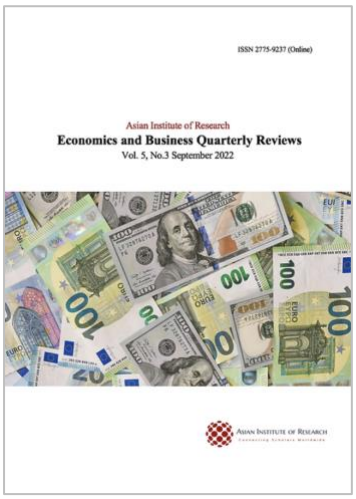

Economics and Business Quarterly Reviews

Mwange, A., Kasongola, P., & Meyiwa, A. (2022). An Assessment of The Effect of Mobile Money Services on The Profitability of The Banking Sector in Zambia. *Economics and Business Quarterly Reviews*, 5(3), 139-152.

ISSN 2775-9237

DOI: 10.31014/aior.1992.05.03.443

The online version of this article can be found at:
https://www.asianinstituteofresearch.org/

Published by:
The Asian Institute of Research

The Asian Institute of Research *Journal of Economics and Business* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of Economics and Business, which includes, but is not limited to, Business Economics (Micro and Macro), Finance, Management, Marketing, Business Law, Entrepreneurship, Behavioral and Health Economics, Government Taxation and Regulations, Financial Markets, International Economics, Investment, and Economic Development. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Journal of Economics and Business* aims to facilitate scholarly work on recent theoretical and practical aspects of Economics and Business.

ASIAN INSTITUTE OF RESEARCH
Connecting Scholars Worldwide

The Asian Institute of Research
Economics and Business Quarterly Reviews
Vol.5, No.3, 2022: 139-152
ISSN 2775-9237

DOI: 10.31014/aior.1992.05.03.443

An Assessment of The Effect of Mobile Money Services on The Profitability of The Banking Sector in Zambia

Austin Mwange[1], Pimpa Kasongola[2], Ayanda Meyiwa[3]

[1] Department of Economics, School of Social Sciences, ZCAS University, Zambia; Department of Economics, School of Accounting, Economics, and Finance, College of Law and Management Studies, University of Kwa Zulu Natal, South Africa; Graduate School of Business/Institute of Distance Education, University of Zambia, Zambia
[2] Banker, Manager, Corporate Services and Administration, Indo-Zambia Bank. Email: pkasongola@gmail.com
[3] Professor, Unit of Maritime Law and Maritime Studies, Department of Economics, School of Accounting, Economics, and Finance, College of Law and Management Studies, University of Kwa Zulu Natal, South Africa. Email: meyiwaa@ukzn.ac.za

Correspondence: ZCAS University, Dedan Kimathi Road, P.O. Box 50497 RW, Lusaka, Zambia.
Email: austinmwange1@gmail.com; 219096990@stu.ukzn.ac.za

Abstract
The aim of the study was to investigate the effect of mobile money services on Zambia's banking sector profitability. Profitability was proxied by Return on equity (ROE) and Gross interest income (GII). Using the Johansen Cointegration approach on quarterly data for the period 2012Q1 to 2021Q4, the results suggest a positive relationship between mobile money services and commercial banks' profitability. Based on the results, the study recommends that there is need for commercial banks to continuously align their operational models with emergent innovative services in the sector while also appealing to regulators to collectively design regulatory frameworks that are responsive to developing sector trends.

Keywords: Mobile Money, Banking Sector, Profitability, Interest Income, Return on Equity

1. Motivation

The financial services landscape has, over the years, undergone a massive shift in both structure and how the services are being packaged and delivered. As regards packaging and delivery, the confluence of financial services and internet-enabled technology (FinTech) has quickened the pace of the shift thereby posing a serious threat to traditional methods (Jayawardhena & Foley, 2000; PwC, 2016; Maino, et al., 2019). Either through their internal technology units or in partnership with technology companies, commercial banks (major providers of financial services) have leveraged on technology to deliver products that have appealed to changing consumer needs. In

revelation of the benefits associated with technology in financial services, an excess of USD 466 billion, nearly 7% of Africa's real GDP in 2019, was invested in the FinTech space at global level between 2017 and 2020 (KPMG, 2020).

While commercial banks in the developing world have not been left behind in the digital banking shift (IFC, 2017a), impressive results have more so come from outside the commercial banking sector. In Sub-Saharan Africa, disruptive innovation has particularly arrived in form of mobile money services offered by Mobile Network Operators (MNOs) and the region has become a global leader in both adoption and usage on this front (Maino, et al., 2019).

In Zambia, the advent of mobile money services dates back to two decades ago when the now unlicensed (on allegations of fraudulent activities and operational challenges) Celpay launched a mobile payment product in 2002 before being joined by Zoona years later in 2009 (Cooper, et al., 2019). Although Zoona built a strong brand and became a mobile money household name, the entry of Mobile Network Operators (MNOs) in the names of Airtel, MTN and Zamtel in 2011, 2012 and 2017 respectively, massively hurried the pace of adoption mirroring paths of Kenya and Uganda on the continent (Kabala & Seshamani, 2016; GSMA, 2019; Cooper, et al., 2019).

At the end of 2019, the number of registered mobile money accounts increased more than 9-fold to over 41 million from 1.4 million in 2012 while the number of active mobile money agent outlets per 1000 square meters jumped to 98 from 2 over the same period.[1]As a result, the volume and value of transactions have grown exponentially over the years. Payments data from the Bank of Zambia (BoZ) indicate a surge in volumes to 750.5 million in 2020 from 17.4 million in 2012 with corresponding value figures rallying over 9000% to ZMW 105.82 billion from ZMW 1.16 billion. Actually, the value of payments made via mobile money surpassed the figure for check settlements in 2018 (ZMW 22.19 billion vs ZMW 12.42 billion).

Just like everywhere else where success has been recorded, mobile money has generated a range of socio-economic benefits for Zambia. For example, increased uptake in mobile money services has resulted in improved levels of financial inclusion (BoZ, 2020), is a source of employment for many especially young people working as booth operators (Kabala & Seshamani, 2016), has encouraged the culture of saving (Cooper, et al., 2019)while also being an enabler of entrepreneurial practice for SMEs. While the contribution to GDP by the mobile money sector in Zambia may currently be unquantified, the above cited benefits imply that it is hard to ignore the increasingly growing importance of the subsector to the overall economy.

The above success story of mobile money services and a plethora of associated benefits notwithstanding, questions on whether the emergence and immense scale of mobile money services is a threat to commercial banks have arisen elsewhere. Largely, these concerns are emanating from the fact that mobile money accounts almost function as a typical bank account in that people can deposit/withdraw money as well as make payments more efficiently and conveniently so than online banking services in some cases (Kubuga & Konjaang, 2016; GSMA, 2017). Besides, central banks have moved into this space with healthy regulation and therefore, these platforms have won the trust and confidence of consumers (Cooper, et al., 2019; Muthiora & Bahia, 2020).

Literature on whether mobile money services are a competition for commercial banks does not indicate consensus. On one hand, the emergence of mobile money services has been found to be limiting the ability of banks to mobilize deposits/savings thereby having a negative effect on banks' liquidity positions in Uganda (Kamukama & Tumwine, 2012), has caused a decrease in commercial banks' capital adequacy and liquidity ratios in Kenya (Samuel & Wamalwa, 2019)while a reduction in the commercial bank deposit account penetration has been observed in Uganda (GSMA, 2019). On the other, and by encouraging formal savings and bringing the previously unbanked and underserved populations into the mainstream financial sector, the exponential growth in mobile money services has been viewed as helping in deposit mobilization therefore credit extension by commercial banks (Mbiti & Weil, 2011; Nampewo, et al., 2016; Bank of Ghana, 2017; Ky, et al., 2019).

[1] Data reported here was obtained from the IMF's Financial Access Survey (FAS)

In addition to the above controversy in empirical findings in countries, published studies on mobile money in Zambia have largely concentrated on drivers behind increasing adoption (Mintz-Roth, 2018; Njele & Phiri, 2021), influence on financial inclusion (Kabala, et al., 2018) and recently impediments on greater adoption (Chipa & Mwanza, 2021). In view of the foregoing, it remains empirically unclear on what the effect of continuously flourishing mobile money services is on profitability of commercial banks in Zambia.

1.1 Objectives

The aim of this is to investigate the effect of mobile money services offered by Mobile Network Operators (MNOs)on profitability of commercial banks in Zambia. Specifically, the study will answer the following research questions:

i. What is the effect of mobile money transactions on commercial banks' return on equity?
ii. What is the effect of mobile money transactions on commercial banks' gross interest income?

The findings of this study are of great significance in informing policy especially beneficial to the monetary authorities who are also regulators of the space in which mobile money operators operate from. The study results are also valuable to both commercial banks and MNOs on how they can reposition themselves for their own good either collectively or individually. In addition, the study provides information vital for advocates of financial sector deepening and financial inclusion in the country as well as beyond.

2. Literature Review

2.1 Theoretical Review

The key theories that explain the use of financial technologies such as mobile money for banking purposes are explained below:

2.1.1. The Actor-Network Theory (ANT)

Originally from the field of sociology, the Actor-Network Theory was initially developed to study how human beings interact with innate objects (Cresswell, et al., 2010). Following the advent of technology, it has since found wider use in studies that involve the adoption of technological products and associated applications (innate object) by human beings. In studies of mobile money services that have leveraged on continued evolution of technological offerings, the theory has previously been used to understand the interaction between suppliers that have leveraged on technological capabilities and consumers of mobile money services and explaining why this interaction has led to disruption of how the financial sector is servicing clients' needs (Harry, et al., 2014; Adaba & Ayoung, 2017).

2.1.2 Technology Acceptance Model (TAM)

An extension of the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM) is anchored on two key human behavioral aspects of intention and attitude where the former determines actual usage of the technology-driven new product offerings while the latter influences the former. It posits that when users are exposed to new technology, their decision to either adopt it or not depends on two factors of its perceived usefulness (PU) as well as the perceived ease of use (PEOU). Given its usefulness and parsimonious nature (Lucas & Spitler, 1999), the model has widely been utilized in empirical studies involving innovations in telemedicine (Hu, et al., 1999), online banking services (Pikkarainen, et al., 2004), e-commerce (Wu & Wang, 2005), e-learning(Jeong, 2011) and recently mobile money revolution (Akinyemi & Mushunje, 2020).

2.2 Empirical Literature

Despite being relatively new, the area of mobile money services has received a lot of attention from different scholars largely due to its disruptive nature in the world of finance especially in the developing world. At the very basic level, studies in this area have focused on the factors behind its success (GSMA, 2010; Chauhan, 2015; IMF,

2019; GSMA, 2020), opportunities embedded in the innovation (Aron, 2018; Maino, et al., 2019) as well as challenges/limitations (Otieno, et al., 2016; Farooq, 2020).

Among the key drivers of the sub-sector's growth, ease with which one can open an account (GSMA, 2020); low delivery and utilization costs (IMF, 2020); efficiency in facilitation of informal risk sharing (IMF, 2019); convenience – network of agent points is widespread (Chauhan, 2015); and also user friendliness (GSMA, 2010) have stood out. Beyond the drivers, ability to bring the unbanked into the mainstream financial system, encouraging the culture of saving, potential to improve the efficiency of the financial services industry as well as employment creation are among the opportunities the innovation offers (Aron, 2018; Maino, et al., 2019). Meanwhile, insufficient agents' liquidity when it comes to servicing clients with large withdrawal needs (Otieno, et al., 2016); fraudulent activities such as identity theft, SMS scams and SIM swaps (Farooq, 2020; INTERPOL, 2020)in addition to episodes of network failure that makes the money inaccessible (Kubuga & Konjaang, 2016) are the most cited challenges.

Further, research has, in recent times, shifted to the effect of mobile money services on the broader aspects of the economy (Kamukama & Tumwine, 2012; Kubuga & Konjaang, 2016; Kabala & Seshamani, 2016; Aron, 2018; GSMA, 2019; Mawejje & Lakuma, 2017; Suri & Jack, 2016). For example, the mobile money technology has been found to be a solution to weak institutional infrastructure and cost structures that are associated with traditional banking services (Aron, 2018); has a positive effect on private sector credit while also improving effectiveness of monetary policy (Mawejje & Lakuma, 2017; GSMA, 2019); and reduces poverty through financial inclusion (Kabala & Seshamani, 2016; Suri & Jack, 2016).

As regards the effect of mobile money technology on commercial banks' performance, there is no census on existing literature. On one hand, reducing banks' depositor base (Kamukama & Tumwine, 2012), decreasing commercial banks' capital adequacy and liquidity ratios (Samuel & Wamalwa, 2019) and reducing deposit account penetration by commercial banks (GSMA, 2019; Deloitte, 2014) have been noted.

On the other, and by encouraging formal savings and bringing the previously unbanked and underserved populations into the mainstream financial sector, the exponential growth in mobile money services has been viewed as helping in deposit mobilization therefore credit extension by commercial banks (Mbiti & Weil, 2011; Nampewo, et al., 2016; Bank of Ghana, 2017). It is argued that this is because MNOs, and with the help of regulatory guidelines, are required to keep their balances with commercial banks (either in a trust or escrow account) so that central banks can have sight of these increasingly growing flows (Mawejje & Lakuma, 2017; Ky, et al., 2019).

Despite having high volumes of transactions, others have noted that the mobile money subsector has no significant effect on operations of commercial banks because the former only serve low income populations that were previously ignored by banks (Kubuga & Konjaang, 2016; GSMA, 2019). Besides, such restrictions as upper limits on how much money a mobile money account can have imply that people still keep their significantly high amounts in banks where they can earn interest (INTERPOL, 2020).

3. Methodology

3.1. Conceptual Framework

The schematic diagram below shows the conceptual framework demostrating how variables to be studied in the undertaking are related. There are four independent variables comprising the value of mobile money transactions, gross domestic product, interest rate spread and asset quality while commercial bank'sprofitability is the dependent variable. As can be seen, each of the independent variables is said to have an individual influence on commercial banks' profitability.

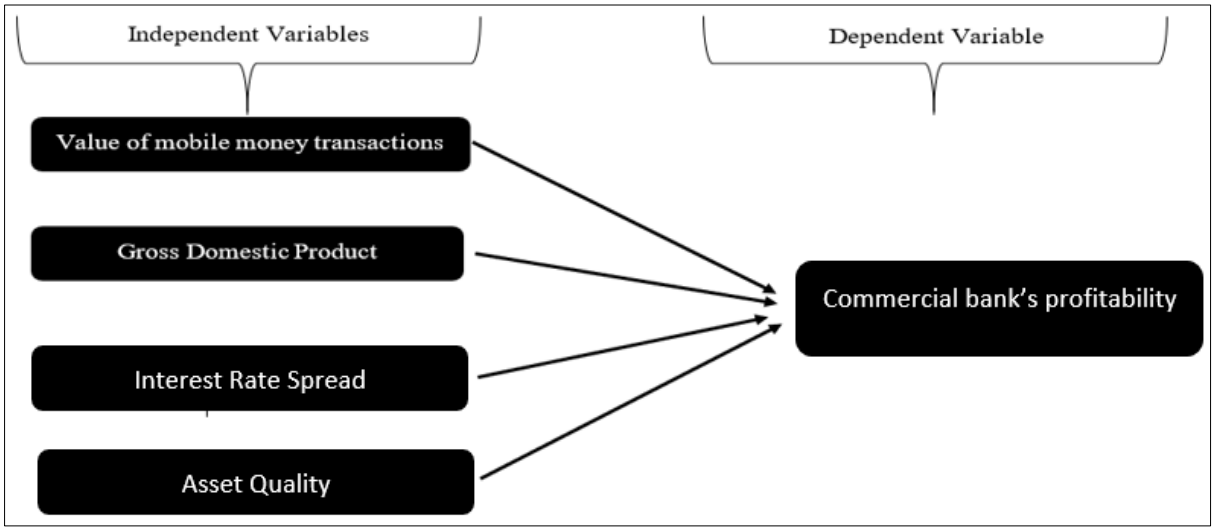

Figure 1: Conceptual Framework

While the main independent variable is mobile money transactions which represents use of mobile money services, gross domestic product (GDP), interest rate spread and asset quality are acting as control variables that have previously been found to be affecting commercial profitability. Particularly, rising GDP or income levels in the economy, higher interest rate spread and improved asset quality are associated with increased commercial bank's profitability (Mishkin, 2011; Kubuga & Konjaang, 2016; Bank of Ghana, 2017; Samuel & Wamalwa, 2019).

3.2. Empirical Model for the Study

The Johansen cointegration approach is employed largely due to its ability to avoid the loss of important information and transfer of possible errors introduced in the first stage by two-step cointegration procedures such as the Engle and Granger approach. In addition, the Johnasen cointegration approach makes it easy to derive an Error Correction Model (ECM) through a simple linear transformation which integrates short run adjustments with long run equilibrium without losing long-run information (Toppinen, 1998; Ngoma & Chanda, 2022).

3.3. Model Specification

Covering two different measures of profitability in the banking sector, the study estimated three models with specifications presented in equations (1) through (2).

$$ROE_t = \beta_0 + \beta_1 MMVT_t + \beta_2 IRS_t + \beta_3 NPL_t + \epsilon_t \quad (1)$$

$$GII_t = \theta_0 + \theta_1 MMVT_t + \theta_2 IRS_t + \theta_3 NPL_t + \mu_t \quad (2)$$

Where:

$\mathrm{ROE_t} = \text{Return on equity in quarter t}$

$\mathrm{GII_t} = \text{Gross interest income in quarter t}$

$\mathrm{MMVT_t} = \text{Value of mobile money transactions in quarter t}$

$\mathrm{IRS_t} = \text{Interest rate spread in quarter t}$

$\mathrm{NPL_t} = \text{Ratio of non} - \text{performing loans representing asset quality in quarter t}$

$\varepsilon_t, \mu_t = \text{Error terms for the above respective models}$

3.4. Sample Size and Data Sources

The study employs of quarterly data for the period 2021-2021 owing to data availability. Data on mobile money transactions, profitability of commercial banks (comprising return on assets, return on equity and gross interest income), ratio of non-performing loans and interest rate spread were sourced from Bank of Zambia (BoZ).

4. Data Analysis and Presentation of Findings

Table 1: Variable Descriptive Statistics

Measure	GII	IRS	MMVT (Million)	NPL	ROE
Mean	68.04	11.93	9085.44	9.33	17.16
Median	67.80	13.55	1313.16	9.30	15.35
Maximum	73.30	17.30	46819.19	13.00	35.10
Minimum	59.60	6.50	189.09	5.80	7.90
Std. Dev.	3.86	4.15	14054.43	2.05	5.79
Skewness	-0.31	-0.12	1.60	0.07	1.29
Kurtosis	2.17	1.36	4.22	1.95	4.46
Jarque-Bera	1.78	4.58	19.45	1.88	14.68
Probability	0.41	0.10	0.00006	0.39	0.000648
Sum Sq. Dev.	580.191	670.1878	7.70E+09	163.604	1308.214
Observations	40	40	40	40	40

4.1. Unit Root Test Results

As per standard procedure in studies that involve modelling of time series data, the variables of interest in the study were subjected to unit root test for purposes of determining whether each of them is stationary of not. Technically, a time series variable is said to be stationary if its mean and variance (standard deviation) are time-invariant (constant) while the covariance only depends on the distance between the two sets of observations for the same variable(Gujarati, 2004). In addition to aiding in the selection of the appropriate model to estimate, examining the stationarity of time series data also helps one to avoid the problem of spurious regression associated with non-stationary time series data.

Utilizing both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (P-P) tests, the variable unit root test results are displayed in Table 2. As can be seen, both tests revealed that all the variables were non-stationary in level form but were stationary after first differencing. According to Brooks (2008), a variable that is non-stationary in level but becomes stationary after being differenced once is said to be integrated of the first order and is generally denoted as I(1).

Table 2: Unit Root Testing Result

Variable	ADF Test Statistic			Assumption	P-P		
	Level	1st Diff.	Lag (SIC-Based)		Level	1st Diff.	Bandwidth
ROE	0.66	-4.79***	0	C&T	0.39	-4.79***	0
GII	-2.02	-5.04***	3	C	-2.25	-7.85***	1
NPL	-1.70	-4.43***	0	C&T	-1.54	-4.38***	2
LOG(MMVT)	-1.97	-6.64***	0	C&T	-1.83	-6.84***	6
IRS	-1.72	-4.44***	0	C&T	-2.12	-4.44***	0

4.2. Lag-Length Selection Criteria

Using the Akaike and Schwarz Bayesian Information Criterions, three lags were appropriate for models' estimations (Table 3).

Table 3: Optimum number of lags

ROE Model

VAR Lag Order Selection Criteria
Endogenous variables: ROE LNMMVT IRS NPL
Exogenous variables: C
Date: 08/10/22 Time: 00:57
Sample: 2012Q1 2021Q4
Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-298.8078	NA	237.7459	16.82265	16.99860	16.88406
1	-137.9974	276.9512	0.076793	8.777633	9.657366	9.084683
2	-128.0249	14.95868	0.111280	9.112497	10.69602	9.665187
3	-119.4214	10.99336	0.184210	9.523414*	11.81072*	10.32174*
4	-102.9509	17.38555	0.216839	9.497273	12.48836	10.54124

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

GII Model

VAR Lag Order Selection Criteria
Endogenous variables: GII LNMMVT IRS NPL
Exogenous variables: C
Date: 08/10/22 Time: 00:59
Sample: 2012Q1 2021Q4
Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-276.5559	NA	69.06082	15.58644	15.76239	15.64785
1	-138.4587	237.8341	0.078786	8.803258	9.682991	9.110309
2	-131.3570	10.65242	0.133909	9.297613	10.88113	9.850304
3	-124.8341	8.334860	0.248832	9.824117*	12.11142*	10.62245*
4	-94.53411	31.98332*	0.135850	9.029673	12.02076	10.07364

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

4.3. Johansen Cointegration Results

The Johansen Cointegration results reveal the existence of one cointegrating relationship on each set of the estimated equations. Both the Trace Statistic approach and the Maximum Eigenvalue (Max Eigen) tests are used on both sets of equations for robustness checks (Table 4).

Table 4: Johansen Cointegration Test Results

Hypothesized No. of CE(s)	**ROE Model Variables**				**GII Model Variables**			
	Trace		**Max Eigen**		**Trace**		**Max Eigen**	
	Test Statistic	**P-Value**	**Test Statistic**	**P-Value**	**Test Statistic**	**P-Value**	**Test Statistic**	**P-Value**
None**	73.697	0.024	37.874	0.016	73.594	0.024	37.917	0.021
At Most 1	35.823	0.405	18.374	0.464	45.052	0.090	22.803	0.230
At Most 2	17.449	0.607	9.437	0.796	23.578	0.219	15.892	0.359
At Most 3	8.112	0.464	6.696	0.526	11.542	0.180	7.367	0.625
At Most 4	1.315	0.251	1.315	0.251	0.268	0.605	6.012	0.190

*The asterisks "**" imply the null hypothesis is rejected at 5% level of significance*

4.4. Vector Error Correction Model Estimates

Having identified that all the variables were integrated of the first order and that a set of them for each proposed model were cointegrated, Vector Error Correction (VEC) models were estimated. Among a family of simultaneous equation models of the regression framework, A VEC model is among the two that uncovers both the long and short run dynamics of the relationships shared among the variables (Ngoma & Chanda, 2022; Zgambo & Chileshe, 20014).

4.4.1. Effect of Mobile Money Services on Banks' Profitability in the Long Run

Table 5 shows the long run estimates for the three sets of equations of interest.

Table 5: Long Run Estimates

	Model One (ROE)	**Model Two (GII)**		
Variable	**Coefficient**	**Test Statistic**	**Coefficient**	**Test Statistic**
Log(MMVT)	0.015~	2.446	0.715~	5.798
NPL	−0.508~	-4.601	-0.109	-3.584
IRS	0.583~	2.272	0.822~	3.191

The tilde "~" signify significance at at a minimum of 5% level of significance based on the 2-t rule of thumb

As was already discussed under the methodology chapter, the study looked at two dimensions of banking sector profitability comprising return on equity (ROE) and gross interest income (GII). The long-run results suggest that mobile money has a positive influence on Banks' profitability. Thus, a percentage increase in the value of mobile money transactions results into a rise in return on equity and gross interest income by 0.015 and 0.715 percentage points, respectively. These results are similar to the findings of Tiriongo and Wamalwa (2020) in Kenya and Opare (2018) in Ghana.

Literature discusses several pathways that mobile money services are complementary to the operations of banking sector players in a manner that the positive impact of mobile money on bank profitability of the latter. First, mobile money services have been noted to be encouraging formal savings in an economy on account of their wide reach to the previously unbanked and the underserved (Mbiti & Weil, 2011). Considering that regulation requires that mobile money service providers keep their deposits in partner commercial banks not only in Zambia (IFC, 2017b) but in other countries (Mawejje & Lakuma, 2017; Greenacre & Buckley, 2016), this means that mobile money services help commercial banks to mobilize deposits.

Second, and suggesting the incidental benefits from the preceding, mobile money services have also been found to be a driver of credit creation at commercial banks (Napewo et al.,2016; Mawejje & Lakuma, 2017). For example, Nampewo et al. (2016) finds that a 1% increase in mobile money transactions is associated with a 0.014% increase in credit that banks extend to the private sector. Given that asset creation is a key driver of commercial banks' revenue, it is not surprising for this study to find that flourishing mobile money services have helped to boost banking sector profitability in terms of return on equity and gross interest incomes.

In addition, mobile money has the capacity to enhance the activities of traditional banking through the linkages between mobile money networks and banking systems to facilitate the movement of fund between traditional bank accounts and mobile wallets. For instance, with the help of newly developed regulations necessitated by the changing landscape in the financial sector, growth has recently been seen in partnerships between commercial banks and providers of mobile money services (Nautiyal & Navarro, 2020). At the center of these partnerships is mobile money interoperability, a technique term which means provision of ability for mobile money clients to be able to transfer their money between two accounts offered by different schemes and/or between a mobile money account and a bank account(Clark & Camner, 2014). This has not only blurred the distinction between a bank account and a mobile money account but has also quickened the pace with which money balances that mobile money providers are able to pool together find their way into commercial banks. This has thereby enabled the banking sector to utilize these resources to carry out their lending activities as was observed by Nampewo et al. (2016).

Beyond mobile money transactions, the profitability models estimated also had control variables that included non-performing loans (NPL) interest rate spread. An increase in the ratio of non-performing loans (which indicates a deterioration in the quality of loans and advanced by commercial banks) leads to a reduction in the commercial bank's profitability. A deterioration in the quality of assets does not only lead to reduced recovery of loans (Singh, et al., 2021) but it also compounds operating expenses as central banks require commercial banks to make higher provisions. Besides, an environment where the quality of assets already sitting on the balance sheet is deteriorating tends to reduce the lending appetite of commercial banks thereby further restricting their revenue generating potential.

Finally, and consistent with results from Musa, et al. (2018), the long run results reveal that widening credit spread boost the profitability of commercial bank regardless of the measure. Specifically, and everything else being equal, a percentage point increase in the interest rate spread improves the return on equity and gross interest income by of 0.583 and 0.822 percentage points, respectively.

4.4.2. Short Run Results

The short run results for the two models are presented in tables 6 and 7. As expected, the coefficients of the error correction term (ECT) for each of the models carry the negative sign and are statistically significant at 5% level

of significance. The statistical significance of the coefficients of the error correction terms confirms the cointegration results reported in section 4.2 Besides, the negative signs on these coefficients also indicate that that once the stable long run relationships are disturbed, the model systems are able to correct back on their own(Zgambo & Chileshe, 2014). Specifically, when the long run ROE and the GII models are shocked, their speed of adjustments to re-establish equilibrium are 55.2% and 2.9%, respectively, per quarter.

Table 1: Short Run Vector Error Correction Model Estimates

Model One (ROE)			Model Two (GII)		
Variable	**Coeff.**	**P-Value**	**Variable**	**Coeff.**	**P-Value**
ECT	-0.55168***	0.0059	ECT	-0.02850**	0.0141
D(ROE(-1))	0.549313**	0.013	D(GII(-1))	5.26E-05	0.9852
D(ROE(-2))	0.172249	0.4389	D(GII(-2))	-0.00088	0.745
D(ROE(-3))	0.450932*	0.0513	D(GII(-3))	-0.00027	0.9175
D(LOG(MMVT(-1)))	-1.53454	0.526	D(LOG(MMVT(-1)))	0.011061	0.6715
D(LOG(MMVT(-2)))	-4.35712	0.2786	D(LOG(MMVT(-2)))	0.01518	0.5564
D(LOG(MMVT(-3)))	-2.61144	0.2152	D(LOG(MMVT(-3)))	-0.00807	0.7561
D(NPL(-1))	-0.22703	0.6929	D(NPL(-1))	-0.00715	0.2303
D(NPL(-2))	0.104621	0.8523	D(NPL(-2))	-0.00235	0.7095
D(NPL(-3))	0.453509	0.4362	D(NPL(-3))	0.003278	0.6045
D(IRS(-1))	-1.60426	0.4356	D(IRS(-1))	-0.00713	0.3844
D(IRS(-2))	0.998492	0.2082	D(IRS(-2))	-0.01476	0.1195
D(IRS(-3))	0.160714	0.8425	D(IRS(-3))	-0.00467	0.613*
Constant	1.139247	0.1181	Constant	0.0325***	0.0003

*The asterisks *, ** and *** signify significance at 10%, 5% and 1% levels, respectively*

In terms of the short run individual effects of the model variables, the study made use of the Wald Coefficient Restriction test. For each model variable, the null hypothesis of the Wald test states that the combined effects of the differenced variable lags are equal to zero against an alternative hypothesis that the combined effect is non-zero. In an event that the null hypothesis is rejected, the direction of the relationship is determined by the sign of the sum of the coefficients for the lagged variables.

TheWaldCoefficient Restrictions Test results suggest that the short-run relationship between mobile money services and profitability (ROE and GII) is statistically insignificant (Table 7). In addition, it has been revealed that, ROE is positively affected by its own past performance while GII is surprisingly negatively affected by interest rates margin. The result on the relationship between GII and IRS may suggest other factors, besides the cost of funds could be more significant in the determination of commercial banks' profitability.

Table 2: Wald Coefficient Restriction Test Results

	Null Hypothesis	Test Statistic	P-Value	Coefficients' Sum
Model One (ROE)	ROE does not granger-cause itself	F=11.65***	0.0029	1.17
	MMVT does not granger-cause ROE	F=3.82*	0.0655	-8.50
	NPL does not granger-cause ROE	F=0.14	0.7090	0.33
	IRS does not granger-cause ROE	F=0.18	0.6756	-0.45
Model Two (GII)	GII does not granger-cause itself	F=0.05	0.8226	0.00
	MMVT does not granger-cause GII	F=0.14	0.7144	0.02
	NPL does not granger-cause GII	F=0.59	0.452	-0.01
	IRS does not granger-cause GII	F=3.36*	0.0826	-0.03

*The asterisks *, ** and *** signify significance at 10%, 5% and 1% levels, respectively*

4.4.2. Statistical Soundness of the Estimated VEC Models

Diagnostic tests are carried out to assess the statistical validity of the study results. Thus, the Jarque Bera normality test of the residuals, LM serial correlation test, heteroskedasticity and dynamic stability tests were undertaken, and the results are shown in table 8.

As can be seen, the residuals of both models were found to be multivariate normal and each of the models does not suffer from the problems of serial correlation and heteroskedasticity. The foregoing conclusions are derived from the fact that the probability values (p-values) associated with the test statistics were all above the 5% level of significance.

Table 3: Post-Estimation Diagnostic Test Results

	Normality		**Serial Correlation**		**Heteroskedasticity**	
	Jarque-Bera Test Statistic	P-Value	Chi-Square Test Statistic	P-Value	Chi-Square Test Statistic	P-Value
ROE Model	12.13	0.2765	17.10	0.878	188.54	0.3162
GII Model	11.98	0.536	21.47	0.891	206.48	0.5403

In addition, the model coefficients were also found to be dynamically stable over the studied period (2012Q1-2021Q4) considering that the CUSUM lines (blue in color) were within the test boundaries (dotted red lines) as can be observed from Figure 3. This means that the coefficients estimated in both models were stable over the course of the period under study thereby also revealing absence of structural breaks.

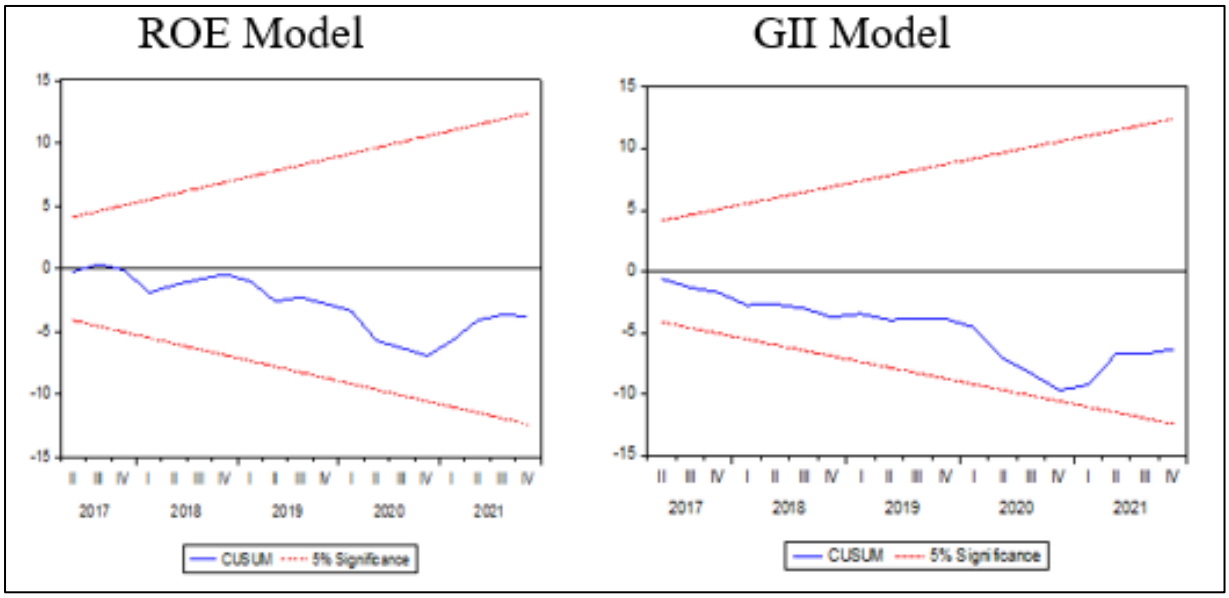

Figure 2: CUSUM Coefficient Dynamic Stability Test Results

5. Summary and Conclusions of the Study

In the advent of mobile money services that have particularly become so popular especially in Sub-Saharan Africa in the last decade, questions have risen bordering on whether these services that are mostly offered by Mobile Network Operators (MNOs) are a competition to traditional commercial banks. Existing literature on the subject does not give consensus with some finding that the mobile money technology has been detrimental to traditional banking activity while others reveal that mobile money services have worked to the advantage of commercial banks.

In view of this controversy and leveraging on the lack of scholarly interest in the subject in Zambia, the study undertook to investigate the effect of mobile money services on Zambia's banking sector profitability. Specifically, the objectives that the study sought to address were the effect of mobile money services on bank profitability using return on equity (ROE) and gross interest income (GII). In addition, and informed by prior empirical findings, the study incorporates non-performing loans (NPL) and interest rate spread (IRS) as model control variables.

Employing the Johansen cointegration approach on quarterly time series data for the period 2012Q1 to 2021Q4 and sourced from the Bank of Zambia (BoZ) and Zambia Statistical Agency (ZamStats). The study finds that mobile money services in Zambia positively affect profitability of commercial banks with a 1% increase in the transactions performed via mobile money platforms associated with increases of by 0.015 and 0.715 percentage points in return on equity and gross interest income in the long run. In the short run, mobile money services are found to be inconsequential to profitability of Zambia's commercial bank as far as return on equity and gross interest income are concerned.

5.1. Recommendations

On the basis of the findings summarized in the foregoing section, the study recommends the following;

I. There is need to commercial banks to adopt operational models that are amenable to incorporation of innovative complimentary product offerings coming from non-banking sector players for the greater good of the sector.
II. As the interplay between the traditional and non-traditional players of the financial sector continues to intensify, respective regulators need to collectively design cross-cutting regulatory frameworks that not only support the growth of the sector but also promote resilience in the face of shocks.
III. While already underway and in view of the findings that the two subsectors are complementary, there is need to accelerate efforts that are aimed at integrating systems of commercial banks and suppliers of mobile money services so as to enhance user welfare.

5.2. Limitations and Suggestions for Future Research

Although the study contributes meaningfully to the ongoing debate on the effect that continued expansion in mobile money services has had on the traditional banking sector, it has one key caveat that the reader needs to be aware of. That is, and from a strict statistical perspective, the conclusions reached from the study only pertain to the period from where the data were drawn. As such, the results may not necessarily hold true in the future especially that both the banking and mobile money sectors are expected to continue evolving as technology becomes more advanced and sophisticated.

With regards to future research, there are a number of dimensions that can be looked that can add value to the findings observed here. First, it would be interest to delve into how the complementarity between banking and mobile money services has affected the efficacy on monetary policy as the latter has been previously been considered to enhance financial sector deepening. Second, and considering that mobile money services are associated with lower operational costs, one can also investigate if this benefit is passed on to borrowers in terms of lending rates.

References

Adaba, G. B. & Ayoung, D. A., 2017. The Development of a Mobile Money Service: An Exploratory Actor-Network Study. *Information Technology for Development*, pp. 668-686.

Adams, D. A., Nelson, R. R. & Todd, P. A., 1992. Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication. *MIS Quarterly,* 16(2), p. 227–247.

Ajzen, I. & Fishbein, M., 1980. *Understanding Attitude and Predicting Social Behavior*. New Jersey: Prentice-Hall.

Akinyemi, B. E. & Mushunje, A., 2020. Determinants of Mobile Money Technology Adoption in Rural Areas of Africa. *Cogent Social Sciences*, 6(1), pp. 1-21.

Andrade, A. D. & Urquhart, C., 2010. The Affordances of Actor-Network Theory in ICT for Development Research. *Information Technology & People*, Volume 23, p. 352–374.

Aron, J., 2018. Mobile Money and the Economy: A Review of the Evidence. *The World Bank Research Observer*, 33(2), p. 135–188.

Bank of Ghana, 2017. *Impact of Mobile Money on the Payment System in Ghana: An Econometric Analysis,* Accra: Bank of Ghana.

BoZ, 2020. *FinScope 2020 Topline Findings,* Lusaka: Bank of Zambia (BoZ).

Callon, M., 1999. *Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. In M. Biagioli (Ed.), The science studies reader (pp. 67–83).* London: Routledge.

Callon, M., 2001. Actor Network Theory. *International Encyclopedia of the Social & Behavioral Sciences,* pp. 62-66.

Chauhan, S., 2015. Acceptance of Mobile Money by Poor Citizens of India: Integrating Trust into the Technology Acceptance Model. *Info,* 17(3), pp. 58-68.

Chen, J. & Adams, C., 2005. *User Acceptance of Mobile Payments: A Theoretical Model for Mobile Payments.* Newcastle upon Tyne, International Conference on Electronic Business (ICEB).

Chipa, N. & Mwanza, B. G., 2021. Factors Impeding Mobile Money Expansion in Zambia. *International Journal of Engineering and Management Research,* 11(1), pp. 178-186.

Cooper, B. et al., 2019. *Zambia Payments Diagnostic,* Cape Town: Cenfri.

Crabbe, M., Standing, C., Standing, S. & Karjaluoto, H., 2009. An Adoption Model for Mobile Banking in Ghana. *International Journal of Mobile Communications,* 7(5), pp. 515-543.

Cresswell, K. M., Worth, A. & Sheikh, A., 2010. Actor-Network Theory and its Role in Understanding the Implementation of Information Technology Developments in Healthcare. *BMC Medical Informatics and Decision Making,* 10(67), pp. 1-11.

Cresswell, K. M., Worth, A. & Sheikh, A., 2010. Actor-Network Theory and its Role in Understanding the Implementation of Information Technology Developments in Healthcare. *BMC Medical Informatics and Decision Making,* 10(67), pp. 1-11.

Czarniawska, B., 2003. *Narratives in Social Science Research.* London: Sage.

Davis, F. D., 1989. Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology. *MIS Quarterly,* 13(3), pp. 319-340.

De Vaus, D. A., 2001. *Research Design in Social Research.* London: Sage.

Deloitte, 2014. *Banking Disrupted: How Technology is Threatening the Traditional European Retail Banking Model,* London: Deloitte.

Engle, R. F. & Granger, C. W., 1987. Co-integration and Error Correction: Representation Estimation and Testing. *Econometrica,* Volume 55, pp. 251-276.

Farooq, S., 2020. *Mitigating Common Fraud Risks: Best Practices for the Mobile Money Industry,* London: Global System for Mobile Communications (GSMA).

Flamini, V., McDonald, C. & Schumacher, L., 2009. The Determinants of Commercial Bank Profitability in Sub-Saharan Africa. *IMF Working Paper Series,* 9(15), pp. 1-30.

Fox, J., 2016. *Applied Regression Analysis and Generalized Linear Models.* 3rd ed. Los Angeles: Sage Publications Inc..

Greenacre, J. & Buckley, R., 2016. Using Trusts to Protect Mobile Money Customers. *Singapore Journal of Legal Studies,* pp. 59-78.

GSMA, 2010. *Mobile Money for the Unbanked: Annual Report 2009,* London: Global System for Mobile Communications (GSMA).

GSMA, 2017. *The Mobile Economy: Sub-Saharan Africa 2017,* London: Global System for Mobile Communications (GSMA).

GSMA, 2019. *The Impact of Mobile Money on Monetary and Financial Stability in Sub-Saharan Africa,* London: Global System for Mobile Communications (GSMA).

GSMA, 2020. *The Mobile Economy: Sub-Saharan Africa 2020,* London: Global System for Mobile Communications (GSMA).

Gujarati, D. N., 2004. *Basic Econometrics.* 4th ed. New York: McGraw-Hill Companies.

Hanseth, O., Aanestad, M. & Berg, M., 2004. Guest Editors' Introduction: Actor-Network Theory and Information Systems. What's So Special?. *Information Technology & People,* Volume 17, pp. 116-123.

Harry, R., Sewchurran, K. & Brown, I., 2014. Introducing a Mobile Payment System to an Emerging Economy's Mobile Phone Subscriber Market: An Actor Network Perspective.. *The Electronic Journal of Information Systems in Developing Countries,* 62(4), pp. 1-26 .

Heeks, R. & Stanforth, C., 2007. Understanding e-Government Project Trajectories from an actor-network perspective.. *European Journal of Information Systems,* Volume 16, pp. 165-177.

Hendrickson, A. R., Massey, P. D. & Cronan, T. P., 1993. On the Test-Retest Reliability of Perceived Usefulness and Perceived Ease of use Scales. *MIS Quarterly,* 17(2), p. 227–230.

Hu, P. J., Chau, P. Y. K. & Sheng, O. R. L., 1999. Examining the Tehnoogy Acceptance Model using Physician Acceptance of Telemedicine Technology. *Journal of Management Information Systems,* 16 (2), p. 91–112.

IFC, 2017a. *Digital Financial Services: Challenges and Opportunities for Emerging Market Banks,* Washington D.C: International Finance Corporation.

IFC, 2017b. *IFC Mobile Money Scoping Country Report: Zambia,* Washington D.C: International Finance Corporation.

IMF, 2019. *Mobile Money Note 2019,* Washington D.C: International Monetary Fund (IMF).

IMF, 2020. *Financial Access Survey: 2020 Trends and Developments,* Washington D.C: International Monetary Fund (IMF).

INTERPOL, 2020. *Mobile Money and Organized Crime in Africa,* Lyon: INTERPOL.

Jayawardhena, C. & Foley, P., 2000. Changes in the Banking Sector: The Case of Internet Banking in the UK. *Internet Research,* 10(1), pp. 19-31.

Jeong, H., 2011. An Investigation of User Perceptions and Behavioral Intentions Towards the e-library. *Library Collections, Acquisitions, and Technical Services,* 35(2-3), pp. 45-60.

Kabala, E. et al., 2018. An Ethnological Analysis of the Influence of Mobile Money on Financial Inclusion: The Case of Urban Zambia. *Zambia Social Science Journal,* 7(1), pp. 53-76.

Kabala, E. & Seshamani, V., 2016. Mobile Technology and Poverty Reduction In Zambia: A SWOT Analysis. *Journal of Economics and Finance,* 7(3), pp. 61-74.

Kamukama, N. & Tumwine, S., 2012. Mobile Money Services: A Liquidity Threat to Uganda's Commercial Banks. *African Journal of Accounting, Economics, Finance and Banking Research,* 8(8), pp. 33-46.

Klejcie, R. V. & Morgan, D. W., 1970. Determining Sample Size for Research Activities. *Educational and Psychological Measurement,* Volume 30, pp. 607-610.

Kothari, C. R., 2004. *Research Methodology: Methods and Technique.* 2nd ed. New Delhi: New Age International Publishers.

Kothari, C. R., 2010. *Research Methodology: Methods and Techniques.* New Delhi: New Age International Publishers.

KPMG, 2020. *The Pulse of FinTech H2 2020 - Global Insight,* Amsterdam: KPMG.

Kubuga, K. K. & Konjaang, J. K., 2016. Mobile Money: A Potential Threat to Banks?. *International Journal of Computer Applications,* 147(4), pp. 30-36.

Ky, S., Rugemintwari, C. & Sauviat, A., 2019. Is fintech good for bank performance? The case of Mobile Money in the East African Community. *Working Papers hal-02155077.*

Law, J., 1992. Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity. *System Practice,* Volume 54, pp. 379-393.

Lucas, H. C. & Spitler, V. K., 1999. Technology Use and Performance: A Field Study of Broker Workstations. *Decision Sciences,* 30(2), p. 291–311.

Lumba, H., 2017. *Lusaka City Market: All Time Trading Center.* Lusaka: Times of Zambia.

Maino, R., Massara, A., Perez-Saiz, H. & Sharma, P., 2019. *FinTech in Sub-Saharan African Countries: A Game Changer?,* Washington D.C: International Monetary Fund (IMF).

Mawejje, J. & Lakuma, P. C. E., 2017. *Macroeconomic Effect of Mobile Money in Uganda,* Kampala: Economic Policy Research Center (EPRC).

Mbiti, I. & Weil, D. N., 2011. Mobile Banking: The Impact of M-PESA in Kenya. *NBER Working Paper Series No. 17129,* June.

Mintz-Roth, M., 2018. *The Gender and Age Dimensions of Mobile Money Adoptions in Zambia,* Nairobi: FSD Kenya.

Mishkin, F. S., 2011. *The Economics of Money, Banking and Financial Markets.* 5th ed. Toronto: Pearson Canada.

Musah, A., Anokye, F. K. & Gakpetor, E. D., 2018. The Effect of Interest Rate Spread on Bank Profitability in Ghana. *European Journal of Business, Economics and Accountancy,* 6(1), pp. 27-39.

Muthiora, B. & Bahia, K., 2020. *The Mobile Money Regulatory Index 2019,* London: Global System for Mobile Communications (GSMA).

Nampewo, D., Tinyinondi, G. A., Kawooya, D. R. & Ssonko, G. W., 2016. Determinants of Private Sector Credit in Uganda: the Role of Mobile Money. *Financial Innovation,* 2(13), pp. 1-16.

Ngoma,C., & Chanda, C., 2022. Pass-Through from Policy Rate to Retail Interest Rates in Zambia. Available at: http://publication.aercafricalibrary.org/handle/123456789/3369 [accessed on 15/07/2022]

Njele, C. C. & Phiri, J., 2021. International Journal of Business and Management. *Factors Affecting Usage of Mobile Money Services and Their Impact on Financial Inclusion: Case of Lusaka Province,* 16(7), pp. 104-118.

Otieno, et al., 2016. Challenges Facing the Use and Adoption of Mobile Phone Money Services. *World Journal of Computer Application and Technology,* 4(1), pp. 8-14.

Pikkarainen, T., Pikkarainen, K. & Karjaluoto, H., 2004. Consumer Acceptance of Online Banking: An Extension of the Technology Acceptance Model. *Internet Research-Electronic Networking Applications and Policy,* 14(3), p. 224–235.

Prout, A., 1996. Actor-Network Theory, Technology and Medical Sociology: An Illustrative Analysis of the Metered Dose Inhaler.. *Sociology of Health and Illness,* Volume 18, pp. 198-219.

PwC, 2016. *What is FinTech?,* New York: PricewaterhouseCoopers (PwC).

Samuel, T. & Wamalwa, P., 2019. *The Effect of Mobile Money on Banking Sector Stability in Kenya,* Nairobi: Kenya Bankers Association.

Saunders, M., Lewis, P. & Thornhill, A., 2009. *Research Methods for Business Students.* 5th ed. London: Pearson Education Limited.

Singh, S. K., Basuki, B. & Setiawan, R., 2021. The Effect of Non-Performing Loan on Profitability: Empirical Evidence from Nepalese Commercial Banks. *Journal of Asian Finance, Economics and Business,* 8(4), p. 709–716.

Skan, J., James, D. & Luca, G., 2016. *FinTech and the Evolving Landscape: Landing Points for the Industry.* Dublin: Accenture.

Suri, T. & Jack, W., 2016. The Long-Run Poverty and Gender Impacts of Mobile Money. *Science,* 354(6317), pp. 1288-1292.

Szajna, B., 1994. Software Evaluation and Choice: Predictive Evaluation of the Technology Acceptance Instrument. *MIS Quarterly,* 18(3), p. 319–324.

Thapa, D., 2011. The Role of ICT Actors and Networks in Development: The Case Study of a Wireless Project in Nepal. *The Electronic Journal of Information Systems in Developing Countries,* Volume 49, p. 1–16.

Tiriongo, S. & Wamalwa, P., 2020. *The Effect of Mobile Money on Banking Sector Stability in Kenya,* Nairobi: Kenya Bankers Association.

Venkatesh, V. & Davis, F., 2000. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science,* 46(2), pp. 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. G., 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly,* 27(3), pp. 425-478.

Wixom, B. H. & Todd, P. A., 2005. A Theoretical Integration of User Satisfaction and Technology Acceptance. *Information Systems Research,* 16(1), p. 85–102.

Wu, J. H. & Wang, S. C., 2005. What Drives Mobile Commerce? An Empirical Evaluation of the Revised Technology Acceptance Model. *Information and Management,* 42(5), p. 719–729.

Zgambo, P. & Chileshe, P. M., 2014. *Empirical Analysis of the Effectiveness of Monetary Policy in Zambia,* Nairobi: COMESA Monetary Institute.