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Re-examining the microeconomic and macroeconomic determinants of nonlife insurers profitability in South Africa: insights from linear and threshold analysis

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Abstract

This study contributes significantly to the literature by exploring the linearity, nonlinearity and threshold levels necessary for the micro- and macrodeterminants to stimulate insurance profitability (thus, return on assets and return on total premiums). The study employs the system generalized method of moments and the dynamic panel threshold techniques based on 71 nonlife companies in South Africa between 2013 and 2019. The findings from the linear analysis show that solvency, investment yield, premium growth, gross domestic products and urbanization are important channels for nonlife insurance profitability. Contrarily, inflation and unemployment present adverse effects. Furthermore, the results from the threshold analysis reveal nonlinearities in the relationship, which nonlife insurers must consider to achieve higher profitability. The findings highlight that solvency, insurance size and investment income stimulate profitability beyond their threshold levels, but premium growth and reinsurance reveal otherwise. The results suggest that excessive premium growth and over-reliance on reinsurance can hurt the profitability of nonlife insurers. Regarding the macroeconomic factors, the study finds that economic growth enhances profitability when it surpasses a certain threshold, while inflation hinders profitability when it exceeds a specific threshold. The study suggests that a stable economic environment is vital to the growth of the nonlife industry. In addition, insurers must employ sound underwriting and risk management practices to avoid financial distress.

Keywords: Determinants, Insurance, Linearity, Profitability, Threshold

JEL Classification: G22, C24, L25

Introduction

Over the last two decades, the determinants of insurance profitability have received great attention from scholars and practitioners (Killins, 2020; Marjanović & Popović, 2020; Sasidhran et al., 2022; Worku et al., 2024). This is due to the significant role that insurance companies play in every economy. By acquiring insurance, economic agents can successfully manage insurable risks that threaten their survival (Horvey & Odei-Mensah, 2024). In addition, through the principle of indemnity, insurance firms

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reduce the cost of goods and services when an insured loss occurs. They also facilitate trade and commerce, minimize losses, encourage investment in critical economic sectors, and help government security activities (Zinyoro & Aziakpono, 2024). More so, the insurance industry contributes significantly to every economy on both the micro- and macrolevels (Zainudin et al., 2018). At the microlevel, the insurance industry provides financial security, risk management services and indemnity in the event of a loss. At the macrolevel, insurance premiums form part of the economy's financial capital, which is a critical resource for investment activities while promoting long-term economic growth (Ghosh, 2013). They also provide employment that absorbs organizations' risk to provide a sense of peace and stability. As a result, the individual, organizational and economic performance of developed and developing countries can be credited in part to the development of the insurance industry. Given this, the profitability and sustainability of the insurance industry are vital; hence, it is essential to examine the factors which stimulate insurance profitability. Thus, the drivers of insurers' profitability should be thoroughly examined to understand the insurance sector's potential for growth and its contribution to the development of the national economy and ensuring the sustainability of the insurance business (Marjanović & Popović, 2020).

Clearly, there are numerous benefits derived from the insurance industry. As a result, many firms and regulators have increased their efforts to ensure superior business performance by implementing sound risk management practices, promoting underwriting efficiency and good investment strategies. These efforts, together with several macroeconomic and firm-specific factors, collectively influence the financial profitability of insurance businesses (Msomi, 2023). This is because insurance companies, in particular, face a unique set of challenges as they are impacted by both internal and external environmental factors. Internally, operational procedures such as underwriting activities, claims handling, size and investments are essential to preserving profitability and reducing risk (Horvey et al., 2024). External macroeconomic factors also substantially impact insurers' risk environment and income. Some of these include inflation, economic growth and urbanization, among others. For instance, economic growth frequently results in higher disposable income, which can raise demand for insurance products. At the same time, inflation can reduce profit margins by increasing the cost of claims. As a result, understanding how the factors from the macroeconomic and microeconomic environment influence insurance profitability is critical for insurers and policymakers involved in the financial system (Camino-Mogro & Bermúdez-Barrezueta, 2019).

The empirical literature on the determinants of insurance profitability is vast, particularly among developed economies. Most of these scholars explored the impact of firm-specific factors on insurance profitability (Ahmeti & Iseni, 2022; Kramaric et al., 2017; Zainudin et al., 2018). Again, macroeconomic determinants such as inflation and economic growth are also reported as significant determinants of insurance profitability (Killins, 2020; Lee, 2014). The issue has also piqued the interest of academics in developing countries, particularly in Africa (Berhe & Kaur, 2017; Boadi et al., 2013; Morara & Sibindi, 2021). Even though previous studies have expanded our knowledge of the determinants of insurance profitability, the literature remains inconclusive, revealing mixed results and controversies on the direction of the relationship in both developed and developing economies. This implies that there may be a nonlinear rather than

direct relationship between these factors and profitability (Horvey et al., 2024; Zinyoro & Aziakpono, 2024). However, existing empirical studies have been methodologically restrictive as most of these studies were concerned about the direct impact of insurance profitability employing the traditional linear regression models. This presents a missed opportunity and epistemological setback that hinders the complex dynamics of the relationship.

Therefore, this study argues that the differences in the results might be due to the limitation of the linear regression, which cannot reveal the level at which the determining factors enhance or suppress profitability. This drawback emphasizes the necessity for estimation techniques that consider possible nonlinearities and thresholds between variables to offer a more thorough comprehension of the factors influencing insurance profitability. Hence, there is a need for re-examination. To the best of our knowledge, Horvey et al. (2024) were the first to estimate the threshold determinants of insurance profitability, suggesting that higher/lower levels of the determinants enhance/weaken insurance profitability, implying that these determining factors influence performance at different levels. However, a notable research gap exists as their study focused primarily on the microeconomic factors in the life insurance sector. Hence, this study builds upon Horvey et al.'s (2024) study by extending this analytical framework to encompass the nonlife industry and considering not only the microeconomic factors but the macroeconomic factors which undoubtedly influence insurance profitability. As a result, the overall purpose of this study is to examine the impact of macroeconomic and microeconomic factors on the profitability of nonlife insurance in South Africa.

Given this, the novelty and originality of the study lies in answering the following questions: (1) what is the impact of macroeconomic and microeconomic factors on nonlife insurance profitability? (2) Is there evidence of thresholds and nonlinearities in the relationship? By examining these issues, the study offers a more thorough understanding of the factors affecting insurance industry profitability and the complex dynamics in the relationship, which has received less attention. Given this, we employ the dynamic panel threshold estimation technique developed by Seo et al. (2019). The technique is capable of estimating whether there is nonlinearity in the relationship and the threshold levels needed to enhance profitability, which has been neglected in the literature. Against these backdrops, this study offers new insights and helps to reconcile the conflicting findings, providing a new perspective and more robust technique to examine the impact of firm-specific and macroeconomic factors on performance at different threshold levels using the nonlife industry in South Africa as a case study.

The South African insurance market offers an interesting context due to its dynamic, intricate, globally engaged and competitive market (Horvey & Odei-Mensah, 2024). In addition, the South African insurance market remains the most dominant market in Africa, with spillover effects on other African economies. There are several options for multi-channel distribution, including technology and the digitalization of insurance markets with the support of strong institutions and regulatory development. As a result, issues concerning the South African insurance market are frequently adopted by other African economies. Thus, investigating the determinants of insurance profitability in South Africa is critical for the economy and other African economies. Again, despite the various research on the insurance industry in South Africa, scholars have completely

ignored the threshold and nonlinear effect of microeconomic and macroeconomic determinants on insurance profitability, which is essential to ensure their profitability. On this note, this paper re-examines the determinants of insurance profitability in South Africa by first exploring the linear effects of firm-specific and macroeconomic factors on South Africa's nonlife insurance industry. In addition, dynamic panel threshold estimation is employed to determine nonlinearity in the relationships.

Examining the determinants of insurance profitability has several implications. The outcomes of this investigation can provide valuable insights for strategic decision-making procedures in the insurance domain and steer the development of policies that promote a robust and prosperous insurance business in South Africa. As a result, stakeholders will receive clear knowledge to judge the levels these factors need to attain to improve insurance profitability. It informs regulators on the policy directions that need to be taken regarding the threshold levels suggested in this paper. Given that no study has considered the threshold impact of the nonlife industry, this study provides a holistic assessment by going beyond the linear relationship by examining nonlinearities of the microeconomic and macroeconomic determinants of the nonlife insurance companies' profitability. Given that the South African insurance market is the most developed and sophisticated in Africa, other African nations might learn a few things from this study about the factors that influence insurance profitability. This will deepen our comprehension of the key elements affecting insurance profitability. Investors will find this to be a nice inducement, because they like more robust organizations.

The rest of this paper is organized as follows. First, an overview and literature relating to the firm-specific and macroeconomic impacts are reviewed in the next section. This is followed by the data and estimation techniques. The analysis and discussion of results are presented next. The conclusions, implications and directions for future research are discussed in the last section of the paper.

Literature review

Overview of the nonlife industry in South Africa

The insurance market in Africa is dominated by the South African insurance industry, which is ranked among the top 20 insurance markets in the world. In 2016, the industry in South Africa accounted for $42 billion of total written premiums, equivalent to 0.89% of the global market. Their growth is spurred by the well-developed and financially sound market, significant regulatory changes such as the solvency assessment and management (SAM) framework, technology and digitization of the insurance industry, and diversified multi-channel distribution models, among others. As provided by the Swiss Re Institute, the insurance penetration rate is about 12.2% as of 2021. Despite the industry's performance, the life industry contributes 10% to the total penetration rate compared to the nonlife industry, which has only 2.2%. This is a bit problematic not only from a performance perspective but also from a managerial perspective. Hence, what important decisions need to be made to drive the performance and penetration levels of the nonlife industry? The low penetration also demonstrates the untapped potential of the nonlife industry in South Africa. PricewaterhouseCoopers (PwC) (2018) suggests several challenges confronting the industry in South Africa, including the risk of over-regulation, increased competition, high level of concentration, and lack of sophistication

in underwriting activities likely to influence their performance. In addition, amid global competition, the nonlife industry cannot afford to overlook their performance. Hence, there is a need to explore the vital avenues to attaining higher performance and penetration levels. Figure 1 presents graphical insights into the performance of the nonlife industry in South Africa between 2013 and 2019.

The results in Fig. 1 show that the industry's gross written premium and assets are very high and have increased significantly over the period. However, claims paid have shown sluggish growth since 2013. Again, the graph indicates fluctuations in the underwriting profit, investment income and operating profit. It is clear from the figure that the profit situation of the nonlife insurance market has not been stable, nor does it show an upward trend over the same period, but there are wide variations. The low-profit values and the extent and frequency of these variations are cause for concern, hence the need to re-examine and determine the factors that propel the profitability of the nonlife industry in South Africa. This will inform the various stakeholders on the decisions to reverse the fluctuating trends and promote nonlife profitability.

Empirical review of microeconomic (firm-specific) determinants

The profitability of insurance companies is influenced by several microeconomic factors, also known as firm-specific determinants, which have been widely explored in the literature. Empirical studies have recognized the role of firm size, premium growth and leverage as major determinants. For instance, firm size aids companies in enjoying economies of scale (Camino-Mogro & Bermúdez-Barrezueta, 2019). Ahmeti and Iseni (2022) support this argument and narrate that larger firms achieve higher profitability due to greater bargaining power. More so, Batool and Sahi (2019) investigated the determinants of insurance performance among insurers in the US and UK using quarterly data from 2007 to 2016. In the case of the US, they found that size, leverage and liquidity were

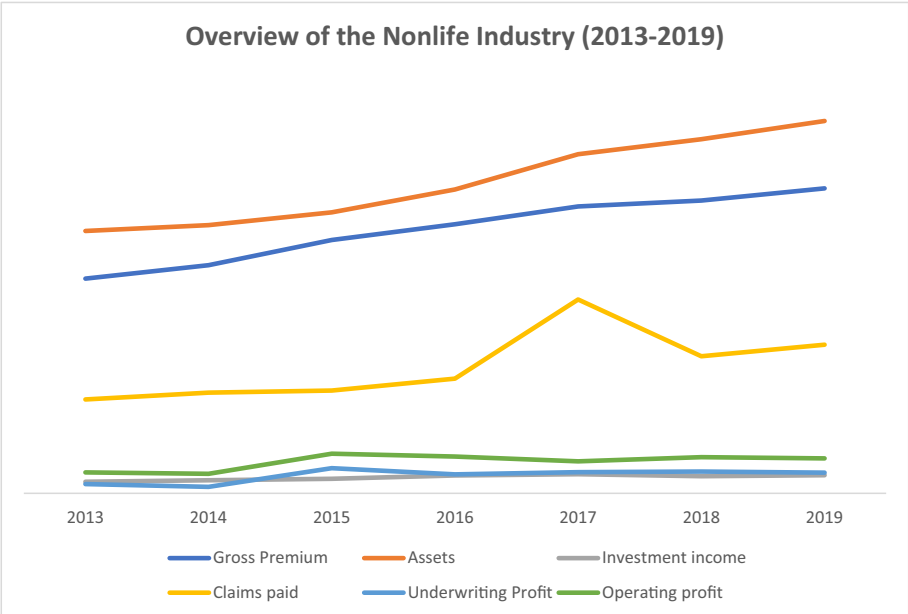


Fig. 1 Overview of the nonlife industry (2013–2019) (Source: Authors)

positively related to performance. Similarly, insurers in the UK found the same relationships, except for leverage, which was negative. Their comparative analysis revealed that US insurance is more efficient than the UK. In line with this opinion, Vojinović et al. (2022) and Worku et al. (2024) found that size significantly improves the profitability of Serbian insurance companies, because larger firms experience cost reductions due to economies of scale. This affirms Zhao et al. (2021) findings that an increase in firm size enhances the profitability of property insurers in China. This is because larger companies may efficiently manage risk by utilizing their vast resources and diversifying their risk portfolios. By lowering exposure to financial instability, this diversification ability helps to improve profitability and stabilize earnings (Horvey et al., 2024).

On the contrary, some scholars argue that larger firms are more difficult to manage and control, and they are more likely to experience agency problems (Kumar et al., 2022). Similarly, Sasidharan et al. (2022) found that size, overreliance on reinsurance, and leverage ratio have little impact on insurance firm profitability. Siopi and Poufinas (2023) support these arguments and attribute this to regulatory scrutiny, operational complexity, and management costs they often face, which weaken the impact of firm size. In addition, though reinsurance helps to spread risk and stabilize returns, it comes with costs that might lower possible profits, whereas leverage may make a company more susceptible to market fluctuations and bankruptcy risk (Choi & Weiss, 2005). Furthermore, Sasidharan et al. (2022) indicate that loss ratio, premium growth, and retention ratio significantly influence insurance profitability, showing that the growth of premiums and retention ratio indicates the growth and stability of expanding its market share, which ultimately affects performance. Camino-Mogro and Bermúdez-Barrezueta (2019) and Ahmeti and Iseni (2022) add that leverage and investment returns tend to increase profitability, explaining that insurers with more investment prospects typically expand quickly. In addition, insurers usually maintain large reserves from policyholders, which they invest to generate additional revenue. In addition, companies with diverse investment portfolios usually have higher levels of profitability as investment income may supplement underwriting revenues (Morara & Sibindi, 2021). However, this component is vulnerable to economic changes as market fluctuations impact investment returns and total profitability.

In the case of the nonlife industry in Turkey, Öner Kaya (2015) found that size and premium growth rate are important drivers of profitability. However, leverage, loss ratio and current ratio adversely affected profitability. The author posits that sound underwriting activities and rules are critical in determining insurance companies' financial success to limit the additional risk associated with underwriting operations and maximize shareholder returns by establishing excellent management standards. Using the random effect model, Zainudin et al. (2018) indicate that size, liquidity and underwriting risk play essential roles in generating profits for life insurers in Asia. However, Hussain (2015) found a significant negative relationship between underwriting risk and profitability. In addition, Zainudin et al. (2018) found a negative relationship between premium growth and profitability, explaining that firms which are excessively focused on premium growth can lead to self-destructive behaviour, as other vital goals, such as investment, may be overlooked. Akotey et al. (2013) support this argument by narrating that rapid premium growth can result in insolvency. Contrary to these opinions, Killins (2020) found

a positive relationship, explaining that premium growth increases profitability and possibly risk, which results in higher returns. For Ecuador, Camino-Mogro and Bermúdez-Barrezueta (2019) explored the life and nonlife insurers and found that net premiums, technical reserves and capital ratio are essential drivers of life insurance profitability. In the case of India, Sasidharan et al. (2022) revealed size, reliance on reinsurance and leverage ratio have little bearing on the profitability of insurance firms, whereas loss ratio, premium growth and retention ratio significantly negatively affect profitability.

Narrowing down to Africa, Berhe and Kaur (2017) studied the determinants of insurance profitability in Ethiopia. The empirical results revealed that insurance size, capital adequacy, and liquidity ratio are significant predictors of insurance company profitability. On the other hand, the leverage, loss ratio and market share were found not to affect profitability. The study recommends that insurance company executives and policymakers in the country take critical steps toward improving insurers' overall profitability by developing policies and strategies. Boadi et al. (2013) explored the insurance industry in Ghana based on a sample of 16 companies between 2005 and 2010. The authors note that, aside from tangibility, leverage and underwriting risk, which have a negative relationship, a positive relationship exists between the liquidity and profitability of insurance firms in Ghana. It is often argued that highly leveraged firms lead to higher shareholder returns and boost profitability, because leverage helps generate more cash flow to satisfy their obligations. Alhassan et al. (2015) also conducted a similar study on the insurance companies in Ghana using a panel data set of 36 companies between 2007 and 2011. A positive relationship was found between firm size and profitability, suggesting that policymakers should develop policies and strategies to improve insurers' profitability.

According to Odira (2018), firm size had a positive and significant effect on the financial performance of Kenyan general insurance companies, whereas solvency had a positive but insignificant effect. The positive result for solvency is not surprising. According to Sandstrom (2016), a solvency margin is the amount of a company's assets which supports some or all of the theoretical solvency requirements specified by regulators. The management of an insurance firm must preserve liquidity, satisfy regulatory solvency constraints, and make an effort to sustain net income growth when it comes to capital and solvency management, ultimately translating into profitability. The study discovered that liquidity, leverage, and underwriting have a negative and significant impact on the performance of Kenyan general insurance companies, affirming the results of Alhassan et al. (2015). Akotey et al. (2013) confirmed this relationship by explaining that offering more risky insurance leads to higher claims payments and, as a result, lower profits. In analysing the determinants of insurance performance in Zimbabwe, Mazviona et al. (2017) present that expense ratio, claims ratio, and insurance size hurt insurance performance, whereas financial leverage was positive. The financial performance of Ethiopia's micro-insurance sector has been adversely affected by reinsurance dependence, premium increases, underwriting risks, and inflation (Kramaric et al., 2017).

In addition, Morara and Sibindi (2021) found a positive relationship between solvency, reinsurance premiums, investment and the performance of Kenyan insurers, arguing that most insurers with strong investment returns reduce their risk of loss. This aligns with Njiiri's (2015) findings, revealing a positive impact of investment on profitability. According to Athanasoglou et al. (2006), when a company's solvency level is high, it can

reduce leverage risk, which can help it improve financial performance. However, Lee and Lee (2012) and Shiu (2004) found negative relationships with higher-profit insurers purchasing less reinsurance, because reinsurance transactions can be costly and inefficient and impact profitability and growth. Chang and Jeng (2016) argue that the use of reinsurance may be costly, inefficient, and have a long-term impact on the profitability of insurance companies. More so, reinsurance transactions are linked to underwriting risk and capacity, impacting the profitability and growth of ceding insurers (Lee & Lee, 2012). Shiu (2004) advises that insurance companies must identify an adequate retention level and strike a balance between lowering the risk of insolvency and lowering possible profits.

Empirical review of macroeconomic determinants

Besides the firm-specific factors, insurers operate within a broader economic environment and are, therefore, affected by macroeconomic conditions. As a result, scholars have taken a keen interest in macroeconomic factors such as GDP, inflation rate, and interest rates, among others. GDP growth reflects a particular country's economic activities and development level over a specified period, usually a year. It is one of the most important macroeconomic indicators used to assess a country's economic health (Sasidharan et al., 2022). GDP growth is a crucial indicator of a country's economic health, and poor economic conditions can reduce profitability by lowering the quality of the finance portfolio. Hence, it is anticipated that when GDP grows, so will the likelihood of selling insurance policies, and insurers will benefit from higher profits. This is empirically supported by Batool and Sahi (2019) and Killins (2020), who found that GDP positively affects insurance companies in the US, UK and Canada. This confirms Berhe and Kaur's (2017) findings, which discovered that GDP growth is a significant predictor of insurance profitability in Ethiopia. Vojinović et al. (2022) also found a significant positive relationship between GDP and insurance profitability in Serbia, highlighting that economic prosperity paired with a successful approach to managing market and credit risk will contribute to the superior performance of insurance companies. On the contrary, Alhassan et al. (2015) revealed an inverse relationship, whereas Sasidharan et al. (2022) failed to find any significant evidence. They attribute this to economic downturn and high competition.

Another important macroeconomic issue affecting the profitability of insurance is inflation. The capacity of insurers to appropriately price their goods is impacted by inflation, which also impacts the actual value of claims and premiums. Insights from the literature present that a negative relationship exists between inflation and insurance profitability (Kramaric et al., 2017). This evidence is supported by Vojinović et al. (2022), who discovered that inflation negatively impacts insurance performance. This is because underwriting losses may result from high inflation as the actual value of claims paid out may be more than the premiums received, which will ultimately influence the profit situation of insurers. In addition, inflationary pressures lower profitability by raising claim costs, especially for property and casualty insurance. Furthermore, inflation reduces growth and wealth for the poor, reducing demand for insurance and potentially impacting profitability. On the contrary, Lee (2014) found an insignificant relationship, suggesting that inflation does not matter to the Taiwan insurance industry. Batool and

Sahi (2019) explained this relationship as negative. Daare (2016) concludes that inflation and profitability are negatively correlated. The negative relationship is because inflation hurts the poor by reducing growth and moving real incomes and wealth away from those in society who cannot defend their economic interests. This reduces the demand for insurance and could impact their profitability.

Unemployment, personal remittances, and urbanisation are important determinants of insurance profitability. Surprisingly, these factors remain incipient in the literature to the best of our knowledge. According to Zerriaa and Noubbigh (2016), a higher level of urbanisation is likely to increase life insurance demand, which will likely enhance their profitability, because urbanisation increases productivity, lowers the cost of goods, and increases the number of services available. In addition, the concentration of consumers in a geographic area facilitates insurance distribution, creating higher demand for insurance, which in turn affects its profitability (PwC, 2018). For personal remittances, Jeaven et al. (2021) found a positive relationship, explaining that remittances can affect income, and higher income levels are associated with more insurance purchases, which is likely to affect their profitability. Crayen et al. (2013) further explain that remittances which represent money sent from migrant workers to their home countries, increase households' capacity to buy financial products, such as insurance. Fromell et al. (2020) add that remittances encourage financial inclusion and the purchase of insurance products as recipients use the funds to protect their financial prospects. Hence, higher demand for insurance products in countries with significant remittance inflows has been associated with better insurer profitability, because remittances offer an additional revenue stream to fund premium payments.

Regarding unemployment, the literature receives much consensus on its adverse effect on insurance profitability. For instance, Cole et al. (2015) expound that employment levels are mostly correlated with insurance demand. Therefore, higher unemployment rates lead to lower insurance demand, affecting insurance returns. Dorofti and Jakubit (2015) provided a similar conclusion by explaining that high unemployment jeopardizes insurers' growth prospects. It makes it more difficult for insurance companies to expand, because households are less willing to spend their limited income on insurance. Furthermore, increased unemployment rates make policyholders more price-sensitive and less able to purchase new homes and goods, both of which require some insurance coverage. This reduces the demand for insurance. As a result, it may weaken overall profitability. Bekeris (2012) investigated the relationship between macroeconomic factors and corporate profitability in Lithuanian small- and medium-sized insurers. His findings show that unemployment has the most significant impact on profitability.

Overall, the existing literature provides a fairly comprehensive account of the impact of firm-specific factors on insurance profitability; however, the effect of the macroeconomic factors is not adequately addressed. In addition, scholars have discovered conflicting results regarding the impact of firm-specific and macroeconomic factors on insurance profitability. The contradictory results do not always imply that some are incorrect, while others are correct. However, the results could be due to differences in environmental factors, nonlinearities, and threshold levels affecting the relationship. Notwithstanding, empirical investigation identifying the level at which these factors affect insurance profitability remains elusive. On this premise, this study examines the

determinants of firm-specific and macroeconomic factors on insurance profitability in South Africa, since this area of study is greatly under-researched. The study further extends knowledge in the current body of literature by exploring the nonlinearity and threshold dynamics of the determinants. It investigates not only the internal factors but also the external factors due to their significant impact on the insurance sector.

Materials and methods

The study employs a panel data set of 71 nonlife insurers to model the impacts of the firm-specific and macroeconomic determinants on profitability from 2013 to 2019. The data started in 2013, because information before this period was not publicly available at the time of the study. The cutoff year in the data set is 2019 to remove the COVID-19 pandemic's confounding effects on financial data and any potential biases that would have skewed the paper's main finding (Horvey et al., 2024). All firm-specific data were drawn from the annual reports of the Financial Sector Conduct Authority (FCSA) database, while the macroeconomic variables were derived from the World Development Indicators (WDI) database. Out of the 91 nonlife insurers in South Africa, 71 insurers, representing 78% of the total nonlife insurers, were used for the analysis. The rest were excluded due to data unavailability, while others were newly established, collapsed or merged. A comprehensive list of the variables, descriptions and sources are presented in Table 1.

Estimation technique and regression model

Generalized method of moments

The study first examines the direct relationship between firm-specific and macroeconomic determinants of nonlife insurance profitability using the dynamic system GMM estimator. The GMM model is employed, because it addresses endogeneity problems by controlling for time series variations and unobserved firm-specific effects (Arellano & Bond, 1991). One of the primary motivations for selecting this technique is based on the caveat that the number of cross sections (i.e., companies) must be greater than the time periods, which is the case in this study, where the number of insurance companies (thus $N=71$) is greater than time (thus $T=7$). According to the econometric research, the GMM technique offers greater benefits than the static model (Blundell & Bond, 2000). By using the time series fluctuations in the data and accounting for unobserved firm-specific effects it helps manage endogeneity issues. More so, this technique is appropriate, because it addresses omitted variables and measurement errors by exploiting the data's time series variations and controlling for unobserved firm-specific effects. Given this, we developed a model, where the dependent variable depends on a vector of observations from its lag and the independent variables. It is important to note that the addition of lags of dependent variables may create endogeneity issues, which motivates the choice of this model. Another endogeneity concern is the bi-causal links between profitability and its determinants (Sasidhran et al., 2022; Vojinović et al., 2022). Given this, the study resorts to using the dynamic system GMM estimator. A two-step GMM estimator is used, which addresses potential instrument proliferation and overfitting, is asymptotically consistent, and provides trustworthy results. This approach is preferred over a one-step GMM estimator. As a result, our model is expressed as:

Table 1 Description of variables

Variable	Symbol	Measurement	References
Dependent variables			
Return on assets	ROA	Net profit/total assets	Horvey and Ankamah (2020), Vojinović et al. (2022)
Return on total premium	ROTP	Net profit/total premium	Vojinović et al. (2022)
Micro/macrodeterminants			
Insurance size	Size	Natural logarithm of total assets	Öner Kaya (2015)
Premium growth	PG	$\frac{GWP_t - GWP_{t-1}}{GWP_{t-1}}$	Morara and Sibindi (2021)
Reinsurance	REINS	Ceded reinsurance premium/total premium	Morara and Sibindi (2021)
Solvency	SOLV	Net income/total liabilities	Öner Kaya (2015), Morara and Sibindi (2021)
Leverage	LEV	Debts/total equity	Ahmeti and Aseni (2022)
Investment yield	Investment	Net income/total investment	Shiu (2020)
GDP growth	GDP	GDP growth (annual %)	Wolde et al. (2020)
Inflation	INF	Inflation, consumer prices (annual %)	Sasidharan et al., (2022), Vojinović et al. (2022)
Urbanization	URB	Urban population (% of total population)	Dragos (2014)
Personal remittances received	Remittances	Log of personal remittances, received (current US$)	Cao and Kang (2020), Jeaven et al. (2021)
Unemployment	UNEMP	Unemployment, total (% of total labor force) (national estimate)	Cole et al. (2015)
Controls			
Expense ratio	Expense	Ratio of operating expenses to net earned premium	Pjanic et al. (2023), Mazviona et al. (2017)
Underwriting retention	Retention	Percentage of gross premiums written, retained as net premiums	Öner Kaya (2015)
Claims incurred	Claims	Log of Total claims	Enekwe et al. (2015)
Total liabilities	Liabilities	Log of total liabilities	Enekwe et al. (2015)

$$\begin{aligned} \mathrm{PROF}_{it} = {} & \beta_1 \mathrm{PROF}_{it-1} + \beta_2 \mathrm{FIRM}_{it} - \mathrm{SPECIFIC}_{it} \\ & + \beta_3 \mathrm{MACROECONOMIC}_{it} + \beta_4 \mathrm{CONTROLS}_{it} + \mu_i + \partial_t + \varepsilon_{it} \end{aligned} \tag{1}$$

where PROF represents profitability; PROF_{it-1} represents the one-period lag of the dependent variable; FIRM-SPECIFIC represents the firm-specific factors (i.e., firm size, leverage, reinsurance, investment yield, Solvency and Premium Growth); MACROECONOMIC represents the macroeconomic variables (i.e., GDP, inflation, remittances, urbanization and unemployment); CONTROLS represents a vector of control variables. β represents the parameters to be estimated; μ_i represents the unobserved country-specific fixed effects; ∂_t represent the time fixed-effect and ε_{it} is the idiosyncratic error term.

Dynamic panel threshold

The second part of the study employs the dynamic panel threshold estimation technique proposed by Seo and Shin (2016) and Seo et al. (2019) to capture nonlinearities and thresholds in the relationships. The dynamic panel threshold approach is chosen for this study, because it is built on GMM principles, which deal with endogeneity and

simultaneity issues (Horvey et al., 2024). It also extends the threshold model by Hansen (1999), which is particularly useful for static models and Kremer et al. (2013). More so, these models do not provide comprehensive information on the direction of the coefficient estimates of the variables at different thresholds, a limitation addressed by the dynamic panel threshold model, offering more comprehensive information by indicating the effect of the coefficient estimates at different levels (Seo et al., 2019). The threshold effects are determined by dividing the determinants into upper and lower regimes. This technique addresses rigorous econometric analyses of dynamic heterogeneous panels and is helpful when the time is short (Seo & Shin, 2016). This method is more appropriate due to its ability to control endogeneity problems associated with the model, since it is built on the principles of the dynamic panel model. The general model is specified as:

$$y_{it} = x_{it}'\beta + (1, x_{it}')\delta 1\{q_{it} > \gamma\} + \mu_i + \varepsilon_{it} \quad i = 1, \ldots, n; \ t = 1, \ldots, T \tag{2}$$

where y_{it} is the dependent variable, which is insurance profitability; q_{it} represents the threshold variable, which includes the firm-specific and macroeconomic determinants and x_{it} includes the lagged dependent variable and control variables; γ is the threshold parameter in the model. T is assumed to be fixed, whereas n is assumed to grow indefinitely. The fixed effect μ_i is removed using the first difference process, and then the unknown parameters are estimated using GMM. Thus $\theta = (\beta', \delta', \gamma)'$.

Results and discussions

Descriptive and correlation analysis

The analysis begins by first describing the variables introduced in the regression models, as depicted in Table 2. The return on assets for nonlife insurers recorded an average value of 0.571, and the return on total premium records an average of 0.006. Premium growth shows a mean of 3.110 with a variation of 7.147. The minimum and maximum values

Table 2 Descriptive statistics. Source: Results were generated from Stata

Variable	Obs	Mean	Std. Dev	Min	Max
Return on assets	497	0.571	0.474	0.034	9.035
Return on total premium	497	0.006	0.012	0.0037	0.075
Premium growth	497	3.110	7.147	−0.5442	38.301
Solvency	497	14.303	170.345	5.712	3726.048
Investment yield	497	0.143	0.158	0.061	0.955
Leverage	497	0.445	0.514	0.727	1.066
Reinsurance	497	0.033	0.389	0.019	0.976
Insurance size	497	13.179	1.499	9.943	16.866
Inflation	497	5.264	0.857	4.120	6.571
GDP	497	1.235	0.683	0.113	2.485
Personal remittances	497	20.592	0.077	20.443	20.693
Urbanization	497	65.334	1.022	63.793	66.856
Unemployment	497	23.613	1.098	22.04	25.54
Expense ratio	497	0.262	0.418	0.003	0.996
Underwriting retention	497	0.594	0.241	0.110	0.858
Claims incurred	497	3.920	0.7984	1.052	6.099
Liabilities	497	12.292	1.852	1.587	16.82

were −0.5442 and 38.301. This finding makes it evident that premium growth among nonlife insurers in South Africa exhibits high dispersion. Results from the descriptive statistics provide an average score of 14.303 for solvency, indicating that nonlife insurers' assets substantially outweigh their liabilities. Investment yield, which explains the amount of income generated by an investment, averaged 0.143, showing a lower yield on investment. The minimum and maximum values were 0.061 and 0.955, respectively. The average value for reinsurance is very low, averaging 0.033, ranging between 0.019 and 0.976. Insurance size exhibits an average value of 13.179 with a variation of 1.499.

The expense ratio enables a business to evaluate the costs associated with underwriting a policy to the expected revenue from the insurance provider. This provides an average value of 0.262; the standard deviation was 0.418. The mean scores for underwriting retention, incurred claims and total liabilities were 0.594, 3.920 and 12.292, respectively. Regarding the macroeconomic variables, the study records an average value of 5.264 for inflation. Annual GDP growth for South Africa averaged 1.235. The measure of dispersion, which is 0.683, shows that the economy is not highly volatile compared to other African economies. Unemployment, which explains the ratio of the labour force that is unemployed, is very high, averaging 23.613. Urbanisation and personal remittances recorded average values of 65.334 and 20.592, respectively, over the study period. The study examines the correlation analysis to determine the possibility of high correlations among the independent variables. This is presented in Table 3. The matrix reveals that the coefficients are typically normal, since the correlation among the pairs of the independent variables is low. Thus, it is not anticipated that the multicollinearity problem will manifest in the modelling.

The direct effects on the determinants of micro-specific and macro-specific factors on nonlife insurance profitability

The study begins by first examining the direct impact of the microeconomic and macroeconomic determinants of nonlife insurance profitability. As was previously mentioned in the section on our methodological approach, the GMM estimation technique was used for the analysis. According to the validity standards used to assess GMM models, all estimated models are valid, as shown in Table 4. The non-significant AR(2) results, which rule out the occurrence of second-order serial correlation, support this. The instruments' validity is supported by the statistically insignificant Hansen test results for all models. The statistical significance of the coefficient value for the lagged dependent variable (profitability) supports the dynamic nature of the regression model. Models (1)–(3) explore the impact of the micro- and macrovariables using ROA as the dependent variables, whereas Models (4) to (6) introduce ROTP as the dependent variable. Models (3) and (6) include the micro- and macrofactors in the same model to determine the consistency in the results.

Beginning with the firm-specific variables, the study finds a positive relationship between size and nonlife insurers' profitability, demonstrating a significant effect on ROTP. The positive relationship suggests that as the size of an insurance firm increases, its profitability tends to increase. This argument is supported by Camino-Mogro and Bermúdez-Barrezueta (2019) and Zhao et al. (2021), who explain that large firms enjoy higher profits due to economies of scale. Ahmeti and Iseni (2022) add that larger firms

Table 3 Matrix of correlations. Source: Results were generated from Stata

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Return on Assets	1.000																
(2) Return on Total Premium	−0.012	1.000															
(3) Premium Growth	−0.038	0.074	1.000														
(4) Solvency	0.027	0.032	−0.001	1.000													
(5) Investment Yield	0.497	0.006	−0.018	−0.015	1.000												
(6) Leverage	−0.323	0.212	0.014	0.057	0.006	1.000											
(7) Reinsurance	0.055	−0.101	0.002	0.009	−0.052	−0.019	1.000										
(8) Insurance Size	−0.310	0.711	0.092	−0.039	0.167	0.350	−0.129	1.000									
(9) Inflation	−0.008	−0.013	−0.007	0.046	−0.042	−0.062	0.032	−0.051	1.000								
(10) GDP	0.009	−0.005	−0.002	0.016	−0.055	−0.050	0.031	−0.075	0.272	1.000							
(11) Personal Remittances	−0.037	−0.013	0.003	0.032	−0.037	0.024	−0.005	−0.033	−0.203	0.605	1.000						
(12) Urbanization	0.007	−0.010	0.026	−0.041	0.050	0.074	−0.057	0.091	−0.562	−0.530	−0.293	1.000					
(13) Unemployment	−0.013	−0.008	0.017	−0.038	0.049	0.071	−0.050	0.086	−0.436	−0.592	−0.354	0.574	1.000				
(14) Expense Ratio	−0.004	0.096	−0.000	0.001	0.072	−0.007	−0.088	0.050	0.058	0.006	−0.050	−0.019	−0.016	1.000			
(15) Underwriting Retention	−0.109	0.233	0.039	−0.111	0.214	−0.217	−0.114	0.286	0.041	0.012	−0.016	−0.038	−0.032	0.054	1.000		
(16) Claims Incurred	−0.054	0.040	0.022	0.043	0.044	−0.084	−0.009	0.080	0.050	0.044	−0.004	−0.095	−0.084	−0.000	0.108	1.000	
(17) Liabilities	−0.360	0.627	0.082	−0.017	0.139	0.578	−0.106	0.314	0.010	−0.004	−0.037	0.021	0.008	0.045	0.176	0.044	1.000

Table 4 System GMM estimation of the micro- and macrodeterminants. Source: Results were generated from Stata

Variables	ROA			ROTP		
	(1)	(2)	(3)	(4)	(5)	(6)
L.ROA	−0.422** (0.178)	0.459** (0.187)	0.479* (0.253)			
L.ROTP				0.378*** (0.092)	0.966*** (0.123)	0.461*** (0.131)
Size	−0.058** (0.028)		0.014*** (0.005)	0.020*** (0.006)		0.034*** (0.001)
Leverage	−0.119 (0.103)		−0.080 (0.079)	0.021 (0.016)		0.013 (0.011)
Reinsurance	0.012** (0.004)		0.011* (0.006)	−0.016* (0.009)		0.013 (0.010)
Investment Yield	1.285*** (0.267)		0.442* (0.282)	0.005** (0.002)		0.014*** (0.005)
Solvency	0.002** (0.000)		0.001* (0.000)	0.013** (0.001)		0.011*** (0.003)
Premium Growth	0.005*** (0.001)		−0.012** (0.004)	0.011*** (0.001)		0.013*** (0.002)
GDP		0.166 (0.104)	0.134 (0.109)		−0.002 (0.003)	0.015* (0.007)
Inflation		0.070 (0.068)	−0.032 (0.053)		−0.041* (0.026)	−0.024* (0.016)
Remittances		12.266* (8.602)	4.217** (1.087)		−0.101 (0.091)	−0.831 (0.684)
Urbanization		0.269* (0.174)	0.205** (0.098)		0.002 (0.002)	0.001* (0.000)
Unemployment		−0.264 (0.199)	−0.213 (0.162)		−0.023 (0.022)	−0.054 (0.043)
Expense ratio	0.001*** (0.000)	0.013 (0.011)	0.005* (0.003)	0.324 (0.297)	−0.124 (0.104)	0.042 (0.031)
Underwriting retention	0.001 (0.001)	−0.002 (0.001)	−0.010 (0.008)	0.023 (0.019)	0.006 (0.005)	0.031 (0.028)
Claims incurred	−0.008*** (0.002)	−0.015** (0.004)	−0.013*** (0.002)	−0.043* (0.028)	0.014 (0.010)	−0.017** (0.009)
Liabilities	0.002 (0.001)	−0.003** (0.001)	−0.053 (0.044)	0.055*** (0.002)	0.071 (0.058)	0.073** (0.034)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	426	426	426	426	426	426
Number of id	71	71	71	71	71	71
Prob > *F*	0.000	0.000	0.000	0.000	0.000	0.000
AR(1)	0.000	0.001	0.000	0.004	0.007	0.010
AR(2)	0.322	0.534	0.869	0.116	0.762	0.384
Hansen	0.200	0.552	0.570	0.0782	0.252	0.362

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; ROA represents return on assets; ROTP represents return on total premium

achieve higher profitability due to greater bargaining power. More so, larger firms can diversify their assets and lower underwriting risks, since they frequently have greater access to financing markets. Hence, insurance companies must take a strategic approach to increase their profits so as to leverage their potential benefits, thereby boosting profitability. The findings of financial leverage revealed conflicting results, showing a negative

impact on ROA and a positive impact on ROTP. Leverage helps insurers to underwrite more policies and increase their premium base using their borrowed funds to increase their underwriting capacity, which might lead to higher returns on profitability. Notwithstanding, leverage can also increase interest payments and financial risk, which can reduce asset-based profitability, particularly if the additional debt does not immediately contribute to revenue. Thus, insurers' profitability tends to decline as they depend more on debt than equity. Increased interest costs brought on by high leverage can lower net income and profitability. This aligns with Kumar et al. (2022), who assert that higher interest costs associated with leverage reduce a company's net income, thereby decreasing its profitability.

Reinsurance also positively impacts both profitability indicators, because it ensures solvency by cushioning the underwriting capacity of insurance companies by assuming some of the risks in the portfolio. By transferring some of their risk to other businesses, reinsurance helps insurers lower their exposure to significant claims, which improves their financial stability (Sasidharan et al., 2022). Reinsurance can also protect against catastrophic losses and promote more consistent cash flows, which enhance a more robust profitability profile (Ahmeti & Iseni, 2022). Similarly, investment yield and solvency exert a positive influence on ROA and ROTP, and the relationship is significant for ROTP. This is not surprising given that higher investment yields boost the returns that insurers receive on their assets, which is likely to boost overall profitability. In addition, high investment yields enable businesses to offset underwriting losses, pay operational costs, and strengthen their financial stability, since the revenue from these investments makes a substantial contribution to the insurer's profit margins. This is consistent with Njiiri's (2015) research, which showed that investments contribute positively to insurance profitability. Similarly, Pjanic et al. (2023) conclude that most insurers with high investment returns increase insurance profitability by reinsuring a percentage of their goods, lowering their risk of loss. In the case of solvency, Morara and Sibindi (2022) explains that solvency safeguards the financial position of nonlife insurers by ensuring that their assets are higher than liabilities. This helps insurers meet their financial obligation and, therefore, guarantee their performance.

Furthermore, the study shows that premium growth has a significant negative relationship with ROA and a significant positive relationship with ROTP. This suggests that premium growth does not yield any positive return on nonlife insurers' assets but improves nonlife premium returns. In essence, premium growth increases premium revenue, leading to better underwriting outcomes. However, this increase does not always result in higher investment income or asset returns for the insurers. This divergence might be because market circumstances and investment strategies have a greater impact on asset returns than premium growth, which is more closely linked to the profitability of underwriting operations. The significant positive relationship suggests that sound underwriting activities tied to premium growth can promote profitability (Öner Kaya, 2015). Notwithstanding, Zainudin et al. (2018) suggest the moderation of premium growth, since excessive increases can have a detrimental impact on insurers.

Turning to the macroeconomic factors, the study discloses a positive relationship between GDP and insurance profitability, suggesting that as the economy of South Africa grows, insurance companies tend to become more profitable. Thus, a country's

economic performance leads to the development of the insurance industry (Batool & Sahi, 2019). The argument that GDP increases insurance profitability is not new. In general, economic growth increases business activity and disposable incomes, which boosts demand for insurance products as people and companies need to safeguard their growing investments and assets. Hence, a thriving GDP creates a favourable environment for insurers to grow their business and increase their financial situation. Killins (2020) supports this argument and presents a positive relationship, explaining that economic growth improves the performance of insurance companies. The empirical result for inflation presents a negative relationship and is significant with ROTP. This is because inflation leads to higher prices, which affects the cost of insurance, such as premiums. This aligns with previous findings (Kramaric et al., 2017). Scholars further argue that inflation reduces consumers' interest in patronizing insurance, since they are more interested in paying a lower amount for insurance products. More so, inflation affects the purchasing power of policyholders, thereby reducing the purchase of insurance policies, which is likely to weaken profitability.

The result for personal remittances disclosed mixed findings. The results suggest a significant positive impact on ROA, but it has no significant impact on ROTP. In other words, whereas remittances improve the insurer's overall financial performance through improved asset utilization, they have no direct effect on the insurer's underwriting operations. The impact of remittances on profitability is confirmed by Jeaven et al. (2021), who found a positive relationship between remittances and insurance profitability, explaining that remittances can affect income, and higher income levels are associated with more insurance purchases, which is likely to affect their profitability. It is important to note that when the insurer is unable to translate that demand into lucrative underwriting operations, the influence on underwriting performance (ROTP) may be lessened. The result for urbanization indicates a significant positive effect on both profitability measures. This affirms the argument in the literature that urbanization is likely to increase insurance demand, since urban settlers resort to insurance to mitigate urban risk (PwC, 2018). More so, higher concentrations of wealth, real estate, and commercial enterprises are often the result of urbanization, which raises demand for a range of insurance products, such as business, health, and property insurance. The requirement for coverage against urban-related risks, including liability, fire, and theft, rises in tandem with the growth of the urban population. For unemployment, the results show an inverse relationship. This is obvious in several respects, because high unemployment affects the disposable income of individuals and families, thereby reducing their purchasing power. This has a potential effect on insurance (Dorofti & Jakubit, 2015).

Regarding the ancillary findings, the study states that higher claims reduce insurance profitability. This is supported by the significant negative impact on both ROA and ROTP. This happens due to increasing payouts to policyholders, resulting in more claims that may surpass the amount of premiums received. In addition, increased claims may result in higher operating costs and a greater requirement for reserves for future commitments, which would further hurt profitability. Ultimately, consistently high claim volumes may harm the insurer's bottom line and restrict its capacity to grow and reinvest. The finding for the expense ratio is positive, which implies that

a reduction in the total expense is likely to increase profitability, but this was mostly insignificant. This contradicts previous findings that predict an inverse relationship (Pjanic et al., 2023). Underwriting retention and liabilities revealed diverse impacts on the different profitability measures.

The threshold relationship of micro-specific and macro-specific factors on nonlife insurance profitability

This section employs the dynamic panel threshold model developed by Seo et al. (2019) to examine the determinants of insurance profitability. The results for the microeconomic factors are reported in Tables 5 and 6 for ROA and ROTP, respectively. The

Table 5 Dynamic threshold estimation of the microdeterminants on ROA. Source: Results were generated from Stata

Variables	(1) Premium growth	(2) Solvency margin	(3) Investment yield	(4) Leverage	(5) Reinsurance	(6) Size
Lower regime						
Lag of ROA	−0.127* (0.083)	−1.601* (0.921)	0.637 (0.922)	−1.990** (0.596)	−0.415*** (0.102)	−0.487** (0.206)
Expense ratio	0.025* (0.015)	0.067 (0.121)	−0.093 (0.073)	0.233* (0.138)	−0.013 (0.189)	0.093 (0.077)
Underwriting retention	−0.005 (0.013)	0.010* (0.006)	−0.008 (0.007)	−0.016 (0.014)	−0.005 (0.009)	−0.007** (0.003)
Claims incurred	0.018 (0.015)	0.016*** (0.004)	−0.015 (0.013)	0.005 (0.004)	0.011 (0.012)	−0.021 (0.016)
Total liabilities	0.091 (0.303)	−0.206 (0.339)	0.121 (0.312)	0.198 (0.323)	−0.072 (0.061)	−0.294* (0.165)
Microvariables	−0.068 (0.057)	−0.034*** (0.008)	−3.130 (4.028)	−4.651*** (1.232)	−1.060 (2.769)	0.186 (0.350)
Upper regime						
Lag of ROA	−0.328** (0.155)	1.078** (0.482)	−2.094*** (0.687)	1.615** (0.676)	−0.819** (0.218)	1.252** (0.453)
Expense ratio	0.038 (0.086)	0.002 (0.157)	0.082 (0.068)	−0.251* (0.140)	−0.023 (0.218)	−0.007 (0.139)
Underwriting retention	0.006** (0.002)	−0.011 (0.009)	0.018 (0.016)	0.008 (0.014)	0.005 (0.006)	0.006 (0.008)
Claims incurred	−0.011* (0.006)	−0.003* (0.002)	0.002 (0.001)	−0.005** (0.002)	−0.009 (0.007)	−0.009 (0.008)
Total liabilities	−0.151** (0.064)	0.073 (0.372)	−0.709** (0.312)	−0.182 (0.505)	−0.388** (0.162)	−0.196 (0.493)
Microvariables	−0.112** (0.048)	0.003*** (0.001)	2.585 (4.878)	4.116** (1.434)	1.522 (2.910)	0.501 (0.727)
Postestimations						
Kink	0.021*** (0.004)	1.834*** (0.051)	0.619*** (0.031)	−0.435*** (0.003)	0.413*** (0.012)	2.292*** (0.023)
Threshold indicator	−0.059 (0.042)	2.496 (2.134)	0.052 (0.074)	0.520*** (0.035)	0.195*** (0.014)	12.439*** (0.017)
Linearity test (Prob.)	0.000	0.000	0.000	0.000	0.000	0.000
No. of insurers	71	71	71	71	71	71

Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$; ROA represents return on assets

Table 6 Dynamic threshold estimation of the microdeterminants on ROTP. Source: Results were generated from Stata

Variables	(1) Premium growth	(2) Solvency margin	(3) Investment yield	(4) Leverage	(5) Reinsurance	(6) Size
Lower regime						
Lag ROTP	−0.602* (0.352)	−0.319 (0.935)	0.183** (0.042)	−0.276 (0.198)	−0.154 (0.383)	−0.148** (0.061)
Expense ratio	0.012 (0.023)	−0.005 (0.004)	−0.034** (0.011)	−0.090 (0.078)	−0.004 (0.003)	−0.012 (0.010)
Underwriting retention	−0.023 (0.022)	−0.002 (0.018)	0.031 (0.024)	0.014 (0.011)	0.002 (0.002)	−0.007 (0.006)
Claims incurred	0.002 (0.005)	0.001 (0.001)	−0.006 (0.009)	0.008*** (0.000)	−0.004 (0.003)	0.009 (0.009)
Total liabilities	0.013 (0.028)	0.008 (0.012)	0.017* (0.009)	0.001 (0.001)	0.005 (0.006)	0.008 (0.007)
Microvariables	0.094 (0.099)	−0.010 (0.060)	0.012 (0.013)	−0.031 (0.068)	0.040 (0.036)	0.043 (0.027)
Upper regime						
Lag of ROTP	−0.273* (0.191)	−0.158* (0.087)	−0.658 (0.559)	−0.256 (0.199)	−0.085 (0.579)	−0.246* (0.172)
Expense ratio	−0.002 (0.003)	0.006 (0.005)	0.032** (0.009)	0.015 (0.011)	0.004 (0.003)	0.024 (0.022)
Underwriting retention	0.002 (0.002)	0.005 (0.007)	−0.008 (0.010)	0.003 (0.002)	−0.004* (0.002)	0.012*** (0.002)
Claims incurred	−0.004 (0.009)	−0.017 (0.015)	0.003 (0.005)	0.005 (0.008)	0.004 (0.003)	0.002*** (0.000)
Total liabilities	0.002* (0.001)	−0.009 (0.011)	−0.003 (0.005)	−0.014 (0.013)	0.022 (0.019)	−0.032 (0.030)
Microvariables	−0.010 (0.018)	0.086 (0.066)	0.080 (0.069)	0.019** (0.008)	−0.048* (0.028)	0.060* (0.038)
Postestimation						
Kink	0.138 (0.109)	(1.954)	0.712*** (0.014)	0.644*** (0.081)	0.130*** (0.007)	12.734*** (0.209)
R	0.087 (1.065)	1.120 (2.256)	0.053 (0.107)	0.657*** (0.164)	0.307*** (0.012)	12.042*** (0.029)
Linearity test (Prob.)	0.000	0.000	0.000	0.000	0.000	0.000
No. of insurers	71	71	71	71	71	71

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; ROTP represents return on total premium

study estimates six econometric models, each considering a microeconomic factor as a threshold variable. The results show a significant threshold indicator across the models, rejecting the null hypothesis of no threshold effect. The linearity test, which is significant at 1%, confirms the models are not linear. The paper further expounds that apart from the threshold, there are kinks in the relationship, showing continuity in the relationship between profitability and its determinants and not necessarily a jump. In addition, the significance of the lagged dependent variables in the estimated models supports the model specification's dynamic nature, affirming the dynamic panel threshold technique.

The empirical result indicates that premium growth negatively impacts nonlife insurers at higher levels, demonstrating a significant impact on ROA. This negative result implies that excessive growth may be detrimental to insurance profitability. This is because rapid

growth in insurance premiums may lead insurers to underwrite policies too aggressively, which might erode underwriting standards and make it more likely that high-risk clients would be admitted. This will lead to increased risk exposure and reduced profitability. In South Africa, there is an excessive focus on marketing in an attempt to increase premiums without setting aside the money required to maintain their portfolio. This leads to high claims and loss ratios, ultimately lowering profitability. Therefore, the study argues that an extreme increase in the nonlife insurers' premiums without better risk management practices may be detrimental to the profitability of nonlife insurers. Zainudin et al. (2018) and Sasidharan et al. (2022) support this argument and point out that insurers who overly focus on premium growth can result in detrimental behavior, since other important factors, such as investment, may be ignored. Vojinovi et al. (2022) add that premium growth implies excessive risk-taking, which is likely to damage profitability as it exposes insurers to higher risk. Hence, insurers targeting higher growth in premiums should do so with sound underwriting and risk management practices.

For solvency, the study reveals a negative relationship at lower levels and a positive relationship at higher levels. This was statistically significant with ROA, indicating that highly solvent nonlife insurers are more likely to reap higher profits than insolvent firms. The result is obvious, given that highly solvent firms are able to meet their financial obligations when they fall due (Horvey et al., 2024). It instils trust in policyholders, regulators, and investors. This confidence may increase customer attraction and retention, since customers want to do business with financially secure insurers. The importance of solvency to insurers' profitability is consistent with (Odira, 2018). Athanasoglou et al. (2006) further posit that insurers' solvency level can boost financial performance by lowering leverage risk when it is high. As a matter of fact, insurers in South Africa are required to have more assets than liabilities. The management of an insurance firm must preserve liquidity, satisfy regulatory solvency constraints, and make an effort to sustain net income growth when it comes to capital and solvency management (Horvey et al., 2024). This focus on maintaining sufficient reserves and income is essential to ensure the solvency of insurance companies, ultimately contributing to their financial stability and performance.

Investment yield also reveals a similar pattern as solvency, showing an inverse relationship when it falls below the threshold and a positive relationship above the threshold level. The results are consistent for ROA and ROTP, showing that nonlife insurers with a higher investment yield are more likely to enjoy higher profits. This aligns with the argument in the literature (Ahmeti & Iseni, 2022; Njiiri, 2015) that insurers with more investment prospects tend to grow faster and enjoy high profitability. Morara and Sibindi (2021) also narrate that insurers with high investment returns reduce their risk of loss. Horvey et al. (2024) narrate that the returns on investment help to offset claims payments and operational costs, leading to a healthier financial situation. As a result, increased investment revenue may also enable insurers to expand their client base, gain market share, and provide competitive premium reductions, all of which can improve profitability. Since it allows insurers to efficiently leverage their capital and produce revenue from sources other than underwriting, strong investment performance often plays a significant role in the profitability of insurance companies.

Interestingly, leverage recorded a negative relationship below the threshold and a positive impact above the threshold for ROA and ROTP, showing that nonlife insurers who rely on leverage to finance their business will yield higher profits. It also presents significant threshold levels of 0.52 and 0.65 for ROA and ROTP, respectively. This contradicts previous findings suggesting that higher leverage weakens insurance company performance (Öner Kaya, 2015). On the contrary, Boadi et al. (2013) argue that the value of insurance companies improves as leverage increases, because leverage increases cash flow so that they can pay their debts. In addition, reinsurance shows a negative relationship below the threshold level and a positive relationship with ROA beyond the threshold. However, the results were statistically insignificant. Contrarily, the results for ROTP indicate a positive relationship when it falls below the threshold and a significant negative relationship above the threshold level. The significant negative relationship implies that too much reliance on reinsurers may harm nonlife insurers. Chang and Jeng (2016) explain that reinsurance may be expensive, ineffective, and have a long-term effect on the financial health of insurance companies. Regarding insurance size, the impact on ROA was positive at both levels, whereas ROTP presents a significant positive relationship at 10% in the upper threshold. This suggests that firm size promotes insurance profitability. The significant positive relationship in the upper regime is because large insurers benefit from economies of scale and a competitive advantage over smaller ones due to their capacity to find the right expertise and resources (Ahmeti & Iseni, 2022; Vojinović et al., 2022). The study further documents significant threshold levels around 13.16 and 12.92 for ROA and ROTP, respectively.

The study further explores the impact of macroeconomic factors on nonlife insurance profitability in South Africa using the dynamic panel threshold model, as reported in Tables 7 and 8 for ROA and ROTP, respectively. Five models were estimated, each treating a macroeconomic factor as the threshold variable. The threshold indicators and linearity test were mostly significant, implying nonlinearity. Inflation, which assesses macroeconomic stability, presents a positive effect on ROA when it falls below the threshold level and a significant adverse impact above the threshold level. This result is consistent with ROTP showing a significant negative relationship above the threshold level. This suggests that high levels of inflation dampen the growth of nonlife insurers. This validates existing studies (Batool & Sahi, 2019; Kramaric et al., 2017). The reason is that high inflation leads to a high cost of living and production, thereby influencing the demand and profitability of insurers (Daare, 2016). The study estimates a significant threshold level for inflation at 1.33 using ROA as the dependent variable. According to Zinyoro and Aziakpono (2024), changes in inflation affect the assets and liabilities of nonlife insurers. For example, an increase in inflation causes claims to increase in value, which negatively impacts nonlife insurers' profitability.

Regarding GDP growth, the study presents a significant positive relationship at both levels for ROA and ROTP at 10% and 5% significance levels, respectively. Zinyoro and Aziakpono (2024) explain that economic growth and the demand for insurance products are positively connected. Accordingly, it is often anticipated to be accompanied, at least initially, by an increase in the performance of nonlife insurers. Thus, a significant increase in South Africa's GDP will yield a positive effect (Killins, 2020). The economic success of South Africa, as indicated by the GDP growth, drives the

Table 7 Dynamic threshold estimation of the macrodeterminants on ROA. Source: Results were generated from Stata

Variables	(7) Inflation	(8) GDP	(9) Personal remit	(10) Urbanization	(11) Unemployment
Lower regime					
Lag of ROA	−0.761** (0.335)	−0.384* (0.217)	−0.993*** (0.213)	−0.329*** (0.102)	−0.495** (0.225)
Expense ratio	−0.032 (0.027)	0.089 (0.079)	−0.078 (0.116)	−0.025 (0.057)	−0.089 (0.079)
Underwriting retention	−0.005** (0.002)	−0.003 (0.003)	0.011 (0.013)	0.003 (0.003)	0.004 (0.005)
Claims incurred	0.003 (0.002)	−0.005 (0.006)	−0.004 (0.003)	−0.006* (0.003)	−0.001 0.004)
Total liabilities	−0.073 (0.083)	−0.137** (0.046)	−0.218** (0.101)	0.109 (0.108)	−0.027 (0.030)
Macrovariables	0.046* (0.029)	0.011*** (0.006)	0.563 (1.041)	0.019 (0.028)	0.008 (0.026)
Upper regime					
Lag of ROA	0.264** (0.085)	0.139* (0.082)	0.297** (0.067)	−0.095 (0.220)	−0.116 (0.286)
Expense ratio	−0.019 (0.039)	0.050 (0.049)	0.072 (0.105)	0.099 (0.069)	0.085 (0.086)
Underwriting retention	0.005* (0.003)	−0.008 (0.007)	−0.003 (0.003)	−0.004 (0.005)	−0.001 (0.003)
Claims incurred	−0.004 (0.004)	−0.001 (0.003)	0.005* (0.003)	0.004*** (0.001)	0.004 (0.003)
Total liabilities	−0.091 (0.068)	0.025 (0.040)	0.053 (0.049)	0.047 (0.043)	−0.035 (0.072)
Macrovariables	−0.052** (0.019)	0.399* (0.258)	−0.223 (1.535)	−0.018 (0.032)	−0.010 (0.026)
Postestimation					
Kink	4.517*** (0.213)	1.213*** (0.161)	2.531*** (0.068)	5.859*** (0.183)	2.642 (0.442)
R	4.517*** (0.882)	1.330*** (0.271)	20.53*** (0.210)	65.34*** (0.354)	23.99*** (3.797)
Linearity test (Prob.)	0.000	0.000	0.000	0.000	0.000
No. of insurers	71	71	71	71	71

Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$; ROA represents return on assets

profitability of its insurance businesses. Hence, their superior financial performance results from an economic boom in the country paired with a successful approach to managing market and credit risk (Vojinović et al., 2022). The study, therefore, suggests that insurance companies should take advantage of South Africa's strong economy to grow their businesses. Insurers can create and broaden their product lines to satisfy the changing demands of companies and consumers by creating tailored insurance products for sectors such as agriculture, health and technology.

Surprisingly, urbanization presents an inverse relationship with ROA when it falls above the threshold, but this was statistically insignificant. On the other hand, the empirical results for ROTP show a significant positive effect at higher threshold levels and a negative impact below the threshold level. At a high level, individuals living in urban areas are exposed to high risk and are more likely to purchase insurance products for security, which might lead to higher returns on premiums (Zerriaa &

Table 8 Dynamic threshold estimation of the macrodeterminants on ROTP. Source: Results were generated from Stata

Variables	(7) Inflation	(8) GDP	(9) Personal remittances	(10) Urbanization	(11) Unemployment
Lower regime					
Lag of ROTP	−0.219** (0.087)	0.048 (0.148)	−0.502*** (0.145)	−0.601* (0.484)	−0.496** (0.217)
Expense ratio	−0.009 (0.007)	0.978* (0.566)	0.026** (0.011)	−0.057*** (0.001)	−0.006*** (0.001)
Underwriting retention	0.003 (0.004)	0.001 (0.005)	−0.010 (0.027)	0.028 (0.022)	0.038** (0.015)
Claims incurred	0.013 (0.011)	−0.009** (0.004)	0.019 (0.041)	0.017* (0.009)	0.019* (0.011)
Total liabilities	0.014*** (0.004)	0.564** (0.236)	0.005 (0.008)	0.001** (0.000)	0.015** (0.006)
Macrovariables	0.716 (0.701)	−0.423*** (0.071)	0.058 (0.044)	−0.011** (0.005)	0.033** (0.012)
Upper regime					
Lag of ROTP	−0.030 (0.112)	0.593*** (0.136)	0.046*** (0.009)	0.145** (0.005)	0.092* (0.061)
Expense ratio	0.052 (0.042)	−0.945*(0.555)	−0.027*** (0.002)	0.005*** (0.001)	0.006*** (0.000)
Underwriting retention	0.025 (0.019)	−0.021 (0.015)	−0.001 (0.002)	−0.002 (0.002)	0.032** (0.015)
Claims incurred	−0.002** (0.000)	0.002*** (0.000)	0.006* (0.004)	−0.004* (0.002)	−0.008 (0.009)
Total liabilities	−0.003 (0.003)	0.179 (0.220)	0.006 (0.007)	−0.008*** (0.001)	−0.009** (0.004)
Macrovariables	−0.889* (0.617)	0.077** (0.031)	0.056 (0.049)	0.011* (0.007)	0.021 (0.017)
Postestimation					
Kink	−0.258 (0.256)	1.163* (0.685)	20.531*** 0.101	6.848*** (0.069)	22.870*** 9.055
R	5.185*** (0.093)	−0.258 (0.257)	1.177* (0.686)	64.85*** (0.069)	22.87*** (0.055)
Linearity Test (Prob.)	0.000	0.000	0.000	0.000	0.000
No. of Insurers	71	71	71	71	71

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; ROTP represents return on total premium

Noubbigh, 2016). Urbanization also presents a significant threshold level of 64.85. Based on this finding, the study suggests that insurers can increase profitability by more effectively using the development prospects that urban markets provide, such as increased premium volume and a diverse clientele. Furthermore, the results further suggest that high levels of unemployment adversely affect ROTP. This affirms Cole et al.'s (2015) argument that high unemployment rates result in decreased insurance demand, which impacts insurance returns. As initially discussed, rising unemployment rates make policyholders more price-sensitive and less able to purchase new homes and goods, both of which require some insurance coverage. This reduces the demand for insurance. As a result, it may weaken overall profitability (Bekeris, 2012).

Personal remittances illustrate diverse impacts on ROA and ROTP but were statistically insignificant.

Conclusion and policy recommendations

Summary and conclusion

Discussions from the empirical literature show that scholars have greatly explored the determinants of insurance profitability worldwide. Notwithstanding, they have failed to reach a unanimous consensus on the impact of the determinants on insurance profitability. In this vein, this study focuses on the insurance industry in South Africa by exploring the impact of microeconomic and macroeconomic factors on insurance profitability in South Africa. The study contributes significantly to the literature by examining the direct, nonlinearities and threshold levels in the relationship based on a sample of 71 nonlife insurance companies between 2013 and 2019. This is important to determine the level these factors need to attain to propel or weaken profitability. This also helps to address the conflicting nexus in the literature. Two performance indicators were employed to measure profitability. That is, return on assets and return on total premium. This is because insurance companies generate profit in two ways. Thus, premiums are received in return for insurance coverage, and part of it is reinvested for higher returns. To address the underlying issue in previous studies, this study employs the dynamic panel threshold estimation technique proposed by Seo and Shin (2016) and used by Seo et al. (2019). This technique addresses endogeneity issues and estimates nonlinearity and threshold levels at which the micro- and macrodeterminants affect insurance profitability.

The findings from the GMM analysis present that solvency, investment yield and premium growth are significant predictors of nonlife insurance profitability. Hence, insurers should consider these significant factors to ensure higher profitability. Similarly, GDP and urbanization are important determinants of nonlife insurance profitability. This is because urban settlers are mostly exposed to higher risk; hence, they are more likely to buy insurance to safeguard themselves and their properties from adversities. Their significant positive relationship supports this. The study also finds that personal remittances positively impact ROA, whereas inflation and unemployment show a significant negative relationship. This is because high unemployment and inflation rates reduce the purchasing power of individuals and companies, which weakens their appetite to purchase insurance products.

The empirical findings further suggest nonlinearities in the relationships and explain that excessive premium growth by nonlife insurers can have a detrimental effect on profitability. The significant negative relationship above the threshold affirms this. More so, solvency and investment yield exhibit a negative impact below the threshold and a positive impact above the threshold. This implies that highly solvent nonlife insurers attaining higher returns on investment will reap higher profitability. Solvency realized a significant threshold level of 2.5, suggesting that the profitability of nonlife insurers is more likely to be enhanced when their income level is more than liabilities. The results further indicate that the use of debt to finance business is not bad. This is due to the positive effect of leverage beyond

the threshold level, documenting significant threshold levels at 0.52 and 0.65 for ROA and ROTP, respectively. The findings further reveal that nonlife insurers relying greatly on reinsurance may not be helpful. Again, a significant positive relationship was found between firm size and profitability, suggesting that large insurers are more likely to reap higher profits than smaller firms. For the macroeconomic factors, the findings indicate that inflation significantly negatively impacts nonlife profitability, signifying that high inflation dampens insurance profitability due to its impact on the cost of living and production. The study further found that growth in South Africa's GDP is necessary to significantly affect the nonlife industry. To realize this outcome, South Africa must persistently reach a level of growth above its threshold. Urbanization also shows a significant positive relationship above the threshold level, implying that under high urbanization, insurance demand increases due to its high risk, thereby promoting nonlife profitability.

Policy recommendations

The study recommends a deliberate attempt to develop the nonlife industry by implementing strategies to grow their market and employing sound underwriting and risk management practices to avoid the cost of financial distress associated with premium growth and leverage. Nonlife insurers can improve their capacity to react to changes in the market and handle claims more effectively by putting strong risk management procedures in place. The study further suggests that increased solvency monitoring could be necessary, particularly for insurers, who seem to be more vulnerable to a higher risk of insolvency. In addition, nonlife insurers must ensure the efficient management of their debt to avoid any cost of financial distress. Regulators must emphasize these factors to ensure the effective use of insurance resources to enhance the profitability of insurance companies in South Africa. Given that nonlife insurers may face challenges if they depend too much on reinsurers, insurance supervisors are urged to encourage these businesses to vary their risk management strategies, such as alternative risk transfer and innovative insurance products. Insurers should be encouraged to increase their internal capacity for risk assessment and claims management to reduce reliance on reinsurance as the primary means of risk transfer.

To capitalize on the substantial positive relationship between firm size and profitability, policymakers should consider implementing measures supporting smaller insurance companies' growth and expansion. For small firms to enhance their operational capabilities and compete more successfully with larger insurers, it will require offering them resources such as capital, technology, and expertise. In addition, fostering an environment that encourages consolidating by mergers or strategic partnerships can help smaller companies grow to the scale needed to boost profitability. By supporting legislation encouraging smaller insurers to grow, regulators may contribute to developing a more varied and competitive insurance market, which will ultimately benefit consumers by providing them with better services and more alternatives.

Again, the nonlife industry should place much importance on urban areas by ensuring that insurance is readily available to urban settlers without ignoring the

insurance demand of the rural areas. Regulators must ensure that insurers that grow their premiums have enough financial reserves to meet their future obligations. This can be achieved by enforcing the risk-based supervisory framework and the Solvency Assessment and Management framework to ensure policyholders are shielded from nonlife insurers' excessive risk-taking. The government must also formulate and implement policies and reforms that reduce inflation and make it stable over time to create an investor-friendly environment and reduce the cost of production to develop the insurance industry. Another policy implication that emerges from our result is that, for the nonlife sector to grow, South Africa's government must ensure a stable economic environment that allows the industry to grow and expand. This will stimulate the performance of the insurance industry. In addition, nonlife insurers must be mindful of economic growth in the country and adopt appropriate measures to reduce costs and enhance the company's performance.

Limitations and future directions

Despite the paper's broad scope and depth, there were some limitations. First, the study did not cover all macroeconomic and insurance-specific factors. Hence, future studies could further explore this by considering other factors such as interest rate, population growth, and underwriting profit. The dynamic panel threshold technique could be used to analyze the determinants in other countries to reveal consistencies in the results. Furthermore, this study could be extended to other countries to understand how these factors influence insurance profitability amid the growing complexity of the economic landscape and differences in the regulatory environment. Comparative research conducted in other contexts, especially emerging economies, will further enhance the comprehension of contextual variations in profitability factors. Given the ongoing digital revolution which is disrupting every aspect of the economy, including the insurance industry's performance, it will be more revealing to explore how factors such as Insurtech drive the insurance industry. In addition, it will be of great interest to examine how corporate governance and institutional structures drive the insurance industry. By focusing only on quantitative factors, the study could have missed qualitative components like management experience and organizational culture, which can also significantly affect profitability. This could be examined in future studies.

Abbreviations

FSCA	Financial Sector Conduct Authority
GDP	Gross domestic product
GMM	Generalized method of moments
PwC	PricewaterhouseCoopers
ROA	Return on assets
ROTP	Return on total premium

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