengthen their capitalisation, promote a stable and efficient market, and make sound risk-taking decisions (Kusi et al., 2019). In the same vein, the risk-based approach was developed to ensure sound corporate governance and implementation of ERM to safeguard sound operational activities and risk-taking preferences (NIC, 2014). This framework fosters establishing, maintaining, and implementing an appropriate and effective CG framework and strong risk management practices in each insurance subsidiary, ensuring that enterprise risk management and control align with its risk profile (NIC, 2015). Nevertheless, there is insufficient knowledge of how these reforms affect the risk-taking preferences of insurance companies in Ghana. These regulatory developments provide a unique context for understanding how ERM and CG shape insurers' risk-taking behaviour. Also, given the emerging nature of Ghana's insurance industry, the relationship between ERM, CG, and risk-taking may not mirror those of the developed economies, necessitating this study. This presents a strong motivation and context to explore how CG and ERM determine insurers' risk-taking behaviour in Ghana.

Given the above, this study makes several contributions to the literature. First, it is one of the initial studies examining linear and nonlinear relationships. In this regard, this paper contributes to knowledge by providing insight into the complex dynamics between CG, ERM and risk-taking, which remains incipient. It does so by employing the dynamic threshold estimation technique to examine the dynamics in the relationships. This technique helps capture whether nonlinearities exist in the relationship. This is very important since existing studies on CG only consider the linear relationship, which has led to conflicting findings in this subject area, which could be explained by the presence of nonlinearities. Also, given the regulatory mandate of insurance companies in Ghana to maintain at least seven board members, with a requirement for one-third to be independent directors, the dynamic threshold regression helps gauge the assessment of this policy and its impact on risk-taking. Second, by examining the ERM and CG features, we can comprehensively understand which ERM and CG feature is essential to determine the optimum amount of risk to be taken by insurers. This provides a basis for regulators to implement policies for appropriate CG and ERM practices and prudent risk-taking behaviour. This is done by considering the understudied insurance sector in Ghana. Third, the study contributes to the literature on CG, ERM and risk-taking from an emerging market perspective, which remains underexplored. While most studies on ERM focus on developed economies, this study extends the frontier of knowledge in under-investigated contexts, specifically in Ghana, by providing new insights and the relevance of strong CG and ERM effectiveness on risk-taking. This sets the tone for further empirical investigation from an emerging market, which shares similar characteristics in terms of low insurance penetration and regulatory transitions in the area of risk management and governance. This is pertinent to Ghana and other emerging economies as it provides avenues to reform financial regulations, and risk culture and deepen

insurance penetration. The remaining portions of the paper are structured as follows: The study reviews the relevant literature and hypotheses in the next section. In Section 3, the study discusses the data, methods and variables. The results and discussions are shown in Section 4. Finally, Section 5 has the conclusion and policy recommendations.

2. Literature review and hypothesis testing

2.1. Enterprise risk management and risk-taking behaviour

The relationship between ERM and risk-taking behaviour has attracted much interest from academics examining the dynamics of organisational decision-making under conditions of uncertainty. Advocates of the theory that ERM encourages risk-taking contend that ERM frameworks provide organisations with greater confidence to achieve their strategic goals. Organisations may make well-informed risk acceptance and allocation decisions by quantitatively identifying and evaluating risks across various operational parameters. This might eventually enhance their risk appetite (Dickinson, 2001). This is because organisations that implement an ERM process gain new insights into goals, risks, supervision, information and communication, and the internal environment. These insights result in improved management, as demonstrated by greater organisation alignment, more informed decisions, improved management-to-management communication regarding risk-taking, and increased management accountability (Gates et al., 2012). Performance is improved as a result of this improved management due to their proactive risk-taking behaviour.

In line with the above, Eckles et al. (2014) examined the impact of ERM adoption on insurers' risk-taking and found that the insurers' stock return volatility has decreased. The authors discovered that implementing ERM increases operational profitability per unit of risk and decreases the marginal costs of risk reduction. Hence, ERM might result in sound risk-taking decisions and an efficient risk management system. Berry-Stölzle and Xu (2018) also claim that the application of ERM decreases the cost of capital by minimising a company's systemic risk. Jurdi and AlGhnaimat (2021) add that adopters of ERM successfully lower overall, systematic, and, to a larger extent, idiosyncratic risks. When tail risk events do not materialise, risk management programs may be costly and of little use to the company. According to Meulbroek (2002), ERM programs give businesses a means of lowering the possible costs associated with the well-known risk-shifting or asset-substitution problem. The probability of companies changing their risk profile is strongly correlated with their current leverage and may be especially significant for financial institutions, including insurance, with swiftly changing risk profiles. Because ERM systems improve risk exposure disclosure, they give insurers a legitimate means of committing to refraining from such activity (Liebenberg & Hoyt, 2003).

Studies such as Dong et al. (2017) state that better risk-adjusted performance metrics are associated with ERM adoption, indicating a positive relationship between risk-taking behaviour and ERM implementation. Also, from the standpoint of shareholders, ERM cannot equate to risk management that is more successful at lowering overall risk, as lowering overall risk would require foregoing worthwhile initiatives (Stulz, 2016). Stulz (2016) further notes that firms must take ex-ante lucrative risks to flourish. This aligns with the corporate risk management theory, which explains that robust risk management lowers the cost of economic distress and supports a company's ERM initiatives. This suggests that companies with effective risk management practices can seize strategic opportunities and take measured risks (Nguyen & Vo, 2020). According to Liu and Xu (2024), ERM improves an organisation's risk-taking behaviour by identifying business risks and external macroeconomic risk variables and then appropriately modifying risk transfer and retention policies.

Nocco and Stulz (2022) claim that ERM improves the risk management process of a company by integrating the company's risk tolerance with its processes and raising awareness of all possible risks. They further argue that to achieve ERM's overall purpose, the board must minimise the likelihood of financial hardship rather than reduce its own risks. This will allow the business to maximise its value. To better represent their decisions to take risks, managers should weigh the costs and benefits of risk in order to optimise their portfolio. This claim is supported by Stulz (2015), who explains that risk management is not intended to completely remove risk, which might have a negative financial impact on shareholders.

Therefore, low risk-taking does not equate to ERM, which might discourage the company from engaging in profitable ventures. Thus, choices about taking risks need to be considered in light of how they will affect the best possible risk. Based on these arguments, the study hypothesises that:

H1: ERM positively affects risk-taking behaviour

2.2. Review of CG and risk-taking

Given insurers critical position in risk management and mitigation, it is important to comprehend the impact of CG on risk-taking behaviour within the sector. A body of research indicates that insurance companies with robust CG policies are more likely to engage in calculated and responsible risk-taking (Elamer et al., 2018). That is, they may incentivise excessive risk-taking. This is because CG ensures transparency and accountability in promoting responsible ERM practices in insurance firms. According to Stulz (2016), effective CG helps management implement strategies so that, within regulatory bounds, the chosen degree of risk maximises shareholders' value. Consequently, performance and business risk-taking are significantly influenced by an organisation's board structure (Akbar et al., 2017). Despite these factors, scholars suggest that they influence risk-taking diversely (Faleye & Krishnan, 2017; Pathan, 2009). These arguments show that the impact of CG on risk-taking is far from reaching a consensus. More so, the literature on CG mostly focuses on the UK and the US, with little empirical effort from developing economies. Hence, this study fills a knowledge gap by emphasising gender diversity, board size and independence. The selection of these variables is motivated by the fact that they feature prominently in the CG governance framework of the insurance industry in Ghana (NIC, 2015). These are discussed below.

2.2.1. Board size and insurers' risk-taking

The impact of board size on insurers' risk-taking behaviour has generated much discussion in the scholarly literature. Consistent with the fundamentals of agency theory, the number of directors on a corporate board influences how the board decides to proceed. Jensen (1993) points out that problems with coordination and communication are the root cause of the protracted and delayed decision-making process in larger boards. More importantly, decisions about fundamental issues are rarely finalised on time, as it is more difficult for larger boards to reach a consensus. This implies that businesses with larger boards would be less willing to take higher risks (Cheng, 2008). This argument is supported by Pathan (2009) and Wang (2012), who present evidence of a negative relationship between board size and many business characteristics. Contrarily, other studies present that large boards can improve risk management procedures by fostering a diversity of viewpoints and levels of competence (Adams & Jiang, 2016; Elamer et al., 2018). Also, Mishra (2011) believes that significant shareholders' oversight at the board level encourages greater risk-taking. This is due to the wide range of experience and decision-making abilities present on large boards. As a result, their approach to risk-taking is more balanced (Kalia & Gill, 2023). However, Pathan and Faff (2013) argue that large boards may experience several problems, including poor coordination, conflicts and time wasting, negatively impacting their ability to supervise management, thereby reducing their risk-taking preferences. Hence, the study hypothesises that:

H2: Board size negatively affects risk-taking behaviour

2.2.2. Board independence and risk-taking behaviour

The literature on CG acknowledges that the board members' independence is a crucial component of internal governance. Most research in this area supports the agency theory, which contends that having more independent board members may improve performance and risk avoidance (Brogi & Lagasio, 2022). Similarly, Jensen and Meckling (2019) contend that adding more non-executive members to boards can help minimise and regulate agency conflicts. Given their independence from management and desire to safeguard their own reputation in the job market, non-executive directors are required to provide competent oversight (Fama, 1980). According to the reputation hypothesis, non-executive directors would encourage investments in less risky ventures that would assist businesses in preventing losses and safeguarding their reputations (Pathan, 2009). This is not without empirical evidence. Studies such as (Akbar

et al., 2017) provide evidence to affirm the notion that independent directors reduce the risk-taking actions. Furthermore, a negative correlation between taking risks and board independence was presented by (Elamer et al., 2018). However, Eling and Marek (2014) argue that establishing effective risk management frameworks and decision-making processes within insurance companies is linked to increased board independence. As a result, independent board members are more likely to have higher risk tolerance and be more proactive in their risk-taking decisions in order to maximise shareholder value and use CG principles to safeguard shareholders' interests. It is further suggested that, because independent directors are thought to make reliable decisions because of their credentials and competencies, they guarantee that management decisions are reflected in the company's risk-taking decisions (Akbar et al., 2017). In light of these arguments, the study formulates the following hypothesis:

H3: Board independence positively affects risk-taking behaviour

2.2.3. Gender diversity and risk-taking behaviour

In academic studies, the effect of gender diversity on risk-taking behaviour has gained significant attention, especially in relation to CG and decision-making procedures. The literature presents a variety of insights on how gender diversity predicts risk-taking; some point to positive impacts, while others show more complex results. This is further explained by the agency theory, which states that managers (agents) behave cautiously to protect their reputations, jobs and opportunities rather than pursuing higher risks to maximise shareholder's wealth (Fama & Jensen, 1983; Mitnick, 2019). In this vein, female executives may adopt a more conservative approach to decision-making, thereby avoiding excessive risk-taking to safeguard their careers (Adams & Funk, 2012). This argument is supported by Yahya et al. (2023), who state that females are more likely to go for low risks due to their risk-aversion. This results from their increased susceptibility to risks when losses are involved rather than rewards. Ballester et al. (2020) add that females experience strong emotions such as anxiety and fear; therefore, risky events influence their satisfaction and make them more risk averse. Thus, when it comes to adopting and managing risks, women are more inclined to select safer policies (Pradhan et al., 2019). Additionally, female directors are more likely to prioritise robust risk management and long-term sustainability over short-term earnings. Therefore, having women on the board deters insurers from taking higher risks. Dong et al. (2017) discovered that the proportion of female directors was negatively correlated with risk-taking. Hurley and Choudhary (2020) support this claim that having more women on the board deters taking risks. Hence, the study states that:

H4: Gender diversity negatively affects risk-taking behaviour

3. Methods

3.1. Data sample

The analysis is based on a sample of 33 insurance companies operating in Ghana. The period of observation is 2015–2021[1]. The start of the study period is 2015 because the recommendations of ERM provided by the NIC were presented in 2014 and took effect in 2015 (NIC, 2014, 2015). The selection of the 33 firms is based on data availability for the sample period and the presence of key variables required for the analysis. There are about 52 insurance companies in Ghana, and only those that continuously operated throughout the study period were considered for the analysis. As a result, insurers that entered the market post-2015 or exited before 2021 were excluded from the study to avoid incomplete data series and to mitigate entry and exit bias. This exclusion criteria applied to about 9 companies, reducing the sample to 43 insurers. Of these, 33 had complete data necessary for analysis, representing 77% of the population. The motivation for the sample is to ensure consistency in the panel data structure and to maintain the integrity of the empirical analysis. Thus, including insurers who entered after 2015 or exited before 2021 would have resulted in an unbalanced panel with incomplete data, potentially compromising the quality and validity of data and biasing coefficient estimates due to missing values of key variables (Peng & Harwell, 2007). More so, it is possible that insurers who exited the market after these

regulatory changes may not have had the opportunity to fully implement or respond to the ERM framework. Hence, including such firms could introduce heterogeneity that confounds rather than enriches the analysis (Carpenter & Lynch, 1999). Therefore, rather than introducing bias, the sample selection was intended to enhance comparability and analytical rigour by focusing on insurers that were consistently subject to the same regulatory environment and for which complete and reliable data were available.

The insurance industry is chosen as a result of the nature of their business. In the insurance industry, risk is not merely a challenge; it is the cornerstone of its business model. Unlike other companies where risk is an external component that needs to be reduced, insurers generate income by absorbing risks from their clients through underwriting and claim settlement (Masci, 2011). Hence, their long-term sustainability and financial stability depend critically on the implementation of a formalised ERM system. Consequently, the insurance industry has a greater propensity to implement ERM and a strong CG system to address any financial distress associated with the insurance business. Furthermore, the growing complexities in the business environment have led to regulatory developments in the insurance industry, particularly in Ghana, which introduces the risk-based supervision framework, with ERM and CG as essential requirements (NIC, 2014). Insurers simultaneously run two businesses: investment and the production of insurance products (Horvey & Odei-Mensah, 2025a). Each of these activities has risk elements. Consequently, insurers engage in activities that may influence their choices regarding risk. This background provides an impetus to empirically examine the relationship between ERM, CG and insurer's risk-taking. Data on the control variables and the dependent variable were extracted from the NIC annual reports. The governance reports of the specific insurers provided the CG and ERM data. Below is an explanation of the variables utilised in the analysis.

3.2. Definition of variables

3.2.1. Dependent variable

The Z-score, the most popular ratio in previous studies, is utilised to quantify the risk-taking of insurance organisations (Alhassan & Biekpe, 2018). The equity, profitability and profit standard deviations are explained by the z-score. This variable calculates how far an organisation is from bankruptcy (Laeven & Levine, 2009). The z-score as a solvency indicator calculates the distance to default and the number of standard deviations the insurer's income must fall by which to erode equity capital (Alhassan & Biekpe, 2018). Thus, the z-score is the number of standard deviations in which a firm's income must go below its expected value to deplete equity and render the insurer insolvent. Hence, an insurance company becomes insolvent when its asset value falls below its debt (Elamer et al., 2018). As a result, higher numbers indicate high levels of stability and solvency, consequently, a greater distance to default and vice versa. The z-score estimation is given in equation (1) below.

$$Z - SCORE_{it} = \frac{ROA_{it} + EQR_{it}}{\sigma ROA_{it}} \tag{1}$$

Where time and individual insurers are denoted by the subscript *i* and *t*, respectively; ROA denotes return on assets, which is measured as the ratio of net profits to total assets; EQR is the equity ratio, which is measured as the ratio of total equity to total assets; while σROA_{it} is the standard deviation of ROA.

3.2.2. Independent variables

3.2.2.1. The ERM index. Insights from the literature show that the majority of researchers relied on a single metric, using keyword searches like 'Chief Risk Officer', 'risk committee' or 'ERM' (Beasley et al., 2021; Hoyt & Liebenberg, 2011; Nguyen & Vo, 2020; Silva et al., 2019). This is due to insufficient information on ERM from secondary sources (Horvey & Odei-Mensah, 2023). Gordon et al. (2009) relied on the COSO framework, while Florio and Leoni (2017) used the risk governance index. To gauge the measurement of ERM, this study follows Horvey and Odei-Mensah's (2025b) approach by employing a more detailed approach by recruiting twelve features for measuring ERM. This information was collected from governance reports of insurance companies. To overcome the limitations of sufficient information from secondary sources, the study further conducted a survey on the ERM features to complement the

secondary data. A purposive sampling technique was used for this study to gather ERM information from the managers or any other person who is sufficiently knowledgeable about the company's ERM processes, such as the risk manager or CRO. The objective is to gather comprehensive information about an insurer's ERM process. Regular reminders were sent to the respondents periodically to encourage them to respond to the questionnaire sent to them via email. First, to ensure the reliability of the instrument, piloting was carried out with the help of anonymous risk specialists. Thirty-three of the forty-three companies that were contacted for data collection responded to the survey, representing a 77% response rate. Ethics approval was obtained from the ethics committee of the University of the Witwatersrand for the study. The protocol number is H/20/11/22. Informed consent forms were distributed, explained, and signed by respondents to declare their agreement to participate in the survey, with consent collected in written form. Their participation was voluntary, and they could opt out at any point in time. Participants were assured of their anonymity and confidentiality. The questions reveal if an insurer has an ERM program and when it started such a program. In addition, detailed inquiries concerning the features of an insurer's ERM program were collected with insights on the year these initiatives were launched. Following Lundqvist and Vilhelmsson (2018), each of the ERM features was treated as a dummy and recorded as one beginning from the year the company started that ERM feature, and the subsequent years assumed the same value. This was merged with the secondary data to ensure a comprehensive analysis of the relationship.

The study focused on twelve features for creating the ERM index. These features were further disaggregated into the operating mechanism index (OMI), risk oversight index (ROI), and risk governance index (RGI). The risk governance index (RGI) outlines the procedure for making decisions pertaining to ERM as well as the direction and control of an insurer's ERM system (Aebi et al., 2012; Horvey & Odei-Mensah, 2025b; Lundqvist, 2015). Risk governance is very fundamental because insurers require a well-governed system to manage risks holistically. Questions under this category focused on key risk governance metrics, including the employment of a Chief Risk Officer (CRO), the presence of the CRO on the board of the company, the declaration of risk appetite levels, the presence of a risk management committee, and whether this committee reports to the board of directors are the metrics for risk governance. If any of these characteristics are present in the organisation, they are scored one; otherwise, they are scored zero.

Another category that was considered in the ERM measurement is the operating mechanism index (OMI), which explains the procedures for ERM implementation (Horvey & Odei-Mensah, 2025b). The metrics used for this index include questions regarding the presence of a risk framework, risk assessment level, frequency, and method. If the firm conducts its risk assessment process at least twice a year, the study set a dummy variable for risk assessment frequency to 1 (Florio & Leoni, 2017). If the firm uses quantitative and qualitative approaches to assessing risk, the risk assessment method is represented as binary, equal to 1. Also, a binary variable equal (1) is assigned to firms with an ERM framework and whether the implementation of ERM occurs across the entire level of an organisation as defined by the COSO framework (Horvey & Odei-Mensah, 2025b). The final category focuses on the risk oversight index (ROI), which reflects the level of effectiveness of the committee's risk oversight. Additionally, it looks at the committee's qualities in monitoring and controlling risk (Ellul & Yerramilli, 2013). The questions posed in this category were to understand whether there is an active risk committee present within the insurance company (ie if they meet at least twice a year), the experience of the risk committee (ie if at least a member of the risk committee has experience in insurance and risk management), and the CRO's competence (ie if the CRO has a qualification and experience in risk and insurance) are the ERM characteristics that fall under this category (Horvey & Odei-Mensah, 2025b). Each of these features is treated as 1 if they are present in the organisation and 0 otherwise. In addition, the twelve distinct features within each category were combined to provide an overall ERM index. This paper made use of the Multiple Correspondence Analysis (MCA). According to Abdi and Valentin (2007), the MCA is better suited to developing an index for dummy variables. By employing the MCA, it is possible to create an index by looking at the association between various categorical variables.

3.2.2.2. Corporate governance. The study employed a set of corporate governance features, which are gender diversity, board independence, and board size. The size of the board comprises the total board

members, including executive and non-executive directors (Kalia & Gill, 2023). Gender diversity was measured as the proportion of women to men on the executive board (Yahya et al., 2023), whereas the board independence assesses the percentage of the board who are independent members (Brogi & Lagasio, 2022).

3.3. Control variables

For econometric prudence, the study includes leverage, financial slack, investment yield, and size as control variables. Financial leverage (LEV) governs the complex link between market appraisal and capital structure. This is calculated by dividing the total debts by total equities (Florio & Leoni, 2017). The natural log of all assets is used to calculate the firm size (SIZE) (Horvey & Ankamah, 2020). The amount of a firm's risks is likely to be influenced by its size as well as the resources available for ERM (Florio & Leoni, 2017). Financial slack was measured as cash and short-term investments divided by total assets. It is plausible that insurers using ERM will reduce their slack due to the presence of a strong risk management system (Hoyt & Liebenberg, 2011). The quality of the investment portfolio is evaluated by the investment yield (INVYIELD), which is proxied as investment income divided by total investment (Horvey, 2025).

3.4. Empirical strategies

3.4.1. Generalised method of moments analysis

To evaluate the direct relationship, this study uses the dynamic generalised method of moments (GMM) estimator proposed by Arellano and Bond (1991). Several factors influenced the decision to adopt the GMM technique. First, the primary justification for employing this technique is the requirement that the number of cross-sections (ie firms) exceed the time, which is the situation in this study. Second, the GMM technique offers more benefits, such as addressing endogeneity issues, which are ignored by the static models. It does so by taking into account time series variations and accounting for unobserved insurance-specific effects. It should be noted that adding the lagged term of the dependent variable to the regression model may create endogeneity issues because the lagged dependent variable relies on the lagged error term, which is a function of the insurance-specific fixed effects. Also, the bidirectional relationship between ERM and risk-taking may further compound the endogeneity problem in the model. The reverse causality is supported by the literature where scholars state that insurers risk-taking choices may trigger ERM adoption and vice versa (González et al., 2020; Liebenberg & Hoyt, 2003; Stulz, 2014), confirming the use of the dynamic GMM estimator. The study used this method to create a model in which the explained variable is dependent on both its lag and a vector of explanatory variables observations. Furthermore, because a two-step GMM captures measurement errors and omitted variable issues while controlling for heteroscedasticity and autocorrelation, it is used in place of a one-step GMM (Blundell & Bond, 1998). Given this, the model is presented as:

$$RT_{it} = \beta_1 RT_{it-1} + \beta_2 ERM_{it} + \beta_3 LEV_{it} + \beta_4 INVYIELD_{it} + \beta_5 SIZE_{it} + \beta_6 SLACK_{it} + \mu_i + \partial_t + \varepsilon_{it} \quad (2)$$

$$RT_{it} = \beta_1 RT_{it-1} + \beta_2 CG_{it} + \beta_3 LEV_{it} + \beta_4 INVYIELD_{it} + \beta_5 SIZE_{it} + \beta_6 SLACK_{it} + \mu_i + \partial_t + \varepsilon_{it} \quad (3)$$

Such that the Z-score is represented by RT, which is risk-taking; the lagged dependent variable is represented by RT_{it-1}. The individual categories and the overall ERM index are represented by ERM in the model. The corporate governance factors are represented by CG; financial leverage is represented by LEV; INVYIELD stands for investment yield; financial slack is represented by SLACK, and SIZE is for firm size; the time fixed effect is represented by ∂_t; and the unobserved fixed effects is denoted by μ_i and ε_{it} is the error term.

3.4.2. Dynamic panel threshold analysis

The study adopts the dynamic panel threshold model developed by Seo and Shin (2016) and Seo et al. (2019) to examine the nonlinear relationship. This technique is appropriate since it is built on the principles

of GMM and helps estimate the model's nonlinearities by dividing it into upper and lower regimes with their coefficient estimates. It also extends Hansen's (1999) threshold model, which is particularly useful for static models and Kremer et al. (2013). Furthermore, the dynamic panel threshold model addresses this limitation by displaying the impact of the coefficient estimates at various levels, providing more thorough information than these models do on the direction of the variable coefficient estimates found in the lower or upper regime (Seo et al., 2019; Seo & Shin, 2016). This model is provided in equation (4).

$$y_{it} = x_{it}^{'}\beta + \left(1, x_{it}^{'}\right)\delta 1\{q_{it} > \gamma\} + \mu_i + \varepsilon_{it} \; i = 1,\ldots,n;\; t = 1,\ldots,T \tag{4}$$

Such that the threshold variable (ie ERM and CG) is denoted by q_{it}; the control variables and lag of the dependent variables are denoted by x_{it}; γ represents the threshold parameter in the model. 1{.} represents the indicator function. While the sample size n increases to infinity, T is taken to be fixed. There, the first difference process eliminates the fixed effect μ_i, and GMM is used to estimate the unknown parameters. That is $\theta = (\beta^{'}, \delta^{'}, \gamma)^{'}$.

4. Analysis and discussion

4.1. Summary statistics

An overview of the variables used in the analysis is presented in this section. Table 1 presents the summary of the average, minimum and maximum values and the standard deviations. The mean value of the Z-score, a measure used to assess insurance risk-taking behaviour, is 21.446. This variable's minimum and maximum values show high variations in insurer's risk-taking preferences in Ghana. The ERM index reports a mean of -0.085. The average score for board size is 7.948. This number implies that, on average, insurers generally satisfy or surpass the regulatory requirements of having at least seven members on the board (NIC, 2015). Board independence averaged 55% of the members, indicating that independent directors make up at least one-third of the executive board, which also aligns with the regulatory requirements (NIC, 2015). This signifies the commitment of insurers to comply with the governance structure of the industry. Also, gender diversity has a mean ratio of 0.236%. The report shows that about 24% of the board members are females. The range between 0.001 and 0.600 shows a significant gender gap on the executive board of insurers in Ghana. The mean for the total asset is 17.905. Additionally, leverage records an average value of 92%, suggesting that insurers rely more on debt to fund their operations. The average investment yield is -0.413, implying that the majority of Ghanaian insurers do not make any return on their investment. Also, the average value of financial slack is 0.287. The reports from the correlation matrix, as presented in Table 2, report low correlation among the independent variables, implying that multicollinearity does not pose a challenge in the model. Table 1 also reports the results of the Variance Inflation Factor (VIF). In line with Ayyangar's (2007) threshold of 10, the variables are below this threshold; hence, they are deemed suitable for utilisation in the regression analysis.

The various features used in measuring ERM are presented in Table 3 to understand the level of adoption across a seven-year time frame, which is further shown in Table 3. This outlines the characteristics taken into account while calculating the ERM index. It explains the number of insurers practising each

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max	VIF
Z-score	231	21.446	23.781	−3.003	178.5	
ERMI	231	−0.085	0.958	−1.192	3.119	4.30
ROI	231	0.080	9.961	−0.884	1.754	3.87
OMI	231	−0.051	0.956	−0.911	2.721	4.13
RGI	231	0.082	0.974	−1.585	2.802	3.98
Board size	231	7.948	2.278	3.000	13.000	1.32
Independent directors	231	0.550	0.154	0.020	0.857	1.29
Gender	231	0.236	0.121	0.001	0.600	1.19
Leverage	231	0.966	1.195	−0.452	12.500	1.71
Investment yield	231	−0.413	4.950	−63.043	6.947	1.09
Size	231	17.905	1.319	12.444	20.887	1.27
Slack	231	0.287	0.921	−3.625	8.000	1.72

of the ERM features over the sample period. The results from Table 3 demonstrate that insurers are progressively implementing more ERM features as the years go by, indicating that the implementation of ERM is gaining increasing attention among Ghanaian insurers. Notwithstanding, some of the features need serious attention as they are less represented. The study reveals that the risk committee is more present among insurers, showing an average of 92%. This is not surprising given the nature of the insurance business; insurers are required to have a risk committee to ensure a strong ERM process. More than 80% of the sample indicated they have a risk committee and an effective risk assessment procedure. The study also found that the CRO is present in about 68% of insurance companies, but only 10% of the sample indicated that their CROs are on the executive board of insurers. However, 69% of the CROs have risk experience. The low representation on the executive describes how CROs are not typically included on the executive board of insurers. Decisions about organisational risk may suffer if the CRO is not on the board. Because it allows the risk manager to have significant influence over risk decisions, having the CRO as a member of the board is a crucial component (Aebi et al., 2012).

4.2. System GMM results of ERM, CG and insurers risk-taking

The influence of ERM and CG on insurers' risk-taking preferences is estimated using the system GMM technique. Table 4 presents the findings. Models (1) to (4) examine the impact of the overall ERM index and its categories, which include the risk oversight index (ROI), operating mechanism index (OMI) and risk governance index (RGI). The estimated results on the influence of CG on risk-taking are provided in Models (5) to (7). The assumptions regarding the application of GMM are fulfilled, indicating no second-order serial correlation, while the Hansen test is statistically insignificant. A significant positive

Table 2. Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Z-score	1.000											
(2) ERMI	0.082											
(3) RGI	0.024	0.802	1.000									
(4) OMI	0.021	0.776	0.447	1.000								
(5) ROI	−0.166	0.753	0.433	0.410	1.000							
(6) Board size	0.183	0.263	0.184	0.271	−0.263	1.000						
(7) Independent directors	0.063	−0.050	−0.053	−0.030	−0.050	0.218	1.000					
(8) Gender	−0.077	0.079	−0.005	0.164	0.079	0.183	0.196	1.000				
(9) Leverage	0.131	−0.203	−0.157	−0.110	−0.203	0.094	−0.250	−0.044	1.000			
(10) Investment yield	0.138	0.182	0.100	0.120	−0.182	0.034	−0.042	0.002	0.018	1.000		
(11) Size	0.215	0.314	0.237	0.172	−0.314	0.142	0.192	0.162	0.074	0.226	1.000	
(12) Slack	0.181	−0.079	−0.013	−0.116	−0.079	0.344	0.107	0.118	0.514	0.030	0.138	1.000

Table 3. The annual ERM features distribution.

Annual ERM features distribution from 2015 to 2021																		
	2015		2016		2017		2018		2019		2020		2021		Freq (2015–2021)		% (2015–2021)	
ERM features	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
CRO appointment	18	15	16	17	12	21	8	25	8	25	6	27	6	27	74	157	32.00%	68.00%
CRO executive	31	2	31	2	31	2	30	3	29	4	28	5	28	5	208	23	90.00%	10.00%
Risk committee	5	28	3	30	2	31	2	31	2	31	2	31	2	31	18	213	8.00%	92.00%
Risk appetite	10	23	8	25	5	28	4	29	4	29	4	29	4	29	39	192	17.00%	83.00%
Risk Com'te report to board	16	17	13	20	11	22	10	23	8	25	8	25	7	26	73	158	32.00%	68.00%
Risk assessment frequency	8	25	7	26	5	28	4	29	4	29	4	29	4	29	36	195	16.00%	84.00%
Risk assessment level	8	25	8	25	7	26	6	27	6	27	6	27	6	27	47	184	20.00%	80.00%
Risk assessment method	14	19	12	21	8	25	7	26	7	26	7	26	7	26	62	169	27.00%	73.00%
Risk framework	9	24	9	24	6	27	4	29	4	29	4	29	4	29	40	191	17.00%	83.00%
Active risk committee	9	24	9	24	8	25	7	26	6	27	6	27	6	27	132	109	57.00%	43.00%
Directors with insurance Exp	18	15	17	16	11	22	7	26	6	27	6	27	6	27	71	160	31.00%	69.00%
CRO expertise	19	14	15	18	11	22	7	26	7	26	6	27	6	27	71	160	31.00%	69.00%

effect was identified for the lag of the dependent variable in Table 4. The dynamic GMM's suitability is justified by the significance of the Z-score. It implies that its present risk-taking choices are influenced by previous risk-taking values. It also demonstrates the considerable inertia in the risk-taking preferences of insurers over time.

The individual categories of the ERM feature report a positive relationship, with risk governance and risk oversight showing statistical significance at 5% and 10%, respectively. This finding suggests that insurance companies with a robust risk governance system and effective risk oversight are better positioned to advance and make informed and strategic risk-taking choices. Magee et al. (2019) support this evidence by stating that effective risk governance frameworks, characterised by strong supervisory processes and clearly defined ERM techniques, give insurers the confidence and capacity to assume higher levels of risk. Risk governance ensures compliance with regulatory requirements, establishes risk policies, and defines risk appetite levels (Florio & Leoni, 2017). Risk oversight ensures high monitoring and transparency in the ERM process and allows insurers to optimise their propensity for taking on risk by striking a balance between potential earnings and level of risk exposure (Dupire et al., 2022). This entails a clear understanding of the level of risk the insurer is willing to assume to achieve its strategic objectives. An insurer with a well-defined risk appetite may choose which risks to pursue and which to avoid, thereby improving the decisions in risk-taking. This is very important within the context of Ghana, where the insurance industry is developing and contends with numerous challenges that influence their risk-taking behaviour (NIC, 2015). To navigate these challenges, effective risk governance and oversight are required to help manage business and financial uncertainties to ensure prudent risk-taking decisions. More so, the operating mechanism index, which explains the risk assessment level, method, and frequency, positively influences insurers' risk-taking, showing that ensuring a robust risk assessment is likely to drive the risk-taking behaviour of insurers (Horvey, 2025). Notwithstanding, the relationship was insignificant. Turning to the overall ERM index, the empirical result shows a significant positive relationship with risk-taking. This positive relationship suggests that an effective ERM system can incentivise insurers to assume risks with greater confidence. The result aligns with the regulatory developments of the NIC,

Table 4. The influence of ERM and CG on risk-taking.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lag of Z-score	0.223***	0.235***	0.226***	0.273***	0.032***	0.041***	0.051***
	(0.007)	(0.005)	(0.007)	(0.009)	(0.001)	(0.007)	(0.009)
Risk governance index	0.097**						
	(0.039)						
Risk oversight index		0.825*					
		(0.500)					
Operating mechanism index			0.979				
			(0.974)				
ERMI				1.814***			
				(0.186)			
Board size					0.639		
					(0.720)		
Gender						−3.121**	
						(1.132)	
Independent director							2.056**
							(0.987)
Leverage	−0.561	−0.196	−0.331	0.479	−1.454	−0.278	−2.874
	(1.378)	(1.471)	(1.239)	(2.200)	(2.006)	(1.620)	(2.086)
Investment yield	0.457	0.436	0.554	0.526	0.430	0.591*	0.426
	(0.349)	(0.378)	(0.464)	(0.426)	(0.380)	(0.343)	(0.367)
Size	1.562	2.204*	1.947**	1.901	3.754**	2.774*	3.315**
	(1.260)	(1.099)	(0.893)	(1.429)	(1.617)	(1.509)	(1.597)
Slack	4.182**	4.148**	3.816**	3.025	2.500	1.596	3.374
	(1.915)	(1.853)	(1.477)	(3.208)	(2.589)	(1.791)	(2.306)
Observations	198	198	198	198	198	198	198
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of groups	33	33	33	33	33	33	33
Number of instruments	14	14	14	14	14	14	14
AR(1)	0.008	0.006	0.002	0.000	0.005	0.000	0.000
AR(2)	0.182	0.166	0.183	0.164	0.353	0.388	0.338
Hansen	0.624	0.633	0.550	0.244	0.319	0.379	0.336

Note. Standard errors in parentheses.
***, **, * denote significance levels of 1%, 5% and 10%, respectively.

which mandated that all insurance companies implement ERM to strengthen their risk management system amid the growing market complexities and emerging risks. Hence, insurers who have embraced ERM as per the regulation of the NIC are more likely to engage in risk-taking activities more prudently and confidently. This is because ERM promotes risk awareness and ensures that insurers have the capacity to manage, assess, and predict risk, granting them the assurance to engage in insurance-related activities like investment and underwriting while reducing their possible losses. As a result, the study agrees with Stulz's (2016) assertion that implementing risk management does not suggest that one should lower risk but rather improves risk-taking behaviour as it can reduce the cost of financial distress. This is because, throughout the company, ERM promotes a thorough assessment and awareness of risks. Decision-makers can take more measured risks by being more informed about the possible outcomes of their choices as a result of meticulously identifying and evaluating risks (Horvey & Odei-Mensah, 2023). Instead of eliminating risks, ERM encourages firms to seek opportunities that align with their goals while managing potential consequences (Dong et al., 2017). This is achieved by striking a balance between risk-taking, strategic objectives and risk tolerance.

Regarding CG features, the study presents that board size positively determines insurers' risk-taking behaviour. Empirical research suggests that larger boards are likely to possess greater depth of knowledge, experience, and competence, which can lead to better discussions and a greater willingness to take calculated risks (Adams & Jiang, 2016). This aligns with the viewpoints of Elamer et al. (2018), who indicate that large boards improve risk-taking by fostering a diversity of viewpoints and levels of competence. However, this requires effective coordination and communication since such inefficiencies could potentially distort these benefits (Jensen, 1993). Gender diversity reveals an inverse relationship, implying that the board is less risky when it is gender-diverse and includes a higher representation of females. Yahya et al. (2022) affirm this argument by narrating that having females on the board may encourage a more measured approach to risk-taking because females are mostly classified as risk averse. Hence, insurance companies with a higher proportion of women on their boards are more likely to make less risky decisions (Horvey, 2025). The agency theory supports this by highlighting women's risk aversion to decisions; hence, they are more likely to pursue lower risks (Yahya et al., 2023). For board independence, the study found a significant positive relationship. This contradicts Akbar et al.'s (2017) explanation that having more independent members on the board reduces insurance companies' risk-taking choices. This is because establishing effective ERM frameworks and decision-making processes within insurance companies is linked to increased board independence (Eling & Marek, 2014). This proactively encourages risk-taking and supports the insurer's strategic objectives, affirming its positive relationship. As the NIC continues to promote stronger corporate governance frameworks and accountability standards across the industry, these results highlight the importance of ensuring growth and diversity on the board in shaping the risk posture of the insurance industry in Ghana. Thus, the board structure should not be merely treated as a compliance requirement but as a strategic requirement that can influence insurers' risk-taking behaviour. Regarding the control variables, firm size and financial slack present a significant positive impact on insurers' risk-taking. Generally speaking, larger insurers own greater financial, human, and technical capital resources. Larger insurers have more resources available to them, which acts as a buffer against possible losses from taking risks. As a result, compared to smaller insurers, they could feel more at ease accepting greater risk. They often operate in different markets, which helps them to be more inclined to pursue higher risks because their overall risk is reduced through diversification. Leverage also showed an inverse relationship, and investment yield demonstrates a positive influence. This is because insurance companies that obtain higher profits on their investment become more confident about taking higher risks because they have the financial capacity to address any financial distress associated with risk-taking.

4.3. The nonlinear relationship between CG, ERM and insurers risk-taking

Taking the discussion further, this paper recruits the dynamic panel threshold technique developed by Seo et al. (2019) to investigate the nonlinear relationships in the model. The essence is to understand whether CG and ERM react the same or differently across varying levels. The results of the ERM index

and its categories are reported in Table 5, while Table 6 reports the findings of the CG features. The tables confirm nonlinearity in the relationship between risk-taking and ERM, as indicated by the significant bootstrap *p* value at 1%; hence, the study rejects the null hypothesis of no threshold effects. The samples may, therefore, be divided into two: the lower regime and the upper regime.

In Table 5, the coefficient values above the threshold level (ie upper regime) are categorised as insurers with a robust ERM, while the values below the threshold level (ie lower regime) are categorised as having an inept ERM system. According to the findings in the Table, the ERM index exhibits an inverse relationship with insurers' risk-taking when it falls below the threshold, which signifies that poor ERM implementations is associated with lower risk-taking. A weak ERM system may create fear about undesirable consequences associated with risk-taking. Decision-makers who are less confident in their ability to manage risks appropriately may opt for less innovative and safer strategies to avoid potential losses or reputational damage, thereby discouraging higher risk-taking (Horvey, 2022). In the upper regime, a significant positive relationship was found between the ERM index and insurers' risk-taking, implying that as ERM advances, insurers are more inclined to pursue higher risks because companies with effective ERM practices have the resources and capabilities to seize strategic opportunities and take measured risks (Nguyen & Vo, 2020). In Ghana, the NIC has been pushing for stronger risk-based supervision, aligning with global trends like Solvency II. Hence, insurers with robust ERM are better positioned to meet this requirement, giving them a competitive edge in their risk-taking choices. Nevertheless, many insurers in Ghana might be operating below the threshold level due to resource constraints, as evidenced in Table 3. Hence, there is a need for continuous capacity building, training, and regulatory support to help insurers improve their ERM system to enhance strategic risk-taking decisions. Risk-taking is essential to every company's success, as potential gains are often unattainable without assuming some level of risk (Mathew et al., 2016). Therefore, it is important to embrace certain risks to capitalise on the opportunities they present. This is made possible when insurers enhance their ERM system. By incorporating risk concerns into decision-making processes through ERM, businesses can make more prudent risk-taking decisions. The reason is that effective ERM provides insurers with the tools and confidence they need to identify, assess, and mitigate potential losses, enabling them to approach risk systematically and

Table 5. The nonlinear effect of ERM on risk-taking.

Variables	ERMI	RGI	OMI	ROI
Lower regime				
Z-score (-1)	0.145***	−0.103**	−0.350***	−0.320***
	(0.029)	(0.048)	(0.025)	(0.012)
Size	5.716**	1.248	10.210***	5.608**
	(2.484)	(1.888)	(3.140)	(2.411)
Leverage	−3.731***	−5.539*	−3.110**	−0.584
	(0.996)	(3.482)	(1.303)	(1.828)
Investment yield	−2.809***	−0.705*	−0.636	−1.833
	(0.126)	(0.394)	(0.498)	(1.902)
Slack	−4.668***	0.952	4.129	3.470
	(1.047)	(3.250)	(2.992)	(2.275)
Threshold variables	−4.061	−5.735	2.148	3.022***
	(3.510)	(6.220)	(1.520)	(0.108)
Upper regime				
Z-score (-1)	−0.638***	−0.607***	1.674***	0.172
	(0.072)	(0.115)	(0.253)	(0.329)
Size	−14.350**	6.978	−3.465	−34.000**
	(6.716)	(5.873)	(11.990)	(12.490)
Leverage	−3.933	4.297***	2.735	−20.731
	(10.190)	(0.999)	(10.483)	(16.650)
Investment yield	5.595***	6.595*	10.240***	2.507
	(1.940)	(3.698)	(1.849)	(1.939)
Slack	4.933	−36.021*	−1.368***	28.990*
	(13.802)	(22.461)	(0.055)	(16.971)
Threshold variables	3.613**	1.794**	2.573***	−3.051**
	(1.630)	(0.830)	(0.455)	(1.480)
Threshold indicator	0.159**	0.108**	0.654***	0.201
	(0.081)	(0.049)	(0.051)	(0.245)
Linearity test	0.000	0.000	0.000	0.000
Observations	33	33	33	33

Note. Standard errors in parentheses.
***, **, * denote significance levels of 1%, 5% and 10%, respectively.

Table 6. The nonlinear effect of CG on risk-taking.

Variables	Bodsize	Gender	Bodind
Lower regime			
Z-Score (-1)	−0.268***	−0.454***	−0.265***
	(0.026)	(0.039)	(0.048)
Size	−6.991***	−1.001	−3.252
	(2.660)	(5.801)	(3.472)
Leverage	3.185*	9.021**	0.943
	(1.690)	(4.014)	(2.104)
Investment yield	2.690*	8.973	−1.985
	(1.557)	(8.380)	(1.631)
Slack	0.799	1.406**	2.354***
	(2.267)	(0.743)	(0.098)
Threshold variable	0.595	1.494*	−1.370**
	(1.142)	(0.987)	(0.523)
Upper regime			
Z-Score (-1)	0.217***	0.382***	0.363***
	(0.025)	(0.035)	(0.063)
Size	−0.250	−4.669	10.632**
	(1.708)	(6.747)	(4.425)
Leverage	1.549***	1.006	1.515
	(0.491)	(2.549)	(1.297)
Investment yield	−3.540**	−9.705	3.992
	(1.715)	(8.515)	(4.014)
Slack	−2.082***	−3.450***	−4.700**
	(0.424)	(0.445)	(2.342)
Threshold variables	−1.338*	−1.303**	1.817***
	(0.735)	(0.047)	(0.176)
Threshold indicator	7.010***	0.153***	0.602***
	(0.441)	(0.007)	(0.043)
Linearity test	0.000	0.000	0.000
Observations	33	33	33

Note. Standard errors in parentheses.
***, **, * denote significance levels of 1%, 5% and 10%, respectively. BODSIZE represents Board Size; BODIND represents Board Independence.

prudently (Mikes & Kaplan, 2014). This enables businesses to weigh potential risks and rewards more effectively. Liu and Xu (2024) support this argument, explaining that an effective ERM system improves an organisation's risk-taking behaviour by identifying business risks and external macroeconomic risk variables and then appropriately modifying risk transfer and retention policies.

The results also demonstrate that insurers are more likely to assume greater risk when there is strong risk governance and operational procedures, as evidenced by the positive and statistically significant effect observed in the upper regime. This highlights that strong governance and effective operating mechanisms lead to improved risk-taking choices as they are able to manage their shortfall. This aligns with Horvey and Odei-Mensah (2025b), who posit that a well-designed risk management operating mechanism may provide insurers with the information and tools they need to accurately evaluate and choose which risks to underwrite, enabling insurers to seize lucrative opportunities while lowering the likelihood of losses. Regarding risk governance, Magee et al. (2019) posit that strong risk governance leads to better outcomes because risk governance increases risk-adjusted performance due to an effective ERM system. Thus, through more efficient ERM, improved risk governance can reduce downside risks and result in improved performance. This affirms Stulz's (2014) argument that effective risk governance does not suggest risk reduction. Rather, it helps the business take on the right amount of risk for its investors. This highlights how crucial risk governance is to insurers since it gives them the resilience they need to handle the challenges associated with pursuing risky projects (Horvey & Odei-Mensah, 2025b). According to Dupire et al. (2022), insurers that have effective risk governance are able to manage risks and return and seize opportunities that align with their strategic goals and risk tolerance level. In a nutshell, the study highlights that the antecedents of risk governance might be different from its outcomes. Although minimising risk is mostly the main driving force behind risk governance, it can also result in better risk-adjusted performance and higher risk-taking. Hence, insurers are encouraged to ensure a robust risk governance system to provide better performance in their risk-taking decisions.

The relationship between risk oversight and risk-taking is negative when it falls above the threshold. This demonstrates that effective risk oversights result in less risky choices. This is not surprising in the

Ghanaian insurance industry. Due to the excessive risk-taking nature of insurers, the NIC has provided several regulations to manage and reduce their risk-taking preferences (Akotey et al., 2023). These include the 'No Premium No Cover' policy and the abolition of outstanding premiums, which resulted from high levels of outstanding premiums among insurers (NIC, 2014). Hence, these regulations were provided to protect insurers from unfavourable risk-taking choices (Kusi et al., 2019). Given this, an effective risk oversight is likely to filter out unfavourable risks, thereby minimising insurers' risk-taking preferences, which explains the inverse relationship in the upper regime. Given this, having an effective risk oversight ensures proper monitoring and risk-taking choices aligned with the company's risk-taking preferences. Thus, better risk oversight leads to lower risk-taking, thereby making companies less vulnerable to risks (Dupire et al., 2022). This is not without empirical support, as Ellul and Yerramilli (2013) found that risk oversight minimises risks. Against this backdrop, the study suggests that insurers must encourage effective risk oversight to ensure sound risk-taking decisions.

Table 6 reports the results for the CG variables. Board independence, gender diversity and size thresholds are 0.602, 0.153 and 7, respectively. The 2015 NIC report, which mandates that insurers have a minimum of seven board members and that at least one-third of them be independent directors, is mostly consistent with the threshold findings (NIC, 2015). Therefore, this investigation supports the NIC's threshold level and encourages insurers to comply with the governance structure defined by the regulators. According to the findings, gender diversity presents a negative effect on insurers' risk-taking behaviour in the upper regime and a positive relationship in the lower regime. This demonstrates an inverted U-shaped relationship, suggesting that the board is less risky when there is more female representation. This is consistent with the persistence of the risk-averse nature of females who are more inclined to lower risk-taking (Hurley & Choudhary, 2020). As initially presented, gender-diverse boards lean toward risk-averse decisions. Jouber (2024) supports this narration and adds that females are naturally less overconfident and risk-averse compared to males. Thus, women are less likely to take on excessive risks than men, who often overestimate the precision of their risk knowledge. Dong et al. (2017) support this result and report a negative association between risk-taking and the proportion of women on the board. They suggest that insurers with a greater number of female board members are more likely to make less risky choices. Since the insurance industry is characterised by higher risk-taking, gender-diverse boards may prioritise risk mitigation and reduction to safeguard the organisation's performance and stability. This implies that the board should hire more females to make less risky choices. In light of this, the Ghanaian insurance industry should pair efforts to increase gender diversity with investments in robust ERM systems. Ensuring diverse perspectives translate into balanced decisions that align with the NIC's goals.

Further, the study presents an inverted U-shaped relationship between board size and risk-taking, suggesting a positive influence in the lower regime and a negative influence in the upper regime. The implication is that large board sizes lead to lower risk-taking, as indicated in the upper regime. While large boards encourage diversity and competence, they sometimes limit the effectiveness of the board due to poor coordination and delays in decision-making. This supports Cheng (2008) and Pathan and Faff (2013), who are of the view that large boards have difficulty coming to an agreement on crucial matters, which could lead them to take fewer risks. This assertion is supported by the agency theory, which posits that large board sizes lead to a lack of communication and coordination problems, which contribute to lesser risks (Jensen, 1993). This makes them less confident and cautious in their risk-taking decisions, thereby influencing them to pursue lower risks (Beasley et al., 2021). This contradicts the idea that large boards bring on board diverse expertise and promote more prudent risk-taking (Adams & Jiang, 2016). Although regulators of the insurance industry in Ghana require a minimum board size of seven members, it is important to understand that merely expanding the size of the board does not always translate into better risk-taking practices. Hence, insurers with larger boards must be well coordinated and include different expertise to facilitate prudent risk-taking decisions.

For board independence, a U-shaped relationship was found, showing that the relationship is positively related when it falls in the upper regime and inversely related in the lower regime. This illustrates that having more independent directors on the executive board is likely to increase the risk-taking preferences of insurance companies. While some scholars argue that independent directors discourage taking excessive risks (Brogi & Lagasio, 2022), the evidence from the analysis implies that having more

independent directors on the board makes the board riskier. This is because independent directors act in the best interest of shareholders; hence, in safeguarding their interests, they exhibit higher degrees of risk tolerance, which implies higher risk-taking (Eling & Marek, 2014). To achieve this, they ensure that taking proactive risks in line with the strategic goals is encouraged. This supports Akbar et al.'s (2017) assertion that in order to improve the wealth of shareholders, independent board members are more likely to be risk-tolerant and to safeguard their interests. Hence, Bradley and Chen (2015) add that for the benefit of their shareholders, insurers are more inclined to assume greater risks.

4.4. Robustness analysis

The study performs other estimations to ensure the robustness of the results. This is done by employing different estimation techniques, such as the Driscoll-Kraay Fixed Effects estimation (Driscoll & Kraay, 1998), to test the direct effects of ERM and CG on insurers' risk-taking, as seen in Table 7. The findings reveal several consistencies, highlighting that ERM positively influences insurers' risk-taking behaviour. Also, board size and independence exhibit positive effects, while gender diversity reveals otherwise. Table 8 presents the results of the threshold effects, which were estimated using the Hansen panel threshold method (Hansen, 1999). The study affirms nonlinearities and significant threshold levels, as Tables 5 and 6 predicted. The consistencies affirm the reliability and validity of the results.

5. Conclusion and recommendations

This paper contributes to the body of knowledge by exploring the linear and nonlinear effect of CG and ERM on the risk-taking behaviour of insurance companies, an area that has received less attention. To achieve this, this paper employs the generalised method of moments and the dynamic panel estimation techniques to analyse a sample of 33 insurers in Ghana between 2015 and 2021. The outcome of the analysis makes it evident that ERM plays a pivotal role in shaping insurance risk-taking behaviour. This is affirmed by its significant and positive impact on risk-taking, implying that ERM improves the risk-taking

Table 7. Robustness analysis on the influence of ERM and CG on risk-taking (Driscoll-Kraay estimations).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Risk governance index	1.277*						
	(0.692)						
Risk oversight index		−1.878***					
		(0.466)					
Operating mechanism index			2.143				
			(1.477)				
ERMI				0.851**			
				(0.387)			
Board size					1.075*		
					(0.591)		
Gender						−1.326*	
						(0.753)	
Independent director							1.107
							(0.746)
Leverage	0.588	0.085	1.140**	0.515	0.752	0.538	0.878
	(0.480)	(0.528)	(0.323)	(0.444)	(0.749)	(0.670)	(0.791)
Investment yield	0.392	0.344	0.490*	0.398	0.396	0.397	0.400
	(0.216)	(0.213)	(0.233)	(0.239)	(0.268)	(0.268)	(0.292)
Size	3.209***	2.646***	3.313***	3.177***	2.922***	2.910***	2.731***
	(0.774)	(0.611)	(0.546)	(0.746)	(0.670)	(0.619)	(0.584)
Slack	3.108*	3.519**	3.428*	3.199*	2.184	2.840	2.539
	(1.431)	(1.389)	(1.447)	(1.610)	(2.228)	(2.006)	(1.697)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of groups	33	33	33	33	33	33	33
Observations	231	231	231	231	231	231	231
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.619	0.672	0.699	0.794	0.801	0.796	0.798

Note. Standard errors in parentheses.
***, **, *denote significance levels of 1%, 5% and 10%, respectively.

Table 8. Robustness analysis on nonlinear effects of ERM and CG on risk-taking (Hansen threshold analysis).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	ERMI	RGI	ROI	OMI	BODSIZE	Gender	BODIND
Size	−2.598	−2.744	−2.744	−2.596	−4.037**	−2.372	−4.141**
	(1.917)	(1.929)	(1.929)	(1.915)	(1.912)	(1.964)	(1.973)
Leverage	2.812*	2.842*	2.842*	2.829*	1.909	2.653	2.583
	(1.690)	(1.689)	(1.689)	(1.689)	(1.650)	(1.714)	(1.675)
Investment yield	0.103	−0.116	−0.116	0.103	0.115	0.184	0.060
	(0.292)	(0.311)	(0.311)	(0.292)	(0.280)	(0.290)	(0.287)
Slack	−4.064*	−3.744	−3.744	−4.076*	−3.677	−3.818	−3.533
	(2.408)	(2.406)	(2.406)	(2.406)	(2.343)	(2.428)	(2.385)
Threshold variable:							
0	0.882	−0.300	−0.060	2.450	0.338	−2.923	6.050***
	(2.905)	(4.016)	(0.803)	(5.878)	(1.566)	(2.802)	(1.939)
1	3.666**	1.589***	2.118***	−3.716**	1.998*	−1.726***	−5.293**
	(1.532)	(0.322)	(0.764)	(1.012)	(1.082)	(0.248)	(1.777)
Threshold level	0.203	1.019	0.321	0.178	7.000	0.160	0.576
Prob.	0.000	0.002	0.010	0.020	0.007	0.012	0.001
Observations	231	231	231	231	231	231	231
Number of groups	33	33	33	33	33	33	33

Note. Standard errors in parentheses.
***, **, * denote significance levels of 1%, 5% and 10%, respectively. BODSIZE represents Board Size; BODIND represents Board Independence.

behaviour of insurers. This underscores the need for insurers to consider a robust ERM system since it enables them to approach risk with greater confidence. The individual categories for ERM present a positive relationship with risk governance and risk oversight being significant, suggesting that strong risk governance and oversight are associated with higher risk-taking decisions. They are, therefore, important factors that influence insurers' risk-taking. Regarding the CG factors, the study found an inverse relationship between gender diversity and risk-taking, which suggests that the board has a greater propensity to be less risky when more females are represented. This supports the agency theory, which shows that women are more likely to pursue lower risks due to their risk aversion. On the other hand, independent directors present a significant positive relationship, while board size is insignificant.

Turning to the nonlinear relationship, the study found that the nexus between ERM and insurers' risk-taking is a direct U-shaped relationship. This tells that insurers with an effective ERM program are more likely to undertake higher risks because ERM promotes a thorough assessment and awareness of risks and helps decision-makers take more measured risks by being more informed about the possible outcomes of their choices by meticulously identifying and evaluating risks. Hence, the study concludes that an effective ERM program does not suggest taking lower risks but rather promotes prudent and well-informed risk-taking decisions. This underscores the need for measures that ensure ERM implementation not only meets regulatory requirements but also adheres to its core principles, thereby enhancing its effectiveness in supporting agile and prudent risk-taking. Further, board independence, gender diversity, and board size thresholds are 0.602, 0.153, and 7, respectively. Also, board size and gender diversity revealed an inverted U-shaped relationship, indicating that boards tend to make less risky decisions when they are large, gender diversified and have a higher proportion of female members. This is due to the fact that it is sometimes difficult for large boards to reach a consensus on crucial matters, which can result in more conservative risk-taking. Additionally, female board members tend to exhibit greater risk aversion, especially when losses are involved rather than rewards, thereby preferring lower risk-taking. On the other hand, board independence positively impacts insurers' risk-taking in the upper regime, suggesting that the executive is riskier when more independent directors are present on the board because they act in the interest of shareholders, who are more inclined to higher risk-taking. In light of these findings, the study highlights the need for a diverse board to ensure effective decision-making and strategic risk management. It also highlights the need for the Ghanaian insurance industry and other emerging markets to consider strong CG structures and ERM in their business operations to ensure prudent risk-taking choices.

Following the above, the policy implications of the study are presented. Given that ERM positively influences insurers' risk-taking preferences, it stands to reason that better risk-taking results from robust ERM implementation, which is likely to translate into higher returns. Therefore, to maximise shareholder value and enhance risk-taking capabilities, insurers should prioritise the

implementation and continuous improvement in their ERM systems. More so, the NIC advocates for the implementation of ERM following the risk-based approach to supervision. Hence, insurers should not treat ERM as mere "window dressing" to meet regulatory compliance but should commit to its proper implementation by adhering to its principles, frameworks, and implementation mechanisms because its robustness ensures prudent risk-taking decisions. Insurers must also adhere to the key features of effective ERM, which include risk governance, assessment, and oversight. The study points out that the antecedents of ERM and governance might be different from their outcomes. Although minimising risk is mostly the main driving force behind ERM and governance, it can also result in better risk-adjusted performance and higher risk-taking. Hence, insurers must encourage ERM implementation to provide better performance in their risk-taking decisions. Also, regulators must strengthen their policies on ERM, including its individual categories, to safeguard the insurance business. In an emerging context like Ghana, strengthening the ERM system serves as a catalyst for enhancing insurers' resilience, performance, and risk-taking choices. Furthermore, even though this study found that ERM encourages risk-taking choices, insurers must be mindful of excessive risk-taking. In order to improve the performance of insurers in Ghana, policymakers and regulators must initiate, establish, and model policies that help tame downside risk and encourage prudent risk-taking choices. More so, the internal CG mechanism must be strengthened, and regulators must ensure a holistic regulation of the CG system. From a managerial perspective, insurers must comply with the CG requirements defined by regulators. For instance, insurers must promote diversity on the board by ensuring that independent directors and females are well represented. Again, the board should hire more females to make less risky choices following the empirical evidence which suggests that the board makes less risky decisions if it is gender diversified. Regulators should stress how crucial it is to ensure that boards are efficiently organised and coordinated in addition to satisfying the minimum size requirement of the board's composition. This might entail implementing strategies to improve the effectiveness of the board, such as encouraging open lines of communication, transparency, and role clarification among board members. The limitation of this paper is that it considered insurers only in Ghana; hence, it could be extended to other emerging countries. Moreover, this study could not take into account all the insurers in Ghana due to data availability. Therefore, future studies should extend this analysis by considering all the insurance companies. Scholars could also explore whether ERM and CG have a synergistic-complementarity effect on risk-taking. Additionally, future studies could explore other aspects of CG and other key elements of ERM.

Note

1. The annual reports of Ghana's National Insurance Commission (NIC), which provided the data for the study can accessed at https://nicgh.org/procurement-notices/annual-report/.

Author contributions

CRediT: **Sylvester Senyo Horvey**: Conceptualization, Writing – original draft, Writing – review & editing.

Publication statement

This article has not been published elsewhere and has not been submitted simultaneously for publication elsewhere.

Disclosure statement

No potential conflict of interest was reported by the author.

Funding

No funding was obtained for this study.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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