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EFFECT OF LENDING INTEREST RATES ON THE FINANCIAL PERFORMANCE OF KENYA TEA DEVELOPMENT AGENCY HOLDINGS LIMITED

BY

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ABSTRACT

This study examined the effect of commercial bank lending interest rates on the financial performance of KTDA Holdings Limited over 2002–2024. Guided by the Fisher Effect, the study used a positivist philosophy, a longitudinal explanatory design, and secondary annual time-series data on the commercial bank lending interest rate from the Central Bank of Kenya and Return on Assets (ROA) from KTDA audited financial statements. The study used a census of 23 annual observations. Descriptive statistics, Pearson correlation, Augmented Dickey-Fuller testing, ARDL bounds testing, and an Error Correction Model were employed. The descriptive results showed mean lending interest rate and ROA of 14.68% and 5.56%, respectively. The Pearson correlation was positive and moderate ($r = 0.433$). Both series were stationary at levels, I(0). The ARDL bounds test indicated a long-run equilibrium relationship ($F = 5.1176$, $p = 0.0167$). The error correction term was negative and significant (-0.9065, $p = 0.0005$), indicating that about 90.65% of short-run disequilibrium was corrected within one year. However, the short-run coefficient on lending interest rate was positive but statistically insignificant (0.4690, $p = 0.1074$), and the long-run coefficient was also positive but statistically insignificant at the 5% level (0.5174, $p = 0.0727$). Thus, the evidence indicates a stable long-run equilibrium relationship, but does not establish a statistically significant interest-rate effect at the 5% level. The study recommends prudent long-term financing and liquidity management and continued consideration of seasonal credit conditions and other determinants of tea-sector profitability.

Keywords: Lending interest rate, financial performance and Return on assets

Background to the Study

The cost of borrowed capital is a direct channel through which macroeconomic conditions can affect firm financial performance. Commercial bank lending rates influence debt-servicing costs, working-capital financing and investment decisions. For capital-intensive agribusinesses that depend on credit for processing infrastructure and seasonal liquidity, changes in lending rates may therefore affect profitability and asset utilization (Liu, 2024).

KTDA Holdings Limited provides an important setting for examining this relationship. It operates tea factories on behalf of about 600,000 smallholder farmers in 16 counties and has substantial financing needs for processing facilities, equipment and seasonal working capital. Commercial borrowing may also be required to manage the timing gap between farmer payments and tea-sale proceeds (Bolton, 2024). Changes in lending rates can therefore alter KTDA's financing costs and financial performance.

The Fisher Effect (Fisher, 1930) links nominal interest rates with real interest rates and expected inflation. For a borrowing firm, higher lending rates increase the cost of debt and, other things being equal, may reduce profitability. Conversely, lower lending rates may reduce financing costs

and support the use of resources for productive activities. In this study, financial performance is measured using Return on Assets (ROA).

Kenya's commercial lending-rate environment changed substantially during 2002–2024 in response to monetary and financial conditions, including the period of interest-rate controls introduced under the Banking (Amendment) Act, 2016, and subsequent monetary tightening. During the same period, KTDA's ROA varied considerably, providing a basis for examining whether movements in lending rates were associated with changes in financial performance.

Previous studies have often examined interest rates alongside other macroeconomic variables or at farmer, factory or financial-institution level. A focused analysis of the lending-rate channel at KTDA Holdings Limited can therefore provide firm-specific evidence using annual time-series data. The present study examines the relationship between commercial bank lending interest rates and ROA over 2002–2024.

Statement of the Problem

From the Fisher Effect perspective, higher commercial bank lending rates increase the cost of borrowing and can reduce the profitability of capital-intensive firms. Because KTDA Holdings Limited requires financing for tea processing and working capital, changes in lending rates may influence its ROA.

Despite this theoretical expectation, firm-specific evidence on the effect of commercial bank lending rates on KTDA Holdings Limited remains limited. Existing studies have mainly examined banks, manufacturing firms, farmers or broader macroeconomic models (Musyimi & Kisingu, 2019; Otwoko et al., 2021; Nyakundi, 2021; Memon et al., 2022; Nyakweba, 2019). This study addresses the gap by examining the lending-rate channel using annual data for 2002–2024.

Objective of the Study

The general objective of this study was to assess the effect of lending interest rates on the financial performance of KTDA Holdings Limited over 2002–2024. Specifically, the study sought to:

(i) Establish the trend and descriptive properties of the lending interest rate and Return on Assets of KTDA Holdings Limited over the study period

(ii) Determine the strength and direction of the statistical association between the lending interest rate and Return on Assets

(iii) Estimate the short-run and long-run effect of the lending interest rate on Return on Assets using a dedicated time-series model.

Hypothesis of the Study

The study tested the following null hypothesis:

H_0: Lending interest rates have no statistically significant effect on the financial performance of KTDA Holdings Limited.

Significance of the Study

The findings are relevant to KTDA's treasury and financial-planning functions because they provide evidence on the association and dynamic behaviour of lending rates and ROA. They also contribute firm-level evidence for monetary and agricultural policy discussions and provide a focused time-series benchmark for researchers examining single macroeconomic determinants of firm performance in data-constrained settings.

Literature review

Theoretical Review: The Fisher Effect

The Fisher Effect, proposed by Fisher (1930), states that the nominal interest rate reflects the real interest rate and expected inflation. For borrowing firms, higher nominal lending rates increase the cost of debt and may reduce net income and ROA when revenues and other costs are held constant.

The theory is relevant to KTDA Holdings Limited because tea-processing operations require

financing for equipment and seasonal working capital, while temporary liquidity pressures may also create borrowing needs (Bolton, 2024). The a priori expectation is therefore a negative relationship between lending interest rates and ROA.

The Fisher Effect also provides a clear theoretical benchmark for testing the interest-rate channel separately. A bivariate time-series model allows the study to examine the direction and timing of the association without attributing the effect to other macroeconomic variables.

Empirical Review

Interest rates influence borrowing costs, investment and liquidity. Liu (2024) reports that higher rates can increase the cost of capital and constrain firms' investment and operating liquidity. This is relevant to agribusinesses that depend on credit for working capital and production assets.

Arthur (2025) reports that interest-rate changes affect agricultural value-chain financing costs and profitability in Sub-Saharan Africa. The findings suggest that expensive credit can reduce liquidity and constrain investment across credit-dependent value chains.

Memon et al. (2022) found that interest-rate conditions were associated with the financial performance of tea farmers in South Asia, with higher rates increasing debt burdens and reducing disposable income. This supports the broader view that financing conditions matter in tea-related agricultural activities.

In Kenya, Nyakweba (2019) found that high interest rates constrained access to credit and productive investment among small-scale tea farmers in Kisii County. Higher borrowing costs were associated with increased production costs and lower farm income.

Musyimi and Kisingu (2019) found that interest-rate regulation affected commercial-bank profitability in Kericho County. Although the study focused on banks, it provides contextual evidence on how changes in local credit conditions can affect financial outcomes in a tea-growing region.

Otwoko et al. (2021) reported a significant relationship between interest-rate determinants and financial performance in Kenyan deposit-taking SACCOs. Their findings indicate that institutional characteristics can shape the strength of the interest-rate performance relationship.

Evidence specific to the KTDA environment is provided by Anyona et al. (2023), who found a negative and significant relationship between interest rates and the profitability of KTDA-managed factories in the Western Rift. They attributed this relationship to higher financing and operating costs. The present study examines whether a similar relationship is observed at the consolidated KTDA Holdings level.

Overall, the reviewed literature generally associates higher interest rates with higher financing costs, weaker liquidity and lower profitability. However, the direction and magnitude of the relationship may vary across sectors, institutions, samples and modelling approaches.

Nyakundi (2021) found a significant inverse relationship between lending rates and the profitability of heavy commercial vehicle dealers in Kenya, linking the result to borrowing costs and working-capital conditions. Although the sector differs from tea processing, the finding supports the theoretical expectation that financing costs can affect firm performance.

Summary of Literature and Research Gap

Existing literature provides substantial evidence that interest rates influence borrowing costs, liquidity, investment and profitability. Kenyan evidence covers tea farmers, financial institutions and KTDA-managed factories (Nyakweba, 2019; Musyimi & Kisingu, 2019; Otwoko et al., 2021; Anyona et al., 2023), but firm-level evidence for KTDA Holdings Limited remains limited.

Most earlier studies combine interest rates with other macroeconomic variables or use cross-sectional designs, making it difficult to isolate the lending-rate channel and to distinguish short-run from long-run dynamics.

The specific gap addressed by this study is therefore firm-level evidence on whether and how lending interest rates are associated with the financial performance of KTDA Holdings Limited.

A further gap concerns the possibility that observed interest-rate relationships may differ from the inverse association expected under the Fisher Effect. With only 23 annual observations, a parsimonious time-series approach is appropriate for examining descriptive patterns, statistical association, and short-run and long-run dynamics.

Research Design and Philosophy

A positivist philosophy was adopted to examine observable relationships between commercial bank lending interest rates and Return on Assets using secondary data (Saunders et al., 2019). A longitudinal explanatory design based on time-series econometrics was used because the study focused on changes in the relationship over 23 annual observations (Pesaran et al., 2001).

Data Sources, Period and Target Population

The study used secondary annual time-series data. Commercial bank lending interest rates were obtained from the Central Bank of Kenya, while ROA was obtained from KTDA Holdings Limited audited financial statements. These institutional sources provided consistent observations for the study period.

The target population consisted of the 23 annual observations for KTDA Holdings Limited from 2002 to 2024, with each year's lending interest rate matched to the corresponding annual ROA. The complete series constituted the universe of analysis.

Sample Size

A census approach was used because all 23 annual observations in the available study period were included. This avoided the loss of observations and retained the full time-series relevant to the analysis (Cooper & Schindler, 2014; Creswell & Creswell, 2018).

Rationale for Employing Autoregressive Distributed Lag Model

The study used an Autoregressive Distributed Lag (ARDL) model to examine the short-run and long-run relationship between lending interest rates and ROA. ARDL accommodates variables integrated at I(0) or I(1) and permits estimation of dynamic relationships and long-run equilibrium (Pesaran et al., 2001; Kripfganz & Schneider, 2023).

Model Specification and Estimation

A bivariate ARDL model was estimated with ROA as the dependent variable and commercial bank lending interest rate as the explanatory variable. The Akaike Information Criterion was used to select the lag structure, with preference for a parsimonious specification. The model was then expressed in error-correction form to estimate short-run dynamics and adjustment towards long-run equilibrium. Diagnostic and stability tests were subsequently performed.

Research Equation

The generic ARDL ((p, q)) model specified as:

$$ROA_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i ROA_{t-i} + \sum_{j=0}^{q} \beta_j INT_{t-j} + \varepsilon_t$$

ROA_t = Return on Assets at time *t*

INT_t = Commercial bank lending interest rate at time *t*

α_0 = Constant term

α_i = Coefficients of lagged ROA

β_j = Coefficients of current and lagged interest rate

p, q = Optimal lag orders

ε_t = Error term

After establishing the long-run relationship, the ARDL was re-specified as an Error Correction Model (ECM) to distinguish short-run dynamics from the long-run relationship. The error correction term measures the speed at which ROA adjusts towards long-run equilibrium after short-run disturbances.

Descriptive Statistics

Descriptive statistics included the mean, median, standard deviation, minimum and maximum values for the lending interest rate and ROA. A time-series graph was also used to examine the movement of the two variables over 2002–2024.

Diagnostic Tests

The Breusch-Godfrey LM test was used to assess serial correlation, while the Breusch-Pagan-Godfrey test assessed heteroscedasticity. A p-value above 0.05 indicates failure to reject the relevant null hypothesis. Model stability was assessed using the CUSUM and CUSUMSQ tests at the 5% level (Brown et al., 1975).

Unit Root Test - Augmented Dickey-Fuller

The Augmented Dickey-Fuller test was used to determine the order of integration of the lending interest rate and ROA. The test was applied at levels and first differences where necessary. A p-value below 0.05 indicates rejection of the unit-root null hypothesis. Variables stationary at levels are I(0), while those stationary after first differencing are I(1).

ARDL Bounds Test for Cointegration

The ARDL bounds test was used to assess whether a long-run relationship existed between lending interest rates and ROA. The null hypothesis states that there is no levels relationship. Cointegration is supported when the F-statistic exceeds the upper critical bound; it is inconclusive between the bounds and not supported below the lower bound (Pesaran et al., 2001).

Cointegration was assessed by comparing the calculated F-statistic with the reported lower and upper critical bounds. Where cointegration was established, the ECM and long-run coefficients were used to examine adjustment dynamics and the long-run association.

Error Correction Model

Where cointegration was present, the ECM was used to estimate short-run changes in ROA and the speed of adjustment towards long-run equilibrium. A negative and statistically significant error correction coefficient indicates convergence towards equilibrium.

Long-Run Relationship

After confirming the long-run relationship, the long-run coefficient of the lending interest rate was examined for direction, magnitude and statistical significance. A negative coefficient is consistent with the cost-of-borrowing prediction, while a positive coefficient indicates a positive estimated association.

Operationalization of Variables

Table 1: Operationalization of Variables

Variable	Type	Indicator	Measurement	Level of Measurement
Lending Interest Rate (INT)	Independent	Commercial bank lending rate	Annual average commercial bank lending rate (%)	Ratio
Financial Performance (ROA)	Dependent	Return on Assets	ROA = (Net Income ÷ Total Assets) × 100 (%)	Ratio

Source: Research Data (2026)

Data Presentation, Analysis and Findings

Descriptive Statistics

Table 2: Descriptive Statistics of Lending Interest Rate and ROA (2002–2024)

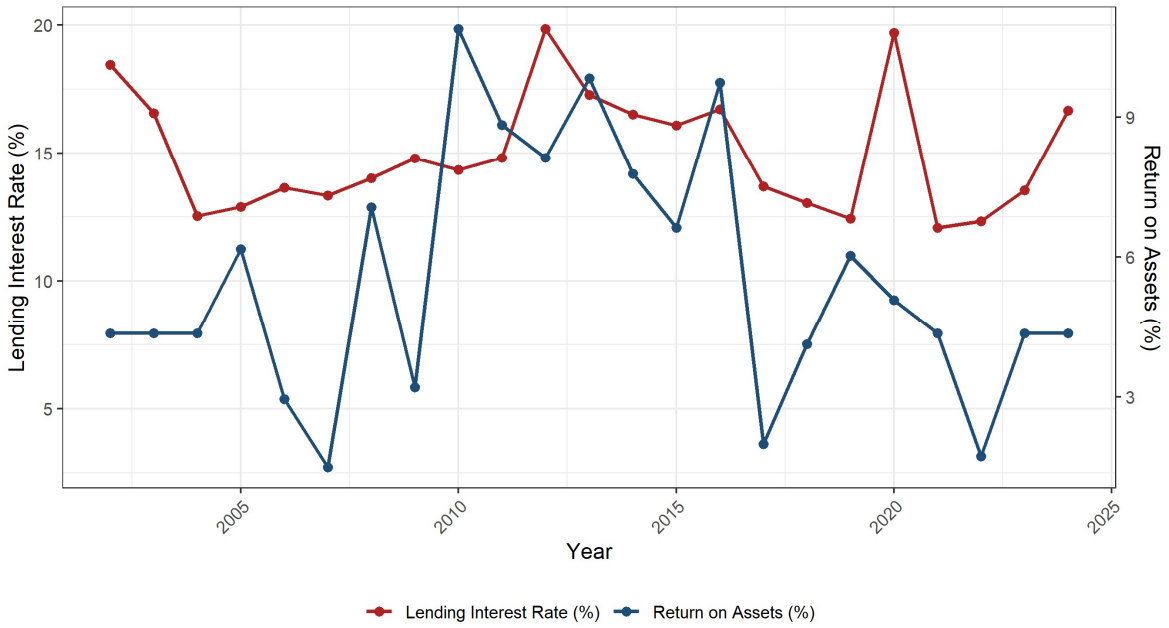
Statistic	Lending Interest Rate (%)	ROA (%)
Mean	14.68	5.56
Median	14.02	4.36
Minimum	11.97	1.50
Maximum	19.85	10.89
Standard Deviation	2.19	2.68
Skewness	0.73	0.41
Kurtosis	2.72	2.31
Jarque-Bera (p-value)	1.989 (0.370)	1.177 (0.555)
Observations	23	23

Source: Research Data (2026)

Table 2 shows that the lending interest rate averaged 14.68%, with a median of 14.02%, a minimum of 11.97% and a maximum of 19.85%. Its standard deviation of 2.19 percentage points indicates moderate dispersion. The series was mildly positively skewed, while the Jarque-Bera probability of 0.370 provided no evidence against normality at the 5% level.

ROA averaged 5.56%, with a median of 4.36%, a minimum of 1.50% and a maximum of 10.89%. Its standard deviation of 2.68 percentage points indicates greater variability than the lending rate. The Jarque-Bera probability of 0.555 likewise provided no evidence against normality at the 5% level.

Trend Analysis



Source: Research Data (2026)

Figure 1 shows the movement of lending interest rates and ROA over the 23-year period. Lending rates declined sharply from 18.45% in 2002 to 12.53% in 2004, while ROA later rose to 10.89% in 2010. Lending rates remained above 16% on average from 2012 to 2016, during which ROA remained relatively high, and both series generally declined after 2017. The visual pattern therefore suggests periods of co-movement, but it does not by itself establish causality.

Correlation Analysis

The Pearson correlation coefficient between lending interest rates and ROA was 0.433, indicating a moderate positive linear association. This direction differs from the inverse relationship expected under the Fisher Effect. Because correlation does not establish causality or long-run equilibrium, the relationship was examined further using time-series methods.

Stationarity (Unit Root) Test Results

Table 3: Augmented Dickey-Fuller Unit Root Test Results

Series	ADF Statistic	p-value	5% Critical Value	Conclusion
Lending Interest Rate – Level	-4.612	0.0001	-3.085	Stationary, I(0)
Return on Assets – Level	-3.382	0.0116	-3.005	Stationary, I(0)

Source: Research Data (2026)

Table 3 shows that both series were stationary at levels in the bivariate specification. The lending interest rate had an ADF statistic of -4.612 (p = 0.0001), while ROA had an ADF statistic of -3.382 (p = 0.0116). Thus, the unit-root null was rejected for both variables and each series was classified as I(0).

Bounds Tests

Table 4: ARDL Long-Run Form and Bounds Test

Dependent Variable: ROA

Selected Model: ARDL(1,0)

Sample: 2003–2024

Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	-0.020774	0.040912	-0.5078	0.6175
INT	0.517394	0.272340	1.8998	0.0727

Bounds Test

Test Statistic	Value	
F-statistic	**5.1176**	
k	**1**	
Significance	**I(0) Bound**	**I(1) Bound**
10%	3.02	3.51
5%	**3.62**	**4.16**
2.5%	4.18	4.79
1%	4.94	5.58

Source: Research Data (2026)

Table 4 presents the long-run coefficient and ARDL bounds test. The lending-interest-rate coefficient was positive at 0.5174 but not statistically significant at the 5% level (p = 0.0727). However, the bounds F-statistic of 5.1176 exceeded the 5% upper bound of 4.16, indicating a statistically significant long-run levels relationship at the 5% level. The evidence therefore supports cointegration, while the individual long-run coefficient is not significant at 5%. The significant error correction term further supports adjustment towards long-run equilibrium.

Short Run Regression and Cointegration Analysis

Table 5: Error Correction Representation of the ARDL Model

Dependent Variable: D(ROA)

Selected Model: ARDL(1,0)

Sample: 2003–2024

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ROA(-1)*	-0.906526	0.220066	-4.1193	0.0005
D(INT)	0.469031	0.277538	1.6900	0.1074
C	-0.018832	0.037536	-0.5017	0.6216
R-squared	0.4469			
Adjusted R-squared	0.4206			
S.E. of regression	0.02446			
F-statistic	16.9700			
Prob(F-statistic)	0.0005			

Source: Research Data (2026)

Table 5 shows the error correction representation of the ARDL(1,0) model. The error correction term was negative and statistically significant (−0.906526, p = 0.0005), indicating that approximately 90.65% of short-run disequilibrium was corrected within one year. The coefficient on D(INT) was positive but statistically insignificant (0.469031, p = 0.1074), indicating no statistically significant short-run effect of changes in lending interest rates on ROA. The model had an R-squared of 0.4469 and an Adjusted R-squared of 0.4206. Overall, the results indicate rapid adjustment towards equilibrium but no statistically significant short-run interest-rate effect at the 5% level.

Summary of Hypothesis Testing

The bounds test rejected the null hypothesis of no levels relationship (F = 5.1176, p = 0.0167), indicating cointegration between lending interest rates and ROA. The error correction term was negative and significant (−0.9065, p = 0.0005),

confirming adjustment towards long-run equilibrium. However, the estimated short-run coefficient was positive but insignificant (0.4690, p = 0.1074), and the long-run coefficient was positive but insignificant at 5% (0.5174, p = 0.0727). Thus, the evidence supports a long-run equilibrium relationship but does not establish a statistically significant interest-rate coefficient at the 5% level.

Discussion of Findings

The findings address all three objectives. First, the descriptive results showed moderate variation in lending interest rates and greater variation in ROA, with mean values of 14.68% and 5.56%, respectively. The trend analysis showed periods in which the two series moved together, although the visual pattern alone does not establish causality. Second, the Pearson correlation of r = 0.433

indicated a moderate positive association between lending interest rates and ROA. This differs from the inverse relationship predicted by the Fisher Effect and from the negative association reported in some Kenyan studies, including Anyona et al. (2023), Nyakweba (2019) and Nyakundi (2021). Third, the ARDL results indicated cointegration and rapid adjustment towards equilibrium, but neither the short-run coefficient (0.4690, p = 0.1074) nor the long-run coefficient (0.5174, p = 0.0727) was statistically significant at the 5% level. The positive estimated coefficients may reflect the operating and financing conditions of KTDA during periods of liquidity pressure, but this interpretation should be treated as a possible explanation rather than a demonstrated causal mechanism. The findings therefore suggest that the interest-rate relationship at KTDA is more evident as a stable long-run equilibrium association than as a statistically significant short-run or individual long-run coefficient.

Conclusion

The first objective established that lending interest rates averaged 14.68% and ROA averaged 5.56% over 2002–2024. The two series displayed periods of co-movement, but ROA was more variable. Both series were stationary at levels, I(0), in the bivariate specification.

The second objective established a moderate positive statistical association between lending interest rates and ROA (r = 0.433). The positive sign differs from the inverse relationship expected under the Fisher Effect, but correlation alone does not establish causality.

The third objective established a long-run equilibrium relationship based on the ARDL bounds test and a significant error correction term. However, the short-run coefficient was statistically insignificant (p = 0.1074), and the long-run coefficient was also insignificant at the 5% level (p = 0.0727). Thus, the evidence supports cointegration and rapid adjustment rather than a statistically significant interest-rate effect in either horizon at the conventional 5% level.

Recommendations

Recommendations to KTDA Holdings Limited

KTDA's treasury function should monitor long-term borrowing costs and distinguish routine financing from borrowing associated with seasonal liquidity needs. Pre-arranged credit facilities may also help manage financing requirements during periods of tight liquidity, while lending-rate forecasts can be incorporated into financial planning.

Recommendations to Policy Makers

Policy makers and relevant authorities should consider the sector-specific transmission of interest rates when assessing effects on agribusinesses such as KTDA. The findings also support attention to seasonal credit availability and complementary factors affecting tea-sector profitability rather than relying on interest rates alone.

Suggestions for Further Research

Future research should test the possible role of liquidity-driven financing more directly using disaggregated KTDA borrowing data. Longer or higher-frequency data, such as quarterly observations, could also provide greater information on short-run dynamics. Comparative studies at individual KTDA-managed factories could further examine whether relationships differ between factory and holding-company levels.

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