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RESEARCH ARTICLE

THE MODERATING EFFECT OF ZERO-SUM GAME THEORY ON INTEREST RATES AND COMMERCIAL BANKS PROFITABILITY

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ABSTRACT

Zero sum is a situation in game theory in which one person's gain is equivalent to another's loss, so the net change in wealth or benefit is zero. There are two types of interest rates charged by banks; one is on borrowers loans and the other is on customers savings. It is expected that the two interest rates should be treated equally since both are benefits to the receivers and in conformity with the zero sum theory. However, this seemed not to have been the case. This notwithstanding, Research has shown that borrowing interest charged by commercial banks have skyrocketed interest received from customers savings. This is a clear indication that the commercial banks businesses operations contradict sharply with the zero sum game. This is, based on the fact that it costs bank borrowers as much as it benefits bank lenders. The specific objectives of the study were derived from the general objective. A conceptual framework was used to explain the key factors, concepts and/or variables studied that indicated the interactive relationships amongst them. The study adopted the zero sum game theory. The total population of the study comprised of bank managers from Commercial banks and Commercial bank borrowers within Nairobi Central Business District. The sample comprised of selected Commercial banks and bank borrowers within Nairobi's Central Business District. The study adopted a descriptive cross-sectional design with a mixture of purposive and simple random sampling techniques. A researcher designed questionnaire was used to collect data from sampled respondents. Regression analysis was used to test the hypotheses. The two null hypotheses developed were tested and both were rejected at 5% level of significance. Findings revealed a significant relationship between interest rates and Commercial banks profitability and a significant moderating effect of zero sum game on the relationship between interest rates and commercial banks profitability. The study recommended that to attain a point of equilibrium, Commercial banks should rate the two interest rates equally so that customers gain should be banks loss and vice versa to be in conformity with the zero sum game theory. This would go along encouraging customers to take more loans and also increase their savings. The multiplier effect would be increased savings and loaning and hence increase in Commercial banks profitability. The study's contribution to knowledge is that banks should strictly adhere to zero sum game theory for continued profitability.

INTRODUCTION

The main objective of the study was an assessment of the relationship between interest rates and Commercial banks profitability with effects of zero sum game theory .In game theory, a zero sum game is a mathematical representation of a situation whereby each participant's gain or loss of utility is exactly balanced by the losses or gains of the utility of the other participants (Business Finance). A zero sum game may have as few as two players or as many as millions of participants. The main aim of a business organization is to maximise profits as it minimises costs (Mudida, 2009). In accounting, profit is defined as the difference between Total net revenues received and the total costs incurred in the process of business operations (Frank Wood &Sangters, 2016)

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In cash flow statement, when banks provide loans to its borrowers, the loans are considered as applications (cash out) by the banks and cash in by the borrowers. This means that the amount of loan is credited in the borrowers account and debited in the lenders accounts. When loans are given to borrowers, they are expected to repay the principal amounts plus interest on a monthly period for a given period depending on the terms and conditions of the loan. It is common practice that bank customers have also been receiving interest from their annual savings. It was also expected that this would create a good bank –customer relationships and especially if a zero sum game theory was applied. This would encourage more savings as there would be a positive return from savings. At the same time customers would be attracted to take more loans as payments will be flexible and affordable (Wambari & Mwangi, 2017). The end result would be that both parties would benefit. Multiplier effect would be witnessed in more investments by both parties, increase in banks profitability (Kavwele, Ariemba, & Evusa, 2018), high standard of living, generation of employment by Kenya's Commercial banks and

general increase in Gross Domestic Product (Makinde, 2016) and hence increase in Kenya's economic growth and development. These facts notwithstanding, Research has shown that commercial banks have continuously given their borrowers loans which attracted high interest rates when compared to very low interest rates which the borrowers received from their savings. This implied non compliancy to the zero sum theory by commercial banks. This has been witnessed from the fact that zero sum game costed bank borrowers as much as it benefited bank lenders. Numerous studies on the relationship between interest rates and Commercial banks profitability have focused mainly on lending interest rates and how these influenced the performance of Commercial banks (Obillo, 2014);(Kavwele, Ariemba, & Evusa, 2018). An empirical assessment of the effects of zero sum theory on commercial banks profitability with effects on zero sum game theory was lacking.

Statement of the Problem: The main problem of the study is that Commercial banks in Kenya have violated the zero sum game theory with regards to interest rates paid and received. Based on the theory, Commercial banks gains from interest rates charged on loans should be the borrowers' loss. Similarly, the customers gain from interest received on savings should be Commercial banks loss (Lim, 1999). In the final analysis the net change in wealth or benefit should be zero. It was expected that the interest rates on both the loans and savings would be charged on a 'Pari passu' basis. This was expected to go along in increasing lending and customers' prosperity to save. The results would be two folds; profits of banks will increase, shareholders will receive high dividends and price per share of banks will go up (Musa, Anyuki, & Otieno, 2020).The multiplier effect was expected to be increase in employment. Similarly, bank borrowers will increase their investments since repayments will be affordable, their standard of living will increase and Kenya's economy will attain economic growth and development (Musa & Kahando, 2020).

Despite the expected benefits, research has shown that Kenya's Commercial banks have not embraced the zero sum game theory. This has been witnessed from the fact that they charge 'fortunes' interest rates on borrowed loans with a minute return on customers' savings. This has resulted into most Kenyans drifting from bank loans to other alternative sources of funds including Co-operatives, Building Societies and Housing Finance that charge fairly low interest rates on borrowing. Further, low interest paid on customers' savings, has discouraged most customers from keeping their monies in the banks. Most of them have looked for 'greener pastures' elsewhere including, treasuring bonds or cooperative societies such as Mwalimu co- operative Society, Stima co-operative which pay high dividends at the end of every year when compared to Commercial banks. Prior studies on Commercial banks profitability have reported many findings without universal agreements (Kavwele, Ariemba, & Evusa, 2018). The studies focused mainly on lending interest rates, interest rates capping, and how these influenced performance of Commercial banks. In addition, the studies used different theories, variables and methodologies when compared to the current study. The studies thus created conceptual, contextual, theoretical and methodological gaps, a void which the current study has attempted to fill by assessing the relationship between interest rates and Commercial banks profitability with effects of zero sum theory which was lacking.

Objectives: The main objective of the study was an assessment of the relationship between interest rates and Commercial banks profitability with effects of zero sum game theory.

Specific objectives

- To evaluate the relationship between interest rates and Commercial banks profitability.
- To determine the moderating effect of zero sum theory on the relationship between interest rates and Commercial banks profitability.

Null Hypotheses

H_{01} There is no significant relationship between interest rates and Commercial banks profitability.

H_{02} There is no significant moderating effect of zero sum theory on the relationship between interest rates and Commercial banks profitability.

Theoretical Review: The study applied Zero Sum Theory**.** Game theory has been of importance on many fields of the social sciences since its rise to prominence more than fifty years ago (Lim, 1999). Zero sum is a situation in game theory in which one person's gain is equivalent to another's loss, so that the net change in wealth or benefit is zero. In game theory, a zero sum game is a mathematical representation of a situation whereby each participants gain or loss of utility is exactly balanced by the losses or gains of the utility of the other participants. A zero sum game may have as few as two players or as many as millions of participants (Turocy & Stengel, 2001).

The theory is relevant to the current study in that the two players are the Commercial banks and borrowers and or savers. The banks have two types of interest rates; amount of interest charged as a payment, that is bank expense or interest on customers' savings and interest as incomes, that is interest chargeable on borrowers' loans. It is expected that both interest rates are given pari-passu treatment that is, treated on equal ratings such that when banks lose on the amount of interest charged on customers' savings, customers gain. Similarly, when customers' lose on the amount of interest charged on borrowers' loans, banks gain. This theory is important to the current study since it informs the study variables. For instant, the first two main objectives of Commercial banks are to make profits and also ensure that their customers receive maximum satisfaction. Embracing this theory will ensure that both objectives are achieved. This is because both customers (borrowers and customers with savings in the banks) will derive satisfaction from interest both payable and receivable. Similarly, Commercial banks will make higher profits since more customers will be induced to save and also more borrowers will take bank loans since the interest rates will be affordable. The multiplier effect will witness an increase in Kenya's Commercial banks profitability, raised share price per unit and therefore more investments by both Commercial banks. Customers are likely to receive high dividends in form of trade and cash and eventually, increased investments, high standards of living to customers including borrowers.

Empirical Review: Numerous studies have been conducted in this area but with different focus; contextually, conceptually, theoretically and methodologically. These included; A study conducted by (Wambari & Mwangi, 2017), the purpose of this study was to analyse effect of interest rates on the financial performance of commercial banks in Kenya. The study established that lending rate ratio influenced the financial performance of commercial banks in a positive way. Deposit interest ratio on the other hand negatively affected performance of commercial banks and that liquidity management influenced performance positively and negatively respectively. The study focus was on interest rates and financial performance of Commercial banks unlike the current study whose focus was on the relationship between interest rates on profitability of Commercial banks with effects on zero sum theory. Further, the prior study applied Liquidity Preference Theory unlike the current study that applied Zero Sum Game Theory. The prior study on data analysis used a census approach unlike the current study which used sampling methods. This created theoretical and methodological gaps.

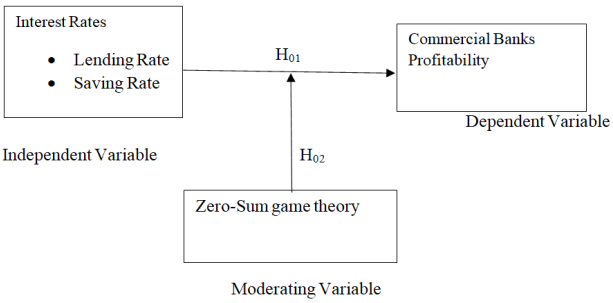
A study by (Obillo, 2014)the main objective of the study was to determine the extent to which lending interest rates affected profitability of commercial banks. The study found that Lending interest rates had a significant positive effect on financial performance of Commercial banks in Kenya. The study also established that the relationship between lending rates and profitability of commercial banks was linear with increase in lending interest rates leading to higher profitability. The current study, on the other hand assessed the extent to which both lending interest rates and savings interest rates affected profitability of Commercial Banks in Kenya with effects of Zero Sum Game theory. Further, prior study concentrated only on landing rates and bank profitability. This was unlike the current study which focused on both lending interest rates and savings interest rates. This created conceptual and contextual gaps.

A study by (Kavwele, Ariemba, & Evusa, 2018)investigated the effect of interest rate capping on the financial performance of Commercial Banks in Kenya. Interest rate capping was found to have a statistically significant negative effect on the performance of commercial banks and specifically from interest income whose negative impact could not be compensated by non-interest income increase or the interest expense decrease and thus the decline in profits. The study was anchored on financial intermediation theory and the modern portfolio theories. The focus of the current study was based on a comparative analysis of both lending and savings interest rates using zero sum game principles. Further there was also a theoretical difference of financial intermediation theory and the modern portfolio theories used by the prior study against Zero Sum Theory applied by the current study. In a study conducted by (Khan & Sattar, 2014), the purpose was an analysis of the impact changes on interest rates had, on the profitability of four major commercial banks in Pakistan. The model adopted was Pearson correlation method. Findings revealed that interest rate affected the banks' interest income considerably. This finding meant that banks' income based on interest was extremely related to interest rates and that bank's profitability was dependent on interest rate. However, the current study created both methodological gaps since the model was also the current study concentrated on both lending and saving interest rates, creating a conceptual gap. Since the prior study was conducted in Pakistan, could the findings be replicated in a Kenyan context? (Mndeme, 2015) the study assessed the Impact of non-interest income on banking performance in Tanzania. The model adopted was panel regression model. Finding established that a share of net interest income had positive impact on performance. Findings confirmed the formed hypothesis that diversification was good for the banking sector performance in Tanzanian banks. This study was similar by that carried out by (Tarawneh, Khaled, & Al-Assaf, 2017) the study assessed the relationship between non-interest income and financial performance of Jordanian banks. The model adopted was regression analysis' the study established that non- interest income increased the profitability of a bank. The study further found that non-interest income had gradually expanded bank sources of income by expanding into a wider menu of services and activities that helped in generating non-interest income. The two studies reported similar findings. However, there was a contextual gap as both studies were conducted in different a country, that is Tanzania and Jordan respectively. The current study had a deviation on focus and methodology from the prior studies in the sense that the model adopted by the current study was regression analysis and the independent variables for the current study were lending and savings interest rates. Further, there was a contextual gap as the studies were conducted from different countries; Tanzania, Jordan and Kenya. (Shuremo, 2016) conducted a study on determinants of banks' profitability in Ethiopian banking industry. The model adopted was based on regression. The study found that as interest rate spread increased or decreased, so did the increases or decreases in the profitability of the banks as well. The study recommended that the policies which aimed at controlling interest rate could be termed as capping. This was based on the fact that interest rates and banks profitability were important factors in determining the wealth of a country's economy. The current study focus was different. Whereas the prior study concentrated on determinants of profitability in the banking industry in Ethiopia, the current study focus was on the effect of zero sum game theory on Commercial banks profitability.

A study carried out by (Tuyishime, Memba, & Mbera, 2017)on the effects of deposits mobilization on financial performance of commercial banks in Rwanda. Finding revealed that there was a positive change in the deposits of interest rate. This consequently affected the level of deposits received and later on the profitability of the bank. This study recommended that banks should design innovative ways to increase the level of low cost deposits which were competitive in order to balance with the interest paid on them. Prior study focused on money deposited in banks and how the deposited monies influenced the financial performance and profitability of Commercial banks. However, the current study focused on zero sum Game theory and its effect on profitability of Commercial banks in Kenya. The main variables used by the current study were interest rates on borrowed loans and bank customers' savings.
A study by (Makinde, 2016) assessed the impact of loan fees on business bank stores in Nigeria. The study used interest rates, Gross Domestic Product and loan costs as its variables. Finding revealed that loan cost had a negative relationship with business bank; Gross Domestic Product had a positive relationship with Commercial bank deposits and that interest rates did not have any effect on Commercial bank deposits. This study produced conflicting results with other studies. From these discussions, it is clear that numerous studies conducted by prior studies differed from the current study on matters of concepts, contexts, methodologies and theories.

Other prior studies produced results without universal agreements. This called for an assessment of the effect of Zero Sum Game Theory on profitability of Commercial Banks in Kenya.

Conceptual Framework:



Source: Author

Figure 1. Conceptual Framework

H_{01} There is no significant relationship between interest rates and Commercial banks profitability.

H_{02} There is no significant moderating effect of zero sum theory on the relationship between interest rates and Commercial banks profitability.

METHODOLOGY

The study adopted a descriptive cross-sectional design. The study sought to assess the influence of the zero sum game on interest rates and commercial banks profitability, the design was deemed appropriate. Kothari (2004) argues that descriptive cross-sectional was chosen in view of the fact that, it is a small- scale study of a relatively short duration and it involved a systematic collection and presentation of data to give a clear picture of a particular situation. The study relied heavily on primary data obtained from structured questionnaires to managers and bank customers. Simple random sampling method was used to identify 75 respondents in Nairobi Central Business District (CBD). Data was analysed and the following was established.

Data Analysis: The study had a 91% response rate since only 68 questionnaires were answered appropriately.

Table 1. Model summaries for interest rates and commercial banks profitability

Source	SS	df	MS	Statistic	Value
				Number of obs =	68
				F(2, 65) =	21.69
Model	14.810	1	7.4053	Prob > F =	0.001
Residual	22.189	66	.34137	R-squared =	0.4003
Total	37	67	.55223	Adj R-squared =	0.3818
				Root MSE =	.58427

	Coeff.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Interest Rate	.5219	.0852	6.13	0.000	.3518033	.6920255
_const.	.3888	1.2561	0.31	0.758	-2.119851	2.897484

In Table 1, the R-squared value 0.4003 indicates that Interest Rates only explain 40.03% of the total variations in Commercial Banks Profitability. The relationship is, however, significant since p-value was less than 0.05 (0.001<0.05). This implies that irrespective of the magnitude and the direction of the effect of Interest Rates on Commercial Banks Profitability, the influence is significant. From the regression coefficients, the constant regression coefficient and that of the independent variable were 0.3888 (*SE=1.2561*) and 0.5219 (*SE=0.0852*) respectively. These regression coefficients were both significant at 5% level since the p-values were less than 0.05.

The coefficient value for the independent variable implied that for every improvement in the pre-specified aspects of Interest Rates by one unit, would result to improvement in Commercial Banks Profitability by 0.5219 units. Thus, based on the significance of the regression coefficient, we express the equation for the model as follows:

$$X_2 = 0.388 + 0.5219\ X_1$$

The study rejected the null hypotheses H_{01}, there is no significant relationship between interest rates and Commercial banks profitability.

Table 2. Moderation Effect of Zero-Sum Game Theory

Information Criterion Change Statistics						
Block	LL	LR	Df	Pr>LR	AIC	BIC
1	-181.293	12.473	2	0.006	368.586	379.843
2	-177.524	7.533	1	0.013	363.051	378.061
Coefficients for Moderation Effect of Zero-sum game theory						
	Coeff.	Std. Err.	Z	P>z	[95% Conf.	Interval]
Interest rate	0.38	0.178	2.135	0.022	0.031	0.729
Zero-sum game theory	0.528	0.201	2.627	0.010	0.134	0.922
Interaction Variable	-0.475	0.24	-1.979	0.017	-0.945	-0.005
_const.	-0.921	0.135	-6.833	0.000	-1.186	-0.656

The study concluded that there is a significant relationship between interest rates and commercial Banks Profitability. In Table 2, the study has the likelihood ratio change due to the addition of the interaction variable. Significance of this change is tested by the p-value in the Block 2 model. From the table, the study observed that the change in the LR due to the addition of the interaction variable is significant as shown by the P-value (= 0.013), which is less than 0.05.

This confirmed that the addition of the interaction variable significantly improved the model at 5% significance level. In the coefficients' section, we have the coefficients for Interest Rates, Zero-sum game theory and the interaction variable. Both Interest Rates and Zero-sum game theory were significant since their respective p-values, 0.022 and 0.010, were significant at 5% level of significance. Of interest was, however, the significance of the added interaction variable. From the output, the study observed that the interaction variables were significant at 5% significance level since the corresponding p-value = 0.017 was less than 0.05. Based on the significances of the both likelihood ratio change and the interaction variable, the study rejected the null hypothesis H_{02}. Zero-sum game theory had no significant moderating effect on the relationship between Interest Rates and Commercial Banks Profitability. The study therefore, accepted the alternative hypothesis which concluded that Zero-sum game theory had a

significant moderating effect on the relationship between Interest Rates and Commercial Banks Profitability.

FINDINGS

The first objective of the study was to evaluate the relationship between interest rates and Commercial banks profitability. The study established a significant relationship between interest rates (include both from savings and lending) and Commercial Banks profitability. This finding was partly consistent by studies conducted by (Obillo, 2014). The study also established that the relationship between lending rates and profitability of commercial banks was linear with increase in lending interest rates leading to higher profitability.

A study conducted by (Khan & Sattar, 2014)concurred, this finding meant that banks' income based on interest was extremely related to interest rates and that bank's profitability was dependent on interest rate. A study conducted by (Wambari & Mwangi, 2017) gave contradicting results. The study established that lending rate ratio influenced the financial performance of commercial banks in a positive way. Deposit interest ratio on the other hand negatively affected performance of commercial banks and that liquidity management influenced performance positively and negatively respectively. A study by (Makinde, 2016) also gave conflicting results. Finding revealed that interest rates did not have any effect on Commercial bank deposits. The second objective of the study was to determine the moderating effect of zero sum theory on the relationship between interest rates and Commercial banks profitability. The study established that there was a significant moderating effect of zero sum game theory on the relationship between interest rates (include both from savings and lending) and Commercial banks profitability. This finding implied that Kenya's Commercial banks should embrace zero sum game theory on both borrowed and savings interest rates in order to maximize their profits.

Limitations, Justifications and Suggestions for Future Researchers

Conceptual Limitations: The study used borrowed interest rates, savings interest rates, zero sum game theory and Commercial banks profitability as its variables. The study could have used more variables including interest rate capping, non- interest incomes.
However, this didn't compromise the quality of the paper. Future researchers could consider introducing the additional variables.

Contextual Limitations: The study concentrated on Kenya Commercial Banks within Nairobi's CBD. This was due to the state of the economy given lock downs caused by Covid -19 pandemic. However, this did not compromise the quality of the paper. Future researchers could consider conducting the study in other major towns in Kenya.

Methodological Limitations: The study used multiple regression analysis models that suited its variables and also given the nature of the questions. Future studies should consider using other models such as parsons' correlation model.

Theoretical Limitations: The study applied zero sum game theory. The study could have used other theories including preference theory, dividend theories. However, the theory used informed the study's variables. Future studies could consider the alternative theories.

Recommendation

Following the study's results, it was recommended that commercial banks in Kenya should manage their lending interest rates based on zero sum game theory given that lending interest ratio was established to be directly related to performance. The study also recommended that commercial banks need to monitor the interest on deposits carefully. The interest charged on deposits is negatively affects performance. It represents the main expense by any commercial bank and therefore for a commercial bank to be profitable, they must maintain a reasonable spread. Commercial banks should strive to raise interest rates on deposits at reasonable rates. This will encourage more customers to deposit money with banks or increase their deposits. Banks will then have money to lend to the customers and thus generate more money, hence increase their profitability. This is due to the fact that Commercial banks that attract deposits cheaply are able to advance loans cheaply and therefore attract more borrowers.

Conclusion

In order to attract more customers to make savings and borrow loans, Kenya's Commercial banks should embrace zero sum game theory in charging fair interest rates on loans and customers savings pari passu. This will go along encouraging more savings and borrowings. The end result will be witnessed in the creation of good bank- customer relationship and hence customer satisfaction. Multiplier effect will translate into high savings, more borrowings and finally high profitability by Commercial banks.

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