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Article

The Hidden Forces Behind Delisting: Non-Financial and Macroeconomic Determinants

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Abstract: This study aims to uncover the hidden forces driving delisting from the Johannesburg Stock Exchange (JSE) in South Africa, focusing on non-financial and macroeconomic determinants within a developing economy. Utilizing Principal Component Analysis (PCA) and a multivariate panel probit regression model, data from 2000 to 2023 were analyzed. Key non-financial factors identified include governance transparency, chairperson qualifications, diffused ownership, institutional influence, company longevity, and analyst recommendations. Strong governance and diverse ownership reduce delisting risks, while extended market presence and positive analyst coverage enhance stability. Significant macroeconomic variables affecting delisting probabilities are inflation, interest rates, credit extensions, unemployment rates, and real economic activity. Moderate inflation supports stability, whereas higher interest rates increase delisting risks. Increased credit availability and economic activity reduce these risks, while higher unemployment rates increase them. The study underscores the importance of robust governance, diverse ownership, and strong institutional investor relationships in South Africa's volatile context. Policymakers are advised to manage inflation, interest rates, and credit availability while addressing unemployment and stimulating economic activity. By revealing the intertwined influences of non-financial and macroeconomic factors, this research provides a comprehensive understanding of delisting dynamics in developing economies and offers strategies to support corporate stability and investor confidence.

Keywords: delisting; johannesburg stock exchange; non-financial determinants; macroeconomic determinants

1. Introduction

In the intricate dance of global finance, the decision to list or delist a company on a stock exchange can be likened to a high-stakes chess move—one that requires strategic foresight and a profound understanding of various determinants. While financial metrics traditionally dominate these decisions, non-financial determinants and macroeconomic variables play equally critical roles in influencing a company's trajectory (Martinez & Serve, 2017). Factors such as corporate governance practices, regulatory compliance, and company reputation are pivotal (Crocì & Giudice, 2014). Macroeconomic variables like gross domestic product (GDP) growth and interest rates significantly impact a company's share price, shaping perceptions among investors, analysts, and regulators (Fernando et al., 2004). These intertwined factors affect a company's ability to raise public capital and potentially lead to delisting (Kashefi Pour & Lasfer, 2013).

The complex interplay between non-financial and macroeconomic determinants complicates the study of delisting decisions. Understanding how these combined factors influence delisting is crucial for corporate leaders, determining whether a company remains listed or opts for delisting (Sallehuddin et al., 2019). Delistings have surged in South Africa, mirroring a global trend. Over the past five years, approximately 40 companies have delisted from the JSE, while only 12 new companies

have been listed, indicating a shrinking market symptomatic of broader economic challenges (Matanga & Holman, 2024). This trend is not unique to South Africa; the London Stock Exchange and the US stock market have experienced similar declines, prompting many companies to seek private capital markets instead (Pezzi, 2018).

Examining non-financial and macroeconomic determinants when studying delisting decisions is necessary for several reasons. Research has focused on financial determinants such as profitability, leverage, and liquidity to predict delisting (Cheng et al., 2010; Martinez & Serve, 2017; Shumway, 2001). However, non-financial factors like corporate governance and regulatory compliance also impact delisting decisions (Liao, 2020). Additionally, the macroeconomic environment can exacerbate or mitigate these effects, influencing non-financial determinants. For instance, economic downturns may lead to stricter regulatory scrutiny and shifts in investor sentiment, impacting corporate governance and compliance practices (Adams, 2017). The lack of comprehensive studies combining these aspects highlights a significant limitation in the literature, which this study aims to address.

The aim of this paper is to provide a comprehensive understanding of the factors influencing delisting decisions by examining the interplay between non-financial and macroeconomic determinants within the South African context. By investigating both non-financial and macroeconomic factors, the study analyzes how they can bolster a company's standing or serve as warning signals prompting delisting considerations.

Furthermore, research on the influence of non-financial and macroeconomic determinants on delisting decisions in emerging economies, particularly in South Africa, is limited. Hence, South Africa, with a significant number of companies delisting from the JSE—the largest stock exchange in Africa and a World Federation of Exchanges member—provides a compelling context. Companies in South Africa experience unique challenges and opportunities distinct from those in developed markets, such as political instability, economic volatility, and socio-economic disparities (Kola et al., 2022). The country's developing economy context adds layers of complexity not as prevalent in more established markets.

Although this study is situated within the South African context, its findings are relevant for other stock exchanges in developing economies. Many emerging markets share similarities with South Africa, including high volatility, regulatory challenges, and evolving corporate governance standards (Krastiņš & Pētersons, 2017). Understanding how non-financial and macroeconomic determinants influence delisting decisions in South Africa can provide stakeholders in other developing markets with valuable insights. These insights can help formulate strategies to enhance corporate stability, attract investor confidence, and mitigate delisting risks in their respective markets.

To identify delisting determinants, we predict delisting probabilities by first conducting a systematic literature review to identify relevant non-financial and macroeconomic determinants. We then employ PCA and a multivariate panel probit regression model. PCA reduces dataset dimensionality and identifies determinants, while the probit regression model assesses the impact of these determinants on delisting likelihood. By incorporating both non-financial and macroeconomic variables, this study aims to provide a comprehensive understanding of the factors influencing delisting decisions. This robust methodological approach offers valuable insights into delisting probabilities, providing a reliable framework for analysis.

The structure of this paper is as follows. Section 2 reviews the literature on non-financial and macroeconomic determinants, situating this research within the broader academic context. Section 3 outlines the methodology, detailing the models and the use of PCA to reduce the variable dimensionality of non-financial variables from related literature into principal components (PCs) for further analysis. Section 4 presents an empirical analysis of the data and findings, offering a comprehensive evaluation of delisting probability using non-financial and macroeconomic determinants through PCA and a multivariate panel probit regression model. Finally, Section 5 synthesizes this study's key insights, discusses implications and recommendations, and proposes directions for future research.

2. Review of Related Literature

Understanding delisting decisions requires examining both non-financial and macroeconomic factors. This review synthesizes insights from prior studies, emphasizing governance, incentive realignment, company age, name changes, and analyst coverage as key contributors to study delisting likelihood.

2.1. Governance

Corporate governance, regulatory compliance, and company reputation are critical in delisting decisions. Poor governance can increase delisting likelihood by failing to protect shareholders and ensure transparency (Hostak et al., 2013; Konno & Itoh, 2018). In this regard governance quality can be assessed through Chief Executive Officer (CEO) duality, board size, composition, and meeting frequency (Dwivedi & Jain, 2005; Hostak et al., 2013; Ning et al., 2010).

The board of directors of a company plays a crucial role. The CEO must align daily operations with the board's strategic goals (Charitou et al., 2007). CEO duality, where the CEO also chairs the board, is contentious and linked to financial distress, potentially increasing delisting risk (Li et al., 2021). Within the South Africa context of this paper, the King IV Report on Corporate Governance (King IV) advises against CEO duality unless a lead independent director is present (IoDSA, 2016).

Independent, non-executive directors offer unbiased perspectives, improving governance quality and potentially reducing delisting likelihood (Fich & Slezak, 2008). Frequent CEO changes can destabilize management and reduce profitability, increasing delisting likelihood (Hwang et al., 2014). Stability in CEO tenure is crucial in assessing delisting risk. Key variables include CEO status, tenure, and the presence of a lead independent director (Armstrong et al., 2012; Gilson & Vetsuypens, 1993; Kashefi Pour, 2015).

Board composition can also influence delisting decisions. While independent directors can improve decision-making, they also increase agency costs, potentially raising delisting probability (Weir et al., 2005). In this regard it is suggested to consider the proportion of executive to non-executive directors, the number of independent non-executive directors, and whether the chairperson is independent (Armstrong et al., 2012; Hillman & Dalziel, 2003; Salloum et al., 2013).

Board size matters too. Smaller boards may be more efficient, but larger boards can enhance oversight and reduce delisting risk for diverse companies (Darrat et al., 2016; Jensen, 1993). Key variables include the total number of directors, incremental increases and board changes (Darrat et al., 2016; Liao, 2020; Malik et al., 2014).

The board, adhering to the Companies Act No 71 of 2008 and the King IV Report, fulfills fiduciary duties and impacts delisting likelihood (J. R. Macey & O'Hara, 2002). Frequent board meetings are often associated with higher delisting likelihood due to increased monitoring of troubled companies (Cheng et al., 2010), suggesting frequent meetings may signal potential delisting risks. Key variables include meeting frequency and attendance rates.

2.2. Incentive Realignment

Agency theory emphasizes aligning the interests of managers (agents) and shareholders (principals) to reduce conflicts related to delisting, especially in companies with diffused ownership where these conflicts are more pronounced (Renneboog et al., 2007). In such structures, executives may not align with shareholders, leading to greater shareholder activism (Crocì & Giudice, 2014). South Africa's Companies Act No 71 of 2008 (Companies Act) mandates that board members be appointed by shareholders, ensuring alignment (IoDSA, 2016). Executive compensation packages, including share options and performance-based bonuses, align managers' interests with shareholders' (Taj, 2016). Insider ownership and concentration also influence delisting decisions; managers with substantial stakes have reduced interest realignment issues (Kashefi Pour, 2015). Directors with significant shareholding may choose to delist to protect their control (Djerbi & Anis, 2015).

Institutional investors can also influence delisting decisions. Increased monitoring by institutional investors narrows conflicts, reducing delisting likelihood (Vismara et al., 2012). Conversely, fewer institutional investors on the board or in ownership concentration increase the likelihood of delisting (Bharath & Dittmar, 2010). Institutional investor presence improves financial visibility, reducing information asymmetry and adverse selection costs (Bancel & Mittoo, 2009).

Furthermore, frequent changes in major shareholders can increase delisting likelihood due to increased conflicts (Hwang et al., 2014). Lower institutional shareholding in financially distressed companies suggests a negative link to institutional ownership and its impact on delisting decisions (Ting et al., 2008). Directors appointed by pressure-resistant institutional investors reduce the likelihood of business failure, influencing delisting decisions (Sallehuddin et al., 2019).

Free float, the number of outstanding shares owned by public investors, excluding locked-in shares held by insiders, is crucial for delisting (Pagano et al., 1998). Companies with higher free float may experience complications in the delisting approval process, while low free float companies are more likely to delist due to lower market share acquisition costs (Crocì & Giudice, 2014).

Additionally, board member compensation, including salary, bonuses, and share options, incentivizes executives to act in the company's and shareholders' best interests (Cyert et al., 2002). Compensation reflects both human resources costs and incentives for profit pursuit. Research indicates that in financially distressed companies, many CEOs were replaced or paid less, highlighting compensation as a variable in predicting financial distress and delisting (Gilson & Vetsuypens, 1993). Higher administrative expense ratios increase the probability of financial distress and delisting (Sanger & Peterson, 1990). Conversely, CEO compensation, including base salary, equity, and discretionary compensation, is negatively associated with default risk (Chaplinsky & Ramchand, 2012). Excessive executive remuneration is negatively associated with accounting performance, indicating an agency problem (Basu et al., 2007).

Donker et al. (2009) incorporated directors' biographic information into prediction models, focusing on workload, nationality, dependency, interlinked directorships, age, and education. Wilson et al. (2014) emphasized networks, proximity, and involvement, showing significant associations between board characteristics and business survival, indirectly affecting delisting probabilities. Female directors, associated with better cash flow and less debt, reduce insolvency likelihood (Hsu & Wu, 2014). Male directors tend to take more risks, while females are more conservative, impacting free cash flow (FCF) (Salloum et al., 2013). Higher education, particularly an MBA, potentially affects board quality and delisting decisions (Hsu & Wu, 2014).

2.3. Company Age and Change in Name

Theories on takeovers suggest younger companies are more prone to acquisitions and experience greater financial constraints, leading to a higher likelihood of delisting (Grove et al., 2011). Young companies lacking sufficient historical data, are harder to evaluate, often listing to improve trading conditions (Rajan et al., 2000). This inadequate evaluation horizon can result in adverse selection costs, increasing delisting likelihood (Michael & Shaw, 1994). Companies with fewer than three years since their initial public offering (IPO) experience higher financial distress risks, while older companies, with lower bankruptcy costs, are less likely to delist (Byun, 2019).

Studies confirm a negative association between company age and delisting, linking asymmetric information problems and adverse selection costs to delisting decisions (Makrominas & Yiannoulis, 2021). Older companies, being more mature and stable, with extensive financial data, have a reduced likelihood of delisting (Carpentier & Suret, 2011). Relevant variables include the age from incorporation to delisting, years listed, and years in operation before listing.

Name changes can also indicate potential delisting. Companies may change names to reposition their image due to undervaluation or poor financial performance (Biktimirov & Durrani, 2017). However, name changes often negatively impact company value (Kot, 2011). Consequently, companies with frequent name changes are more likely to delist (Biktimirov & Durrani, 2017).

2.4. Analyst Coverage

Financial visibility and investor interest are crucial in delisting decisions. Companies with less financial visibility often experience higher return volatility, fewer published recommendations, and lower trading volumes, leading to greater information asymmetries and an increased likelihood of delisting (Mehran & Peristiani, 2010). Hence, companies with lower trading volumes may find the benefits of listing insufficient, prompting delisting decisions.

Market activity, as it relates to analyst coverage, influences delisting decisions. Higher market index levels, used as a market activity proxy, suggest lower investor standards (Ljungqvist et al., 2006). Carpentier & Suret (2011) utilized a binary variable, while Demers & Joost (2007) and Ahmad & Jelic (2014) included the average underpricing of IPOs. Despite the use of different proxies, literature indicates that companies with lower analyst coverage have shorter IPO survival rates and are more likely to delist due to lower trading volumes. Relevant variables related to analyst coverage include the number of recommendations for the company's shares by analysts and the annual average recommendations made by analysts.

2.5. Macroeconomic Determinants

Macroeconomic variables significantly influence consumer behavior and demand (Bonfim, 2009). Economic prosperity increases disposable income and spending, while downturns reduce consumer confidence and spending, impacting company performance (Garcia & Liu, 1999). These changes affect key metrics such as return on assets, return on equity, analyst coverage, liquidity, competitiveness, growth, and FCF (Shrieves & Wachowicz, 2001).

Beyond financial metrics, the macroeconomic environment influences several non-financial determinants. For example, favorable economic conditions encourage companies to invest in innovation and market expansion, while downturns lead to a focus on cost management and operational efficiency (Habib et al., 2020). Fluctuations in raw material prices and exchange rates can disrupt supply chains and affect operational stability (Kola et al., 2022). Additionally, economic conditions impact company reputation and regulatory compliance, as companies must navigate changing legal and market landscapes during economic shifts (Siegel, 2005).

The overall macroeconomic environment can shape corporate governance practices. Companies in a stable economic climate are more likely to adhere to robust governance standards, while economic volatility may lead to lapses in governance as companies are challenged to stay afloat (Armstrong et al., 2012). Variables related to these non-financial determinants include changes in innovation investment, supply chain stability, company reputation, regulatory compliance, and adherence to governance standards. Key macroeconomic variables to consider include GDP growth, inflation, exchange rates, interest rates (repo rate, prime rate, total credit extensions), unemployment rate, yearly oil price, capital market traded shares, and real economic activity, such as electricity generation and distribution.

Incorporating electricity generation and distribution is particularly important in the South African context due to the significant impact of loadshedding on companies and the overall economy. Loadshedding, involving planned power outages to manage electricity demand, has become a recurring issue. These power disruptions can severely affect business operations, leading to production halts, increased operational costs, and revenue losses (Kola et al., 2022). Companies heavily reliant on continuous power supply, such as manufacturing and mining sectors, are particularly vulnerable. Loadshedding can also disrupt supply chains, impacting the delivery of goods and services and causing delays that ripple through the economy.

From a corporate governance perspective, frequent loadshedding can lead to lapses in governance as companies divert resources and attention from long-term strategic planning and robust governance practices to immediate survival tactics. This economic volatility forces companies to struggle with maintaining compliance with regulatory standards and upholding their reputations, potentially increasing delisting risks. Monitoring electricity generation and distribution provides

insights into the broader economic health and stability, helping predict potential challenges companies might experience (Mago & Olajuyin, 2022).

3. Methodology of Study

Delisting from stock exchanges significantly impacts corporations and financial markets (Kang, 2017). While global studies have examined delisting determinants, research on delistings at the JSE is limited, particularly concerning non-financial and macroeconomic variables. This study addresses this limitation by analyzing how these factors influence delisting decisions from the JSE.

The research design involves several key steps. First, a systematic literature review identified relevant non-financial and macroeconomic variables for studying delisting decisions. These determinants were then used in a quantitative methodology by utilizing PCA to reduce the dimensionality of non-financial variables into PCs. Subsequently, a multivariate panel probit regression model was used to examine how these determinants could predict the probability of delisting. All statistical analyses, including PCA and multivariate panel probit regression, were performed using Stata Statistical Software: Release 18, College Station, TX: StataCorp LLC. This experimental design tests the cause-and-effect relationships between non-financial and macroeconomic variables and delisting decisions.

Data was gathered from secondary sources, including Bloomberg and audited financial statements of companies. The dataset covers delisted companies and those listed as a control group from 2000 to 2023, based on companies that delisted between 2010 and 2023 and their listed counterparts as of 31 December 2023. Economic data related to South Africa, such as CPI, interest rates, exchange rates, GDP, and unemployment rates, were sourced from the South African Reserve Bank. The sample comprises 302 companies delisted from the JSE between 2010 and 2023, and 302 companies that remained listed as of 31 December 2023, serving as the control group.

All companies delisted from the JSE since 1 January 2000 were considered for sampling, as the JSE could only provide delisting data from 2000 onwards. However, due to incomplete data before 2010, the observation period for sample selection was from 1 January 2010 to 31 December 2023, focusing on delisting ordinary equity. Of the 781 company ordinary shares delisted from 2000 to 2023, 312 delisted during the observation period. After excluding delistings of preference shares and other funds, the final sample comprised 302 companies that delisted ordinary equity between 1 January 2010 and 31 December 2023, and 302 companies that remained listed as of 31 December 2023 as the control group.

3.1. Reducing Financial Variable Dimenstions Through PCA

A systematic literature review identified key non-financial and macroeconomic variables to analyze delisting decisions. PCA was applied to reduce the dimensionality of these variables, streamlining the dataset by focusing on non-financial data. PCA creates linear combinations of variables to maximize explained variance, identifying components representing the underlying factors that can be used to study the delisting decision (Abdi & Williams, 2010). This process results in uncorrelated principal components used for further analysis (Beorchia & Russell, 2020).

Each principal component explains a portion of the total variance, represented by its eigenvalue (Wold et al., 1987). PCA identifies components until all significant variance is explained (Hasan & Abdulazeez, 2021). This method preserved most variability in non-financial variables related to delisting while excluding macroeconomic variables. Standardization ensured equal contribution from each variable with the following equation (Colak et al., 2022):

$$Z_{ij} = \frac{X_{ij} - \mu_i}{\sigma_i} \quad (1)$$

Where Z_{ij} is the standardised value of the variable, X_{ij} is the original value of the variable, μ_i is the mean of the variable, and σ_i is the standard deviation of the j th variable.

After standardising the variables, the next step involved computing the covariance matrix, using the following equation (Abdi & Williams, 2010):

$$Cov(X, Y) = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y}) \quad (2)$$

Where $Cov(X, Y)$ is the covariance between X and Y (covariance matrix), x_i is the value of x for the i th observation, $\bar{x}$ is the mean of x , y_i is the value of y for the i th observation, $\bar{y}$ is the mean of y , $\frac{1}{n-1} \sum_{i=1}^n$ is the vector of standardised values for the i th observation, and n = the number of observations.

Eigenvalues, which measure the variance captured by each PC, were used to determine the number of PCs in the PCA, considering cumulative variance as well. These were calculated based on the covariance matrix. PCA aims to retain enough components to explain a substantial portion of the total variance, ideally around 60%, balancing explanatory power and simplicity (Colak et al., 2022). This approach includes the most significant factors and excludes components that add little value, even if some have eigenvalues above 1 (Wold et al., 1987). The result is an efficient and interpretable model, described by the following equation (Hasan & Abdulazeez, 2021):

$$Cvk = \lambda k vk \quad (3)$$

Where C is the covariance matrix, vk is the k th eigenvector, and λk = the k th eigenvalue.

Forming the PCs involved projecting the standardized data onto the eigenvectors using the following equation (Colak et al., 2022):

$$Y = ZV \quad (4)$$

Where Y is the matrix of principal components, Z is the matrix of standardised data, and V is the matrix of the eigenvectors.

After forming the PCs, the final step was to examine the factor loadings. High absolute values indicated a strong influence on the component. Positive loadings signified positive contributions, while negative loadings signified negative contributions (Wold et al., 1987). Based on the variables that contributed strongly to each component, we renamed the PCs to reflect these key contributing factors to use in the panel probit regression to predict delisting probability.

3.2. Using a Multivariate Panel Probit Regressions Analysis to Predict Delisting

After the PCA, a multivariate panel probit regression analysis was employed to model variables in panel data, collected over multiple periods for the same entities. Entities include companies delisted from the JSE and those listed as of 31 December 2023. Data spans 2000 to 2023, focusing on companies delisted between 2010 and 2023 and those still listed by the end of 2023. Variables are continuous and correspond to a binary outcome (delisted or remained listed) over the study period.

The panel probit regression accommodates cross-sectional and time-series variations to predict delisting probability (delisted (1) or remained listed (0)). This model evaluates the likelihood of a company delisting based on several continuous independent variables, including non-financial PC variables from PCA and macroeconomic variables. A random effects panel probit regression model was used to predict delisting probability by comparing PC and macroeconomic variables of delisted companies between 2010 and 2023 with those that remained listed as of 31 December 2023.

The dependent variable in this study is the delisting of companies, defined as the removal of a company's ordinary shares from trading on the stock exchange (J. Macey & Pompilio, 2008). The panel probit regression model also included companies that remained listed during the observation period to compare delisting determinants with delisted companies (control group). The 'delisted' and 'remained listed' categories were based on non-financial and macroeconomic variables. Independent variables comprise these non-financial and macroeconomic factors, with PCs representing the non-

financial variables. These variables were treated as cross-sectional continuous data incorporating time series.

To predict the probability of delisting based on PC and macroeconomic variables for delisted companies and those still listed as of 31 December 2023, the independent variables included non-financial PC variables derived from PCA and macroeconomic factors. The model is specified by the following equation (Baltagi et al., 2016):

$$P(Y_{it} = 1|X_{it}, \alpha_i) = \Phi(\beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \alpha_i + \epsilon_{it}) \quad (5)$$

Where $P(Y_{it} = 1|X_{it}, \alpha_i)$ is the probability that the dependent variable (binary outcome) (Y) (delisted) for the subject (i) (delisted vs. remained listed) equals one given the predictor (X_{it}) (continuous independent variables is the PC non-financial variables from PCA and macroeconomic variables) and the random effect (α_i), Φ is the cumulative distribution function of the standard normal distribution, Y_{it} is the dependent binary outcome (Y) indicating delisting for a subject (i) (company delisted vs. remained listed) at the time (t), X_{it} is the vector of independent variables (PC variables from PCA and macroeconomic variables) to measure the probability of delisting (Y), β_0 is the intercept term that represents the baseline probability of the outcome (delisted) when all predictors (X_{it}) are zero, β_1, β_2 and β_k is the coefficients (estimated coefficients) for the independent variables X_{1it}, X_{2it} and X_{kit} (continuous independent variables consisting of PC variables from the PCA and macroeconomic variables) that indicates the z-score (standard normal deviation) change for a one-unit change in the predictors. Positive coefficients increase the probability of the outcome, while negative coefficients decrease the probability of the outcome (Olin & Greenberg, 1998), α_i is entity-specific deviation from the overall relationship, accounting for the unobserved heterogeneity (random effect capturing unobserved heterogeneity), and ϵ_{it} represents the idiosyncratic error.

Formulating the multivariate panel probit regression analysis involves modeling the latent variable (Y_{it}) as the probability of a company (i) delisting (dependent variable) over time (t). This is modeled as a linear function of explanatory variables (X_{it}), with individual-specific effects (α_i) and an error term (ϵ_{it}) to capture random noise (Mullahy, 2016). The random effects model accounts for company-specific effects and missing data points, providing insights into unique factors influencing delisting (Baltagi et al., 2016). This approach identifies differences in variables for delisted versus listed companies and predicts delisting probabilities.

Maximum likelihood estimation was used to fit the model, with robust standard errors calculated. Model fit was assessed using Pseudo- R^2 , and overall significance was determined by the Wald test (Mullahy, 2016). Significance levels of 1% ($p < 0.01$) and 5% ($p < 0.05$) were used to determine statistical significance, with 5% indicating a 5% risk of Type I error and 1% providing stronger evidence against the null hypothesis. A 95% confidence interval along with 1% and 5% significance levels ensures reliable and meaningful findings (Baltagi et al., 2016). A 10% significance level ($p < 0.10$) was excluded to maintain rigor and reliability (Mullahy, 2016).

4. Empirical Analysis

The empirical analysis begins by reducing the dimensionality of non-financial variables using PCA. Following this, the PCs representing non-financial determinants, along with macroeconomic determinants, are utilized in a multivariate panel probit regression to model the probability of delisting.

4.1. Reducing Variable Dimensionality of Non-Financial Variables

To streamline the non-financial variables identified in the systematic literature review, PCA was employed. This step is crucial as it extracts PCs that encapsulate the most influential aspects of the original variables, making the dataset more manageable and insightful. Below, we discuss the outcomes of the PCA.

4.1.1. Determinants Related to CEO Duality (DET1) and CEO Changes (DET2)

CEO duality and CEO changes are key determinants in the study of delisting decisions. For DET1, the variable related to CEO duality examined the number of years the CEO held the same position during the delisting year. This variable was only relevant for the final year and was thus excluded from PCA and analyzed separately. Table 1 shows that DET1_PC1, with an eigenvalue of 1.003, explained 50.17% of the variance. The presence of a lead independent director contributed strongly, whereas the CEO as chairperson contributed minimally. The CEO changes (DET2) variable focused on the number of CEO changes during the delisting year and was analyzed individually, not through PCA. Consequently, DET1_PC1 was renamed the ‘board independence factor’ and the CEO’s tenure was considered individually in studying delisting decisions with CEO duality as a determinant.

Table 1. Determinant 1 – CEO Duality (DET1).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.003	0.007	0.502	0.5017
2	0.997	-	0.498	1
Variable			PC and Variable Weight (PC Scores)	
			PC1	
1.	CEO status – is the CEO also the chairperson		-0.707	
2.	Does the company have a lead independent director		0.707	

Note: this table shows the PCA results for the CEO duality determinant (DET1), including eigenvalues, variance proportion, and variable scores for the first principal component (PC1).

4.1.2. Composition of the Governing Body (DET3)

Out of the seven variables relevant to the governing body of a company concerning delisting decisions, six were included in the PCA. The variable pertaining to the chairperson was excluded since all companies had one. The PCA yielded two PCs: PC1 with an eigenvalue of 2.089 and PC2 with 1.446, jointly accounting for 58.9% of the total variance in the original variables (refer to Table 2). DET4_PC1 revealed a high PC score of 0.699 for the percentage of executive directors, indicating this variable’s strong contribution to the PC. In contrast, the percentage of independent directors had a low score of 0.129, signifying its weak contribution to the PC in the context of delisting decisions.

DET4_PC2 consisted of three variables: the percentage of independent board members (PC score 0.502), an independent non-executive chairperson (PC score 0.475), and the Bloomberg governance disclosure score (PC score 0.644). These variables underscore the importance of unbiased oversight, balanced decision-making, and transparency. Consequently, DET4_PC1 was renamed ‘executive influence on delisting decisions’, reflecting the pivotal role of executive directors, while DET4_PC2 was renamed ‘governance transparency and independence’, highlighting the collective impact of independent directors and governance disclosures on corporate governance practices in the study of delisting decisions.

Table 2. Determinant 3 – Governing Body Composition (DET3).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.089	0.643	0.348	0.348
2	1.446	0.441	0.241	0.589
3	1.005	0.160	0.168	0.757
4	0.845	0.230	0.141	0.898
5	0.615	0.615	0.103	1.000
6	0.000	-	0.000	1.000
Variable			PC and Variable Weight (PC Scores)	

	PC1	PC2
1. Percentage of executive directors	0.699	-0.008
2. Percentage of non-executive directors	-0.699	0.008
3. Percentage of independent board members	0.129	0.502

Table 2 continued

Variable	PC and Variable Weight (PC Scores)	
	PC1	PC2
4. Is the chairperson an independent non-executive director	-0.031	0.475
5. Does the chairperson own shares in the company	0.019	0.327
6. Governance disclosure score by Bloomberg	-0.069	0.644

Note: this table presents the results of the PCA related to the governing body of companies and their role in delisting decisions. It identifies two principal components (PC1 and PC2) with their respective eigenvalues, proportions, and cumulative variances.

4.1.3. Board Size (DET4)

In the study of delisting decisions, PCA incorporated three variables related to the size of a company’s board of directors. This analysis yielded one PC with an eigenvalue of 2.434, accounting for 81.1% of the variance (see Table 3). The findings indicate that variables associated with the board of directors strongly contributed to the formation of the PC. Notably, the total number of directors had a moderate influence (PC score of 0.503), while both the number and percentage of board changes exhibited higher scores (0.617 and 0.605, respectively), suggesting a more substantial impact. This implies that dynamic changes within the board, such as frequent replacements or adjustments, are more closely associated with the PC. These results underscore the importance of governance stability and board dynamics in corporate decisions. Consequently, DET4_PC1 was renamed ‘board dynamics and stability’ to reflect the pivotal role of board changes and stability in influencing governance and strategic decisions.

Table 3. Determinant 4 – Board Size (DET4).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.434	1.917	0.811	0.811
2	0.517	0.468	0.172	0.984
3	0.049	-	0.017	1.000

Variable	PC and Variable Weight (PC Scores)	
	PC1	
1. Total number of directors	0.503	
2. Number of board of director changes	0.617	
3. Percentage of board of director changes	0.605	

Note: this table outlines the PCA results for three variables related to the size of a company’s board of directors and their impact on delisting decisions. It identifies one principal component (PC1) with its eigenvalue, proportion, and cumulative variance.

4.1.4. Board Meetings (DET5)

The analysis of delisting decisions included three variables related to the frequency of board meetings. The PCA revealed one key component (DET5_PC1) with an eigenvalue of 2.434, explaining 67.7% of the variance (see Table 4). A strong contribution was made by the number of board meetings (PC score of 0.675), which signifies a proactive and engaged board essential for effective oversight and timely decision-making. While a higher meeting frequency might correlate with better risk management, literature suggests it could also indicate potential delisting (Chou et al., 2013). The percentage of board meeting attendance, with a PC score of 0.639, also showed a strong contribution, reflecting active participation and commitment by board members, which enhances decision-making

and oversight (Djerbi & Anis, 2015). Independent directors’ attendance, with a PC score of 0.368, highlights their role in maintaining unbiased oversight and investor confidence, although their lower score indicates a lesser impact. As a result, DET5_PC1 was renamed ‘board meeting engagement’, emphasizing the importance of meeting frequency and active participation in board meetings, underscoring their relevance to study delisting decisions and risk management.

Table 4. Determinant 5 – Board Meetings (DET5).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.036	0.041	0.345	0.345
2	0.995	0.026	0.332	0.677
3	0.969	-	0.323	1.000

Variable	PC and Variable Weight (PC Scores)
	PC1
1. Number of board of director meetings	0.675
2. Percentage of board of director meeting attendance	0.639
3. Percentage of independent directors attending meetings	0.368

Note: this table presents the PCA results for three variables related to the frequency of board meetings. The analysis identified one principal component (PC1) and includes the contributions of each variable to the formation of this PC.

4.1.5. Diffused Ownership and Control (DET6)

In examining delisting decisions, four variables related to diffused ownership and control were included, leading to the identification of one PC (DET6_PC1) with an eigenvalue of 2.025, accounting for 50.6% of the variance (see Table 5). DET6_PC1 was strongly influenced by the percentage of public shareholders and individual investors, both with a PC score of 0.500. This suggests that DET6_PC1 captures the variation in ownership structure linked to these shareholders, highlighting ownership diffusion. Companies scoring higher on this component may have more dispersed ownership, potentially affecting delisting decisions by reducing control by any single entity. Conversely, low scores for other variables indicate they did not strongly contribute to DET6_PC1. Emphasizing variables with a positive PC score of 0.500 simplifies the model, ensuring more efficient and robust results. Thus, DET6_PC1 was renamed ‘ownership diffusion component’, emphasizing its focus on the spread of ownership among public and individual investors, aligning with the study’s context on delisting decisions and ownership structure.

Table 5. Determinant 6 – Diffused Ownership (DET6).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.025	0.049	0.506	0.506
2	1.975	1.975	0.494	1.000
3	0.000	0.000	0.000	1.000
4	0.000	-	0.000	1.000

Variable	PC and Variable Weight (PC Scores)
	PC1
1. Percentage of public shareholders	0.500
2. Percentage of non-public shareholders	-0.500
3. Percentage of individual investors as shareholders	0.500
4. Percentage of institutional investors as shareholders	-0.500

Note: this table presents the PCA results for variables related to diffused ownership and control and details the contributions of each variable to the formation of this PC.

4.1.6. Insider Ownership (DET7)

The analysis of insider ownership’s impact on the likelihood of delisting from a stock exchange involved three variables. The PCA yielded one PC (DET7_PC1) with an eigenvalue of 2.001, explaining 66.7% of the variance (see Table 6). DET7_PC1 was primarily influenced by the percentage of non-public shareholders, with a PC score of 0.707, indicating a strong impact from shares held by insiders or closely related entities. This suggests a concentrated ownership structure where control is maintained by a small group of insiders, potentially affecting strategic decisions like delisting. The low PC score for public shareholders indicates minimal influence on this component, reinforcing the focus on non-public ownership. The percentage of shares held by board members had a low PC score of 0.025, suggesting it did not strongly contribute to this component. Excluding the percentage of public shareholders, with a negative PC score of -0.707, helps maintain clarity in analyzing insider ownership. Thus, DET7_PC1 was renamed ‘concentrated ownership component’, emphasizing the central role of non-public shareholders in ownership structure and their potential impact on delisting decisions due to their preference for maintaining control.

Table 6. Determinant 7 – Insider Ownership (DET7).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.001	1.001	0.667	0.667
2	0.999	0.999	0.333	1.000
3	0.000	-	0.000	1.000

Variable	PC and Variable Weight (PC Scores)	
	PC1	
1. Percentage of shares held by board of director members (insider ownership)	0.025	
2. Percentage of non-public shareholders	0.707	
3. Percentage of public shareholders	-0.707	

Note: this table presents the PCA results for variables related to insider ownership detailing the contributions of each variable to the formation of this PC.

4.1.7. Institutional Investors (DET8)

The study on the probability of delisting from a stock exchange incorporated two variables related to the presence of institutional investors. The PCA identified one PC (DET8_PC1) with an eigenvalue of 2.000, accounting for 100% of the variance (see Table 7). DET8_PC1 was strongly influenced by the percentage of institutional investors, with a PC score of 0.707, indicating a major impact. Conversely, the percentage of individual investors, with a low PC score of -0.707, was excluded to maintain clarity and relevance in the analysis. By focusing on institutional investors, the model emphasizes ownership concentration and governance quality. Therefore, DET8_PC1 was renamed ‘institutional influence’, capturing the role of institutional investors in shaping strategic decisions such as delisting, while the presence of individual investors had a lesser impact.

Table 7. Determinant 8 – Institutional Investors (DET8).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	2.000	2.000	1.000	1.000
2	0.000	-	0.000	1.000

Variable	PC and Variable Weight (PC Scores)	
	PC1	
1. Percentage of individual investors	-0.707	
2. Percentage of institutional investors	0.707	

Note: this table presents the results of the PCA for variables related to the presence of institutional investors, detailing the contributions of each variable to the formation of this PC.

4.1.8. Major Shareholder Changes (DET9)

The analysis of changes in major shareholders and their possible relation to delisting decisions involved seven variables. The PCA resulted in two PCs: PC1 with an eigenvalue of 1.912 and PC2 with 1.885, together explaining 54.24% of the variance (see Table 8). DET9_PC1 was largely influenced by the percentage change in non-public shareholders, with a high PC score of 0.707, indicating their strong impact. In contrast, variables like the percentage change in shareholders had lower scores, contributing minimally. This suggests that fluctuations in non-public shareholders, including insiders and institutional investors, play an important role in shareholder dynamics. DET9_PC2 was similarly influenced by the percentage change in institutional investors, with a high PC score of 0.707, reflecting their substantial impact. Variables with negative PC scores, such as public and individual investors, were excluded for clarity. Consequently, DET9_PC1 was renamed ‘non-public shareholder dynamics’, and DET9_PC2 was renamed ‘institutional and major shareholder dynamics’, highlighting the influence of these groups on delisting decisions.

Table 8. Determinant 9 – Changes in Major Shareholders (DET9).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.912	0.027	0.273	0.2731
2	1.885	0.724	0.269	0.5424
3	1.161	0.161	0.166	0.7083
4	1.000	0.162	0.143	0.8511
5	0.838	0.724	0.120	0.9709
6	0.114	0.024	0.016	0.9872
7	0.090	-	0.013	1

Variable	PC and Variable Weight (PC Scores)	
	PC1	PC2
1. Percentage change in shares outstanding	0.004	-0.001
2. Percentage change in shareholding	0.023	0.005
3. Percentage change in public shareholding	-0.707	-0.001
4. Percentage change in non-public shareholding	0.707	-0.001
5. Percentage change in insider shareholding	0.005	0.000
6. Percentage change in institutional investor shareholding	-0.001	0.707
7. Percentage change in individual investor shareholding	-0.001	-0.707

Note: this table presents the PCA results for variables related to changes in major shareholders. The analysis identified two principal components (PC1 and PC2) detailing the contributions of each variable to the formation of these PCs.

4.1.9. Free Float (DET10)

Four variables related to a company’s free float were included in the DET10 Group to study delisting decisions. However, over 30% of the data for these variables was missing, making PCA unfeasible and meaningful comparison impossible. As a result, DET10 was excluded from further analysis.

4.1.10. Management Compensation (DET11)

The examination of management compensation and its relation to delisting decisions involved three variables. The PCA identified one PC (DET11_PC1) with an eigenvalue of 1.091, explaining 71.9% of the variance (see Table 9). DET11_PC1 was strongly influenced by the directors’ remuneration to sales ratio and the directors’ remuneration to total assets ratio, with PC scores of 0.719 and 0.629, respectively. In contrast, the variable concerning a chairperson holding shares had a much lower PC score, indicating minimal impact. This suggests that direct financial incentives for

directors are more influential in forming the PC than chairperson ownership stakes. Higher remuneration relative to sales and assets may incentivize directors to pursue delisting (Salloum et al., 2013). Consequently, DET11_PC1 was renamed ‘management compensation’, highlighting its focus on the directors’ financial incentives and their potential impact on strategic decisions like delisting.

Table 9. Determinant 11 – Management Compensation (DET11).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.091	0.085	0.364	0.364
2	1.007	0.105	0.336	0.699
3	0.902	.	0.301	1.000
Variable			PC and Variable Weight (PC Scores)	
			PC1	
1. Director’s remuneration to sales			0.719	
2. Director’s remuneration to total assets			0.629	
3. Does the chairperson own shares			-0.298	

Note: this table presents the PCA results for variables related to management compensation detailing the contributions of each variable to the formation of this PC.

4.1.11. Biographic Information of Board Members (DET12)

Determinant 12 examines how the biographical details of board members could influence delisting decisions. Various variables were considered, with the CEO’s age retained separately for further analysis. PCA identified four PCs, explaining 52.7% of the variance (see Table 10).

DET12_PC1 emphasizes CEO compensation, focusing on the proportion of the company’s earnings, revenue, and net profit allocated to CEO remuneration. High values in this component, such as a PC score of 0.533 for the CEO’s remuneration relative to operating income, suggest large financial resources directed towards the CEO, indicating either substantial influence or an organizational culture that prioritizes rewarding the top executive. This was similarly reflected in the PC scores for CEO remuneration relative to sales (0.504) and net profit (0.523) (see Table 10).

DET12_PC2 is dominated by the number of concurrent positions held by the chairperson, with a PC score of 0.602. This component highlights the chairperson’s external commitments and potential conflicts of interest, impacting company decision-making processes.

DET12_PC3 focuses on the educational and professional qualifications of the CEO, underscoring their importance in shaping company operations and strategic decisions. For example, the PC scores for CEO’s post-graduate qualifications and professional qualifications are 0.661 and 0.659, respectively.

DET12_PC4 emphasizes the chairperson’s educational and professional qualifications, reflecting their impact on leadership and governance. This is evident from the PC scores for the chairperson’s post-graduate qualifications (0.648) and professional qualifications (0.658).

Based on these findings, DET12_PC1 was renamed ‘CEO compensation’, DET12_PC2 as ‘chairperson external commitments’, DET12_PC3 as ‘CEO qualification’, and DET12_PC4 as ‘chairperson qualification’. These names effectively capture each component’s essence and relevance to the company’s governance to study the delisting decision.

Table 10. Determinant 12 – Biographic Information of Board Members (DET12).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	3.310	1.417	0.207	0.207
2	1.893	0.240	0.118	0.325
3	1.653	0.073	0.103	0.429
4	1.580	0.176	0.099	0.527
5	1.404	0.295	0.088	0.615
6	1.109	0.144	0.069	0.684

7	0.965	0.030	0.060	0.745
8	0.935	0.040	0.058	0.803
9	0.895	0.097	0.056	0.859
10	0.798	0.380	0.050	0.909
11	0.418	0.062	0.026	0.935
12	0.356	0.070	0.022	0.957
13	0.285	0.049	0.018	0.975
14	0.236	0.113	0.015	0.990
15	0.123	0.083	0.008	0.998
16	0.040	.	0.003	1.000

Variable	PC and Variable Weight (PC Scores)			
	PC1	PC2	PC3	PC4
1. Age of the chairperson	-0.166	0.010	-0.023	0.047
2. Number of other positions held by chairperson	-0.038	0.602	0.077	0.067
3. Ln (CEO remuneration)	0.157	-0.099	0.076	0.075
4. Ln (CEO remuneration to operating income)	0.533	-0.035	0.038	0.049
5. Ln (CEO remuneration to sales)	0.504	-0.051	0.047	0.042
6. Ln (CEO remuneration to net profit)	0.523	-0.035	0.039	0.050
7. Number of other positions held by CEO	0.233	0.293	-0.216	-0.215
8. Board tenure in years	0.060	0.094	0.049	0.045
9. Chairperson is female	0.070	-0.279	-0.063	-0.132
10. Chairperson has postgraduate qualification	0.052	0.044	-0.055	0.648
11. Chairperson has professional qualification	0.015	0.022	-0.043	0.658
12. Chairperson has other positions	-0.052	0.598	0.043	0.031
13. CEO is female	-0.043	-0.027	0.053	0.122
14. CEO has postgraduate qualification	0.027	0.048	0.661	-0.059
15. CEO has professional qualification	0.030	0.029	0.659	-0.035
16. CEO has other positions	0.252	0.293	-0.219	-0.206

Note: this table presents the PCA results for variables related to the biographic information of board members detailing the contributions of each variable to the formation of these PCs.

4.1.12. Company Age, Name Change and Pre-Listing Years (DET13)

Determinant 13 (DET13) focused on company age, name changes, and pre-listing years in relation to study the delisting decision. The PCA for DET13 identified one PC (DET13_PC1) with an eigenvalue of 1.907, explaining 47.68% of the variance (see Table 11). The PCA revealed that the number of years a company was listed and the company’s age were strong factors, with positive PC scores of 0.700 and 0.705, respectively. This indicates that longer listed and older companies tend to have higher DET13_PC1 scores. In contrast, variables such as name changes and the number of pre-listing years had very low PC scores, suggesting minimal influence on this component. Consequently, DET13_PC1 was renamed ‘company longevity and listing duration factor’ to reflect its strong association with both the age of a company and its listing duration.

Table 11. Determinant 13 – Company Age, Name Change and Pre-Listing Years (DET13).

Component	Eigenvalue	Difference	Proportion	Cumulative
1	1.907	0.863	0.477	0.4768
2	1.044	0.096	0.261	0.7379
3	0.948	0.848	0.237	0.975
4	0.100	.	0.025	1

Variable	PC and Variable Weight (PC Scores)	
	PC1	
1. Number of years listed on the JSE	0.700	

2. Number of years operational before listing on the JSE	0.056
3. Company age	0.705
4. Number of name changes	-0.098

Note: this table presents the PCA results for variables related to company age, name changes, and pre-listing years in the context of delisting decisions detailing the contributions of each variable to the formation of this PC.

4.1.13. Analyst Recommendations (DET14)

Analyst recommendations (DET14) relate to delisting decisions and consist of a single variable. As only one variable was involved, PCA was not applicable. The variable measuring the number of analyst recommendations was retained for further analysis.

4.2. Multivariate Panle Probit Regression Analysis Restuls

After the PCA, a panel probit regression model was used to analyze delisting determinants. This aimed to predict delisting likelihood by examining 20 non-financial variables from PCA and nine macroeconomic determinants. Data from 2000 to 2023 included 302 delisted and 302 still listed companies. The dependent variable was listing status, classified as delisted (1) or remained listed (0). The results include initial model outcomes, stepwise elimination of insignificant determinants, and the final model’s results.

4.2.1. Results Form the Initial Model and Stepwise Ellimination of Insignificant Variables

The comprehensive model in Table 12 includes all 29 determinants. Analysis shows several determinants significantly impact delisting probability, with p-values less than 0.05. Some variables have even stronger significance with p-values below 0.001, emphasizing their critical role in predicting delisting. These findings highlight the combined influence of non-financial and macroeconomic determinants, providing a robust framework for understanding and mitigating delisting probabilities. A 10% p-value threshold was not used to minimize Type I errors, ensuring robustness and reliability (Baltagi et al., 2016).

Table 12. Initial Model Results of Significant Determinants for Delisting.

Variables	Estimated Coefficient	Standard Error	p-Value
Non-financial Determinants			
CEO Duality (DET1):			
1. Board independence factor	0.0081	0.0381	0.91
2. Number of years the CEO was in the role	-0.0061	0.0218	0.43
CEO Changes (DET2):			
3. Number of times the CEO changes	0.011	0.013	0.31
Governing Body Composition (DET3):			
4. Executive influence on delisting decision	-0.0060	0.0110	0.81
5. Governance transparency and independence	-0.19	0.03	<0.001*
Size of the Board of Directors (DET4):			
6. Board dynamics and stability	0.013	0.045	0.77
Frequency of Meeting of the Board of Directors (DET5):			
7. Board meeting engagement	-0.042	0.032	0.34
Diffused Ownership (DET6):			
8. Ownership diffusion component	-3.1	2.1	0.26
Insider Ownership (DET7):			
9. Concentrated ownership component	-2.2	1.6	0.37
Institutional Investors (DET8):			

10. Institutional influence	-4.2	1.7	0.45
Changes in Major Shareholders (DET9):			
11. Non-public shareholder dynamics	0.0032	0.0668	0.84
12. Institutional and major shareholder dynamics	0.052	0.067	0.48
Free Float (DET10) – N/A (Excluded)			
Management Compensation (DET11):			
13. Management compensation	-0.11	0.09	0.64
Biographic Information of Board of Director Members (DET12):			
14. CEO compensation	-0.012	0.08	0.31
15. Chairperson external commitments	-0.078	0.058	0.53
16. CEO qualification	0.015	0.051	0.60
17. Chairperson qualification	0.074	0.052	0.031 *
18. Age of the CEO in the year of delisting	0.058	0.044	0.19
Name Change and Years of Listing (DET13):			
19. Company longevity and listing duration	-0.18	0.03	<0.001*
Analyst Recommendations (DET14):			
20. Number of analyst recommendations	-0.26	0.07	<0.001*
Macroeconomic Determinants			
GDP (DET15):			
21. GDP	-0.000055	0.000378	0.81
Inflation (DET16):			
22. CPI	-0.11	0.04	0.033 **
Exchange Rates (DET17):			
23. Exchange rates	0.012	0.006	0.32
Interest Rates (DET18):			
24. Repo rate	0.028	0.006	<0.001*
25. Credit extensions	-0.078	0.010	<0.001*
Unemployment (DET19):			
26. Unemployment rate	0.039	0.013	<0.001**
Commodities (DET20):			
27. Oil price	0.0029	0.0031	0.61
<i>Table 12 continued</i>			

Variables	Estimated Coefficient	Standard Error	p-Value
Capital Markets (DET21):			
28. Shares traded	0.00043	0.00037	0.32
Real Economic Activity (DET22):			
29. Electricity generation and distribution	-0.082	0.047	0.063

Note: this table presents the initial multivariate panel probit regression results for delisting determinants. It includes estimated coefficients, standard errors, and p-values for 29 variables, with significant determinants highlighted at 1% (*) and 5% (**) levels. The variables include 20 non-financial (e.g., CEO duality, governance transparency) and nine macroeconomic (e.g., GDP, inflation) factors used to predict delisting likelihood.

The Pseudo-R² value of 0.82 (see Table 13) signifies strong explanatory power, indicating that the model accounts for approximately 82% of the variability in delisting probability (Mullahy, 2016). Additionally, the Wald chi-square statistic of 378.13, with a p-value of less than 0.001, confirms the combined relevance of the predictors included in the model (Baltagi et al., 2016).

Table 13. Initial Model Fit and Significance.

Description	Model Fit	Overall Significance of Model
Pseudo-R ²	0.82	-
Wald chi-squared	-	378.13
p-value for Wald test	-	< 0.001

Note: this table shows the model fit and significance metrics for the initial multivariate panel probit regression model predicting delisting determinants. It includes the Pseudo-R² value (explanatory power), the Wald chi-squared statistic (overall model significance), and the Wald test p-value (combined predictor relevance).

As shown in Table 12, four non-financial determinants were strongly related to predicting the probability of delisting: governance transparency and independence (p-value < 0.001, coefficient = -0.19), chairperson qualification (p-value = 0.031, coefficient = 0.074), company longevity and listing duration (p-value < 0.001, coefficient = -0.18), and number of analyst recommendations (p-value < 0.001, coefficient = -0.26). These findings suggest that improvements in these areas decrease the probability of delisting.

Furthermore, four macroeconomic determinants were significant: inflation (p-value = 0.033, coefficient = -0.11), repo rate (p-value < 0.001, coefficient = 0.028), credit extensions (p-value < 0.001, coefficient = -0.078), and unemployment rates (p-value < 0.001, coefficient = 0.039). Higher inflation and increased credit availability were associated with a lower delisting probability, while higher interest and unemployment rates were linked to a higher delisting probability. These findings are supported by literature such as Campbell et al. (2008), Donker et al. (2009), and Matadeen (2017), which emphasize the complex interplay between financial stability, economic conditions, and firm performance in determining delisting risks. However, our research shows an interconnectedness between non-financial determinants and macroeconomic variables in relation to delistings as well.

After the initial model, a stepwise elimination of insignificant variables was employed to refine the multivariate model. This process involved repeated regressions, removing the least significant variable, and refitting the model. This continued until only significant variables remained. Stepwise elimination was chosen for its efficiency in refining the model without compromising its integrity. Cross-validation techniques were used to ensure robustness (Mullahy, 2016). This methodical approach streamlined the model, highlighting essential determinants and enhancing predictive accuracy and interpretability.

4.2.1. Final Panel Probit Regression Results

After the stepwise elimination of insignificant variables, the final multivariate model is shown in Table 14. It includes three additional determinants compared to the comprehensive model in Table 12: ‘ownership diffusion component’, ‘institutional influence’, and ‘real economic activity’ through the measure of electricity generation and distribution within South Africa.

Table 14. Final Model Results of Significant Determinants for Delisting.

Variables	Estimated Coefficient	Standard Error	p-Value
Non-financial Determinants			
Governing Body Composition (DET3):			
1. Governance transparency and independence	-0.12	0.04	<0.001*
Diffused Ownership (DET6):			
2. Ownership diffusion component	-0.15	0.08	0.020**
Institutional Investors (DET8):			
3. Institutional influence	-0.16	0.04	0.008**
Biographic Information of Board of Director Members (DET12):			
4. Chairperson qualification	0.071	0.041	0.021**

Name Change and Years of Listing (DET13):			
5. Company longevity and listing duration	-0.14	0.02	0.004 **
Analyst Recommendations (DET14):			
6. Number of analyst recommendations	-0.16	0.06	<0.001 *
Macroeconomic Determinants			
Inflation (DET16):			
7. CPI	-0.098	0.025	0.014 **
Interest Rates (DET18):			
8. Repo rate	0.023	0.004	<0.001 *
9. Credit extensions	-0.097	0.024	<0.001 *
Unemployment (DET19):			
10. Unemployment rate	0.025	0.006	0.011 **
Real Economic Activity (DET22):			
11. Electricity generation and distribution	-0.089	0.026	<0.001 *

Note: this table presents the final multivariate panel probit regression results for delisting determinants. It includes estimated coefficients, standard errors, and p-values for 11 variables, with significant determinants highlighted at 1% (*) and 5% (**) levels. The variables include six non-financial (e.g., governance transparency, institutional influence) and five macroeconomic (e.g., inflation, real economic activity) factors used to predict delisting likelihood.

The Pseudo-R² value of 0.79 indicates strong explanatory power, accounting for approximately 79% of the variability in delisting probability (Mullahy, 2016). This reflects the model’s effectiveness in capturing key determinants of delisting. Additionally, the Wald chi-square statistic of 341.62, with a p-value of less than 0.001, confirms the overall significance of the model, indicating that the predictors collectively have a significant impact on delisting probability (see Table 15).

Table 15. Final Model Fit and Significance.

Description	Model Fit	Overall Significance of Model
Pseudo-R ²	0.79	-
Wald chi-squared	-	341.62
p-value for Wald test	-	< 0.001

Note: this table shows the model fit and significance metrics for the final multivariate panel probit regression model predicting delisting determinants. It includes the Pseudo-R² value (explanatory power), the Wald chi-squared statistic (overall model significance), and the Wald test p-value (combined predictor relevance).

Several key non-financial variables are significant in predicting the probability of delisting, as shown in Table 14. These include ‘governance transparency and independence’, ‘ownership diffusion component’, ‘institutional influence’, ‘chairperson qualification’, ‘company longevity and listing duration’, ‘number of analyst recommendations’, ‘inflation’, ‘repo rate’, ‘credit extensions’, ‘unemployment rate’, and real economic activity measures by electricity generation and distribution within South Africa. The significant non-financial and macroeconomic delisting determinants from the final model are discussed below.

First, the composition of the governing body, particularly in terms of governance transparency and independence, is a significant factor influencing delisting. This includes the percentage of independent directors, whether the chairperson is an independent non-executive director, and the Bloomberg governance disclosure score. With a p-value of < 0.001 and an estimated coefficient of -0.12, higher governance transparency and independence are linked to a lower probability of delisting. Companies with more independent directors and an independent chairperson are less likely to delist, showcasing the stabilizing effect of robust governance practices. This is supported by literature, including Anderson & David (2003) and Jensen & Meckling (1976), which emphasize the importance

of strong governance in reducing agency costs and enhancing company value and investor confidence.

Agency theory underscores the role of independent directors in aligning management and shareholder interests by enhancing board oversight and reducing agency costs (Jensen & Meckling, 1976). Stakeholder theory suggests that good governance builds trust and confidence among all stakeholders, crucial for long-term viability (Mahajan et al., 2023). Empirical studies, such as Hsu & Wu (2014), further support these findings, highlighting that firms with more independent directors experience lower financial distress and delisting risks.

Diffused ownership, referred to as the 'ownership diffusion component', is another crucial determinant for delisting from our model. This includes the percentage of public shareholders and individual investors. Though initially not significant, it emerged as important in the final analysis with a p-value of 0.020 and an estimated coefficient of -0.15 (see Table 14). Greater ownership diffusion, characterized by more public shareholders and individual investors, lowers the likelihood of delisting. This broader base reduces the risks of concentrated control and enhances stability, promoting balanced governance (Boot et al., 2006). This finding is supported by literature such as Djerbi & Anis (2015), which highlights the benefits of dispersed ownership in reducing agency costs and improving corporate governance.

In this regard, agency theory suggests that diverse ownership structures mitigate conflicts of interest between management and shareholders, increasing scrutiny and accountability, and reducing delisting risks (Donaldson & Davis, 1991). Stakeholder theory also values diffused ownership, as it demonstrates inclusiveness and responsiveness to a broader range of interests, enhancing trust and confidence. Empirical studies, like those by Boot et al. (2006) and Donker et al. (2009), validate that diffused ownership leads to more effective monitoring, better corporate outcomes, and lower delisting risks.

We also found institutional investors to play a crucial role in reducing the probability of delisting. This determinant, labelled 'institutional influence', is measured by the percentage of institutional investors and has a p-value of 0.008 with a coefficient of -0.16 (see Table 14). The negative coefficient suggests that a higher percentage of institutional investors is associated with a lower probability of delisting, as their stability and oversight could enhance corporate governance and strategic decision-making. Agency theory highlights that institutional investors help monitor management and reduce agency costs, ensuring that management acts in shareholders' best interests. Signaling theory adds that their presence signals market confidence, thereby reducing delisting risks (Connelly et al., 2011). Empirical studies, including those by (Renneboog et al., 2007; Ting et al., 2008), support the importance of institutional investors in improving governance and reducing agency conflicts. However, we view high institutional ownership can sometimes lead to delisting if these investors push for strategic moves like mergers or buyouts to maximize shareholder value.

The biographical information of board members, specifically the 'chairperson qualification', is another significant determinant. This determinant examines whether the chairperson holds a postgraduate or professional qualification, with a p-value of 0.021 and a coefficient of 0.071 (see Table 14). The positive coefficient suggests that higher qualifications for the chairperson are associated with a slightly increased probability of delisting. Highly qualified chairpersons may identify strategic opportunities for mergers, acquisitions, or corporate restructuring that could lead to delisting. They may also be more inclined towards transformative strategies that, although beneficial in the long run, could cause temporary instability. Agency theory explains that a well-qualified chairperson can reduce agency costs by effectively monitoring management and ensuring alignment with shareholder interests. However, these qualifications could also empower the chairperson to initiate corporate changes, like delisting, if perceived to benefit the company and its shareholders. Signaling theory posits that the chairperson's qualifications signal the company's commitment to high standards of governance and strategic leadership, enhancing investor confidence.

The final model also identified 'company longevity and listing duration' to be a critical determinant in predicting the probability of delisting. With a p-value of 0.004 and an estimated

coefficient of -0.14 (see Table 14), this factor shows that longer company longevity and extended listing duration correlate with a lower probability of delisting. Established companies benefit from accumulated experience, strong stakeholder relationships, and resilient operational frameworks, which contribute to their enduring presence on the exchange. Literature, such as (Kot, 2011), supports this, highlighting that older companies with a prolonged market presence tend to have more stable financial performance and better adaptability to market changes, thus reducing delisting risk. Agency theory suggests that older, well-established companies have mature governance structures that align management's actions with shareholders' interests, reducing financial distress and delisting likelihood. Stakeholder theory emphasizes the importance of strong relationships with stakeholders, fostering trust and confidence, which contributes to corporate stability and lower delisting risks. Signaling theory proposes that long-established companies send positive signals to the market about their stability and reliability. A lengthy listing duration indicates that a company has successfully navigated various market conditions, signaling to investors that it is well-managed and capable of sustaining its market presence. Bonding theory posits that companies with a long history on the exchange build strong relationships and reputations, fostering stakeholder loyalty and long-term commitment, which act as safeguards against delisting.

Empirical studies further reinforce this finding. Sanger & Peterson (1990) suggest that older companies benefit from more stable cash flow and diversified operations, enhancing their resilience to market fluctuations. Doidge et al. (2017) note that companies with extended listing durations exhibit lower volatility. Bessler et al. (2022) indicate that company age positively correlates with reduced bankruptcy risks.

Another significant determinant is analyst recommendations, particularly the number of analysts recommending a company's shares. With a p-value of < 0.001 and an estimated coefficient of -0.16, this factor shows that more analyst recommendations are significantly associated with a lower probability of delisting (see Table 14). Positive analyst coverage boosts company visibility, investor confidence, and market perception, thus reducing delisting risks (Mehran & Peristiani, 2010). This increased confidence enhances the company's visibility and attractiveness to investors, thus lowering delisting likelihood. Analysts' scrutiny holds management accountable, reducing agency costs and delisting risks (Lins et al., 2002).

On the macroeconomic front, the final model identifies five significant macroeconomic predictors of delisting probability: inflation, the repo rate, credit extensions, unemployment rate, and real economic activity (see Table 14). Compared to the initial model, these factors remained significant, with real economic activity, represented by electricity generation and distribution, emerging as an additional key factor.

The CPI has a p-value of 0.014 and an estimated coefficient of -0.098 (see Table 14). This suggests that higher inflation rates are linked to a lower probability of delisting. Inflation can drive economic activity, increase nominal revenues, and lessen real debt burdens, contributing to financial stability and supporting better financial planning and corporate governance (Garcia & Liu, 1999).

The repo rate shows a p-value of < 0.001 and a coefficient of 0.023 (see Table 14). Higher interest rates increase the probability of delisting by raising borrowing costs and straining financial resources, impacting strategic decision-making and company performance (J. R. Macey & O'Hara, 2002).

Measured by year-on-year percentage change, credit extensions have a p-value of < 0.001 and a coefficient of -0.097. Increased credit availability reduces delisting probability by supporting financial stability and growth, promoting long-term corporate stability.

The unemployment rate in South Africa has a p-value of 0.011 and a coefficient of 0.025 (see Table 14). Higher unemployment rates increase delisting probability, reflecting broader economic challenges that affect companies and investor confidence.

Measured through year-on-year percentage change in electricity generation and distribution, real economic activity has a p-value of < 0.001 and a coefficient of -0.089 (see Table 14). Higher economic activity reduces delisting probability, fostering corporate stability and investor confidence.

Interestingly, while GDP was not a significant predictor, real economic activity measured through electricity usage was, suggesting it as a more immediate indicator of economic activity within South Africa. Local macroeconomic variables like CPI, interest rates, credit extensions, unemployment rates, and real economic activity are crucial in influencing delisting risks, offering a clearer understanding of delisting decisions within the South African context.

5. Conclusions

This paper examined the non-financial and macroeconomic determinants influencing the probability of delisting from the JSE in South Africa, using PCA and a multivariate panel probit regression model. Key non-financial determinants identified included 'governance transparency and independence', 'chairperson qualification', 'diffused ownership', 'institutional influence', 'company longevity', and 'analyst recommendations'. Strong governance practices, such as having a high percentage of independent directors and an independent chairperson, were associated with lower delisting probabilities, likely due to enhanced corporate stability. Similarly, a broader ownership base and significant institutional ownership contributed to reduced delisting risks by potentially promoting balanced governance and reducing the influence of concentrated control. Longer market presence and favourable analyst coverage also played crucial roles in lowering the likelihood of delisting by increasing company visibility and investor confidence.

We also found macroeconomic variables such as 'inflation', 'interest rates', 'credit extensions', 'unemployment rate', and 'real economic activity' to significantly impact delisting probabilities. Higher inflation rates were linked to lower delisting risks, as moderate inflation could support financial stability and better financial planning. Conversely, higher interest rates increased delisting risks by possibly raising borrowing costs and straining financial resources. Increased credit availability potentially enhanced financial stability and reduced delisting probabilities by providing growth opportunities. Higher unemployment rates reflected broader economic challenges that impacted companies, increasing delisting risks. Higher economic activity, measured through electricity generation and distribution, supported corporate stability and investor confidence, thereby reducing delisting probabilities.

Yet, within the context of this research these macroeconomic variables not only potentially influenced financial stability but also had an impact on non-financial factors such as governance transparency, corporate planning, and investor confidence. For instance, stable inflation rates can foster better governance practices by facilitating long-term financial planning, while higher interest rates might challenge strategic decisions impacting corporate governance. Credit availability enhances growth opportunities, which in turn supports institutional influence and company longevity. High unemployment rates can affect stakeholder relationships and corporate reputation, increasing delisting risks. Real economic activity, reflected through electricity generation and usage, provides immediate insights into corporate operations and stability, reinforcing investor confidence.

Several recommendations emerged from our findings. Companies should implement robust governance practices, ensure diverse ownership, and foster strong relationships with institutional investors to reduce delisting risks. Policymakers should aim to maintain moderate inflation, manage interest rates to avoid excessive borrowing costs, and support credit availability to sustain corporate stability. Stimulating economic activity and addressing unemployment are essential to mitigate delisting risks. The JSE could support listed companies by promoting financial health and stability, providing guidance on best practices, and collaborating with policymakers to advocate for macroeconomic stability.

Future research should explore sector-specific non-financial determinants, longitudinal studies tracking companies over time, and the role of corporate governance practices in delisting decisions. Comparative studies across different stock exchanges could help identify unique factors and commonalities influencing delisting decisions globally. Investigating the influence of behavioral factors, such as investor sentiment and management decisions, on non-financial determinants and delisting probability could provide a more comprehensive understanding of delisting dynamics.

Additionally, future studies should focus on the impact of various non-financial strategies and management practices on delisting decisions, offering deeper insights into how these practices affect a company's likelihood of delisting.

This paper contributed to the existing literature by highlighting the importance of non-financial determinants alongside macroeconomic factors in predicting delisting probabilities. By integrating these multifaceted determinants, our paper provided a comprehensive understanding of the factors influencing delisting decisions in the South African context. These findings are valuable for corporate leaders, policymakers, and stakeholders in developing strategies to enhance corporate stability, attract investor confidence, and mitigate delisting risks in financial markets in developing economies.

While this study was set within the South African context, the insights gained are relevant for other stock exchanges and stakeholders in developing economies. Other exchanges can learn from these findings by considering both non-financial and macroeconomic determinants in combination to address the unique challenges and opportunities they experience.

In essence, navigating the dynamic landscape of the stock market required a strategic blend of sound non-financial management and adaptive responses to macroeconomic conditions. Companies that mastered this balance would not only survive but thrive, ensuring their resilience in the face of economic fluctuations and market uncertainties. This comprehensive analysis offered a foundation for developing effective strategies to support corporate stability and investor confidence in the South African market and in those of developing economies. It underscored that resilience in the stock market is a continuous process of adaptation, growth, and strategic foresight, emphasizing the critical role of non-financial determinants in influencing delisting decisions. As we reflect on these insights, it becomes clear that the future of corporate success hinges not only on financial acumen but also on an adept understanding of the multifaceted forces at play.

The challenge for companies now is to transform these findings into actionable strategies, ensuring they remain stalwart players in an ever-evolving market landscape. Our journey towards sustained market presence and financial stability is a continuous process, filled with adaptation, growth, and strategic foresight. By understanding and integrating these multifaceted determinants, companies can truly thrive in the dynamic environment of global finance.

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