UNIVERSITY OF CAPE TOWN

GSB DEFIC DEVELOPMENT FINANCE CENTRE

MASTER OF COMMERCE IN DEVELOPMENT FINANCE

EQUIS ACCREDITED ASSOCIATION OF MBAS ACCREDITED AACSB ACCREDITED

The impact of mobile money on macroeconomic development: insights from Côte d'Ivoire

A Dissertation

Submitted to

The **Development Finance Centre (DEFIC)**
Graduate School of Business
University of Cape Town

In partial fulfilment
of the requirements for the Degree of
Master of Commerce in Development Finance

by

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February 2024

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ABSTRACT

Mobile money has contributed to financial inclusion across African countries. Indeed, mobile money has proven immense economic benefits to developing countries and is a driving force behind numerous economic activities. However, there are concerns that mobile money may perhaps weaken financial stability. The consequences of mobile money on these macroeconomic indicators such as: inflation, interest spread rates, money stock, private-sector credit, and economic aggregate activity are intriguing. Côte d'Ivoire is viewed as the most robust financial state within the African continent and mobile money has evolved rapidly across the country. As such, this gives room to prospect the consequences of mobile money on macroeconomic development in Côte d'Ivoire. Indeed, the core idea of this analysis is to evaluate the repercussion of mobile money on macroeconomic development in Côte d'Ivoire.

The study adopted a time series approach, making use of monthly data from January 2013 till December 2021. The economic investigation adopts the structural vector autoregressive (SVAR) to analyse the data. The results showed moderate effect on the macroeconomic development variables in Côte d'Ivoire. Specifically, the shocks involving mobile money may take time to impact productivity but nonetheless support economic aggregate activity in the country. Mobile money seems to not cause inflationary pressures. In the case of money stock, mobile money leads to a shift from non-financial assets to financial assets thus influencing money supply. Furthermore, mobile money may take time to influence supply of private credit but remains an essential tool for the supply private credit. As for interest spread rates, a positive impact is noticed, and remain relatively stable. Regarding the conduct of monetary policy, mobile money has moderate impact on monetary policy transmission mechanisms, monetary effects take longer to gain full potential in Côte d'Ivoire.

ACKNOWLEDGMENT

First of all, I would like to express my immense gratitude to Almighty God, who has guided me and given me the courage and patience to overcome this difficult and uncertain journey.

To my dear parents, brothers and fiancé, thank you for your constant love, support and prayers. Thank you for always believing in me, even when I did not. I am forever grateful for the sacrifices you have made so that I could pursue my dreams.

Lastly, a special thank you to my supervisor Professor Abdul Latif Alhassan for providing valuable insights. Thank you for your support and encouragement.

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LIST OF ABBREVIATIONS

AML/CFT	Anti-money Laundering and Counter-Terrorist Financing
ARDL	Autoregressive Distributed Lag
BCEAO	The Central Bank of West African States
E-money	Electronic Money
E-value	Electronic Value
GDP	Gross Domestic Product
ICT	Information and Communication Technology
LCPI	Natural Log of Inflation for Consumer Price Index
LGDP	Natural Log of Gross Domestic Product for Economic Aggregate Activity
LINT	Natural Log of Interest Spread Rates
LM2	Natural Log of Money Stock
LMMB	Natural Log of Mobile Money Balances
LPSC	Natural Log of Private-Sector Credit
MNOs	Mobile Money Operators
P2B	Person-to-Business
P2P	Peer-to-Peer
SVAR	Structural Vector Autoregressive
VAR	Vector Autoregressive
WAEMU	West African Economic and Monetary Union

CHAPTER 1

Introduction

1.1 Background of the study

Significant improvements have been noticed within the financial industry across the world in regards to innovation and growth (Zhu et al., 2020). Technology has been vital for financial inclusivity by means of deepening and enhancing efficiency within the financial industry. Mobile money has contributed to financial inclusion in economically emerging nations, particularly within the Sub-Saharan African countries (Kipkemboi & Bahia, 2019). Additionally, across the region, it has been observed that approximately 400 million mobile money accounts have been registered in 2018 and over one in ten adults are exclusively dependent on mobile money as a means for accessing finance (Kipkemboi & Bahia, 2019). Indeed, mobile money is widely famous among African countries and has known a quick uptake, offering the underprivileged an effective as well as an efficient way to participate in the financial scheme (Ouma et al., 2017). The digitalisation that happened across the African countries has initiated immense development prospects for payment services (Jocevski et al., 2020). As of today, contrary to the rest of the globe, Africa is at the forefront of digital finance deployment (IFC, 2018).

Mobile money services have brought immense economic benefits to emerging countries and widely demonstrated though empirical evidence (Aron, 2018; Abiona & Koppensteiner, 2022). In fact, mobile money represents a considerable driver of numerous economic activities such as: business investments, consumption, savings, and household financial well-being among others (Donovan, 2011; Lwanga & Adong, 2016; Munyegera & Matsumoto, 2016; Ouma et al., 2017; Mathieu & Kakinaka, 2020; Twumasi Baffour et al., 2021; Abiona & Koppensteiner, 2022). Mobile money remains an effective financial instrument that provides financial services to every segment of the population and eases remittance flow (Burns, 2015; Myeni & Makate, 2020; Kim, 2020; Tembo & Okoro, 2021). Recognising the utilization of mobile money specifically with reference to accessibility, speed, and convenience along with reducing transactional cost, has permitted the population to acquire access to financial services in isolated regions (Ouma et al., 2017). In essence, these advantages have empowered mobile money subscribers to expand their standard of living.

While mobile money allows to boost the efficiency of the financial system, it can similarly complicate the ecosystem in which the macroeconomic development operates (Nampewo & Jacob, 2016). Indeed, the emergence of mobile money is expected to influence financial stability in emerging countries (Mohamed & Nor, 2023). Central banks are faced with challenges that are not only related to the achievement of efficiency, but also to the achievement of financial stability in the system. Mobile money may influence the way the economy responds to macroeconomic development (Ndirangu & Nyamongo, 2015). There are apprehensions that mobile money might weaken financial stability as well as the regulation of monetary policy (Mawejje & Lakuma, 2019). Nevertheless, the implications of mobile money upon macroeconomic development are still unclear particularly in terms of monetary stability which forms part of the main objective of central banks.

1.2 Research Problem

Mobile money has been considered as an innovative network that addresses product gap involving the poor and financial services, as well as those who wish to carry out cashless transactions (Aron, 2018). As financial inclusion intensifies, policymakers can observe that their decisions have far reaching impacts; indeed, individuals and households that were formerly excluded by policy tariffs are currently integrated in the banking and financial sector, their savings along with consumption patterns have changed. As such, this gives opportunities for policy development, enabling policymakers to focus and target various variables. Policies that are developed and innovative concentrating towards different targets. Additionally, mobile money adoption has consequence on how the state design and enact developmental policies.

The influence of mobile money on these macroeconomic indicators such as: money stock, inflation, interest spread rates, private-sector credit, and economic aggregate activity is intriguing. Indeed, the accelerated uptake of mobile money has raised debate about the efficacy of monetary policy (Katusiime, 2021). Mobile money improves financial inclusion thus, can ease monetary policy (Wiafe et al., 2022). Household with access to finance can benefit from savings and borrowing (Katusiime, 2021; Wiafe et al., 2022). Additionally, changes in policy interest rates directly influence consumption and investment decisions (Katusiime, 2021; Wiafe et al., 2022). On the other hand, concerns have been raised since the spread of mobile transactions influences traditional banking, thus impacting financial development, monetary policy and regulation in terms of weakening the liquidity (Mawejje & Lakuma, 2019; Katusiime, 2021; Wiafe et al., 2022). The implementation of mobile money entails shifting

from real cash balances to bank deposits (Mawejje & Lakuma, 2019; Katusiime, 2021; Wiafe et al., 2022). This implies a bigger money multiplier since mobile money accounts are reflected by cash deposits through a presumed escrow account of the affiliated commercial bank (Mawejje & Lakuma, 2019; Katusiime, 2021; Wiafe et al., 2022). Moreover, mobile money also demands a footprint on the velocity of money in distribution since mobile money decreases transaction costs of retail payment (Mawejje & Lakuma, 2019; Katusiime, 2021).

Central banks' ability to manage interest rates might be compromised by the design and development of more business models for mobile money, which are emerging as an alternative to demand deposits in commercial banks. (Tumusiime-Mutebile, 2015). Central banks manage short-term interest through the diversification of the liquidity at disposal to banks to maintain their reserve ratios (Tumusiime-Mutebile, 2015). Nevertheless, if mobile money ultimately results in a diminished role for commercial banks in the financial sphere, the transmission of interest rates, which depends on the variation in short-term interbank rates being transmitted to all counterparts of interest rates in the economy, could deteriorate (Tumusiime-Mutebile, 2015). Consequently, this could lead to a fragile transmission of monetary policy mechanism (Tumusiime-Mutebile, 2015).

The footprint of mobile money on macroeconomic development and the implication of central banks policy instruments needs to be explored through empirical analysis, as from a theoretical point of view they are still ambiguous and have not been sufficiently explored. The consequences of such innovation upon financial governance aimed by central banks have been underexplored. Indeed, research into the footprint of mobile money in macroeconomics is narrow and scarce. Most studies tend to focus on microeconomic effect instead (Jack & Suri, 2011; Lwanga & Adong, 2016; Aron & Muellbauer, 2019; Mathieu & Kakinaka, 2020; Patnam & Yao, 2020; Naito et al., 2021; Nyimbiri, 2021; Douanla Meli et al., 2022; Asongu & le Roux, 2023). The few studies that have focused on macroeconomic development have shown to be inconsistent (Weil et al., 2011; Ndirangu & Nyamongo, 2015; Nampewo & Jacob, 2016; Dunne & Kasekende, 2018). Mobile money could have a hidden role in the economy if its outcomes on macroeconomic variables are not further explored. This could result to unintentional policy being distorted.

Côte d'Ivoire is viewed as the most robust financial state within the African continent and mobile money has rapidly evolved across the country. As such, this gives room to prospect the

consequences of mobile money on macroeconomic development in Côte d'Ivoire. Yet, it took more than two decades for low-income and underserved groups for mobile money to enhance their savings and change their life in Côte d'Ivoire (CGAP, 2018). There has been substantial advancement in financial inclusion across Côte d'Ivoire with 41% of adults owing an account, depicting a rise of 21% since 2014 (Demirgüç-Kunt et al., 2017). As far as mobile money is involved, 34% of the adult population owns an account (Demirgüç-Kunt et al., 2017). Mobile money has been acknowledged as a key financial innovative instrument for economic development (APIF CI, 2020; FinDev, 2021). Côte d'Ivoire has taken interest in developing as well as improving the sophistication of its financial system (APIF CI, 2020). As such, it is critical to analyse the footprints of mobile money services on these macroeconomic indicators namely: money stock, inflation, interest spread rates, private-sector credit, and economic aggregate activity in order to design activities drawn on global best practices. Subsequently, it is crucial to review the consequences of mobile money with a view to lead towards development policy.

Understanding the footprint of mobile money upon macroeconomic policy is necessary for the development of an effective policy framework that openly allows for development and growth within the industry (Katusiime, 2021). This is predominantly essential due to the fact that access to finance could be compromised by economic impediments (Aron, 2018).

Although, the macroeconomic framework is essential for the success of mobile money, the impact is very scarce due to data limitation and complexity as it is relatively a new field (Katusiime, 2021). Nonetheless, there is curiosity among academics on how mobile money may perhaps influence macroeconomic variables in developing countries (Aron et al., 2015; Mawejje & Lakuma, 2019). As such, this study aims to support published articles by exploring the connection involving mobile money and macroeconomic development.

1.2.1 Research Question

The fundamental question that is intended to be addressed by this analysis is:
What is the impact of mobile money on Côte d'Ivoire's macroeconomic development?

- Sub-questions:
  - What is the impact of mobile money on inflation in Côte d'Ivoire?
  - What is the impact of mobile money on private-sector credit in Côte d'Ivoire?
  - What is the impact of mobile money on money stock in Côte d'Ivoire?

- What is the impact of mobile money on interest spread rates in Côte d'Ivoire?
- What is the impact of mobile money on economic aggregate activity in Côte d'Ivoire?
- What is the impact of mobile money the conduct of monetary policy in Côte d'Ivoire?

1.3 Research objectives

The prime focus of this report is:

- To investigate the impact of mobile money on Côte d'Ivoire's macroeconomic development.
  - To investigate the impact of mobile money on inflation in Côte d'Ivoire.
  - To investigate the impact of mobile money on private-sector credit in Côte d'Ivoire.
  - To investigate the impact of mobile money on money stock in Côte d'Ivoire.
  - To investigate the impact of mobile money on interest spread rates in Côte d'Ivoire.
  - To investigate the impact of mobile money on economic aggregate activity in Côte d'Ivoire.
  - To investigate the impact of mobile money on the conduct of monetary policy in Côte d'Ivoire.

1.4 Scope and Justification of the study

Through the findings, the study hopes that this may be useful to policymakers, the central bank, and the government in Côte d'Ivoire in optimizing the significance of mobile money on the economy and sophisticate the country's financial system. Indeed, central bank might need to modify their operating procedures due to the demand of mobile money in order to ensure of financial growth and sustainability. In addition, this report attempts to bridge the gaps in the academic literature but also amplify the need to find the right balance namely by adjusting the regulatory framework in order to facilitate financial innovation for economic growth but also manage and mitigate corresponding risks. Moreover, the findings attempt to provide information on factors that should be focused for support of mobile money growth along with effective expansion of the transmission of monetary policy. The outcomes can therefore provide significant insights on mobile money along with its impact on macroeconomic development.

1.5 Organization of the study

The research is structured as per the following: Chapter one lays out an overall view of the contextual and purpose of the study, motivation, along with the research problem; Chapter two relates to reviewing the literature such as, definitions, concepts along with a synopsis of the empirical literature across mobile money and macroeconomic development; Chapter three showcases the research approach along with the research design implemented for the goal of this study; Chapter four analyses the discoveries from the data that has been collected; And lastly, chapter five summarises the main arguments and the recommendations for the study.

CHAPTER 2

Literature Review

2.1 Introduction

This chapter covers the review of literature for this project. This chapter is structured in three parts: Part one relates to the country economic overview; Part two talks about the theoretical background along with the conceptual framework applied for this study; Lastly, part three showcases the previous research conducted on the topic.

2.2 Côte d'Ivoire at a glance

2.2.1 Economic outlook

Côte d'Ivoire is essentially considered as an economic powerhouse, generating more than one-third of West African Economic and Monetary Union's (WAEMU) Gross Domestic Product (GDP) and over 40% of the zone's exports in the region (Direction Générale du Trésor, 2022; World Bank, 2022). With a population estimated to be 27.4 million which represents approximately 21% of the total population within the WAEMU region (World Bank, 2021; Direction générale du Trésor, 2022). As from 2012, the Ivorian economy has focused on sustained growth, averaging around 8% per year (Direction générale du Trésor, 2022). The country has been a global leader of cocoa production accounting for more than 40% market share and within a few years became the world's most significant manufacturer of cashew nuts with 20% of market share (Deloitte, 2017). The primary sector, essentially focuses on agriculture, accounts for 22% of GDP; the secondary sector, which makes up for about 23% of GDP, essentially focuses on energy, oil refining, agribusiness, and construction; lastly, the tertiary sector, which makes up for approximately 55% of GDP, is ruled by telecommunications, transportation, trade and financial activities (Deloitte, 2017; Direction Générale du Trésor, 2022) . In addition, the economic performance of the Ivorian economy is built from the monetary stability benefitted under the membership of the WAEMU, reflected by a low inflation, below 3% (Deloitte, 2017; Direction Générale du Trésor, 2022). Unfortunately, the good economic accomplishment does not hide that the country still faces important socio-economic and geographical disparities (Deloitte, 2017; Direction Générale du Trésor, 2022). Poverty is estimated at 39.4% in 2018, major geographic gaps that linger between Abidjan, the country's financial and investment capital, and the rest of the country: indeed, 80% of the country's financial activity is concentrated in Abidjan solely, which is home to just under a quarter of the country's inhabitants (Deloitte, 2017; Direction Générale du

Trésor, 2022). In addition, the economy is fundamentally still informal which accounts for 51% of GDP; informal employment accounts for more than 90% of the labour force (Deloitte, 2017; Direction Générale du Trésor, 2022). The country must engage in enhancing a more inclusive and comprehensive growth system (Deloitte, 2017; Direction Générale du Trésor, 2022).

2.2.2 Synopsis of the financial sector in Côte d'Ivoire

As in developing countries, the Ivorian financial sector is marked by dualism; alongside the modern formal sector, there is a semi-formal and informal sector with a relatively small market share (APIF CI, 2020). The formal financial sector is dominated by national banking institutions, and non-bank financial institutions, while the decentralized financial sector is made up of mutual savings and loan institutions (APIF CI, 2020).

Many weaknesses characterize the Ivorian financing market. The financial institutions are not sufficiently well-diversified (World Bank, 2016; APIF CI, 2020). In particular, there is currently no specialized institution for agriculture, industry and exports (World Bank, 2016; APIF CI, 2020). Similarly, there is no national reinsurance company, no deposit guarantee fund to protect savers, and no mortgage market (World Bank, 2016; APIF CI, 2020). The market also lacks venture capital companies and a bank loan guarantee company (World Bank, 2016; APIF CI, 2020).

The Ivorian formal credit market has an oligopolistic infrastructure; as a result, it is characterized by monopolistic competition despite its liberalization and this situation leads to the existence of credit rationing with its negative effects of adverse selection and moral hazard (World Bank, 2016; APIF CI, 2020). The Ivorian formal credit market is not efficient in the allocation of resources in the sense that its equilibrium situation reflects a non-optimal supply of credit with respect to the demand for credit and the profit function of the banking system (World Bank, 2016; APIF CI, 2020).

Table 1: Key financial service providers and their networks

Financial institutions	Distribution network	About the players on the field
Banking institutions	**30** financial establishments of which **28** licenced banks & **2** institutions of banking nature. **691** branches and **975** ATMs	Bank branches, as distribution points, remain at the core of the banks' commercial strategy, however the cost of setting up a branch cuts heavily into the profitability of banks (FinTalk Mag, 2021).

Insurance companies	**34** insurance companies of which **12** life branches & **22** non-life branches **239** insurance brokerage firms **646** insurance agents **11** re-insurance companies	Although, the sector is dominated by non-life insurance, life insurance is gaining momentum (APIF CI, 2020).
Microfinance institutions	**51** licensed institutions **4** cooperative unions **30** unitary cooperatives **17** joint stock companies Together, these structures represent about **374** points of service, unevenly distributed across the country.	Due to a decentralised financial system, the microfinance sector is experiencing some difficulties, such as inability to ensure their financial autonomy and lack of management systems for the deployment of its activities (APIF CI, 2020).
Mobile money service providers	**5** service providers with more than **200** branches and distribution network.	In order to offer financial services, mobile network operators have had to enter into partnerships with financial institutions (APIF CI, 2020).
Post Office	More than **200** agencies and relay points.	The Post Office has set up a partnership with financial institutions, with the purpose of boosting its financial tools and services to meet the various requirements of urban and rural populations (APIF CI, 2020).
Informal services	**6.4** million traders	Approximately 11% of adults only make use of informal financial services for instance: village savings and informal lending associations (Ndiomewese, 2019).

Source: (Ndiomewese, 2019; APIF CI, 2020; FinTalk Mag, 2021; BCEAO, 2022)

2.2.3 Mobile money in Côte d'Ivoire

Côte d'Ivoire launched mobile money in 2008. Despite a slow start at the beginning, mobile money in the country has rapidly evolved. By December 2011, there were approximately 2 million mobile money subscribers, and two years later there were approximately 6 million subscribers (IFC, 2013). In 2006, The Central Bank of West African States (BCEAO) issued a regulation that allowed non-banking institutions to be licensed as electronic money (e-money) issuers (IFC, 2013; GSMA, 2014). Since this regulation, the sector has evolved considerably, and the biggest mobile financial service providers are mobile money operators (MNOs) in partnership with banks (IFC, 2013; GSMA, 2014). Mobile money transactions in the country increased from $7.7 billion to $10.8 billion between 2016 and 2018 (Oxford Business Group, 2020). The mobile money services have considerably increased financial inclusion in the country with 41% of adults owing an account, depicting an rise of 21% since 2014 (Demirgüç-Kunt et al., 2017). The country is perceived as one of the most vigorous economies across Africa. Yet, it took more than two decades for low income and underserved groups for mobile money to enhance their savings and change their life in Côte d'Ivoire (CGAP, 2018). Significant progress has been made and financial institutions are working towards providing

financial services as well as modalities of delivery that match the requirements of every portions of the population (Riquet-Bamba, 2018). The Côte d'Ivoire Agency promoting financial inclusivity in the country is currently developing the national financial inclusion strategy (APIF CI, 2020). The strategy involves around reaching the most vulnerable and excluded segments (APIF CI, 2020). Mobile money has been labelled as an essential instrument for inclusive finance (APIF CI, 2020; FinDev, 2021). Indeed, mobile money is viewed as an innovative product that promotes affordable services tailored to the population's needs be it in rural and urban areas.

2.3 Theoretical Framework

2.3.1 Defining of key terms

2.3.1.1 Mobile money

Mobile money is a form of electronic money that link consumers financially by means of mobile phones, thus making mobile money an innovative mobile data service that provides financial services to the population whether banked or unbanked (Tobbin, 2011; Lawack, 2013). The notion of mobile money is to put forward financial services, tools and products to the unbanked thus differentiating itself from the standard concept of mobile payment as well as mobile banking (Tobbin, 2011).

2.3.1.2 Mobile money services

There is a wide scope of transactions and services of which mobile money can be utilized (Jenkins, 2008; Dolan, 2009). On a general level, mobile money provides a range of services from peer-to-peer (P2P) transfers which include domestic and cross-border remittances; person-to-business (P2B) transactions for purchase and sales of goods and services; mobile banking that enables customers to log on to their bank accounts, make deposits and withdrawals as well as paying bills as shown in figure 1 (Dolan, 2009; Jack & Suri, 2011; Donovan, 2011; Riley, 2018). In a nutshell, mobile money enables mobile subscribers be it banked or unbanked to deposit value as well as send value to another subscriber, which in turn have the option to store the value or turn the value into cash easily (Lawack, 2013). Indeed, mobile money is used in several ways through the usage of a cell phone, enabling financial transactions to be carried out without having to the physical visit a financial institution (Aker & Mbiti, 2013; Tobbin, 2011).

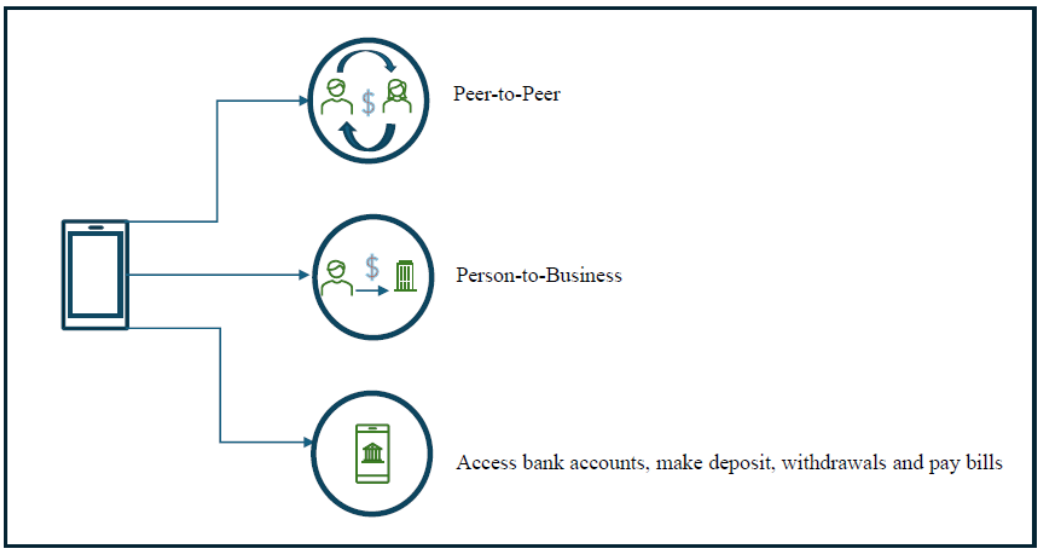

Figure 1: Mobile money services
(Source: Author's interpretation based on Tobbin, 2011)

2.3.1.3 The mobile money ecosystem

Mobile money ecosystem is made up of different players such as organisations and individuals who contribute to the expansion of mobile money services (Jenkins, 2008; Dolan, 2009). As such, it is vital to explore the ecosystem and understand the structures and roles of the different players within the ecosystem. The key actors in the ecosystem are namely: mobile money operators, consumers, banks, agents, merchants, and regulators. Figure 2 depicts a visual representation of the ecosystem.

- Mobile money operators

The MNOs are important players in the industry and hold the leadership role in the expansion of the mobile money ecosystem (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). Indeed, MNOs bring in the infrastructure such as wireless communication, back-end server and applications for mobile devices (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). They have existing distribution channels that are far more extensive than bank branches and have the capacity of attracting customers across all income segments to mobile money (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). As indicated in section 2.2.2, there are 5 MNOs with more than 200 branches and distribution networks that offer mobile money services across Côte d'Ivoire.

- Banks (Financial institutions)

Besides providing financial services, banks come into the ecosystem with their immense experience in handling money (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). Banks are

considered as a focal point for distribution channels, merchants and agents (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). In most cases, banks are intermediaries between the MNOs and agents for obtaining electronic value (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). As for merchants, banks facilitate the flow of money through the integration of mobile commerce system of the MNOs to ease their transactions (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). They also offer regulatory advice to the MNOs (Jenkins, 2008; Dolan, 2009; Tobbin, 2011). As per table 1, there are 30 financial institutions in Côte d'Ivoire with 691 offices across the country.

- Agents

Agents are non-bank organisations or individuals representing MNOs who act as first point of contact with the customers. On behalf of the MNOs, agents are in charge of customer registration, cash-in and cash-out points, and are widely distributed throughout the territory especially in rural areas. There are approximately more than 20,000 agents spread across the territory in Côte d'Ivoire (Meagher, 2017).

- Merchants

Merchants such as retail shops, online shops, and service providers among others engage in the mobile money hub as a way to secure transactions from customers. Indeed, mobile money enables the customer to make payments to the merchant using electronic value (e-value). In Côte d'Ivoire, on average 80% of payments are done in cash and only 1% are conducted via mobile money (Rousset et al., 2018). On a general basis, merchants prefer small-value transactions (Rousset et al., 2018).

- Regulators

Regulators are vital for the survival of the ecosystem as they enable an extensive variety of financial services while addressing Anti-money Laundering and Counter-Terrorist Financing (AML/CFT) concerns by enforcing compliance and regulations. BCEAO is the principal regulator and mobile money operations are dictated by Instruction n°008-05-2015 of May 21, 2015, regulating the terms and conditions for carrying out the activities of e-money issuers in WAEMU member states.

- Customers

Customers are key players in the mobile money service. Success as well as failure of the ecosystem varies heavily on the behaviour of the customer towards mobile money services.

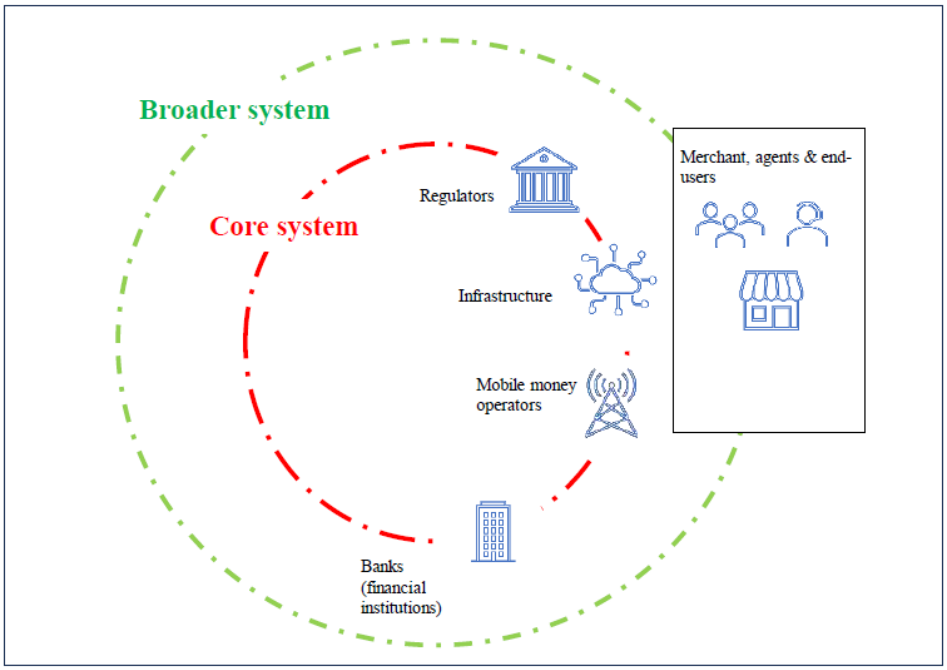

Figure 2: Mobile money ecosystem
(Source: Author's interpretation based on Tobbin, 2011)

2.3.1.4 Mobile money structure

The structure around mobile money is constantly growing, yet most mobile money implementations are focused on the characteristics of mobile money transfer (P2P; P2B), airtime top-up, and mobile banking functions. Figure 3 depicts a visual representation of mobile money structure.

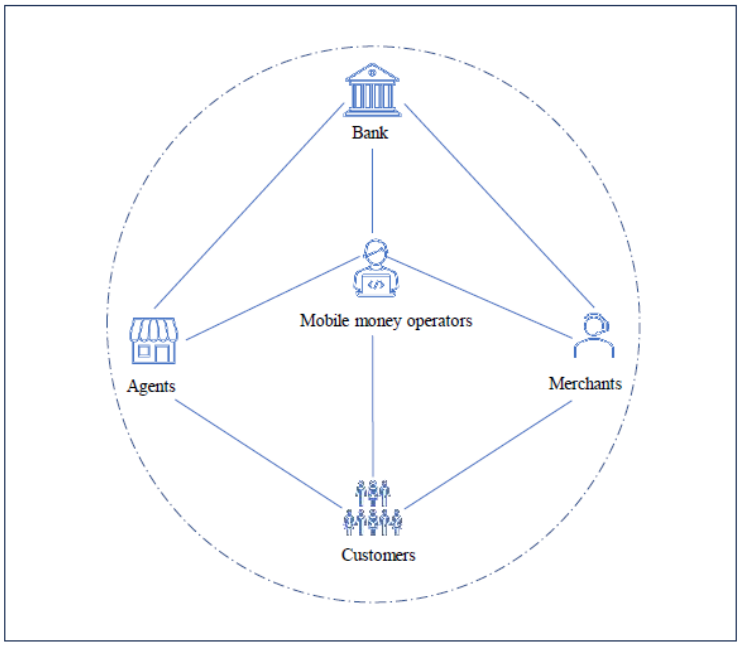

Figure 3: Mobile money structure
(Source: Author's interpretation based on Tobbin, 2011)

2.3.1.5 Mobile money improves access to credit and deposits

As mobile money gained additional ground, came the demand for credit and deposits (Kabala et al., 2021). Indeed, mobile money is part of the mainstream of the economic structure for both developing and developed countries (Aker & Mbiti, 2013; Demirguc-Kunt et al., 2015; Demirgüç-Kunt & Klapper, 2012; Donovan, 2011). The different features of mobile phones collectively with the growth of mobile internet coverage have revolutionised the financial services ecosystems. Indeed, the rising usage of mobile phones and internet connection facilities, have created a remarkable opportunity for individuals, especially those who are underserved, to access to financial services (Chatterjee, 2020). A good internet coverage enables better flow of information, thus decreasing information asymmetries and facilitating deposits and access to credit (Andrianaivo & Kpodar, 2011; Chatterjee, 2020). In addition, the progress of Information and Communication Technology (ICT) had led to the reduction of cost in financial intermediation and contributed to the emergence of branchless financial services (Andrianaivo & Kpodar, 2011; Chatterjee, 2020). Hence, improving access to financial services for individuals that would be credit constraints (Andrianaivo & Kpodar, 2011).

The rapid uptake of mobile money and ICT development have led to question the extent of which mobile money influences borrowing and savings. It has been noticed that in developing countries, there is a high degree of insufficient savings due to the deficit of access to safe mode of savings. In fact, the absence of access to credit and savings prevents individuals against economic shocks. Households lacking access to formal financial services switch to informal lending and savings networks that are within proximity to each other. Thus, leaving these households vulnerable to experiencing same economic shocks (Aron, 2018; Aron & Muellbauer, 2019). Through the use of mobile money accounts, households have the ability to transfer and share resources through a wider and diverse network that in unlikely to experience the same shocks at the same time hence, smoothing consumption over time and minimize risks (Aron & Muellbauer, 2019). Cash-based households are known to have informal savings associations namely: cash under the mattress, livestocks, or savings with non-formal savings clusters making loss of savings in that regard ordinary. Mobile money accounts provides a practical framework and safe storage of cash (Aron & Muellbauer, 2019). On a theoretical basis, Naito et al., (2021) mention different avenues through which mobile money influences borrowing. Firstly, when individuals lack access to financial institutions, the possibility of being financed by a mobile money operator increases borrowing when experiencing negative shocks; Secondly, even if individuals have access to borrowing from financial institutions, the switch to borrowing to a mobile money operator is still feasible. Since, mobile money enables individuals to borrow from their family and friends in case of negative shocks, thus increasing borrowings. Lastly, mobile money allows to store value in mobile money accounts, which offers more convenience and safety to individuals and prepare them for negative shocks, thus decreasing demand for borrowing.

It is expected that giving individuals located in remote and rural locations access to mobile money services might influence their inclination to keep money aside (Aker & Mbiti, 2013; Allen et al., 2016). Mobile money can possibly narrow this gap as a vast number of individuals use mobile money as an alternative to standard banking.

2.3.1.6 Mobile money enables allocation of credit efficiently

As mobile money services evolve and become more sophisticated, individuals will continue to benefit from extension of speed, security and convenience to a wider choice of services such as credit (Dolan, 2009). As individuals develop financial transactions and histories with mobile money, as such this provides the ability to expand credit and assign credit scores by financial

institutions based on those financial histories (Donovan, 2011). The movement of cash to electronic accounts provides records of financial transaction in real time, especially for the unbanked (Donovan, 2011; Aron, 2018). Every withdrawals, deposits, payments or transfer operations through the mobile money accounts generate financial records (Aron & Muellbauer, 2019). These records can be used as credit scores for individuals after a reasonable period of usage (Donovan, 2011; Aron, 2018). This helps in addressing and resolving problems link to information asymmetries since financial institutions can assess creditworthiness (Donovan, 2011; Aron, 2018). Collecting data on depositors can be leveraged to analyse creditworthiness more effectively and efficiently (Aron, 2018). Hence, opening a pathway for listed users of mobile money to formal banking services such as credit to invest in livelihood (Aron, 2018). Immediate access and availability of credit, with lower transaction fees have made mobile money attractive for financial institutions to propose digital loans (Donovan, 2011; Aron, 2018; Kirui, 2021). Access and availability of short-term microloans allow some households that are eligible to benefit from digital credit since these types of loans do not require collaterals (Kirui, 2021). This is due to the fact that households that are eligible for digital credit respond better to shocks (Kirui, 2021; Naito et al., 2021).

2.3.1.7 Mobile money eases financial transactions

Mobile money is viewed as more accessible in terms of delivering financial services easily to a larger population. This is because mobile money operators take full advantage of existing and current mobile network infrastructure that facilitates delivering financial services and transactions (Kim, 2020). As long as there is mobile connectivity, mobile money operators will continue to serve the unbanked population (Kabala et al., 2021). By extending financial services, mobile money has essentially removed the problems linked to restricted banking infrastructure for access to financial transactions (Kim, 2020). Low income people and those located in rural and isolated areas have access easily to financial services, thus removing the geographical constraints and providing locations within close proximity to customers (Kabala et al., 2021; Kim, 2020). Clients transact anywhere with a minimum response time for account holders wanting to send or receive money, withdraw, deposit, or borrow money (Kabala et al., 2021; Llewellyn-Jones, 2016). Also, mobile money has developed and deepened the P2P transaction services, particularly with regard to sending money, especially small amounts, mobile money services are much cheaper, considerably lower and provide a more reasonable alternative as a financial network for low-income people (Kabala et al., 2021; Kim, 2020; Kim, 2020; Bair & Tritah, 2019). It is a known fact that low-income people send, deposits, and

withdraw fairly smaller sum of money. Indeed, mobile money is considered as affordable, secure and convenient, a digital revolution that made life of billions of people easier in developing and emerging markets (Osafo-Kwaako et al., 2018). It has also contributed to a better integration of financial habits among the population, enabling them to adopt healthier financial decisions (Osafo-Kwaako et al., 2018). The mechanism behind mobile money's ability to enhance financial inclusion enables developmental impact on a large scale. The fact that financial services are accessible to the needy, can empower them to forge their way out of poverty.

2.3.2 The relationship between monetary stability and mobile money

In the last decade, financial innovation tools such as mobile money have transformed the way banking services are provided, how banks operate, and how retails payments are done (Ndung'u, 2022). These financial innovations have redefined the knowledge of money and its form through the uptake of mobile money and afterwards shape the monetary frameworks accordingly (Jiang et al., 2022). The rise in the consumption of mobile money has been regarded as the catalyst to savings and investment, enhance economic activity across several sectors; drive innovation in the financial industry, and most importantly, increase accessibility to financial services at various stages (Ndung'u, 2022). The growth in access to finance is certainly driving towards to economic vibrancy and promote inclusive growth across African countries (Ndung'u, 2022).

It is believed by most scholars that mobile money could potentially harm the effectiveness of monetary policy (Jiang et al., 2022). For instance, the expansion of mobile money could possibly impact money demand and ultimately adjust the landscape of monetary policy (Muli, 2019). Ali et al., (2014) believe that financial innovation tools like mobile money lack appropriate framework, leading to negative impact on monetary system, predominantly in regard to the monitoring of money supply and the establishment of interest rates. On the other hand, mobile money is believed to have a favourable effect on money supply. Indeed, as financial markets progress, people are actively encouraged to join in the stock markets, and react to monetary policy shocks (Jiang et al., 2022). Consequently, the interest rate mechanism of the monetary framework will be further relaxed to reinforce the effect of monetary policy (Jiang et al., 2022).

The rise of mobile money has caused a decrease in cash handling outside the banking system (Kipkemboi & Bahia, 2019; Ndung'u, 2022). The velocity of money circulation is not steady anymore and the link between broad and base money is not foreseeable (Ndung'u, 2022). As such, these elements have resulted to a movement from a quantity-to price-based monetary policy framework (Ndung'u, 2022). Under the monetary targeting framework, central banks have the possibility to influence money supply as an interim goal to accomplish price stability (Kipkemboi & Bahia, 2019).

Financial regulators have the tough challenge in creating the right balance namely by adjusting the regulatory framework in order to facilitate financial innovation for economic growth, but also manage and mitigate corresponding risks (Bernoth et al., 2017).

2.3.3 Conceptual framework

The conceptual background is built around the ideas of Mawejje & Lakuma, (2019). The framework has been created to associate mobile money with these macroeconomic indicators namely: money stock; inflation; interest spread rates; private-sector credit; and economic aggregate activity (Mawejje & Lakuma, 2019).

2.3.3.1 Mobile money and stock

Two convincing opinions on the influence of mobile money with regard to money stock. The first opinion is based on Mehrotra & Yetman, (2015) philosophy that speak on financially excluded people gathering savings through non-financial assets namely land; livestock; and jewellery. As a result, mobile money represents an opportunity for many households to switch from non-financial asset to electronic money, which would pave the way to an uptake in the demand for broad money (Mawejje & Lakuma, 2019). Additionally, we could speculate that mobile money has a strong and favourable connection with money aggregates (Mawejje & Lakuma, 2019). However, the second point of view from Ndirangu & Nyamongo, (2015) believes that financial innovation could possibly decrease the demand for money, especially if transaction cost and risks are reduced when dealing with cash.

2.3.3.2 Mobile money and inflation

Academics have noted that mobile money may not drive to inflationary constraints (Adam & Walker, 2015; Aron et al., 2015). Simpasa et al., (2011) prompted doubts on the possible inflationary consequences of mobile money in emerging states. In fact, Simpasa et al., (2011) believe that mobile money can be an important driver of high inflation levels since customers

are able to transact easily, thus raising the velocity of money circulation. Mobile money can have an impact on inflation if the velocity of money circulation in distribution is influenced without automatically adjusting the aggregate output levels (Mawejje & Lakuma, 2019; Wiafe et al., 2022). On the other hand, there can also be an opposite effect whereby mobile money can promote productivity and enhance economic output, thus leading to reasonable transaction costs, better outcomes and eventually no impact on consumer price index (Aron et al., 2015).

2.3.3.3 Mobile money, credit, interest rates and aggregate activity

Private credit and demand for money channelling through mobile money are believed to affect monetary policy effectiveness within an economy (Wiafe et al., 2022). Mobile money may influence interest rates due to money demand as well as supply of private credit (Mawejje & Lakuma, 2019; Wiafe et al., 2022). Indeed, if mobile money affects money demand and inflation, authorities may possibly engage in implementing tight monetary policies, thus augmenting interest rates (Mawejje & Lakuma, 2019). Additionally, mobile money might also influence private credit. Indeed, deposits made through mobile money and held by financial institutions in escrow accounts might be converted to loanable funds, leading to an increase for credit (Mawejje & Lakuma, 2019; Wiafe et al., 2022). Consequently, mobile money impacts economic efficiency and supports economic aggregate activity (Mawejje & Lakuma, 2019; Wiafe et al., 2022). It is believed that mobile money use promotes agricultural and labor market efficiency, along with risk sharing and financial development (Aker & Mbiti, 2013; Munyegera & Matsumoto, 2016; Mawejje & Lakuma, 2019). These effects as a result, will likely have positive significant repercussions on economic development and growth (Andrianaivo & Kpodar, 2011).

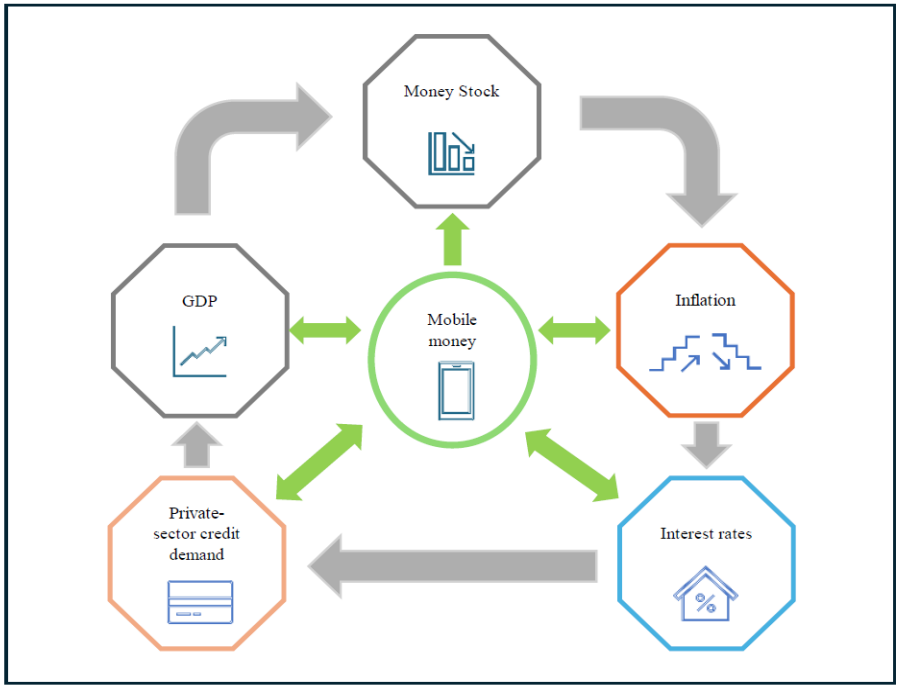

Figure 4: Analytical framework
(Source: Mawejje & Lakuma, 2019)

2.4 Empirical evidence

The section relates to the empirical evidence that has analysed the macroeconomic consequences of mobile money within a given economy across Africa. There has been debate across published articles on the macroeconomic effect of financial innovation especially mobile money (Mawejje & Lakuma, 2019).

2.4.1 Mobile money and monetary policy

Weil et al., (2011) were among the first to investigate financial innovation implications on monetary policy across East African nations. The researchers investigated the high velocity of mobile money transactions, and concluded mobile money velocity is not greater compared to the velocity of the alternative monetary aggregates. Finally, the findings also indicated that the usage of mobile money for sound monetary policy is minimal at the most.

Wiafe et al., (2022) have studied the role of mobile money on the performance of monetary policy in Ghana. Using a structural vector autoregressive (SVAR) and monthly data, the findings revealed that the monetary policy becomes less successful and efficient as mobile money grows. The study further uncovered that mobile money shocks exert an influence on short-term interest duties. The analysis demonstrated that the transactions of mobile money

have a substantial outcome on monetary policy, which is vital for stability and output of the economy.

Nampewo & Jacob, (2016) have studied the footprint of financial innovation and velocity of money circulation across Uganda. The research adopted a time series data through the use of an autoregressive distributed lag (ARDL) econometric technique. The study main purpose was to uncover whether the velocity of money circulation was an essential element in the inflation-targeting mechanism. The results showed that financial innovations have both adverse and favourable consequences on the velocity of money in both the short- and long-term.

Dunne & Kasekende, (2018) have reviewed the development of financial innovation and its significance on the demand for money across Sub-Saharan African countries. The study took into account a panel data assessment across 34 nations between 1980 and 2013. The figures showed that there is an adverse association connecting financial innovation and mobile demand, implying that innovative product in the financial sphere plays an essential role in clarifying the demand for money in Sub-Saharan Africa. They further indicated that financial innovations namely mobile money has vital consequences for future policy design.

Qiu, (2022) has studied the consequence of mobile money expansion and inflation in emerging countries. The study used the Quantity Theory of Money, at the heart of which Fisher's Equation of Exchange Framework lies. The investigation used a regression model of differences in a panel of countries based on macro level to measure the relationship between mobile money and inflation. The results specified that mobile money distribution expands inflation across the board.

On the other hand, Aron et al., (2015) have developed and studied an inflation forecasting models to test the relevancy of mobile money using error correction techniques in Uganda. The results are not conclusive and indicate that there is not enough data to support that mobile money is positively correlated with inflation.

2.4.2 Mobile money and macroeconomic variables

Nampewo et al., (2016) have investigated the influence of mobile money on private sector credit in Uganda. The study adopted the vector error correction (VEC) model and Granger

causality analysis along with a time-series approach. The findings showed that, in fact, mobile money is a crucial element for private credit supply through the saving and deposit mechanism.

Mohamed & Nor, (2023) have investigated the footprint of mobile money on economic activities in Somalia, based on quarterly figures from 2010 to 2020. The authors used the SVAR technique to scrutinise the correlation between macroeconomic parameters and mobile money. The findings showed that mobile money stimulates consumer purchasing power due to low transaction fees, and facilitates access to finance, thereby boosting overall economic growth. Additionally, the authors also revealed that mobile money helps to stabilize exchange rates, maintain price levels and encourage trade. Moreover, the findings indicated that mobile money has a short-term link with economic activity, price indexes, trade openness and household consumption.

Katusiime, (2021) has examined the interaction between the deployment of mobile money and macroeconomic policy in Uganda. The research adopted an ARDL model along with a time-series approach. The findings concluded that in the short-term, mobile money use is favourably influenced by inflation, while the exchange rate, interest rates and taxes negatively influence mobile money activity in Uganda. Additionally, in the long-run, mobile money consumption is favourably influenced by inflation, economic activity and economic crisis, while customer credit balances, interest rates, exchange rates and taxes have a negative impact.

Mawejje & Lakuma, (2019) have studied the repercussion of mobile money deployment on macroeconomics drivers in Uganda also. The authors adopted a SVAR method and the analysis indicated that mobile money had a moderately favourable impact on monetary indexes, inflation, domestic credit, and overall activity. In addition, the figures proved that operational patterns involving mobile money usage had a greater macroeconomic leverage compared to savings.

Table 2: Key research on impact of mobile money on macroeconomic development

Authors	Methodology	Findings	Type
Weil et al., (2011)	Regression Model	The speed of circulation of mobile money is no higher than that of other monetary aggregates.	Financial innovation

Wiafe et al., (2022)	SVAR Model	Monetary policy gradually becomes ineffective as mobile money advances and mobile money shocks impact short-term yields.	Mobile money & monetary policy effectiveness
Nampewo & Jacob, (2016)	ARDL Model	The impact of innovations in the financial sphere on the speed of money circulation is both negative and favourable in the short- and long-term.	Financial innovation
Dunne & Kasekende, (2018)	ARDL Model	An adverse affiliation between innovation in finance and mobile demand, implying that innovation acts as a vital player in clarifying the demand for money in Sub-Saharan Africa.	Financial innovation
Qiu, (2022)	Regression Model	Mobile money distribution increases inflation across the board.	Mobile money & inflation
Aron et al., (2015)	Error Correction Model & Multivariate Time Series	The results are not conclusive and indicate that there is not enough documentation to prove that mobile money is positively correlated with inflation.	Mobile money & inflation
Nampewo et al., (2016)	Vector Error Correction Model & Granger Causality Analysis	Mobile money is a key factor for the supply of private credit through the savings and deposit mechanism.	Mobile money & private credit
Mohamed & Nor, (2023)	SVAR Model	Mobile money stimulates consumer purchasing power thanks to low transaction fees, and facilitates access to financing, thereby boosting overall economic growth. Additionally, mobile money helps to stabilize exchange rates, maintain price levels and encourage trade.	Mobile money & macroeconomic
Katusiime, (2021)	ARDL Model & Time Series Model	Mobile money use is favourably influenced by inflation, while the exchange rate, interest rates and taxes negatively influence mobile money activity in Uganda.	Mobile money & macroeconomic policy
Mawejje & Lakuma, (2019)	SVAR Model	Mobile money has had a moderately favourable influence on monetary indexes, inflation, domestic credit and overall activity. The figures proved that transactional patterns linked to mobile money usage had a greater macroeconomic leverage compared to savings.	Mobile money & macroeconomic

Source: Summarised from above literature

2.5 Research gap

The repercussions of mobile money on macroeconomic development and the implication of central bank policy instruments need to be explored through empirical analysis, since theoretically it is still ambiguous and not sufficiently explored. The consequences of this type

of innovation for the central bank financial governance have not been sufficiently studied. Indeed, research on the macroeconomic effect of mobile money is sparse. The vast majority of studies tend to focus on microeconomic effect instead (Jack & Suri, 2011; Lwanga & Adong, 2016; Aron & Muellbauer, 2019; Mathieu & Kakinaka, 2020; Patnam & Yao, 2020; Naito et al., 2021; Nyimbiri, 2021; Douanla Meli et al., 2022; Asongu & le Roux, 2023). The few studies that have focused on macroeconomic development have mostly targeted monetary policy and money aggregates and findings have shown to be inconsistent (Weil et al., 2011; Ndirangu & Nyamongo, 2015; Nampewo & Jacob, 2016; Dunne & Kasekende, 2018). The above debate demonstrates that the consequences of mobile money on macroeconomic activities have not been sufficiently studied in the academic field. Nevertheless, academics are interested on how mobile money may influence macroeconomic variables in emerging nations (Aron et al., 2015; Mawejje & Lakuma, 2019). As such, this paper aims to make further contribution to the field by delving into the causality linking macroeconomic development and mobile money.

CHAPTER 3

Methodology

3.1 Introduction

This chapter depicts the method employed in this project. The techniques and processes serve as a foundation for answering the research question and, consequently, achieving the objective as well. The report investigates the relationship of mobile money on various macroeconomic indicators in Côte d'Ivoire. Subsequently, this entails a quantitative analysis through the estimation of a SVAR model.

3.2 Research approach

This study is aiming to judge the significance of mobile money upon macroeconomic development. As such, a quantitative exploratory study is more suitable to investigate the problem. The use of statistical analytical tools is considered appropriate in order to make sense of the very large volume of numerical data that is drawn from the sample (Kotronoulas et al., 2023). A quantitative research approach presumes that the concepts being studied can be measured and handle numerical data to identify relationships (Kotronoulas et al., 2023). Variable construction and definition are at the heart of quantitative data management (Kotronoulas et al., 2023). Typically, the variables will cover quantitative data for statistical analysis (Kotronoulas et al., 2023).

3.3 Research design

3.3.1 Data source, period, and scope

As per Creswell, (2009) the purpose of the research is based on the problem definition and research aims. As such, based on the research objectives, the study mainly focuses on secondary data collected from the BCEAO Economic and Financial Statistics Database. The data sources are readily available online. The study adopts monthly data spanning January 2013 to December 2021. The observational period was determined by verifying the existence of data for all parameters within the time span. Additionally, the research adopts the variables from Mawejje & Lakuma, (2019) framework namely; the natural log of mobile money balances (LMMB), money stock (LM2), inflation (LCPI) for consumer price index, interest spread rates (LINT), private-sector credit (LPSC), and the natural log of gross domestic product (LGDP) for economic aggregate activity. Table (3) showcases the descriptive statistics from the data.

3.3.2 Estimation model

The estimation model below is applied to appraise the impact of mobile money upon macroeconomic developments. The results are likely to explain how and to what extent the significance of mobile money on macroeconomic developments.

$$LMMB_t = \varphi + \sum_{i=1} \varphi_{1i}\, LMMB_{t-1} + \sum_{i=0} \varphi_{2i}\, LM2_{t-1} + \sum_{i=0} \varphi_{3i}\, LCPI_{t-1} + \sum_{i=0} \varphi_{4i}\, LINT_{t-1} + \sum_{i=0} \varphi_{5i}\, LPSC_{t-1} + \sum_{i=0} \varphi_{6i}\, LGDP_{t-1} + \varepsilon_t$$

where LMMB, denotes mobile money balances in period t; LM2, LCPI, LINT, LPSC and LGDP represent money stock, inflation, interest spread rates, private-sector credit, and gross domestic product in time t respectively and ε as the error variable. All the variables are set as endogenous and stated in natural logarithms.

3.3.2.1 Definition and Measurement of variables

Mobile money balances: As stated above mobile money is an outline as electronic money that connect consumers financially by means of mobile phones (Tobbin, 2011; Lawack, 2013). By definition, mobile money balances reflect the balances of active mobile money accounts (Shirono et al., 2021). For the purpose of this study values of mobile money transactions are factored in to measure mobile money balances.

Money stock: Money is viewed as an important macroeconomic variable within an economy (Yong & Systems, 2023). Economic stability entails that supply of money should be maintained at optimal level (Yong & Systems, 2023). The supply of money is denoted as the overall stock of money in circulation within an economy (Nizam, 2022; Yong & Systems, 2023). Narrow and broad money supplies which comprise of monetary aggregates are vital nominal anchors of monetary policy within an economy (Yong & Systems, 2023). The money supply, through the monetary aggregates M1, M2 and M3, is an operational variable that contributes to the transmission of monetary policy in an economy (Waiter, 1989). For this paper, the M2 aggregate as a share of GDP is used to assess the broad money supply in the economy.

Inflation: Inflation influences all aspect of the economy. In fact, inflation is a vital macroeconomic factor regardless of the economic reality. As per McConnell, (2009), the overall price increases are described as inflation, and when inflation is significantly high, the purchasing power of goods and services deteriorates. Inflation has a considerable impact for

economic growth (Garnier et al., 2013). Indeed, the stability of an economy relies on movement of inflation and by controlling those fluctuations, central banks get to sustain the inflation through monetary and fiscal policy (Atigala et al., 2022). For this study, the consumer price index as a proportion of the GDP is being used to assess the inflation.

Private-sector credit: This indicator relates to financial resources being provided by financial institutions by means of loans, trade credits among others (OECD, 2011). For this study, the most common measurement is being used namely domestic private-sector credit as a share of GDP.

Interest spread rates: For the purpose of this study, the interest rate spread is being used as an indicator. The interest rate spread refers to the distinction between the interest rates the banks provide to their depositors and the interest rates they receive from loans (Ghasemi & Rostami, 2016). As such, this study uses the rate derived from lending rate minus the deposit rate within the given economy.

Gross domestic product: GDP is a macroeconomic title that covers the overall sum of goods and services and refers to the economy's total productivity over a period of time across an economy (Dutt, 2006). The aggregate economic activity and gross domestic product are used interchangeably in this study. As such, for the sake of this paper, GDP growth is used as a measure.

3.4 Estimation approach

3.4.1 Structural vector autoregressive (SVAR) model

This research applies the SVAR model of 9 variables in order to estimate how macroeconomic developments especially money stock, inflation, and private-sector credit respond and interact with mobile money. SVAR model provides a more suitable approach since, it offers the opportunity to investigate the concurrent outcome of variables upon the dependent variable which the vector autoregressive (VAR) is limited as the model is not efficient except for providing endogenous relationships from past values (Pfaff, 2008). The SVAR enables both empirical likelihood and the relationship connecting theory and data with the use of assumptions for the underlying layout of the economy (Hamilton, 1994). The SVAR equation is formulated as follows (1):

$$AZ_t = \gamma + \sum_{i=1}^{P} A_i Z_{t-1} + Bu_t \quad (1)$$

Zt is expressed as an nx1 vector for variables that are endogenous; A along with B are inverting *n x n* arrays that highlight coexistent of variables in the Zt vector; γ stands for vectorial constants; Ai demonstrates the *nxn* ratios on lagged valued of unidentified components of Zt that need to be estimated; μt relates to the *nx*1 vector in which correlated structural shocks that matches to all factors of Zt in an array that is covariance E|utut ′| = Σε for t = (1, 2, 3, …, T); finally *n* represents the amount of indicators. A cut-down interpretation of equation (1) is created by multiplying each side of the equation by the opposite of matrix A, is shown below in equation 2:

$$Z_t = \varphi + \sum_{i=1}^{P} \varphi_i Z_{t-1} + \varepsilon_t \quad (2)$$

By virtue of which $\varphi = (A^{-1}\gamma;\ \varphi_i = A^{-1}A_i)\ and\ \varepsilon_t = (A^{-1}Bu_t)$

The Cholesky decomposition of the variance-covariance format of abbreviated VAR residuals, Σε is used for creating structural shocks. As per Lütkepohl, (2005), in order to find A as well as B and create impulse reaction modes, a minimum 2n2 − n(n + 1)/2 additional boundaries are necessary in addition to the *n* standardization boundaries for the structure to be recognized.

As per Mawejje & Lakuma, (2019), a recursive identifying approach is adopted whereby priori limitations are insisted on concurrent interactions within *Zt* indicators to classify the coefficient array *A*. Subsequently, the strong presence of μt could be emphasized on all component of Z. In this condition, mobile money balances (LMMB), money stock (LM2), inflation (LCPI), interest spread rates (LINT), private-sector credit (LPSC) and gross domestic product (LGDP) are variables set endogenous and stated as natural log. The sequence of the indicators is essential in the SVAR technique since the model outlines transmission of structural shocks, which represent economic theory. As per the diagnostic framework of Mawejje & Lakuma, (2019), it is presumed that mobile money balances are influenced by product development, money stock is shaped by mobile money; inflation is driven by money stock and by mobile money; interest spread rates is impacted by inflation, money stock and also mobile money; moreover, private-sector credit is shaped by interest spread rates, inflation, money stock and mobile money; finally GDP is influenced by all the indicators that are endogenous, involve in the model. The line up of the indicators is shown in the equations below:

$$\varepsilon_t^{LMMB} = u_t^{LMMB} \quad (3)$$

$$\varepsilon_t^{LM2} = a u_t^{LMMB} + u_t^{LM2} \quad (4)$$

$$\varepsilon_t^{LCPI} = a u_t^{LMMB} + a u_t^{LM2} + u_t^{LCPI} \quad (5)$$

$$\varepsilon_t^{LINT} = a u_t^{LMMB} + a u_t^{LM2} + a u_t^{LCPI} + u_t^{LINT} \quad (6)$$

$$\varepsilon_t^{LPSC} = a u_t^{LMMB} + a u_t^{LM2} + a u_t^{LCPI} + a u_t^{LINT} + u_t^{LPSC} \quad (7)$$

$$\varepsilon_t^{LGDP} = a u_t^{LMMB} + a u_t^{LM2} + a u_t^{LCPI} + a u_t^{LINT} + a u_t^{LPSC} + u_t^{LGDP} \quad (8)$$

CHAPTER 4

Discussion of findings

4.1 Introduction

This chapter depicts in detail the modelling strategy as discussed in chapter three. The core goal of this report is to discover the significance of mobile money on macroeconomic development. As such, the results are presented, interpreted, and discussed with a view to address the research questions and objectives.

4.2 Descriptive statistics

Table 3 showcases the synopsis of the variables for this paper. The mean of inflation is 1,24, demonstrating that over the estimating period, Côte d'Ivoire's monthly inflation averaged 1,24 with a standard deviation of 1,05. The lowest monthly inflation rate registered is 0,38 and the highest level is 3,93. The mean for aggregate activity shows 7,01 with a standard deviation of 2,26. During the study phase, the lowest monthly aggregate activity rate indicates 1,77 and the highest monthly rate is 10,97. As for the money stock aggregate, the mean rate is 27,14 with a standard deviation of 4,12. Additionally, the highest monthly rate for money stock is 38,76 and the lowest monthly rate shows 21,69. Regarding the mobile money, the mean rate is 691,85 with a standard deviation of 511,43. The lowest monthly value for mobile money stands at 70,47 and the highest is 1812,11. Moreover, the interest spread rate mean is position at 3,37 along with a standard deviation of 1,70. The minimum interest spread rate is -3,80 and the maximum rate is 6,81. The private-sector credit mean rate stands at 18,09 with a standard deviation of 2,64. The lowest rate for the private-sector credit is 13,18 and the highest rate is 22,38.

Table 3: Descriptive statistics

Variable	Observations	Mean	Median	Standard deviation	Minimum	Maximum
LMMB	108	691,85	544,86	511,43	70,47	1 812,11
LGDP	108	7,01	7,11	2,26	1,77	10,97
LM2	108	27,14	26,97	4,12	21,69	38,76
LCPI	108	1,24	0,85	1,05	(0,38)	3,93
LINT	108	3,37	3,54	1,70	(3,80)	6,81
LPSC	108	18,09	18,36	2,64	13,18	22,38

Note: LMMB= mobile money balances; LGDP= gross domestic product; LM2= money stock; LCPI= inflation; LINT= interest spread rates; LPSC= private-sector credit.

4.3 Correlation analysis

The correlation test is performed to identify the robustness of the connection between the explanatory variables. The results are detailed below in table 4.

Table 4: Correlation matrix

	LMMB	LGDP	LM2	LCPI	LINT	LPSC
LMMB	1,00	-0,59	0,96	0,25	-0,20	0,91
LGDP	-0,59	1,00	-0,63	0,20	0,20	-0,73
LM2	0,96	-0,63	1,00	0,19	-0,25	0,92
LCPI	0,25	0,20	0,19	1,00	0,08	-0,06
LINT	-0,20	0,205	-0,25	0,08	1,00	-0,23
LPSC	0,91	-0,73	0,92	-0,06	-0,23	1,00

Note: LMMB= mobile money balances; LGDP= gross domestic product; LM2= money stock; LCPI= inflation; LINT= interest spread rate; LPSC= private-sector credit.

The output depicts that the value of the relationship between LMMB and LGDP is -0,589564, as such this indicates a negative correlation among the variables. Furthermore, the correlation coefficient between LMMB and LCPI is 0,246483, suggesting that the relationship between these two indicators is weak. Additionally, the correlation coefficient between LMMB and LINT is -0,195009, suggesting a negative and very weak relationship. However, the value of the relationship between LMMB and LM2 is 0,960758, showing a significant positive correlation between these two indicators. The same result applies between LMMB and LPSC, the value is 0,906635, which indicates a strong and positive relationship. These values seem to depict evidence of multicollinearity among MMB and M2 as well as LMMB and LPSC as their value is close to 1, determining multicollinearity. Moreover, the unit root test is employed for this analysis and the differencing reduces multicollinearity.

4.4 Unit test roots

The research also has engaged into the Augmented Dickey-Fuller procedure of Dickey & Fuller, (1979) to assess the unit roots for the data-generating process in order to assess if the data is stationary or non-stationary. Trends and intercepts are considered in the data-output process while performing the unit root tests. From the analysis, it is determined that all the indicators are non-stationary and have to be differenced as per table 5.

Table 5: Augmented Dickey-Fuller unit root test

Augmented Dickey-Fuller							
		At level					
		LMMB	**LGDP**	**LM2**	**LCPI**	**LINT**	**LPSC**
Intercept	T-statistics	1,480	-2,181	1,108	-1,854	-4,985	-0,905
	Prob	0,999	0,214	0,997	0,353	0,000	0,783
Trend & intercept	T-statistics	0,190	-2,279	-1,138	-1,822	-8,892	-2,093
	Prob	0,998	0,441	0,916	0,687	0,000	0,543
None	T-statistics	1,328	-1,147	-1,910	-1,335	-1,835	1,937
	Prob	0,953	0,228	0,986	0,167	0,063	0,987
		Difference					
		d(LMMB)	**d(LGDP)**	**d(LM2)**	**d(LCPI)**	**d(LINT)**	**d(LPSC)**
Intercept	T-statistics	-12,079	10,122	-7,341	-10,286	-11,696	-6,963
	Prob	0,000	0,000	0,000	0,000	0,000	0,000
Trend & intercept	T-statistics	-12,448	-10,070	-7,257	-10,226	-11,643	-6,954
	Prob	0,000	0,000	0,000	0,000	0,000	0,000
None	T-statistics	-11,785	-10,173	-7,322	-10,339	-11,748	-7,009
	Prob	0,000	0,000	0,000	0,000	0,000	0,000

Note: LMMB= mobile money balances; LGDP= gross domestic product; LM2= money stock; LCPI= inflation; LINT= interest spread rate; LPSC= private-sector credit**.**

4.5 Lag length selection

The lag length selection process is applied for each variable as indicated in table 6. As per the LR test statistics, Final prediction error, and Akaike information criterion all indicated an optimize lag length of four. However, this report did not use the recommended lag length because of the issue related to degrees of freedom due to the minor sample we are dealing with. As such, we applied a lag length of two.

Table 6: Lag length selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1387,604	NA	29682,270	27,326	27,480	27,388
1	-1194,105	360,439	1354,769	24,237	25,318*	24,675
2	-1126,231	118,447	730,309	23,612	25,620	24,425*
3	-1086,590	64,513	692,379	23,541	26,475	24,729
4	-1048,411	57,643*	686,848*	23,498*	27,359	25,061

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

4.6 Macroeconomic influences of mobile money

To review the consequences of mobile money on macroeconomic development variables, we evaluated the SVAR technique as mentioned in chapter three. As per the framework of Mawejje & Lakuma, (2019), the SVAR included the macroeconomic variables namely the natural log of mobile money balances (LMMB), the natural log of money stock (LM2), the natural log of inflation (LCPI) for consumer price index, the natural log of interest spread rates (LINT), the natural log of private-sector credit (LPSC), along with natural log of gross domestic product (LGDP) for economic aggregate activity. As mentioned in chapter 3, the SVAR recognises structural shocks in the VAR model through means of enforcing limitations that copy economic theory (Mawejje & Lakuma, 2019). The SVAR model used assumes that the variables are in recurrent manner. A two-lag length is applied for each variable as indicated in section 4.3.

The findings as per figure 5 indicates the repercussions of mobile money upon the macroeconomic indicators. The lines marked as blue show the response of the given variable to a Cholesky Impulse function. The dotted red lines denote the 95% confidence interval across the estimated impulse.

The observation indicates an elevated gross domestic product in the second period, reached the lowest in the third period, increased in the fourth period, before witnessing a steady declined, approaching equilibrium after the eighth period. The findings reveal that shocks linked to mobile money may possibly be slow to have the desired impact on productivity. As per Mawejje & Lakuma, (2019), although mobile money enhances resource allocation, eases financial transactions, increased investment among others, it may not lead to greater productivity. As such, the shock in mobile money is quite volatile and spark off cyclical behaviour but nonetheless support economic aggregate activities. This theory is in harmony with Mohamed & Nor, (2023) research. Additionally, a favourable shock in mobile money generates a surge in inflation level within the first period. It instantly follows a sharp decline. However, from the fourth period inflation rises, reaches its peaked and begins to fall, approaching equilibrium becoming insignificant. The findings confirm the theory of Aron et al., (2015), Adam & Walker, (2015) signifying that mobile money may not push for inflationary pressures. In the case of money stock, supply fell short before rising to its peak in the third period preceding the innovation shock. The rise in the money supply after the decline suggest that the shock is gradual as well as consistent over the period. The increase in the stock

of money may be due to the high volume of transactions caused by mobile money agents. As such, the results are consistent with the theory of Mawejje & Lakuma, (2019) that mobile money can cause a decrease in non-financial assets. Furthermore, the observation indicates that a shock to mobile money expands credit to the private sector at an early stage up to the sixth period. The deficit tends to narrow from the eighth period onwards. The results showcase that mobile money may take time to impact supply of private credit. Nonetheless, the results support the theory of Nampewo et al., (2016) findings indicating that mobile money is in fact an essential factor in the supply of private credit. Moreover, a positive shock leads to sharp increase in interest spread rate before experiencing a sharp decline in the fourth period. The widening of the interest-rate spread turned into a recurring trajectory of ups and downs, before becoming relatively stable, which may be the result of a tightening of monetary policy and a positive shock to mobile money.

4.7 Mobile money and the conduct of monetary policy

In order to investigate mobile money consequences on the regulation of monetary policy, an estimate of the response of mobile money and the other macroeconomic variables is conducted. Figure 6 presents mobile money response to changes in policy rate. The observation indicates that one standard deviation shock across monetary policy leads to a widening of the gap in mobile money at initial stage before reaching equilibrium towards the end. The findings conclude that financial innovation such as mobile money has moderate impact on monetary policy transmission mechanisms. In addition, the observation also shows that a shock to the interaction between the money stock and the interest spread rate differential follows a recurring trajectory of rises and falls before stabilizing after the sixth period. The results suggest that monetary policy tightening has a moderate impact on money aggregates. Furthermore, an increase in interest spread rate contribute to a rise in inflation in the second period, declining significantly in the third period before reaching equilibrium level towards the end. The results insinuate that monetary effects take longer to gain full potential which is consistent with the findings of Mawejje & Lakuma, (2019). As far as the response of aggregate activity is concerned, a positive monetary policy shock has no synchronous influence on output. The output gap seems to widen at the beginning but slowly starts to contract gradually after the sixth period. With enhanced productivity and growth along with monetary tightening the output gap seems to reduce and reach an equilibrium level towards the end. Moreover, the observation indicates that a shock in interest spread rate affects significantly private-sector credit. As such,

the results show that high interest rates have potential implication for demand for private-sector credit. This theory is coherent with the research of Nampewo et al., (2016).

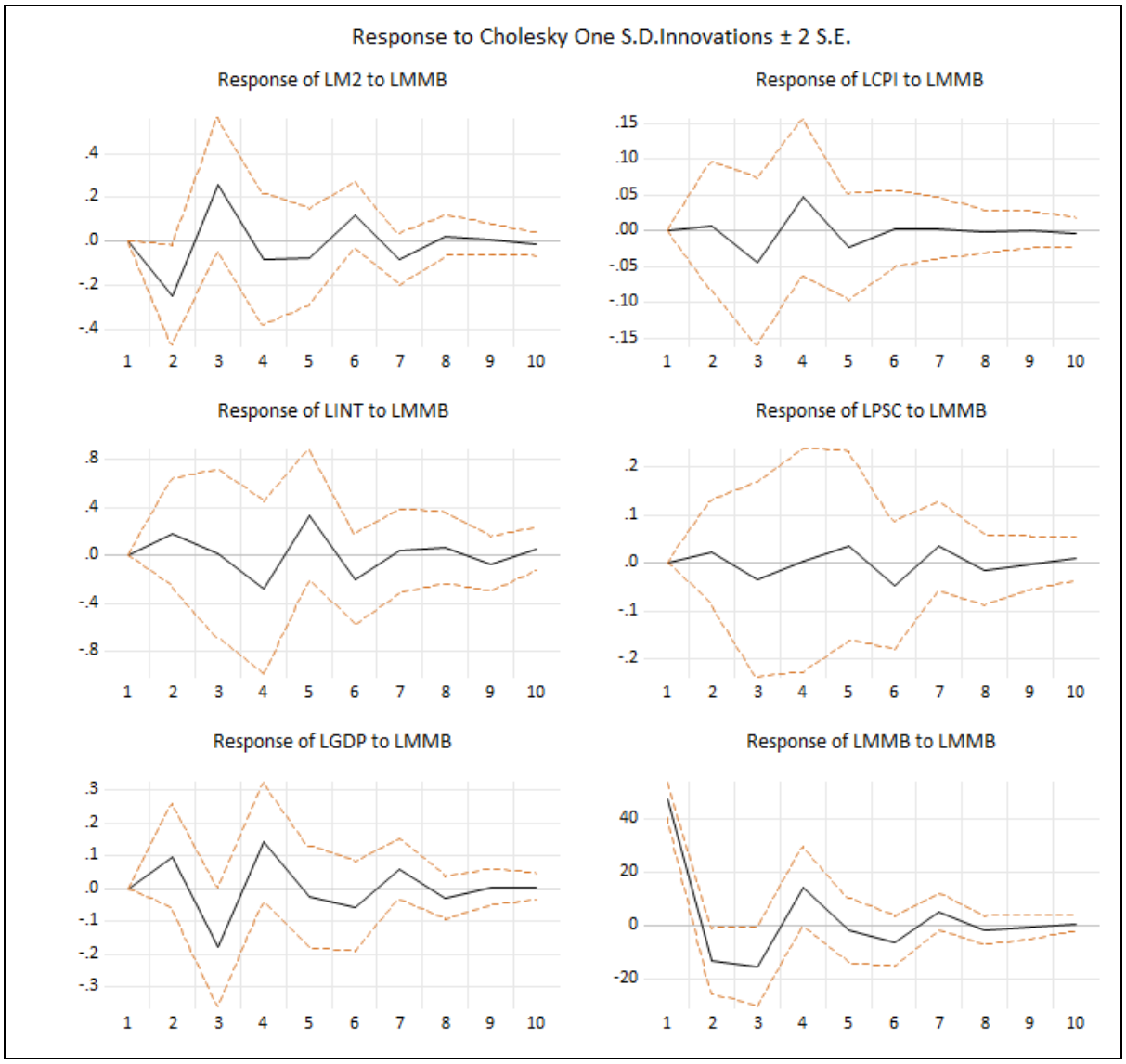

Figure 5: The macroeconomic effect of mobile money

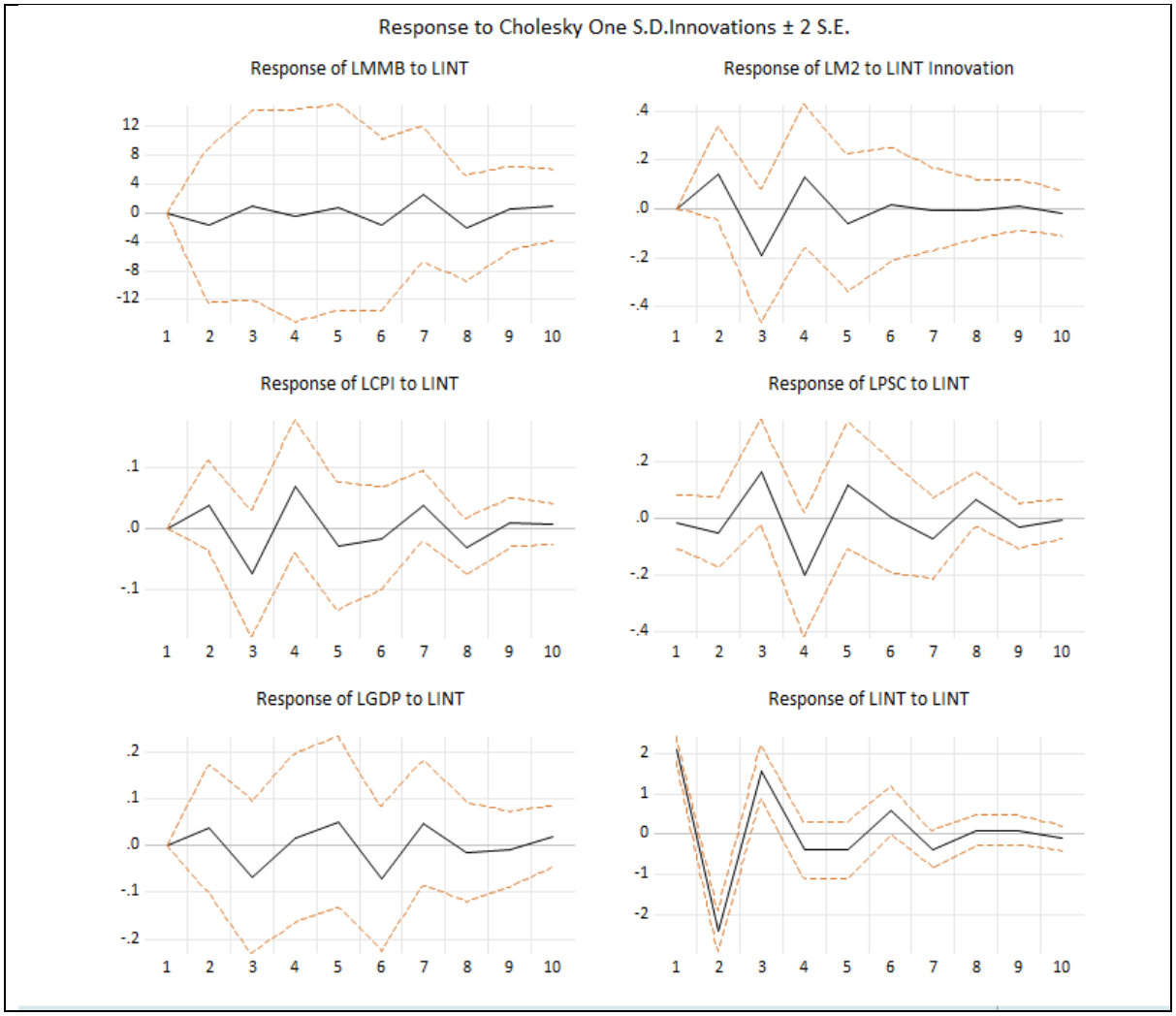

Figure 6: The conduct of monetary policy and mobile money

4.8 Summary of findings

The results from the economic investigations have revealed that on a general basis mobile money has a modest impact upon the macroeconomic development variables. Indeed, mobile money may take time before having the desired impact but supports overall economic activities. Mobile money has moderate impact on monetary policy transmission mechanisms, monetary effects take longer to gain full potential. The next chapter delivers a detailed outline of the discoveries as well as recommendations for the research based on the results.

CHAPTER 5

Conclusion and recommendations

5.1 Introduction

This chapter showcases an integrated view of the findings, along with recommendations, in the hope of assisting policymakers and future research in the field. Although data limitation and complexity, this study provides further insights to a relatively new field.

5.2 Conclusion

Technology in finance has been of immense importance for financial inclusivity along with improving the financial sector. Mobile money, for instance, has contributed to financial inclusion across African countries and has experienced a sharp rise, providing especially the underserved an efficient way to be integrated in the financial system. The digitalisation that occurred in Africa, has put the continent ahead of the rest of the world in terms of digital financial deployment.

Mobile money has proven to have immense economic benefits for emerging countries. However, there are apprehensions that mobile money might weaken financial stability as well as the conduct of monetary policy (Mawejje & Lakuma, 2019). The impact of mobile money on these macroeconomic indicators such as: inflation; interest spread rates; money stock; private-sector credit; and economic aggregate activity is intriguing. Côte d'Ivoire is viewed as the most robust economy in Africa and mobile money has rapidly evolved across the country. As such, this gives prospect to inquire into the involvement of mobile money on macroeconomic development in Côte d'Ivoire. Indeed, the principal idea of this investigation is to appraise the influence of mobile money on macroeconomic development in Côte d'Ivoire.

In order to accomplish the objective of this investigation, we first explored theoretically the ecosystem, the services and the structure of mobile money with the aim to understand its economic importance within an economy. We then analysed the empirical evidence of mobile money and macroeconomic development across Africa. We applied the conceptual framework developed by Mawejje & Lakuma, (2019) that links mobile money and macroeconomic variables. From there, data were collected from BCEAO Economic and Financial Statistics Database. The study adopted a time-series approach, making use of monthly data span from January 2013 till December 2021.

The economic investigation employs the structural vector autoregressive (SVAR) to analyse the data. The SVAR model showed moderate effect on the macroeconomic development variables in Côte d'Ivoire. The shocks in mobile money may linger to impact productivity, but nonetheless support economic aggregate activity in the country. Mobile money may not push for inflationary pressures. In the case of money stock, mobile money leads to a shift from non-financial assets to financial assets thus influencing money supply. Furthermore, mobile money may take time to influence supply of private credit but remain an essential tool for the supply of private credit. As for interest spread rates, a positive impact is noticed, and remain relatively stable. Regarding the conduct of monetary policy, mobile money has moderate impact on monetary policy transmission mechanisms, monetary effects take longer to gain full potential in Côte d'Ivoire.

5.3 Recommendations for policymakers

The monetary policy in Côte d'Ivoire should be reinforced and emphasized for the development of mobile money. Indeed, this intervention will help influence economic growth in the desired way. Additionally, designing an effective monetary policy that will work towards strengthening market development along with innovation. Furthermore, policymakers should consider integrating a digital financial development framework into the monetary policy that will target the digitalization of mobile money.

5.4 Recommendations for further research

The outcomes from the study should be taken with caution due to the restricted data available and the short period examined. We find the results reasonable, however future studies should include a bigger time frame to improve the results. This study contributes and provides insights to a relatively new and complex field on the impact of mobile money on macroeconomic development and act as a foundation to include other indicators for further research. A cross-sectional country approach across African countries could be investigated in order to get a wider perspective on the topic.

Reference

Abiona, O., & Koppensteiner, M. F. (2022). Financial Inclusion, Shocks, and Poverty Evidence from the Expansion of Mobile Money in Tanzania. *Journal of Human Resources*, *57*(2), 435–464. https://doi.org/10.3368/jhr.57.2.1018-9796R1

Adam, C., & Walker, S. (2015). Money and Monetary Policy. *University of Oxford*, *1*(3), 6. https://doi.org/10.2307/20079788

Aker, J. C., & Mbiti, I. M. (2013). Learning with Mobile Technologies, Handheld Devices and Smart Phones: Innovative Methods. *Online Information Review*, *37*(3), 482–483. https://doi.org/10.1108/oir-04-2013-0088

Ali, R., Barrdear, J., Clews, R., & Southgate, J. (2014). The Economics of Digital Currencies. *Topical Articles*, *1*, 276–286. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2499418

Allen, F., Demirguc-Kunt, A., Klapper, L., & Martinez Peria, M. S. (2016). The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts. In *Journal of Financial Intermediation* (Vol. 27, Issue December). https://doi.org/10.1016/j.jfi.2015.12.003

Andrianaivo, M., & Kpodar, K. (2011). ICT, Financial Inclusion, and Growth Evidence from African Countries. *IMF Working Papers*, *11*(73), 1. https://doi.org/10.5089/9781455227068.001

APIF CI. (2020). *Rapport Annuel sur L'Inclusion Financiere 2020*. https://apif.finances.gouv.ci/images/app/publications/170/cote-divoire-rapportannuel-2020-sur-linclusion-financiereapif-ci.pdf

Aron, J. (2018). Mobile Money and the Economy: A Review of the Evidence. *World Bank Research Observer*, *33*(2), 135–188. https://doi.org/10.1093/wbro/lky001

Aron, J., & Muellbauer, J. (2019). *"The Economics of Mobile Money: Harnessing the Transformative Power of Technology to Benefit the Global Poor." May*, 1–31. https://cepr.org/voxeu/columns/economics-mobile-money-harnessing-transformative-power-technology-benefit-global-poor

Aron, J., Muellbauer, J., Sebudde, R., Clements, M., Durevall, D., Farrell, G., Hendry, D., & Smit, B. (2015). Inflation Forecasting Models for Uganda: Is Mobile Money Relevant? *Centre For Study Of African Economies Working Paper*, *44*(0). www.csae.ox.ac.uk

Atigala, P., Maduwanthi, T., Gunathilake, V., Sathsarani, S., & Jayathilaka, R. (2022). Driving the Pulse of the Economy or the Dilution Effect: Inflation Impacting Economic

Growth. *PLOS ONE*, *17*(8 August), 1–17. https://doi.org/10.1371/journal.pone.0273379

Bair, S., & Tritah, A. (2019). Mobile Money and Inter-Household Financial Flows: Evidence from Madagascar. *Revue Economique*, *70*(5), 847–871. https://doi.org/10.3917/reco.705.0847

BCEAO. (2022). *Paysage Bancaire de l'UMOA*. 2022. https://www.bceao.int/fr/content/paysage-bancaire

Bernoth, K., Gebauer, S., & Schafer, D. (2017). *Monetary Policy Implications of Financial Innovation In-Depth Analysis*. *120*.

Burns, S. (2015). Mobile Money and Financial Development: The Case of M-PESA in Kenya. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2688585

CGAP. (2018, December 13). *Understanding Côte d'Ivoire's Financially Excluded Women*. https://www.cgap.org/blog/understanding-cote-divoires-financially-excluded-women

Chatterjee, A. (2020). Financial Inclusion, Information and Communication Technology Diffusion, and Economic Growth: A Panel Data Analysis. *Information Technology for Development*, *26*(3), 607–635. https://doi.org/10.1080/02681102.2020.1734770

Creswell, J. W. (2009). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. In *Intercultural Education* (3rd Editio). Sage Publication. https://doi.org/10.1080/14675980902922143

Deloitte. (2017). *Invest in Côte d'Ivoire a Business Guide for Africa's Fastest-Growing Economy*. *March*. https://www2.deloitte.com/content/dam/Deloitte/za/Documents/africa/za_ASG_Country Reports_Cote_dIvoire_Repro.pdf

Demirgüç-Kunt, A., & Klapper, L. (2012). Measuring Financial Inclusion: The Global Findex Database. *Policy Research Working Paper*, *April*, 1–4.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2017). *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution*. World Bank Group. https://globalfindex.worldbank.org/sites/globalfindex/files/2018-04/2017 Findex full report_0.pdf

Demirguc-Kunt, A., Klapper, L., Singer, D., & Van Oudheusden, P. (2015). The Global Findex Database 2014. *World Bank Policy Research Working Paper*, *7255*, 1–4.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association*, *74*(366), 427. https://doi.org/10.2307/2286348

Direction Générale du Trésor. (2022, July 13). *Situation Economique et Financière - Côte*

d'Ivoire. https://www.tresor.economie.gouv.fr/Pays/CI/situation-economique-et-financiere

Dolan, J. (2009). Accelerating the Development of Mobile Money Ecosystems. *Proceeding of Mobile Money Summit*, 1–24. https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/programs/cri/files/report_39_mobile_money_january_09.pdf

Donovan, K. (2011). Mobile Money for Financial Inclusion. *Mobile Money For Financial Inclusion*, 61–74.

Dunne, J. P., & Kasekende, E. (2018). Financial Innovation and Money Demand: Evidence from Sub-Saharan Africa. *South African Journal of Economics*, *86*(4), 428–448. https://doi.org/10.1111/saje.12205

Dutt, A. K. (2006). Aggregate Demand, Aggregate Supply and Economic Growth. *International Review of Applied Economics*, *20*(3), 319–336. https://doi.org/10.1080/02692170600736094

FinDev. (2021). *Côte d'Ivoire: Une Stratégie Nationale pour Faire Progresser L'Inclusion Financière*. https://www.findevgateway.org/fr/interview/2021/10/cote-divoire-une-strategie-nationale-pour-faire-progresser-linclusion-financiere

FinTalk Mag. (2021, April 5). *Côte d'Ivoire: 5 Banques Possèdent Plus 50 Agences Bancaires*. https://fintalk-mag.com/2021/04/05/cote-divoire-5-banques-possedent-plus-50-agences-bancaires/

Garnier, C., Mertens, E., & Nelson, E. (2013). *Trend Inflation in Advanced Economies Trend Inflation in Advanced Economies* *. 65–136.

Ghasemi, A., & Rostami, M. (2016). Determinants of Interest Rate Spread in Banking Industry. *Department of Economics*, *5*(1), 320–331. https://core.ac.uk/download/236086303.pdf

GSMA. (2014). Mobile Money in Côte d'Ivoire: A Turnaround Story. *GSMA: Mobile Money for the Unbanked*, *February*. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/05/MMU_Cote_dIvoire_Turnaround_Story.pdf

Hamilton, J. D. (1994). Time Series Analysis. In *International Encyclopedia of Human Geography*. Princeton University Press. https://doi.org/10.1016/B978-008044910-4.00546-0

IFC. (2013). Overview of Côte d'Ivoire. *World Bank Group*. https://www.ifc.org/wps/wcm/connect/34f2a8f3-f315-4361-9f44-369eba2ce0be/ifc_emoney_english.pdf?MOD=AJPERES&CVID=kC3SXYK

IFC. (2018). Digital Finance: The Future of Financial Inclusion in Africa. *Borsa Istanbul Review*, *November*, 2–3. https://www.ifc.org/wps/wcm/connect/aa5e09c7-121e-4588-803a-52ef56b846b2/201805_Digital-Access_The-Future-of-Financial-Inclusion-in-Africa_v1.pdf?MOD=AJPERES

Jack, W., & Suri, T. (2011). Mobile Money: The Economics of M-Pesa. *NBER Working Paper Series*, 1–30. https://www.nber.org/papers/w16721

Jenkins, B. (2008). Developing Mobile Money Ecosystems. *Harvard Kennedy School*. https://gsma.com/mobilefordevelopment/wp-content/uploads/2012/06/report_30_mobilemoney.pdf

Jiang, S., Qiu, S., & Zhou, H. (2022). Will Digital Financial Development Affect the Effectiveness of Monetary Policy in Emerging Market Countries? *Economic Research-Ekonomska Istrazivanja*, *35*(1), 3437–3472. https://doi.org/10.1080/1331677X.2021.1997619

Jocevski, M., Ghezzi, A., & Arvidsson, N. (2020). Exploring the Growth Challenge of Mobile Payment Platforms: A Business Model Perspective. *Electronic Commerce Research and Applications*, *40*(April 2019), 100908. https://doi.org/10.1016/j.elerap.2019.100908

Kabala, E., Mapoma, R., Nalutongwe, C., Muyani, D., & Lungu, J. (2021). An Ethnological Analysis of the Influence of Mobile Money on Financial Inclusion: The Case of Urban Zambia. *Zambia Social Science Journal*, *7*(1), 4.

Katusiime, L. (2021). Mobile Money Use: The Impact of Macroeconomic Policy and Regulation. *Economies*, *9*(2). https://doi.org/10.3390/economies9020051

Kim, K. ha. (2020). The Role of Mobile Money in Improving the Financial Inclusion of Nairobi's Urban Poor. *African Journal of Science, Technology, Innovation and Development*, *12*(7), 855–865. https://doi.org/10.1080/20421338.2020.1733281

Kipkemboi, K., & Bahia, K. (2019). The Impact of Mobile Money on Monetary and Financial Stability in Sub-Saharan Africa. *GSMA*, 32. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/03/The-impact-of-mobile-money-on-monetary-and-financial-stability.pdf

Kirui, E. (2021). Utilization of Mobile Money Services in Enhancing Household's Financial Resilience and Performance of Micro and Small Enterprises in Kenya. *Dissertation*. https://ir-library.ku.ac.ke/bitstream/handle/123456789/22591/Utilization of Mobile Money....pdf?sequence=1&isAllowed=y

Kotronoulas, G., Miguel, S., Dowling, M., Fernández-Ortega, P., Colomer-Lahiguera, S.,

Bağçivan, G., Pape, E., Drury, A., Semple, C., Dieperink, K. B., & Papadopoulou, C. (2023). An Overview of the Fundamentals of Data Management, Analysis, and Interpretation in Quantitative Research. *Seminars in Oncology Nursing*, *39*(2), 151398. https://doi.org/10.1016/j.soncn.2023.151398

Lawack, V. A. (2013). *Mobile Money, Financial Inclusion and Financial Integrity: The South African Case*. *8*(3).

Llewellyn-Jones, L. (2016). Mobile Money: Part of the African Financial Inclusion Solution? *Economic Affairs*, *36*(2), 212–216. https://doi.org/10.1111/ecaf.12177

Lütkepohl, H. (2005). New Introduction to Multiple Time Series Analysis. *Department of Economics*, 1–764. https://doi.org/10.1007/978-3-540-27752-1

Lwanga, M. M., & Adong, A. (2016). *A Pathway to Financial Inclusion: Mobile Money and Individual Savings in Uganda*. *127*. https://ideas.repec.org/p/ags/eprcrs/234553.html

Mathieu, L., & Kakinaka, M. (2020). Financial Inclusion, Mobile Money, and Individual Welfare: The Case of Burkina Faso. *Telecommunications Policy*, *44*(3), 101926. https://doi.org/10.1016/j.telpol.2020.101926

Mawejje, J., & Lakuma, P. (2019). Macroeconomic Effects of Mobile Money: Evidence from Uganda. *Financial Innovation*, *5*(1). https://doi.org/10.1186/s40854-019-0141-5

McConnell, B. F. (2009). *Economics: Principles, Problems, and Policies* (18th Editi). McGraw-Hill Irwin.

Meagher, P. (2017). Cadre Réglementaire Pour les Services Financiers Numériques en Côte d'Ivoire Etude Diagnostique. *CGAP*. https://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjfx6OY8-H_AhXMRfEDHVe_ALsQFnoECA4QAQ&url=https%3A%2F%2Fwww.cgap.org%2Fsites%2Fdefault%2Ffiles%2FWorking-Paper-Regulatory-Framework-for-DFS-in-Cote-dIvoire-Nov-2017-

Mehrotra, A., & Yetman, J. (2015). Financial Inclusion – Issues for Central Banks. *BIS, Quarterly Review*, *March*, 83–96. https://www.bis.org/publ/qtrpdf/r_qt1503h.htm

Mohamed, A. A., & Nor, M. I. (2023). *The Macroeconomic Impacts of the Mobile Money: Empirical Evidence from EVC Plus in Somalia*. *15*(1), 1–15. https://doi.org/10.1108/JFEP-06-2022-0152

Muli, C. M. (2019). *The Effect of Digital Finance on Money Demand in Kenya [Master Dissertation, University of Nairobi]*. http://erepository.uonbi.ac.ke/handle/11295/109385

Myeni, S., & Makate, M. (2020). *Does Mobile Money Promote Financial Inclusion in Eswatini ? 47*(6), 693–709. https://doi.org/10.1108/IJSE-05-2019-0310

Naito, H., Ismailov, A., & Kimaro, A. B. (2021). The Effect of Mobile Money on Borrowing and Saving: Evidence from Tanzania. *World Development Perspectives*, *23*(October). https://doi.org/10.1016/j.wdp.2021.100342

Nampewo, D., & Jacob, O. (2016). *Financial Innovations and Money Velocity in Uganda*. *28*(4), 371–382.

Nampewo, D., Tinyinondi, G. A., Kawooya, D. R., & Ssonko, G. W. (2016). Determinants of Private Sector Credit in Uganda: the Role of Mobile Money. *Financial Innovation*. https://doi.org/10.1186/s40854-016-0033-x

Ndiomewese, I. (2019). *How Keiwa is Including Côte d'Ivoire's Informal Sector into the Financial System*. Techpoint Africa. https://techpoint.africa/2019/01/18/keiwa-feature/

Ndirangu, L., & Nyamongo, E. M. (2015). Financial Innovations and Their Implications for Monetary Policy in Kenya. *Journal of African Economies*, *24*, i46–i71. https://doi.org/10.1093/jae/eju029

Ndung'u, N. (2022). Fintech in Sub-Saharan Africa. *United Nations University World Institute for Development Economics Research*.

Nizam, M. A. (2022). *Impact of E-Money on Money Supply: Estimation and Policy Implication for Bangladesh*. *January 2021*, 1–18. https://doi.org/10.1371/journal.pone.0267595

Nyimbiri, B. A. (2021). *The Impact of the Mobile Money on People's Use of Financial Services in Sub-Sahara Africa*. *9*(59), 137–146. https://doi.org/10.2478/mdke-2021-0010

OECD. (2011). *List of Indicators of Entrepreneurial Determinants. Access to Finance*. *June*, 1–3. https://www.oecd-ilibrary.org/list-of-indicators-of-entrepreneurial-determinants_5jrxf62mxdg5.pdf

Osafo-Kwaako, P., Singer, M., White, O., & Zouaoui, Y. (2018). Mobile Money in Emerging Markets: The Business Case for Financial Inclusion. *McKinsey & Company*, *March*, 10.

Ouma, S. A., Odongo, T. M., & Were, M. (2017). Mobile Financial Services and Financial Inclusion: Is it a Boon for Savings Mobilization? *Review of Development Finance*, *7*(1), 29–35. https://doi.org/10.1016/j.rdf.2017.01.001

Oxford Business Group. (2020). *Mobile Banking in Côte d'Ivoire*. https://oxfordbusinessgroup.com/reports/cote-divoire/2020-report/economy/in-network-mobile-money-fills-the-gaps-left-by-traditional-banks

Pfaff, B. (2008). VAR, SVAR and SVEC Models: Implementation Within R Package Vars.

Journal of Statistical Software, *27*(4), 1–32.

Qiu, C. M. (2022). Regionalized Liquidity: A Cross-Country Analysis of Mobile Money Deployment and Inflation in Developing Economies. *World Development*, *152*, 105781. https://doi.org/10.1016/j.worlddev.2021.105781

Riley, E. (2018). Mobile Money and Risk Sharing Against Village Shocks. *Journal of Development Economics*, *135*(July 2016), 43–58. https://doi.org/10.1016/j.jdeveco.2018.06.015

Riquet-Bamba, C. (2018, July 5). *L'Inclusion Financière à la Croisée des Chemins en Côte d'Ivoire*. FinDev. https://www.findevgateway.org/fr/blog/2018/07/linclusion-financiere-la-croisee-des-chemins-en-cote-divoire

Rousset, M., Bersudskaya, V., & Zoro, N. (2018). Évaluation du Réseau de Paiement Marchand. *Microsave*. https://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiss6Wu-uH_AhXrgP0HHaOdBfAQFnoECCUQAQ&url=https%3A%2F%2Fmicrosave.net%2Ffr%2Fwp-content%2Fuploads%2F2019%2F03%2FRapport-E%25CC%2581valuation-du-Re%25CC%2581seau-de-P

Shirono, K., Carcel Villanova, H., Chhabra, E., Das, B., & Fan, Y. (2021). Is Mobile Money Part of Money? Understanding the Trends and Measurement. *IMF Working Papers*, *21*(177), 1. https://doi.org/10.5089/9781513587851.001

Simpasa, A., Gurara, D., Shimeles, A., Vencatachellum, D., & Ncube, M. (2011). Inflation Dynamics in Selected East African Countries: Ethiopia, Kenya, Tanzania and Uganda. *AfDB Policy Brief*, 1–22. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/07022012Inflation East Africa - ENG - Internal.pdf

Tembo, J. (2019). *Mobile Money and Regional Financial Integration: Evidence from Sub-Saharan Africa*. 1–13.

Tobbin, P. (2011). *Understanding the Mobile Money Ecosystem: Roles, Structure and Strategies*. *November*. https://doi.org/10.1109/ICMB.2011.19

Tumusiime-Mutebile, E. (2015). *Opening Remarks by Mr Emmanuel Tumusiime-Mutebile, Governor of the Bank of Uganda, at the Workshop on "The Economics of Mobile''' Money".''* https://doi.org/10.2307/2550555

Waiter, J. R. (1989). *Monetary Aggregates: A User's Guide*. *February*. https://www.richmondfed.org/~/media/richmondfedorg/publications/research/economic_

review/1989/pdf/er750102.pdf

Weil, D., Mbiti, I., & Mwega, F. (2011). *The Implications of Innovations in the Financial Sector on the Conduct of Monetary Policy in East Africa*. 20–21.

Wiafe, E. A., Quaidoo, C., & Sekyi, S. (2022). Monetary Policy Effectiveness in the Advent of Mobile Money Activity: Empirical Evidence from Ghana. *Cogent Economics and Finance*, *10*(1). https://doi.org/10.1080/23322039.2022.2039343

World Bank. (2016). La Course Vers l'Emergence Pourquoi La Côte d'Ivoire Doit Ajuster Son Système Financier. *Situation Économique de La Côte d'Ivoire, Banque Mondiale*, *3e édition*(Juillet 2016), 64 pages.

World Bank. (2021). *Population, Total - Cote d'Ivoire | Data*. https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CI

World Bank. (2022, October 12). *Côte d'Ivoire Overview: Development News, Research, Data | World Bank*. https://www.worldbank.org/en/country/cotedivoire/overview

Yong, C., & Systems, B. (2023). *The Persistence of Strong Money Supply Growth in China: The Forces of Endogenous Determinants*.

Zhu, X., Asimakopoulos, S., & Kim, J. (2020). Financial Development and Innovation-Led Growth: Is too Much Finance Better? *Journal of International Money and Finance*, *100*(November 2018). https://doi.org/10.1016/j.jimonfin.2019.102083