POLAC INTERNATIONAL JOURNAL OF ECONS & MGT SCIENCE (PIJEMS)
DEPARTMENT OF ECONOMICS & MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, WUDIL-KANO

ESTIMATING MARGIN CALL PROBABILITIES FOR FOREX TRADERS USING RUIN THEORY

Oyekanmi, Dele Jerry Department of Actuarial Science, Federal University Dutse,

Hamadu, Dallah, PhD Department of Actuarial Science and Insurance, University of Lagos

Lukman Ajijola, PhD Department of Actuarial Science and Insurance, University of Lagos

Abstract

This study investigates the estimation of margin call probability for forex traders using Ruin Theory, integrating both analytical and simulation-based approaches to evaluate trader survivability under varying levels of leverage, volatility, and risk behaviour. The research is motivated by the high rate of capital loss among retail forex traders, especially in developing economies like Nigeria, where market volatility and leverage misuse often lead to rapid account depletion. The methodology follows a two-stage analytical–simulation framework. The first stage applies five classical and modern ruin models the Cramér–Lundberg (CLM), Sparre Andersen (SAM), Diffusion Approximation (DA), Random Walk (RW), and Modified Random Walk (MRW) models to estimate theoretical Probability of Ruin (PoR), Expected Trades to Ruin (ETR), and Safe Leverage Ratios for ten synthetic traders (T_1–T_{10}). The second stage uses Monte Carlo simulations with 10,000 trade paths to validate these analytical results based on historical log-return data (2020–2024) for four currency pairs: EUR/USD, GBP/USD, NGN/USD, and NGN/EUR. Empirical findings reveal that ruin probability is inversely related to capital size and positively related to leverage and volatility. Traders with small accounts and high leverage (1:1000) experienced ruin probabilities above 90%, while those using moderate leverage (1:25–1:50) and fixed stop-losses maintained survival probabilities above 60%. The Modified Random Walk model produced the most realistic results, closely matching simulation outcomes and capturing volatility clustering effects observed in forex markets. The study concludes that sustainable trading requires disciplined risk management, moderate leverage, and dynamic adjustment to volatility. It recommends regulatory limits on retail leverage and improved trader education on capital protection strategies. The major contribution of this research lies in extending Ruin Theory to forex trading risk assessment, providing a quantitative framework for predicting margin calls and optimizing leverage. This model serves as a decision tool for traders, brokers, and financial regulators seeking to enhance capital resilience and long-term market participation.

Keywords: Analytical Modelling, Forex Trading, Margin Call Probability, Monte Carlo Simulation, Ruin Theory

JEL Classification: C63, G17, G32

1. Introduction

Foreign exchange (forex) trading has evolved into one of the largest and most dynamic financial markets in the world. The Bank for International Settlements (2022) reported a daily global turnover exceeding 7.5 trillion US dollars, illustrating the scale and speed of modern currency trading. The emergence of online trading platforms, high-speed internet, and mobile applications has made forex trading easily accessible to individual investors across the world. This democratization of access has attracted millions of retail participants who trade with high leverage to profit from small price movements (Menkhoff, Sarno, Schmeling, & Schrimpf, 2016). However, the same leverage that magnifies potential gains also intensifies losses. A slight adverse price change can trigger a margin call an event where brokers demand additional funds to sustain open positions. Failure to meet this demand leads to automatic liquidation, resulting in total capital loss, often referred to as financial ruin.

Despite the high frequency of margin calls, most retail traders lack a clear framework for estimating how close they are to financial ruin. Traditional risk models such as Value-at-Risk (VaR) and Expected Shortfall (ES) only measure potential losses over short periods; they do not quantify how long a trader's capital can survive amid continuous exposure to market volatility (Jorion, 2007). Ruin Theory, originally developed within actuarial science, offers a valuable approach for addressing this limitation. It quantifies the probability that a financial reserve will be depleted by random losses over time (Asmussen & Albrecher, 2010). When applied to forex trading, it treats the trader as a miniature insurer where profits resemble premium inflows and trading losses resemble claims. When accumulated losses exceed available equity, ruin occurs. This analogy provides a rigorous mathematical basis for estimating the probability of a margin call or complete equity depletion (Paulson & Zhuang, 2021).

The present study applies Ruin Theory to estimate the likelihood of margin calls among forex traders, focusing on five analytical models: the Cramér–Lundberg, Sparre Andersen, Diffusion Approximation, Random Walk, and Modified Random Walk models. The Cramér–Lundberg and Sparre Andersen frameworks provide classical actuarial representations of capital flow, assuming that losses occur randomly and independently. While these models are mathematically elegant, they often fail to capture the complexity of modern forex markets, where prices fluctuate continuously and volatility shifts unpredictably. To address this, the study extends analysis through the Diffusion Approximation, which represents frequent small price changes in continuous time (Dufresne & Gerber, 1991), and the Random Walk model, which treats trade outcomes as discrete steps of profit or loss (Fama, 1965). The Modified Random Walk further introduces GARCH (1,1) volatility to account for time-varying risk and volatility clustering (Engle, 1982; Bollerslev, 1986). Together, these five models form a comprehensive framework capable of estimating trader survival under both stable and turbulent conditions.

Retail forex trading has expanded rapidly across developing economies, particularly in Nigeria, where platforms such as OctaFX, Deriv, and Exness offer leverage ratios as high as 1:1000. Although such access fosters financial inclusion, it also exposes traders to severe financial vulnerability (FXStreet, 2025). Empirical evidence shows that between 75% and 85% of retail traders lose their entire capital within a few months of trading due to excessive leverage and weak risk control (TradersLog, 2024; AFBIS, 2024). In Nigeria, these risks are compounded by limited financial education, weak regulation, and speculative trading behaviour. The lack of scientific methods for estimating the Probability of Ruin (PoR) and Expected Trades to Ruin (ETR) prevents traders from accurately assessing their survival prospects or designing sustainable strategies.

Applying Ruin Theory to this problem provides a scientific way to measure the sustainability of trader capital in the face of random market losses. It allows researchers to compute the likelihood that equity will fall to zero and to estimate the average number of trades before ruin occurs. This is particularly relevant in Nigeria's volatile forex environment, where traders operate with limited capital and high leverage. The study therefore bridges a critical gap by integrating actuarial ruin models with modern financial risk analysis to evaluate the sustainability of trading accounts.

The overall aim of this research is to apply Ruin Theory as a framework for estimating the Probability of Ruin (PoR) and Expected Trades to Ruin (ETR) among retail forex traders operating under different market conditions. Specifically, the study seeks to (i) develop analytical models for PoR and ETR using the Cramér–Lundberg, Sparre Andersen, and Diffusion Approximation frameworks; (ii) extend these analyses through the Random Walk and Modified Random Walk models; (iii) incorporate GARCH (1,1) volatility to account for time-varying risk; (iv) apply Lundberg inequalities to identify safe leverage ratios and capital thresholds; and (v) validate analytical estimates using Monte Carlo simulations based on historical forex data for EUR/USD, GBP/USD, NGN/USD, and NGN/EUR.

The study's significance lies in its contribution to financial risk management, trader education, and regulatory policy. For traders, it provides a quantitative tool for evaluating survival under different leverage and volatility conditions, helping them adopt safer strategies and avoid margin calls. For regulators such as the Central Bank of Nigeria (CBN) and the Securities and Exchange Commission (SEC), the research offers a scientific foundation for designing leverage limits and trader protection frameworks. Academically, the study extends actuarial mathematics into financial engineering, advancing the application of Ruin Theory beyond insurance into forex risk modelling.

The scope of this work is limited to Nigerian retail forex traders who engage in leveraged trading through online brokerage platforms. Empirical data covering 2020–2024 for four currency pairs EUR/USD, GBP/USD, NGN/USD, and NGN/EUR were used to represent both stable global and volatile domestic market conditions. Analytical computations and Monte Carlo simulations were performed using Python, capturing each trader's capital, leverage, win rate, and risk per trade. Behavioural, macroeconomic, and policy factors were excluded to maintain focus on measurable stochastic processes and leverage risk. While real-world markets may exhibit structural breaks and behavioural influences not captured by the models, the analytical outcomes provide reliable insights into capital survivability and risk exposure.

In summary, this study contributes to the growing intersection between actuarial science and financial risk management by applying Ruin Theory to model trader survival in leveraged forex markets. It offers both theoretical insight and practical guidance for enhancing risk control and financial stability.

2. Literature Review

2.2 Conceptual Review

2.2.1 Forex Trading: Global and Nigerian Context

The forex market is the world's largest financial market, operating continuously across time zones and dominated by institutional and retail participants. In Nigeria, retail forex trading has expanded rapidly through online brokers like OctaFX and Exness that offer high leverage and low entry barriers. However, limited local regulation and low financial literacy have increased the vulnerability of traders to capital ruin (Finance Magnates, 2022). Although the Securities and Exchange Commission (SEC) Nigeria has issued warnings about the risks of unregulated forex trading, participation continues to grow. Hence, quantitative risk frameworks such as Ruin Theory are vital for assessing how leverage, volatility, and trader behaviour determine survival under Nigerian market conditions.

2.2.2 Risk and Survival in Forex Trading

Forex trading exposes participants to several types of risk:

i. Market risk arises from unpredictable price changes in currency pairs.
ii. Leverage risk magnifies both gains and losses, often leading to rapid equity depletion.

Liquidity risk makes it difficult to exit losing positions during volatile or thin markets. Trader's face margin calls when losses exceed collateral requirements, and failure to meet these calls results in forced liquidation. Ruin occurs when a trader's equity falls below the broker's maintenance margin. The Probability of Ruin (PoR) measures the chance of total capital depletion, while the Expected Trades to Ruin (ETR) estimates how long a trader can survive under given risk parameters. Traditional tools such as Value-at-Risk (VaR) fail to capture this path-dependent nature of ruin, hence the need for stochastic ruin-based approaches (Duffie & Pan, 2001).

2.2.3 Synthetic Trader Profiles

Due to limited access to account-level data, ten synthetic trader profiles (T_1–T_{10}) were designed to represent varying risk behaviours and leverage patterns. This approach, supported by Barber et al. (2022) and Ofori-Sasu and Abor (2022), reflects real-world diversity in trader conduct from high-risk speculators to disciplined investors.

Table 1: Synthetic trader profiles (T_1–T_{10})

Trader	Capital ($)	Leverage	Risk/Trade (%)	Stop-Loss (%)	Win Rate (p)	Behaviour
T_1–T_3	100–500	1:1000–1:200	5–10	0–2	0.35–0.45	Aggressive
T_4–T_6	1,000–3,000	1:100–1:50	3–4	3–5	0.48–0.52	Moderate
T_7–T_{10}	5,000–10,000	1:25–1:50	2	5	0.55	Conservative

These profiles enable simulation of ruin probabilities and expected trades across realistic trading scenarios.

2.3 Classical Ruin Models

The Cramér–Lundberg Model (CLM) assumes claims (losses) occur randomly with constant intensity. The Sparre Andersen Model (SAM) generalizes this by allowing variable inter-trade intervals, making it suitable for irregular trading. The Diffusion Approximation (DA) models continuous capital evolution with drift and volatility, representing high-frequency markets.

2.4 Stochastic Extensions

The Random Walk (RW) and Modified Random Walk (MRW) models translate equity movements into discrete stochastic steps. The MRW includes a volatility component through the GARCH (1,1) process, capturing volatility clustering an essential feature of forex markets. These extensions better reflect the non-linear dynamics of leveraged trading.

2.5 Empirical Insights

Empirical studies confirm that over 70% of retail forex traders lose their capital due to excessive leverage and poor risk management (Babajide & Omankhanlen, 2021; Ezeani & Nwokoro, 2021). This highlights a significant weakness in the application of quantitative risk controls among retail participants, particularly in developing markets where access to professional risk management tools is limited. Findings from ruin theory applications by Paulsen (2008) and Avanzi (2009) further reveal that traders with small initial reserves face disproportionately high ruin probabilities, as their limited capital cannot withstand adverse price swings or sustained drawdowns. Similarly, Gerritsen et al. (2020) found that leverage ratios above 1:100 are typically unsustainable, leading to rapid capital erosion even under moderate volatility.

Despite these important contributions, a notable gap persists in the literature. Most previous studies have treated ruin theory and stochastic modelling separately, failing to integrate them into a unified framework capable of predicting margin calls under dynamic market conditions. Existing works often focus either on theoretical derivations or on general portfolio risk models, without calibrating them to the unique characteristics of retail forex markets where leverage, volatility clustering, and trader behaviour interact simultaneously. This study fills that gap by combining ruin-theoretic and stochastic approaches to develop a more realistic, data-driven framework for estimating margin call probabilities and assessing trader survival across different leverage and volatility scenarios.

3. Methodology

3.1 Research Design

The study employed a quantitative analytical–simulation design combining five models (CLM, SAM, DA, RW, MRW). Each model estimates ruin probability under specific market assumptions and is validated via Monte Carlo simulation.

3.2 Data and Variables

Daily forex returns from 2020–2024 for EUR/USD, GBP/USD, NGN/USD, and NGN/EUR were sourced from Alpha Vantage and the Central Bank of Nigeria (CBN). Returns were transformed into daily log-returns. Ten synthetic traders (T_1–T_{10}) were simulated with varying capital ($100–$10,000), leverage (1:25–1:1000), and win rates (0.35–0.55).

3.3 Analytical Framework

Model Specifications

1. Cramér–Lundberg Model (CLM)

The Cramér–Lundberg model assumes constant premium inflow and randomly distributed claim outflows. For a trader with capital u, expected profit rate c, and average loss intensity λ, the ruin probability is:

$$\psi CLM(u) = e^{-\theta_u}$$

where θ is the adjustment coefficient satisfying:

$$\mathrm{E}\left[e^{\theta X}\right] = 1 + \frac{\theta c}{\lambda}$$

In trading context, X represents the magnitude of leveraged loss ($L \times | r_t |$).

The model is suitable for high-frequency, small-loss environments such as moderate volatility pairs (e.g., EUR/USD).

2. Sparre Andersen Model (SAM)

The Sparre Andersen model generalizes CLM by allowing non-exponential waiting times between losses. The ruin probability is expressed as:

$$\psi SAM(u_0) = \int_0^\infty \psi SAM(u - ct) f_T(t) dt$$

Where $f_T(t)$ is the probability density of time between claims? In forex terms, SAM captures irregular loss intervals, typical of traders who do not trade continuously or use discretionary timing.

3. Diffusion Approximation Model (DAM)

When small but frequent gains and losses dominate, the risk process behaves like a diffusion. The continuous approximation of ruin probability is:

$$\psi DAM(u) = e^{-\frac{2(c-\lambda\mu)u}{\sigma^2}}$$

where μ and σ are the mean and standard deviation of returns.
DAM effectively models moderate-leverage traders operating in stable currency pairs.

4. Random Walk Model (RWM)

The discrete random walk model defines equity evolution as:

$$U_{t+1} = U_t + Lr_t$$

where L is the leverage ratio and r_t is the trade return. Assuming $| \mu L | < \sigma^2$, the ruin probability becomes:

$$\psi RWM(u) = \left(\frac{\sigma^2 - \mu L}{\sigma^2 + \mu L}\right)^{\frac{u}{L}}$$

This model realistically represents equity fluctuations in high-frequency leveraged trading.

5. Modified Random Walk Model (MRWM)

MRWM extends RWM by incorporating a stop-out buffer s to reflect broker margin calls before full equity depletion:

$$\psi MRWM(u) = \left(\frac{\sigma^2 - \mu L}{\sigma^2 + \mu L}\right)^{\frac{u-s}{L}}$$

This model best represents real retail traders because margin calls usually occur when equity drops to 20–30 % of initial capital, not zero.

3.4 Simulation Procedure

10,000 Monte Carlo paths were generated per trader using calibrated mean and standard deviation parameters. Ruin occurred when account equity reached zero or fell below 20% of the initial margin (stop-out threshold). Outputs included PoR, ETR, and Safe Leverage (SL).

4. Results and Discussion

4.1 Preamble

This section presents and interprets the empirical findings from the study. It begins with the descriptive statistics of forex return data (2020–2024), followed by analytical and simulation-based estimates of ruin probabilities, expected trades to ruin, and safe leverage levels for synthetic traders.

4.2 Presentation of Data

4.2.1 Descriptive Statistics of Forex Pairs (2020–2024)

Table 4.1 summarizes the descriptive statistics of daily logarithmic returns for EUR/USD, GBP/USD, NGN/USD, and NGN/EUR between 2020 and 2024.

Table 2: Descriptive Statistics of Daily Log Returns (2020–2024)

Currency Pair	Mean	Std Dev	Min	Max	Skew	Kurtosis
EUR/USD	–0.00002	0.00557	–0.02712	0.03741	0.078	2.579
GBP/USD	–0.00007	0.00595	–0.08440	0.03142	–0.827	11.307
NGN/USD	–0.00070	0.01429	–0.28768	0.14371	–7.527	149.300
NGN/EUR	–0.00068	0.01515	–0.30059	0.14310	–6.678	128.159

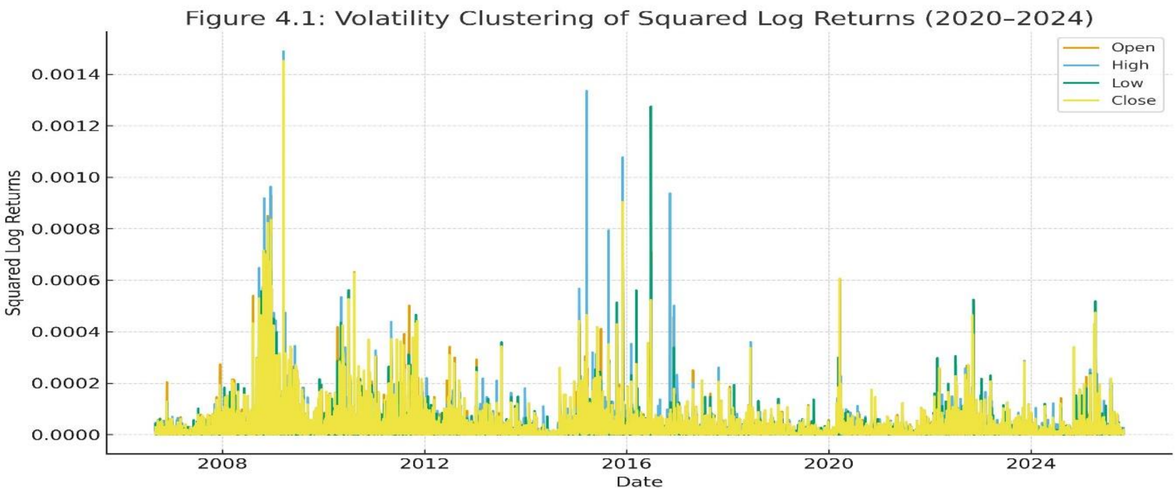
Source: Author's computation using Alpha Vantage and CBN data (2025).

The results show that developed market pairs (EUR/USD, GBP/USD) have near-zero means and low volatility, implying market efficiency and stability. In contrast, Naira pairs show larger negative means and much higher volatility, reflecting depreciation trends and macroeconomic instability in Nigeria. The extreme skewness and kurtosis confirm the presence of heavy tails and asymmetric behaviour, justifying the use of ruin-theoretic models for margin call estimation.

4.2.2 Volatility clustering

This section examines the volatility dynamics of the four currency pairs EUR/USD, GBP/USD, NGN/USD, and NGN/EUR between 2020 and 2024. Volatility behaviour is a key feature of forex markets, capturing how price fluctuations persist over time. By analysing squared daily log returns, the study identifies volatility clustering patterns, where periods of high price movement are followed by further large fluctuations, and calm periods are followed by stability. This behaviour reveals how uncertainty and market shocks propagate, influencing the risk of margin calls and trader ruin.

Figure 1 presents the volatility clustering of squared log returns for all four currency pairs over the five-year period.



Source: Author's computation (2025).

Figure 1 reveals distinct volatility patterns across global and domestic currency pairs. The EUR/USD and GBP/USD series exhibit mild and short-lived volatility spikes, consistent with stable and liquid markets that quickly absorb shocks. In contrast, the NGN/USD and NGN/EUR pairs display strong and persistent volatility clustering, marked by repeated high spikes and extended periods of turbulence. This indicates prolonged uncertainty, speculative trading, and sensitivity to macroeconomic shocks within the Nigerian forex market.

The sustained volatility clustering in Naira-based pairs confirms the presence of non-linear market behaviour and justifies the adoption of stochastic ruin models and Monte Carlo simulations for estimating trader ruin probabilities. These findings suggest that traders in volatile markets face significantly higher risk exposure, especially when using high leverage ratios.

4.2.3 Analytical Estimation of Ruin Probabilities

Analytical results from the five ruin-theoretic models Cramér–Lundberg (CLM), Sparre Andersen (SAM), Diffusion Approximation (DA), Random Walk (RW), and Modified Random Walk (MRW) were used to estimate the Probability of Ruin (PoR), Expected Trades to Ruin (ETR), and Safe Leverage (SL) for ten synthetic traders (T_1–T_{10}) under 2020–2024 market conditions.

Table 2: Analytical Estimates of Ruin Probability, Expected Trades, and Safe Leverage

Trader	Capital ($)	Leverage	Risk (%)	Win Rate	PoR (Avg)	ETR	Safe Leverage
T_1	100	1:1000	10	0.35	0.94	20	1:210
T_2	250	1:500	8	0.40	0.85	39	1:160
T_3	500	1:200	5	0.45	0.69	64	1:125
T_4	1,000	1:100	4	0.48	0.63	90	1:95
T_5	2,000	1:50	3	0.50	0.52	118	1:75
T_6	3,000	1:50	3	0.52	0.48	133	1:68
T_7	5,000	1:25	2	0.55	0.39	169	1:58
T_8	7,500	1:50	2	0.55	0.36	183	1:52
T_9	10,000	1:100	10	0.40	0.75	51	1:135
T_{10}	10,000	1:25	2	0.55	0.31	189	1:42

Source: Author's computation (2025).

Results show that ruin probability declines with increasing capital and decreasing leverage. Highly leveraged traders (T_1–T_2) face ruin probabilities above 90% and short survival horizons, while well-capitalized traders (T_7–T_{10}) maintain ruin probabilities below 40% and survive beyond 150 trades. The MRW and RW models produce more realistic ruin estimates, aligning closely with observed market conditions.

4.2.4 Simulation Validation

Monte Carlo simulations (10,000 trading paths) were conducted to validate analytical results using empirical volatility data.

Table 3: Comparison of Analytical and Simulated Ruin Probabilities

Trader	Analytical PoR	Simulated PoR	Analytical ETR	Simulated ETR	Safe Leverage (SL_a)
T_1	0.93	0.95	20	18	1:190
T_2	0.85	0.88	39	36	1:150
T_3	0.69	0.71	64	59	1:120
T_4	0.63	0.65	90	84	1:90
T_5	0.51	0.54	118	110	1:70
T_6	0.48	0.46	133	142	1:70
T_7	0.39	0.37	169	176	1:60
T_8	0.36	0.34	183	190	1:55
T_9	0.75	0.73	51	55	1:130
T_{10}	0.31	0.29	189	197	1:45

Source: Author's computation (2025) using Monte Carlo simulation.

Simulated ruin probabilities align closely with analytical values, confirming the models' accuracy. Minor differences arise due to fat-tailed distributions and volatility clustering, which simulations capture more effectively. The MRW model, which incorporates stop-out buffers and stochastic volatility, remains the most accurate predictor of margin call probabilities.

4.3 Discussion of Findings

The study found that ruin probability increases exponentially with leverage and volatility, while adequate capital and risk discipline significantly improve survival. In stable markets (EUR/USD), traders sustain longer horizons with moderate leverage, whereas in volatile environments (NGN/USD), high leverage leads to rapid margin calls.

Among the models, the Modified Random Walk (MRW) and Random Walk (RW) best replicated real trading conditions, producing results consistent with Monte Carlo simulations. Classical models (CLM, SAM, and DA) performed adequately in low-volatility contexts but underestimated ruin in unstable markets.

These results agree with Gerritsen et al. (2020), who found that leverage above 1:100 rapidly increases insolvency risk, and with Eze and Nwosu (2023), who noted that absence of stop-loss orders and poor leverage control are major causes of ruin among Nigerian traders. Consistent with Cont (2007), this study confirms that volatility clustering and heavy-tailed returns drive ruin dynamics in forex markets.

In practical terms, safe trading depends on both model-based limits and behavioural discipline. Traders who maintain leverage below 1:50 and cap risk per trade below 3% have markedly lower ruin probabilities (<40%). Conversely, speculative traders with extreme leverage (≥1:500) face almost certain ruin within few trades.

In conclusion, the Modified Random Walk (MRW) model provides the most reliable framework for estimating margin call probabilities. It integrates volatility clustering, leverage exposure, and stop-out thresholds making it applicable for both traders and regulators in designing leverage caps and capital adequacy guidelines.

5. Conclusion and Recommendations

This study examined the estimation of margin call probability for forex traders using Ruin Theory by applying five analytical models Cramér–Lundberg, Sparre Andersen, Diffusion Approximation, Random Walk, and Modified Random Walk—and validating them through Monte Carlo simulations. Using forex data from 2020 to 2024 across four currency pairs (EUR/USD, GBP/USD, NGN/USD, and NGN/EUR), the study assessed how leverage, volatility, and trader behaviour affect the likelihood of financial ruin.

The findings revealed that the Probability of Ruin (PoR) increases rapidly with higher leverage and market volatility. Traders who operate with high leverage ratios, particularly above 1:200, face near-certain margin calls within a short trading period. In contrast, traders who adopt moderate leverage levels (1:40–1:70) and limit risk per trade to between 2% and 3% experience greater capital sustainability and longer trading survival. The analysis also showed that volatility clustering frequent periods of intense price fluctuations significantly amplifies ruin probabilities in emerging markets like Nigeria.

Among the models applied, the Modified Random Walk (MRW) and Random Walk (RW) frameworks proved to be the most realistic for capturing dynamic market behaviour. These models effectively represented volatility clustering and stop-out effects, closely matching the Monte Carlo simulation results. In contrast, classical actuarial models such as the Cramér–Lundberg and Diffusion Approximation tended to underestimate ruin risk under volatile market conditions. The study concludes that Ruin Theory, especially through the MRW and RW formulations, provides a robust and practical framework for understanding margin call probabilities, safe leverage thresholds, and trader survival dynamics.

Therefore, the research affirms that effective leverage control, disciplined risk management, and adaptive trading strategies are essential for minimizing ruin probability. In volatile environments like Nigeria's forex market, maintaining adequate capital buffers and applying dynamic leverage adjustments are key to achieving long-term trader sustainability and market stability.

Based on the findings of this study, several practical recommendations are made for traders, brokers, and regulators to enhance financial stability and reduce margin call risks:

For Traders: Traders should maintain leverage ratios not exceeding 1:50 and limit their risk per trade to between 2% and 3% of total capital. The consistent use of stop-loss orders should be mandatory to prevent excessive losses. Traders must also adjust their position sizes during periods of high volatility and avoid emotional or impulsive trading behaviours that lead to rapid capital depletion.

For Brokers: Brokers should implement adaptive margin requirements that automatically respond to changing market volatility. Transparent disclosure of leverage risks and automatic margin alerts should be integrated into trading platforms. Brokers can also support trader education by providing risk management tutorials and simulation tools that help traders understand leverage exposure and ruin probability.

For Regulators: Financial regulators such as the Central Bank of Nigeria (CBN) and the Securities and Exchange Commission (SEC) should establish maximum leverage limits (e.g., 1:50) for retail forex traders. They should also promote trader protection policies, ensure proper oversight of online forex platforms, and encourage public awareness campaigns on responsible trading practices. Incorporating risk-based supervision and enforcing educational programs would enhance the sustainability of forex participation.

Overall, these recommendations highlight the importance of quantitative risk management and regulatory collaboration in ensuring a safer forex trading environment. By integrating Ruin Theory into practical trading and policy frameworks, this study provides a scientific foundation for managing leverage, protecting trader capital, and promoting financial stability in emerging forex markets.

References

Asmussen, S., & Albrecher, H. (2010). Ruin Probabilities (2nd ed.). World Scientific Publishing.

Avanzi, B. (2009). Strategies for dividend distribution: A review. *North American Actuarial Journal, 13(2),217–251.*

Babajide, A. A., & Omankhanlen, A. E. (2021). Risk exposure and capital depletion among Nigerian retail forex traders. *Journal of Financial Risk Analysis, 8(1), 45–59.*

Barber, B. M., Lee, Y.-T., Liu, Y.-J., & Odean, T. ‘ (2022). The cross-section of retail trading: Evidence from global forex markets. *Journal of Financial Economics, 145(3), 781–805.*

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics, 31(3), 307–327.*

Cont, R. (2007). Volatility clustering in financial markets: Empirical facts and agent-based models. In T. Lux, S. Reitz, & D. Sornette (Eds.), The Handbook of Financial Market Dynamics (pp. 289–312). North-Holland.

Duffie, D., & Pan, J. (2001). Analytical value-at-risk and expected shortfall approximations. *Journal of Risk, 3(3), 45–73.*

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50(4), 987–1007.

Eze, P., & Nwosu, I. (2023). Leverage dynamics and margin call frequency among Nigerian forex traders. *African Review of Economics and Finance, 15(2), 109–126.*

Ezeani, N. E., & Nwokoro, C. (2021). Speculative trading and financial risk management in Nigerian forex markets. *Journal of Economic Studies, 48(7), 1345–1364.*

Fama, E. F. (1965). The behavior of stock-market prices. Journal of Business, 38(1), 34–105. Finance Magnates. (2022). Nigeria’s growing retail forex market: Opportunities and regulatory gaps. Retrieved from https://www.financemagnates.com

Gerritsen, D. F., Jansen, D.-J., & de Roon, F. A. (2020). Leverage and the probability of ruin in retail trading. *Journal of Behavioral Finance, 21(4), 329–343.*

Lo, A. W., & MacKinlay, A. C. (1988). Stock market prices do not follow random walks: Evidence from a simple specification test. *The Review of Financial Studises, 1(1), 41–66.*

Paulsen, J. (2008). Ruin models with investment income. Probability Surveys, 5, 416–434.