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FINANCIAL INNOVATIONS AND FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN KENYA

[1]Marks Oeta Biraori, [2]Dr Tumaini Mutungi, [3]Dr Cynthia Waga

[1] Scholar, School of Business and Entrepreneurship, JKUAT, Kenya

[2] Lecturer, School of Business and Entrepreneurship, JKUAT, Kenya

[3] Lecturer, School of Business and Entrepreneurship, JKUAT, Kenya

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Abstract: **Commercial banks in Kenya are increasingly adopting financial innovations to enhance competitiveness, expand access to financial services, retain customers, increase revenue, and reduce operational costs. However, limited empirical attention has been given to how specific financial innovations, particularly payment cards, influence the financial performance of commercial banks in Kenya. This study examined the effect of payment cards on the financial performance of commercial banks in Kenya, with financial performance measured using Return on Assets. The study adopted a descriptive research design. The target population comprised all 38 commercial banks in Kenya, and a census approach was used. The study relied on secondary data obtained from Central Bank of Kenya reports covering the period 2015 to 2024. Data were analyzed using STATA software through descriptive and inferential statistics. The Vector Error Correction Model was employed to examine both short-run dynamics and long-run equilibrium relationships between financial innovation and financial performance. Pre-estimation diagnostic tests, including unit root tests, lag length selection, and Johansen cointegration analysis, were conducted to confirm the suitability of the model. The results revealed the existence of statistically significant long-run relationships between financial innovation and the financial performance of commercial banks in Kenya. Payment cards had a strong, positive, and statistically significant long-run effect on financial performance. Short-run results further indicated that payment cards contributed positively to bank performance. The study concluded that payment cards is an important financial innovation that enhance profitability and operational efficiency among commercial banks in Kenya. The study contributes to the financial innovation literature by providing empirical evidence on the role of payment cards in shaping bank performance within the Kenyan banking sector. The study recommends that commercial banks increase investment in secure, reliable, and scalable digital payment infrastructure to maximize the performance benefits of this innovation. It further recommends that regulators strengthen policy frameworks that support innovation, cybersecurity, interoperability, and consumer protection in digital financial services.**

Keywords: **Payment Cards, Financial Innovation, Financial Performance, Commercial Banks, Kenya.**

1. INTRODUCTION

Financial innovation encompasses new markets, institutions, technologies, and instruments. Modern finance is fundamentally based on financial innovation, which includes the development and promotion of new financial products, processes, and markets (Tufano, 2018). These innovations are broadly divided into procedural, institutional, and product categories (Frame & White, 2020), and they are primarily driven by customer demand, technology, and regulations (Lerner & Tufano, 2019). In Kenya and other rising economies, financial innovations are highly sought after as they may increase banking efficiency, cost savings, and overall customer satisfaction. Specifically, payment cards have widespread usage and a clear, significant influence on the profitability, efficiency, and financial inclusion of commercial banks.

Globally, the integration of digital payment cards presents both risks and opportunities for commercial banks. In European nations like Germany and France, payment cards are expected to dominate non-interest revenue (Zopa & Mikel, 2019). Similarly, in Sweden and the United Kingdom, new payment technologies have successfully enhanced transaction speeds and consumer satisfaction (Petrovic & Milosevic, 2021). In Western Africa, credit cards have been found to boost commercial bank earnings and efficiency by increasing transaction volumes, reducing cash management expenses, and improving customer retention, despite the high infrastructure costs associated with payment card systems (Kusi, Mensah, & Sai, 2021).

Locally, increasing financial inclusion and technology have revolutionized Kenya's financial innovation industry over the last two decades. Kenya's commercial banks, regulated by the Central Bank of Kenya (CBK), play a vital role in promoting economic stability and progress by bringing together savers and borrowers across numerous economic sectors (Central Bank of Kenya, 2021). The digital revolution has boosted efficiency and consumer satisfaction, with commercial banks increasingly utilizing the internet to simplify online transactions, account administration, and financial data monitoring. To navigate this competitive and changing financial environment, the CBK enforces capital and risk management regulations (Gikandi & Bloor, 2010), including risk-based supervision and anti-money laundering measures, to safeguard depositors and ensure industry stability (Central Bank of Kenya, 2011).

1.1 Statement of the Problem

Commercial banks provide a strong financial system that can resist unfavorable shocks, and their financial performance is heavily impacted by industry competition and the variety of goods provided (Olweny & Shipho, 2011). As Kenya's commercial banks have grown in number, clients have become increasingly price-conscious and open-minded, which has contributed to a notable fall in performance for the majority of the banking sector (Olweny & Shipho, 2011).

Within this highly competitive landscape, financial innovations are viewed as one of the most important methods to increase a bank's income and enhance its services (Jack & Suri, 2011). However, the implementation of these innovations confronts a variety of hurdles, including low consumer trust, security problems, system malfunctions, transaction failures, and network disruptions (Muthoni, 2021). Because of these persistent challenges, consumers continue to visit physical bank branches for services despite the broad availability of alternative digital banking channels, raising significant worries about the true impact of these innovations on the profitability of commercial banks (Muthoni, 2021).

Previous empirical studies regarding the influence of financial innovation on financial performance have yielded highly inconsistent results. Some research indicates that financial innovation and information technology conceptualization have a major positive influence on a bank's financial performance (Mwania & Muganda, 2011). Similarly, the adoption of electronic banking innovations has been found to have a direct, significant impact on the financial outcomes of commercial banks (Aduda & Kingoo, 2012). Conversely, these findings are directly contradicted by other studies showing that internet-based financial innovations had absolutely no influence on bank financial performance and risk (Francesca & Claeys, 2010; Pooja & Balwinder, 2009). Furthermore, studies focusing on alternative banking models also emphasize these contrasting dynamics, making further investigation into the influence of financial innovation on the financial performance of Kenya's commercial banks both necessary and motivated (Chipeta & Muthinja, 2018).

General objective of the study

The overall objective of the study was to determine the influence of financial innovations on the financial performance of commercial banks in Kenya.

Specific objectives of the study

The study is based on specific objectives;

i. To determine the influence of payment cards on the financial performance of commercial banks in Kenya.

Research Hypotheses

H_{01}: Payment cards have no significant influence on financial performance of commercial banks in Kenya.

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2. LITRATURE REVIEW

Theoretical Review

System Theory

Ludwig von Bertalanffy established systems theory in the 1940s, postulating that biological systems collaborate to maintain homeostasis and achieve goals (Bertalanffy, 1968). Kenneth Boulding, Anatol Rapoport, and Ross Ashby later expanded these concepts to emphasize the importance of systemic links and feedback loops required to understand complex organizations (Ashby, 1956; Boulding, 1956; Rapoport, 1986). Jay W. Forrester further depicted financial institutions as complex systems with interrelated components that directly influence performance (Forrester, 1961). This theory's principal claim is that an organization is a complex, adaptable system that works together to achieve its overarching goals. The idea goes on to say that modern organizations, such as commercial banks, must act as learning organizations that understand systemic linkages inside and beyond the firm to remain adaptable (Senge, 1990).

The theory's proponents assert that robust payment card systems increase a bank's income and market share by boosting customer happiness, transaction efficiency, and client retention (Mwangi, 2022). Systems operated by financial firms generate feedback that, when paired with big data analytics and real-time transaction monitoring, helps banks identify fraud, cut losses, and maintain customer trust (Kamau, 2023). In a similar vein, the dynamic character of systems theory promotes innovation and flexibility, allowing financial institutions to successfully adapt to changing payment technologies, economic downturns, and regulatory shifts in a constantly changing financial market (Senge, 1990).

Conceptual Framework

A conceptual framework is a diagrammatic description of the relationships between studied variables. Several research reviewed in the literature have provided empirical and theoretical explanations for the link between financial innovations and financial performance of Kenyan commercial banks.

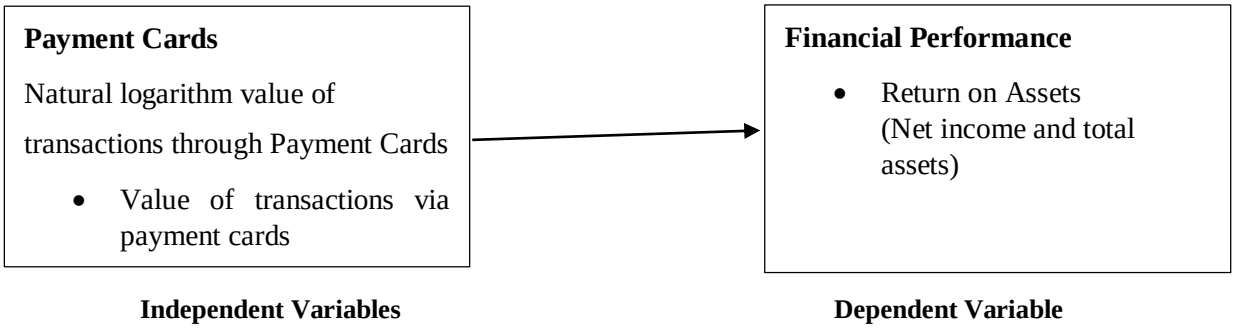

Figure 1: Conceptual framework

Payment Cards

Previous research has established the value of debit and credit card transactions as typical indicators for evaluating alternative payment methods. To measure this specific financial innovation, the total value of transactions conducted throughout a ten-year study period (2015 to 2024) is calculated using the natural logarithm. The transaction amounts are derived using data from the Central Bank of Kenya (CBK) alongside individual bank accounts. This methodological approach aligns with previous studies that evaluated the impact of credit card usage on commercial bank financial performance as well as research exploring financial innovations within branchless banking models in Kenya (Chipeta, 2018).

Financial Performance

The primary indicators used to evaluate a firm's financial performance include return on equity (ROE), return on assets (ROA), and the financial leverage indicator, which represents the ratio of equity to total assets. By utilizing long-term trend analysis, institutions can accurately identify patterns in indicator performance regarding profitability. Specifically, the rate of return on assets (ROA) serves as a broad and highly effective tool for analyzing a firm's success by comparing its returns directly against its total assets (Chipeta, 2018). Ultimately, higher ROA levels are a direct implication of increased profitability and overall financial performance.

Empirical Review

Payment Cards and Financial Performance

Empirical evidence indicates that payment cards significantly and positively influence the financial performance and profitability of commercial banks (Mukulu et al., 2024). A study analyzing commercial banks listed on the Nairobi Securities Exchange from 2018 to 2022 revealed that the use of credit cards, automated teller machines (ATMs), and point-of-sale (POS) technology directly enhances financial outcomes (Mukulu et al., 2024). To further boost performance, researchers suggest that banks decrease credit card issue requirements and reduce transaction barriers for POS systems across various retail enterprises (Mukulu et al., 2024). Similarly, between 2009 and 2019, increased debit card usage favorably impacted the Kenyan banking sector's profitability by lowering transaction costs, increasing consumer convenience, and facilitating the acquisition of new customers (Ndhine et al., 2020).

Globally, the diffusion and adoption of credit cards in the Indian banking sector are heavily dictated by bank-specific features such as size, non-interest income, non-performing assets, profitability, and market share (Kaur & Kaur, 2019). Additionally, research among private bank staff in Myanmar demonstrated that simple access to credit and low minimum payment criteria substantially encourage credit card usage, whereas, surprisingly, prior credit card knowledge presented a negative impact (Paing, 2020).

3. RESEARCH METHODOLOGY

Since the study needed to investigate the study variables as they are, and assess them without manipulating them, a descriptive research design was employed (Crewell & Creswell, 2017). The total number of the commercial banks in Kenya was 38 with observations taken quarterly for 2015 -2024, thus 40 observations.

This study adopted the "census sampling design" technique wherein the desired target population was not sampled but only all the commercial banks were included since these banks were the only ones under consideration (Kothari, 2004). This was appropriate in a population that was more manageable, and limited sampling error and made findings more reliable. The document review guide from the Central Bank of Kenya website, CBK reports and Central Bank Supervision Reports 2015-2024 were used to collect secondary quantitative data.

Data analysis was both descriptive and inferential statistical techniques. To present general trends, descriptive statistics were used which comprise mean, median, mode and standard deviation, while inferential analysis employs VECM which examined short term financial phenomena and long-term relationships of financial innovations and financial performance (Brooks, 2008). Testing procedures like stationarity tests, lag length selection, Johansen cointegration tests and post-estimation tests for stability, autoregression, heteroscedasticity, and normativity of residuals were also applied to ensure the reliability of the study (Johansen & Juselius, 1988). The regression model was as follows:

$$\Delta X_t = \alpha\beta X_{t-1} + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \Gamma_3 \Delta X_{t-3} + \ldots\ldots\ldots\ldots\ldots\ldots \Gamma_p \Delta X_{t-p} + \varepsilon_t$$

Where

α = is coefficients of the adjustments matrix

β = is co-integrating equations matrix coefficients

Γ = is short run coefficients

X_t = model endogenous variables.

4. RESEARCH FINDINGS AND DISCUSSIONS

Descriptive Studies

Table 1: Descriptives Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Financial Performance	40	10.43442	7.751826	.380477	25.7039
Payment Cards	40	10.35054	5.859569	.7377987	20.01419

Financial performance exhibits a mean of 10.43 and a relatively high standard deviation of 7.75, with values ranging from 0.38 to 25.70. The minimum value suggests at least one institution recorded very low performance, while the maximum signals strong performance in more competitive or technologically advanced banks. This notable dispersion is indicative of institutional heterogeneity, a pattern supported by Muthinja and Chipeta (2018), who found that banks in Kenya exhibit differing financial returns depending on their technological agility, customer base, and scale.

Payment cards show a mean of 10.35 and a standard deviation of 5.86, with values ranging from 0.73 to 20.01. The growth rate for payment cards is likely steady and more urban-focused. According to Kombe (2023), card usage is growing but remains largely constrained to middle- and upper-income users in metropolitan zones, making it less transformative in rural inclusion efforts.

All evaluated variables show similar growth patterns over time with comparable means clustering between 10.35 and 10.43 and variability. This narrow spread suggests that banks are investing in this innovation at roughly equal levels, likely as part of cohesive digital transformation strategies. This convergence aligns with insights from Chelangat and Kiprop (2022), who observed that Kenyan commercial banks tend to roll out electronic services concurrently as part of integrated service delivery models. The relatively uniform standard deviations across these innovations further reinforce the idea that the rate of growth and adoption has been broadly consistent across the sector.

Correlation Analysis

Table 2: Correlation Matrix

	Financial Performance
Financial performance	1.0000
Payment Cards	0.9962

The correlation matrix reveals exceptionally high positive correlations between financial performance and digital banking innovations. Payment cards (r = 0.9962) exhibit a strong positive association with financial performance, suggesting that banks adopting this innovation tend to experience higher profitability and operational efficiency. These findings align with previous studies by Halima (2023) and Chelangat and Kiprop (2022), which concluded that the increased adoption of digital banking channels directly contributes to better financial performance and greater customer engagement within the banking sector.

Stationarity Tests

Augmented Dickey-Fuller (ADF)

Table 3: Unit root test for Financial Performance

Augmented Dickey-Fuller test for unit root Number of obs = 35

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-1.222	-3.682	-2.972	-2.618

MacKinnon approximate p-value for Z(t) = 0.6642

Financial Performance (FP) Based on 35 observations and four lags, the test reveals a test statistic of -1.222. This value is higher than the critical values at the 1% (-3.682), 5% (-2.972), and 10% (-2.618) levels, with a MacKinnon approximate p-value of 0.6642. Thus, the null hypothesis cannot be rejected, indicating non-stationarity at level form.

Table 4: Unit root test Payment Cards

Augmented Dickey-Fuller test for unit root		Number of obs =	35
	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -0.945	-3.682	-2.972	-2.618

MacKinnon approximate p-value for Z(t) = 0.7727

Payment Cards (PC) The test yields a statistic of -0.945 and an approximate p-value of 0.7727. Because the statistic is higher than the critical thresholds, payment card usage exhibits a non-stationary stochastic trend over time.

Phillips-Perron (PP) Test (Robustness Check)

Table 5: Phillips-Perron Test for Financial Performance

Phillips-Perron test for unit root		Number of obs =	39
		Newey-West Lags =	3
	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) -0.275	-18.152	-12.948	-10.480
Z(t) -0.617	-3.655	-2.961	-2.613

MacKinnon approximate p-value for Z(t) = 0.8670

Financial Performance (FP) Generates a Z(t) statistic of -0.617 and a MacKinnon p-value of 0.8670, failing to exceed the critical values at 1% (-3.655), 5% (-2.961), and 10% (-2.613). This reinforces the ADF conclusion that the variable is non-stationary.

Table 6: Phillips-Perron Test for Payment Card

Phillips-Perron test for unit root		Number of obs =	39
		Newey-West Lags =	3
	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho) -0.044	-18.152	-12.948	-10.480
Z(t) -0.112	-3.655	-2.961	-2.613

MacKinnon approximate p-value for Z(t) = 0.9482

Payment Cards (PC) Returns a Z(t) statistic of -0.112 and a p-value of 0.9482, indicating that the series is non-stationary in its level form. This collective behavior satisfies the necessary preconditions for conducting multivariate cointegration analysis within a VECM framework.

VAR Lag Order Selection

Table 7: VAR lag order selection

Selection-order criteria

Sample: **2017q1 - 2024q4** Number of obs = **32**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-170.872				.040873	10.992	11.0679	11.221
1	-72.4803	196.78	25	0.000	.000426	6.40502	6.8605	7.77915
2	-60.0032	24.954	25	0.465	.001053	7.1877	8.02276	9.70694
3	-22.873	74.261	25	0.000	.000698	6.42956	7.64419	10.0939
4	9.13265	64.011	25	0.000	.00101	5.99171	7.5859	10.8012
5	83.7821	149.3	25	0.000	.000309	2.88862	4.86238	8.84317
6	2449.74	4731.9	25	0.000	2.2e-64*	-143.421	-141.068	-136.321
7	4348.2	3796.9	25	0.000	.	-261.762	-259.333	-254.434
8	4387.81	79.231*	25	0.000	.	-264.238*	-261.809*	-256.91*

Endogenous: Financial Performance Payment Cards

Exogenous: _cons

Lag selection statistics present significant variation across criteria, with the AIC, HQIC, and SBIC reaching their minimum values at lag eight, a finding also supported by the likelihood ratio (LR) test. However, based on economic intuition and the practical interpretability of a quarterly dataset, a lag length of four is recommended. This lag length achieves competitive values across information criteria while effectively capturing one full year of seasonal and short-run dynamics. This decision is consistent with Njeru (2023), who emphasized the importance of quarterly lags in capturing regulatory cycles and innovation effects in financial systems.

Cointegration Test

Table 8: Johansen cointegration test Constant

Johansen tests for cointegration

Trend: constant Number of obs = 38

Sample: 2016q1 - 2024q4 Lags = 4

Maximum rank	parms	LL	eigenvalue	Trace Statistic	5% critical value
0	80	-66.052657	.	77.4619	68.52
1	89	-51.828329	0.54626	49.0132	47.21
2	96	-38.400909	0.52572	22.1584*	29.68
3	101	-31.375588	0.32314	8.1077	15.41
4	104	-27.709079	0.18429	0.7747	3.76
5	105	-27.321724	0.02129		

The cointegration test is a fundamental procedure used to determine whether a set of non-stationary variables, individually integrated of order one (I(1)), share a stable, long-run equilibrium relationship without persistent divergence. Identifying this cointegration is a prerequisite for applying the Vector Error Correction Model (VECM), which effectively decomposes variable dynamics into long-run equilibrium forces and short-run adjustments (Johansen, 1991; Lütkepohl, 2005).

Based on the Johansen cointegration test conducted with a constant trend assumption and four lags the trace statistics indicate the presence of at least two statistically significant cointegrating relationships among the variables. Specifically, the null hypothesis of no cointegration (rank = 0) is rejected because the trace statistic of 77.4619 exceeds the 5% critical value of 68.52, with the rejection continuing at rank 1. Because the trace statistics fall below the corresponding critical values from rank 3 onward, the appropriate cointegration rank is securely established as 2. Ultimately, this confirms that the financial innovation indicators share distinct, meaningful long-run equilibrium relationships with financial performance, fully validating the use of the VECM to model short-run deviations through error correction mechanisms.

VECM Estimation

Since this study found that the series are co-integrated, it did not use the VAR, but rater computed the VEC to capture the relationship

Table 9: Vector Error Correction Estimates

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	3	1968.898	0.0000

Identification: beta is exactly identified

Johansen normalization restrictions imposed

Beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
Financial Performance	1	.	.	.	.	.
Payment Cards	4.673381	2.038943	2.29	0.022	.6771263	8.669635
_cons	.9575881	.	.	.	.	.

From the findings, the following counteracting/correction equation was developed;

$$FI_{t-1} = .9575881 + 4.673381\Delta InPC_{t-1}$$

Based on the VEC estimates, payment cards exert a significant positive long-run influence on financial performance (coefficient = 4.6734, p = 0.022). This indicates that expanded card usage enhances revenue generation, transaction efficiency, and overall financial outcomes over time. Ultimately, the long-run equilibrium of financial performance is primarily driven by payment card usage, which serves as a key enhancer of performance.

Table 10: short-run coefficient

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D Financial Performance						
_ce1						
L1.	-.5337791	.1666607	-3.20	0.001	-.8604281	-.2071302
Financial Performance						
LD.	010375	.2435089	0.04	0.966	-.4668937	.4876436
L2D.	.1955283	2482005	0.79	0.431	-.2909357	.6819924
L3D.	-.0643963	.2170594	-0.30	0.767	-.4898249	.3610323
Payment Cards						
LD.	.2837182	.2961512	0.96	0.338	-.2967276	.8641639
L2D.	.1745953	.2980238	0.59	0.558	-.4095207	.7587113
L3D.	-.0037814	.2980238	-0.01	0.990	-.5911161	.5835533
_cons	.186305	.4746629	0.39	0.695	-.7440171	1.116627

From the findings, the study also developed the generalized VEC model;

$$FP_t = .186305 + 010375FP_{t-1} + .2837182PC_{t-1}$$

The Vector Error Correction Model (VECM) results explain how financial performance (FP) responds in the short run to changes in payment cards (PC) while adjusting toward long-run equilibrium. The error correction term (_ce1) is negative and statistically significant (coefficient = −0.5338, p = 0.001), confirming a stable long-run equilibrium relationship. This indicates that approximately 53.4% of short-run disequilibrium in financial performance is corrected within one period, reflecting a relatively fast speed of adjustment. In the short run, the lagged changes in financial performance (LD.FP) do not significantly influence current performance. For payment cards, all lagged coefficients are statistically insignificant, implying that card usage does not exert an immediate, meaningful impact on financial performance.

Hypothesis Testing

H01: Payment cards have no significant effect on the financial performance of commercial banks in Kenya.

The short-run coefficients for payment cards are statistically insignificant across all lags (p > 0.30), leading to a failure to reject H01 in the short run; payment card usage does not exert an immediate influence on bank performance. In the long run, however, the results show a positive and statistically significant coefficient (4.6734, p = 0.022). After reversing the sign as required by VECM interpretation, this suggests that growth in payment card usage may reduce long-run financial performance if associated costs such as high infrastructure and fraud management fees outweigh generated revenues (Ogutu, 2018).

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion of the Study

Payment cards do not influence financial performance in the short run, but they play a statistically significant role in the long run. The absence of short-run significance implies delayed transmission of card-related benefits or costs to bank performance. However, the significant long-run coefficient suggests that payment card activities shape long-run financial outcomes, with the direction of adjustment implying that long-term costs may outweigh revenues if not efficiently managed.

5.2 Recommendations

Payment cards show no significant short-run effects, they exhibit a significant long-run relationship with financial performance, indicating that card services influence performance only after sustained usage. However, the long-run adjustment effect implies that card growth can become performance-dampening if costs dominate revenues. Based on this, banks should shift from card issuance growth strategies to usage-intensity and cost-containment strategies. The findings support focusing on increasing transaction frequency per card and reducing fraud-related and infrastructure costs, rather than expanding card portfolios indiscriminately. This recommendation directly reflects the delayed but structurally important role of payment cards shown in the cointegrating relationship.

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