EFFECT OF INTEGRATED MOBILE BANKING SERVICES ON EFFICIENCY AMONG DEPOSIT-TAKING SAVINGS AND CREDIT COOPERATIVE SOCIETIES IN KENYA

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DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

Signed:  Date: 21/11/2022

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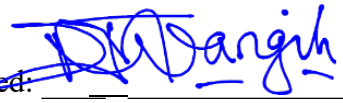
This research project has been submitted for presentation with my approval as University Supervisor

Signed:  Date: 24 November 2022

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DEDICATION

This work is dedicated to my parents Julius Ngangi Mutisya and Mary Kindili Ngangi, who have a great influence on my understanding of issues and reasoning. I feel so blessed and honored to have been raised by caring parents like you.

Special thanks also go to my classmates for their support and positive criticism which have helped come up with an up to standard research paper.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATM	Automated Teller Machine
DEA	Data Envelopment Analysis
DFA	Distribution Free Approach
DMU	Decision -making unit
DT-SACCOs	Deposit Taking Savings and Credit Cooperative Societies
FOSA	Front Office Service Activity
NPL	Non- Performing Loans
OTE	Overall Technical Efficiency
PTE	Pure Technical Efficiency
ROA	Return on Assets
SACCOs	Savings and Credit Cooperative Societies
SASRA	SACCO Society Regulatory Authority
SFA	Stochastic Frontier Analysis
SPSS	Statistical Package for Social Sciences
STE	Scale Technical Efficiency
TAM	Technology Acceptance Model
TFA	Thick Frontier Approach
VIF	Variance Inflation Factors

ABSTRACT

DT-SACCOs play a role in financial intermediation which has included 6.3% Kenyans and approximately 60% of Kenyans are dependent on them. The last decade has seen DT SACCOs in Kenya embrace integrated mobile banking. This innovation of integration of mobile banking has revolutionized the convenient means of accessing financial services. Mobile banking platforms are perceived as enablers for formal financial services through remote transactions. The main aim of this research was determining integrated mobile banking effect on efficiency of DT-SACCOs in Kenya. The independent variables for the research were integrated mobile banking, credit risk, liquidity risk, SACCO size and capital adequacy while the dependent variable was efficiency measured as the ratio of outputs to inputs. The research was guided by financial intermediation theory, diffusion of innovation theory and technology acceptance model. Descriptive research design was utilized in this research. The 175 DT-SACCOs in Kenya as at December 2021 served as target population. The research obtained secondary data for five years (2017-2021) on an annual basis from SASRA and individual DT-SACCOs annual reports. Descriptive, correlation as well as regression analysis were undertaken and outcomes offered in tables followed by pertinent interpretation and discussion. The research discovered a 0.083 R square value implying that 8.3% of changes in DT-SACCOs efficiency can be described by the five variables chosen for this research. The multivariate regression analysis further revealed that individually, both credit risk and liquidity risk have a negative effect on efficiency of DT-SACCOs as shown by (β=-0.157, p=0.000) and (β=-0.254, p=0.000) correspondingly. Integrated mobile banking unveiled a positive though not statistically significant influence on efficiency. SACCO size displayed a positive and significant efficiency influence as shown by (β=0.104, p=0.008) while capital adequacy displayed a positive and not significant influence (β=0.021, p=0.592). The study recommends that DT-SACCOs should work at reducing their liquidity risk and credit risk as these two adversely affects efficiency in a negative way. Future research ought to focus on other financial institutions in Kenya to corroborate or refute the conclusions of this research.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Integrated mobile banking has substantially affected the operation of financial firms and created the foundation for the financial institutions to differentiate between their products and services. According to Abdulkarim and Ali (2019), integrated mobile banking is necessary to allocate risk to those who can handle it and move money to productive uses, which improves efficiency. Integrated mobile banking is anticipated to improve financial inclusion, resulting in improved efficiency of the intermediaries (Rasheed, Law, Chin & Habibullah, 2016). Neaime and Gaysset (2018) asserted that in general, mobile banking integration has a substantial influence in increasing efficiency of financial firms.

This research drew support from innovation diffusion theory, the technology adoption model and the financial intermediation theory. The anchor theory is Diamond's (1984) financial intermediation theory, which states that via intermediation, financial institutions can develop and offer tailored financial solutions that are tailored to the needs of each client. The financial intermediaries expand their credit reach and increase their effectiveness by doing this. According to Rogers (1995), the mechanism whereby a new invention spreads through a particular social system depends on the use of a particular preference channel. The Technology Acceptance Model (TAM) clarifies how consumers use and benefit from a cutting-edge idea (Davis, 1989). TAM will be employed in this research to establish the adoption of new technologies by SACCOs in Kenya.

The study focused on Deposit Taking Savings and Credit Cooperatives (DT SACCOs) in Kenya; this is because the last decade has seen DT SACCOs in Kenya

embrace financial technology. Integrated mobile banking is available in Kenya in a number of forms, inclusive of mobile phone apps, mobile money wallets, as well as payroll borrowing. This innovation of integration of mobile banking has revolutionized the convenient means of accessing financial services (Mohamed, 2018). Platforms for mobile finance are seen as enabling formal financial services via remote transactions (CBK, 2019). The current study seeks to investigate how this influences the efficiency among DT SACCOs in Kenya as they play a key role in financial intermediation and inclusion.

1.1.1 Integrated Mobile Banking

Integrated mobile banking is the ability of performing financial transactions via mobile terminal, or more broadly, the capacity to perform bank transactions using a mobile terminal (Sheleg & Kohali, 2011). Mobile banking has also been defined as capability of banking virtually anytime and anywhere using mobile device (Triki & Faye, 2013). Integrated mobile banking, is innovative technology enabling financial services through mobile phones (Freytag & Fricke,2017). The current study defines integrated mobile banking is the ability to access banking services and conduct transactions virtually using a mobile device.

Integrated mobile banking provides a range of technological options for comfort, faster reaction time and operating efficiencies (Klapper, 2016). Integrated mobile banking has affected many financial industry players. As a result, services of asset management have improved by providing retailers wealth management services via streamlined systems, algorithm proposals to assist decision-making and managed portfolios artificially through robots. The financial sector has also been affected by monitoring tax labiality, spending, credit, saving, bank service provision besides

traditional banking, distribution leading technology allows for quicker transaction, mobile transfer, the usage of cryptocurrencies, and data analytics allows for cellular lending to individuals and small businesses (Yang & Liu, 2016).

In regard to operationalization, integrated mobile banking has been operationalized before in various ways. The most adopted measure of integrated mobile banking is the volume of transactions through the mobile platforms (Demirguc-Kunt et al., 2018). Koki (2018) operationalized integrated mobile banking as the accessibility, cost as well as mobile loans amount issued in a given year. This research tried quantifying the level of integrated mobile banking utilization, as assessed by the total number of transactions performed via mobile banking.

1.1.2 Firm Efficiency

Efficiency as per Daraio and Simar (2016) denotes the firm's capacity of producing a level of output(s) through minimum possible resources. When a company fulfills its objectives by producing high quality output with the fewest feasible inputs or optimizes its outputs given an input set, it is considered to have efficiency (Farrel, 1957). Efficiency according to Daraio and Simar (2007) is a firm's capacity to produce a certain output level using the minimum possible resources. As per Sharma and Barua, (2013) it is the difference between the actual amount of inputs and outputs used and the ideal input-output combination, which is signified by the efficient frontier of a firm within the sector or cluster, is used to identify it. The current study defines efficiency as effectiveness by which a specific amount inputs is employed to yield outputs.

Efficiency is important in any organization since it is an indicator of success in technical performance through which production units are accessed and any cause of inefficiency is eliminated. Efficiency is capability to divide the efficiency score into Pure Efficiency (PTE) and Scale Efficiency (STE) is a crucial benefit (Farrel, 1957). Pure efficiency presupposes a Variable Return to Scale (VRS) and assesses inefficiency linked to managerial choices made by Decision-Making Units (DMU) on the basis of underlying return to scale hypothesis. The resultant efficiency will indicate an Overall Efficiency (OTE) when the size of DMUs and the best input/output pairing are taken into account. Contrarily, STE provides the correlation between output levels and the average cost related to firm size (Kumar & Gulathi, 2008b).

Since the concept's introduction, estimation and study of efficiency in organizations have advanced significantly. As per Sharma et al. (2013) two wot main approaches—parametric as well as non-parametric have arisen. The common popular parametric strategies are the SFA attributed to Aigner, Lovell, and Schmidt (1977), the TFA developed by Berger and Humphrey (1991), and the Distribution Free Approach (DFA) attributed to Berger's works (1993). The more open-ended non-parametric method is dominated by Data Envelopment Analysis (DEA), which is attributed to Charnes et al. (1978) and Free Disposal Hull (FDH), developed by Deprins et al. (1984). The current research adopted DEA as a measure of efficiency due to its ability to determine input-output weights, its ability to compare data from different DMUs using production frontier, easy to compute and also due to its broader pertinence in prior literature.

1.1.3 Integrated Mobile Banking and Firm Efficiency

The diffusion of innovation hypothesis says that every economically impactful change centers on market power, entrepreneurship and innovation. Based on this perceptive emerge theories about the integrated mobile banking revolution. Rogers (1995) trusts that invention momentarily creates a monopoly, wherein imitators strive and eliminate monopolies. Therefore, if financial institutions utilize integrated mobile banking and secure hedging other institutions by means of new goods as well as services, they will definitely possess an effect on efficiency.

Based on the number of integrated mobile banking transactions rise, households, credit as well as savings offerings for everyone is simplified (Mehotra & Yetman, 2015). Long-term financial institutions efficiency is one of the projected benefits of integrated mobile banking (Rasheed, Law, Chin & Habibullah, 2016). According to Zins and Weill (2016), ensuring that individuals can easily access and make use of these services is essential for promoting social growth and sustainable economic development, reducing poverty, and aiding in the stabilization of the financial sector.

Improved financial access, as per Lenka and Sharma (2017), encourages the creation of jobs in rural regions since inhabitants there will have more disposable income and be able to save and expand their deposits, that boosts economic growth generally because of the multiplier effect. The difficulty to obtain funding due to suboptimal integrated mobile banking implementation has a negative effect on a financial institution's effectiveness. Since it's assumed that the poor's incapacity to invest in and save for sources of income stems from a lack of money. On the other side, integrated mobile banking's simplified access to finance stimulates companies to make more

investments and take on more risk, increasing the financial institution's efficiency (Neaime & Gaysset, 2018).

1.1.4 Deposit Taking Savings and Credit Cooperative Societies in Kenya

As per the Government of Kenya (2018) Deposit-taking SACCOs are those who do the business of collecting deposits and then providing credit facilities to their members. The DTS agrees to carry out daily transactions of acceptance of deposits and withdrawals, just like banks do. Non-Deposit taking SACCOs normally operate at the back office only and have not obtained licensing from SASRA to have operations at a front office. FOSAs are one of the major profit centers for SACCOs, and they offer valuable services to their members (Wambua, 2015). By introducing FOSAs, there has been positive performance of SACCOs through improvement in profitability thereby leading to high members dividend rates declaration (IFSB, 2015).

According to Mudibo (2015), deposit taking SACCOs highly impact Kenya's economy. These institutions are responsible for approximately 45% of Kenya's GDP. This is in spite of the fact that they had not been formally recognized into the financial system. In 2010, the SACCO Societies Act No.14 of 2008 was enacted where these institutions have registered tremendous growth. The SASRA Annual report (September, 2021) at the end of 2020 stated that they had grown to 175 from 110 DTS in 2011 a growth of 59%. In 2020, these institutions' total assets under their management totaled over 393 billion, up from 167 billion in 2011, a 135 percent increase in ten years.

Integrated mobile banking endures to modify and shape the Kenyan SACCO sub-sector. The integrated mobile banking strategy has received more attention in the Kenyan SACCO sub-sector as a means of achieving the organization's two basic

objectives of cost containment and revenue maximization. Almost all DT-SACCOs have some aspect of mobile banking through their digital platforms (CBK, 2020). The big question is whether the efficiency resulting from the use of integrated mobile banking has improved.

1.2 Research Problem

Around the world, the financial sector has dramatically boosted its use of integrated mobile banking. The improvement has aided a variety of financial operations, namely stock trading, offering financial services, managing electronic payments, and processing payments. As a consequence, financial institutions all around the world now offer services of higher quality (Babajide et al., 2015). Finances are just as important to the growth process as innovation (Kim, Yu & Hassan, 2018). Evidence suggests that innovation specialists are continuously confident that the integrated mobile banking promotion will boost financial institutions' efficiency. On the other side, if access to integrated mobile banking is constrained, financial institutions may miss out on the advantages of increased efficiency (Neaime & Gaysset, 2018).

DT-SACCOs play a role in financial intermediation which has included 6.3% Kenyans and approximately 60% of Kenyans are dependent on them (FinAccess, 2019). The last decade has seen DT SACCOs in Kenya embrace integrated mobile banking. This innovation of integration of mobile banking has revolutionized the convenient means of accessing financial services (Mohamed, 2018). Mobile banking platforms are perceived as enablers for formal financial services through remote transactions (CBK, 2019). The current study seeks to investigate how this influences the efficiency among Kenyan DT SACCOs as they crucially contribute to financial intermediation and inclusion

Despite the fact that there have been global studies in this area, they have largely focused on specific financial innovation aspects and how they impact financial performance. Stoica, Mehdian, and Sargu (2015) looked into how internet banking influences the efficiency of Romanian banks. E-banking, according to the study, provides affordable and efficient services that help banks operate better. Wadhe and Saluja (2015) studied E-banking impacted the profitability in India banks from 2006 to 2014. The outcomes depicted that e-banking had a favorable link with profitability in both private and public sector banks. Hujud and Hashem (2017) examined the connection between Lebanon's financial innovations and profit statuses of commercial banks and concluded financial innovations have a positive and significant relation to profitability. Since each of these studies was carried out in a different environment, the outcomes cannot be generalized to the current context.

Locally, Mutinda's (2018) study on effect of technology advancements upon the profitability of public commercial banks has found that mobile banking has a significant negative link to Kenya's profitability of public commercial banks. In contrast, Kariu (2017) studied the financial technology and profitable business banking in Kenya and concluded financial technology has a statistically substantial link to commercial bank profitability. Kamande (2018) showed the statistically meaningful excellent outcomes of only agency banking with statistically irrelevant, positive financial performance connections among ATM, internet and mobile banking.

Motivation of the research was the reality that despite the existence of prior studies shows that there exists contextual, conceptual and methodological gaps that need to be filled. Conceptually, prior studies have operationalized integrated mobile banking

differently hence findings depend on the operationalized method. Further, almost all prior research investigated integrated mobile banking impact on financial performance leaving a gap on efficiency. Contextually, prior studies have mostly focused on commercial banks which operate differently compared to SACCOs. Methodologically, the research methodologies adopted have not been uniform hence explaining variance in results. The current study was based on these gaps and tries to answering the research question; how does integrated mobile banking influence efficiency of deposit-taking SACCOs in Kenya?

1.3 Research Objective

The objective of this study was to determine the effect of integrated mobile banking on efficiency of deposit-taking SACCOs in Kenya.

1.4 Value of the Study

This research's results will contribute to the existing theoretical and empirical literature on integrated mobile banking and efficiency. The results will also aid in theory creation because they will shed light on the limitations and applicability of the existing theories to the research variables. On the basis of the suggestions for further research, additional investigations may also be conducted.

The government and the regulator SASRA may find the research's conclusions useful in formulating legislation for the population that is the subject of the study. By giving details on the risk-return tradeoffs present in organizations and their effects on efficiency, the research results will be helpful to potential investors who are thinking of investment in the study population.

The conclusions will aid investors as well as practitioners comprehend the link between the two variables, which is important for ensuring strong management team

with diverse viewpoints and competences streamlining operations as well as managing integrated mobile banking, and for building confidence among corporate stakeholders, that eventually optimize efficiency.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter describes the theories on which integrated mobile banking and efficiency is based. It too discusses prior empirical studies, identified knowledge gaps, summarizing in a conceptual framework as well as hypotheses displaying the anticipated link among the research variables.

2.2 Theoretical Framework

The segment scrutinizes the theories that support the research of integrated mobile banking and efficiency. The study reviewed the financial intermediation theory, diffusion of innovation theory and technological acceptance model.

2.2.1 Financial Intermediation Theory

The theory was founded by Diamond (1984) and it serves as the anchor theory. The theory plays a central role in the financial intermediation process predominantly among banks to mitigate information asymmetry that lies between borrowers and lenders, hence their constant interaction assists lenders in producing credit worthy information to borrowers. Information that is provided gives creditors and loan officers a strong incentive in assessing and appraising credit to those that require it. Modern theories state that the business of financial intermediation is pegged on economic imperfections from 1970s with limited contributions (Jappelli & Pagano, 2006). The presence of the intermediaries is based on their capability to lower transaction and information costs from asymmetries (Tripe, 2003).

The biggest criticism of the financial intermediation theory is its inability to give recognition to the role of lenders in the process of risk management (Levine et al.,

2000). Scholtens and Van Wensveen (2000) stated that they do not recognize credit risk management as an important factor in the financial industry and emphasizing the participation costs concept. They suggested future developments in the financial intermediation theory to understand challenges in the financial sector.

The theory is pertinent to the research because DT-SACCO efficiency can be increased by using integrated mobile banking solutions that make it simple as well as suitable for clients to conduct banking transactions. Financial intermediaries utilize mobile apps and other digital lending mechanisms that are useful in lowering transactional costs brought about by information asymmetry. They hence play a central role in effective functioning of financial markets. The theory is useful in understanding how integrated mobile banking and efficiency relate.

2.2.2 Diffusion of Innovation Theory

Rogers (1962) developed the theory. An innovation is any newly introduced ideas, practices or item into a social structure whereas, on the contrary, innovation dissemination is the way the new concept is transmitted over a duration of time to the social system via a default route. In this regard, this theory attempts to outline how new innovations are accepted and utilized in a social system such as mobile banking and online banking (Clarke, 1995). Rogers (1995) broadened the idea by saying that the study on technological diffusion was insufficient, further explaining that the technology cluster had additional distinctive characteristics that were thought to be fully linked. That is why the advantages and repercussions of embracing or refusing to embrace innovation should be notified to people and societies at large. Rogers (2003) says plainly that interpersonal connections are necessary because dissemination includes a social process.

Robinson (2009) criticizes the theory for taking a dramatically different view of other change theories. It is not about attempting to persuade people to change, though about making progress or re-inventing goods and character, so that they can better suit what the person wants or needs. In this idea, people do not change, but innovations have to adapt to the demands of the people. The invention process takes time, as per Sevcik (2004), and it does not happen immediately. He also believes that the spread of innovation and the opposition to changes has the greatest impact on the process of innovation because it delays it down.

Rogers (2003) argues that the perception of these characteristics by an organization affects the degree of breakthrough technology adoption. If an organization realizes the benefits arising from integrated mobile banking, these innovations will be taken into account when additional technologies are available. Innovation is quicker adopted in companies having internet access as well as information technology than in those lacking. The hypothesis is based on the present research, which shows how innovations like integrated mobile banking are taken up by financial institutions.

2.2.3 Technology Acceptance Model

Davis (1989) founded technology acceptance model and is sometimes referred to as the Davis model. The model takes into account how users embrace new technologies, which is used to choose a system which is both practical and advantageous to them. Moon and Kim (2015) examined the fundamentals of TAM validity and discovered that user acceptance is influenced by the usage of technology and other usability factors rather than the fundamental design of TAMs. The assumption that a technology or computer system will greatly enhance work performance once it is implemented defines its anticipated usefulness (Davis, 1989).

The ease with which a system can be utilized is still valued; it is a sign that the user has mastered its use and the new technology. Emphasizes ease of use of the model as per Gefen, Karahanna and Straub,(2013). as a way to forecast system utility. In relation to Potaloglu and Ekin, (2015 people are more likely to adopt electronic banking when they believe it is efficient. Features such as perceived usability simplicity and perceived utility are seen as essential to the promotion of e-banking.

Research methodology has changed as a result of the theory of technology acceptance. The current study mainly aims to establish the advantages as well as drawbacks of integrating mobile banking into DT-SACCOs in Kenya as well as assess how simple or complex it is to use electronic banking within the DT-SACCO industry in Kenya.

2.3 Determinants of Firm Efficiency

Numerous factors affecting a firm's efficiency that can be observed inside or outside the company. Firm-specific internal variables that can be changed internally include integrated mobile lending, credit risk, liquidity risk, asset base and capital adequacy. As per Athanasoglou et al., (2005) factors external to a firm influencing efficiency comprises; inflation, GDP, political stability as well as interest.

2.3.1 Integrated Mobile Banking

Mobile banking involves making investments using cutting-edge technology in order to raise revenue and the effectiveness and efficiency of the system (Sheleg & Kohali, 2011). John, Fredrick, and Jagongo (2014) define mobile banking as the use of new technologies to facilitate financial transactions and money transfer services that are Mobile phone trading is governed and conducted by financial institutions as opposed to traditional over-the-counter service.

World Bank (2016) has identified that mobile loans and mobile money have had a positive link on financial inclusion levels. Nevertheless, increase in financial inclusion did not always translate to superior efficiency for financial institutions. The correlation between mobile banking and efficiency was found to be insignificant. The current study seeks to contribute in this area.

2.3.2 Credit Risk

This indicates a SACCO's asset risk and stability. It estimates the asset quality magnitude among the characteristics that impact banks' health. The value of assets under the control of a SACCO is heavily dependent on credit risk, and the quality of the assets owned by the SACCO heavily relies on specific risks, level of NPLs, and debtors cost to the SACCO. This ratio should be at the lowest level. If lending is susceptible to risk in a well-functioning bank, the indicator in this case would be the applied interest margins. A low ratio shows an insufficient risk cover by the margins (Athanasoglou et al., 2009).

A Sacco's assets primarily consist of a loan portfolio, current as well as fixed assets, and other investments. The quality of assets mostly improves with the age and bank size (Athanasoglou et al., 2005). The primary assets that generate income for Saccos' are loans. The loan portfolio quality hence determines bank performance. Good quality assets reduce losses arising from NPLs, and this subsequently impacts performance (Dang, 2011).

2.3.3 Liquidity Risk

Liquidity refers to a company's ability, in this example a SACCO, to pay its debts that are due within a year with the help of cash and quickly liquidating short-lived assets.

Therefore, as per Adam and Buckle, (2013) it occurs as a consequence of the capacity to satisfy debt obligations to payables deprived of other current assets liquidation.

When businesses lack access to external financing, having an adequate amount of liquid assets enables them to finance their operations and make investments. Companies having this level of liquidity are able to cover unforeseen liabilities and commitments that must be paid (Liargovas & Skandalis, 2008). According to Almajali et al. (2012), a bank's liquidity has a major effect on the loan amounts it can afford to make to customers; as a result, saccos must maintain more liquid assets and less short-term liabilities. Increased SACCO liquidity, according to Jovanovic (1982), may be detrimental to the firms.

2.3.4 SACCO Size

How much a SACCO is impacted by legal and financial factors depends on the size. Since large companies collect cheap capital and produce huge income, SACCO size is closely linked to capital adequacy (Amato & Burson, 2007). Bank total assets nominal value is usually used in its size determination. Furthermore, ROA possess positive correlated to bank size, demonstrating large banks might achieve economies of scale and lower operational costs and still growing their loan portfolios (Amato & Burson, 2007). As per Magweva and Marime (2016), SACCO size is linked to capital rations, and profitability increases with size.

Amato and Burson (2007) mentioned that a firm’s size is dependent on the assets owned by the organization. One may argue a SACCO's ability to invest in more profitable ventures than smaller companies with less assets is correlated with the amount of assets it owns. Additionally, a larger firm can have more collateral which

can be used as security for more credit facilities (Njoroge, 2014). As per Lee (2009), a company's assets under its control have an effect on its profitability level over time.

2.3.5 Capital Adequacy

Also called the capitalization ratio, the adequacy ratio shows how equity and total assets are related. It shows the ability of a bank to remain solvent by regulating risks. Berger and DeYoung (1997) in an investigation showed a negative relation between capital adequacy and performance. In imperfect capital markets, institutions with sufficient capital ought to reduce borrowing to back a specific asset class, hence lowering the predicted bankruptcy costs hence incur less financing costs.

A financial institution with sufficient capital signals the market that a superior performance is to be anticipated. The results of Magweva and Marime (2016) revealed that capital holdings are positively related to bank profitability, indicating that Greek banks are in a stable financial position. Also, Amato and Burson (2007) showed a positive causality between capital contributions and profitability.

2.4 Empirical Review

Locally and globally studies have established the link between integrated mobile banking and efficiency, the objectives, methodology as well as these studies conclusions are as discussed.

2.4.1 Global Studies

Wadhe and Saluja's (2015) study focused on electronic banking impact on bank profitability in India from 2006 to 2014. The survey used data relating to Indian commercial banks. The relationship between banking service against profitability was examined via multiple regression analysis. E-banking has been linked to higher

profitability for both private and public sector banks, according to research. According to this study, profitability rises as the number of ATMs rises. There were some links, however weak, between the financial institutions' profits and branch number.

Khamis (2016) has investigated impact of agent banking techniques on customer services of commercial bank in Ghana. Services provided to clients have a significant impact on such elements as decreased banking hall waits times, reduced service costs and personally tailored banking services, leading to the conclusion that the development of excellent financial services and customer service is closely related. In addition, the research showed that bank representatives substantially enhance the overall efficiency and quality of customer service in banks. As a consequence, the research deemed it essential for financial institutions to develop methods to guarantee their employees are properly motivated and to propose the usage of performance based incentives.

King'ang'ai et al. (2016) examined financial outcome of banks' performance via agents in the Rwandan country of East Africa utilizing four Rwandan commercial bank currently functional by 31 December 2015. The results from the research showed that the regulation of bank agencies, low transaction cost via banking agencies, access to banking-related services through bank agents and general development in the market had a favorable effect on performances in terms of financial position of commercial bank. Findings of linear regression model have created a favorable connection among agency banking effect and performances in terms of financial position of commercial bank.

Le, Ho, and Mai (2019) focused on how financial industry innovation affect income disparity in developing nations. Financial innovations impact on income inequality is examined in 22 developing economies between 2005 and 2015 using the two-stage least squares model and two financial innovations indices. The study's findings indicate that the GINI coefficient and the financial innovations index have a negative relationship. One of the proposals made is that policy recommendations are necessary to reduce income disparity through the creation of financial innovations

In order to pinpoint the important concerns and gaps in their research, Kim et al. (2019) looked at 54 academic works on the connection between development, integration, and mobile services. Conclusions show that the majority of the literature under review focused on the environment, delivery, and mobile services. In the early stages of the research, the sections looked at verified a bias to individual and institutional situations in the implementation of mobile banking services, contrasted to the supply and demand of actual users and their social impact. Furthermore, the study methodologies chosen showed little depth and variety. With regard to inclusivity among emerging regions, this research broadens the knowledge of recent publications on mobile financial services and emphasizes the need for additional research.

2.4.2 Local Studies

Using secondary data gathered between 2013 and 2017, Muli (2018) investigated how commercial banks efficiency is influenced by electronic banking. A sample was taken from each of Kenya's 42 banks. The variable predictor has been chosen as electronic banking based on the value of transactions performed by using ATMs, mobile banking, internet, and agency banking. Performance was utilized as a study response variable. The findings showed that the good and important effects of bank size,

liquidity, capital adequacy, ATMs and mobile banking were achieved. Internet banking and agency banking have been identified as statistically negligible factors for efficiency in commercial banks.

Wanalo (2018) evaluated the financial position of commercial banks and their performance in establishing if the employment of technical financial technology has a substantial influence on financial performance. This research was completed using the descriptive research methodology. All commercial banks were considered for this research. In total, 15 people were sampled for this study drawn from commercial and non-commercial sectors. In addition to data acquired from the CBK and the bank's website, supplementary data was obtained via annual reports delivered by commercial banks amidst 2012 to 2016. The study made use of panel data analysis. The Prais Winstein regression model was utilized to generate the results. Despite being more widely used, agency banking and ATMs possess minimal effect on a bank general financial stability.

Sindani, Muturi, and Ngumi (2019) looked at the effects of the evolution of financial distribution channels on financial inclusion in Kenya over a six-year period starting in 2012 and ending in 2017.Secondary data was acquired. Frequency tables, percentages, and mean were utilized in analyzing the data and show how the study's findings were reached. In this research, descriptive statistics were used to show the category sets that were generated by the research. The function of the variance, mean, and standard deviation on the dependent and independent variables was to characterize the study's variables. This study's result being internet banking fosters productivity and efficiency, it has a positive impact on Kenya's financial sector. Additionally, the use of ATMs has increased financial inclusion in Kenya.

Ogweno (2019) looked at the impact of financial innovations on the Kenyan regulated DT-SACCO market's financial performance. The population comprised 13 registered microfinance institutions (DT-SACCOs). Every year in first project's existence five years, data were collected. The results show that a descriptive cross-sectional design was utilized in the research methodology, and a multiple linear regression model was used to assess the connection between variables. The study's conclusions showed that deposit, mortgage, and bank size all had a significant impact on the growth and balances of savings accounts. ATMs number, agency banking, and bank financial performance were not significantly correlated.

Abdulkadir (2019) undertook in-depth research on digital payments impact on the operations of commercial banks. The quantity of transactions made via mobile and internet banking was a factor in the adoption of digital internet banking. In this instance, all of the data originates from commercial banks. The study made use of financial institution and capital adequacy ratio variables to assess the size of the bank. A descriptive research strategy was used to collect information on all of Kenya's commercial banks. Using Pearson correlation, the straightforward linear link was produced. Regression analysis was used to reveal the dynamics of the connection. The study found that financial innovations influenced financial performance.

2.5 Summary of the Literature Review and Research Gaps

The theoretical reviews exhibited the anticipated link between integrated mobile banking and the efficiency of financial institutions. Main factors that affect effectiveness have been examined. Existence of knowledge gap requiring completion based on the research that have been examined. From the studies analyzed, there are differing inferences regarding the association between integrated mobile banking and

performance. The variations between the studies can be attributed to the various operationalization's of integrated mobile banking by the researchers, showing that the operationalization model affects the conclusions. Additionally, earlier study concentrated on how financial innovations affected performance, allowing the current research to fill the efficiency gap.

Moreover, numerous studies used various designs, some of which depended on empirical analysis to draw conclusions and others of which relied on existing literature to gauge the relationships between the variables. Researchers produced a variety of conflicting results and failed to pinpoint the precise connection between integrated mobile banking and the volume of mobile banking transactions. This highlights the need for additional study in future research to bridge the gap via conceptualizing the impact of integrated mobile banking on efficiency.

2.6 Conceptual Framework

Displayed in figure 2.1 is the forecast link between the variables. The predictor variable is integrated mobile banking given by the volume of transactions via mobile apps. The control variables were credit risk given as NPL to total loans, liquid risk given by total assets to liquid assets, SACCO size given by total assets natural log and capital adequacy by core capital to risk weighted assets. The outputs to inputs proportion served as the response variable for efficiency.

Independent variables **Dependent variable**

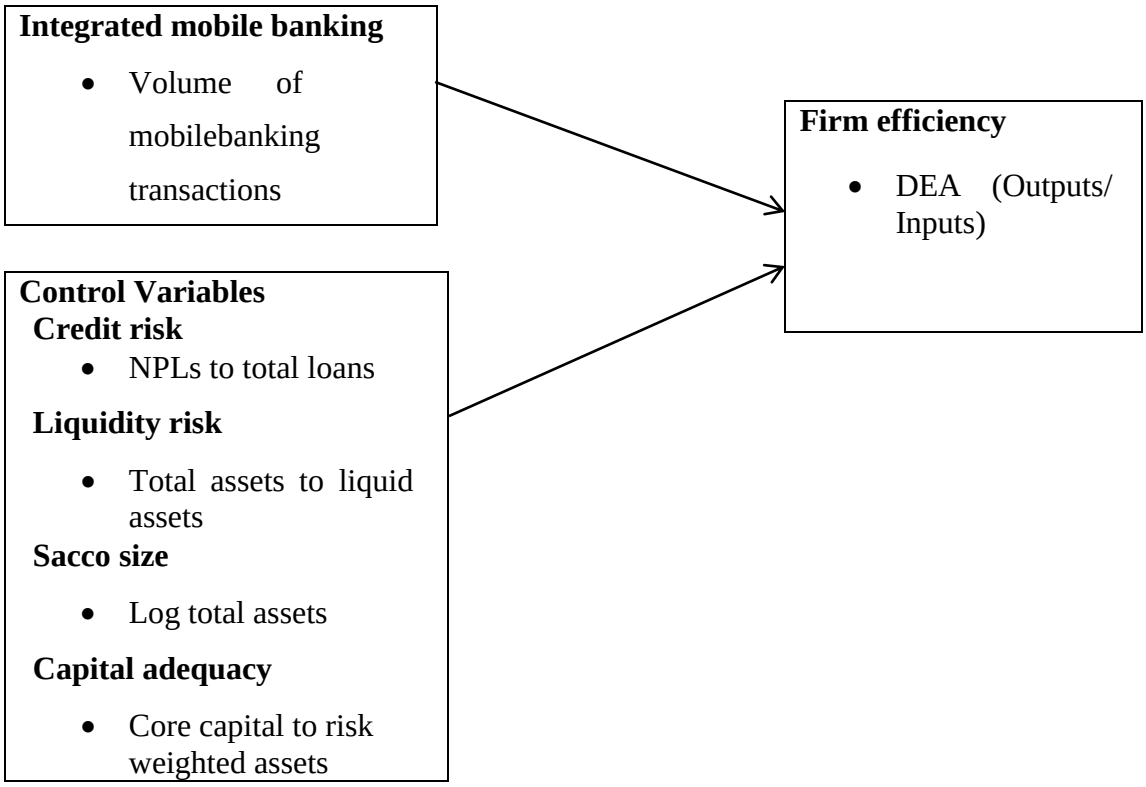

Figure 2.1: The Conceptual Model

Source: Researcher (2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes the methodology made use of in achieving the research objective that was to establish how integrated mobile banking affects efficiency of DT-SACCOs in Kenya. Particularly, the chapter highlights the; the design, data collection, as well as analysis.

3.2 Research Design

To ascertain the relationship between integrated mobile banking and DT-SACCOs' efficiency, a descriptive approach was used. This design was suitable since the researcher was particularly interested in the phenomenon nature (Khan, 2008). Additionally, it was adequate for describing how the occurrences are related to one another. Additionally, as per Cooper & Schindler, (2008) this design authentically and precisely represented the variables, providing satisfactory responses to the research questions.

3.3 Population

The study population was the 175 licensed DT SACCOs in Kenya as at December 2021 (see appendix I). Because of relatively small population, the research utilized a census technique where all the 175 DT-SACCOs in Kenya were taken into account.

3.4 Data Collection

Secondary data was relied on in this research which was extracted from published annual financial statements of the DT-SACCOs from 2017 to 2021 and captured in data collection forms. The five-year duration was selected since it offered the most recent market trends and sufficient data for reliable regression analysis. The reports

were obtained from the individual financial publications of the precise DT-SACCOs and SASRA reports. The specific data collected included members deposits as well as borrowings, interest/dividends on members deposits, staff costs, other operational costs, loans to members, interest income, other incomes, total mobile banking transactions, total loans, total assets, net operating income, total debt, liquid assets, core capital, risk weighted assets.

3.5 Diagnostic Tests

The linear regression was based on a numerous conventions including linearity, no auto-correlation, no or little multi-collinearity, homoscedasticity and multivariate normality. The diagnostic tests to be performed are outlined in Table 3.1

Table 3.1: Diagnostic Tests

Test	Meaning	Statistical method	Interpretation	Diagnosis
Autocorrelation	Occurs when the residuals lack independence from each other.	Durbin-Watson statistic	When the test outcomes fall within critical values (1.5<d<2.5) there is no autocorrelation	Correlogram (Auto Correlation Function-ACF plot) Review model specifications
Multicollinearity	How closely related are the independent variables of the study	Variance Inflation Factors (VIF)	VIF less than 10 implies that there is no multicollnearity	Data that was causing Multicollinearity was adjusted using log transformation
Heteroscedasticity	When data lacks similar variance as assumed by standard linear regression model	Breusch Pagan Test Levene Test Normal P-P plots	Data split into high and low value. If data differ significantly, there is an element of heteroscedasticity	Non-linear transformation

Normality Test	When linear regression analysis for all variables is multivariate normal	Goodness of fit test Shapiro-Wilk test	Kolmogorov-Smirnov test prob.> 0.05. If the test is not substantial, the distribution is possibly normal.	Data that was not normally distributed was adjusted for using log transformation and non-linear log transformation.
Stationarity	a unit-root test to establish if the data was stationary	Levin-Lin Chu unit root test	A p value less than 0.05 implies that the data is stationary	Robust standard errors were utilized wherever data failed the test.

3.6 Data Analysis

To evaluate the data, SPSS software version 24 was employed. The results were presented quantitatively in tables and graphs. Measures of central tendency and dispersion were calculated using descriptive statistics, and standard deviation provided for every variable. Correlation and regression were used in inferential statistics. The size of the link between the research variables was determined by correlation, and cause and effect relationships between the variables were established via regression. The link between the dependent and independent variables was established linearly via a multivariate regression.

3.6.1 Analytical Model

The equation shown below was appropriate:

$$Y= \beta_0 + \beta_1X_1+ \beta_2X_2+ \beta_3X_3 + \beta_4X_4+ \beta_5X_5 +\varepsilon$$

Where: Y = Efficiency given by outputs to inputs ratio on an annual basis

The outputs to inputs ratio used in this study were in line with a study

done by Mwangi (2014). The inputs were deposits and borrowings by member ; member deposits interest/dividend; borrowings cost; staff costs; and other operating costs. Outputs were loans to members and other earning assets; interest income; and other income.

β_0 =y intercept of the regression equation.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ =were the regression coefficients

X_1 = Integrated mobile banking as measured by the natural logarithm of the total number of mobile banking transactions on an annual basis

X_2 = Credit risk as measured by the ratio of NPLs to total loans on an annualbasis

X_3 = SACCO liquidity risk as measured by the ratio of total assets to liquidassets

X_4 = SACCO size as measured by the natural logarithm of total assets

X_5 = Capital adequacy as given by the ratio of total core capital to riskweighted assets

ε =error term

3.6.2 Tests of Significance

Parametric tests established significance of the general model and variables. ANOVA was used to do the F-test, which recognized significance of model and a t-test, which established every variable significance.

CHAPTER FOUR: DATA ANALYSIS RESULTS AND FINDINGS

4.1 Introduction

This chapter offers descriptive statistics and the results and interpretations of various tests namely; test of normality, Multicollinearity, heteroskedasticity tests, autocorrelation and stationarity test. The chapter also presents the results of Pearson correlation and regression analysis.

4.2 Descriptive Statistics

This section presents the descriptive findings from the collected data. The descriptive results include mean and standard deviation for every research variables. The analyzed data was obtained from individual DT-SACCOs annual reports for a duration of 5 years (2017 to 2021). The number of observations is 630 (126*5) as 126 DT-SACCOs provided complete data for the 5 year period. The results are as shown in Table 4.1

Table 4.1: Descriptive Results

Variable	Obs	Mean	Std. Dev.	Min	Max
Firmeffici~y	630	1.074638	.5371557	.0074338	3.295662
Integrated~g	630	4.579897	2.163952	.246271	11.38837
Creditrisk	630	.0913324	.0899685	0	.57
Liquidityr~k	630	2.357213	1.458019	1.023697	10.08932
SACCOsize	630	7.773746	.5696384	6.072405	8.730346
Capitalade~y	630	.2618176	.2541563	.0227	1.9617

Source: Field data (2022)

4.3 Diagnostic Tests

As rationalised in chapter three, the researcher conducted diagnostic tests to ensure that the assumptions of Classic Linear Regression Model (CLRM) are not violated and to attain the appropriate models for probing in the significance that the CLRM

hypotheses are infringed. As a result, pre-approximation and post-approximation assessments of the regression model were performed prior to processing. The multicollinearity test and unit root test were the pre-approximation tests used in these situations, whereas the normalcy test, test for heteroskedasticity, and test for autocorrelation were the post-estimation tests. These analyses were performed by the study to avoid having factual regression results.

4.3.1 Normality Test

The normality of data can be tested using a variety of methods. The most commonly utilized approaches include the Shapiro–Wilk test, Kolmogorov–Smirnov test, skewness, kurtosis, histogram, P–P Plot, box plot, Q–Q Plot, mean and standard deviation. The most extensively used normality tests are the Kolmogorov–Smirnov test and the Shapiro–Wilk test. The Shapiro–Wilk test is better for small sample sizes (n <50 samples), while it can also be used on more extensive samples selections, whereas the Kolmogorov–Smirnov test is better for n>50 samples. As a result, the study used the Kolmogorov–Smirnov test as the numerical method of determining normality. For both of the above tests, the null hypothesis says that the data are obtained from a normal distribution population. When P-value is below 0.05,null hypothesis is rejected and the data are said to be not normally distributed.

Table 4.2: Test for Normality

	Kolmogorov-Smirnov	**P-value**
Firm efficiency	0.869	0.078
Integrated mobile banking	0.918	0.102
Credit risk	0.881	0.094
Liquidity risk	0.874	0.091
SACCO size	0.892	0.101
Capital adequacy	0.923	0.120

Source: Research Conclusions (2022)

Evident in Table 4.2 results, all the research variables have a p value above 0.05 and therefore were normally distributed.

4.3.2 Multicollinearity Test

Multicollinearity transpires when the independent variables in a regression model are significantly linked. Multicollinearity was assessed using the VIF and tolerance indices. When the VIF value is above ten and the tolerance score is less than 0.2, multicollinearity is present, and the assumption is broken. The VIF values are less than 10, indicating no problem with multicollinearity.

Table 4.3: Multicollinearity

	Collinearity Statistics	
Variable	**Tolerance**	**VIF**
Integrated mobile banking	0.724	1.382
Credit risk	0.684	1.463
Liquidity risk	0.697	1.434
SACCO size	0.703	1.422
Capital adequacy	0.661	1.513

Source: Research Findings (2022)

4.3.3 Heteroskedasticity Test

The residual variance from the model must be constant and unrelated to the independent variable in linear regression models calculated using the Ordinary Least Squares (OLS) method(s). Homoskedasticity refers to constant variance, whereas heteroscedasticity refers to non-constant variance (Field, 2009). The research utilized the Breusch-Pagan/Cook-Weisberg test to check if the variation was heteroskedastic. The null hypothesis implies constant variance, indicating that the data is homoscedastic. The outcomes are presented in Table 4.4.

Table 4.4: Outcomes of Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity		
chi2(1)	=	0.8227
Prob > chi2	=	0.6314

Source: Research Findings (2022)

As evident in Table 4.4 null hypothesis was not rejected due to p-value was 0.6314, which was statistically significant (p>0.05). As a result, the dataset had homoskedastic variances. Since the P-values of Breusch-Pagan's test for homogeneity of variances above 0.05. The test thus confirmed homogeneity of variance. The data can therefore be used to conduct panel regression analysis.

4.3.4 Autocorrelation Test

Serial correlation, also known as autocorrelation, makes the standard errors of coefficients appear to be less than in linear panel data models, resulting in higher R-squared and erroneous hypothesis testing Autocorrelation was verified via Durbin-Watson test. If the Durbin-Watson test results in a value of 2, the error terms of regression variables are uncorrelated (i.e. between 1 and 3). The nearer the figure to 2 is; the better. The outcomes are presented in Table 4.5.

Table 4.5: Test of Autocorrelation

Durbin Watson Statistic
1.849

Source: Research Findings (2022)

The Durbin-Watson statistic was 1.849, according to the findings in Table 4.5. The fact that the Durbin-Watson statistic was near to 2 demonstrates that the error terms of regression variables are uncorrelated.

4.3.5 Stationarity Test

The research variables were subjected to a panel data unit-root test to establish if the data was stationary. The unit root test was Levin-Lin Chu unit root test. At a standard statistical significance level of 5%, the test was compared to their corresponding p-values. In this test, the null hypothesis is that every panel has a unit root, and the alternative hypothesis is that at least one panel is stationary. The Levin-Lin Chu unit root test outcomes are listed in Table 4.6.

Table 4.6: Levin-Lin Chu unit-root test

Levin-Lin Chu unit-root test			
Variable	**Hypothesis**	**p value**	**Verdict**
Firm efficiency	Ho: Panels contain unit roots	0.0000	Reject Ho
Integrated mobile banking	Ho: Panels contain unit roots	0.0000	Reject Ho
Credit risk	Ho: Panels contain unit roots	0.0000	Reject Ho
Liquidity risk	Ho: Panels contain unit roots	0.0000	Reject Ho
SACCO size	Ho: Panels contain unit roots	0.0000	Reject Ho
Capital adequacy	Ho: Panels contain unit roots	0.0000	Reject Ho

Source: Research Findings (2022)

As demonstrated in Table 4.6, this test concludes that the data is stationary at a 5% level of statistical significance since the p-values all fall below 0.05.

4.4 Correlation Results

To determine the degree and direction of link between each predictor variable and the response variable, correlation analysis was carried out. The correlation findings in Table 4.8 display correlation nature between the research variables in relation to

magnitude and direction. The correlation results disclose integrated mobile banking has a weak positive as well as significant link with efficiency of DT-SACCOs in Kenya (r=0.141) at 5 percent significance level. The outcomes disclose that credit risk and efficiency have a negative as well as significant correlation (r=-0.5677) at 5 % significance level. The relationship between liquidity risk and efficiency was also negative and significant (r=-0.5755) at 5 % significance level. The outcomes also reveal that both capital adequacy and size had positive as well as significant relation with efficiency as depicted by p values below 0.05.

Table 4.7: Correlation Results

		Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
Firm efficiency	Pearson Correlation	1					
	Sig. (2-tailed)						
Integrated mobile banking	Pearson Correlation	.141**	1				
	Sig. (2-tailed)	.000					
Credit risk	Pearson Correlation	-.567**	-.072	1			
	Sig. (2-tailed)	.000	.071				
Liquidity risk	Pearson Correlation	-.575**	-.034	.115**	1		
	Sig. (2-tailed)	.000	.389	.004			
SACCO size	Pearson Correlation	.585**	.095*	.131**	.225**	1	
	Sig. (2-tailed)	.000	.017	.001	.000		
Capital adequacy	Pearson Correlation	.467**	.035	.166**	.060	.023	1
	Sig. (2-tailed)	.000	.385	.000	.133	.568	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
c. Listwise N=630

Source: Research Findings (2022)

Source: Research Findings (2022)

4.5 Regression Results

The performing of regression analysis aided in establishing the magnitude at which efficiency is expounded by the chosen variables. Table 4.8-4.10 displays the regression outcomes.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.300[a]	.090	.083	.5455655

a. Predictors: (Constant), SACCO size, Credit risk, Liquidity risk, Integrated mobile banking, Capital adequacy

Source: Research Findings (2022)

According to the deductions as shown by the adjusted R^2, the studied independent variables expounded variations of 8.3% in efficiency of Kenya's DT-SACCOs. Thus, 8.3% of the variations in efficiency of Kenya's DT-SACCOs is as a result of the five variables while the unstudied elements explained 91.7% of the variations.

Table 4.9: ANOVA Analysis

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.377	5	3.675	12.348	.000[b]
	Residual	185.728	624	.298		
	Total	204.105	629			

a. Dependent Variable: Firm efficiency

b. Predictors: (Constant), SACCO size, Credit risk, Liquidity risk, Integrated mobile banking, Capital adequacy

Source: Research Findings (2022)

According to ANOVA statistics in Table 4.9 the significance level of data is 0.000 which permits the model to be fit for summarizing on the variables.

Table 4.10: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.432	.088		84.177	.000
	Integrated mobile banking	.080	.041	.075	1.937	.053
	Credit risk	-.995	.248	-.157	-4.017	.000
	Liquidity risk	-.099	.015	-.254	-6.568	.000
	SACCO size	.027	.010	.104	2.675	.008
	Capital adequacy	.047	.087	.021	.537	.592

a. Dependent Variable: Firm efficiency

Source: Research Findings (2022)

The coefficient of regression model was as below;

$$\mathbf{Y = 7.432 - 0.157X_1 - 0.254X_2 + 0.104X_3}$$

Where:

Y = Firm efficiency X_1 = Credit risk; X_2=Liquidity risk X_3= SACO size

4.6 Discussion of Research Findings

The objective of this research was establishing integrated mobile banking impact on efficiency of DT-SACCOs in Kenya. The research applied a descriptive design whereas population was the 175 DT-SACCOs in Kenya. Complete data was obtained from 126 DT-SACCOs in Kenya and which were considered adequate for regression analysis. The research applied secondary data gotten from SASRA and individual DT-SACCO annual statements. The independent variable was integrated mobile banking measured as the number of mobile banking transactions in a given year while the control variables were; credit risk, liquidity risk, firm size and capital adequacy. Both

descriptive and inferential statistics were applied in analyzing the data. This section discusses the conclusion.

Multivariate regression outcomes revealed that the R square was 0.083 implying that 8.3% of changes in efficiency of DT-SACCOs are due to five variables alterations selected for this study. This means that variables not considered explain 91.7% of changes in efficiency. The overall model was also statistically significant as the p value was 0.000 that is below the 0.05 significance level. This implies that the overall model had the required goodness of fit.

The multivariate regression analysis further revealed that individually, both credit risk and liquidity risk have a negative effect on efficiency of DT-SACCOs as shown by (β=-0.157, p=0.000) and (β=-0.254, p=0.000) correspondingly. Integrated mobile banking unveiled a positive though not statistically significant influence on efficiency. SACCO size displayed a positive and significant efficiency influence as shown by (β=0.104, p=0.008) while capital adequacy displayed a positive and not significant influence (β=0.021, p=0.592).

These conclusions concur with those of Muli (2018) who investigated how commercial banks efficiency is influenced by electronic banking. A sample was taken from each of Kenya's 42 banks. The variable predictor has been chosen as electronic banking based on the value of transactions performed by using ATMs, mobile banking, internet, and agency banking. Performance was utilized as a study response variable. The findings showed that the good and important effects of bank size, liquidity, capital adequacy, ATMs and mobile banking were achieved. Internet banking and agency banking have been identified as statistically negligible factors for efficiency in commercial banks.

The research findings also concur with Ogweno (2019) who looked at the impact of financial innovations on the Kenyan regulated MFI market's financial performance. The population comprised 13 registered microfinance institutions (MFIs). Every year over the first five years of the project's existence, data were collected. The results show that a descriptive cross-sectional design was utilized in the study methodology, and a multiple linear regression model was used to assess the connection between variables. The study's conclusions showed that deposit, mortgage, and bank size all had a significant impact on the growth and balances of savings accounts. The number of ATMs, agency banking, mobile banking and bank financial performance were not significantly correlated.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The key aim of the research was determining how integrated mobile banking influences the efficiency of DT-SACCOs in Kenya. This section includes a summary of the findings from the previous chapter as well as the conclusions and limitations of the study. Additionally, it makes recommendations for potential policy measures. The chapter provides recommendations for further research.

5.2 Summary of Findings

The objective of this research was to assess how integrated mobile banking influence efficiency of DT-SACCOs in Kenya. The selected variables for investigation included integrated mobile banking, credit risk, liquidity risk, SACCO size and capital adequacy. To finish the survey, a descriptive research design was chosen. SASRA was used to collect secondary data, and SPSS and Stata were used for the analysis. Annual reports for 126 DT-SACCOs were used to compile annual data for the five years between 2017 and 2021.

The first objective was examining the effect of integrated mobile banking on efficiency among DT-SACCOs, Kenya. The correlation results at 5% significance level show that integrated mobile banking had a positive association with efficiency. The affiliation was though not statistically significant. Regression results (β=0.075, p=0.053) depict presence of a positive though not significant effect of integrated mobile banking on efficiency among DT-SACCOs in Kenya.

The second objective was to establish credit risk effect on efficiency among DT-SACCOs in Kenya. The 5% level of significance correlation results reveal that credit risk and efficiency did not correlate positively. Implying a rise in credit risk would lead to decrease in efficiency. Regression results (β=-0.157, p=0.000) display presence of a negative and significant credit risk effect on efficiency among DT-SACCOs in Kenya.

The third objective was to assess the effect of liquidity risk on efficiency among DT-SACCOs in Kenya. The 5 % significance level correlation outcomes exhibit liquidity risk had a negative correlation with efficiency. This infers that increase in liquidity risk might yield decrease in efficiency. Regression results (β=-0.254, p=0.000) exhibit presence of a negative and significant effect of liquidity risk on efficiency among DT-SACCOs in Kenya.

The fourth objective was to examine firm size effect on efficiency amongst DT-SACCOs in Kenya. 5% significance level correlation results infer firm size possessed a positive link with efficiency. This infers enhancement in firm size might yield a rise in efficiency. Regression results (β=0.104, p=0.008) show presence of a positive as well as significant firm size impact on efficiency among DT-SACCOs, Kenya.

The fifth objective was examination of capital adequacy impact on efficiency among DT-SACCOs in Kenya. 5% significance level correlation results infer that capital adequacy had a positive connection with efficiency. Additionally, the association showed statistical significance. Regression results (β=0.021, p=0.592) infer presence of a positive but not significant effect of capital adequacy on efficiency among DT-SACCOs in Kenya.

5.3 Conclusions

The research intention of the research was establishing correlation between integrated mobile banking and Kenyan DT-SACCOs efficiency. The conclusions indicated that integrated mobile banking has no significant effect on efficiency of SACCOs. The findings designated that credit risk had a negative and significant effect on efficiency. This may imply that DT-SACCOs with high credit risk have low levels of efficiency. Credit risk management is therefore necessarily to achieve the targeted performance.

Additionally, the outcomes discovered that liquidity risk has a significant negative effect on efficiency. This infers that firms with low liquid assets level compared to their assets end up having a lower efficiency. This can be explained by the inability of illiquid firms of taking investment opportunities advantage whenever they arise. More, the research discovered that operating risk possess a positive impact on efficiency although not substantial impact.

The research outcomes further depicted that DT-SACCO size owned a positive as well as significant influence on efficiency which might mean that an increase in asset base of an DT-SACCO leads to enhanced efficiency. This can be explained by the fact that bigger DT-SACCOs are likely to have developed structures to monitor the internal operations of a firm leading to better efficiency. Bigger DT-SACCOs are also likely to have better governance structure which can also explain the high efficiency associated with firm size.

5.4 Recommendations for Policy and Practice

The study's results indicate that credit risk significantly and negatively affected efficiency. Hence, the study recommends that DT-SACCO administrators endeavor to lower the amount of non-performing loans. This can be accomplished by developing

efficient ways for managing credit risk that will allow the DT-SACCO to discriminate between creditworthy and credit-worthy borrowers.

Further, liquidity risk was discovered to possess a significant and positive impact on efficiency. The research therefore commends that management of DT-SACCOs in Kenya should ensure that they do not over commit their assets by giving excess loans as this will likely lead to reduced efficiency. The DT-SACCOs should come up with effective liquidity risk management strategies. Regulators should ensure that the DT-SACCOs do not led beyond a certain set limit of their asset base.

From the study findings, SACCO size was found to enhance efficiency of DT-SACCOs, this study recommends that DT-SACCOs should keep adequate asset levels to sustain their obligations when they fall due whereas simultaneously time enjoying short term investment chances which may arise. The policy makers should set a limit of the asset level that DT-SACCOs should have as too much assets is also disadvantageous as it comes with opportunity costs.

5.5 Limitations of the Study

The focus was on various factors which are thought to influence efficiency of Kenyan DT-SACCOs. The study specifically examined five explanatory factors. Though, in certainty, there is presence of other variables probable to influence efficiency of firms including internal like corporate governance attributes and internal controls whereas others are beyond the control of the firm like interest rates as well as political stability.

In this study, a five-year period from 2017 to 2021 was selected. There is no proof that comparable results will remain the same across a longer time frame. Moreover, it is impossible to predict if the same outcomes would persist until 2021. Given that

additional time contains instances of big economic transitions like recessions and booms, it is more dependable.

The quality of the data was the main restriction for this study. It is impossible to conclusively conclude that the study's findings accurately reflect the current reality. It has been presumed that the data utilized in the study are accurate. Due to the current conditions, there has also been a great deal of incoherence in the data measurement. The study made use of secondary data rather than primary data. Due to the limited availability of data, only some of the growth drivers have been considered.

The data analysis was performed using regression models. Because of the limitations associated with using the model, like inaccurate or erroneous findings resulting from a change in the variable value, the researchers would not be able to generalize the conclusions precisely. A regression model cannot be performed using the prior model after data is added to it.

5.6 Suggestions for Further Research

It has been suggested that several areas for advanced future research to be done on the basis of the tangible information gathered and the clarifying comprehension established in this research. First, other financial technology aspects influence firm efficiency apart from integrated mobile banking. More research can be conducted to determine and evaluate them. Additionally, other factors moderate, intervene, or mediate the relationship between integrated mobile banking and firm efficiency apart from SACCO size, credit risk, liquidity and capital adequacy. Further research can be done to identify and analyze them.

The current research scope was restricted to five years; more research can be done past five years to determine whether the results might persist. Thus, inherent future

studies may use a wider time span, that can either support or criticize the current research conclusions. The scope of the study was additionally constrained in terms of context where DT-SACCOs were examined. Further studies can be extended to other financial firms to establish if they complement or contradict the current study findings. Researchers in the East African region, the rest of Africa, and other global jurisdictions can too perform the research in these jurisdictions to ascertain if the current research conclusions would persist.

The research only used secondary data; alternate research may use primary data sources such in-depth questionnaires and structured interviews given to practitioners and stakeholders. These can then affirm or criticize the results of the current research. This study used multiple linear regression and correlation analysis; future research could use other analytic techniques such factor analysis, cluster analysis, granger causality, discriminant analysis, and descriptive statistics, among others.

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APPENDICES

Appendix I: Deposit Taking SACCOs in Kenya

1. NK Sacco Society Ltd
2. Acumen Sacco Society Ltd
3. Afya Sacco Society Ltd
4. Agro-Chem Sacco Society Ltd
5. Ainabkoi Sacco Society Ltd
6. Airports Sacco Society Ltd
7. Amica Sacco Society Ltd
8. Ammar Sacco Society Ltd
9. Ardhi Sacco Society Ltd
10. Asili Sacco Society Ltd
11. Azima Sacco Society Ltd
12. Bandari Sacco Society Ltd
13. Baraka Sacco Society Ltd
14. Baraton University Sacco Society Ltd
15. Biashara Sacco Society Ltd
16. Biashara Tosha Sacco Society Ltd
17. Bi-High Sacco Society Ltd
18. Bingwa Sacco Society Ltd
19. Boresha Sacco Society Ltd
20. Capital Sacco Society Ltd
21. Centenary Sacco Society Ltd
22. Chai Sacco Society Ltd
23. Chuna Sacco Society Ltd
24. Comoco Sacco Society Ltd
25. Cosmopolitan Sacco Society Ltd
26. County Sacco Society Ltd
27. Daima Sacco Society Ltd
28. Dhabiti Sacco Society Ltd
29. Dimkes Sacco Society Ltd
30. Dumisha Sacco Society Ltd
31. Eco-Pillar Sacco Society Ltd
32. Egerton Sacco Society Ltd
33. Elimu Sacco Society Ltd
34. Enea Sacco Society Ltd
35. Faridi Sacco Society Ltd
36. Fariji Sacco Society Ltd
37. Fortitude Sacco Society Ltd
38. Fortune Sacco Society Ltd
39. Fundilima Sacco Society Ltd
40. GDC Sacco Society Ltd
41. Golden Pillar Sacco Society Ltd
42. Good Faith Sacco Society Ltd
43. Goodhope Sacco Society Ltd
44. Goodway Sacco Society Ltd
45. Gusii Mwalimu Sacco Society Ltd

46. Harambee Sacco Society Ltd
47. Hazina Sacco Society Ltd
48. Ilkisonko Sacco Society Ltd
49. Imarika Sacco Society Ltd
50. Imarisha Sacco Society Ltd
51. Invest and Grow (IG) Sacco Society Ltd
52. Jacaranda Sacco Society Ltd
53. Jamii Sacco Society Ltd
54. Jitegemee Sacco Society Ltd
55. Joinas Sacco Society Ltd
56. Jumuika Sacco Society Ltd
57. Kencream Sacco Society Ltd
58. Kenpipe Sacco Society Ltd
59. Kenversity Sacco Society Ltd
60. Kenya Achievas Sacco Society Ltd
61. Kenya Bankers Sacco Society Ltd
62. Kenya Highlands Sacco Society Ltd
63. Kenya Midland Sacco Society Ltd
64. Kenya Police Sacco Society Ltd
65. Kimbilio Daima Sacco Society Ltd
66. Kimisitu Sacco Society Ltd
67. Kingdom Sacco Society Ltd
68. Kipsigis Edis Sacco Society Ltd
69. Kite Sacco Society Ltd
70. Kitui Teachers Sacco Society Ltd
71. Kolenge Tea Sacco Society Ltd
72. Koru Sacco Society Ltd
73. K-Pillar Sacco Society Ltd
74. K -Unity Sacco Society Ltd
75. Kwetu Sacco Society Ltd
76. Lainisha Sacco Society Ltd
77. Lamu Teachers Sacco Society Ltd
78. Lengo Sacco Society Ltd
79. Mafanikio Sacco Society Ltd
80. Magadi Sacco Society Ltd
81. Magereza Sacco Society Ltd
82. Maisha Bora Sacco Society Ltd
83. Mentor Sacco Society Ltd
84. Metropolitan National Sacco Society Ltd
85. MMH Sacco Society Ltd
86. Mombasa Port Sacco Society Ltd
87. Mudete Factory Tea Growers Sacco Society Ltd
88. Muki Sacco Society Ltd
89. Mwalimu National Sacco Society Ltd
90. Mwietheri Sacco Society Ltd
91. Mwito Sacco Society Ltd
92. Nacico Sacco Society Ltd
93. Nafaka Sacco Society Ltd
94. Nandi Farmers Sacco
95. Nanyuki Equator Sacco Society Ltd

96. Nation Sacco Society Ltd
97. Nawiri Sacco Society Ltd
98. Ndege Chai Sacco Society Ltd
99. Ndosha Sacco Society Ltd
100. New Forties Sacco Society Ltd
101. Nexus Sacco Society Ltd
102. Ng'arisha Sacco Society Ltd
103. Noble Sacco Society Ltd
104. NRS Sacco Society Ltd
105. NSSF Sacco Society Ltd
106. Nufaika Sacco Society Ltd
107. Nyala Vision Sacco Society Ltd
108. Nyambene Arimi Sacco Society Ltd
109. Nyamira Tea Farmers Sacco Society Ltd
110. Nyati Sacco Society Ltd
111. Ollin Sacco Society Ltd
112. Orient Sacco Society Ltd
113. Patnas Sacco Society Ltd
114. Prime Time Sacco
115. PUAN Sacco Society Ltd
116. Qwetu Sacco Society Ltd
117. Rachuonyo Teachers Sacco Society Ltd
118. Safaricom Sacco Society Ltd
119. Sheria Sacco Society Ltd
120. Shirika Deposit Taking Sacco Society Ltd
121. Shoppers Sacco Society Ltd
122. Simba Chai Sacco Society Ltd
123. Siraji Sacco Society Ltd
124. Skyline Sacco Society Ltd
125. Smart Champions Sacco Society Ltd
126. Smart - Life Sacco Society Ltd
127. Solution Sacco Society Ltd
128. Sotico Sacco Society Ltd
129. Southern Star Sacco Society Ltd
130. Stake Kenya Sacco Society Ltd
131. Stawisha Sacco Society Ltd
132. Stima Sacco Society Ltd
133. Suluhu Sacco Society Ltd
134. Supa Sacco Society Ltd
135. Tabasamu Sacco Society Ltd
136. Tabasuri Sacco Society Ltd
137. Tai Sacco Society Ltd
138. Taifa Sacco Society Ltd
139. Taqwa Sacco Society Ltd
140. Taraji Sacco Society Ltd
141. Telepost Sacco Society Ltd
142. Tembo Sacco Society Ltd
143. Tenhos Sacco Society Ltd
144. Thamani Sacco Society Ltd
145. The Apple Sacco Society Ltd

146. Times-U Sacco Society Ltd
147. Tower Sacco Society Ltd
148. Trans-Elite County Sacco Society Ltd
149. Trans Nation Sacco Society Ltd
150. Trans-Counties Sacco Society Ltd
151. Trans-National Times Sacco Society Ltd
152. Uchongaji Sacco Society Ltd
153. Ufanisi Sacco Society Ltd
154. Ukristo na Ufanisi wa Anglican Sacco Society Ltd
155. Ukulima Sacco Society Ltd
156. Unaitas Sacco Society Ltd
157. Uni-County Sacco Society Ltd
158. Unison Sacco Society Ltd
159. United Nations Sacco Society Ltd
160. Universal Traders Sacco Society Ltd
161. Ushuru Sacco Society Ltd
162. Vihiga County Farmers Sacco Society Ltd
163. Viktas Sacco Society Ltd
164. Vision Africa Sacco Society Ltd
165. Vision Point Sacco Society Ltd
166. Wakenya Pamoja Sacco Society Ltd
167. Wakulima Commercial Sacco Society Ltd
168. Wana-anga Sacco Society Ltd
169. Wananchi Sacco Society Ltd
170. Wanandege Sacco Society Ltd
171. Washa Sacco Society Ltd
172. Waumini Sacco Society Ltd
173. Wevarsity Sacco Society Ltd
174. Winas Sacco Society Ltd
175. Yetu Sacco Society Ltd

Source: SASRA (2021)

Appendix II: Research Data

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
1	2017	0.7526	5.1251	0.1600	3.9703	8.2162	0.1723
1	2018	0.7788	4.5563	0.0600	3.9512	8.2177	0.1645
1	2019	0.9003	6.7565	0.1500	3.9318	8.2509	0.1528
1	2020	1.2190	7.4478	0.0400	3.9120	8.2695	0.1560
1	2021	0.7812	7.2316	0.0500	3.8918	8.3168	0.1844
2	2017	1.5348	2.7423	0.1400	3.9120	8.3379	0.1592
2	2018	1.2537	3.2537	0.1500	3.8918	8.4239	0.1639
2	2019	1.8550	2.8869	0.1200	3.8712	8.4141	0.1616
2	2020	1.6321	2.9535	0.0900	3.8501	8.4557	0.1578
2	2021	3.2957	2.7541	0.1100	3.8286	8.4859	0.1602
3	2017	0.6206	6.4279	0.0100	4.3944	8.2067	1.8796
3	2018	0.6118	6.6621	0.0200	4.3820	8.2879	1.9617
3	2019	1.1138	6.6387	0.0200	4.3694	8.3768	0.3053
3	2020	1.0363	6.5259	0.0400	4.3567	8.4253	0.3229
3	2021	1.5372	6.3715	0.0600	4.3438	8.4516	0.3466
4	2017	1.4935	1.1578	0.1300	3.1781	7.5576	0.1596
4	2018	1.1013	1.3225	0.1200	3.1355	7.6198	0.1840
4	2019	0.7508	1.6563	0.1300	3.0910	7.5878	0.1786
4	2020	0.8794	1.4725	0.1700	3.0445	7.5652	0.1803
4	2021	1.1345	1.2701	0.2200	2.9957	7.5406	0.1638
5	2017	0.5897	7.0066	0.0400	2.0794	8.0577	0.3941
5	2018	0.6198	6.9122	0.0500	1.9459	8.1238	0.4230

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
5	2019	0.5994	7.0197	0.0100	1.7918	8.1659	0.4574
5	2020	0.7079	6.5030	0.0100	1.6094	8.2286	0.5397
5	2021	0.5240	5.3769	0.0700	1.3863	8.3287	0.4392
6	2017	1.8238	7.3306	0.1000	3.5835	8.5767	0.2730
6	2018	1.5769	6.6133	0.0800	3.5553	8.6278	0.2832
6	2019	1.1119	5.9541	0.0200	3.5264	8.6514	0.2637
6	2020	1.2749	6.0810	0.3900	3.4965	8.6986	0.2555
6	2021	1.3443	5.4965	0.0600	3.4657	8.7303	0.2764
7	2017	0.9830	3.8258	0.0400	3.9703	8.0019	0.1791
7	2018	1.0618	3.5541	0.1500	3.9512	8.0506	0.1792
7	2019	1.7404	4.0251	0.3100	3.9318	8.0485	0.1845
7	2020	1.2006	5.7342	0.0200	3.9120	8.1428	0.1732
7	2021	0.9407	5.6053	0.1100	3.8918	8.1599	0.1573
8	2017	1.3215	2.8898	0.3500	3.9120	7.9815	0.1099
8	2018	0.7600	5.5063	0.1800	3.8918	8.0263	0.0939
8	2019	0.6879	4.3085	0.3900	3.8712	8.0767	0.0790
8	2020	0.9920	7.6511	0.1900	3.8501	8.1894	0.0509
8	2021	1.0697	5.8032	0.0500	3.8286	8.2824	0.0280
9	2017	0.2677	2.4783	0.1000	4.3944	8.0201	0.1883
9	2018	0.3491	2.4053	0.1100	4.3820	8.0438	0.1551
9	2019	0.3323	3.5773	0.1200	4.3694	7.9725	0.2285
9	2020	0.2661	2.2843	0.0400	4.3567	7.9744	0.1477
9	2021	0.3119	2.2110	0.0500	4.3438	7.9950	0.1451

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
10	2017	1.1178	5.1441	0.0200	3.1781	8.1877	0.2165
10	2018	1.1099	5.2963	0.0200	3.1355	8.2356	0.2126
10	2019	0.9898	5.8661	0.1900	3.0910	8.2709	0.2277
10	2020	0.8495	6.9341	0.0200	3.0445	8.3291	0.0227
10	2021	1.0610	6.0711	0.0300	2.9957	8.3508	0.1618
11	2017	0.8533	5.3464	0.0900	2.0794	8.3898	0.2345
11	2018	0.9362	5.9238	0.0900	1.9459	8.4802	0.2442
11	2019	0.1414	5.0765	0.1000	1.7918	8.5279	0.2508
11	2020	0.1037	6.9348	0.0400	1.6094	8.5719	0.2355
11	2021	1.1535	7.6295	0.0200	1.3863	8.6261	0.2456
12	2017	0.2616	7.9523	0.0200	2.3571	7.2060	0.2291
12	2018	0.2229	7.8483	0.0200	2.2968	7.1988	0.1463
12	2019	0.2479	6.9704	0.0300	2.6813	7.2236	0.1850
12	2020	0.2867	6.6765	0.0400	2.3480	7.3186	0.1901
12	2021	0.2803	6.8287	0.0300	2.6204	7.3549	0.2111
13	2017	0.8533	3.0733	0.0600	1.3164	7.7230	0.4230
13	2018	0.9362	2.2910	0.1900	1.1960	7.6766	0.4574
13	2019	1.1535	0.3275	0.1900	1.1739	7.5374	0.5397
13	2020	0.5988	8.1011	0.0200	1.2056	7.4993	0.7005
13	2021	0.8328	7.4564	0.0400	1.2276	7.4789	0.2990
14	2017	0.9120	1.5561	0.3000	1.0562	7.6874	0.3184
14	2018	1.0407	1.7376	0.2400	1.0962	7.7237	0.2496
14	2019	0.6973	3.3564	0.2000	1.1120	7.5611	0.1944

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
14	2020	1.0418	3.2217	0.1700	1.1601	7.6254	0.1599
14	2021	0.9047	3.7710	0.1400	1.1233	7.6188	0.1659
15	2017	0.5927	3.9301	0.0000	4.5106	8.2162	0.2120
15	2018	1.1535	4.4434	0.2000	6.2963	8.2177	0.2018
15	2019	0.6937	3.8448	0.0100	10.0893	8.2509	0.1966
15	2020	0.7149	3.2752	0.0200	4.2579	8.2695	0.2041
15	2021	0.5761	2.6956	0.1200	8.8431	8.3168	0.2041
16	2017	1.1737	1.4248	0.0200	1.1065	7.3921	0.2691
16	2018	0.9834	1.0373	0.0300	1.1464	7.3912	0.1441
16	2019	1.3268	0.9045	0.1300	1.3815	7.4269	0.2078
16	2020	1.1912	1.8812	0.3800	1.5359	7.4953	0.1986
16	2021	1.2957	2.9505	0.0100	1.4639	7.6089	0.1952
17	2017	2.6058	5.8197	0.0500	1.2832	7.7088	0.1125
17	2018	1.9871	5.2869	0.0500	1.1679	7.7925	0.1145
17	2019	1.7572	5.6893	0.0700	1.3048	7.7958	0.1399
17	2020	1.5740	4.6180	0.0500	1.1971	7.8087	0.1534
17	2021	1.5548	5.0652	0.0500	1.1606	7.7387	0.0911
18	2017	1.3073	4.3657	0.0700	1.5853	8.1416	0.2335
18	2018	1.2215	4.6527	0.0600	1.9464	8.2161	0.2649
18	2019	2.6804	4.8576	0.0500	1.0851	8.2482	0.2547
18	2020	2.2625	4.9525	0.0400	1.0237	8.2873	0.2387
18	2021	0.6313	6.1537	0.0300	1.4691	8.2934	0.2597
19	2017	1.2513	10.0598	0.2100	1.9836	7.0270	0.1712

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
19	2018	1.0568	7.9749	0.0500	1.3339	6.9998	0.1763
19	2019	1.2442	9.6619	0.0500	1.5404	6.9773	0.1904
19	2020	0.9423	3.6584	0.0800	1.2591	6.9368	0.2022
19	2021	1.0481	4.4554	0.0300	1.1154	6.9339	0.2275
20	2017	1.0131	4.1929	0.5700	4.1442	6.8581	0.1351
20	2018	1.1560	8.6744	0.5300	7.9538	6.8614	0.1577
20	2019	1.5957	5.2021	0.0800	8.4745	6.9607	0.1872
20	2020	1.3150	4.7512	0.0600	3.3451	7.0390	0.1620
20	2021	1.0811	4.6638	0.0000	1.9506	7.1179	0.1866
21	2017	1.1535	3.8078	0.0600	1.0966	8.3379	0.2022
21	2018	0.7844	3.8256	0.0700	1.4218	8.4239	0.3213
21	2019	1.0194	3.9366	0.0600	1.4858	8.4141	0.3911
21	2020	0.8533	4.7076	0.0400	1.7358	8.4557	0.1700
21	2021	0.9362	2.7861	0.1200	1.2374	8.4859	0.1534
22	2017	1.1157	2.8513	0.1300	1.9502	8.3379	0.3909
22	2018	0.0074	2.9480	0.1600	1.9346	8.4239	0.1813
22	2019	1.2995	2.6592	0.2000	1.9684	6.7611	0.1769
22	2020	1.1102	2.7969	0.2300	1.2242	6.7943	0.1700
22	2021	0.8008	2.7711	0.0200	1.6434	8.2879	0.1534
23	2017	0.9872	2.4030	0.0600	1.0320	8.2067	0.1885
23	2018	0.7481	2.6147	0.0600	1.9226	8.2879	0.2020
23	2019	0.7565	2.4046	0.1000	1.8973	8.3768	0.1815
23	2020	0.7018	2.1650	0.0800	1.1574	8.4253	0.1858

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
23	2021	0.6975	8.2018	0.1200	1.5021	8.4516	0.1793
24	2017	0.6772	8.8776	0.1600	1.4648	8.4859	0.2610
24	2018	0.9922	8.0052	0.1400	1.5627	8.3379	0.1625
24	2019	0.8564	8.5523	0.1100	1.4005	8.4239	0.2008
24	2020	0.3208	8.6836	0.1100	1.0634	6.0724	0.1933
24	2021	1.1535	0.7826	0.1700	1.6245	6.5049	0.1915
25	2017	2.5763	0.9095	0.0500	1.7402	7.5107	0.2101
25	2018	2.2844	1.4783	0.0100	4.3944	7.5376	0.1536
25	2019	0.2538	1.9144	0.0900	4.3820	7.5084	0.1801
25	2020	0.2260	2.3880	0.1000	4.3694	7.6403	0.1663
25	2021	0.2058	2.6507	0.0300	2.2050	7.6508	0.1955
26	2017	0.8533	2.2119	0.0500	2.5238	8.3898	0.1945
26	2018	0.9362	2.2886	0.0100	3.3740	8.4802	0.4270
26	2019	0.7533	2.5349	0.0900	2.8332	8.5279	0.3933
26	2020	2.0736	3.0281	0.0300	3.0200	8.5719	0.5708
26	2021	0.8535	2.9394	0.0500	4.4016	8.6261	0.4494
27	2017	1.3268	2.8013	0.0100	2.3280	7.6734	0.4576
27	2018	1.1912	2.8432	0.0700	1.7710	7.7973	0.3498
27	2019	1.2957	3.8223	0.0900	1.8952	7.6170	0.3869
27	2020	2.6058	2.8331	0.0700	2.1309	7.6754	0.3316
27	2021	1.9871	2.7102	0.0800	1.9554	7.6856	0.3093
28	2017	1.7572	2.6740	0.0100	1.2192	7.1251	0.1393
28	2018	1.1535	2.3577	0.0000	1.1561	7.0917	0.1399

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
28	2019	1.1457	2.4099	0.0800	1.1158	7.1023	0.0715
28	2020	1.3058	11.3884	0.0700	1.0780	7.1695	0.0542
28	2021	1.5680	9.3893	0.2500	1.5236	7.1649	0.0370
29	2017	1.6418	7.2817	0.1400	1.4882	7.4691	0.2104
29	2018	1.4860	6.7329	0.1600	1.2774	7.4211	0.2059
29	2019	0.9118	5.8688	0.0000	1.2997	7.4344	0.2304
29	2020	0.7956	4.7591	0.0100	1.1003	7.4408	0.2227
29	2021	0.6188	4.3676	0.0000	1.6298	7.4577	0.1869
30	2017	1.0494	3.8762	0.0300	1.5950	7.1018	0.2545
30	2018	0.7956	3.4674	0.0100	1.4871	7.0967	0.2412
30	2019	0.6495	3.4581	0.0300	1.2846	7.0904	0.2741
30	2020	0.6850	3.4841	0.0400	1.4099	7.1179	0.2946
30	2021	0.8274	3.4685	0.0300	1.0780	7.1249	0.2853
31	2017	0.6214	3.0992	0.0200	1.5236	7.1984	0.1676
31	2018	1.2494	3.5693	0.0400	1.4882	7.2791	0.1729
31	2019	0.9985	3.6862	0.0600	1.0983	7.3376	0.2216
31	2020	1.4241	6.8343	0.2300	1.0861	7.4162	0.2248
31	2021	1.5200	6.7928	0.0300	2.3685	7.4263	0.3729
32	2017	0.5531	5.9359	0.0300	2.2713	6.5049	0.2056
32	2018	0.7350	7.6256	0.1000	1.8378	7.5107	0.2468
32	2019	0.5475	7.5373	0.0300	2.3583	7.5376	0.2325
32	2020	0.8323	3.6862	0.0400	2.5221	7.5084	0.1646
32	2021	1.2338	6.8343	0.0400	1.3097	7.6403	0.1440

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
33	2017	0.8533	6.7928	0.1000	1.1747	7.6508	0.1723
33	2018	0.9362	9.0631	0.0000	1.1699	8.3898	0.1870
33	2019	0.7038	8.8924	0.0300	1.1666	8.4802	0.1812
33	2020	1.5759	5.3014	0.0800	1.1380	8.5279	0.1684
33	2021	1.5392	5.2639	0.0300	2.5641	8.5719	0.1723
34	2017	2.2120	5.3700	0.0000	1.0423	8.6261	0.1982
34	2018	2.2265	4.5236	0.0000	1.0590	7.6734	0.2116
34	2019	2.2665	4.0286	0.1100	1.1121	7.7973	0.2091
34	2020	3.0110	0.4569	0.1000	1.1251	7.6170	0.1852
34	2021	1.2633	0.7479	0.0900	1.0611	7.6754	0.1947
35	2017	1.1535	0.7480	0.1600	1.1587	7.6856	0.1071
35	2018	1.0683	0.8429	0.1900	1.1441	7.1251	0.1745
35	2019	0.7225	3.6403	0.2300	1.1447	7.0917	0.1627
35	2020	0.5202	5.5968	0.1900	1.0939	7.1023	0.1265
35	2021	1.1515	5.2449	0.2600	1.0332	7.1695	0.2201
36	2017	0.9985	5.2609	0.2700	1.2705	7.1649	0.2773
36	2018	0.8278	5.5477	0.2300	1.2776	7.4691	0.2164
36	2019	0.8314	0.2463	0.2200	1.1715	7.4211	0.2230
36	2020	0.6253	7.1792	0.0600	1.1658	7.4344	0.2908
36	2021	0.9044	7.0968	0.2300	1.5334	7.4408	0.2111
37	2017	0.6952	6.3610	0.1200	1.6234	7.4577	0.5862
37	2018	0.7589	5.6699	0.0500	1.6385	7.1018	0.2379
37	2019	1.1507	4.9121	0.0600	1.6048	7.0967	0.3868

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
37	2020	0.4991	4.9245	0.0500	1.5050	7.0904	0.3878
37	2021	0.6157	4.4818	0.0900	1.2653	7.1179	0.3316
38	2017	0.9182	4.2288	0.1300	1.2875	7.1249	0.2908
38	2018	1.3433	4.3671	0.1700	1.2781	7.1984	0.1723
38	2019	1.6103	4.8607	0.1200	1.2225	7.2791	0.2545
38	2020	1.8041	3.9169	0.0400	1.1691	7.3376	0.2274
38	2021	1.6465	2.8042	0.0300	1.1254	7.4162	0.2109
39	2017	1.3569	5.2970	0.0400	1.0996	7.4263	0.1592
39	2018	0.5875	4.6800	0.0498	1.0417	8.2161	0.1639
39	2019	1.0541	4.5000	0.0389	1.2396	8.2482	0.1616
39	2020	1.5925	4.4200	0.0387	2.2624	8.2873	0.1578
39	2021	2.1825	3.4100	0.0360	2.9326	8.2934	0.1602
40	2017	1.6103	2.8300	0.0284	3.5336	7.0270	1.8796
40	2018	1.8041	4.0000	0.0498	2.5000	6.9998	1.9617
40	2019	0.8533	3.1800	0.0389	3.1447	6.9773	0.3053
40	2020	0.9362	3.9900	0.0387	2.5063	6.9368	0.3229
40	2021	1.1110	4.0000	0.0360	2.5000	6.9339	0.3466
41	2017	1.4241	3.3500	0.0284	2.9851	6.8581	0.1596
41	2018	1.5200	3.2600	0.0449	3.0675	6.8614	0.1840
41	2019	0.5531	3.3800	0.0446	2.9586	6.9607	0.1786
41	2020	0.7350	3.7600	0.0471	2.6596	7.0390	0.1803
41	2021	0.5475	3.3700	0.0278	2.9674	7.1179	0.1638
42	2017	0.8323	4.6000	0.0374	2.1739	8.3379	0.3941

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
42	2018	1.2338	6.7900	0.0417	1.4728	8.4239	0.4230
42	2019	0.8533	4.1400	0.0414	2.4155	8.4141	0.4574
42	2020	0.9362	7.3700	0.0427	1.3569	8.4557	0.5397
42	2021	0.7038	5.4600	0.0386	1.8315	8.4859	0.4392
43	2017	0.7526	5.1251	0.1600	3.9703	8.2162	0.1723
43	2018	0.7788	4.5563	0.0600	3.9512	8.2177	0.1645
43	2019	0.9003	6.7565	0.1500	3.9318	8.2509	0.1528
43	2020	1.2190	7.4478	0.0400	3.9120	8.2695	0.1560
43	2021	0.7812	7.2316	0.0500	3.8918	8.3168	0.1844
44	2017	1.5348	2.7423	0.1400	3.9120	8.3379	0.1592
44	2018	1.2537	3.2537	0.1500	3.8918	8.4239	0.1639
44	2019	1.8550	2.8869	0.1200	3.8712	8.4141	0.1616
44	2020	1.6321	2.9535	0.0900	3.8501	8.4557	0.1578
44	2021	3.2957	2.7541	0.1100	3.8286	8.4859	0.1602
45	2017	0.6206	6.4279	0.0100	4.3944	8.2067	1.8796
45	2018	0.6118	6.6621	0.0200	4.3820	8.2879	1.9617
45	2019	1.1138	6.6387	0.0200	4.3694	8.3768	0.3053
45	2020	1.0363	6.5259	0.0400	4.3567	8.4253	0.3229
45	2021	1.5372	6.3715	0.0600	4.3438	8.4516	0.3466
46	2017	1.4935	1.1578	0.1300	3.1781	7.5576	0.1596
46	2018	1.1013	1.3225	0.1200	3.1355	7.6198	0.1840
46	2019	0.7508	1.6563	0.1300	3.0910	7.5878	0.1786
46	2020	0.8794	1.4725	0.1700	3.0445	7.5652	0.1803

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
46	2021	1.1345	1.2701	0.2200	2.9957	7.5406	0.1638
47	2017	0.5897	7.0066	0.0400	2.0794	8.0577	0.3941
47	2018	0.6198	6.9122	0.0500	1.9459	8.1238	0.4230
47	2019	0.5994	7.0197	0.0100	1.7918	8.1659	0.4574
47	2020	0.7079	6.5030	0.0100	1.6094	8.2286	0.5397
47	2021	0.5240	5.3769	0.0700	1.3863	8.3287	0.4392
48	2017	1.8238	7.3306	0.1000	3.5835	8.5767	0.2730
48	2018	1.5769	6.6133	0.0800	3.5553	8.6278	0.2832
48	2019	1.1119	5.9541	0.0200	3.5264	8.6514	0.2637
48	2020	1.2749	6.0810	0.3900	3.4965	8.6986	0.2555
48	2021	1.3443	5.4965	0.0600	3.4657	8.7303	0.2764
49	2017	0.9830	3.8258	0.0400	3.9703	8.0019	0.1791
49	2018	1.0618	3.5541	0.1500	3.9512	8.0506	0.1792
49	2019	1.7404	4.0251	0.3100	3.9318	8.0485	0.1845
49	2020	1.2006	5.7342	0.0200	3.9120	8.1428	0.1732
49	2021	0.9407	5.6053	0.1100	3.8918	8.1599	0.1573
50	2017	1.3215	2.8898	0.3500	3.9120	7.9815	0.1099
50	2018	0.7600	5.5063	0.1800	3.8918	8.0263	0.0939
50	2019	0.6879	4.3085	0.3900	3.8712	8.0767	0.0790
50	2020	0.9920	7.6511	0.1900	3.8501	8.1894	0.0509
50	2021	1.0697	5.8032	0.0500	3.8286	8.2824	0.0280
51	2017	0.2677	2.4783	0.1000	4.3944	8.0201	0.1883
51	2018	0.3491	2.4053	0.1100	4.3820	8.0438	0.1551

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
51	2019	0.3323	3.5773	0.1200	4.3694	7.9725	0.2285
51	2020	0.2661	2.2843	0.0400	4.3567	7.9744	0.1477
51	2021	0.3119	2.2110	0.0500	4.3438	7.9950	0.1451
52	2017	1.1178	5.1441	0.0200	3.1781	8.1877	0.2165
52	2018	1.1099	5.2963	0.0200	3.1355	8.2356	0.2126
52	2019	0.9898	5.8661	0.1900	3.0910	8.2709	0.2277
52	2020	0.8495	6.9341	0.0200	3.0445	8.3291	0.0227
52	2021	1.0610	6.0711	0.0300	2.9957	8.3508	0.1618
53	2017	0.8533	5.3464	0.0900	2.0794	8.3898	0.2345
53	2018	0.9362	5.9238	0.0900	1.9459	8.4802	0.2442
53	2019	0.1414	5.0765	0.1000	1.7918	8.5279	0.2508
53	2020	0.1037	6.9348	0.0400	1.6094	8.5719	0.2355
53	2021	1.1535	7.6295	0.0200	1.3863	8.6261	0.2456
54	2017	0.2616	7.9523	0.0200	2.3571	7.2060	0.2291
54	2018	0.2229	7.8483	0.0200	2.2968	7.1988	0.1463
54	2019	0.2479	6.9704	0.0300	2.6813	7.2236	0.1850
54	2020	0.2867	6.6765	0.0400	2.3480	7.3186	0.1901
54	2021	0.2803	6.8287	0.0300	2.6204	7.3549	0.2111
55	2017	0.8533	3.0733	0.0600	1.3164	7.7230	0.4230
55	2018	0.9362	2.2910	0.1900	1.1960	7.6766	0.4574
55	2019	1.1535	0.3275	0.1900	1.1739	7.5374	0.5397
55	2020	0.5988	8.1011	0.0200	1.2056	7.4993	0.7005
55	2021	0.8328	7.4564	0.0400	1.2276	7.4789	0.2990

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
56	2017	0.9120	1.5561	0.3000	1.0562	7.6874	0.3184
56	2018	1.0407	1.7376	0.2400	1.0962	7.7237	0.2496
56	2019	0.6973	3.3564	0.2000	1.1120	7.5611	0.1944
56	2020	1.0418	3.2217	0.1700	1.1601	7.6254	0.1599
56	2021	0.9047	3.7710	0.1400	1.1233	7.6188	0.1659
57	2017	0.5927	3.9301	0.0000	4.5106	8.2162	0.2120
57	2018	1.1535	4.4434	0.2000	6.2963	8.2177	0.2018
57	2019	0.6937	3.8448	0.0100	10.0893	8.2509	0.1966
57	2020	0.7149	3.2752	0.0200	4.2579	8.2695	0.2041
57	2021	0.5761	2.6956	0.1200	8.8431	8.3168	0.2041
58	2017	1.1737	1.4248	0.0200	1.1065	7.3921	0.2691
58	2018	0.9834	1.0373	0.0300	1.1464	7.3912	0.1441
58	2019	1.3268	0.9045	0.1300	1.3815	7.4269	0.2078
58	2020	1.1912	1.8812	0.3800	1.5359	7.4953	0.1986
58	2021	1.2957	2.9505	0.0100	1.4639	7.6089	0.1952
59	2017	2.6058	5.8197	0.0500	1.2832	7.7088	0.1125
59	2018	1.9871	5.2869	0.0500	1.1679	7.7925	0.1145
59	2019	1.7572	5.6893	0.0700	1.3048	7.7958	0.1399
59	2020	1.5740	4.6180	0.0500	1.1971	7.8087	0.1534
59	2021	1.5548	5.0652	0.0500	1.1606	7.7387	0.0911
60	2017	1.3073	4.3657	0.0700	1.5853	8.1416	0.2335
60	2018	1.2215	4.6527	0.0600	1.9464	8.2161	0.2649
60	2019	2.6804	4.8576	0.0500	1.0851	8.2482	0.2547

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
60	2020	2.2625	4.9525	0.0400	1.0237	8.2873	0.2387
60	2021	0.6313	6.1537	0.0300	1.4691	8.2934	0.2597
61	2017	1.2513	10.0598	0.2100	1.9836	7.0270	0.1712
61	2018	1.0568	7.9749	0.0500	1.3339	6.9998	0.1763
61	2019	1.2442	9.6619	0.0500	1.5404	6.9773	0.1904
61	2020	0.9423	3.6584	0.0800	1.2591	6.9368	0.2022
61	2021	1.0481	4.4554	0.0300	1.1154	6.9339	0.2275
62	2017	1.0131	4.1929	0.5700	4.1442	6.8581	0.1351
62	2018	1.1560	8.6744	0.5300	7.9538	6.8614	0.1577
62	2019	1.5957	5.2021	0.0800	8.4745	6.9607	0.1872
62	2020	1.3150	4.7512	0.0600	3.3451	7.0390	0.1620
62	2021	1.0811	4.6638	0.0000	1.9506	7.1179	0.1866
63	2017	1.1535	3.8078	0.0600	1.0966	8.3379	0.2022
63	2018	0.7844	3.8256	0.0700	1.4218	8.4239	0.3213
63	2019	1.0194	3.9366	0.0600	1.4858	8.4141	0.3911
63	2020	0.8533	4.7076	0.0400	1.7358	8.4557	0.1700
63	2021	0.9362	2.7861	0.1200	1.2374	8.4859	0.1534
64	2017	1.1157	2.8513	0.1300	1.9502	8.3379	0.3909
64	2018	0.0074	2.9480	0.1600	1.9346	8.4239	0.1813
64	2019	1.2995	2.6592	0.2000	1.9684	6.7611	0.1769
64	2020	1.1102	2.7969	0.2300	1.2242	6.7943	0.1700
64	2021	0.8008	2.7711	0.0200	1.6434	8.2879	0.1534
65	2017	0.9872	2.4030	0.0600	1.0320	8.2067	0.1885

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
65	2018	0.7481	2.6147	0.0600	1.9226	8.2879	0.2020
65	2019	0.7565	2.4046	0.1000	1.8973	8.3768	0.1815
65	2020	0.7018	2.1650	0.0800	1.1574	8.4253	0.1858
65	2021	0.6975	8.2018	0.1200	1.5021	8.4516	0.1793
66	2017	0.6772	8.8776	0.1600	1.4648	8.4859	0.2610
66	2018	0.9922	8.0052	0.1400	1.5627	8.3379	0.1625
66	2019	0.8564	8.5523	0.1100	1.4005	8.4239	0.2008
66	2020	0.3208	8.6836	0.1100	1.0634	6.0724	0.1933
66	2021	1.1535	0.7826	0.1700	1.6245	6.5049	0.1915
67	2017	2.5763	0.9095	0.0500	1.7402	7.5107	0.2101
67	2018	2.2844	1.4783	0.0100	4.3944	7.5376	0.1536
67	2019	0.2538	1.9144	0.0900	4.3820	7.5084	0.1801
67	2020	0.2260	2.3880	0.1000	4.3694	7.6403	0.1663
67	2021	0.2058	2.6507	0.0300	2.2050	7.6508	0.1955
68	2017	0.8533	2.2119	0.0500	2.5238	8.3898	0.1945
68	2018	0.9362	2.2886	0.0100	3.3740	8.4802	0.4270
68	2019	0.7533	2.5349	0.0900	2.8332	8.5279	0.3933
68	2020	2.0736	3.0281	0.0300	3.0200	8.5719	0.5708
68	2021	0.8535	2.9394	0.0500	4.4016	8.6261	0.4494
69	2017	1.3268	2.8013	0.0100	2.3280	7.6734	0.4576
69	2018	1.1912	2.8432	0.0700	1.7710	7.7973	0.3498
69	2019	1.2957	3.8223	0.0900	1.8952	7.6170	0.3869
69	2020	2.6058	2.8331	0.0700	2.1309	7.6754	0.3316

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
69	2021	1.9871	2.7102	0.0800	1.9554	7.6856	0.3093
70	2017	1.7572	2.6740	0.0100	1.2192	7.1251	0.1393
70	2018	1.1535	2.3577	0.0000	1.1561	7.0917	0.1399
70	2019	1.1457	2.4099	0.0800	1.1158	7.1023	0.0715
70	2020	1.3058	11.3884	0.0700	1.0780	7.1695	0.0542
70	2021	1.5680	9.3893	0.2500	1.5236	7.1649	0.0370
71	2017	1.6418	7.2817	0.1400	1.4882	7.4691	0.2104
71	2018	1.4860	6.7329	0.1600	1.2774	7.4211	0.2059
71	2019	0.9118	5.8688	0.0000	1.2997	7.4344	0.2304
71	2020	0.7956	4.7591	0.0100	1.1003	7.4408	0.2227
71	2021	0.6188	4.3676	0.0000	1.6298	7.4577	0.1869
72	2017	1.0494	3.8762	0.0300	1.5950	7.1018	0.2545
72	2018	0.7956	3.4674	0.0100	1.4871	7.0967	0.2412
72	2019	0.6495	3.4581	0.0300	1.2846	7.0904	0.2741
72	2020	0.6850	3.4841	0.0400	1.4099	7.1179	0.2946
72	2021	0.8274	3.4685	0.0300	1.0780	7.1249	0.2853
73	2017	0.6214	3.0992	0.0200	1.5236	7.1984	0.1676
73	2018	1.2494	3.5693	0.0400	1.4882	7.2791	0.1729
73	2019	0.9985	3.6862	0.0600	1.0983	7.3376	0.2216
73	2020	1.4241	6.8343	0.2300	1.0861	7.4162	0.2248
73	2021	1.5200	6.7928	0.0300	2.3685	7.4263	0.3729
74	2017	0.5531	5.9359	0.0300	2.2713	6.5049	0.2056
74	2018	0.7350	7.6256	0.1000	1.8378	7.5107	0.2468

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
74	2019	0.5475	7.5373	0.0300	2.3583	7.5376	0.2325
74	2020	0.8323	3.6862	0.0400	2.5221	7.5084	0.1646
74	2021	1.2338	6.8343	0.0400	1.3097	7.6403	0.1440
75	2017	0.8533	6.7928	0.1000	1.1747	7.6508	0.1723
75	2018	0.9362	9.0631	0.0000	1.1699	8.3898	0.1870
75	2019	0.7038	8.8924	0.0300	1.1666	8.4802	0.1812
75	2020	1.5759	5.3014	0.0800	1.1380	8.5279	0.1684
75	2021	1.5392	5.2639	0.0300	2.5641	8.5719	0.1723
76	2017	2.2120	5.3700	0.0000	1.0423	8.6261	0.1982
76	2018	2.2265	4.5236	0.0000	1.0590	7.6734	0.2116
76	2019	2.2665	4.0286	0.1100	1.1121	7.7973	0.2091
76	2020	3.0110	0.4569	0.1000	1.1251	7.6170	0.1852
76	2021	1.2633	0.7479	0.0900	1.0611	7.6754	0.1947
77	2017	1.1535	0.7480	0.1600	1.1587	7.6856	0.1071
77	2018	1.0683	0.8429	0.1900	1.1441	7.1251	0.1745
77	2019	0.7225	3.6403	0.2300	1.1447	7.0917	0.1627
77	2020	0.5202	5.5968	0.1900	1.0939	7.1023	0.1265
77	2021	1.1515	5.2449	0.2600	1.0332	7.1695	0.2201
78	2017	0.9985	5.2609	0.2700	1.2705	7.1649	0.2773
78	2018	0.8278	5.5477	0.2300	1.2776	7.4691	0.2164
78	2019	0.8314	0.2463	0.2200	1.1715	7.4211	0.2230
78	2020	0.6253	7.1792	0.0600	1.1658	7.4344	0.2908
78	2021	0.9044	7.0968	0.2300	1.5334	7.4408	0.2111

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
79	2017	0.6952	6.3610	0.1200	1.6234	7.4577	0.5862
79	2018	0.7589	5.6699	0.0500	1.6385	7.1018	0.2379
79	2019	1.1507	4.9121	0.0600	1.6048	7.0967	0.3868
79	2020	0.4991	4.9245	0.0500	1.5050	7.0904	0.3878
79	2021	0.6157	4.4818	0.0900	1.2653	7.1179	0.3316
80	2017	0.9182	4.2288	0.1300	1.2875	7.1249	0.2908
80	2018	1.3433	4.3671	0.1700	1.2781	7.1984	0.1723
80	2019	1.6103	4.8607	0.1200	1.2225	7.2791	0.2545
80	2020	1.8041	3.9169	0.0400	1.1691	7.3376	0.2274
80	2021	1.6465	2.8042	0.0300	1.1254	7.4162	0.2109
81	2017	1.3569	5.2970	0.0400	1.0996	7.4263	0.1592
81	2018	0.5875	4.6800	0.0498	1.0417	8.2161	0.1639
81	2019	1.0541	4.5000	0.0389	1.2396	8.2482	0.1616
81	2020	1.5925	4.4200	0.0387	2.2624	8.2873	0.1578
81	2021	2.1825	3.4100	0.0360	2.9326	8.2934	0.1602
82	2017	1.6103	2.8300	0.0284	3.5336	7.0270	1.8796
82	2018	1.8041	4.0000	0.0498	2.5000	6.9998	1.9617
82	2019	0.8533	3.1800	0.0389	3.1447	6.9773	0.3053
82	2020	0.9362	3.9900	0.0387	2.5063	6.9368	0.3229
82	2021	1.1110	4.0000	0.0360	2.5000	6.9339	0.3466
83	2017	1.4241	3.3500	0.0284	2.9851	6.8581	0.1596
83	2018	1.5200	3.2600	0.0449	3.0675	6.8614	0.1840
83	2019	0.5531	3.3800	0.0446	2.9586	6.9607	0.1786

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
83	2020	0.7350	3.7600	0.0471	2.6596	7.0390	0.1803
83	2021	0.5475	3.3700	0.0278	2.9674	7.1179	0.1638
84	2017	0.8323	4.6000	0.0374	2.1739	8.3379	0.3941
84	2018	1.2338	6.7900	0.0417	1.4728	8.4239	0.4230
84	2019	0.8533	4.1400	0.0414	2.4155	8.4141	0.4574
84	2020	0.9362	7.3700	0.0427	1.3569	8.4557	0.5397
84	2021	0.7038	5.4600	0.0386	1.8315	8.4859	0.4392
85	2017	0.7526	5.1251	0.1600	3.9703	8.2162	0.1723
85	2018	0.7788	4.5563	0.0600	3.9512	8.2177	0.1645
85	2019	0.9003	6.7565	0.1500	3.9318	8.2509	0.1528
85	2020	1.2190	7.4478	0.0400	3.9120	8.2695	0.1560
85	2021	0.7812	7.2316	0.0500	3.8918	8.3168	0.1844
86	2017	1.5348	2.7423	0.1400	3.9120	8.3379	0.1592
86	2018	1.2537	3.2537	0.1500	3.8918	8.4239	0.1639
86	2019	1.8550	2.8869	0.1200	3.8712	8.4141	0.1616
86	2020	1.6321	2.9535	0.0900	3.8501	8.4557	0.1578
86	2021	3.2957	2.7541	0.1100	3.8286	8.4859	0.1602
87	2017	0.6206	6.4279	0.0100	4.3944	8.2067	1.8796
87	2018	0.6118	6.6621	0.0200	4.3820	8.2879	1.9617
87	2019	1.1138	6.6387	0.0200	4.3694	8.3768	0.3053
87	2020	1.0363	6.5259	0.0400	4.3567	8.4253	0.3229
87	2021	1.5372	6.3715	0.0600	4.3438	8.4516	0.3466
88	2017	1.4935	1.1578	0.1300	3.1781	7.5576	0.1596

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
88	2018	1.1013	1.3225	0.1200	3.1355	7.6198	0.1840
88	2019	0.7508	1.6563	0.1300	3.0910	7.5878	0.1786
88	2020	0.8794	1.4725	0.1700	3.0445	7.5652	0.1803
88	2021	1.1345	1.2701	0.2200	2.9957	7.5406	0.1638
89	2017	0.5897	7.0066	0.0400	2.0794	8.0577	0.3941
89	2018	0.6198	6.9122	0.0500	1.9459	8.1238	0.4230
89	2019	0.5994	7.0197	0.0100	1.7918	8.1659	0.4574
89	2020	0.7079	6.5030	0.0100	1.6094	8.2286	0.5397
89	2021	0.5240	5.3769	0.0700	1.3863	8.3287	0.4392
90	2017	1.8238	7.3306	0.1000	3.5835	8.5767	0.2730
90	2018	1.5769	6.6133	0.0800	3.5553	8.6278	0.2832
90	2019	1.1119	5.9541	0.0200	3.5264	8.6514	0.2637
90	2020	1.2749	6.0810	0.3900	3.4965	8.6986	0.2555
90	2021	1.3443	5.4965	0.0600	3.4657	8.7303	0.2764
91	2017	0.9830	3.8258	0.0400	3.9703	8.0019	0.1791
91	2018	1.0618	3.5541	0.1500	3.9512	8.0506	0.1792
91	2019	1.7404	4.0251	0.3100	3.9318	8.0485	0.1845
91	2020	1.2006	5.7342	0.0200	3.9120	8.1428	0.1732
91	2021	0.9407	5.6053	0.1100	3.8918	8.1599	0.1573
92	2017	1.3215	2.8898	0.3500	3.9120	7.9815	0.1099
92	2018	0.7600	5.5063	0.1800	3.8918	8.0263	0.0939
92	2019	0.6879	4.3085	0.3900	3.8712	8.0767	0.0790
92	2020	0.9920	7.6511	0.1900	3.8501	8.1894	0.0509

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
92	2021	1.0697	5.8032	0.0500	3.8286	8.2824	0.0280
93	2017	0.2677	2.4783	0.1000	4.3944	8.0201	0.1883
93	2018	0.3491	2.4053	0.1100	4.3820	8.0438	0.1551
93	2019	0.3323	3.5773	0.1200	4.3694	7.9725	0.2285
93	2020	0.2661	2.2843	0.0400	4.3567	7.9744	0.1477
93	2021	0.3119	2.2110	0.0500	4.3438	7.9950	0.1451
94	2017	1.1178	5.1441	0.0200	3.1781	8.1877	0.2165
94	2018	1.1099	5.2963	0.0200	3.1355	8.2356	0.2126
94	2019	0.9898	5.8661	0.1900	3.0910	8.2709	0.2277
94	2020	0.8495	6.9341	0.0200	3.0445	8.3291	0.0227
94	2021	1.0610	6.0711	0.0300	2.9957	8.3508	0.1618
95	2017	0.8533	5.3464	0.0900	2.0794	8.3898	0.2345
95	2018	0.9362	5.9238	0.0900	1.9459	8.4802	0.2442
95	2019	0.1414	5.0765	0.1000	1.7918	8.5279	0.2508
95	2020	0.1037	6.9348	0.0400	1.6094	8.5719	0.2355
95	2021	1.1535	7.6295	0.0200	1.3863	8.6261	0.2456
96	2017	0.2616	7.9523	0.0200	2.3571	7.2060	0.2291
96	2018	0.2229	7.8483	0.0200	2.2968	7.1988	0.1463
96	2019	0.2479	6.9704	0.0300	2.6813	7.2236	0.1850
96	2020	0.2867	6.6765	0.0400	2.3480	7.3186	0.1901
96	2021	0.2803	6.8287	0.0300	2.6204	7.3549	0.2111
97	2017	0.8533	3.0733	0.0600	1.3164	7.7230	0.4230
97	2018	0.9362	2.2910	0.1900	1.1960	7.6766	0.4574

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
97	2019	1.1535	0.3275	0.1900	1.1739	7.5374	0.5397
97	2020	0.5988	8.1011	0.0200	1.2056	7.4993	0.7005
97	2021	0.8328	7.4564	0.0400	1.2276	7.4789	0.2990
98	2017	0.9120	1.5561	0.3000	1.0562	7.6874	0.3184
98	2018	1.0407	1.7376	0.2400	1.0962	7.7237	0.2496
98	2019	0.6973	3.3564	0.2000	1.1120	7.5611	0.1944
98	2020	1.0418	3.2217	0.1700	1.1601	7.6254	0.1599
98	2021	0.9047	3.7710	0.1400	1.1233	7.6188	0.1659
99	2017	0.5927	3.9301	0.0000	4.5106	8.2162	0.2120
99	2018	1.1535	4.4434	0.2000	6.2963	8.2177	0.2018
99	2019	0.6937	3.8448	0.0100	10.0893	8.2509	0.1966
99	2020	0.7149	3.2752	0.0200	4.2579	8.2695	0.2041
99	2021	0.5761	2.6956	0.1200	8.8431	8.3168	0.2041
100	2017	1.1737	1.4248	0.0200	1.1065	7.3921	0.2691
100	2018	0.9834	1.0373	0.0300	1.1464	7.3912	0.1441
100	2019	1.3268	0.9045	0.1300	1.3815	7.4269	0.2078
100	2020	1.1912	1.8812	0.3800	1.5359	7.4953	0.1986
100	2021	1.2957	2.9505	0.0100	1.4639	7.6089	0.1952
101	2017	2.6058	5.8197	0.0500	1.2832	7.7088	0.1125
101	2018	1.9871	5.2869	0.0500	1.1679	7.7925	0.1145
101	2019	1.7572	5.6893	0.0700	1.3048	7.7958	0.1399
101	2020	1.5740	4.6180	0.0500	1.1971	7.8087	0.1534
101	2021	1.5548	5.0652	0.0500	1.1606	7.7387	0.0911

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
102	2017	1.3073	4.3657	0.0700	1.5853	8.1416	0.2335
102	2018	1.2215	4.6527	0.0600	1.9464	8.2161	0.2649
102	2019	2.6804	4.8576	0.0500	1.0851	8.2482	0.2547
102	2020	2.2625	4.9525	0.0400	1.0237	8.2873	0.2387
102	2021	0.6313	6.1537	0.0300	1.4691	8.2934	0.2597
103	2017	1.2513	10.0598	0.2100	1.9836	7.0270	0.1712
103	2018	1.0568	7.9749	0.0500	1.3339	6.9998	0.1763
103	2019	1.2442	9.6619	0.0500	1.5404	6.9773	0.1904
103	2020	0.9423	3.6584	0.0800	1.2591	6.9368	0.2022
103	2021	1.0481	4.4554	0.0300	1.1154	6.9339	0.2275
104	2017	1.0131	4.1929	0.5700	4.1442	6.8581	0.1351
104	2018	1.1560	8.6744	0.5300	7.9538	6.8614	0.1577
104	2019	1.5957	5.2021	0.0800	8.4745	6.9607	0.1872
104	2020	1.3150	4.7512	0.0600	3.3451	7.0390	0.1620
104	2021	1.0811	4.6638	0.0000	1.9506	7.1179	0.1866
105	2017	1.1535	3.8078	0.0600	1.0966	8.3379	0.2022
105	2018	0.7844	3.8256	0.0700	1.4218	8.4239	0.3213
105	2019	1.0194	3.9366	0.0600	1.4858	8.4141	0.3911
105	2020	0.8533	4.7076	0.0400	1.7358	8.4557	0.1700
105	2021	0.9362	2.7861	0.1200	1.2374	8.4859	0.1534
106	2017	1.1157	2.8513	0.1300	1.9502	8.3379	0.3909
106	2018	0.0074	2.9480	0.1600	1.9346	8.4239	0.1813
106	2019	1.2995	2.6592	0.2000	1.9684	6.7611	0.1769

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
106	2020	1.1102	2.7969	0.2300	1.2242	6.7943	0.1700
106	2021	0.8008	2.7711	0.0200	1.6434	8.2879	0.1534
107	2017	0.9872	2.4030	0.0600	1.0320	8.2067	0.1885
107	2018	0.7481	2.6147	0.0600	1.9226	8.2879	0.2020
107	2019	0.7565	2.4046	0.1000	1.8973	8.3768	0.1815
107	2020	0.7018	2.1650	0.0800	1.1574	8.4253	0.1858
107	2021	0.6975	8.2018	0.1200	1.5021	8.4516	0.1793
108	2017	0.6772	8.8776	0.1600	1.4648	8.4859	0.2610
108	2018	0.9922	8.0052	0.1400	1.5627	8.3379	0.1625
108	2019	0.8564	8.5523	0.1100	1.4005	8.4239	0.2008
108	2020	0.3208	8.6836	0.1100	1.0634	6.0724	0.1933
108	2021	1.1535	0.7826	0.1700	1.6245	6.5049	0.1915
109	2017	2.5763	0.9095	0.0500	1.7402	7.5107	0.2101
109	2018	2.2844	1.4783	0.0100	4.3944	7.5376	0.1536
109	2019	0.2538	1.9144	0.0900	4.3820	7.5084	0.1801
109	2020	0.2260	2.3880	0.1000	4.3694	7.6403	0.1663
109	2021	0.2058	2.6507	0.0300	2.2050	7.6508	0.1955
110	2017	0.8533	2.2119	0.0500	2.5238	8.3898	0.1945
110	2018	0.9362	2.2886	0.0100	3.3740	8.4802	0.4270
110	2019	0.7533	2.5349	0.0900	2.8332	8.5279	0.3933
110	2020	2.0736	3.0281	0.0300	3.0200	8.5719	0.5708
110	2021	0.8535	2.9394	0.0500	4.4016	8.6261	0.4494
111	2017	1.3268	2.8013	0.0100	2.3280	7.6734	0.4576

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
111	2018	1.1912	2.8432	0.0700	1.7710	7.7973	0.3498
111	2019	1.2957	3.8223	0.0900	1.8952	7.6170	0.3869
111	2020	2.6058	2.8331	0.0700	2.1309	7.6754	0.3316
111	2021	1.9871	2.7102	0.0800	1.9554	7.6856	0.3093
112	2017	1.7572	2.6740	0.0100	1.2192	7.1251	0.1393
112	2018	1.1535	2.3577	0.0000	1.1561	7.0917	0.1399
112	2019	1.1457	2.4099	0.0800	1.1158	7.1023	0.0715
112	2020	1.3058	11.3884	0.0700	1.0780	7.1695	0.0542
112	2021	1.5680	9.3893	0.2500	1.5236	7.1649	0.0370
113	2017	1.6418	7.2817	0.1400	1.4882	7.4691	0.2104
113	2018	1.4860	6.7329	0.1600	1.2774	7.4211	0.2059
113	2019	0.9118	5.8688	0.0000	1.2997	7.4344	0.2304
113	2020	0.7956	4.7591	0.0100	1.1003	7.4408	0.2227
113	2021	0.6188	4.3676	0.0000	1.6298	7.4577	0.1869
114	2017	1.0494	3.8762	0.0300	1.5950	7.1018	0.2545
114	2018	0.7956	3.4674	0.0100	1.4871	7.0967	0.2412
114	2019	0.6495	3.4581	0.0300	1.2846	7.0904	0.2741
114	2020	0.6850	3.4841	0.0400	1.4099	7.1179	0.2946
114	2021	0.8274	3.4685	0.0300	1.0780	7.1249	0.2853
115	2017	0.6214	3.0992	0.0200	1.5236	7.1984	0.1676
115	2018	1.2494	3.5693	0.0400	1.4882	7.2791	0.1729
115	2019	0.9985	3.6862	0.0600	1.0983	7.3376	0.2216
115	2020	1.4241	6.8343	0.2300	1.0861	7.4162	0.2248

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
115	2021	1.5200	6.7928	0.0300	2.3685	7.4263	0.3729
116	2017	0.5531	5.9359	0.0300	2.2713	6.5049	0.2056
116	2018	0.7350	7.6256	0.1000	1.8378	7.5107	0.2468
116	2019	0.5475	7.5373	0.0300	2.3583	7.5376	0.2325
116	2020	0.8323	3.6862	0.0400	2.5221	7.5084	0.1646
116	2021	1.2338	6.8343	0.0400	1.3097	7.6403	0.1440
117	2017	0.8533	6.7928	0.1000	1.1747	7.6508	0.1723
117	2018	0.9362	9.0631	0.0000	1.1699	8.3898	0.1870
117	2019	0.7038	8.8924	0.0300	1.1666	8.4802	0.1812
117	2020	1.5759	5.3014	0.0800	1.1380	8.5279	0.1684
117	2021	1.5392	5.2639	0.0300	2.5641	8.5719	0.1723
118	2017	2.2120	5.3700	0.0000	1.0423	8.6261	0.1982
118	2018	2.2265	4.5236	0.0000	1.0590	7.6734	0.2116
118	2019	2.2665	4.0286	0.1100	1.1121	7.7973	0.2091
118	2020	3.0110	0.4569	0.1000	1.1251	7.6170	0.1852
118	2021	1.2633	0.7479	0.0900	1.0611	7.6754	0.1947
119	2017	1.1535	0.7480	0.1600	1.1587	7.6856	0.1071
119	2018	1.0683	0.8429	0.1900	1.1441	7.1251	0.1745
119	2019	0.7225	3.6403	0.2300	1.1447	7.0917	0.1627
119	2020	0.5202	5.5968	0.1900	1.0939	7.1023	0.1265
119	2021	1.1515	5.2449	0.2600	1.0332	7.1695	0.2201
120	2017	0.9985	5.2609	0.2700	1.2705	7.1649	0.2773
120	2018	0.8278	5.5477	0.2300	1.2776	7.4691	0.2164

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
120	2019	0.8314	0.2463	0.2200	1.1715	7.4211	0.2230
120	2020	0.6253	7.1792	0.0600	1.1658	7.4344	0.2908
120	2021	0.9044	7.0968	0.2300	1.5334	7.4408	0.2111
121	2017	0.6952	6.3610	0.1200	1.6234	7.4577	0.5862
121	2018	0.7589	5.6699	0.0500	1.6385	7.1018	0.2379
121	2019	1.1507	4.9121	0.0600	1.6048	7.0967	0.3868
121	2020	0.4991	4.9245	0.0500	1.5050	7.0904	0.3878
121	2021	0.6157	4.4818	0.0900	1.2653	7.1179	0.3316
122	2017	0.9182	4.2288	0.1300	1.2875	7.1249	0.2908
122	2018	1.3433	4.3671	0.1700	1.2781	7.1984	0.1723
122	2019	1.6103	4.8607	0.1200	1.2225	7.2791	0.2545
122	2020	1.8041	3.9169	0.0400	1.1691	7.3376	0.2274
122	2021	1.6465	2.8042	0.0300	1.1254	7.4162	0.2109
123	2017	1.3569	5.2970	0.0400	1.0996	7.4263	0.1592
123	2018	0.5875	4.6800	0.0498	1.0417	8.2161	0.1639
123	2019	1.0541	4.5000	0.0389	1.2396	8.2482	0.1616
123	2020	1.5925	4.4200	0.0387	2.2624	8.2873	0.1578
123	2021	2.1825	3.4100	0.0360	2.9326	8.2934	0.1602
124	2017	1.6103	2.8300	0.0284	3.5336	7.0270	1.8796
124	2018	1.8041	4.0000	0.0498	2.5000	6.9998	1.9617
124	2019	0.8533	3.1800	0.0389	3.1447	6.9773	0.3053
124	2020	0.9362	3.9900	0.0387	2.5063	6.9368	0.3229
124	2021	1.1110	4.0000	0.0360	2.5000	6.9339	0.3466

DT-SACCO	Year	Firm efficiency	Integrated mobile banking	Credit risk	Liquidity risk	SACCO size	Capital adequacy
125	2017	1.4241	3.3500	0.0284	2.9851	6.8581	0.1596
125	2018	1.5200	3.2600	0.0449	3.0675	6.8614	0.1840
125	2019	0.5531	3.3800	0.0446	2.9586	6.9607	0.1786
125	2020	0.7350	3.7600	0.0471	2.6596	7.0390	0.1803
125	2021	0.5475	3.3700	0.0278	2.9674	7.1179	0.1638
126	2017	0.8323	4.6000	0.0374	2.1739	8.3379	0.3941
126	2018	1.2338	6.7900	0.0417	1.4728	8.4239	0.4230
126	2019	0.8533	4.1400	0.0414	2.4155	8.4141	0.4574
126	2020	0.9362	7.3700	0.0427	1.3569	8.4557	0.5397
126	2021	0.7038	5.4600	0.0386	1.8315	8.4859	0.4392