Routledge
Taylor & Francis Group

Applied Economics

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/raec20

Measuring an equilibrium long-run relationship between financial inclusion and monetary stability in Mozambique

Carla Fernandes, Maria Rosa Borges, Esselina Macome & Jorge Caiado

To cite this article: Carla Fernandes, Maria Rosa Borges, Esselina Macome & Jorge Caiado (20 Apr 2023): Measuring an equilibrium long-run relationship between financial inclusion and monetary stability in Mozambique, Applied Economics, DOI: 10.1080/00036846.2023.2203457

To link to this article: https://doi.org/10.1080/00036846.2023.2203457

Published online: 20 Apr 2023.

APPLIED ECONOMICS
https://doi.org/10.1080/00036846.2023.2203457

Routledge
Taylor & Francis Group

Measuring an equilibrium long-run relationship between financial inclusion and monetary stability in Mozambique

Carla Fernandes[a], Maria Rosa Borges[b], Esselina Macome[a] and Jorge Caiado[c]

[a]FACECO (Faculdade de Economia), Eduardo Mondlane University, Maputo, Mozambique; [b]ISEG (School of Economics and Management), Universidade de Lisboa, UECE (Research Unit on Complexity and Economics), Maputo, Portugal; [c]ISEG (School of Economics and Management), Universidade de Lisboa, REM (Research in Economics and Mathematics) and CEMAPRE, Maputo, Portugal

ABSTRACT

The present work aims to assess the existence of the relationship between financial inclusion and monetary stability in Mozambique based on the analysis of the VEC model for the period from 2005 to 2020. In addition to indicators of traditional banking institutions, this article goes further by also incorporating indicators relating to services of electronic money institutions with the objective of capturing the impact of digital financial services on financial inclusion and their role in financial stability. The long-term VEC model proved to be statistically significant and confirmed the existence of a long-term relationship between financial inclusion and monetary stability. The results also showed that the traditional financial inclusion and non-traditional digital financial inclusion drives the price stability, and in turn, monetary stability. The study concludes that the effectiveness of monetary policy in Mozambique depends on the predictive capacity of the monetary policy instruments, which are highly correlated, to financial inclusion. In this sense, the monetary authority must consider the need to incorporate financial inclusion variables, especially the non-traditional digital ones, in the transmission and forecasting model of the monetary policy rule, to capture the dynamics of financial inclusion segment and its contribution to price stability.

KEYWORDS

Financial Inclusion; monetary stability; VEC model; digital financial services

JEL CLASSIFICATION

G20; G21; G28

I. Introduction

Financial inclusion is a multidimensional concept, which represents the levels of access, use, quality and well-being of the financial services and products, by the economically active population and has been promoted through several channels, with emphasis on digital channels.

Galí, López-Salido, and Vallés (2004), Khan (2011), Mehrotra and Yetman (2015) and Gortsos (2016) and other recent literature analysed the impacts of financial inclusion on the monetary stability. According to those authors financial inclusion affects the monetary stability due the capacity it has to change the behaviour of companies and consumers for improving the effectiveness of monetary policy transmission mechanism. Financial inclusion has also impact on reducing extreme poverty and promoting sustainable economic development, through reducing inequalities in income distribution, and increasing food security (Ouma, Odongo, and Were 2017; Demirgüç-Kunt, Beck, and Honohan 2008; Ait Lahcen and Gomis-porqueras 2019). Financial inclusion has a positive impact on the economy as it contributes to improving levels of access to financial services, especially for the non-banked and rural population, improving the well-being due the increase in savings, dynamization of the credit and reducing a nation's vicious circle of poverty (Ellis, Lemma, and Rud 2010).

One of the main drives of financial inclusion is the digital financial innovations observed through the availability of new channels of access and use of financial services, especially in digital form. Digital financial inclusion involves the use of digital means to reach the financially excluded population, not served by traditional financial services providers.

Digital financial services influence financial inclusion and consequently, the transmission mechanism of monetary policy and monetary stability (Mehrotra and Yetman 2014, 2015; Gortsos 2016; Galí, López-Salido, and Vallés 2004; Khan 2011; Mbutor 2013; Ashraf, Karlan, and Yin 2006;

CONTACT Maria Rosa Borges mrborges@iseg.utl.pt ISEG (School of Economics and Management), Universidade de Lisboa, UECE (Research Unit on Complexity and Economics), Maputo, Portugal

Fernandes, Borges, and Caiado 2020). The observed impact results from the role that financial inclusion plays in smoothing the consumption behaviour of citizens and companies and, consequently, in the effectiveness of monetary policy.

Nevertheless, there are barriers that limit the improvement of levels of financial inclusion and its impact on monetary stability. For Lenka, Bairwa, and McMillan (2016), on the demand side, such barriers include the potential absence of financial resources for savings, loans, and financial illiteracy. On the supply side, the barriers are based on the lack of bank branches, the high fees and commissions for financial services, the absence of documentation for opening a bank account and the need to provide guarantees for obtaining bank loans.

Barriers that limit the levels of financial inclusion also result from geographic, historical, cultural, religious, socioeconomic inequalities, economic structure and economic policy factors (Hariharan and Marktanner 2013). The effectiveness of monetary policy can only be achieved with the inclusion of people in the formal financial system, as savings and investment decisions taken outside the formal financial system are not affected by monetary policy.

Data from central Bank of Mozambique reveal that the level of access to financial services in the economy measured by the adult population with bank account at a formal financial institution observed a growth from 2005 to 2020 particularly those services provided through non-traditional digital platforms. Non-traditional digital financial services such as mobile money provided by the telecom companies reached out 66% of the adult population in 2020, while the traditional financial services such as bank account reached out 31,0% reflecting the role of digital financial inclusion in financial inclusion.

It is in this context that this article aims to analyse the role that financial inclusion, achieved through digital financial innovations, plays in the monetary policy transmission mechanism and, consequently, in monetary stability, for the Mozambican case. So, the novelty of this study remains on the consideration of new digital financial inclusion variables in the analysis of the impact of financial inclusion in monetary stability, going ahead of the consideration of the non-traditional financial inclusion variables made by previous researchers. This study also contribute to the existing literature of case studies on less development countries, deriving a set of policy implications.

The remainder of this artcile is organized as follows. After the introduction, Section II presents the literature review, including the concepts of financial inclusion and monetary stability, the relationship between financial inclusion and monetary stability as well as the empirical evidence on the subject. Section III presents the Mozambican monetary policy framework. Section IV provides the methods and procedures used to assess the relationship between inclusion and monetary stability, including the description of indicators. Section V presents the results of the dispersion, correlation, variance decomposition, Granger causality, Impulse Response and VEC model results, and finally Section VI derives the conclusions and policy implications.

II. Literature review

The concepts of financial inclusion and monetary stability

Several definitions of financial inclusion have been established in the literature. Ellis, Lemma, and Rud (2010) define financial inclusion as improving access to formal financial services at affordable costs and in a fair and transparent manner. For Lenka, Bairwa, and McMillan (2016), financial inclusion means making banking services accessible to the vast segment of society that is poor or excluded. For Hung (2016) financial inclusion refers to the state in which individuals with low incomes and small businesses have access to and make use of a wide range of formal financial services.

The concept of financial inclusion has evolved over time because of the emergence of digital financial services offered through digital platforms such as mobile phones, internet, cards, points of sale (POS), internet, among others.

Digital financial services contribute to accelerating the benefits and effects of financial inclusion on monetary stability (Hanning and Jensen 2010; Morgan and Pontines 2014; Ozili 2018; Pham,

Doan, and DOAN 2020). Several international organizations and central banks have been adopting the concept that includes five dimensions of financial inclusion, namely, knowledge, access, use, quality and well-being, as defined by the BM (de Moçambique 2013, 2017a, 2017b), CGAP (2011, 2017) and AFI (2010, 2011).

The concept of monetary stability is consensual. According to Swamy (2013), monetary stability refers to the stability of the general price level, that is, an environment in which inflation does not materially affect economic decisions. Nevertheless, monetary stability can also been achieved when the following ultimate objectives pursued are reached: (i) the high level of employment; (ii) economic growth; (iii) price stability; (iv) interest rate stability; (v) stability of financial markets; and (vi) stability in the domestic and international foreign exchange market (Mishkin and Savastano 2000).

The relationship between financial inclusion and monetary stability

There are several studies that have demonstrated the role of financial inclusion in policy effectiveness and monetary stability. The approaches followed by the different authors diverge, considering the model, regime and monetary policy indicators used.

According to Galí, López-Salido, and Vallés (2004), Khan (2011), Mehrotra and Yetman (2015) and Gortsos (2016), financial inclusion impacts on the monetary stability because a significant increase in financial inclusion can change the behaviour of companies and consumers and influence the effectiveness of monetary policy. The increase in financial inclusion leads, on the one hand, to more consumers being able to smooth their consumption over time, influencing the monetary policy transmission mechanism and, on the other hand, it encourages consumers to move their savings from physical assets and cash for deposits which influence monetary policy operations and the effectiveness of interim policy targets.

For these authors, consumption smoothing occurs as a result of financial inclusion effects on monetary policy due the following reasons: (i) the higher the percentage of financially excluded households, the higher will be the policy response needed to stabilize aggregate demand and inflation as a result of a shock; (ii) as financial inclusion increases, there is an increase in money in the broad sense (M3), leading to an increase in interest on bank deposits, increasing access to financial services and, consequently, economic activity; (iii) the use of price indices such as core inflation[1] can reduce the impact of monetary policy on the low-income population, especially agricultural producers, who are financially excluded, which makes it difficult for the Central Bank to stabilize inflation.

Khan (2011) presented empirical evidence that there is a multiplier effect in the economy that makes financial inclusion contribute to the improvement of monetary policy. The evidence is that financial inclusion contributes to an increase in disposable income among the rural population, which leads to an increase in savings in banking institutions and other financial institutions. It also argues that financial inclusion leads to the involvement of different segments of society in the formal financial sector, contributing to the effectiveness of monetary policy. A large informal sector negatively impacts the monetary policy transmission process since the decisions taken by the financially excluded segment of the population and micro-entrepreneurs are less affected by the monetary policy decisions transmitted by the central bank.

It is in this context that Yetman (2017) studied how changing the level of financial inclusion can influence monetary policy by influencing consumer behaviour. Yetman argues that the financially included consumer can smooth their consumption in response to shocks more effectively compared to the financially excluded consumer. This occurs because the financially included consumer is directly influenced by monetary policy decisions and reacts to them contrary to the non-included one.

For a better effectiveness of the impact of financial inclusion on financial stability Yetman draws attention to the following aspects in the definition of monetary policy: (a) in economies with a low level of financial inclusion, the

[1]According to Mehrotra and Yetman (2015), core inflation is a measure of price changes that excludes the most volatile components of consumer prices.

choice of core inflation as the inflation target may represent a less right choice compared to headline inflation; (b) in financial included economies, the effectiveness of the different monetary policy tools is greater, as a result of the increase in credit and deposits which influences the determination of reference interest rates by central banks; and (c) an increase in financial inclusion influences the monetary policy rule pursued by central banks also named as central bank's reaction function.

Mehrotra and Nadhanael (2016) analysed the links between financial inclusion and monetary policy, considering the sensitivity of interest rates to the gross domestic product and the price level, and concluded that the sensitivity of the interest rate to the gross domestic product is higher in economies with higher levels of financial inclusion.

A study by Evans (2016) found a long-term relationship between financial inclusion and monetary policy. This study identified a statistically significant interest rate, as well as a significant effect on the level of effectiveness of monetary policy. It also identified a unilateral causality between monetary policy to financial inclusion, having concluded that the effectiveness of monetary policy is the driver of financial inclusion.

Lenka, Bairwa, and McMillan (2016) also found the significance of the impact of financial inclusion on monetary policy. These authors concluded that increasing financial inclusion can reduce the inflation rate in the economy, leading to stability in the general price level. This conclusion is also supported by Ellis, Lemma, and Rud (2010), who also found significant impact of financial inclusion in stability of the general price level, as it contributes to a better circulation of money in the economy, intensifies the investment rate and the purchasing power parity with the reduction of the inflation rate.

Mbutor (2013) studied the impact of financial inclusion on monetary stability for the Nigerian' financial inclusion strategy case. This strategy foresaw as one of the premises for achieving monetary and economic prices stability, the increase of levels of savings, investment and consumption decisions made at the level of the formal financial sector. For these authors, financial inclusion contributes to improve liquidity management and economic strength.

Anthony-Orji, Ogbuabor, and James (2019) analysed the impact of monetary policy shocks on financial inclusion in Nigeria. They argued that the access to financial services by the low-income population allows to save safely away from their homes and contributes to mitigating the risks that this population faces from economic shocks.

Ait Lahcen and Gomis-porqueras (2019) corroborate the postulate that financial inclusion plays an important role in the effectiveness of monetary policy since they proved that an increase in savings channels makes consumers more reactive to changes in interest rates, improving the transmission of monetary policy.

Despite the current research have already proved the role of financial inclusion in monetary stability it does not trigger the non-traditional digital financial inclusion with substantial impacts in financial inclusion nowadays particularly in less development countries. The lack of studies with empirical evidence on the role of non-traditional digital financial inclusion on monetary stability remains one of the challenges research gaps need to address.

Empirical evidence

There are a considerable number of studies that have tested the impact of financial inclusion on monetary stability, such as the cases of Mbutor (2013), Mehrotra and Yetman (2014), Lapukent (2015), Evans (2016), Hung (2016), Lenka, Bairwa, and McMillan (2016) and Brownbridge et al. (2017).

Mehrotra and Yetman (2014), Evans (2016), and Brownbridge et al. (2017) used a similar approach to study the impact of financial inclusion on monetary policy effectiveness, using panel and cross section data. Indeed, Mehrotra and Yetman (2014) used the model defined by Galí, López-Salido, and Vallés (2004) and examine the implications of changes in inflation when financial inclusion is maximized, for 130 economies around the world based on cross-section data. The model assumed that only financially included households can smooth their consumption in response to income volatility, while financially excluded households

consume their entire income. The study showed that the ratio of output volatility to inflation volatility has increased as a function of the percentage of consumers financially included in the economy when monetary policy is conducted optimally.

Evans (2016) reached a similar conclusion as Mehrotra and Yetman studying a set of African countries, for the period 2005 to 2014, using panel data and a Vector Error Correction Model (VECM) methodology. The author concluded the existence of the following set of long-term relationships between financial inclusion and monetary policy: (i) a financial inclusion shock plays a role in explaining changes in monetary policy effectiveness via interest rate, since, in the long run, more than 45% of changes in monetary policy effectiveness are explained by interest rate shocks; (ii) there is an unidirectional causality relationship in the Granger sense of monetary policy to financial inclusion; and (iii) financial inclusion is not a significant explanatory factor for Monetary stability in Africa, but that monetary stability is the engine for financial inclusion.

Brownbridge et al. (2017) used the Panel Vector Error Correction Model (PVECM) to estimate the impact of financial inclusion on the interest rate channel of the monetary policy transmission mechanism of four African countries (Uganda, Ghana, Mauritius, and South Africa), for the period 2001 to 2016. These authors concluded that the effect of a restrictive monetary policy, which involves an increase in the interest rate, is negative on inflation, in line with economic theory. The authors used the number of deposit accounts to distinguish between high and low levels of financial inclusion and concluded that the effect of monetary policy on inflation is greater for countries with high levels of financial inclusion.

In turn, Mbutor (2013), Lapukent (2015), Lenka, Bairwa, and McMillan (2016) and Hung (2016) studied the impact of financial inclusion on monetary policy based on time series data.

Mbutor (2013) studied the impact of financial inclusion on Nigeria's monetary policy between 1980 and 2012 using cointegration analysis. The study showed that there is a strong but inverse relationship between the inflation rate and the volume of bank loans as a percentage of GDP, indicating that bank financing boosts investment, which reduces inflation levels. The increase in rural bank branches also shows a negative coefficient with inflation. The study reinforced the notion that financial inclusion is an effective strategy for increasing the effectiveness of monetary policy and economic growth. These authors also concluded that the use of the digital platform, with emphasis on mobile payments, even non-banking, as well as the use of banking agents for access and use of financial services, contribute to reducing costs and improving the efficiency of the economy and the financial system.

Lapukent (2015) in turn used the approach followed by Mbutor (2013) to study the impact of financial inclusion on the effectiveness of monetary policy in Malawi for the period 2001 to 2013 using the Vector Autoregression (VAR) estimates, having concluded that the long-term model explains approximately 70% of the observed changes in inflation. The results showed that the money supply has negative sign contrary to economic theory. The financial inclusion indicators proved not to be statistically significant but showed a unidirectional granger causality from the inflation to money supply, as expected. The study concludes that improving financial inclusion will contribute to improving the predictability of the money supply and, consequently, the effectiveness of monetary policy in Malawi.

Lenka, Bairwa, and McMillan (2016) studied the impact of financial inclusion for the countries of the South Asian Association for Regional Cooperation (SAARC[2]), during the period 2004–2013, based on the analysis of the main component and based on the construction of a financial inclusion index which served as a proxy for the accessibility of financial inclusion in these countries. These authors showed that there is a statistically significant negative relation between financial inclusion and the monetary policy variable at the level of the SAARC countries. This result showed that if financial inclusion increases, it will reduce the inflation rate in the economy, causing price stability. The interest rate on bank loans that

[2]Acronym for the South Asian Association for Regional Cooperation (SAARC).

meets the short and long-term financing needs of the private sector has a negative relationship with inflation in the countries studied, showing that the increase in the interest rate will help to reduce inflation and vice versa-versa. The negative sign was also observed in the exchange rate variable, showing that the moderate increase in the exchange rate has an impact on price stability.

Hung (2016) studied the impact of financial inclusion on the effectiveness of monetary policy in Vietnam for the period 2004–2015, following the same methodology proposed by Lenka, Bairwa, and McMillan (2016). His results are in line with those achieved by Lenka and Bairwa. The estimated coefficient for the financial inclusion index, exchange rate and interest rate obtained the expected (negative) signs consistent with the theory. An increase in the financial inclusion index and loan interest rate can reduce inflation in Vietnam, and exchange rate depreciation can lead to a higher inflation rate. For this author, the presence of cointegration between the variables suggested a long-term relationship, as well as a long-term causal relationship of the financial inclusion index towards inflation, reinforcing the conclusion that the impact of financial inclusion in monetary policy is significant, and that increasing financial inclusion reduces inflation. Hung concludes that the financial sector plays an important role in the transmission process of monetary policy and that the effectiveness of the transmission process depends on the development of the financial market measured by financial inclusion.

Two more recent studies (Arshad et al. 2021; Jungo, Madaleno, and Botelho 2022) analysed the relationship between financial inclusion and monetary policy in a comparative perspective and reach to similar conclusions.

Arshad et al. (2021) applied a structural vector auto-regressive model to the period 2004–2018, to analyse the causal relationship between monetary policy effectiveness and financial inclusion in developed and under-developed countries. They conclude that there is a reverse causality between financial inclusion and the effectiveness of monetary policy in more developed countries and a single causality from monetary policy to financial inclusion in less developed countries. They also found that financial inclusion positively affects the effectiveness of monetary policy by having an impact on the inflation rate.

Jungo, Madaleno, and Botelho (2022), performed a comparative analysis between Sub-Saharan Africa (SSA) and Latin America and Caribbean countries (LAC) using PVAR and FGLS models and concluded that there is a bidirectional relation between financial inclusion and monetary policy. They found that in SSA and LAC countries financial inclusion promotes effectiveness and efficiency of monetary policy. Their results also reveal the importance of increasing the use of financial services for controlling inflation rates.

Whether looking at individual countries studies or to comparative analysis, the majority of empirical studies conclude that there is a significant relation between the financial inclusion and the effectiveness of monetary policy.

III. The framework of Mozambique financial inclusion and monetary policy

Financial inclusion and monetary stability are objectives pursued by the Bank of Mozambique (BM). The BM's current mission is 'preserving the value of the national currency and promoting a solid and inclusive national financial sector'. In turn, it is possible to observe that monetary stability is pursued through the 'preservation of the value of the national currency' and financial inclusion through the promotion of 'an inclusive national financial system'.

The emergence of electronic financial services in Mozambique becomes notorious with the introduction of electronic clearing in 1996 and the issuance of the first bank payment cards in the country in 1997. From 2001 to 2008 the electronic payment systems as the real-time gross domestic payment and settlement system as well as channels such as automatic teller machines (ATMs) and point of sell (POS) set the pillars to include financially people to the Mozambican financial system.

In 2004, the amendments made on the banking law create electronic money institutions which significantly improve the levels of access to financial system. In 2020, the demographic access to e-money accounts and agents shows a great improvement compared to bank accounts and

agencies showing the ability of mobile channels to reach customers located in remote areas. Indeed, demographic access to e-money accounts stood at 66 accounts per 100 thousand adults in 2020, against 31 bank accounts in the same period. The same phenomenon can be seen at the level of e-money agents which in 2020 stood at 421 agents per 100 thousand adults against 4 bank branches per 100 thousand adults.

The BM study (de Moçambique 2013) on the challenges of financial inclusion in Mozambique presented a preliminary approach on the relationship between financial inclusion and monetary stability. This study refers that the improvement of the formulation and implementation of financial and monetary policies is achieved through the increased in multi-sector coordination between financial and non-financial institutions with the aim of increasing the levels of access and use of financial services by the population and by increasing control over the circulation of liquidity flows in the economy.

The BM's Monetary Policy Framework approved by the Monetary Policy Committee, in April 2017, defines the adoption of inflation targeting as the new monetary policy regime to pursue and the use of a policy interest rate as an operational variable, namely the Mozambique Interbank Monetary Market (MIMO) rate. In May 2017, the agreement that standardizes the calculation basis (indexing) of the interest rate in the banking system was signed and updated in September 2018. This agreement became the basis for calculating the prime rate of the financial system and for setting variable interest rates agreed upon by Credit Institutions and Financial Companies authorized to carry out credit operations in the country.

Under the new monetary policy framework, the policy interest rate offers to the financial market participants a credible and stable anchor for the determination of retail interest rates with an emphasis on credit products. The relationship between monetary stability and financial inclusion can be observed by improving the access of credit through an attractive nominal and real interest rate which allows the increase of access by low-income social groups to bank credit, in addition to encouraging savings and investment.

The indicators in Table 1 show that the objective of price stability has been achieved, at one digit inflation rate since 2017 and a growth rate at 6% between 2005 and 2015, nevertheless the slowdown observed since then[3]

Access to formal banking services grew between 2005 and 2015 from 6.5% to 31.1%, having

Table 1. Financial Inclusion and Monetary Policy Indicators.

		2005	2010	2015	2020
1.	Financial Inclusion Indicators				
	1.1. % of Adults with Bank Account in a Formal Financial Institution	6,5	14,7	31,1	31,0
	1.2. % de Adults with Account in an Electronic Money Institution (EMI)	0,0	0,0	28,6	65,6
	1.3. Nº of bank branches per 100 thousand adults	2,1	3,4	4,3	4,1
	1,4, Nº of Agents of EMI per 100 thousand adults	0,0	0,0	125,9	420,9
2.	Monetary Policy Indicators				
	2.1. CPI (% Anual Var.)	11,5	16,62	11,1	2,93
	2.2. GDP (%, Anual Var.)	6,6	6,5	6,7	−1,23
	2.3. Exchange Rate (MT/USD)	25,75	29,55	50,24	74,6
	2.4. Interest Rate[4]				
	2.4.1. FPC	15,5	15,5	9,75	13,25
	2.4.2. Banks lending rate	19,2	21,67	19,09	18,79
	2.4.3. Mimo rate	-	-	-	10,25
	2.4.4. Prime rate	-	-	-	15,9

Source: INE; BM.

[3]Mozambique's economic growth contracted by 1.23% in 2020, influenced, among other factors, by exogenous shocks, namely, climatic (cyclone Idai and Kenneth), epidemiological (covid 19 pandemic) and security in the northern region of Mozambique...

[4]According to the Bank of Mozambique's metadata, the Permanent Lending Facility (FPC) rate is a rate with an 'overnight' maturity, applied in the FPC window for liquidity ceding operations by the Bank of Mozambique to banks operating in the interbank money market (MMI), with temporary liquidity deficits and accessing the window on their own initiative. It is available to operators who are commercial banks. The banks' lending rate is the interest rate practiced by commercial banks (Bcoms) for lending operations with a maturity of 1 year. The MIMO rate is the Monetary Policy interest rate, being the main indicator for the BM intervention in the MMI overnight. The prime rate of the Mozambican financial system is the single reference rate for credit operations and results from the sum of the single index (measured by the volume of operations in the MMI for the overnight term for operations at the MIMO interest rate and repo operations between banks and liquidity swap operations between banks) and the cost premium (margin representing the risk elements of banking activity not reflected in interbank market operations).

remained unchanged between 2015 and 2020. However, the gains from financial inclusion were notorious in terms of electronic money services measured by the increase in access and use of these services compared to traditional banking. In fact, over the last 15 years the banking financial inclusion indicators has been stable at 31% in terms of demographic access while digital financial inclusion increasing from 28.6% to 65.5% between 2015 and 2020.

IV. Data

This study aims to analyse the relationship between financial inclusion and monetary stability. It covers a quarterly data series from 2010 to 2020, comprising a database of 64 observations. The time period was chosen to capture data availability for non-traditional digital financial inclusion (e-money institutions) which was allowed to operate in the country by law just in 2004 (Banking Law 9/2004 from 21 July which emends law 15/99 from 1 November).

Monetary stability (Y_t) is the dependent variable defined as the consumer price index (CPI) annual variation collected from the Mozambique National Statistics Institute (INE).

The independent variables comprehend the financial inclusion indicators and the control variables. The financial inclusion indicators are the primary indicators and this study pretends to explain the relation with monetary stability. For this study we used traditional and digital financial inclusion indicators collected from the Central Bank of Mozambique database. The traditional financial inclusion indicators used are: (i) the number of bank branches per 100 thousand adults (X_1) and bank account per 100 thousand adults (X_2). The digital financial inclusion indicators included in the model are: (i) number of agents of electronic money institutions (EMI) per 100 thousand adults (X_3) and (ii) number of EMI accounts per 100 thousand adults (X_4).

The control variables $(Ctrl_t)$ were used to capture the other reasons beside the ones related to financial inclusion which also contribute for financial stability but consider as a secondary variable for the purpose of this study. In this context, for the purpose of this study, we used the control variables as the following: (i) Exchange rate MT/USD (X_5) and (ii) Interest rate on commercial bank loans for 1-year maturity (X_6).

V. Methodology

This study aims to test the hypothesis that financial inclusion contributes to monetary stability in Mozambique. To test this hypothesis, the model is based on Equation (1) adapting the models developed by Mbutor (2013), Lapukent (2015), Lenka, Bairwa, and McMillan (2016) and Hung (2016). According to Equation (1) MS_t represents monetary stability, FI_t represents financial inclusion, $Ctrl_t$ represents control variables, and the coefficients $\alpha_0, \alpha_1 and \alpha_2$ represent the impact of financial inclusion indicators and control variables on monetary stability, respectively, and ε_t represents the error term.

$$\boldsymbol{MS_t} = \alpha_0 + \alpha_1 \boldsymbol{FI_t} + \alpha_2 \boldsymbol{Ctrl_t} + \varepsilon_t. \tag{1}$$

In our study, we include digital financial services indicators in addition to the traditional financial inclusion indicators, as described in the extensive model below:

$$\boldsymbol{Y_t} = \beta_0 + \beta_1 \boldsymbol{X}_1 + \beta_2 \boldsymbol{X}_2 + \beta_3 \boldsymbol{X}_3 + \beta_4 \boldsymbol{X}_4 + \beta_5 \boldsymbol{X}_5 + \varepsilon_t, \tag{2}$$

where Y_t represents monetary stability measured by the consumer price index, X_1 represents the number of bank branches per 100.000 adults, X_2 value the number of bank accounts per 100.000 adults, X_3 represents the number of agents of electronic money institutions per 100,000 adults, X_4 denotes the number of EMI accounts per 100.000 adults, X_5 represents the MT/USD exchange rate and X_6 represents the interest rate of commercial bank loans for 1-year maturity.

The analysis of the relationship between financial inclusion and monetary stability was carried out using the following methodologies:

(i) **Exploratory data analysis**. This analysis aims to assess the relationship and synergies between the indicators of financial inclusion (measured by demographic access to banking and electronic money services) and

indicators of monetary stability (measured by the variance of inflation, gross domestic product (GDP) and currency in circulation). According to Mehrotra and Yetman (2014, 2015), Morgan and Pontines (2014), Evans (2016) and Yetman (2017), the ratio output volatility to inflation volatility increases as a function of the percentage of financial included consumers in the economy. When a monetary policy is conducted in an optimal way, as inclusion increases, the central banks can focus more on stabilizing inflation.

(ii) **Econometric modelling**. We provide an analysis between monetary and financial inclusion aggregates using unit root tests, variance decomposition and impulse response functions, Granger causality tests, and error correction model (ECM) estimation. We carry out an augmented Dicky-Fuller (ADF) test that includes a constant in the test regression and employ lag length selection using an Akaike Information Criterion (AIC). We perform VAR-based cointegration tests using the Johansen cointegration methodology (Johansen 1995). A vector error correction model was then estimated for nonstationary cointegrated variables. We carry out VECM granger causality tests and tested whether an endogenous variable in the system can be excluded and treated as exogenous. We provided information about the shocks to one endogenous variable on to the other variables in the system through the impulse response functions and the relative importance of each innovation in affecting the variables in the system through the variance decomposition functions. We are interested in studying the dynamic response of each variable in the system to innovation impulses and the portion of the variation in each endogenous variable due to the innovation terms in the VAR model. We believe that these tools help to provide a more complete understanding of the interrelationships between the multiple economic variables, allowing for more accurate forecasting and policy analysis.

VI. Results

Exploratory data analysis

Figure 1 shows scatter plots of relationships between monetary stability and traditional financial inclusion indicators. There is a positive relationship between financial inclusion and gross domestic product. This reveals that in Mozambique, a financially included population contributes positively to the increase of GDP. In turn, there is a negative relationship between financial inclusion and the percentage of banknotes and coins in circulation in the total monetary base, revealing a positive impact of financial inclusion in monetary policy. As the inclusion increases there is a reduction in currency in circulation, thus improving the central bank's ability to forecast and control monetary variables.

Figures 1(c-e) illustrate the relationship between financial inclusion and the variance of output gap, variance of inflation and the variance of output gap to inflation gap, respectively. Those graphs demonstrate that there is no relationship between the increase in financial inclusion and the volatility of output gap and inflation, individually, but does exist in relation to the ratio of output gap to inflation volatility. This result is in line to postulate by Mehrotra and Yetman (2014, 2015) confirming that the rise of output volatility to inflation volatility as financial inclusion increases because the central bank cares to set monetary policy to optimize the trade-off between both indicators. This occurs because financially included consumers are better able, than excluded consumers to adjust their saving and investment decisions to partially insulate their consumption from output volatility. Thus, central bank become able to focus more on stabilizing inflation as the degree of financial inclusion rises.

Figure 2 presents the same approach used in Figure 1, however relating monetary policy indicators to the non-traditional digital financial inclusion indicators. The results are as expected revealing a positive impact of financial inclusion, measured by electronic money services, on monetary policy.

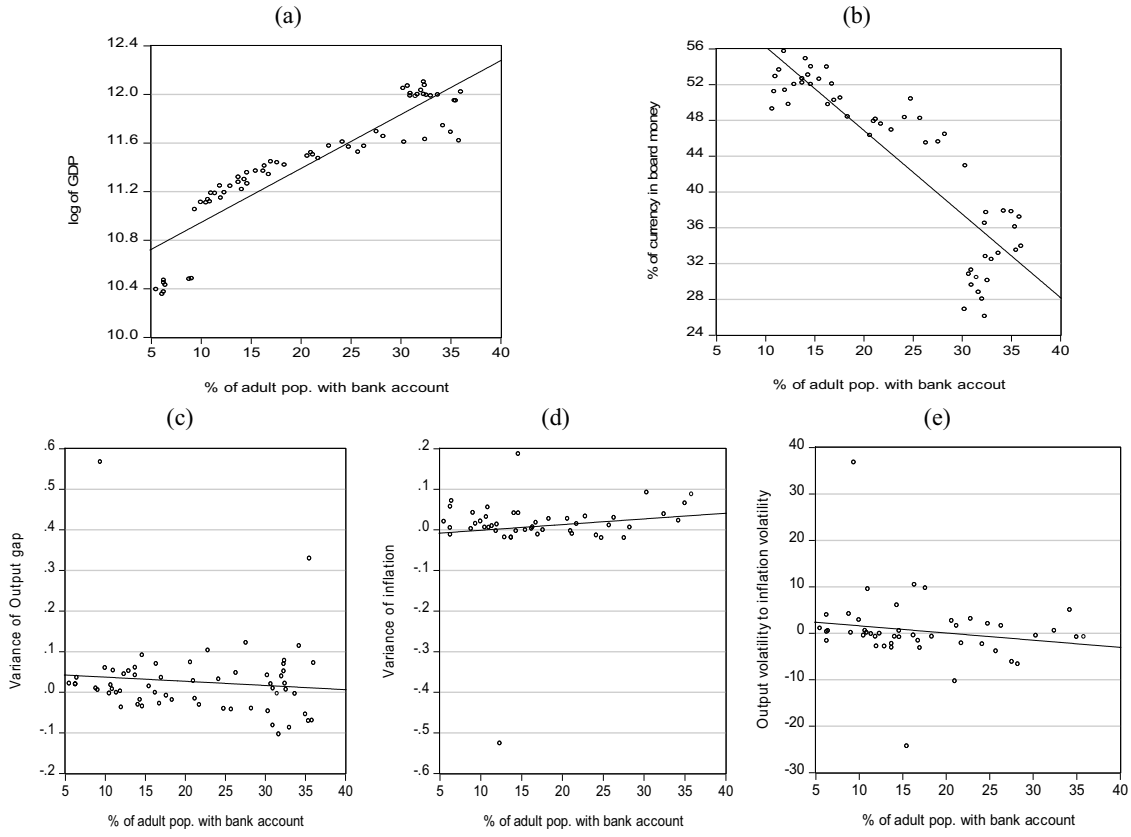

Figure 1. Relationship between monetary stability and traditional financial inclusion indicators. Source: Author's calculations based on BM and INE data

Unit root test

The results of the ADF unit root test are presented in Table 2. It can be seen that the financial inclusion variables, number of bank accounts per 100 thousand adults and number of agents of electronic money institutions per 100 thousand adults, are stationary in first differences at the 1% significance level. The monetary stability proxy measured by inflation and the control variables measured by the exchange rate of the metical to US dollar and the loan interest rate for the maturity of 1 year are also stationary in first differences at the 5% significance level.

Variance decomposition

Table 3 displays a separate variance decomposition for each endogenous variable. It can be seen that the percentage of the forecast error variance of inflation due to shocks in inflation at 8-year horizon is 70.5%. The remaining fractions of the forecast error variance decomposition of inflation, 7.9% are due to the changes observed in the interest rate, 6.7% and 6.0% due to the changes observed in the number of accounts of EMI agents, respectively. The number of branches and bank accounts contributed with 5.3% and 2.1%, respectively, to the variations observed in inflation and the exchange rate with 1.6%.

The results of variance deposition reveal that: (a) all financial inclusion indicators included in the model contribute for monetary stability in 20%, reflecting the role of financial inclusion in price-level stability in Mozambique; (b) the non-traditional financial indicators, including e-money accounts and agents, have more impact in price stability compared to the traditional financial inclusion indicators as banks agencies and accounts. Indeed, e-money agents and accounts respond for 12,7% of changes observed in price levels, against the 7,3% of bank agencies and accounts. The lack of access to bank branches

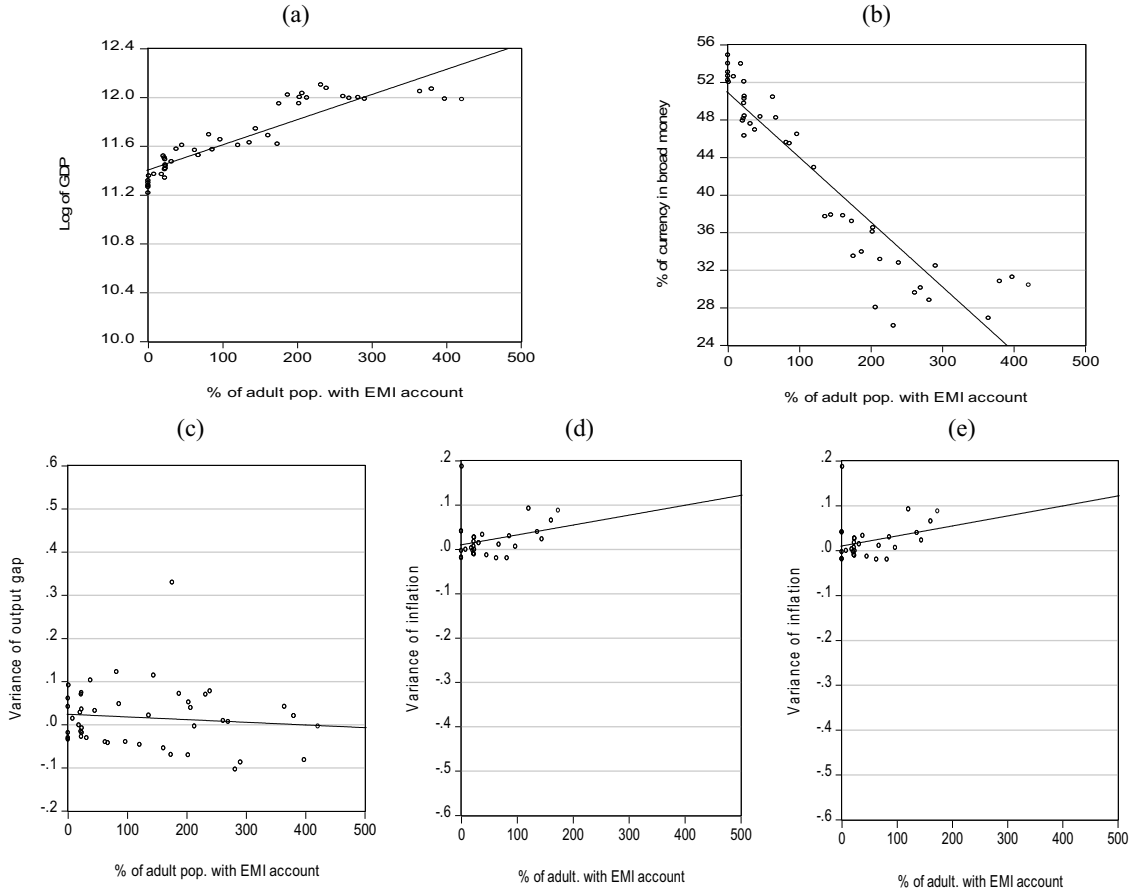

Figure 2. Relationship between monetary stability and non-traditional digital financial inclusion indicators. Source: Author's calculations based on BM and INE data

Table 2. ADF Unit Root Tests.

Variable	*I*(1)	*I*(2)
BANK_AC	−1.101 (0)	−3.990* (1)
BANK_BR	−2.360 (4)	−2.511 (3)
EMI_AG	1.420 (0)	−6.785* (0)
EMI_AC	0.694 (5)	−2.461 (8)
ER	−0.055 (2)	−5.324* (1)
INF	−3.327** (10)	−6.070* (3)
IR	−3.481** (2)	−4.652* (0)

*, **, *** significant at 0.01, 0.05, and 0.10, respectively. Automatic lag length selection based on Akaike Information Criterion (AIC) indicated in brackets. The ADF regressions for both unit root tests, *I*(1) and *I*(2), include a constant term.

Table 3. VECM Variance Decomposition (Cholesky method).

Period	S.E.	LNINF	LNBANK_BR	LNEMI_AG	LNBANK_AC	LNEMI_AC	LNER	LNIR
1	0,425	100,000	0,000	0,000	0,000	0,000	0,000	0,000
2	0,598	94,104	1,949	1,094	0,108	1,928	0,064	0,754
3	0,725	87,827	3,338	2,385	0,343	3,878	0,203	2,027
4	0,820	82,489	4,146	3,507	0,655	5,319	0,405	3,479
5	0,886	78,162	4,633	4,412	1,007	6,223	0,657	4,906
6	0,929	74,776	4,949	5,116	1,372	6,667	0,949	6,171
7	0,955	72,246	5,163	5,643	1,727	6,774	1,266	7,183
8	0,970	70,468	5,302	6,010	2,050	6,692	1,589	7,889

Cholesky Ordering: LNINF LNBANK_BR LNEMI_AC LNBANK_AC LNEMI_AC LNER LNIR

Source: Author's calculations based on BM and INE data.

Table 4. VEC Granger causality tests.

	Dependent variable			
Excluded	D(BANK_AC)	D(BANK_BR)	D(EMI_AG)	D(EMI_AC)
D(BANK_AC)		0.84	6.45***	11.41*
D(BANK_BR)	6.06***		18.79*	1.06
D(EMI_AG)	8.17**	2.70		0.89
D(EMI_AC)	5.14	1.19	1.09	
All	12.65	5.76	24.30*	15.34***

*, **, *** indicate rejection of the null hypothesis of no VEC Granger causality at 0.01, 0.05 and 0.10, respectively. The table reports Wald statistics for the joint significance of the other lagged first differenced variables in the equation.

particularly in the rural areas is replaced by the availability of the e-money services provided by the simplified channels as non-sophisticated mobile phones and agents represent the main reason for this result.

Granger causality tests

Table 4 presents the results of the Granger's causality tests accounting for both short and long-run dynamics. From the short-run causality, it follows that E-money Agents (EMI_AG) and Bank Branches (BANK_BR) Granger cause dynamics in bank account (BANK_AC), at 5% and 10%, respectively, Bank Account (BANC_AC) and Branch Account (BANK_BR) Granger causes dynamics in E-money Agents (EMI_AG) at 10% and 1%, respectively, and, Bank accounts (BANK_AC) unilateral Granger causes dynamics in E-money Accounts (EMI_AC).

The results confirm that the dynamics in non-traditional financial inclusion indicators have been promoted by the traditional banking system.

Impulse response functions

Figure 3 shows the VEC generalized impulse responses using Pesaran and Shin (1998)approach. It reveals that a shock of innovation measured by the non-traditional digital financial services lead to an immediate negative impact to Bank Accounts (BANK_AC) and Bank Branches (BANK_BR), but

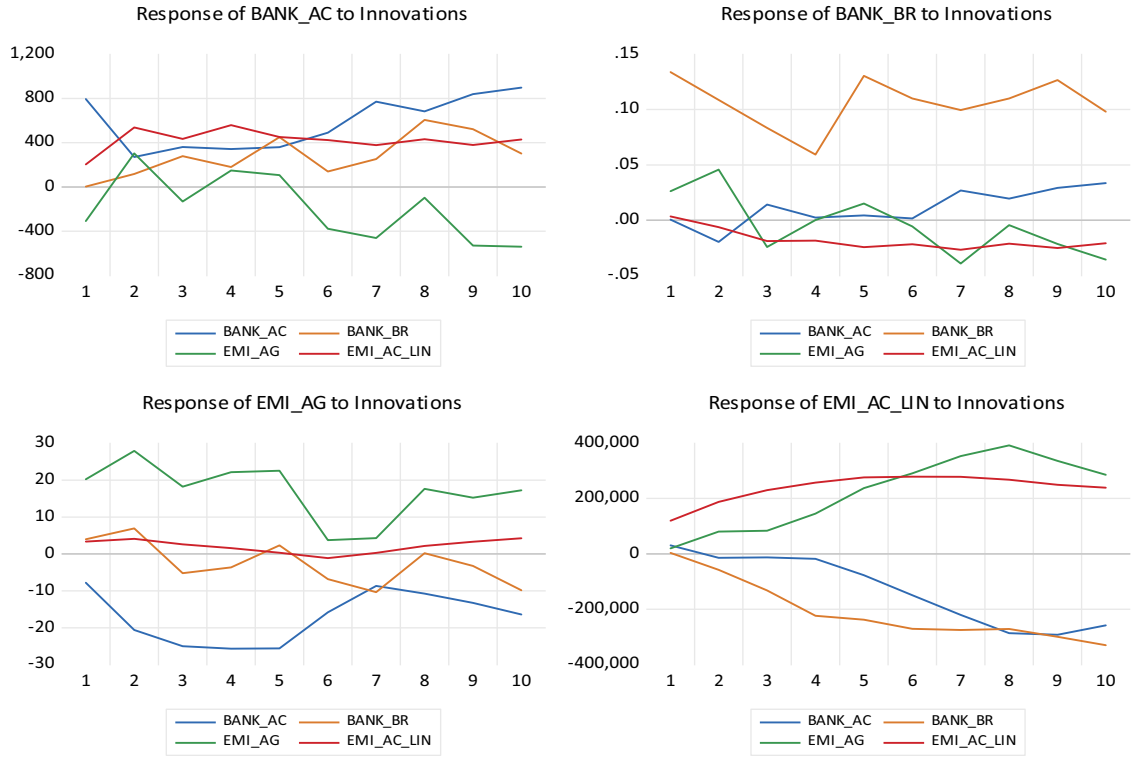

Figure 3. VEC generalized impulse responses of Pesaran.

Table 5. Johansen cointegration tests: Number of cointegrating relationships.

Null hypothesis	Eigenvalue	Trace test statistic	Max-Eigen test statistic
$r = 0$	0.678	82.48*	43.01*
$r \leq 1$	0.434	39.47*	21.64**
$r \leq 2$	0.357	17.83*	16.79**
$r \leq 3$	0.027	1.04	1.04*

*, **, *** indicate rejection of the null hypothesis of no cointegration at 0.01, 0.05 and 0.10, respectively. The test includes intercept (no trend) in cointegration equation. Probability values of trace and maximum eigenvalue tests are computed using asymptotic chi-square distribution. *r* is the number of cointegrating relationships.

immediately reverted to positive impact since the second and fourth quarters respectively. In the same way, a shock in innovations leads to a positive impact in the E-money Accounts (EMI_AC) and Agents (EMI_AG).

Johansen cointegration tests and vector error correction model

The Johansen cointegration test presented in Table 5 was estimated with the variables in first difference and using a lag as suggested by the SIC and HQ criteria, thus fulfiling the requirements for estimating this test. This test indicates the presence of 2 and 3 cointegration equations at 5% for trace and max-eigen test, respectively.

The Trace test statistic contained in the results of the Johansen cointegration test revealed that they reject the null hypothesis of no cointegration for a significance level of 1%, thus showing that there is cointegration and, consequently, a long-term relationship between the variables. The maximum eigenvalue test statistic revealed the same result, confirming the existence of cointegration for a significance level of 1% and 5%. It is also concluded that the VEC model can be estimated since the variables are stationary in first difference and have a cointegration relationship between them in the long run.

The results of the VEC model on the relationship between financial inclusion and monetary stability are shown in Table 6 for the long- and short-term models with exchange rate D(ER) as exogenous variable (Model 1) and with interest rate as exogenous variable (Model 2). The estimated equations present coefficients of determination (R^2) of 63,1% and 63,8, respectively, showing that there is a model adjustment and long-term equilibrium. The results of the long-term equations show a negative sign of the bank branches, bank accounts and c-money account as expected, confirming that financial inclusion contributes for stabilization of inflation rate and then for monetary stability.

The coefficient of adjustment (ECT) presented in the short-term cointegration Model 1 and 2 revealed that the deviation of the previous period's inflation from the long-term equilibrium is corrected in the current period at a speed of 37% of adjustment. The error correction term (ECT) is significant for the equations where the endogenous variables are bank accounts (BANL_AC), e-money agents (EMI_AG) and D(EMI_AC). The results show that the

Table 6. Vector error correction (VEC) estimates.

		Endogenous variable			
Coefficients	D(INF)	D(BANK_AC)	D(BANK_BR)	D(EMI_AG)	D(EMI_AC)
Model 1					
Error correction (Eq1)	−0,37*	−131,98*	0,001	4,27*	−22227,62*
Exogenous variable:					
D(ER)	0,18	11,84	0,004	1,75	−4044,41
Model 2					
Error correction (Eq2)	−0,37*	−104,82	0,007	5,03*	−18477,74*
Exogenous variable: IR	−0,22	−71,29	−0,02	−4,02	−4340,72

*, **, *** significant at 0.01, 0.05, and 0.10, respectively.

Eq1 is the cointegration equation for model 1: INF(−1) +34,56–0,002BANK_AC(−1)-5,551BANK_BR(−1)-0,125EMI_AG(−1)+7,54E-06EMI_AC_LIN(−1) = 0

Eq2 is the cointegration equation for model 2: INF(−1) +34,74–0,001BANK_AC(−1)-6,289BANK_BR(−1)-0,125EMI_AG(−1)+7,54E-06EMI_AC_LIN(−1) = 0.

dynamics of financial inclusion indicators, bank accounts, e-money accounts and agents drive the price stability, contributing for monetary stability.

VII. Conclusions and discussion

This study concludes that there is a relationship between financial inclusion and monetary stability, consistent with economic theory by confirming that financial inclusion contributes to monetary stability for the case of Mozambique.

The conclusion is based on the results achieved by the combined dispersion and econometric analysis. We conclude that financial inclusion contributes to reduce the banknotes and coins in circulation, increase credit to the economy and increase investment. In turn, the monetary stability indicator, measured by inflation showed a negative relationship with digital financial inclusion, measured by the number of e-money accounts. This result is in line with economic theory, since it shows the inverse relationship between inflation and financial inclusion indicators, meaning that the expansion of the geographic and demographic country's electronic money supply contributes to the reduction of inflation.

Empirical results showed that 20% of changes observed in inflation are due to financial inclusion dynamics, that there is a causality between non-traditional digital financial inclusion indicators and traditional financial inclusion indicators, and the estimated long-term VEC model proved to be statistically significant, revealing that there is a long-term relationship between the variables.

The results are aligned with theory and found that financial inclusion is relevant to achieve monetary stability. The non-traditional digital financial inclusion indicators such as e-money agents and accounts demonstrate to be effective to ensure price stability in Mozambique due to the levels of penetration and country coverage of e-money institutions, particularly in the rural area.

The Mozambican monetary authority should pay special attention on financial inclusion indicators in the ruling the monetary policy instruments in order to ensure an accurate and better calibrated transmission mechanism and channels of monetary policy.

Nevertheless, to ensure the effectiveness of the monetary policy without compromising financial stability efforts based on the prudential and risk-based approach measures must to be taken into consideration.

Thus, the following policy implications can be derived for the case of Mozambique: (i) the effectiveness of monetary policy depends on the predictive capacity of the policy instruments. In this sense, there is a need to incorporate financial inclusion variables, especially the non-traditional digital ones, in the transmission and forecasting model of the monetary policy rule, to capture the dynamics of financial inclusion segment and it contributes to price stability. (ii) as postulated by Anand and Prasad (2012) and by Mehrotra and Yetman (2014, 2015), for the less development countries, inflation measures excluding food prices (core inflation) may be a poor guide to policy for economies with low levels of financial inclusion. In this sense, to ensure the increase in the effectiveness of monetary policy, the forecast model of the central bank must place greater focus on headline inflation; and (iii) third, it must always be considered that improving financial inclusion is only achieved by observing increased financial education and financial consumer protection, as well as observing financial integrity, so that government must take adequate measures that ameliorates those subjects, when deciding public policies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

UECE (research unit on complexity and economics) is financially supported by fct (fundação para a ciência e a tecnologia), Portugal. This article is part of the strategic project (UIDB/05069/2020)

ORCID

Maria Rosa Borges http://orcid.org/0000-0001-5340-471X
Jorge Caiado http://orcid.org/0000-0002-0405-1695

References

AFI. 2010. "Financial Inclusion Measurement for Regulators: Survey Design and Implementation." Policy Paper, Alliance for Financial Inclusion e Bankable Frontier Associates.

AFI. 2011. *Measuring Financial Inclusion: Core Set of Financial Inclusion Indicators*. Malasyia: Financial Inclusion Data working Group.

Ait Lahcen, M., and P. Gomis-porqueras. 2019. "A Model of Endogenous Financial Inclusion: Implications for Inequality and Monetary Policy", University of Zurich, Department of Economics, Working Paper Series nº310.

Anand, R., and E. S. Prasad. 2012. *Core Vs Headline Inflation Targeting in Models with Incomplete Markets*. New York: Cornell University. Manuscript.

Arshad, M. U., Z. Ahmed, A. Ramza, M. N. Shabbir, Z. Bashir, F. N. Khan, and M. C. Díaz Roldán. 2021. "Financial Inclusion and Monetary Policy Effectiveness: A Sustainable Development Approach of Developed and Under-Developed Countries." *PLoS One* 16 (12): e0261337. doi:10.1371/journal.pone.0261337.

Ashraf, N., D. Karlan, and W. Yin. 2006. "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines." *The Quarterly Journal of Economics* 121 (2): 635–672. doi:10.1162/qjec.2006.121.2.635.

Brownbridge, M., T. Bwire, D. K. Rubatsimbira, and G. A. Tinyinondi. 2017. "The Impact of Financial Inclusion on the Interest Rate Channel of the Monetary Policy Transmission Mechanism", Working Paper Series, Bank of Uganda.

CGAP. 2011. *Financial Inclusion and Development: Recent Impact Evidence*. Washington D.C: The Consultative Group to Assist the Poor (CGAP). Focus Note nº92.

CGAP. 2017. "Advancing Financial Inclusion to Improve the Lives of the Poor", the Consultative Group to Assist the Poor (CGAP) Annual Report 2017.

Demirgüç-Kunt, A., T. Beck, and P. Honohan. 2008. "Finance for All? Policies and Pitfalls in Expanding Access." Washington D.C: A World Bank Policy Research Report.

de Moçambique, B. 2013. *Desafios da Inclusão Financeira em Moçambique: Uma Abordagem do Lado da Oferta*. Pemba: Banco de Moçambique.

de Moçambique, B. 2017a. *Quadro de Política Monetária do Banco de Moçambique*. Maputo: Banco de Moçambique.

de Moçambique, B. 2017b. Relatório de Implementação da Estratégia Nacional de Inclusão Financeira 2016–2022. Relatório de Inclusão Financeira 2016. *Maputo: banco de Moçambique*.

Ellis, K., A. Lemma, and J. -P. Rud. 2010. "Financial Inclusion, Household Investment and Growth in Kenya and Tanzania." *Project Briefing, Overseas Development Institute* 43: 1–4.

Evans, O. 2016. "The Effectiveness of Monetary Policy in Africa: Modeling the Impact of Financial Inclusion." *Iranian Economic Review* 20 (3): 327–337.

Fernandes, C., M. R. Borges, and J. Caiado. 2020. "The Contribution of Digital Financial Services to Financial Inclusion in Mozambique: An ARDL Model Approach." *Applied Economics* 53 (3): 400–409. doi:10.1080/00036846.2020.1808177.

Galí, J., J. López-Salido, and J. Vallés. 2004. "Rule-Of-Thumb Consumers and the Design of Interest Rate Rules." *Journal of Money, Credit, and Banking* 36 (4): 739–763. doi:10.1353/mcb.2004.0064.

Gortsos, C. 2016. "Financial Inclusion: An Overview of Its Various Dimensions and the Initiatives to Enhance Its Current Level", Working paper, nº2016/15, ECEFIL.

Hanning, A., and S. Jensen. 2010. "Financial Inclusion and Financial Stability: Current Policy Issues", ADBI Working Paper Series, Asian Development Bank Institute.

Hariharan, G., and M. Marktanner. 2013. *The Growth Potential from Financial Inclusion*. Georgia: ICA Institute and Kennsaw State University.

Hung, B. 2016. *Financial Inclusion and the Effectiveness of Monetary Policy in Vietnam: An Empirical Analysis*. Hanoi: Banking Academy.

Johansen, S. 1995. "A Statistical Analysis of Cointegration for I(2) Variables." *Econometric Theory* 11 (1): 25–59. doi:10.1017/S0266466600009026.

Jungo, J., M. Madaleno, and A. Botelho. 2022. "The Relationship Between Financial Inclusion and Monetary Policy: A Comparative Study of Countries in Sub-Saharan Africa and Latin America and the Caribbean." *Journal of African Business* 23 (3): 794–815. doi:10.1080/15228916.2021.1930810.

Khan, H. R. 2011. "Financial Inclusion and Financial Stability: Are They Two Sides of the Same Coin?" *BANCON 2011, Indian Bankers Association and Indian Overseas Bank, Chennai*.

Lapukent, A. F. 2015. "The Impact of Financial Inclusion on Monetary Policy Effectiveness: The Case of Malawi." *International Journal of Monetary Economics and Finance* 8 (4): 360–384. doi:10.1504/IJMEF.2015.073229.

Lenka, S. K., A. K. Bairwa, and D. McMillan. 2016. "Does Financial Inclusion Affect Monetary Policy in SAARC Countries?" *Cogent Economics & Finance* 4 (1): 1–8. doi:10.1080/23322039.2015.1127011.

Mbutor, M. 2013. "The Impact of Financial Inclusion on Monetary Policy in Nigeria." *Journal of Economics and International Finance* 5 (8): 318–326. doi:10.5897/JEIF2013.0541.

Mehrotra, A., and G. Nadhanael. 2016. "Financial Inclusion and Monetary Policy in Emerging Asia." InFinancial Inclusion in Asia, 93–127. Palgrave Macmillan.

Mehrotra, A., and J. Yetman. 2014. "Financial Inclusion and Optimal Monetary Policy." BIS WP nº476.

Mehrotra, A., and J. Yetman. 2015. "Financial Inclusion – Issues for Central Banks." *BIS Quarterly Review* march: 83–96.

Mishkin, F., and M. Savastano. 2000. *Monetary Policy Strategies for Latin America*. NBER, Cambridge: National Bureau of Economic Research.

Morgan, P., and V. Pontines. 2014. "Financial Stability and Financial Inclusion", ADBI Working Paper Series, Nº. 488. Asian Development Bank Institute.

Orji, A., J. Ogbuabor, and E. O. James. 2019. "Financial Inclusion and Monetary Policy Shocks Nexus in Nigeria: A New Empirical Evidence." *Journal of Academic Research in Economics* 11 (2): 364–389.

Ouma, S., T. Odongo, and M. Were. 2017. "Mobile Financial Services and Financial Inclusion: Is It a Boom for Savings and Financial Inclusion?" *Review of Development Finance* 7 (1): 29–35. doi:10.1016/j.rdf.2017.01.001.

Ozili, P. 2018. "Impact of Digital Finance on Financial Inclusion and Stability." *Borsa Istanbul Review* 18 (4): 329–340. doi:10.1016/j.bir.2017.12.003.

Pesaran, M. H., and Y. Shin. 1998. "An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis." *Econometric Society Monographs* 31: 371–413.

Pham, M. and T. P. L. DOAN. 2020. "The Impact of Financial Inclusion on Financial Stability in Asian Countries." *The Journal of Asian Finance, Economics and Business* 7 (6): 047–059. doi:10.13106/jafeb.2020.vol7.no6.047.

Swamy, V. 2013. "Banking System Resilience and Financial Stability – an Evidence from Indian Banking." *Journal of International Business and Economy* 4 (1): 87–117. doi:10.51240/jibe.2013.1.5.

Yetman, J. 2017. "Adopting Monetary Policy to Increasing Financial Inclusion." Bank for International Settlements, Irving Fisher Committee on Central Banks Statistics, Bank of Morocco – CEMLA – IFC Satellite Seminar at the ISI World Statistics Congress on Financial Inclusion.