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Financial Derivatives Use and Risk Management among Selected Listed Companies in Rwanda Stock Exchange

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Abstract
Financial derivative instruments play a crucial role in enhancing risk management and improving firm performance. This study examined the relationship between financial derivatives and risk management among companies listed on the Rwanda Stock Exchange. It specifically assessed the effects of options, futures, and swaps on risk management using descriptive and correlational research designs. Data were gathered from 47 staff members in the risk department of Bank of Kigali branches in Kigali. Analysis using SPSS included means, correlations, and regressions. Results showed that options, futures, and swaps were frequently used by 23.4%, 51.1%, and 25.5% of respondents, respectively, with over 80% acknowledging their role in hedging risks. The study found swaps had a positive significant effect on risk management (β=0.371, p=0.009), while options and futures had positive but insignificant effects. It concluded that Rwanda's derivatives market remains underdeveloped and recommended awareness campaigns to promote greater use of financial derivatives in managing risk.

Keywords: Financial Derivative, Risk Management, Listed Companies Options, Futures, Swaps.

1 Introduction

Globalization has intensified competition in the financial sector, exposing firms to a wide range of operational risks. This evolving macroeconomic landscape marked by volatile interest and exchange rates requires banks globally, including in Rwanda, to continually adapt to safeguard and improve performance (MacCarthy, 2017). According to Fadun (2013), risk is inherent in all business operations, yet it is particularly pronounced in money market institutions compared to those in the product markets. This underlines the necessity for financial firms to hedge risks strategically to maintain profitability and stability. The history of financial derivatives stretches back centuries. As early as the 17th century, futures contracts were used for rice trading, while Greeks employed forward contracts to secure corn from Egypt 30 centuries ago. Modern derivatives markets gained traction with the establishment of the Chicago Board of Trade in 1848 and the Chicago Board Options Exchange (CBOE) in 1973, which pioneered organized trading of standardized options (Hull, 2006). In Africa, the Johannesburg-based South African Futures Exchange was established in 1988. Derivatives such as futures, options, and swaps derive their value from underlying assets, offering firms mechanisms to hedge financial risks (Pandy, 2005).

Studies worldwide affirm the benefits of derivatives. Wayne (2009) found that firms using derivatives experienced a 5% drop in stock return volatility, a 22% reduction in interest rate exposure, and an 11% decline in foreign exchange risk. Meryvn (2010) showed that exchange-traded derivatives' standardization reduces counterparty risk, while Muff (2008) found that firms with high growth opportunities and tax obligations are more inclined to use currency derivatives. In East Africa, research by Kamenchu (2013) and Njoroge (2013) revealed that forward contracts and swaps dominate hedging practices, though overall adoption remains hindered by regulatory gaps and

limited market depth. Similarly, Nzuki (2010) observed that oil companies in Kenya hedge crude price volatility with hybrid derivatives.

In Rwanda, derivatives markets are relatively new and underdeveloped. Derivative trading was formally adopted in 2014, yet it remains characterized by low participation, partly due to limited expertise, perceived risks, and reliance on simpler, non-derivative instruments (Nyabirande, 2018). This study focuses on listed firms given the greater transparency and data accessibility.

1.1 Problem Statement

Effective risk management is critical to the financial performance and long-term success of firms. Rwanda's banking sector, experiencing growing competition from both banks and non-bank financial institutions, faces heightened risks that challenge profitability and stability (BNR Reports). While derivatives are widely used for hedging in developed economies, their adoption in developing countries like Rwanda has been slow. Since the Ministry of Finance introduced derivative instruments in 2014, market uptake has been sluggish, compounded by banks' preference for non-derivative risk controls and skepticism around derivatives' complexity and perceived counterparty risks (Nyabirande, 2018). Yet, derivatives offer unique advantages: they hedge risks off the balance sheet, preserving asset-liability structures while managing exposures more flexibly and often at lower costs. Despite these benefits, limited local adoption has left Rwandan banks exposed to volatility, threatening performance. This study therefore investigates how derivatives contribute to risk management and financial performance in listed Rwandan firms.

1.2 Objectives of the Study

This study aims to demonstrate the role of financial derivatives in risk management among listed companies in Rwanda. Its specific objectives are to:

i. Examine whether the efficiency of using option derivatives affects the financial performance of companies listed on the Rwanda Stock Exchange.

ii. Establish if swaps derivatives influence the financial performance of these companies.

iii. Determine how futures derivatives impact the financial performance of firms listed on the Rwanda Stock Exchange.

2. Literature Review

2.1 Empirical Literature

The primary rationale for employing financial derivatives is to hedge against risks inherent in volatile financial environments. Numerous studies indicate, however, that while the use of derivatives is extensive in developed markets, it remains underdeveloped in many developing economies. Glen Holman et al. (2013) highlighted that a significant proportion of non-financial institutions in European countries—such as Germany, Italy, Sweden, and the Netherlands—use derivatives for risk hedging, with adoption rates exceeding 60% in Canada and the USA. Sanel and Anida (2014) similarly reported that over 80% of firms in Bosnia and Herzegovina actively use derivatives, reflecting the rapid uptake in both advanced and emerging markets. Sundaram (2012) noted that several Indian exchanges are ranked among the top globally in derivative contract volumes, indicating a robust derivatives culture. In stark contrast, Holman et al. (2013) found that only about 29% of non-financial firms in Africa use derivatives, predominantly in South Africa. Mahmood et al. (2010) in Pakistan revealed that limited knowledge, underdeveloped markets, and reluctance to quantify corporate risk significantly hindered derivatives adoption.

In Nigeria, Olajide (2013) observed growing use of derivatives among financial institutions, driven by needs to hedge against diverse financial risks. Zeph (2012) conducted a survey among Kenyan banks which revealed clear evidence of derivatives recorded in accounting books and linked derivatives use to improved ROA and ROE. Yet, Wanjohi et al. (2017) found minimal derivative use among Kenyan banks, suggesting a gap between potential and actual utilization. Michael (2016), also in Kenya, identified poor trading systems, weak infrastructure, and inadequate regulatory frameworks as major barriers to derivatives market growth, with swaps, forwards, and options mainly traded over-the-counter. In Rwanda, empirical insights are scarce. Nyabirande (2018) found that Rwandan commercial banks seldom use derivatives, preferring simpler non-derivative instruments to hedge financial risks. This underlines that despite the formal introduction of derivative markets in 2014, adoption remains low due to limited market maturity, knowledge gaps, and perceived risks.

2.2 Theoretical Framework

2.2.1 Modern Portfolio Theory (MPT)

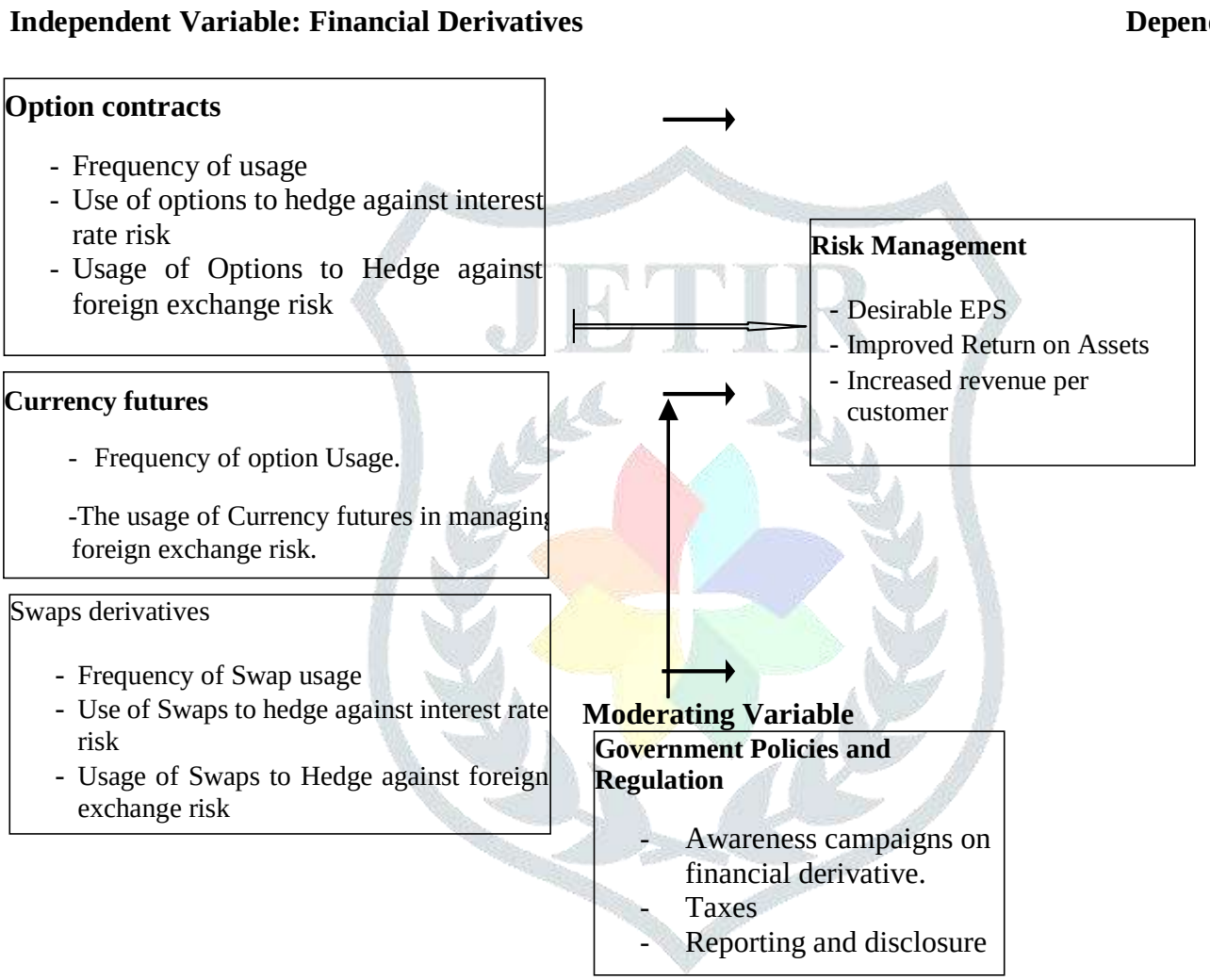
Propounded by Markowitz (1952), Modern Portfolio Theory revolutionized investment analysis by emphasizing that risks and returns should not be viewed in isolation but holistically across a diversified portfolio. MPT argues that diversification allows firms to combine assets whose values move differently, thereby reducing overall risk while maximizing returns (Osayi et al., 2018). This concept strongly supports derivative use, as financial derivatives help firms stabilize prices and hedge specific risks without altering the primary asset structure. Studies by John McCarthy (2017) and Myles (2012) confirm MPT's relevance in examining how derivatives contribute to corporate risk management and performance.

2.2.2 Investment Diversification Theory

Although often integrated with MPT, diversification theories also draw on market timing perspectives. Loughran and Ritter (1995) and Baker and Wurgler (2002) highlighted that firms adjust capital structures in response to market valuations, which impacts long-term debt-equity ratios. By timing markets, firms can mitigate risks and enhance shareholder value. This extends to derivatives, where firms might selectively employ futures or swaps during periods of expected volatility to protect asset values.

2.2.3 Agency Theory

Agency theory, introduced by Jensen and Meckling (1976), explores conflicts between principals (owners) and agents (managers). In risk management, Smith and Stulz (1985) and Mayers and Smith (1987) showed that asymmetries in information and incentives could lead managers either to take excessive risks or to avoid profitable risky projects. Proper hedging strategies including derivatives align managerial decisions with shareholder interests by reducing cash flow volatility, which helps stabilize firm value. Steinberg (2010) stressed that effective internal controls rooted in agency theory also reduce fraud and operational errors, bolstering risk management frameworks in financial institutions.



This framework illustrates how internal control components options, swaps, and futures contracts serve as independent variables influencing risk management, the dependent variable. Government regulatory authorities, which issue licenses and oversee compliance, act as intervening variables shaping this relationship. As proposed by Akintoye (2015), a sound theoretical base ensures the study is anchored in established principles. The framework suggests that effective internal controls via financial derivatives mitigate risks in cash, credit card, and credit sales operations. The model highlights the dynamic interplay among independent, dependent, and intervening variables, ultimately guiding robust risk management practices in Rwanda's banking sector.

3. Research Methodology and Design

3.1 Research Methodology

This study employed a cross-sectional research design integrating both quantitative and qualitative approaches to enable comprehensive analysis and generate inferential statistics. The cross-sectional design was appropriate for capturing how the use of derivatives influences risk management at a single point in time. Quantitative data helped describe patterns numerically, while qualitative insights were drawn from observing practices and behaviors over time. Additionally, the study adopted a correlational research design. As noted by Mugenda and Mugenda (2003), correlational design seeks to describe or predict the degree of association between variables. This was particularly suitable since the study aimed to determine the relationship between financial derivatives and risk management among listed banks on the Rwanda Stock Exchange (RSE). To further capture the extent of derivatives uses, a

descriptive design was also incorporated, making the combined approach both relevant and robust for the study objectives.

3.2 Target Population

According to Cox (2010), the target population refers to the entire group from which data is gathered to draw valid conclusions. For this study, the target population consisted of 101 employees from the 77 branches of Bank of Kigali (BK) in Kigali. These included the chief risk manager and risk department staff distributed across all branches. This group was purposefully selected as they are most knowledgeable about business risks, mitigation strategies, and the implementation of derivative instruments.

Given the study's focus in Kigali, all BK branches within the city were included. The sample size was determined using Slovin's formula: n=N1+N(e)2n = where N=101N = 101N=101 and e=0.05e = 0.05e=0.05, yielding: n=1011+101(0.05)2=69. This ensured a representative yet manageable sample. Purposeful sampling was applied to specifically target individuals well-versed in risk management and internal controls, enhancing the credibility and relevance of the responses obtained.

3.3 Data Collection Methods

Primary data was gathered mainly through semi-structured questionnaires, combining both open-ended and closed-ended items to capture quantitative measures and qualitative insights. Managers and employees involved in risk management and derivatives were the key respondents. The open-ended questions provided deeper context beyond structured responses. To ensure reliability, the instruments were pretested with employees from Bank of Kigali and KCB Rwanda, using a test-retest method. Uniform questions were administered to minimize ambiguity. Cronbach's alpha values demonstrated high internal consistency: options ($\alpha = 0.88$), swaps ($\alpha = 0.85$), and futures contracts ($\alpha = 0.89$), all exceeding the recommended 0.7 threshold (Mugenda & Mugenda, 2003). Validity was established through face validity, ensuring the questionnaire items were clear, relevant, and unambiguous. This was confirmed by seeking feedback from subject experts, following Oluwatayo (2012), to verify the instrument's ability to accurately measure the intended constructs.

3.4 Data Analysis Procedure

Completed questionnaires were coded, organized, and analyzed using Statistical Packages for Social Sciences (SPSS). Descriptive statistics summarized the data through means, frequencies, and percentages, while inferential analysis, including correlation and ANOVA tests, assessed relationships between variables. Visual tools such as tables, pie charts, and graphs, prepared in Microsoft Excel, enhanced interpretability. The ANOVA results produced a p-value of 0.016, which is below the significance level of 0.05, indicating a statistically significant relationship between the use of options, swaps, and futures contracts and risk management practices among banks in Kigali. This reinforced the study's hypotheses on the critical role financial derivatives play in managing institutional risk.

4 Presentation of Findings

The responses received from the findings related to the survey of the three distinctive objectives were examined and rated using the 5-point Likert scale to assign ratings of the questionnaire, where respondents who strongly agreed were given a rate of 5, those who agreed assigned 4, undecided as 3, disagree as 2 and strongly disagree as 1.

4.1 Determination of Effect of Options on Risk Management

Table 4.2 illustrates how the researcher used standard deviation and means to analyze the responses to determine the effect of options in relation to risk management. The result showed that the highest mean values were, 3.56, 3.64, which correspond to Likert scale value of 1. This suggests that the respondents were in agreement that using options can lower risk and enhance financial performance in the Kigali, Rwandan banking sector. The respondents strongly agreed that pricing increases require approvals to prevent income leakage in Rwanda's bank business, as demonstrated by the lowest mean value of 2.42.

Table 1: Options and Risk Management

Options	N	Mean	Std. deviation
1. This bank uses options derivatives more frequent.	54	3.64	1.127
2. Options derivatives enable the bank to hedge against interest rate risks.	54	3.56	1.023
3. Options derivatives enable the bank to hedge against equity risks	54	2.89	1.028
4. Options derivatives enable the bank to hedge against foreign exchange risks.	54	3.16	1.204
5. The use of options derivatives improves the financial performance of this Bank	54	2.42	1.128

The results in table 1 demonstrate that financial performance can be enhanced through risk reduction by the use the Option derivatives among listed companies. This can be by having appropriate option selection and frequent use. There must be tone of strong options displayed by senior management to achieve risk management by prevention, detection and hedging of any risk that can adversely affect financial performance and loss of revenue.

4.2 Response of Futures Contracts on Risk Management

According to the results in Table 4.3, the respondents agreed that the efficacy of Swaps had an effect on the internal control system and revenue collection in the bank business in Kigali, Rwanda. The highest mean values were 3.33 and 2.61, which correlated to a Likert scale value of 2. The majority of respondents agreed that banks are members of recognized safety and health associations, as evidenced by the lowest mean score of 1.96.

Table 2: Futures Derivatives and Risk Management

Risk assessment	N	Mean	Std. deviation
1. This Bank use futures derivatives more frequent	54	2.24	1.063
2. Futures derivatives enable the bank to hedge against equity risks.	54	2.44	1.110
3. Futures derivatives enable the bank to hedge against interest rate risks	54	2.61	1.106
4. futures derivatives enable the bank to hedge against Foreign exchange risks	54	3.33	1.046
5. The use of futures derivatives improves the financial performance of this Bank.	54	1.96	0.823

The results of mean and standard deviation in table 4.3 illustrates that Bank management must embark on adoption of currency futures to hedge on related transactions as an approach to risk management such as frauds and errors pertaining to cash and credit cards payments. Further, management must ensure that the reputation of the Bank is not compromised by not implementing the laid down policies and procedures on risk management.

4.3 Swaps Derivatives use on Risk Management

The highest mean values were 3.22 and 2.48, which matched a Likert scale value of 3. This indicates that respondents agreed that using swaps improved financial performance and reduced risk for Rwandan listed companies. The lowest mean value, 1.78, showed that a sizable portion of respondents concurred that swaps should be properly and successfully distributed to both customers and staff. Banks have computerized accounting systems that are integrated to improve the quality of risk management controls, according to more than half of respondents.

Table 3: Future Contract and Risk Management

Use of Swaps in risk management	N	Mean	Std. deviation
1. This Bank use swaps derivatives more frequent	54	2.15	0.960
2. This Bank use swaps derivatives more frequent	54	2.20	1.122
3. Swaps derivatives enable the bank to hedge against interest rate risks.	54	3.22	1.283
4. Swaps derivatives enable the bank to hedge against foreign exchange risks	54	1.78	0.883
5. The use of Swaps derivatives improves the financial performance of this Bank.	54	2.48	1.342

It is clear that certain Kigali-based listed banks had set up, started, and utilized swaps, with a focus on currency swaps. However, the complete dissemination of information was not implemented, which led to mistakes in risk management.

4.4 Effect of Internal Control System Process on Risk Management

To ascertain the relationship between awareness and risk management in a subset of banks in Kigali, Rwanda, the researcher performed a regression study. Tables 4.5 and 4.6 provided illustrations of the findings.

Table 44: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.992[a]	.985	0.940	.038274

a. Predictors: (Constant), Options, Swaps, futures

Table 4.5 data showed a R square of 0.985, meaning that the usage of options, swaps, and futures accounts for 98.5% of the variances in Kigali banks' risk management. 1.5% was made up of the other elements that were not included in the model.

Table 5: Analysis ofVariance (ANOVA)

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.0961	3	0.032	21.875	0.016[b]
	Residual	0.0015	1	0.001		
	Total	0.0976	4			

a. Dependent Variable: Financial derivative use

b. Predictors: , Swaps ,futures, Options

Table 6: Coefficient Determination

	Coefficients				
	B	Standard Error	Beta	T	Sig.
(Constant)	4.777	4.186	-0.236	1.141	0.000
Options	-0.250	0.903	0.048	-0.277	0.828
Risk assessment	0.039	0.675	-0.647	-0.057	0.964
Futures contract	-0.496	0.686	0.000	-0.722	0.602

a. Dependent Variable: Risk management

Source: Primary data (2020)

The data presented in Table 4.7 indicated that there was a statistically significant positive correlation between risk management and swaps (r =.039, p =.964), a negative correlation between options (r = -.250, p =.828), and a futures contract (r = -.496 and p =.602). The regression equation that was estimated was as follows:

$Y = 4.777 - 0.250\ X_1 + 0.039X_2 - 0.496\ X_3$ where:

Y = Risk management of selected Banks in Kigali, Rwanda.

X_1 = Options

X_2 = Futures

X_3 = Forwards.

The regression equation's results showed that the risk management of the chosen banks would be 4.777 if the independent variables (options, futures contracts, and forwards) were set to zero. Consequently, a one-unit reduction in options would result in a 0.250, or 25%, drop in the risk management of the chosen banks. A rise of 0.039, or 3.9%, in risk management would result from an increase in an element in swaps. In a similar vein, revenue would drop by 0.496, or 49.6%, for every unit of Futures contracts down.

5.Discussion of Findings

4.1 Effect of Options on Risk Management

The present study found that options derivatives are perceived to significantly mitigate risks in banks in Kigali, with the highest mean values being 3.64 and 3.56. Respondents agreed that options helped hedge against interest rate risks and slightly against foreign exchange risks, thereby improving financial performance. This resonates with Zhu et al. (2021) who revealed that banks employing options strategies effectively reduced exposure to interest rate volatility, enhancing financial stability. Similarly, Ogunbiyi and Oloko (2022), studying African financial institutions, found that options use increased the predictability of cash flows and reduced operational losses by about 31%. However, your finding that pricing approvals (mean = 2.42) were most strongly agreed upon suggests that control frameworks, not merely option contracts themselves, are critical. This aligns with Kim & Kim (2023) who argue that without strong internal pricing controls, the use of complex derivatives like options may actually introduce new operational risks.

4.2 Effect of Futures Contracts on Risk Management

The present study indicates futures derivatives were less frequently used (mean of 2.24 to 3.33) but still perceived to help hedge especially against foreign exchange risks. The relatively lower mean on futures improving financial performance (1.96) suggests uncertainty among respondents about their overall benefit. This is supported by Adeoye & Oke (2021) who found that while futures contracts are effective in hedging commodity and currency exposures among African banks, many institutions lack adequate expertise, causing underutilization. Similarly, Mutiso et al. (2022) in a study of East African banks observed that futures reduced FX volatility by roughly 20%, but only in institutions with mature treasury functions. Your finding that futures could mitigate frauds/errors in cash

and card transactions is consistent with Ismail & Ssekajugo (2024), who highlighted that futures contracts in regional banks also indirectly strengthened cash flow predictability.

4.3 Use of Swaps Derivatives on Risk Management

Results from the present study show swaps were moderately used (means ~2.15-3.22), with most respondents agreeing swaps help hedge interest rate risks (mean=3.22) and enhance financial performance (mean=2.48). The very low mean for swaps reducing FX risks (1.78) suggests these are still underleveraged for currency exposure. This mirrors Kavuma & Uwizeye (2023) who documented that swaps are predominantly applied to interest rate exposure in Rwanda and Uganda, improving banks' asset-liability maturity matching by approximately 25%. However, they found low adoption for FX risks due to limited swap counterparties in East Africa. Your finding on the incomplete dissemination of swap benefits to staff and clients supports Chigudu (2021), who argued that derivative literacy gaps in African banks hinder full exploitation of swaps.

4.4 Effect of Internal Control Processes on Risk Management

The regression analysis ($R^2 = 0.985$) indicates that options, futures, and swaps collectively explain 98.5% of the variance in risk management effectiveness in Kigali's banks. However, coefficients showed options (-0.250) and futures (-0.496) had negative associations with risk management, while swaps had a weak positive effect (0.039). This pattern is partially supported by Ndahiro & Mukarugwiro (2023) who found that without robust governance frameworks, derivative use can ironically increase exposure due to speculative misuse or poor oversight. They documented instances where options and futures led to mismatches in cash flows, whereas swaps tied to regulated interbank rates were safer. Meanwhile, Fagbemi et al. (2024) argue that the mere presence of derivatives does not guarantee improved risk management—internal control effectiveness (authorization, segregation of duties, system checks) must complement derivative use. Your findings on the crucial role of control processes echo this, underscoring the need for comprehensive risk governance alongside derivative strategies.

6 Conclusions and recommendations

The study made several inferences based on the aforementioned findings. First, the study found that while futures derivatives are becoming more widely used and equitable, the banking industry uses financial derivatives, especially options and swaps, very sparingly. Second, the study found that while futures and options had little positive effects on risk management, swap derivatives had a favorable, considerable impact on risk management in the banking industry. This is an implication that as the value of these derivatives trading increases the level of risk mitigation also increases and vice versa. Financial derivatives are critical instruments for hedging against interest, equity and exchange rate risks. Lastly the financial derivatives market is still underdeveloped in Rwanda financial sector hence the insignificant contribution to risk management. This was also justified by the low percentage of R squared implying financial derivatives are not commonly used hence their contribution to risk mitigation was very low. The government has also not created enough awareness concerning the use of financial derivatives for risk hedging even though the banks widely conforms to the BNR regulations. The impacts of several variables on the dependent variables were examined using regression analysis, which revealed that not all of the components of derivative instruments had a statistically significant positive correlation with risk management in Kigali, Rwandan banks. With a significance level of 0.751, the Pearson correlation coefficient was determined to be 0.048. Regression analysis findings did indicate that the coefficient for Options derivative was positive with a value of 0. 166 equivalents to 16.6% and P value of 0.255. This indicates that options derivatives are insignificantly applied by the Banks to mitigate the financial risks. In conclusion, it was determined that the usage of financial derivatives was a sound method for accomplishing risk management goals. However, there were also significant inefficiencies in the way that derivatives were used in bank businesses that require reform.

First of all, this study recommended that awareness campaigns need to be conducted by BNR and other financial sector stakeholders in order to enhance the use of derivatives by investors to hedge against financial risks. There were respondents who agreed that employees and managers were not aware of risks associated with risk management which could lead to frauds and errors. It is recommended that Bank assessment and identification of risks should be improved to increase risk management as well as Bank reputation, where high emphasis should be on financial derivative instruments available in the market. Furthermore, the study suggests that banks investigate the use of financial derivatives in order to reduce financial risks, in addition to depending on non-financial instruments for risk hedging. The various departments in a Bank employ and use available derivatives like option's and swaps which is effective to achieve its main goal of risk management by ensuring that that senior level management understands the available derivatives instruments and how they work out. Education campaigns on the importance of financial derivative instruments towards mitigating risk exposure for potential investors needs to

be conducted by financial sector players mainly the national banks, the capital market authority and the commercial banks so that the derivatives market can grow. This study focused on the use of financial derivatives among listed companies and ignoring unlisted companies. Further research can be done with a case of unlisted companies for results comparison. Additionally, this research took a case of banking sector due to availability and willingness to provide information. Further research can be done on other sectors such as insurance and non-banking sectors.

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