Fall 2-17-2022

Financial Inclusion and Monetary Policy - Investigating the Relationship between Financial Inclusion and Monetary Policy: The Case of Egypt

Salma Maher
salmammsag@aucegypt.edu

School of Business

Financial Inclusion and Monetary Policy

Investigating the Relationship between Financial Inclusion and Monetary Policy: The Case of Egypt

A Thesis Submitted to

Department of Economics

By Salma M. Abdel Ghany

In Partial Completion of the Course Requirements of

The Degree of Master of Arts (MA) in Economics

Under the instruction of:

Dr. Sarfaraz Ali Shah Syed

December 2021
The American University in Cairo

Acknowledgments

Praise be to Allah, for his showers of blessings throughout my studies that have allowed me to see my degree to completion.

I am gratefully indebted to my supervisor, **Dr. Sarfaraz Ali Shah Syed**, Assistant Professor of Economics, for his continued guidance and patience throughout this research. I will always be thankful for his understanding, wisdom and enthusiasm throughout the thesis writing process.

I would like to extend a mountain of debt and appreciation to all my professors throughout my undergraduate and graduate journey at the American University in Cairo.

I am deeply grateful to my colleagues at the Export Development Bank of Egypt and my team in the Strategic Planning Department for their constant support and understanding; and for inspiring the topic of this thesis.

Some debts cannot ever be repaid, but I will endeavor to repay a minuscule of it to my family. Thank you, **mom** and **dad**, for your unwavering faith in me. I know I was very irritating the past couple of years- sorry about that. To my **brothers**, thank you for your special brand of support: sarcasm and general mockery of my "nerdiness".

Three cheers for the "post-grad crew", **Aya**, **Yassmina**, **Yasmine**, **Noha**, **Maha**, **Sara** and **Noaman**. Your friendship and support not only made the master's bearable, but also enjoyable.

Lastly, to my ever patient and supportive **fiancé**: Yes, we can finally get married now.

Abstract

In the past decade, financial inclusion has become an issue of increasing importance to developing nations. This is due to its perceived effects on poverty alleviation, sustainable growth and enhancing monetary policy effectiveness. Unfortunately, there is little empirical research on the effects of financial inclusion. The thesis hopes to contribute to the literature by inspecting the relationship between financial utilization indices and monetary policy in Egypt. The thesis utilizes quarterly data on outstanding deposits and loans from 2004 to 2020 as well as a VAR model – supplemented with an ARDL model – to test the aforementioned relationship. The thesis contributes to the literature by inspecting which of the following sectors – households or SMEs – are more conducive to monetary policy efficiency in order to develop more tailored policy recommendation. The findings imply a significant and negative relationship between total deposits by both households and SMEs to inflation. Some specifications imply the existence of a significant positive relationship between loans authorized to SMEs and inflation, implying an instance of over indebtedness in the sector that can impact the overall financial stability

Keywords: Financial Inclusion, Monetary Policy, ARDL, VAR, Granger Causality, Cointegration, Impulse Response Function

JEL Classification: E52, G18, F36, C32

Table of Contents

Acronyms	
ADF	Augmented Dicky Fuller Test
AFI	Alliance for Financial Inclusion
AML	Anti-Money Laundry
ARDL	Autoregressive-Distributed Lag
ATM	Automated Teller Machine
CAPMAS	Central Agency for Public Mobilization and Statistics
CBE	Central Bank of Egypt
CCA	Caucus and Central Asia
EGP	Egyptian Pounds
IMT	International Money Transfers
IRF	Impulse Response Function
ITM	Intelligent Teller Machine
FAS	Financial Access Survey
FCY	Foreign Currency
FDIP	Financial and Digital Inclusion Project
FMCG	Fast Moving Consumer Goods
FRA	Financial Regulatory Authority
GLS	Generalized Least Squares
HNW	High Net Worth
LCY	Local Currency
MENAP	Middle East, North Africa and Pakistan
MFI	Microfinance Institutions
MPC	Monetary Policy Committee
MSMEs	Micro, Small and Medium Enterprises
NBFIs	Non-Banking Financial Institutions
NCP	National Council for Payments
PCSE	Panel Corrected Standard Error
POS	Point of Sale
PP	Philips Perron Test
ROSCA	Rotating Savings and Credit Association
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
SOP	Standard Operating Procedure
UFA	Universal Financial Access
VAR	Vector Autoregression
VECM	Vector Error Correction Model
VSLA	Village Saving and Loans Associations

List of Tables

Note: Shaded Tables can be found in the Appendix

List of Figures

Note: Shaded Figures can be found in the Appendix

Introduction

The concept of *Financial Inclusion* is built into the very foundation of monetary policy. Gali (2004) elucidated that most monetary policy researchers took for granted a "rule of thumb" consumer: those with adequate financial access and are able to save, accumulate capital and consume in varying rates in response to shocks and policy. The fact of the matter remains that in much of the developing world, this "rule of thumb" consumer may be quite uncommon. Gali postulated that there are, in fact, two types of consumers: the financially included and the financially *excluded*; and their proportion relative to a population may have significant effects on economic development, growth, poverty reduction as well as monetary policy effectiveness and financial stability.

Financial exclusion is thus a common phenomenon in emerging economies and developing countries; and addressing it has garnered both international and local attention[1]. The G20 has expressed its commitment to advance financial inclusion across the globe and implemented the G20 High-Level Principles for Digital Financial Inclusion. The World Bank Group deems financial inclusion a critical contributor to alleviating extreme poverty and generating sustainable growth, as a result they have presented an ambitious international target to reach Universal Financial Access (UFA) by 2020 (World Bank report, 2020).

In the previous decade, over than fifty-five countries have expressed their commitment to boosting financial inclusion, and over sixty countries have either initiated or are drafting their national strategy. Since 2010, governments and financial authorities globally have increased efforts in promoting financial *inclusion*. Data from the World Bank suggest that 69% of eligible adults worldwide have accounts with formal financial institutions in 2017, up from 62% in 2014 and 51% in 2011. This figure can be further broken down to 94% of adults in high-income economies and 63% in developing economies. The aforementioned facts emphasize the progress in the past decade, as well as the disparity between developed and developing economies in terms of financial inclusion (World Bank report, 2020).

[1] The United Nations has identified financial inclusion as a facilitator of seven of the seventeen Sustainable Development Goals

Financially excluded households have incomplete or no access to appropriate financial services that facilitate saving, borrowing and consuming. As a consequence, they are unable to smooth out their intertemporal consumption, as well as have limited direct response to changes in policy interest rates. There is evidence that financially included individuals tend to be more productive, consume more and invest more, thus increasing financial inclusion portends positive effects on the overall macroeconomy (Ashraf et al., 2006).

Financial inclusion does not only affect the economy at the household level, but on the business level as well; particularly on Small and Medium Enterprises (SMEs). Though SMEs represent about 96% of all registered companies in the Middle East, North Africa and Pakistan (MENAP) and the Caucuses and Central Asia (CCA), and employ about half of their labor force, they represent only about 7% of total bank lending in those regions. Baduel et al (2018) predict that greater levels of SMEs financial inclusion can translate into the creation of approximately sixteen million jobs on the aforementioned regions. Greater levels of SMEs financial inclusion are associated with greater levels of fiscal policy effectiveness, as it will entail better tax collection. Additionally, countries with higher levels of SMEs financial inclusion exhibit enhanced monetary policy transmission mechanism, as well as comparatively stable prices: as more SMEs gain access to formal financial institutions, interest rate pass through is enhanced, improving monetary policy transmission, and facilitate monetary authorities to better ensure price stability (Gregor, et al. 2019).

But no matter the level of interest, a key perceived effect of increased financial inclusion is on monetary policy effectiveness, financial stability, and price stability. This is due to the fact that financial inclusion directly halts or disrupts the monetary policy transmission mechanism. The monetary policy transmission mechanism follows the interest rate paths, which influence cost of borrowing, savings rate and real value of physical assets as well as total aggregate demand. Ultimately, the monetary policy transmission mechanism results in changes in macroeconomic indicators of growth and inflation. As the financially excluded do not make their economic decisions in response to policy changes in interest rates, central monetary authorities in economies with high levels of financial exclusion often have to exaggerate their policy changes in order to reach the desired results (Mehrotra and Yetman, 2014).

Utilizing a local lens we observe that Egypt exhibits one of the lowest measures of financial inclusion the MENAP regions, with only 33% of adults possessing an account with a formal financial institution[2]. The Central Bank of Egypt (CBE) has expressed particular interest in financial inclusion in recent years: expediting approvals for digital banking, authorizing an interbank government prepaid card, as well as putting forth several SMEs lending initiatives.

Though the CBE has never explicitly stated its pursuit of financial inclusion to improve the monetary policy transmission mechanism in Egypt, the effects of financial inclusion on monetary policy has become a point of investigation to monetary policy researchers. The conceptual framework underpinning this investigation is that increased levels of financial exclusion in Egypt will dampen the sensitivity to monetary policy, as a result, monetary policy does not instigate the required effect on aggregate demand or inflation. Thus, the central objective of the thesis is to investigate the relationship between increased levels of financial inclusion and monetary policy transmission in Egypt, through investigating the effect of financial inclusion on the nation's inflation. The research is meant to add to the growing corpus on financial inclusion, particularly the effects of financial inclusion on monetary policy and financial inclusion in the MENA region. The investigation will utilize a Vector Autoregression Model (VAR) supplemented by an Autoregressive Distributed Lag Model (ARDL) in order to determine the effects of financial inclusion in Egypt. Furthermore, the data is divided into households and SMEs to determine which of those sectors, if any, is more conducive to financial inclusion and thereby has the most significant effect on monetary policy. As both sectors are deeply affected by financial exclusion and significantly affect both aggregate demand and aggregate supply in the economy, it will be myopic to examine only one of them in the frame of financial inclusion, without including the other.

The thesis will progress as follows, after the introduction will be Section (1) which will include a reflection of the conceptual framework underpinning the research: the monetary policy transmission mechanism. Section (2) will consist of a review of literature, which will be divided into a theoretical sub-section and an empirical sub-section. The theoretical subsection is concerned with definitions of financial inclusion, evaluation and

[2] As of the 2017 Global Findex Report

measurement as well as challenges facing financial inclusion policies. The empirical section will be focused on effects of financial inclusion, with particular interest in its effects on monetary policy. Following the literature review will be Section (3) which will provide an insight into Egypt's financial inclusion efforts, incorporating stylized facts. Sections (4) and (5) Data and Methodology, respectively, are chiefly concerned with the variables selected and the empirical treatment to be applied. The results of the aforementioned empirical models will be examined and analyzed in Section (6). Lastly, Section (7), the Conclusion section will include policy recommendations, limitations, and suggestion for further research.

1. Conceptual Framework: The Monetary Policy Transmission Mechanism

The purpose of the thesis is to inspect the effects of financial inclusion on the monetary policy transmission mechanism. As Gali (2004) alluded, financial inclusion can only be noticed in its absence, that is due to the fact that most monetary policy theories, researchers and recommendations assume financially inclusive economy, in which most – if not all players – are included in the financial framework. Thus, if this assumption was challenged, it can disrupt, halt or dampen the mechanism of monetary policy. This theory provides the foundation of subsequent analysis of the effects of financial inclusion on the macroeconomy.

The monetary policy transmission mechanism describes – in its most broad sense – the rate by which prices (inflation) and other general economic indices change as a result of monetary policy. Peter Ireland (2006) of the Federal Reserve Bank defined it as " the process by which policy-induced changes in the nominal money stock or the short-term nominal interest rate impact real variables such as aggregate output, inflation and employment". The central banking authority has monopoly on two instruments or policies : money supply and overnight deposit and lending rates.

Private agents' demand for real base money M/P – where M is nominal money stock and P is prices - can be defined as a decreasing function of the short-term nominal interest rate i: $M/P = L(i)$. This function L summarizes how, as the nominal interest rate rises, other liquid assets become more attractive as short-term stores of value, incentivizing households and firms to cut back on their holdings of currency and banks to cut down on their holdings of reserves. Prices are generally "sticky" in the short run, as a result when the price level P cannot adjust fully in the short run, the central bank's monopolistic control over the nominal quantity of base money M also allows it to influence the short-term nominal interest rate i. This relationship illustrates how the central banking authority can trigger changes in rates: either directly through changing short term nominal interest rates, or indirectly through changing nominal money stock.

In this simplistic model where changes in *nominal money supply* represent the sole source of ambiguity, the deterministic relationship that links M and i implies that monetary policy actions can be defined interchangeably in terms of its effects on either the nominal monetary base or the short-term nominal interest rate. Changes in the short-term nominal

interest rate goes through the monetary policy channels to ultimately affect real economic indices – namely, inflation.

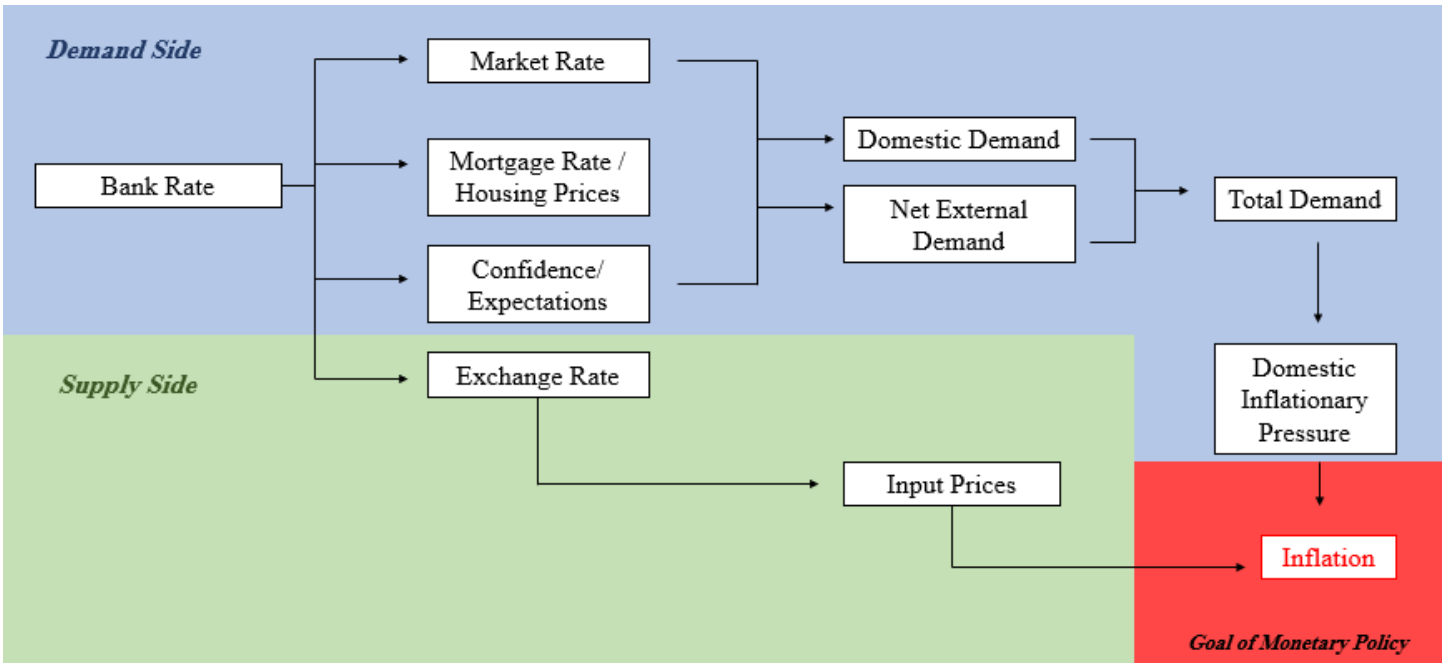


Figure 1 - Infographic: The Monetary Policy Transmission Mechanism. Developed by Author

Figure 1 above illustrates the monetary policy transmission mechanism. Changes in short term bank rate – either directly dictated in the monetary policy committee (MPC), or indirectly generated given central banking authority's changes in monetary base – will pass through one of two channel: *interest rate channel*, or *exchange rate channel*. They can also be described as the *demand side* or the *supply side*, respectively. Both sides begin with a change in bank rates. If the MPC reduces overnight deposit and lending rates – for example – it will reduce the cost of funds for commercial banks, which will reduce the rates issued to bank clients. Therefore, a cut in bank rates will translate in a cut in the overall economy. This will make borrowing and mortgages more attractive – encouraging investment and saving less attractive – encouraging consumption. And vice-versa if interest rates are raised.

Interest rates has a direct impact on housing prices. Continuing with the previous example, if interest rates are cut – Ceteris Paribas – demand for housing will increase given increased demand for mortgages, pushing up the price of houses. Interest rate affects the expectations and sentiment in the economy, if the public perceives that an interest rate will stimulate further growth in the economy, it will raise their expectations and their likelihood

to consume. If interest rates rise, it can be perceived as a sign of "over heating" in the economy, an instance where inflation is too high, in this case a rise in interest rates is meant to curtail growth which will dampen the exchange rate. The interest rate channel lies at the heart of the traditional Keynesian textbook IS-LM mode. The above three pathways: market rate, housing prices and expectation affect domestic demand and external demand in local assets. Consequently, they affect aggregate – total demand - which will instill a domestic inflationary pressure that will finally be expressed in price levels, or inflation.

The supply side focuses on the effects of interest rates on the exchange rate and how that effects input prices in turn. If the interest rates are cut by the MPC, it can depreciate the exchange rate as foreign investors move their money away from local investment, seeking a more lucrative return. This will increase the supply of local currency, causing it to depreciate, making foreign products more expensive. If the country is a net importer, or imports a substantial portion of its production material, input prices will increase. When input prices increase, prices of goods and services rise, ultimately affecting inflation.

Financial exclusion dampens the transmission mechanism. If a large portion of the society is immune or indifferent to changes in bank rates, inflation rates – the target of monetary policy – may become immune to monetary policy instruments. As the financially excluded do not make their economic decisions in response to policy changes in interest rates, central monetary authorities in economies with high levels of financial exclusion often have to exaggerate their policy changes in order to reach the desired results (Mehrotra and Yetman, 2014). This places an undue burden on the portion of the economy that is financially included, as they have to shoulder exaggerated policies, resulting in an overall decline in economic growth.

2. Literature Review

I. Theoretical Literature

a. Defining Financial Inclusion

The first formal use of financial inclusion – or rather financial *exclusion* - in the economic sense could be traced to Leyshon and Thrift (1995). Unsurprisingly, their definition was inexorably tied to *social exclusion*. Leyshon and Thrift defined financial exclusion as referring to those processes that serve to prevent certain *social* groups and individuals from gaining access to financial services. Sinclair (2001) elaborated on the definition to include "*appropriate* financial services and products", as Sinclair believed that financial services must be segmented and tailored to fit the respective customer. Though Sinclair, Leyshon and Thrift provided the first mention of financial exclusion, their definition, however, did not delve deeper into the determinants of financial inclusion, or inspect the banking sector's depth or breadth.

The first definition of financial inclusion as it pertains to the formal financial sectors of the economy was outlined by Mahendra (2006). The author defined financial inclusion as "the availability of banking services at an affordable rate to the large segment of the vulnerable and low-income groups". He stated that financial inclusion extends a wide range of financial and monetary services beyond simply extending credit; such as savings, insurance, payments and remittance facilities issued by formal financial institutions. Rangarajan Committee of India (2008) adapted Mahendra's definition to be "the process of ensuring timely and adequate access to financial services and credit by vulnerable groups such low-income groups at an affordable cost"

The most popular definition is perhaps the World Banks' definition, where they stated in the 2015 report that "Financial Inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs. Such as, but not limited to, transactions, payments, savings, credit and insurance . These products must be delivered in a responsible and sustainable way by official institutions" . The World Bank's definition is thus the first to include private businesses in its definition of the demographics to be considered when discussing financial inclusion.

In the CBE's circular dated April of 2017, financial inclusion was defined along four central points:-

1. Providing financial services to all sectors of the economy, individuals or institutions.
2. Empowering these sectors to appropriately use these services .
3. Aforementioned services are of appropriate quality and price
4. The aforementioned services are offered through the official streams (banks, banks agents, post office and authorized micro-credit institutions)

It is important to note that the CBE's definition explicitly recognizes the importance of the efforts of Non-Banking Financial Institutions (NBFIs), as well bank agents and micro-credit institutions in perpetuating financial inclusion and financial literacy.

In analyzing and collecting the above definitions of financial inclusion, it was determined that the Alliance for Financial Inclusion (AFI) offers the most well-rounded description of financial inclusion. The AFI (2011) defines financial inclusion according to three dimensions of *Access, Usage* and *Quality*. The *access* dimension is concerned with the availability of formal, regulated financial services, the physical proximity of formal institutions to individuals and private businesses in a given region as well as the affordability of the services offered. The *usage* dimension is concerned with the regular and periodic utilization of the financial products. This is a critical component as it weeds out the dormant accounts and accounts of deceased individuals. The last dimension is the most difficult to quantify; *quality* is concerned with the appropriate segmentation and tailoring of products to fit different client's needs; it takes into account the average literacy and resources of the client. As of the date of the thesis, there is yet to be a measure or database of the quality of financial products.

b. Measuring Financial Inclusion

In 2008, Sarma attempted the first holistic definition of financial inclusion. Her definition was trifold: *penetration*, *availability*, and *usage*. The first aspect, *penetration*, refers to the degree that financial institutions were able to penetrate geographical areas of a given nation. The second aspect, *availability*, refers to the portfolio of financial products provided. The last aspect, *usage*, is concerned with the regularity of utilization of the aforementioned products. She adopted the aforementioned themes as well as the concept used in the calculation of the Human Development Index (HDI) to categorize countries

into High financial inclusion, Medium Financial Inclusion and Low Financial Inclusion. Her categorization, though became the basis of measuring financial inclusion, did not develop into an intertemporal database.

The first effort in developing a global intertemporal database came in 2012, when Demirguc-Kunt and Klapper (2012) developed the Global Financial Inclusion (Global Findex) database. The database was funded by the Bill and Melinda Gates foundation, it releases annual data on how adults of 148 countries save, borrow, and consume. The Findex Report is published every three years, the most current being the 2020 report. Their data is collected through national surveys – in partnership with Gallup, Inc. - of more than 150,000 adults in the 148 countries represented. To date, it is the most popular global database of financial inclusion indices.

Though there is yet to be a singular index of financial inclusion, which forces researchers to conduct a Principle Component Analysis (PCA) to proxy financial inclusion, supply side data from central banking authority usually offer sufficient data to stand in for the rate of financial inclusion. Though data on account ownership in developing countries are usually scant, central banking authorities routinely collect and report figures on outstanding volume of deposits, loans and other financial solutions. Researchers conducting a time series analysis have relied heavily on these datasets as they sufficiently address financial access and usage. Additionally, oftentimes central banking authorities provide these data at a higher frequency or segmented by sectors or regions allowing for more detailed analysis (Mbatur and Uba, 2013).

c. Determinants of Financial Inclusion

Jones (2008), Jang et al. (2014), Allen et al (2012), Donovan (2012) , Kunt et al. (2013), Srenivasan and Burrell (2015) all examined the determinants of financial inclusion. Their separate efforts reached the joint conclusion that the necessary and sufficient conditions to promote financial inclusion include mobile money and mobile transaction, bank policies and procedure that require the offering of basic services for low fees, exempting certain groups from onerous documentation requirements, permitting correspondent and agent banking and permitting banks to undertake government payments such as taxes or violation tickets. Additionally, further analysis suggests that reducing collateral requirements and investing in physical digital infrastructure can promote financial inclusion.

On a social sense, Demigruc-Kunt et. al (2013) found that legal discrimination against certain demographics – particularly women – significantly affects levels of financial inclusion. This finding mirrors the findings of Sarma and Pais (2011), wherein they concluded that in order to accurately measure and promote financial inclusion, one must also consider the following social metrices of human development: income inequality, literacy, gender, urbanization, degree of physical infrastructure, and degree of information in a given population; these figures were found to significantly influence levels of financial inclusion regionally and within the given nation. Sarma and Yangdol (2019) continues to highlight demand side factors such as religion, culture, perceptions and trust and their effects on financial inclusion levels.

In summary, supply side determinants of financial inclusion comprise of (1) facilitating digital banking (2) onerous banking bureaucracy (3) exclusionary high fees, commissions and collateral requirements and (4) national and governmental regulations that forces financial institutions to comply with financial inclusion projects. The demand side determinants of financial exclusion include (1) gender (2) income (3) education – both general literacy and financial literacy (4) access to financial institutions (5) culture and psychological preconceptions.

After identifying the determinants into supply side and demand side, Baeck et. al. (2007) divided the definition of financial exclusion into the voluntary excluded and the involuntary excluded. The voluntary excluded describes individuals who have no

perceived need for financial services or refuse to engage with financial institutions on cultural or religious grounds. Thus, national and private efforts to include them are moot. The involuntary excluded describes the individuals who are excluded by the institution itself due to its framework; this segment is thus the deserving target of financial inclusion efforts. The infographic below illustrates this distinction.

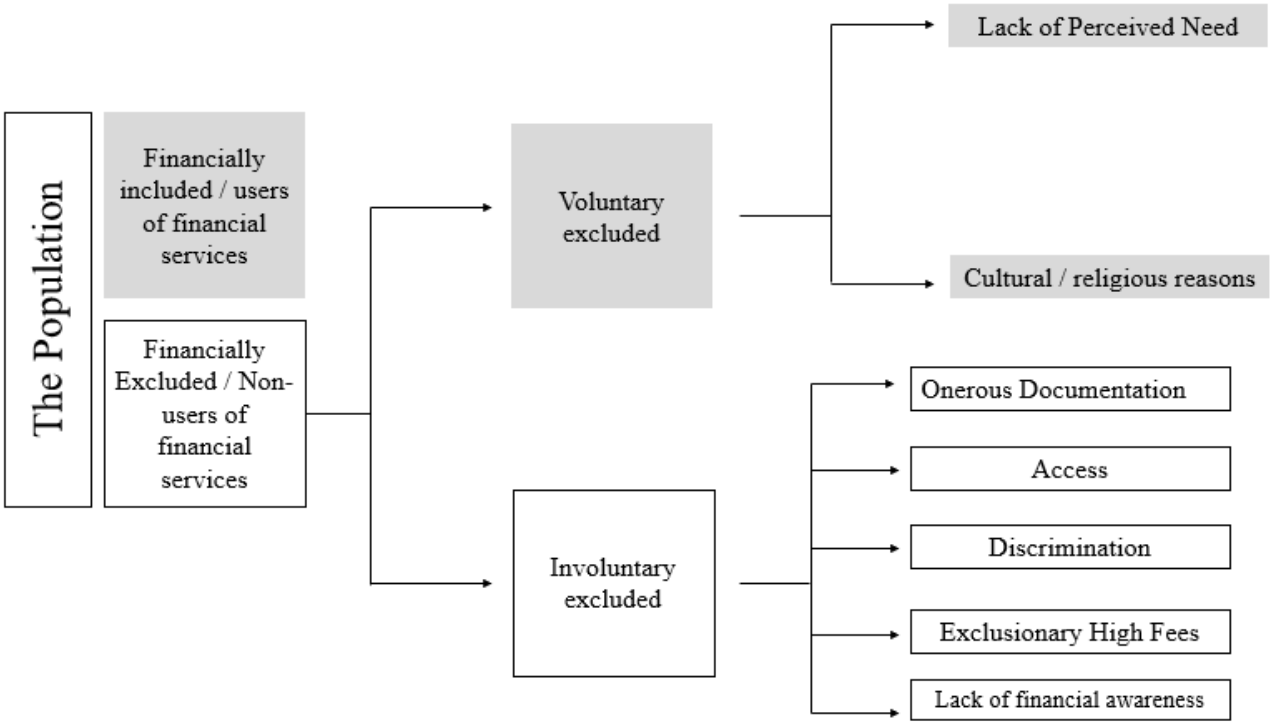


Figure 2 -Infographic: Distinction of Involuntary and Voluntary Financial Exclusion, Developed by Author

d. Policies and Challenges for Financial Inclusion

Conditions halting the progress of financial inclusion can be sorted into three categories: banking sector bias, central monetary authorities' policies and regulations and geographic bias. Financial inclusion will entail the extension of lending facilities to previously unbanked individuals, a substantial portion of which with questionable credit worthiness. Though financial inclusion has been associated with poverty reduction and overall economic growth, overextension of credit to non-credit worthy clients coupled with a relaxation of documentation processes can lead to large scale financial instability. This phenomenon will mirror the Unites States' Sub-Prime crisis of 2007; particularly in the

sense that banks will report high profitability in the short run due to a rapid growth of assets, followed by a high level of defaulting on the aforementioned loans, leading to financial instability and social discontent (Aras, 2017).

Presently, commercial banks and other financial institutions employ stock market operations to fund their fundamental functions, which exerts pressure on banks to maintain a "stock market worthy" level of operational risk, that dissuades them from what can be considered *risky lending*. This leads to a peculiar paradox: as more financial innovation leads to more financial inclusion products, the risk of lending increases, forcing commercial banks and other financial institutions to focus on High-Net-Worth Individuals (HNWs) as a means to cushion the risk of increased financial inclusion. Ironically, this leads to an asymmetric increase in HNW clients with respect to financial inclusion clients, ultimately contributing to additional financial *exclusion*. Banks presently function on the premise that HNW clients are more profitable, as a result funds and products should be allocated to the more profitable segment (Kumar, 2011).

Jones (2008), Demirguc-Kunt and Levine (2008), Rosengard and Prasetyantoko (2011) Examined regulatory constraints on financial inclusion in Asia and Europe. Chief among the issued were Anti-Money Laundry and Countering Financial Terrorism (AML and CFT) regulations, consumer protection regulation, and the introduction of regulation proportioned to innovation. Inconsistent implementation of AML/CFT regulation can result in the exclusion of individuals and legitimate business from the formal banking system. The easiest example is documentation requirements for account opening: workers in informal or rural sectors seldom have the necessary wage slips or formal proof of residence required to open accounts. As a result, in those communities individuals rely more on family lending, ROSCA and loan sharks for credit. The ironic result of the overly strict AML/CFT regulations is increased risk of money laundry and terrorist financing as funds are shifted to informal sectors. The banking sector as a whole must strike the delicate balance of appropriate risk measures without onerous bureaucracy.

Setting the appropriate regulation is becoming increasingly difficult; as more financial innovation is applied to develop financially inclusive products at reduced costs, more digital applications are developed. Furthermore, with the rise of FinTechs in the previous decade, the financial inclusion landscape is increasingly populated with tech companies with little or no understanding of regulatory oversight, and minimal adherence

to CBE's reporting standards. FinTechs outpace traditional banks in their efforts to capture the financial inclusion segments. This is mostly due to the fact that FinTechs have a faster rate of mobilization , cheaper products and lower turn-around-time. As a result, several banks of late have been acquiring or white labeling[3] FinTechs in an effort to include them in the formal regulatory framework as bank's agents.

The regulatory bodies must race the development of these products to set the appropriate regulations and standard operating procedures (SOPs). These regulations operate across sectors and industries, as they oversee banks, telecommunication companies, bank agents and service providers. As a result, recent regulation development incorporates waves of testing and deployment of financial inclusion products.

Communities in most need of financial inclusion products have limited experience with formal financial institutions, as a result, their financial literacy (and sometimes, basic literacy) is less than what banks are currently equipped for. Often, these individuals face challenges in comprehending the service and their obligations as clients; without enforced protective measures, the initially excluded maybe subjected to abusive sales measures and risk being sold ill-tailored or harmful products – a phenomenon known as predatory lending. The 2017 Global Findex report states that approximately 18% of adults forsake formal banking due to "lack of trust in banks" (Aras, 2017).

Though financial inclusion tends to be a national issue, research has indicated that policies promoting financial inclusion are geographically disproportionate. Though low-income urban communities suffer similarly from financial exclusion, policies concerning access in particular are concentrated to *rural* areas (Bastia, 2013). Nevertheless, banks can be argued to have achieved global expansion; policies on financial access now consider *conditional* access, which entails the creation of financial services that can only be used by particular devices, thereby excluding though who do not or cannot use that device. As technological development and financial innovation propel low-cost financial inclusion products, the requirement of access increases. This poses a challenge to service providers, as technological products can more efficiently reach the financially excluded compared to

[3] A process by which formal banks acquire FinTechs products or services platforms and install it within their own interface. The bank then rebrands the service to their clients to make it appear as if they offer the service.

on ground access, the average financial and technological literacy of the given community poses a substantial constraint.

e. Financial Inclusion in Egypt

As previously mentioned, research on financial inclusion is particularly sparse in the MENA region; however, there are a fair number of published articles that provide more detailed insights on the Egyptian experience of financial inclusion. Thus, the purpose of this subsection is to contextualize the determinants, challenges and effects of financial inclusion in the Egyptian economy.

As with a global lens, determinants – and the subsequent challenges – of Financial inclusion in Egypt can be investigated through a demand side and a supply side. The first paper to investigate the determinants of financial inclusion in Egypt is by Awad and Eid (2018), the purpose of their research was to measure the individual level of accessibility and awareness of financial services in Egypt. This was done through a survey conducted on a random sample of Cairo residents. On the supply side, Awad and Eid (2018) cite the causes of financial exclusion on the individual level to be exclusionary high fees and transaction costs, onerous documentation, high collateral requirements, complex bureaucracy and far branches.

Demand side causes of involuntary financial exclusion were determined to be income, employment, education, gender, and religion. Awad and Eid concluded that there is a strong and positive relationship between income, years of employment and years of education to financial inclusion. Their ordinal data suggest that women are less likely to be financially included than men and that Muslims avoid financial institutions on religious grounds against usury.

The findings of Awad and Eid are further corroborated by the Global Findex report (2017) which concluded that income , education and employment affect the degree of financial inclusion in Egypt. The global findex added an extra determinant: age. On average, the older population is increasingly disinterested in banking services, this may be an example of selective (or voluntary) exclusion.

The findings of Awad and Eid are presented in juxtaposition with the findings of Rashdan and Eissa (2019). The authors utilized World Bank's Global Findex 2017 database

to conduct a logistic regression to analyze the determinants and challenges of financial inclusion in Egypt. Their results indicate that while there is no significant direct relationship between gender and financial inclusion in Egypt, age, education, employment, and income have a strong significant relationship with financial inclusion. This is in agreement with Allen et al. (2016) and Fungáčová and Weill (2015) wherein they concluded that being richer and more educated is more likely to lead to full employment and therefore being financially included.

The paper continues that while there is no *direct* relationship between gender and financial inclusion in Egypt, discrimination against women can be discerned *indirectly* through the income and education inequality between men and women. Supply side factors highlighted by the paper corroborate the findings of Awad and Eid and they conclude that onerous documentation, complicated financial terminology, and exclusionary high fees contribute negatively to financial inclusion.

A social group that is financially excluded and is mostly ignored by literature are refugees and asylum seekers. According to the UNHCR report of 2019, Egypt currently hosts 256,000 refugees from fifty-six different countries, mostly in Africa. Presently, the CBE documentation requirements do not accommodate the refugees when it comes to account opening, nor permit remittances to or from their countries. This exclusionary documentation has led to the exclusion of these social groups.

This factor transitions into the analysis of regulations in Egypt. Implementation of SOPs in Egypt is not an easy feat. As more digitization and FinTechs collaboration is required – particularly with the FinTech giant FAWRY – operational risk increases, mostly due to the reliance on non-banking institutions who have no previous experience in compliance. As a result, the CBE has employed tranches deployment of products in tandem with a "wait and see" approach, in order to test for regulatory issues.

Like the modern trend in banking, Egyptian banks also suffer from a client bias. Fourteen of the thirty-eight banks in Egypt are publicly listed. Additionally all banks offer *premiere* banking products for HNW clients. As a result, profitability and shareholders returns is a key component of their objectives. This leads to two effects (1) profit and target oriented marketing (2) preference to HNW clients. As banks work to increase share price, profitability becomes increasingly important, this leads to increases asset targets, raising

of standard commissions and even predatory marketing. Which can result in either over-selling assets to low-income groups resulting over indebtedness, or can yield exclusionary high cost of transactions, benignly steering the portfolio to HNW clientele.

SMEs access to banking and credit is another concern when exploring financial inclusion in Egypt. according to CAPMAS 2017 census[4], there are 3.8 Million micro-enterprises in Egypt and over sixty-seven thousand small and medium enterprises. However, access to finance by this sector is limited. According to the ElSaid, Mahmoud and Zaki (2013), less than 50% of SMEs seem to be dealing with banks in any capacity. Of those, even fewer SMEs and MSMEs are able to gain credit from formal financial institutions. They have concluded the barriers of SMEs lending in Egypt to include (1) the requirement of official legal documents, (2) the nature of economic activity, (3) sales turnover, (4) turn-around-time in banks and (5) lack financial awareness of business owner.

MSMEs business owners view tax collection and regulation negatively. They exhibit a general distrust of authority and dislike to taxes. Though Egypt has a high corruption index[5], financial inclusion is often presented as means to address this corruption. It becomes an odd self-fulfilling prophecy in Egypt: business owners fear/hate authority corruption, avoid dealing with authority, do not extract the appropriate legal documents, do not engage in formal financial sector, supply the demand for unregulated informal financial sector, perpetuating more corruption. MSMEs business owners exhibit a disproportionate gap in legal documents. This particular challenge must be met with increased literacy and highlight the benefit of formal financing, as the CBE cannot and should not compromise on the soundness of legal documents.

Banks exhibit a significant bias in which MSMEs sectors are extended credit. According to ElSaid et. al (2013), manufacturing clients are over 50% more likely to gain financial credit than service clients or retailers. This is because banks often claim the manufacturing line as collateral. This finding persist when accounting for the legal and financial soundness of the companies. This highlights one of the major challenges of SMEs lending in Egypt: high collateral requirements.

[4] The census only measures enterprises with valid commercial registers. MSMEs without a valid commercial register are not reported. This indicates an underestimation of the MSMEs sector in Egypt.
[5] According to 2020 Corruption Perception Index, Egypt scored 33/100 and ranked 117/179

SMEs in Egypt are classified according to their annual sales turnover[6]. Micro and Small enterprises are often benignly ignored by most financial sector due to comparatively smaller single obligor rates. Despite the small "ticket size" each client undergoes an extensive credit granting process, lending relationship officer tend to forgo to the small and micro enterprises for the sake of medium enterprises that have a larger financial appetite.

Despite all the pressing challenges presented above, ElSaid et. al. (2013) have determined that the largest barrier to SMEs access is lack of financial literacy. Banking jargon is complex enough in the retail level, it becomes exponentially more complex in the business banking sector. This exclusionary use of jargon coupled with the complex operations required to manage financial service cause MSMEs business owners to avoid dealing with formal financial services.

The effects of increased financial inclusion on growth is explored by Sayed, Abbas and Touny (2020). They examined financial inclusion 's impact on Egypt's GDP using financial access and usage indicators as presented by the FAS. The study found a positive effect of number of ATMs (proxy of financial access) on GDP and a negative effect of total deposits (proxy of financial usage) on GDP. The authors concluded that in order for deposits to cause a positive effect on GDP, these savings must be invested. Otherwise, these savings only exhibit a decrease in consumption. The authors also conducted an ARDL model bounds test which concluded the existence of a stable long run relationship between financial inclusion indices and economic growth in the Egyptian economy.

[6] Micro: Less than 1 Million EGP a year
Small: 1 to 50 Million EGP a year
Medium: 50 to 200 Million EGP a year

II. Empirical Literature

This section of the literature review is concerned with the effects of financial inclusion on the macro-economy, particularly on monetary policy and financial stability. It is worthy to note that this particular aspect of the literature is scant, there is a substantial gap on the mediating role of financial inclusion on financial development or financial innovation. Furthermore, the impact of financial inclusion on real macroeconomic variables – particularly variables concerning monetary policy – is scarcely investigated. However, there are notable papers whose contribution contextualize the objective of this thesis.

Early research on the effects of financial inclusion was mostly concerned with its effects on social issues, among the earliest of such research is the work of Dittus and Klein (2011) which insinuated a causal link between the availability of financial products and poverty alleviation, income inequality reduction, as well as social mobility in a given community. The paper proposed the notion that access to appropriate financial services allows the individual to smooth out their consumption across time, save and even invest in small businesses, thereby increasing their income and contributing to the economic development of their community.

Financial inclusion is not without its risk, however. Diniz et. al (2010) research on the social impacts of financial inclusion illuminated that while increased financial inclusion contributes to local social economic development, it can be associated with a negative effect on the community, such as low-income population over-indebtedness, thereby intensifying poverty traps and causing a negative spillover on the overall financial stability.

The effects of financial inclusion on human development are divergent given the relative economic classification of a country. Unnikrishnan and Jagannathan (2015) found that the effect of financial inclusion on overall human development is substantial in lower middle- and low-income communities of a given country. However, there is still no determined relationship or causal link between financial inclusion and human development in higher income communities or higher income countries.

There is unfortunately limited research on the relationship between financial inclusion and monetary policy or financial stability. Nevertheless, there is some empirical research in that vein. Hannig and Jasen (2010) argued that greater levels of financial

inclusion can lead to enhanced financial stability. furthermore, they concluded that financial *exclusion* could present a risk at the institution level. On the effects of financial inclusion on banking and monetary policy, Mehrotra and Yetman (2014) concluded that in countries where financial inclusion is low, central banking authorities of the nation must exaggerate changes in bank rates in order to reach the targeted stabilizing effect after a shock. They present their policy as a corollary to the argument that high levels of financial exclusion entail a larger portion of the population who are immune to changes in bank rates, thus in order to reach the desired aggregate effect, the change must be large enough to be captured by the comparatively smaller portion of the population that *do* react to interest rate changes, this can have a negative effect on economic activities.

Mehrotra and Yetman (2015) continued their investigation on the effects of inclusion on central banks' policies. Their subsequent research was concerned with the different ways in which increased financial access facilitates policies intended to promote financial and monetary stability. They reiterate the findings of Hannig and Jasen: financial inclusion can be associated with financial stability as more households are capable of smoothing out their consumption intertemporally.

The first paper to utilize an econometric model to investigate the effects of financial inclusion and monetary policy is by Mbatur and Uba (2013), wherein the authors investigated the impact of financial inclusion on monetary policy in Nigeria. Using data on outstanding loans and deposits from 1981 to 2013 in Nigeria and a VAR model, they reached the conclusion that financial inclusion is a proper strategy for promoting monetary policy effectiveness. They ascertained a strong and inverse relationship between inflation and the size of commercial bank loans and advances. This indicated that simply making credit available in the system would boost investment and dampen inflation. The number of branches coefficient however had a negative effect on financial inclusion, which is due to the fact that several branches in Nigeria are not motivated by inclusion or enabled to offer inclusive products, rather they are motivated by profit. This mirrors the findings of Kumar (2011) on profit motivation of commercial banks dissuading financial inclusion.

Olaniyi Evans (2016) expanded the objective of Mbatur and Uba, she investigated the impact of financial inclusion on the effectiveness of monetary policy in Africa. Her study utilized a panel Vector Error Correction Model (VECM) in fifteen African countries: Algeria, Angola, Botswana, Cameroon, Ghana, Kenya, Libya, Malawi, Mali, Morocco,

Namibia, Niger, Nigeria, Senegal and South Africa. She proxied financial inclusion through conducting a Principal Component Analysis (PCA) utilizing data on access and usage from the FAS from the years 2004 to 2014. The study indicates that financial inclusion and monetary policy effectiveness are linked by a series of long-term relationships. To various degrees, financial inclusion, money supply, and interest rates have some role in explaining monetary policy. But about 45% of the variation of monetary policy is explained by interest rates, which illustrates the indirect effect of financial inclusion, as the level of financial exclusion can dampen interest rate pass through. Moreover, there exists a one-way causality from monetary policy effectiveness to financial inclusion.

This study establishes that financial inclusion is not the driver of monetary policy, rather monetary policy effectiveness is the driver of increased financial inclusion. As a result, for increased financial inclusion in Africa, heightened levels of effective monetary policy will be required. This implies that monetary policy effectiveness in Africa is highly influenced by the perceived faith and trust the citizens have in the central banking authority. The author elaborates that due to the perceived dependence on central banking authority on the government, and the notion perpetuated within the public that banks only serve the elite and the wealthy, the public is not interested in seeking financial inclusion. As a result, the central monetary authority must exercise efforts in rebranding and re-establishing the aforementioned trust.

Lapukeni (2015) investigated the impact of financial policy on monetary policy effectiveness in Malawi. The paper used quarterly data from the central banking authority of Malawi from 2001 to 2013 to conduct a VAR, a Granger Causality test as well as some basic trends analysis. The study revealed consistent trends and some causality between financial inclusion indicators and inflation - the indicator of monetary policy effectiveness. The study further showed that money supply had an inverse relationship with inflation, contrary to theory. This finding suggest that this is because the accounting of monetary aggregates does not include the activities of those outside the banking system. Thus, Lapukeni concluded that increased financial inclusion will extend monetary policy's reach and allow policy makers to achieve more accurate predictions on inflation and other macro-indicators.

As of the date of this thesis, the only econometric investigation in Asia was by Lenka and Bairwa (2016), wherein they investigated the effect of financial inclusion on monetary policy in the South Asian Association for Regional Cooperation (SAARC) countries. The countries are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka. The paper used PCA to construct a financial inclusion index that serves as a proxy variable for the accessibility of financial inclusion in the SAARC countries. The paper then uses a Generalized Least Squares model (GLS) and a Panel Corrected Standard Error (PCSE) model, which shows that financial inclusion, interest rate, and exchange rate are statistically significant and negatively associated with inflation. Based on those outcomes, SAARC countries must seek to improve efficiency of the financial sector through financial inclusion, as it is proven to contribute to stabilizing price levels.

On a more local lens, Marwa Sherrif (2019) has attempted to investigate the effect of financial inclusion on monetary policy in Egypt. Using the same methodology as Evans of conducting a PCA on data from the FAS to create an inclusion index for Egypt for the period 2000 to 2017, she determined that financial inclusion and monetary policy are linked by a series of long-term relationships. On the direction of causality between inclusion and monetary policy, she also determined that monetary policy effectiveness is the driver of financial inclusion in Egypt, the reverse of the hypothesized causality.

III. Reflecting on Empirical Literature

The purpose of this thesis is to investigate (1) if financial inclusion has any significant effects on monetary policy in Egypt (2) the nature of said impact. The purpose of this section is to reflect on the presented empirical literature that have previously explored the aforementioned relationships particularly. As previously stated, there is not much literature in this scope, but there is still some valuable precedence to refer to. They are summarized in the table below.

Table 1: Summary of Selected Empirical Literature

Article	Authors	Methodology	Data	Results
The Impact of Financial Inclusion on Monetary Policy in Nigeria (2013)	Mbatur O. Mbatur, Ibrahim A. Uba	VAR Model	• **Annual Data from 1981 to 2003** • Number of Branches • Annual Outstanding Loans and Deposits with rural banks • Inflation (Annual CPI) • Exchange Rate • Commercial Banks Lending Rates • Broad Money Supply	• A strong inverse relationship between inflation and Outstanding Loans (FI Variable) • Number of branches have a negative on inflation, this is symptomatic of the clustering of branches in particular locations with the purpose to maximize profits and serve HNW clients rather than FI
Effectiveness of Monetary Policy in Africa: Modelling the Impact of Financial Inclusion (2016)	Olaniyi Evans	Panel VECM	• **Annual Global Findex data for 15 African Countries from 2005 to 2014** • # of Depositors of Commercial Banks (/1,000 adults) • Inflation (annual CPI) • Broad Money Supply • Commercial Lending rate • Exchange Rates	• Financial inclusion and monetary policy are linked by a set of long-term relationships • Inverted causality from monetary policy to financial inclusion • Monetary policy is the driver of financial inclusion in the Panel of selected African countries
The Impact of Financial Inclusion on Monetary Policy Effectiveness: The	Angella F. Lapukeni	VAR Model	• **Quarterly data from 2001 to 2013** • Inflation (Annual CPI) • Outstanding Loans with Commercial banks	• Although both financial inclusion indicators are statistically insignificant, Granger Causality show that Money Supply granger

Case of Malawi (2015)			• Total Deposits with Commercial Banks • Broad Money Supply • Foreign Exchange • Commercial Lending rate	causes deposits and loans in the system (indirect relationship) • Money Supply had an inverse effect on inflation the result of accounting of monetary aggregates does not include the activities of those outside the banking system
Does Financial Inclusion Affect Monetary Policy in SAARC Countries (2016)	Sanjaya K. Lenka and Arun K. Bairwa	PCA and GLS	• **Annual Global Findex Data for a Panel of 8 countries from 2004 to 2013** • Branches / 100,000 adults • Branches / 1000 km2 • ATMs / 1000 km2 • ATMs / 100,000 adults • Outstanding deposits • Outstanding loans • Inflation (Annual CPI) • Commercial Lending Rate • Exchange Rate • Broad Money Supply	• A negative and significant effect of financial inclusion index and inflation
The Relationship Between Financial Inclusion and Monetary Policy Transmission: The Case of Egypt (2019)	Marwa ElSherif	PCA and VECM	• Annual Global Findex Data from 2000 to 2017 • Commercial Branches per 100k Adults • ATMs/ 100K adults • Outstanding Loans • Depositors / 1000 adults • Account Ownership (% of population) • Inflation (Annual CPI) • Exchange Rate • Broad Money Supply • Commercial Lending Rate	• Financial Inclusion and monetary policy are linked by a series of long-run relationships • The reaction of policy effectiveness to financial inclusion shocks is statistically significant • The study concluded that monetary policy inclusion is a driver of financial inclusion in Egypt.

***Blue Shading** : Author(s) conducted timeseries analysis using central banking authority indices.*
***Orange Shading** : Author(s) conducted a PCA using annual data from FAS on a Panel of countries*

There is a general lack of consensus in findings of the empirical literature, this is due to the relative novelty of the research as well as the high circumstantial aspect of the topic. However, they deduced some level of effect between financial inclusion indicators and monetary policy, either direct or indirect as well as some form of causal link between the variable. Furthermore, when inspecting the research conducted on Egypt, Marwa Sherif used PCA and data from FAS to develop a financial inclusion index. This may yield spurious results as the number of observations she had is not sufficient for her methodology of choice. As a result, in inspecting a time series relationship in Egypt, the author is partial to Mbatur and Uba and Lapukeni' s approach, as relying on data from central authority provides a sufficient proxy for financial inclusion and at higher frequencies than the FAS. Additionally, in the case of Egypt , it will allow for the inspection of both the household and SMEs sectors, a variable not yet captured by the FAS

3. Insights on the Egyptian Efforts in Financial Inclusion

As previously mentioned, financial inclusion has garnered popular global support in the previous decade; this is mostly due to its perceived effects on poverty alleviation and sustainable development. However, this thesis is chiefly concerned with financial inclusion and its effect(s) in Egypt. The purpose of this section is to contextualize the efforts, constraints and figures surrounding financial inclusion in Egypt; thus elucidating the landscape from which the data is derived and setting the stage for future recommendation.

I. The Importance of Financial Inclusion in Egypt

While the number of formally financially included Egyptians has risen progressively – from 9.7% of the population aged fifteen and over in 2011, to 14.1% in 2014 and 32.8% in 2017[7], financial access in Egypt remains below the 43.5% regional average in the MENA and the global average of 68.5%. Egypt has the capacity to include over 44 million adults into the formal financial sector[8]. With only 33% of Egyptian adults owning a financial account (and only 27% bank accounts are owned by females), the opportunity for growth is vast (Villasenor et. al., 2017; World Bank, 2019).

The Financial and Digital Inclusion Project (FDIP) issues an annual report that examines the efforts of twenty-six economically, geographically and politically diverse countries in improving access and utilization of formal financial services amongst the underserved segments of the population. Countries are given scores based on their performance on four metrics that measure different dimensions of financial inclusion: country commitment, mobile capacity, regulatory environment, and the adoption of traditional and digital financial services (Figure 3). Egypt had the lowest score amongst the twenty-six countries covered in the report due to the very low levels of engagement of low-income populations and women with formal financial services (Villasenor et. al., 2017). This low score highlights the necessity of financial inclusion for Egypt to be on par with its regional peers.

[7] According to the Global Findex Database 2017
[8] According to the World Bank Alliance for Financial Inclusion Report 2019

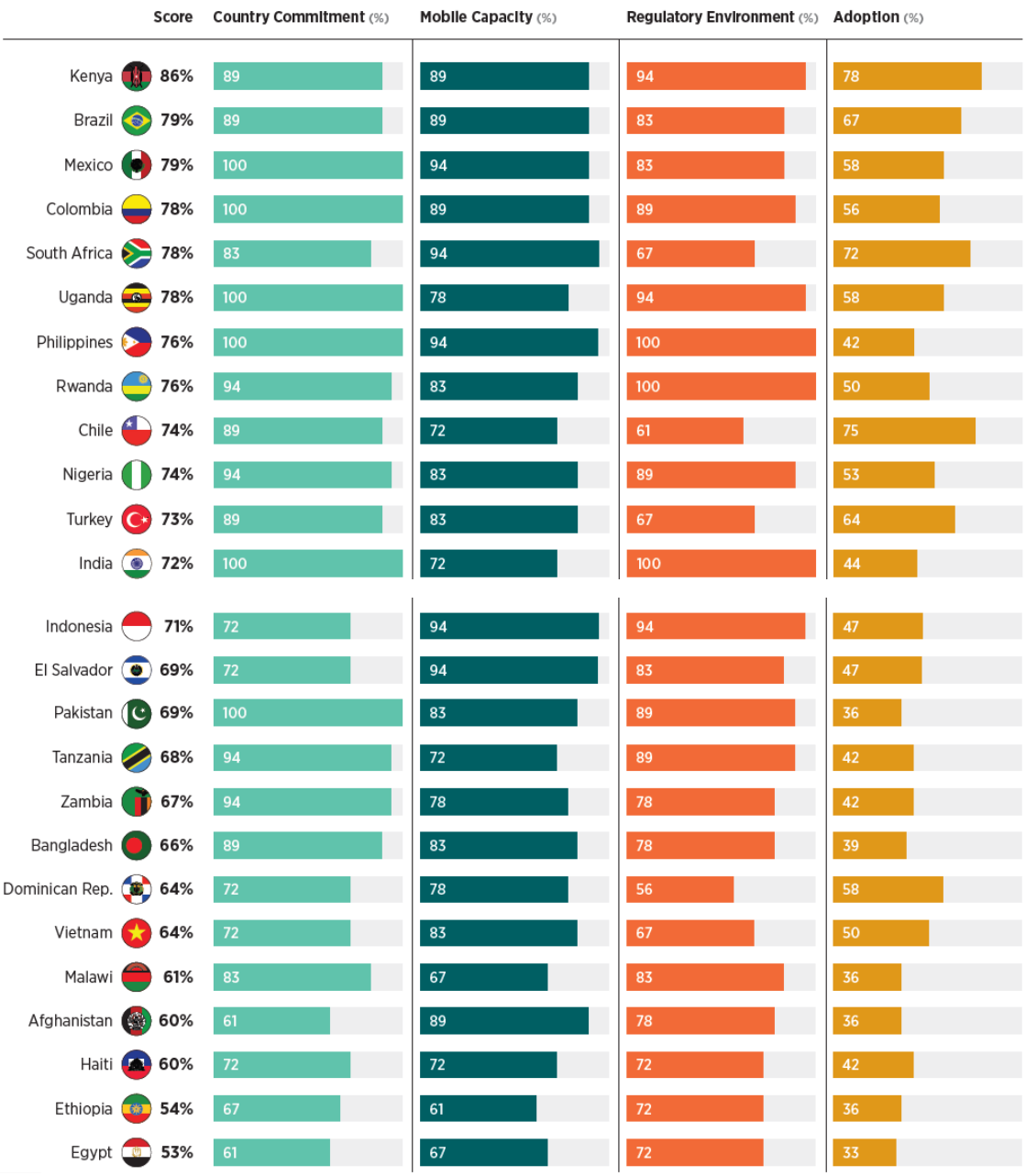


Figure 3- Infographic: FDIP Country Rankings; Villasenor et. al(2017)

Financial inclusion provides the opportunity of the Egyptian economy to reduce its informal sector, reduce tax evasion and income inequality (Soliman, 2020). Furthermore increased levels of financial inclusion present a positive correlation with popular sentiment and trust of the financial sector, thereby promoting financial stability. Rahman (2014) hypothesized that increased levels of financial inclusion will result in greater levels of social and political legitimacy. A consequence of high financial exclusion is that the

general public tend to view regulated financial institutions to be self-serving: the rich providing for the rich. Increased levels of inclusion can thus motivate the formation of a representative client base, which boost popular perception of the financial sector. This domino effect will ultimately result in increased levels of financial inclusion, increased transparency from the central banking authority, better monetary sector indices and better monetary policy.

Additionally, Egypt suffers from a high rate of inequality, poverty and illiteracy. Financial inclusion may serve as a tool that alleviates these issues as it permits households to spread their intertemporal consumption, and permit savings. The findings of Honohan (2004) and Beegle et. al. (2003) have illustrated the long-term effects of financial inclusion on income levels, education and financial literacy. They postulate that increase in incremental income of the household can result in reduced reliance on child labor, increasing child schooling years and ultimately result in a better educated labor force. This can result in decreased income inequality and reduced interaction with the informal financial sector. Better financial inclusion can enable the poor through enhancing their wellbeing and community status. In a more immediate sense, financial inclusion of MSMEs results in an immediate increase employment, increased entrepreneurship and local tax collection in the immediate community, which in turn, is re-invested to the social benefit of the community's residents.

II. National Level Initiatives

Financial Inclusion is an Egyptian National initiative. It is a goal and an instrument of realizing the "Sustainable Development Strategy: Egypt Vision 2030" : a national framework that guides the policy development and program implementation to achieve these seventeen Sustainable Development Goals (SDGs). The homegrown economic reform program includes measures to ensure macroeconomic stability and enhance social inclusion services. The Egyptian government has been taking active steps to advocate a more inclusive economy in the past decade. As a first step, Egypt joined the AFI in 2013.

As financial inclusion is to be achieved through the formal financial sector, the CBE has adopted the initiative and all its projects and events under its supervision. The CBE's

position is that financial inclusion will contribute to lower rates of poverty, unemployment, tax evasion, money laundry and financial crimes, as well as increase remittances, and profitability for the commercial banks. There is yet to be an official statement by the CBE that financial inclusion is promoted with the objective of improving monetary policy effectiveness

The CBE has communicated several circulars to the banking sector with regards to financial inclusion, highlighting the importance of it to the CBE.

Table 2: CBE Circulars Regarding Financial Inclusion

Date	Circular Summary
6th of April, 2017	The purpose of the circular is to set up the 27th of April as the "Financial Inclusion Day" as per the recommendation of the Council of Governors of the Arab Central Banks and Monetary Agencies. During which, financial institutions are allowed to send representatives outside their premises (to universities and public centers etc.) to market their products. Under the initiative of *"An Account for Every Citizen"* banks are to open accounts for no fees and no minimum account balance on that day. The circular continues to define FI, its benefits and highlights the role of the banks and the CBE within the initiative.
12th of April, 2018	Extended "financial inclusion day" to "financial inclusion week" from the 15th of April to the 30th of April. During which, financial institutions are allowed to send representatives outside their premises (to universities and public centers etc.) to market their products. Under the initiative of *"An Account for Every Citizen"* banks are to open accounts for no fees and no minimum account balance on that day. Banks are encouraged to collaborate with EBI to host info sessions on Financial Inclusion.
2nd of September, 2018	The purpose of the circular is to announce the setup of a database for collecting and analyzing data regarding financial inclusion to determine the real number of beneficiaries
17th of July, 2019	The purpose of the circular is to elucidate the regulations of GRC, KYC and AML with regards to Financial Inclusion. The circular further announced the setting up of a department at CBE that handles banks comments and requests. It further tasked banks with preparing a quarterly progress report for the products and services developed for financial inclusion.
5th of March, 2020	The circular directed all Egyptian banks to set up a separate financial inclusion department under the supervision of the CEO or VCEO. The department is tasked with coordinating internally with the bank departments as well as the CBE with all that pertains to financial inclusion. Their responsibilities include • Setting up a mid-term strategy (3 to 5 years) • Annual action plan that includes geographic expansion, product development, emphasizing youth and women, digital products expansion (wallets and prepaid cards)

<table>
<tr><td></td><td>

Promote financial literacy
Set up monitoring mechanism for FI projects and FI strategy
Offer recommendation to CBE FI Dept.
Collaborate with CBE for FI events
Hire and train employees in the department
Set up technical infrastructure for the products/clients/employees
Prepare periodic reports

The circular identified Mr. Khaled Bassiouny as representative in CBE and head of CBE dept.
</td></tr>
<tr><td>5th of October, 2020</td><td>The purpose of the circular was to further elucidate GRC and AML regulation with regards to financial inclusion. The circular instructed banks to exempt MSMEs FI clients from onerous documentation and oversight. MSMEs can open an account called an “economic activity account” . The circular also instructed banks to increase daily transfer limits to allow ease for MSMEs</td></tr>
<tr><td>29th of July, 2021</td><td>The purpose of the circular was to expand FI activities by introducing the following sanctioned events to better tailor events for target demographics
<table>
<tr><th>Date</th><th>Event</th></tr>
<tr><td>8th of March to 31st of March</td><td>International Women’s Day and Women’s Month</td></tr>
<tr><td>1st of April to 30th of April</td><td>Arab FI month</td></tr>
<tr><td>1st of August to 15th of August</td><td>International Youth Week</td></tr>
<tr><td>1st of September to 15th of September</td><td>National Farmer’s Day</td></tr>
<tr><td>15th of October to 31st of October</td><td>International Savings Week</td></tr>
<tr><td>1st of December to 15th of December</td><td>International Special Needs Week.</td></tr>
</table>
</td></tr>
<tr><td>1st of November, 2021</td><td>The purpose of the circular is to expand the segments of financial inclusion to include individuals living with disabilities. The CBE has instructed the Egyptian banks to include in their financial inclusion strategies provisions regarding accessibility. This has included making ATMs/ITMs of a suitable height for wheelchair users, ensuring ramps in all branches as well as accommodating those with vision or hearing impairments with the appropriate tools.</td></tr>
<tr><td colspan="2">The above is a summary of all CBE circulars regarding financial inclusion extracted from the CBE Webpage as of 5th of November, 2021</td></tr>
</table>

As part of the CBE's initiative, the National Council for Payments (NCP) was initiated in 2016 with the objective to ensure access to financial services with particular interest in women, youth and small business owners. The NCP is set to achieve its objective through three pillars:

- Reducing the use of bank notes outside the banking system
- Promoting electronic payments
- Modernizing and digitizing the national payments system.

The NCP is monitored by the CBE and Egyptian Financial Regulatory Authority (FRA).

The table below illustrated the implemented CBE tools for promoting Financial Inclusion

Table 3: CBE Tools for Financial Inclusion

Tools for Financial inclusion	CBE's Objective
Use of Mobile Wallets	Banks can initiate a mobile interface to conduct transactions. Each national ID is limited to two wallets. Initiated with the purpose of FINTECH collaboration to pay bills, receive government pension, make purchases, transfers and credit disbursements and monthly payments to/from borrowers (microfinance institutions).
Card-less ATMs	Allows cash deposit and withdrawal of mobile wallets users
International Money Transfers (IMT)	Receive IMT using mobile wallets.
Village Savings and Loans Associations (VSLA)	Group lending mechanism, participants organize themselves into credit groups to act as guarantor to one another as well as expand their credit to more than 4.5 Million EGP. VSLA members use their own savings account to access loan tranches.
Fast-Moving Consumer Goods (FMCG)	Facilitates digital payments between customer and merchants through the use of mobile wallets.
Mobile Merchant Payment QR codes	Complete small value transactions through QR codes that connect to merchant's accounts. Uses mobile wallets.
Nano-finance	Lending of low value credit to individuals or micro businesses. Credit score is based on I-Score [9]classification.
New Regulations for Mobile Payments	Transfers funds and remittances via mobile accounts.

[9] Credit scoring algorithm initiated in 2006 by the Egyptian Credit Bureau. The Egyptian Credit Bureau "I-Score" maintains a database of credit information for SMEs and consumers.

Meeza Prepaid Card	Meeza cards are issued for free and allow customers to withdraw cash from ATMs, conduct purchases and E-commerce transactions locally. Meeza Generic prepaid card (Karty) issued to anyone with a national ID and Meeza Governmental prepaid card ,issued to government institutions' employees.

Table Extracted from the 2017 Report *Facilitating Bank Account Transactions: Steps Towards Financial Inclusion in Egypt, Policy Recommendation* in the Federation of Egyptian Banks Meeting in 9/2017

Financial inclusion measures of the CBE were not targeted towards the households only, in fact, the CBE has set forth several initiatives for the SMEs in the past decade. In Egypt, there are over 2.5 Million registered SMEs representing more than 75% of the total employed workforce and 99% of non-agricultural private sector establishments (Al Said et. al., 2011). Access to finance remains one of the highest hurdles for SMEs to overcome, with several of them relying on capital or informal financing, particularly in the start-up phase. In this vein, the CBE has put forth its SMEs Initiative in December 2015. The initiative obligated all thirty-eight banks operating in the Egyptian market to dedicate a minimum of 20% of their loan portfolios to SMEs; the micro-projects were also included in the initiative at a later time. Furthermore, SMEs lending rates were capped at 5%, 7%, and 12%, depending on the type and size of the funded activity. Presently, the banking sector in Egypt approved around EGP 160 Billion to finance 86,000 small- and medium-sized projects. Mr. Tarek Amer, Governor of the CBE in an interview with Daily News on June 30th of 2020, pointed out that there are many banks that have already reached the percentage set in the initiative. The initiative has been extended for four more years as of January 1st, 2020.

III. The Effects of COVID-19 on Financial Inclusion and Banking Stability in Egypt

One of the major things that changed in the field of economics after 2020, is that there is not going to be a single economics paper that doesn't reference COVID-19. Much like the financial crisis of 2008, COVID-19 will become a precipice point in macro-economics. The Coronavirus pandemic affected the world as a whole with the economic indices serving as a barometer of the impact of the pandemic. Several industries were severely hit by the pandemic, namely exports, tourism and banking sector. Given high levels of defaults, the financial stability of Egyptian banks was compromised in the height of the pandemic. So much so that on May 11th President Abdel Fattah El Sisi passed a new law increasing Egypt's state budget by LE10bn ($635m) during the fiscal year. These extra funds were partly used to cover the wages of workers affected by the lockdown and alleviate the pressure on the financial sector. This was in addition to an LE3bn ($190m) initiative from the country's finance ministry, which was also launched on May 11th to help businesses in the tourism and financial sectors cover operational costs and workers' salaries (Oxford Business Group, 2020).

Though SMEs play an important role in the Egyptian economy, they are also some of the demographics most vulnerable to the effects of the COVID-19 pandemic. A series of bank regulations and funds were instituted to support SMEs creditors, they included removing penalties on late installments, rescheduling installments, and bridge finance to cover short term liquidity squeeze. The CBE also reduced fees on transfers and allowed for higher limits on transfers and wallet transactions.

Though not stated as an intention, several of the initiatives taken by the CBE in remediating the effects of the pandemic had the positive externality of promoting financial inclusion. The CBE published a report in December of 2020 describing measures undertaken to offset the impact of COVID-19. Of the eighteen measures taken, *seven* have inadvertently addressed barriers of financial inclusion. They include:

1. Cutting interest rates	4. Amending Credit Risk Registry rules to reduce weight of collateral	7. Amendments on the Financial inclusion simplified KYC
2. Facilitating the usage of electronic payments and online onboarding	5. Initiating electronic payments of taxes and customs through QR Code systems	
3. Adjusting interest rates on CBE initiatives including SMEs initiatives	6. Setting up 6500 ATMs across Egypt.	

In a report developed by Pharos Holding studying the financial impact of COVID-19 on twenty-six Egyptian banks, It was curious to note that banks that reported higher levels of financial inclusion accounts fared better than banks that reported lower levels of financial inclusion. This is due to a set of theories referred to as “risk absorption hypothesis” . The financial inclusion segments are less likely than the HNW to withdraw their deposits in periods of economic instability, higher deposits improve bank’s capital base , which in turn, improves a bank’s ability to absorb risk and create liquidity (Han and Melecky, 2013).

IV. Stylized Facts

The purpose of this section is to present some supplementary data to the Egyptian economy and financial sector in order to set the stage for hypothesis testing and recommendations. The stylized facts presented illustrate some economic conditions often associated with financial exclusion as well as valuable insights by FAS financial access and usage data. Though the FAS hosts several financial inclusion indices, they are not presented with the required frequency for intertemporal study, they are presented here to compliment the financial usage indicators that will be used in the scope of the econometric analysis.

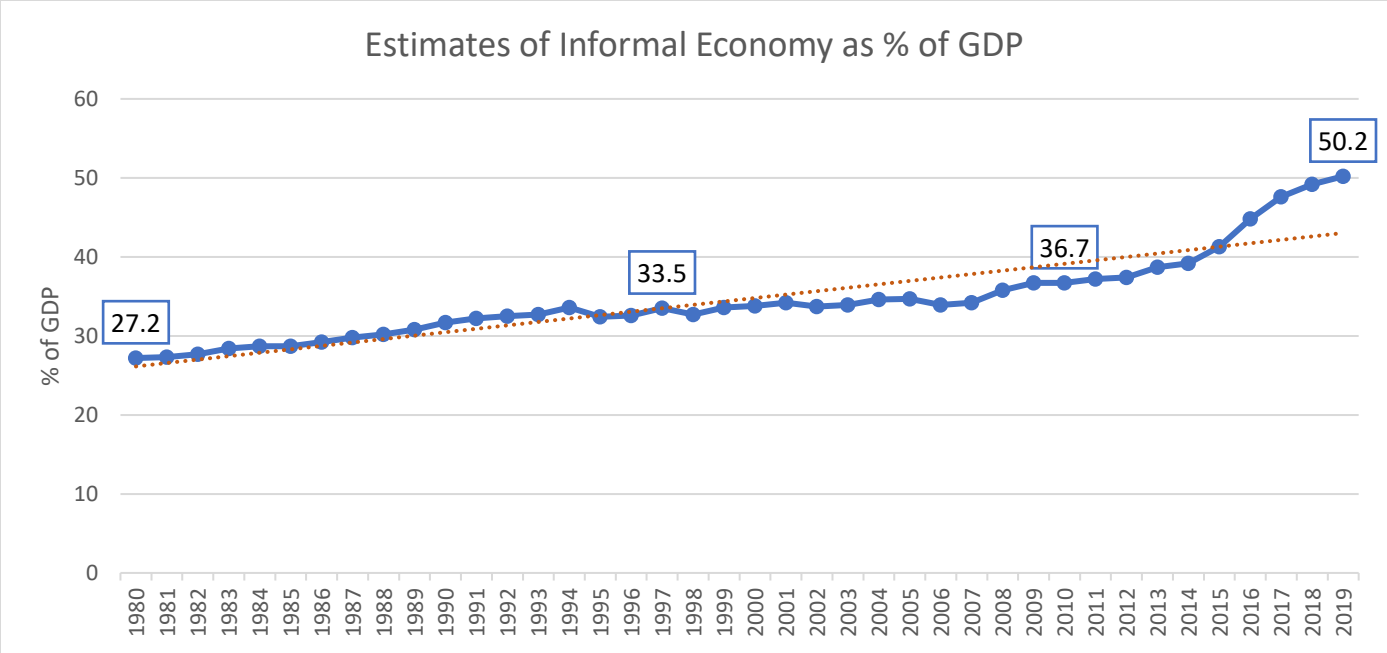


Figure 4 - Data Source: International Financial Statistics (2019)

Financial exclusion is a symptom of economies with large informal economies. The informal economy need not only mean "illegal" activities, it merely reflects economic activities that are not captured and recorded by the authorities and do not report income or taxes. Presently, the "shadow" economy in Egypt represents over 50% of the nation's GDP and over 68% of new jobs. Research indicates that the informal economy in Egypt grows in relative size to the formal economy by one-percent as the lowest estimate. Over the past five decades, the informal economy has been a haven for low-income families who seek cheaper good and services, small business avoiding corrupt authorities and tax collectors and those seeking employment but do not have the required documentation. Figures (4) and (5) illustrate the size of the informal economy in Egypt in terms of GDP and employment respectively.

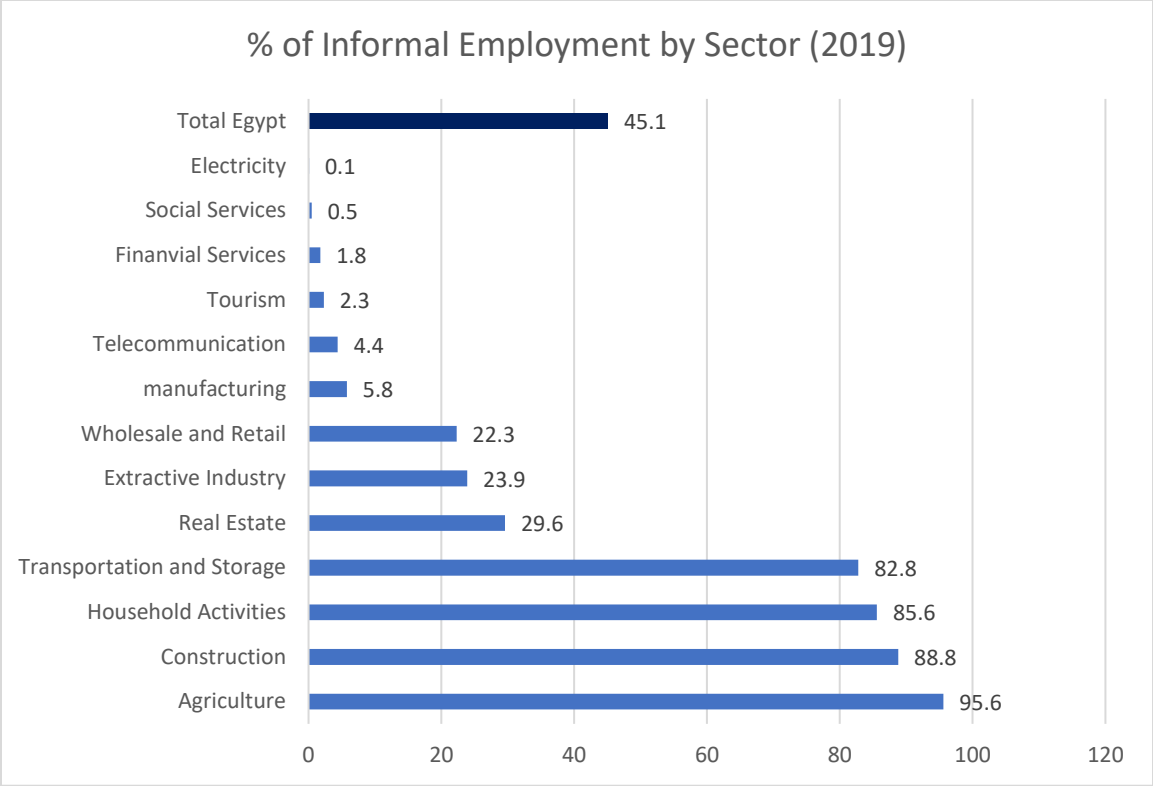


Figure 5 - Data Source: International Labor Organization (2019)

Financial inclusion was presented as a solution by the Federation of Egyptian Banks to formalizing the informal sector. They propose that if cash-less transactions becomes the norm for conducting business, the informal businesses will be forced to issue the required legal documents, and deal with regulated financial authorities in order to gain access to the digital financial infrastructure network. This is in line with government efforts to digitize its payment systems. If utilities, infringement tickets and other government dealings are cashless, business will be forced to issue a digital card from banks, thus increasing financial inclusion and reducing the size of the informal sector, even if marginally.

Presently, 67% of adults in Egypt solely rely on cash. The following graph illustrates the level of financial inclusion in Egypt, by highlighting the percentage of eligible adults with accounts at official financial institutions.

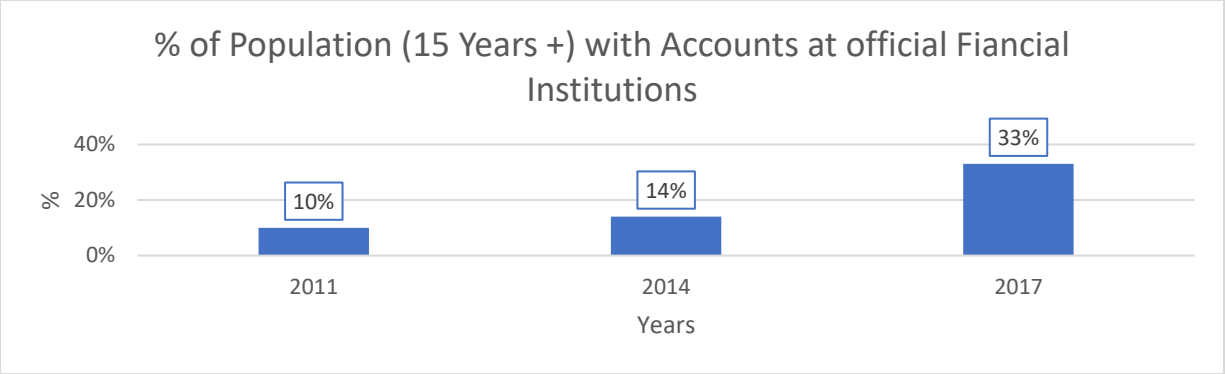
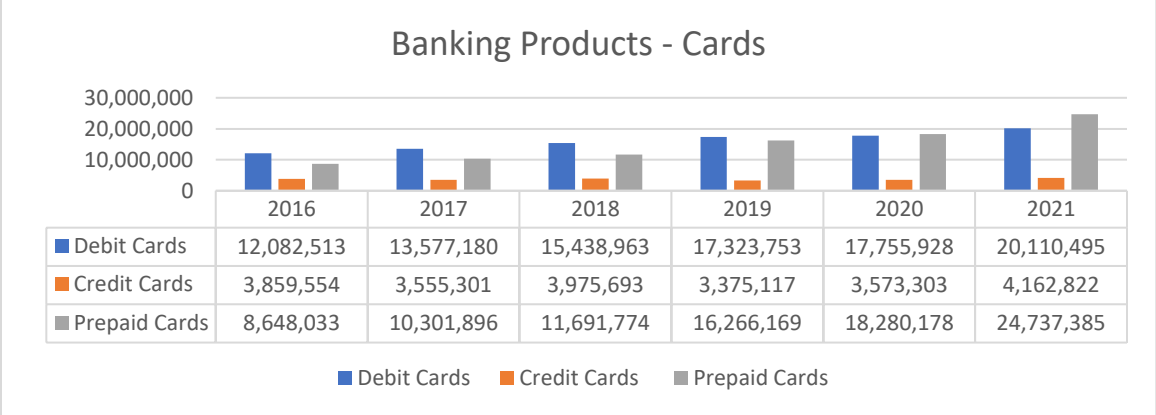


Figure 6- Data Source: Global Findex (2017)

The following stylized facts extracted from the CBE's bulletin illustrate the trend of promoting products and infrastructure in Egypt as of the initiation of the NCP



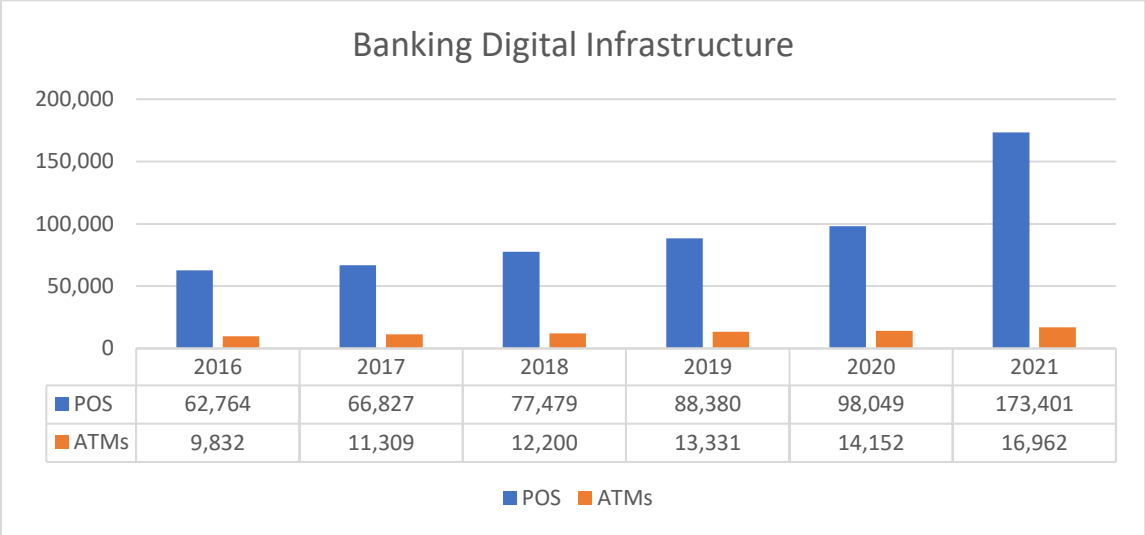
	2016	2017	2018	2019	2020	2021
Debit Cards	12,082,513	13,577,180	15,438,963	17,323,753	17,755,928	20,110,495
Credit Cards	3,859,554	3,555,301	3,975,693	3,375,117	3,573,303	4,162,822
Prepaid Cards	8,648,033	10,301,896	11,691,774	16,266,169	18,280,178	24,737,385

Figure 7- Data Source: CBE Bulletin, Banking Supervision Sector (Note: figures represented June of every year as the Egyptian Fiscal Year ends on 30/6)

The figure above illustrates the number of active cards [10] in Egypt. The number of debit cards has steadily increased since 2016, that figure illustrates an increase of eight million cards or around 66% increase in five years. Prepaid cards have more than tripled, largely due to the free issuance of the Meeza cards. Credit cards have experienced a modest growth of 303 hundred thousand card or around 8%. These figures corroborate the findings of Rashdan and Eissa (2019), the products that experienced the highest increase are the least expensive ones: debit cards and prepaid cards. Credit cards are expensive to issue and incur additional costs on the client in the forms of penalties. Rashdan and Eissa's research indicate that the main barrier to financial inclusion in Egypt is "not enough money", as

[10] The CBE Defines an active card as one that is used at least once a year

products commissions and rates exclude certain demographics. Additionally, lending products are on average less popular in the Egyptian community, due to a general risk aversion in the public, reliance on ROSCA and other informal forms of lending and a cultural and religious aversion to bank loans on the basis of usury (Rashdan and Eissa 2019).



[11]

Figure 8- Data Source: CBE Bulletin, Banking Supervision Sector (Note: figures represented June of every year as the Egyptian Fiscal Year ends on 30/6)

Digital infrastructure is a pillar of financial inclusion; it provides the most efficient forms of coverage with the lowest of costs. Points of Service (POS) machines have increased by 110 hundred thousand machine or around 176%, likely the result of similar increase in cards (total cards increased by 99%). ATMs have increased by 72%, this is the result of banks choosing to expand by means of Intelligent Teller Machines (ITMs) and ATMs rather than open new branches. ITMs and modern ATMs are capable of most ordinary business and retail transactions, additionally they are less costly to set up and maintain, furthermore, they are not regulated by the same law that require rigorous licensing of new branches.

[11] The observation of POS machines in 2021 excludes 508,078 POS machines owned by the payment facilitator company, Fawry as per Fawry' s agreement with 3 Egyptian Banks – National Bank of Egypt, Banque Misr and Alex Bank. This makes the total number of POS machines in Egypt 680,279

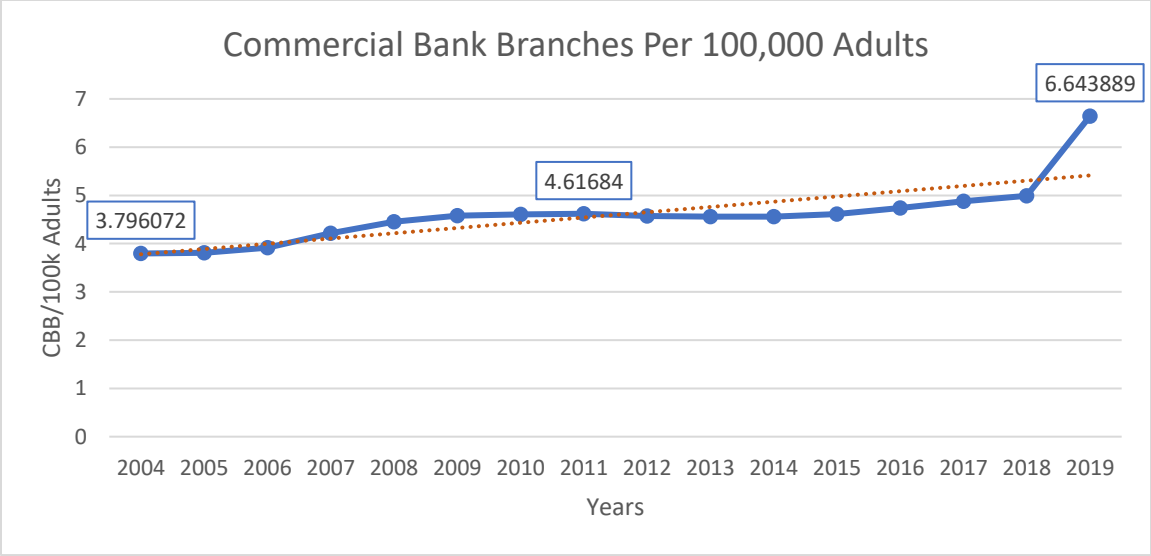


Figure 9- Data Source: Financial Access Survey (2019)

The setting up of commercial bank or other financial institution branches in Egypt requires the approval of the Board of Directors of the CBE. This is an arduous process and often stipulates that *new* branches must not be established, rather branches must expand by purchasing other bank's branches. Nevertheless, the law permits establishing of new branches particularly in areas with low branches density to promote financial inclusion. The number of branches per 100,000 adults in Egypt has subsequently doubled in the time period presented as commercial banks are expanding to new areas. This is also considering the establishment and population of New Cairo and Administrative Capital, which have precluded the establishment of several branches and posting numerous ATMs/ITMs; this accounts for the sharp upturn from 2018 to 2019. It is worthy to note that new areas developed in Egypt are largely populated with HNW individuals, this may lead to the effect postulated by Kumar (2011): banks are motivated by profit to seek HNW clients, thereby commercial banks' expansion ironically hamper financial inclusion.

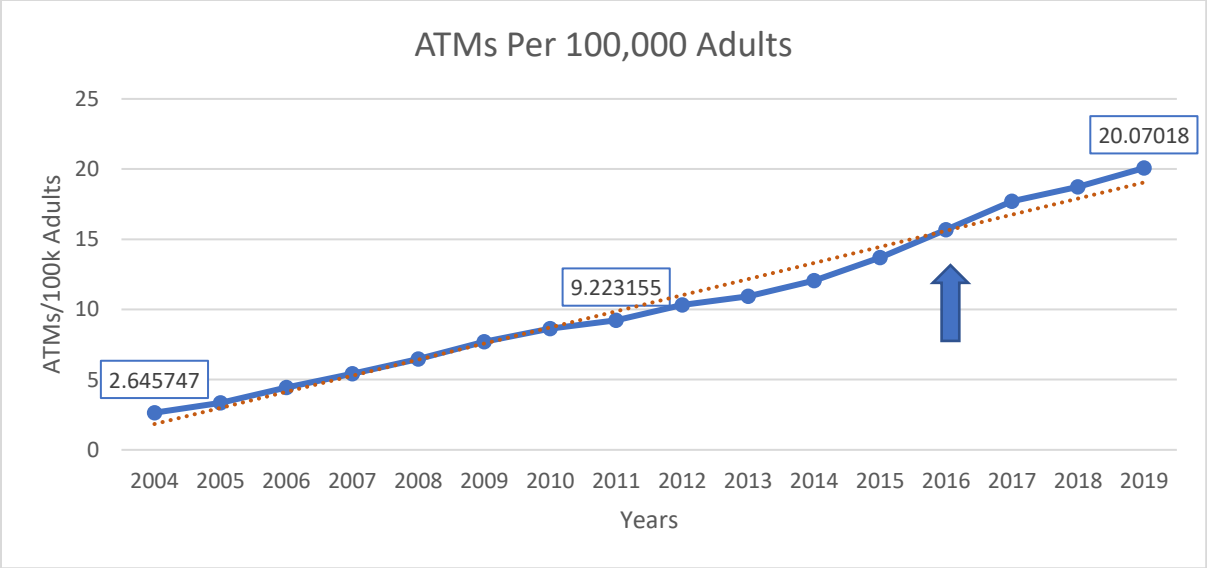


Figure 10- Data Source: Financial Access Survey (2019)

As previously mentioned, ATMs and ITMs expansion has become part of the necessary requirements of financial inclusion infrastructure. With the spread of mobile wallets and cards services, ATMs and ITMs has increased by more than tenfold during the period presented.

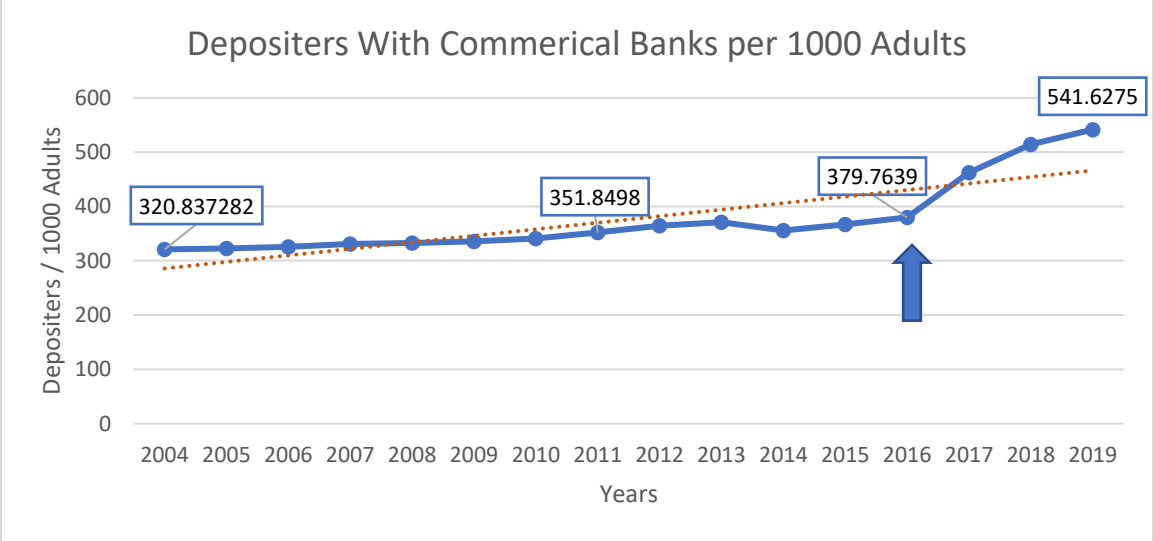


Figure 11 - Data Source: Financial Access Survey (2019)

Data on deposits and borrowers with the formal banking system is presented to compliment the financial inclusion indices that will utilized in the model. Though FAS observations are not sufficient to run a time series analysis, the insights they provide are

still valuable. The data from the central banking authority elucidates the outstanding value of deposits and loans in millions of EGP. Data on number of accounts are currently unavailable in the frequency required for the empirical analysis. Though regulation on maximum deposits and loans should be sufficient to conclude that the increase in value of deposits and loans are due to new to bank accounts rather than increase in volume of existing accounts, it is prudent to juxtapose these figures with FAS figures on number of accounts.

The figure above illustrates the number of depositors with commercial banks per 1000 adult for the period 2004 to 2019. Depositors with commercial banks increased by about 68% over the period observed, or about 220.8 depositors / 1000 adults. It is worthy to note the sharp upturn as of 2016 and the initiation of the NCP, wherein the growth rate from 2016 to 2019 is 42% whereas the growth rate from 2004 to 2016 is merely 18% over the twelve-year period.

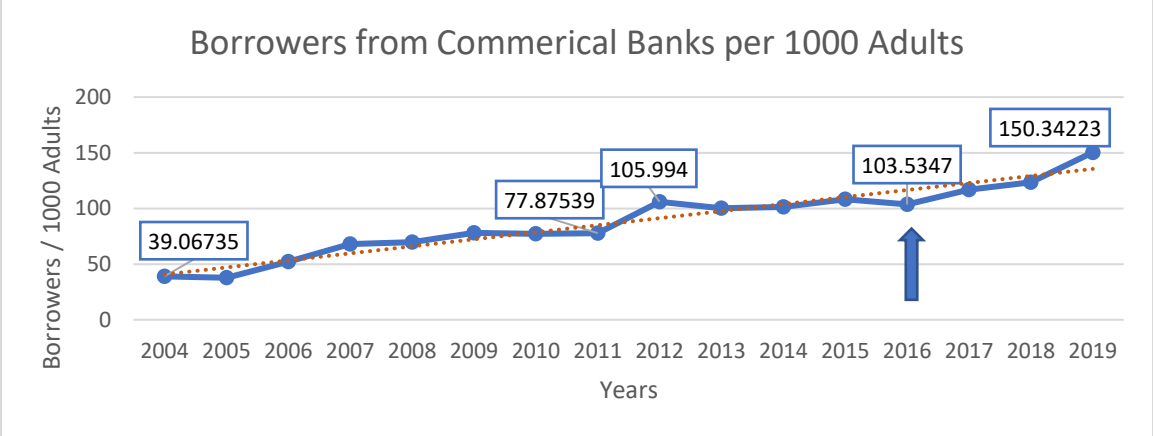


Figure 12 - Data Source : Financial Access Survey (2019)

The figure above illustrates the number of borrowers with commercial banks per 1000 adults for the period 2004 to 2019. The number of borrowers increased by 285% or about 111 borrowers per 1000 adult. It is worthy to note the sharp upturn witnessed in 2016 due to the initiation of the NCP, wherein the growth rate in the period is 45% over a three-year period. The sharp upturn in borrowing in 2012 is due to the repercussion of the Egyptian revolution which was characterized with a short-term liquidity squeeze.

4. Data

The objective of the thesis is to investigate the relationship between a metric of financial inclusion and monetary policy in Egypt. This constitutes three challenges: the first, finding a proxy of financial inclusion; the second, finding a proxy for monetary policy; the third, utilizing the appropriate econometric model. The first two challenges will be addressed in this section, the third will be addressed in the following section. The first challenge is particularly troublesome as most countries are just beginning to track and record their financial inclusion data. Supply side metrics, particularly those concerning Non-Banking Financial Institutions (NBFIs) , mobile banking and agent banking, are scarce and often incomplete.

As of the date of the thesis, the database with the most comprehensive set of metrics on financial access and utilization is the IMF Financial Access Survey (FAS), which was started in 2004. The database hosts indicators such as:

- *Access indicators*: Number of commercial bank branches per 1000 km^2; Number of commercial bank branches per 100,000 adults; Number of ATMs per 1000 km^2; and Number of ATMs per 100,000 adults.
- *Usage Indicators*: Number of borrowers from commercial banks per 1000 adults; Outstanding loans from commercial banks; Number of depositors with commercial banks per 1000 adults (or % of adults who are banked) and Outstanding deposits with commercial banks.

Other surveys such as the World Bank's Global Findex also use similar indicators. It is important to note that data on *Quality* of Financial Products have not yet been presented as of the date of this thesis, likely due to the fact that *Quality* is an unquantifiable component of financial inclusion. These data sets were used by Evans (2016), Sherif (2019), and Lenka and Bairwa (2016).

But despite the comprehensiveness of the FAS, its data cannot be used for the purposes of this study. The FAS database presently has annual data on the aforementioned metrices from 2004 to 2019, this is an insufficient number of observations for a time-series analysis. Authors such as Evans and Lenka and Bairwa were able to circumvent this issue by conducting a panel analysis of a region. This not only provided them with the necessary

number of observations, but also added a depth to their analysis as their research included a comparative study.

For the purposes of this research, however, we will use an adapted version of Mbatur and Uba (2013) and Lapukeni' s (2015) methodologies. Though supply side data could be improved, supply side data extracted from central banks or other supervisory bodies provide sufficient coverage on bank deposits and loans, and at higher frequencies. Borrowing from the FAS financial usage indicators, the data selected to proxy financial inclusion are:-

- Outstanding Deposits in EGP Million with banks from Q2 2004/2005 to Q2 2020./2021
- Outstanding Loans in EGP Millions with banks from Q2 2004/2005 to Q2 2020./2021

It is the belief of the authors, as well as the belief of the thesis, that simply investigating the amount of loans and deposits can be a sufficient proxy of both utilization and access, as those individuals must have had access to the financial institution to deposit or request a loan. Usage of banking services as measured through the above indices has the additional benefit of countering the effects of "No Frills" accounts and dormant accounts. Furthermore, in addressing the concern that these figures may just reflect increased volume of deposits and loans by already "financially accessible" individuals, regulation on maximum loans and deposit limits would indicate that the growth in those figures must be due to the increase in *number of depositors and borrowers*, rather than simply an increase in *volume of deposits and loans of the existing client base* .Additionally, the results of the model will be inspected in juxtaposition with the FAS's indicators on Depositors with commercial banks and borrowers from commercial banks per 1,000 adults as a form of robustness against the aforementioned concern[12].

This thesis expands on the work of Lapukeni, Mbatur and Uba by dividing the loans and deposits variables into *Households* (denoted with HH) and *SMEs Businesses* (denoted with P), which allows for a comparative analysis of the relative efficacy of each of those segments in facilitating the monetary policy transmission mechanism. Financial inclusion is not only an individual issue; as proven by the literature, small private businesses and

[12] Refer to Insights on the Egyptian Efforts in Financial Inclusion Stylized Facts sub-section for the relevant figures

SMEs struggle similarly with access to appropriate finance options. Furthermore, the CBE has implemented initiatives for financial inclusion for both households and small businesses sector, so it is myopic to only consider one of them over the other. Upon completion, the empirical model can theoretically determine which of those sectors is more conducive to financial inclusion, and which of them (if any) has a significant effect on monetary policy.

Sufficiently addressing the first challenge, we must now address the second challenge: determining a proxy for monetary policy. A ubiquitous argument is that as financial inclusion increases, the increased number of people with access to formal financial accounts will cause aggregate demand and investment to become more responsive to the monetary policy changes in interest rates (Mbutor and Uba, 2013). This will cause a reduction of the pressure on foreign exchange markets, stabilizing the local currency. One can then postulate the financial inclusion will work through the deposit banks' lending rates, money supply and the exchange rate of local currency to ultimately affect inflation.

Inflation is thus used as the dependent variable, as the price stability is the ultimate goal of monetary policy and thus the variable most appropriate to model policy success Ngalawa (2009) . Ngalawa also insisted that bank lending rate, broad money supply and the exchange rate contain critical information on the monetary policy transmission mechanism, as such they will be used as a series of control variables and to control for omitted variable bias. The opinion of Ngalawa is corroborated with findings in the reflection on empirical literature section, where it was observed that all empirical analysis on the effects of financial inclusion and monetary policy utilized a vector of foreign exchange rate, commercial lending rate and broad money supply as control variables.

Furthermore, the inclusion of the vector of control variable allows for the inspection of indirect effects in dynamic analysis. As observed in the literature, some authors deduced an indirect relationship of financial inclusion on monetary policy by way of the monetary policy channels of interest rates and money supply. As a result, the authors conclude that the inclusion of these variables are useful for (1) comparability (2) controlling for Omitted Variable bias (2) inspecting indirect dynamics.

Table 4: Summary of Data

Code	Variable Definition	Source
TOTDEPHH	Total Outstanding Deposits with Central Bank deposits (LCY and FCY) in EGP 000s . Households (2004 to 2020)	CBE statistical bulletin
LHH	Total Outstanding Loans in EGP 000s with CBE (LCY and FCY). Households (2004 to 2020)	CBE statistical bulletin
M2	M2 (broad money supply)	CBE statistical bulletin
IR	Commercial Lending Interest Rate	CBE statistical bulletin
INF	Inflation (Annual CPI)	CBE statistical bulletin
TOTDEPP	Total Outstanding Deposits with Central Bank deposits (LCY and FCY) in EGP 000s. SMEs (2004 to 2020)	CBE statistical bulletin
LP	Quarterly: Total Outstanding Loans with CBE (LCY and FCY). SMEs (2004 to 2020)	CBE statistical bulletin
FX	Foreign Exchange (USD to EGP) (2004 to 2020)	CBE statistical bulletin
All data are compiled Quarterly from Q2 2004/2005 to Q2 2020./2021		

The table above summarizes the data that will be used in the empirical analysis. Data codes, data definition and data sources are presented above. Quarterly data compiling yielded sixty-four total observations, which is sufficient to run a significant VAR and ARDL model. The size of data sets is important in autoregressive class of modelling as the best fit model may require numerous lags of observations, thus the data set must withstand "losing" some observations to the lag selection process without becoming spurious. This is an issue that brings into question the validity of the methodology selected by Sherif (2019) as the fifteen annual observations supplied by the FAS may not be sufficient to run a VECM model or a Granger Causality.

5. Methodology

Borrowing from similar studies, particularly those of Mbutor, Uba and Lapukeni, the research will utilize a VAR model. the VAR model is selected as the primary model for the thesis due to its ability to present the dynamic relationship between all the regressors, thus elucidating an indirect effect if it exists. Additionally, most empirical papers on monetary policy transmission mechanism have employed the VAR methodology in their analysis following the seminal work by Sims (1980). The thesis will supplement the findings of the VAR model with an ARDL model as well, as a form of robustness check. Though the ARDL has not been used in any empirical investigation of financial inclusion to date, it is useful to disentangle long-run relationships from short-run dynamics; it has also proven its robustness in inflation analysis of Egypt (Noureldin et. al., 2019). Both models as well as any statistical analysis will be conducted via E-Views 12.

The VAR model was developed by Christopher Sims with the purpose to model the joint dynamics and economic relationships among a set of variables. The VAR is an extension of the univariate autoregressive (AR), in that it allows for more than one evolving variable. The system consists of variables that each has its own explanatory equation based on its own lagged values, the lagged values of the other variables, and an error term

The ARDL model was initially developed by Pesaran and Shin (1999) for the purposes of analyzing long run dynamics when the underlying variables are integrated of level 1 – I(1). Then, the model was then adapted by Pesaran, Shin and Smith (2001) to test for the relationship between the dependent variable and the set of regressors, regardless of the levels of the integration of the variables, as long as they are integrated of a level below I(2). The ARDL model consists of a single dependent variable, the lag of the lagged dependent variable, and a vector of explanatory dynamic variables.

The empirical portion of the analysis must begin with a unit root test, which will be accomplished via an Augmented Dicky Fuller test and a Philips Perron test, the null hypothesis of which is the existence of a unit root (non-stationarity) is tested against the alternative hypothesis of that no unit root exists (stationarity). This is necessary as VAR models require that all variables be integrated of the same rank.

The next step will be to determine the maximum number of lags, which is a critical issue of VAR models. This involves a delicate balance between incorporating the number

of lags that adequately capture the nature of the relationship and eliminate serial correlation on one hand, but do not excessively reduce the degrees of freedom in the model on the other. The criteria for the lags determination will be the Schwartz Information Criterion (SIC) which was found to be the superior indicator in cases of a large sample (60 observations and above), in the manner that it minimizes the chance of underestimation while maximizing the chance of recovering the true lag length. It is also known for yielding the most parsimonious models, which counters the possibility of having excessive variables (Liew, 2004). The optimal lag length would then be verified by running a lag exclusion Wald test.

VAR models allow for supplementary analysis through the use of Granger Causality Tests, Correlation Matrix, Variance Decomposition, Impulse Response Functions and Johannsson Cointegration; all of which will be developed for the final specification.

The ARDL model will be presented after the VAR model. One of the benefits of the ARDL model is that it can tolerate variables of I(0) or I(1) integration, thus accounting for any discrepancy in stationarity levels. The ARDL also offers useful supplementary tests such as the Bounds Test, which will be conducted to test for the presence of long-term relationships between the variables.

With regards to the relationship between financial inclusion indicators and inflation we hypothesize the following:

- A significant relationship between financial inclusion indicators and inflation
- A negative coefficient for financial inclusion indicators
- The existence of a long run dynamic relationship between inflation and financial inclusion indicators

6. Results and Analysis

As outlined in the section above, the thesis will utilize both a VAR model and an ARDL model; but prior to inspecting the results of either models, we must first ascertain the stationarity of the selected variables. The Augmented Dickey Fuller and the Phillips-Perron tests both have the null hypothesis of having a unit root. The ADF and the PP are based on the below equation respectively:

$\Delta y_t = \beta_1 + \delta y_{t-1} + \alpha_t \Delta y_{t-1} + \alpha_2 \Delta y_{t-2} + \cdots + \varepsilon_t$ and $y_t = \alpha + \rho y_{t-1} + \varepsilon_t$; where ε_t is a white noise process.

The ADF and the PP tests are presented below.

Table 5: Augmented Dicky Fuller Stationarity Test

H0: A Unit Roots Exits							
	Level			1st difference			Conclusion
Variable Name	Intercept	Intercept + trend	None	Intercept	Intercept + trend	None	
INF	-2.9627**	-3.0202	-1.1858	-6.2064***	-6.1676***	-6.2545***	I(0)
M2	7.1533	1.6998	11.968	-1.8096	-6.7482***	-1.9462**	I(1)
IR	-2.4913	-2.5005	-0.8747	-2.2396	-2.2200	-3.7540***	I(1)
FX	-0.5956	-2.0553	0.5691	-5.2704***	-5.3058***	-5.1833***	I(1)
TOTDEPHH	8.0580	2.3568	12.398	-1.6029	-5.8343***	-0.0875	I(1)
LHH	13.0376	7.2878	18.319	-2.1547*	0.4772	3.0772	I(1)
TOTDEPP	1.1825	-1.1345	3.9929	-7.3095***	-7.5916***	-6.0419***	I(1)
LP	2.7578	0.0547	4.7585	-6.3127***	-7.2300***	-5.2699***	I(1)

*This table has the values of **the t-statistics** from the ADF tests, where automatic bandwidth selection is applied using the Newey-West bandwidth selection. The maximum lags specified was 8, given that the data is quarterly. ***, **, and * respectively mark statistical significance at the 1, 5, and 10 percent levels of significance.*

Table 6: Phillips Perron Stationarity Tests

H0: A Unit Roots Exits							
	Level			1st difference			Conclusion
Variable Name	Intercept	Intercept + trend	None	Intercept	Intercept + trend	None	
INF	-2.9184**	-2.4648	-1.9460**	-6.2109***	-6.1685***	-6.2581***	I(0)
M2	6.1838	1.3914	10.373	-4.2602***	-6.9073***	-2.0025**	I(1)
IR	-1.7472	-1.8587	-0.5492	-3.7976***	-3.7771**	-3.8165***	I(1)
FX	-3.9544	-1.8451	0.7962	-5.2812***	-5.3212***	-5.1798***	I(1)
TOTDEPHH	6.2288	1.6896	9.5526	-3.325**	-6.0956***	-1.4141	I(1)
LHH	12.2280	7.7646	13.876	-2.1465	-4.4107***	-1.0158	I(1)
TOTDEPP	1.1008	-1.1757	3.7668	-7.3376***	-7.5906***	-6.3135***	I(1)
LP	3.1992	0.2770	4.9839	-6.3127***	-7.1647***	-5.3042***	I(1)

*This table has the values of **the t-statistics** from the PP tests, where automatic bandwidth selection is applied using the Newey-West bandwidth selection. The maximum lags specified was 8, given that the data is quarterly. ***, **, and * respectively mark statistical significance at the 1, 5, and 10 percent levels of significance.*

The tests are run on the variables at level and at first difference. Even though the test allows for testing up to second difference, for the purposes of the model, variables integrated at a level above I(1) are spurious. The ADF and PP show mostly consistent and theoretical results. With Inflation (INF) being I(0), as it is essentially the first difference of CPI, and all the other variables are integrated at I(1). Though the VAR demands that all variables be integrated of the same order, this does not present an issue. All variables will be brought "down" to I(0) by calculating their respective first difference. There is no danger of over differencing as the change of the variables provide exactly the level of data needed for analysis i.e. how does he change in these variables affect inflation. Despite the fact that the ARDL model accepts variables integrated of I(0) or I(1), the ARDL model will also utilize the first difference of the explanatory variables to maintain consistency in comparing coefficients.

A supplementary unit root test – the Break Point Dicky Fuller Test – was utilized. Given the foreign exchange shock in 2016, there is legitimate concern that the data exhibits structural breaks. As a result, the ADF and PP test may confuse structural breaks for the existence of a unit root. The Break point test is presented below to address this concern

Table 7: Break Point Unit Root Test

H0: Unit Root Exists

Variable Name	Level			1st Difference			Conclusion
	Intercept	Trend and Intercept	Trend	Intercept	Trend and Intercept	Trend	
Inf	-4.607**	-4.473	-3.08	-7.70***	-7.630***	-6.418***	I(0)
FX	-16.68***	-4.536	-4.413*	-6.296***	-27.269***	-5.914***	I(0)
IR	-4.639*	-4.670	-4.64*	-5.44***	-6.482***	-4.524**	I(1)
M2	-1.536	-3.672	-3.615	-7.922***	-8.254***	-7.571***	I(1)
TOTDEPHH	-1.414	-3.416	-1.414	-13.33***	-14.432***	-13.33***	I(1)
LHH	0.377	-0.198	-0.277	-5.059**	-5.116*	-4.865**	I(1)
TOTDEPP	-3.693	-3.720	-3.815	-11.655***	-11.057***	-8.061***	I(1)
LP	-5.461***	-6.456***	-5.453***	-7.610***	-7.868***	-7.581***	I(0)

*This table has the values of the t-statistics from the Break Point tests. The optimal lags was determined automatically by the F-Statistic as it is the preferred method for large data sets (more than 60 observations) . ***, **, and * respectively mark statistical significance at the 1, 5, and 10 percent levels of significance.*

There is some discrepancy between the breakpoint test and the ADF and PP tests yet is does not affect the approach that will be utilized. All the financial usage indices and the full vector pf control variables will be brought down to I(0) is the rate of change is the level of data required for this investigation.

Following the unit root tests and determining the stability of the forthcoming models, nine specifications of both the ARDL and the VAR models were run. The selection of the specifications was determined as thus:

- All Financial Inclusion variables must be present in all regression specifications as it is the purpose of the thesis to inspect their dynamic relationship with inflation.
- Inflation remained the dependent variable (in ARDL) as the literature indicates.
- Monetary policy indicators are added one by one and then two at a time and finally the full vector of control variables is added.

A quick summary for the forthcoming findings is presented below to be explored further in the results section.

- Deposits (either households or SMEs) are consistently significant and follow the hypothesized sign (negative). Variations in the specifications reflect different levels of significance (10%, 5%, or 1%) and magnitudes of the coefficients.
- Loans by SMEs exhibit a positive coefficient in some specifications. This may be indicative of predatory lending or overextension of loans to clients with poor credit worthiness, which contributes to a bank's rate of NPLs, compromising the bank's – and in a larger scale, the financial sector's – stability.
- Inflation is *highly* affected by its own momentum which is compliant with theory
- Broad money supply and FX are consistently significant in the specifications they appear in, but there is a general insensitivity to interest rates

I. All Models Specification

a. The VAR Models

Table 8: Summary of VAR Specifications

Spec.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Variables	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, interest rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, exchange rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, interest rate, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, interest rate, exchange rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, broad money supply, exchange rate	Inflation, interest rate, exchange rate, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, exchange rate, interest rate, broad money supply
Sig. variables	Loans to SMEs *** deposits to households ** deposits to SMEs ** Inflation***	Loans to SMEs** deposits to households* deposits to SMEs** Inflation***	deposits to households* deposits to SMEs** Inflation***	deposits to households*** deposits to SMEs* Broad Money supply*** Inflation***	deposits to households*** deposits to SMEs* Broad Money supply*** Inflation***	deposits to households* deposits to SMEs** Inflation***	deposits to households*** deposits to SMEs* Broad Money Supply*** Inflation***	Broad Money supply* Inflation***	Exchange rate* deposits to households*** deposits to SMEs* Broad money supply*** Inflation***

*Shaded specification is selected as the **main** model*

** significant at 10%*
*** significant at 5%*
**** significant at 1%*
Note: (1) the optimal lag selected according to the Schwarz Criterion was 1
Refer to Table (14) in appendix for full table, including coefficients, signs and R^2

b. The ARDL Models

Table 9: Summary of All ARDL Specifications

Specs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Variables	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, interest rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, exchange rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs , deposits to Households, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, interest rate, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, interest rate, exchange rate	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, broad money supply, exchange rate	Inflation, interest rate, exchange rate, broad money supply	Inflation, loans to SMEs, Loans to Households, deposits to SMEs and deposits to Households, exchange rate, interest rate, broad money supply
Lag Length	2,0,0,0,3	1,0,1,0,3,0	1,0,0,0,3,3	2,0,0,0,1,3	1,0,1,0,1,0,3	1,0,0,3,1,0,3	1,0,0,0,3,3,0	2,0,0,3	1,3,0,0,0,0,3
Sig. SR variables	Total deposits to SMEs* (-1)*** (-3)***	Loans to SMEs** Deposits to SMEs* (-1)** (-3)*** interest rate**	Deposits to SMEs*** (-1)* (-3)*** Exchange Rate** (-1) * (-3)***	Loans to SMEs** Deposits to households** broad money supply*** (-3)***	Loans to SMES** Deposits to households (-1) *** Money supply(-1)*** (-2)* (-3)***	Deposits to SMEs*** (-3)*** Deposits to households* (-1)* Exchange rate*** (-1)** (-3)***	Deposits to SMEs (-1)* (-3)*** Exchange rate*** (-1)* (-3)***	Exchange rate*** Broad money supply** (-1)*** (-2)* (-3)***	Exchange rate*** (-1)* (-3)*** Deposits to households** Deposits to SMEs (-1)* (-2)* (-3)***
Sig. LR variables	Deposits to SMEs***	Deposits to SMEs** Interest rates**	Deposits to SMEs** Exchange rate***	Loans to SMEs*	Loans to SMEs** Interest rate**	Deposits to SMEs* Deposits to households** Exchange rate***	Deposits to SMEs*** Exchange Rate***	Exchange Rate*** Broad money supply***	Deposits to SMEs*** Deposits to households** Exchange rate*** Money supply*

*Shaded specification is selected as the **main** model*

** significant at 10%*
*** significant at 5%*
**** significant at 1%*
Note: (1) all specifications pass the Bounds Test
Refer to Table (15) in appendix for full table, including coefficients, signs and R^2

The *main* model selected is specification 9, which represents inflation, the four financial inclusion variables, and the full vector of monetary policy control variables. The model selected exhibits a satisfactory balance of significance and parsimony (as represented by the adjusted R^2, F-statistic and Schwartz Criterion). Additionally, as the methodology of the thesis is "borrowed" from the papers of Mbatur and Uba (2013) and Lapukeni (2015), it was more prudent to maintain the specifications they selected. Though the other specifications rendered significant insights, beyond proving the hypothesis of the thesis, the thesis aims to compare its findings with the larger corpus. As a result, to maintain comparability, the model selected and elaborated was the ninth specification. The eight unselected specifications will serve as a robustness check for the main model and their insights will be used to strengthen the recommendation section.

II. The Selected VAR Model

a. Lag Length Selection

In determining the optimal lag, the thesis utilized the lag length selection option of EViews 12. Allowing for a maximum of eight lags, given that the data was quarterly, the SC Criterion (refer to Appendix 1, Figure 16) determined the optimal lag to be one. This insinuates that variables have a significant impact on one another up to one period after the event. The existence of a lag additionally validates that use of the auto regressive model. A Lag Exclusion Wald test (refer to Appendix 1, Figure 17) was also administered to determine the necessity of the lag. The joint Chi-Squared test leads to rejection of the Null Hypothesis – that the lags are unnecessary – advocating for the inclusion of the lag.

b. Roots of Characteristics Polynomial

To ascertain the stability of the model, it is important to inspect the Roots of Characteristic Polynomial. The VAR's stability is important particularly with respect to the IRF as it counters the possibility of explosive results. Figure 13 below illustrates the unit circle of the inverse Roots of the AR Characteristic Polynomial. All variables lie within the unit root circle, indicating the stationarity of the model; this reaffirms the findings of the ADF and the PP tests. The Figure below is further corroborated by Figure 18 in Appendix 1, as the Roots of the Characteristic Polynomial indicates that the eigenvalues of all variables are less than one in modulus.

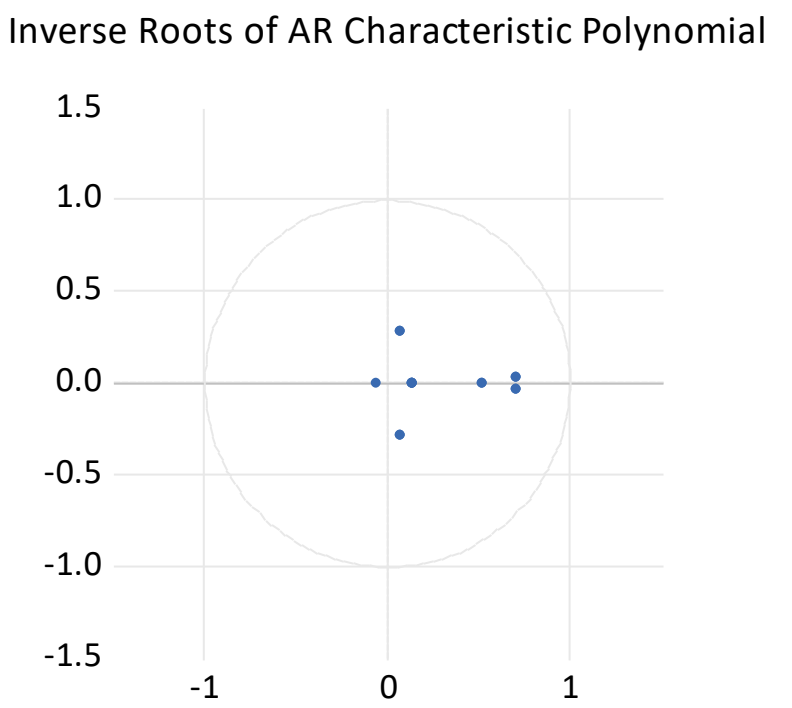


Figure 13 - Author's Output via EViews 12

c. Model Output

The unrestricted VAR as developed by Sims (1980), which allows for dynamic interactions between the variables of a system without impinging on the theoretical structures on observation estimates follows the following equation:

$$Y_t = \beta_0 + \sum_{k-1}^{p} \beta_k Y_{t-k} + \varepsilon_t$$

Where:

- Y_t is a K×1 vector stochastic process that includes all the variables in the system
- β_k are K×K matrices
- ε_t is a vector of white noise process satisfying three conditions
    - $E(\varepsilon_t) = 0$
    - $E(\varepsilon_t \varepsilon'_{t-s})=0$
    - $E(\varepsilon_t \varepsilon'_t)=\Sigma$, *a positive definite matrix*

The full Model Output is presented in Appendix 1, Figure 24. This section will discuss and analyze the insights of the model. The VAR model allows for dynamic analysis of all variables simultaneously. The exchange rate, commercial lending interest rate, broad money, total deposits to SMEs, total deposits to households, outstanding loans to SMEs and outstanding loans to households equations all have low R^2 levels, illustrating the poor explanatory power of the respective regressions. Their results will thus be interpreted with a grain of salt. Exchange rate was not significantly influenced by any variables, including its own lag which can insinuate the existence of hidden peg (Noureldin et. al, 2019). Interest rate is only significantly affected by its own lag. It is curious to note that changes in inflation rate do not affect changes in interest rates. This mirrors the findings of Ngalawa (2004) and Magnani (2012). Both authors insinuated that in cases where the interest rate is not influenced by inflation, it can imply that the central banking authority is not inflation targeting, or that the central banking authority is not truly independent, as a result, does not set its lending or deposit rates according to inflation or other financial sector markers.

Contextualizing this findings to the Egyptian Economy, the CBE Monetary Policy Report I for 2021 states that given the high inflationary pressure experiences from Q4 of 2020 to Q3 of 2021, The CBE "*intends* to put in place a formal inflation targeting framework to anchor monetary policy once the fundamental prerequisites are met. This will further enhance the predictability and transparency of the monetary policy in Egypt. In the transition period, the CBE will meet its inflation objectives by steering short term interest rates, keeping in view the developments in credit and money supply, as well as a host of other factors which may influence the underlying rate of inflation". The *intention* to set an inflation target alludes the lack of a current inflation targeting framework, strengthening the argument of Ngalawa and Magnani.

Loans to households is significantly affected by exchange rate and its own lags at the 1% level and broad money supply at the 10% level. LHH represents the outstanding loans by households, total of local currency and foreign currency. As a result, the fact that it is significantly affected by exchange rate is logical. As exchange rate increases, household loans decrease. This means that as the exchange rate increases local borrowers are dissuaded from borrowing in foreign currency, as the interest rates on foreign debt would be exponentially high. Broad money supply increases outstanding loans by households; by increasing the

money supply in the economy, the CBE encourages private consumption. Increasing money supply decreases the interest rate, which encourages borrowing and investment.

Loans to SMEs, loans to households, deposits to SMEs, are seemingly unaffected by any variable. It is curious to note that the instruments of monetary policy are not significantly affected by inflation. This insinuates the findings of Noureldin et. al (2019) that (1) there are structural rigidities in the Egyptian economy that disrupt monetary policy. (2) the potential prevalence of a monetary policy that is accommodative of fiscal policies at the expense of volatile inflation.

Table 10: Summary of Selected VAR Findings
Inflation Equation

Regressors	
d_FX(-1)	0.174* (1.646)
d_IR(-1)	0.065 (0.569)
d_LHH(-1)	-0.042 (-0.262)
d_LP(-1)	0.076 [0.424]
d_TOTDEPHH(-1)	-1.559*** (-3.212)
d_TOTDEPP(-1)	-0.184* (-1.666)
d_M2(-1)	1.854*** (2.640)
INF(-1)	0.841*** (11.392)
C	1.181 (0.848)
Adjusted R^2	0.7927

Values represent coefficients
() are t-statistics
** significant at 10%*
*** significant at 5%*
**** significant at 1%*

Despite the lack of the explanatory power of the other regressions, Inflation (the variable of interest) had an equation with an adjusted R^2 of 79%, highlighting the explanatory power of the model. A summary of the inflation equation outputs is presented in Table (10) above. As the model utilized the first difference of the explanatory variables, the inflation equation now looks like:

$$inf_t = \beta_0 + \beta_1 D\_TOTDEPHH_{t-1} + \beta_2 D\_LHH_{t-1} + \beta_3 D_{TOTDEPP_{t-1}} + \beta_3 D_{LP_{t-1}} + \beta_4 D_{IR_{t-1}} + \beta_5 D_{FX_{t-1}} + \beta_6 D_{M2_{t-1}} + \beta_7 INF_{t-1} + \varepsilon_t$$

Inflation is highly influenced by its own lag, highlighting the persistence of inflation in Egypt, which complies with theory. Money supply had a significant positive effect on inflation that is compliant with theory. Interest rates, however, did not have a significant effect on inflation. This mirrors the findings of Lapukeni (2015) who later concluded that the "indifference" of inflation to interest rate is a result of financial *exclusion* halting the monetary policy transmission mechanism.

Inflation is influenced by the change in exchange rate in the first lag. This is not surprising given the volatile inflation experienced post the currency floatation in late 2016. Furthermore exchange rate had a positive coefficient with regards to inflation, which complies with theory as Egypt is a net importer.

FI *usage* variables have very significant effect on inflation, namely, total deposits by households. This indicates that households are the most significant sector in facilitating financial inclusion. Total deposits by private business are weakly significant. It is worthy to note that both variables express the hypothesized signs. Neither loans indices are significant, which indicates that deposit products are the more significant contributor to financial inclusion, as well contributing positively to financial stability. This mirrors the findings of Khan (2011) as well as Hannig and Jasen (2010) and Han and Melecky (2013). The authors jointly concluded that lower income groups – the targets of financial inclusion – are less likely to engage in "bank runs" in the downturn of economics cycles. Thus, including them in the financial sector will likely raise the sector's overall stability. As financial inclusion means allowing the entry of more small savers – depositors – in the financial system, the deposit volume and its stability would rise, diminishing the reliance on non-core financing, which has deteriorating impact in times of financial catastrophe. Consequently, financial inclusion

measured by increased access and utilization of deposits, can build a stronger bank's deposit base, which act as a stability cushion in periods of financial trauma. The aforementioned impact is particularly significant in middle income countries.

It is worthy to note, however that loans issued to SMEs exhibits a sign that is the opposite of the hypothesis. Though not significant in this specification, the positive coefficient was significant in other specification, this can serve as an early warning sign of predatory lending or overextension of loans to clients with poor credit history in the SMEs sector. This can compromise the stability of the financial sector similar to Khan (2011) findings.

d. Model Residuals

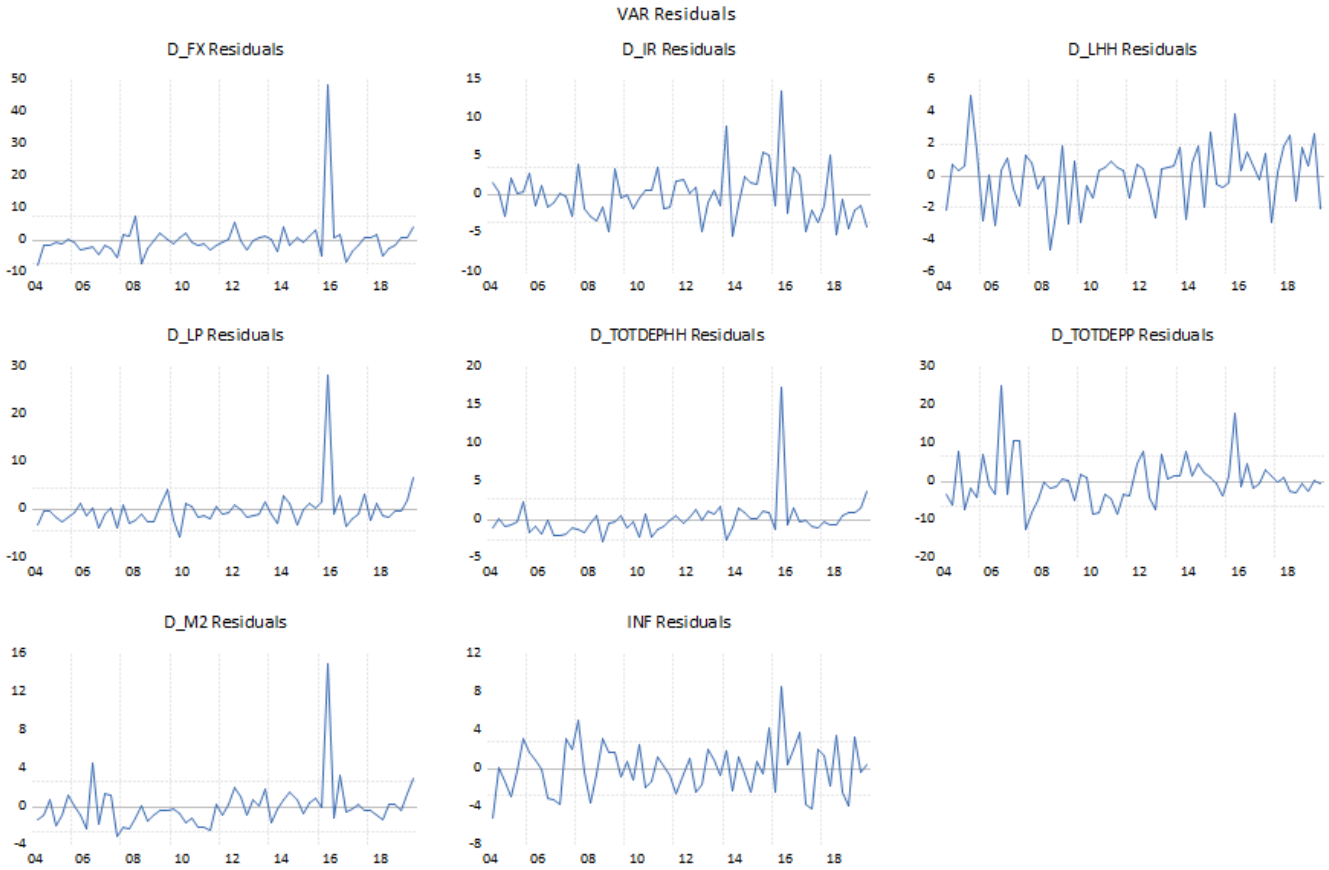


Figure 14-VAR Model Residuals. Author's Output Via EViews 12

The model's residuals are presented in Figure 14 above. The graphs of the residuals above challenge an assumption of the VAR model: constant variance. This is mostly due to the effect of singular event – the floatation of the pound in 2016 – that severely impacted the

banking sector and the overall economy in Egypt. This indicates that the constant variance is not the result of faulty data, but of a critical outlier event. As a result, this event cannot be dropped or ignored in the analysis. Though this presents a caveat in analysis, however, other tests (refer to Appendix 1, Figures 19 and 20) show that the model is well specified.

e. Johansson Cointegration

The Johansson Cointegration tests seeks to find if a cointegration relationship – or rather a long-term relationship – exists between the variables. The test is considered the superior test of cointegration. The cointegration rank tests can be found in Appendix 1, Figure 21. The results are summarized here for clarity. The null hypothesis of the Johansen test is that there is no co-integration equation, and the decision criteria is based on two values; the trace and maximum eigenvalue statistic; if they are bigger than the 5% critical value, the null hypothesis is to be rejected. The Trace test indicates that there is at least four cointegrating relationships, as the test rejects the null hypothesis at the 5% level. The Eigenvalues test confirms the findings of the Trace test, but it determines the existence of only two cointegrating equations. Nonetheless, both tests confirm the existence of a stable long run relationship in the system.

A key assumption of the Johansson Cointegration is that all values are integrated of level I(1). This assumption is challenges somewhat in this system as inflation is integrated of I(0), however, as it is one variable, it does not profoundly affect the validity of the results. The results of the Johansson Cointegration are also presented in juxtaposition with the ARDL's Bounds test for robustness.

Table 11 : The Cointegrating Equation

Normalized Cointegrating Coefficients (Standard Error) [t-statistic]

INF	TOTDEPP	TOTDEPHH	M2	LP	LHH	IR	FX
1.00	0.01436	0.03506	-0.7609	-0.0068	0.0021	7.38	-32.11
	(0.00724)	(0.0099)	(0.246)	(0.0025)	(0.00019)	(1.33)	(2.55)
	[1.98]**	[3.541]***	[-3.09]***	[-2.633]***	[10.69]***	[5.55]***	[-12.6]***

The cointegration equation is summarized in Table 11 above. It is important to note that the cointegration equation coefficients have the opposite sign of their impact. So, if a

coefficient appears in the cointegration equation with a positive coefficient, it has a negative impact and vice versa. The variables of financial utilization all have a stable long-term relationship with inflation. Total deposits by both households and SMEs have a strong negative impact on inflation. Money supply consistently has a positive correlation with inflation, compliant with theory. Loans appear to have an opposing sign in the long term, with loans issues to households having a negative impact on inflation and loans issued to SMEs having a positive impact on inflation. This can be indicative of predatory lending or poor credit worthiness, which implies that if SMEs lending continues with the same trend, it can deeply impact financial stability and the banking sector .

Since a cointegrating relationship exists between the variables of the model, a VECM was model generated at the first difference. Figure 22 in the appendix illustrates the output of the VECM model. the error correction term (CointEq1) is -0.3557; the negative sign implies the convergence to a long-term equilibrium. The results imply that the error of the previous period is corrected in the following period with a rate of 35%, which can be considered a moderate pace of adjustment.

f. Granger Causality

Granger causality has a null hypothesis in the negative; x does not granger cause y. It is exclusive to vector analysis and is considered the standard method to determine whether one variable is useful in predicting another and it is a good indicator of whether a VAR is needed. The term 'causality' is misleading. It is in fact a temporal precedence rather than causality. Because it could be that there is a *z* variable excluded from the system causing the changes of both *x* and *y* variables (does not account for indirect effects). As a result, granger causality indicates that one variable's movement tends to precede the other.

The table below highlights the Granger Causality of Inflation. Jointly, all the explanatory variables granger cause inflation. However, inflation does not granger cause any of them. Thus, it is a single direction of causality. With regards to financial inclusion indices, it is perhaps further evidence of the effect of financial usage in facilitating monetary policy. This mirrors the findings of Lapukeni and Mbatur and Uba, but conflicts with the findings of Evans and El Sherif who alluded to a reverse causality. Granger causality for the system as whole can be found in the Appendix 1, Figure 23

Table 12: Granger Causality of Inflation

Variable	DF	Prob	Direction of Causality
d_FX	1	0.0922*	FX → INF
d_IR	1	0.5688	IR → INF
d_LP	1	0.6717	LP → INF
d_LHH	1	0.7929	LHH → INF
d_M2	1	0.0083***	M2 → INF
d_TOTDEPHH	1	0.0013***	TOTDEPHH → INF
d_TOTDEPP	1	0.0728*	TOTDEPP → INF
Joint	7	0.0000	All variables Granger Cause inflation

** significant at 10%*
*** significant at 5%*
**** significant at 1%*

g. Variance Decomposition

In econometrics and other applications of multivariate time series analysis, a variance decomposition or forecast error variance decomposition (FEVD) is used to aid in the interpretation of the VAR model once it has been fitted. The variance decomposition indicates the amount of information each variable contributes to the other variables in the autoregression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. The Decomposition of interest is the Inflation decomposition.

Table 13:
Variance Decomposition of Inflation

Period	S.E	D_FX	D_IR	D_LHH	D_LP	D_TOTDEPHH	D_TOTDEPP	D_M2	INF
1	2.78	20.82	2.39	0.10	0.61	0.62	2.22	0.02	73.11
2	4.51	36.69	3.30	0.58	2.03	2.85	1.89	4.92	47.71
3	5.51	40.17	5.34	0.64	2.25	3.72	3.42	5.48	38.95
4	6.06	39.98	7.54	0.65	2.05	4.43	4.36	5.68	35.26
5	6.37	39.38	9.26	0.68	1.87	4.91	4.77	5.83	33.36
6	6.55	38.96	10.44	0.71	1.77	5.19	4.91	5.91	32.06
7	6.65	38.70	11.21	0.74	1.72	5.35	4.95	5.95	31.35
8	6.72	38.55	11.69	0.76	1.70	5.43	4.95	5.96	30.92
9	6.74	38.46	11.99	0.78	1.70	5.48	4.93	5.95	30.67
10	6.77	38.42	12.17	0.79	1.70	5.50	4.92	5.94	30.53

Inflation starts with almost 73% of its variation caused by its own persistence. However, as time goes on, namely 10 periods or 2.5 years, only a third of its variation is due to its momentum. It is worthy to note that the initial value decays to half by the following period. In the meantime, total deposits by households begin to account for 5% of the variance of inflation in the following period – a mere quarter. Total deposits by both households and private businesses account for 10% by end of the periods presented. It continues to increase and has a modest impact on inflation by the end of the period illustrated.

It's worthy to note that the impact of total deposits overshadows the impact of M2, a monetary policy instrument, at all periods. The lack of influence that interest rate and M2 has on inflation also echoes the sentiments of Magnani (2012) who alludes that the reason of interest rate "insensitivity" may be due to (1) lack of independence of the central banking authority (2) a large informal economy that is largely apathetic to changes in interest rates.

h. Impulse Response Function

The impulse response function is an essential tool in the VAR model to analyze its dynamic properties and measure the changes in the future responses of all variables in the model when a variable is shocked. The IRF was generated with different Cholesky orderings, yet it seems that there is no major change. The figure below outlines changes in inflation due to different shocks/impulses/innovations of the other variables in the system. The specific variable IRF are presented in the appendix. It is worthy to note that the confidence interval for the IRF – excluding inflation and foreign exchange – includes the 0 – level, which challenges the validity of the IRF. Nonetheless, the IRF still provides useful insights to variables reactions. The full IRF with bounds are presented in Appendix 1, Figure 26.

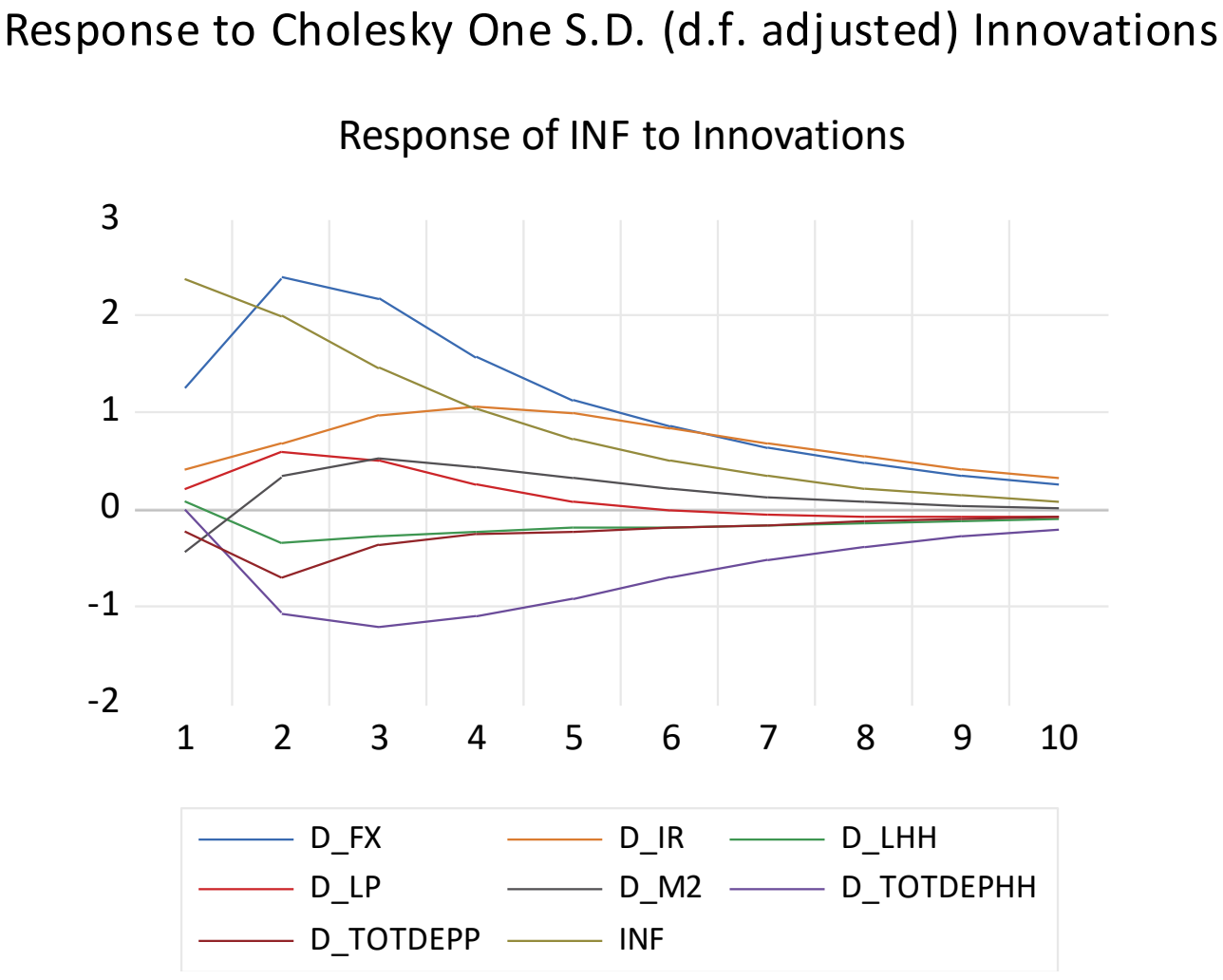


Figure 15- Impulse Response Function of Inflation. Developed by Author via EViews 12

First of all, inflation is *highly* susceptible to its own shocks, as inflation shocks take approximately ten periods to die down. This is evident as inflation in Egypt is highly persistent. Inflation responds with a high positive immediate shock to FX impulses that take on average 2.5 years to die down as well, this is logical given the time required for inflation to settle after the floatation of currency in 2016. Total deposits (household and private business) both have a substantial and negative effect on inflation for about a year to a year and half, indicating that inflation is in fact affected by changes (impulses) in financial inclusion indicators. Money supply has a moderate positive effect on inflation, which is compliant with theory. It is curious to note that inflation behaves a-theoretically to interest rate, increased interest rate should result in downward pressure on inflation, yet the IRF shows that impulses of interest rate increase inflation. This may be indicative of the findings of Noureldin et. al. (2019) that (1) there are structural rigidities in the Egyptian economy that disrupt monetary policy. (2) the potential prevalence of a monetary policy that is accommodative of fiscal policies at the expense of volatile inflation.

Loans to SMEs and Loans to households have opposing results with impulses of loans of households having a negative effect on inflation and impulses of loans to SMEs having a positive effect on inflation. This is indicative of lack of creditworthiness in the SMEs sector, or perhaps an instance of predatory lending, that can destabilize the financial sector. This is in line with the findings of the Johansson cointegration, wherein it was determined that if the trend of SMEs lending continue as is, it can impact financial stability and increase inflation The household sector loans seem to be well characterized, as it does not contribute to inflation.

III. The Selected ARDL Model

The autoregressive distributed lag model of Pesaran and Shin (1999), and Pesaran, Shin, and Smith (2001) is employed in this study with the following equation:

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i y_{t-1} + \sum_{j=0}^{q} \beta'_j X_{t-j} + \gamma' Z_t + \varepsilon_t$$

Where y_t is the dependent variable X_{t-j} is a vector of explanatory dynamic variables, Z_t is a vector of exogenous static variables that appear only contemporaneously and ε_t is a mean-zero uncorrelated error term.

In this study, however, all regressors are dynamic regressors so the model changes to the following equation

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i y_{t-1} + \sum_{j=0}^{q} \beta'_j X_{t-j} + \varepsilon_t$$

The ARDL model is added to this thesis as a form of robustness test to the primary model – the VAR. none of the other empirical papers utilized an ARDL model despite its strength. That is mostly due to the fact that the ARDL only allows for a single explanatory equation rather than investigate the dynamic relationship between all the variables. Most authors utilized the VAR in hopes of its exploiting the descriptive tests that accompany it, particularly since financial inclusion and monetary policy is still a nascent area of study, with its direct and indirect relationships yet unclear.

Nonetheless, the ARDL is a powerful model with valuable insights that will compliment and contribute to the thesis. As specified in the methodology section, despite the fact that the ARDL can tolerate variables with integration levels of I(0) and I(1), all I(1) variables will *still* be presented in their first difference to allow for more direct comparison between coefficients of the VAR model and the ARDL model. the model depicts inflation is the dependent variables, and all the other variables are depicted as explanatory variables, all existing as dynamic regressors. Similar to the VAR model, the equation remains:

$$inf_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} inf_{t-i} + \sum_{i=0}^{q1} \beta_{1i} D\_TOTDEPHH_{t-i} + \sum_{i=0}^{q2} \beta_{2i} D\_LHH_{t-i} + \sum_{i=0}^{q3} \beta_{3i} D\_TOTDEPP_{t-i} + \sum_{i=0}^{q4} \beta_{4i} D\_LP_{t-i} + \sum_{i=0}^{q5} \beta_{5i} D\_IR_{t-i} + \sum_{i=0}^{q6} \beta_{6i} D\_FX_{t-i} + \sum_{i=0}^{q7} \beta_{7i} D\_M2_{t-i} + \varepsilon_t$$

a. Lag Length Selection

As with the VAR model, optimal lag length selection is crucial in selecting the appropriate ARDL model. The maximum lags allowed were four lags – or one year. To maintain comparability with the VAR model, the criterion of selection was maintained as the Schwarz Criterion of selection. The graph of the lag selection can be found in the Appendix 2, Figure 27.

b. Short Run Output

Table14: Summary of Selected ARDL Findings

A. Short Run Dynamics		
Selected Lags: ARDL (1,3,0,0,0,0,0,3)		
Variables	**Coefficient**	**t-statistic**
INF(-1)	0.584	8.266***
d_FX	0.295	2.786***
d_FX(-1)	0.099	1.801*
d_FX(-2)	0.093	1.608
d_FX(-3)	0.1742	3.048***
d_IR	-0.073	-0.738
d_M2	-0.853	-1.349
d_LHH	-0.107	-0.682
d_TOTDEPHH	-0.005	1.964**
d_LP	0.278	1.677*
d_TOTDEPP	-0.007	-0.067
d_TOTDEPP(-1)	-0.097	-1.782*
d_TOTDEPP(-2)	-0.096	-1.735*
d_TOTDEPP(-3)	-0.200	-3.950***
C	5.288	3.968***
Adjusted R^2		0.7927
F-Statistic		30.170
Schwarz Criterion		39.695
B. Long Run Dynamics		
Variables	**Coefficient**	**t-statistic**
d_FX	1.594	3.882***
d_IR	-0.177	-0.730
d_M2	2.0555	1.432*
d_LHH	-0.2588	-0.690
d_TOTDEPHH	-0.0699	-1.964**
d_LP	0.6696	-1.657*
d_TOTDEPP	-0.9311	-2.528***
C	12.589	5.091***

** significant at 10%*
*** significant at 5%*
**** significant at 1%*

The outputs of the short run dynamics are presented in Appendix 2, Figure 28. But for clarity and brevity as summary of the most important ARDL outputs are presented in Table 14 above. The ARDL differs from the VAR test in that it has (1) one specific equation, of which the Inflation is the dependent variable (2) different explanatory variables can present themselves with different lags as per the model's criterion's optimal presentation.

Section A of Table 14 outline the short run dynamics. The outputs compliment the VAR model in that inflation is highly affected by its own lags; a fact that is compliant with theory across the board. Inflation is also highly affected by exchange rate shocks, as d_FX is represented up to three lags or three quarters of a year. A fact that is also theory compliant and evidenced by the recent exchange rate shock of 2016. Foreign exchange is positive which is expected in Egypt as Egypt is a net importer. Exchange rate remains significant and positive until 3 lags or 3 quarters. Unlike the VAR model, broad money supply is not significant, in the short run dynamics. In comparing to the VAR coefficient, this can be due to the fact that the broad money supply appears in a lagged effect, where is the ARDL the optimal model selected has broad money supply appearing in the immediate effect. In contextualizing the finding with the Egyptian economy, we note a general insensitivity to the instruments of monetary policy, mimicking the findings of Mangani (2012) once again.

Total deposits by households remain significant at the 5% level, but it appears that its effect is less impactful in the immediate sense and more in the long run, as the coefficient is less than that of the VAR. However, it expresses the hypothesized sign. Total deposits by SMEs are strongly significant in this model as total deposits by SMEs are significant for three lags (three quarters). The difference between this and the VAR is that the VAR allowed for only one lag of total deposits of SMEs whereas the ARDL allowed for three.

Loans once more have a divergent effect, with loans issued to SMEs exhibiting a positive coefficient, reaffirming the insights of the VAR model of predatory lending in the sector. The outstanding loans issued to households, though not significant, exhibits the hypothesized negative sign, insinuating that in the households sector at least, there is no predatory lending.

The model as a whole is significant with an R2 of 90% and an adjusted R2 of 87%. The F-stat is also significant at the 1%.

c. Residuals Tests

To determine the soundness of the model, several tests on the models residuals were performed. The outputs of these tests can be found in Appendix 2, Figures 29, 33, 34 and 35 but they are summarized here for efficiency. The serial correlation LM test was adopted with a failure to reject the null hypothesis that there is no serial correlation up to 4 lags. The normality test, according to Jarque-Bera, indicates that the residuals are normally distributed at the 5 percent level of significance, as the null hypothesis was rejected. Finally, the Breusch-Pagan test for heteroskedasticity, with P-value of 0.0482, implied that the data is free from heteroskedasticity. In conclusion, the regression is well-specified as the residuals are free from serial correlation, heteroskedasticity, and the residuals are normally distributed according to the Jarque-Bera test.

d. Bounds Tests and Long Run form

Much like the Johansson test for cointegration of the VAR model, the ARDL model also has a test to determine the long run dynamics between the variables . The Bounds test follows the equation below:

$$\begin{aligned}\Delta inf_t = \tilde{\alpha}_0 &+ \sum_{i=1}^{p} \tilde{\alpha}_{1i}\Delta inf_{t-i} + \sum_{i=0}^{q1} \tilde{\beta}_{1i}\Delta D\_TOTDEPHH_{t-i} + \sum_{i=0}^{q2} \tilde{\beta}_{2i}\Delta D\_LHH_{t-i} \\ &+ \sum_{i=0}^{q3} \tilde{\beta}_{3i}\Delta D\_TOTDEPP_{t-i} \\ &+ \sum_{i=0}^{q4} \tilde{\beta}_{4i}\Delta D\_LP_{t-i} \\ &+ \sum_{i=0}^{q5} \tilde{\beta}_{5i}\Delta D\_IR_{t-i} + \sum_{i=0}^{q6} \tilde{\beta}_{6i}\Delta D\_FX_{t-i} + \sum_{i=0}^{q7} \tilde{\beta}_{7i}\Delta D\_M2_{t-i} + \delta_0 inf_{t-1} \\ &+ \delta_1 D\_TOTDEPHH_{t-1} + \delta_2 D\_LHH_{t-1} + \delta_3 D\_TOTDEPP_{t-1} + \delta_4 D\_LP_{t-1} + \delta_5 D\_IR_{t-1} \\ &+ \delta_6 D\_FX_{t-1} + \delta_7 D\_M2_{t-1} + \eta_t\end{aligned}$$

The Bounds Test is the test of a null hypothesis of these coefficients being jointly equal to zero. If they are jointly equal to zero, it means the lagged levels are not significant, and thus we only need to focus on the short-term dynamics. The bounds test F-test is based on the following hypothesis:

$$H_0 = \delta_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$$

The output of the Bounds Test can be found in Appendix 2, Figure 30. Rejecting the hypothesis declares the existence of a long-run relationship among the variables. The F-stat

exceeds the upper bound at the 1% indicating the presence of a cointegration between the variables. This implies that there is a stable long run relationship between the variables. The long run dynamics is presented in section B of Table 14 above.

Exchange rate is significant at the 1% and has the appropriate sign. Inflation remains insensitive to interest rates , but broad money supply is weekly significant at the 10% level and presents the theoretical sign. Inflation remains unaffected by total loans issued to households, though it is worthy to mention the loans to households still presents the hypothesized sign. Total loans issued to SMEs , however, present with a positive coefficient in the long run, indicating that if the trend of SMEs lending continues as such , financial stability may be compromised.

Inflation is significantly affected by total deposits of households and businesses at the 5% level. The signs are also compliant with the hypothesis. These findings are justified given Mbatur and Uba's (2013) analysis, where they stated that if the deposits are used for savings and loans are used for investment, we can expect them to have a negative correlation with inflation. That is, we can expect financial inclusion to facilitate monetary policy. However, if new loans and advances are not put into investment, it is the result of predatory lending and will lead to an increase in inflation rates. Predatory loans, those that are issued to customers with low credit worthiness, raise the default rates in banks and are highly inflationary. In this case, though insignificant, the coefficient of loans for private businesses is positive and that may be an explanation. The long run form of the ARDL model generally corroborates the Johansen cointegration equation where financial usage indicators are concerned.

7. Concluding Remarks

I. Summary

The purpose of the thesis is to examine the relationship between financial inclusion and monetary policy in Egypt. The specific hypotheses investigated were (1) there is a significant relationship between financial inclusion indices and inflation – the proxy for monetary policy effectiveness (2) the relationship is negative, i.e. as financial utilization increases, inflation decreases (3) there exists a significant Granger Causality between financial inclusion indices and inflation. These hypotheses were investigated via a time series analysis comprised of a VAR model supplemented by an ARDL model. The analysis relied on data extracted from the CBE, which included the financial usage indices of outstanding deposits and loans, as well as a vector of control variables that included foreign exchange, broad money supply and commercial lending rate. The data is reported quarterly from Q2 of FY 2004/2005 to Q2 of FY 2020/2021.

Financial inclusion is an assumed property of economies, most economies don't feel its value until it's not there. Countries with higher levels of financial *exclusion* report higher volatility, lower growth rates and higher inequality. Egypt is one of such countries. With less than 40% of its eligible population banked, Egypt suffers from a high level of financial exclusion due to both supply side and demand side factors. As a result, financial inclusion and financial literacy has been undertaken as a national initiative in the past decade.

Though the CBE never explicitly stated that the facilitation of the monetary policy transmission mechanism is a goal of the financial inclusion initiative, it's a relationship that warrants study. Given that (1) Egypt is undertaking several financial inclusion initiatives and (2) monetary policy in Egypt is met with structural rigidities, the country offers an interesting landscape for financial inclusion analysis. The research contributes to the literature by splitting the aforementioned financial usage data into households and SMEs so as to determine which sector is more conducive to financial inclusion and provide more targeted policy.

The VAR model indicated a strong and negative relationship between changes in total deposits in households and inflation. It also indicated a weakly significant relationship between total deposits by SMEs and inflation. This alludes that increased levels of financial deposits do in fact result in better monetary policy transmission mechanism. The model also presented a weakly significant positive relationship between loans issued to SMEs and inflation, indicating an early warning sign of predatory lending in the sector.

the VAR model allows for supplementary test such as the granger causality – which determined that financial usage indicators do granger cause changes in inflation – and the Johansson cointegration tests – which determined that there exists a stable long-term relationship between the variables.

The ARDL model, which acts as a robustness test for the above model, confirms the significant and negative relationship between total deposits of households and inflation. There is a noticeable difference in the coefficients of the VAR model and the ARDL model, but nonetheless, the ARDL model confirms the significance and the sign of the VAR. As the optimal ARDL model selected allowed for more lags of total deposits of SMEs, TOTDEPP showed a significant and negative relationship with inflation throughout the reported lags. This indicates that deposits are the more conducive variable to financial inclusion. The ARDL further confirms the positive relationship between loans issued to SMEs and inflation, raising a red flag to the state of lending in that sector. The bounds test – much like the Johansson Cointegration – confirmed the existence of stable long-term relationship between the variables.

II. Limitations

The thesis is limited by data availability. The Global Findex FAS is the only body that calculates variables of financial access and utilization. The Global Findex's database was initiated in 2000 with data starting from 2004 for 148 countries. The data is reported annually and released every three years. This means that for any given nation, the maximum years reported is fifteen as of the date of the thesis. This limits the ability to conduct a time series analysis on access and usage variables simultaneously. Additionally, even when relying on the FAS, there is no singular index of financial exclusion, researchers have to use supplementary measures such as PCA to propose an index utilizing available access and usage data in the FAS. This can result in divergent results depending on which access and usage data used by researchers.

Most researchers who are interested in conducting a time series analysis must rely on the central banking authority's statistics on account ownership and utilization. It is important to note that as financial exclusion disproportionately affects less developed economies, such data may not be available or collected regularly. In the case of Egypt, the thesis could have benefited from an additional variable on financial *access* but as of the date of submission, the

CBE does not report any financial access indices for the period selected for study, or in the frequency required to run a significant time series study.

Data availability also hinders the investigation of financial inclusion in the wider context of informal economy and commercial lending gaps, as data on the size of informal economy or shares of SMEs lending relative to total loans issued are not collected by any viable institution with the required frequency to conduct and empirical investigation.

In a more theoretical sense, the thesis is limited by virtue of its surrounding literature. Literature on financial inclusion – particularly empirical literature – is limited and sparse. As a result, there is yet to be a singular understanding of the variables and their dynamic effects on one another. Additionally, there is yet to be a paper that utilizes the ARDL model, as a result, there is no way to determine the validity the model in the corpus of literature.

III. Future Research

This thesis aims to act as a springboard for future research on financial inclusion in Egypt and the MENAP. Future research can include a panel of the MENAP to investigate financial inclusion in this region as whole. With the increased interest in financial inclusion and the development of data bases by central banking authorities – including the CBE – it would be beneficial to investigate a more micro lens of financial inclusion, such as high-income governorates vs. low-income governorates, rural vs. industrial governorates , and youth vs. adults.

On a technical sense, it would be fruitful to investigate the same relationship, but incorporating FX with a dummy variable to account for exchange rate shock of 2016, if the researcher wishes to isolate the effects of the shock for the purposes of developing exchange rate policy. An interesting technical research to conduct would be to investigate the lags of financial inclusion and their effects on monetary policy

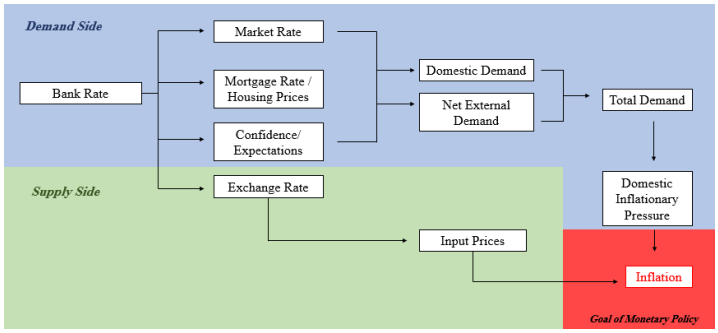
There were several findings within the body of thesis that can present an independent question for further research, the first being causality. Though the tests confirm the existence of a one-way causality between financial inclusion and inflation, reverse causality was the more logical outcome given the financial sector perception in Egypt. A detailed investigation on directions of causality can help elucidate, confirm or contest this finding.

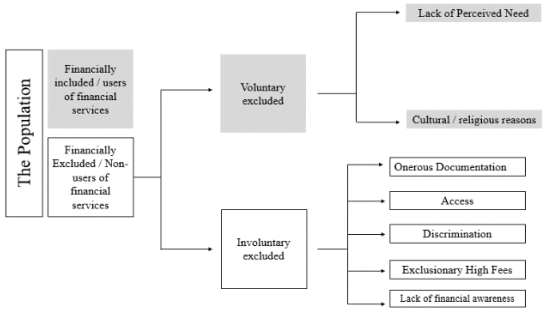
Provided the availability of the required data, research on SMEs lending as share of total loans – particularly in the context of the new SMEs lending fund – could help understand the barriers of MSMEs financial access and their effects on the overall economy. This can then be extended to investigating the relationship between the informal economy and financial inclusion, and the effects of both of economic stability, as it seems from the research that policy makers propose financial inclusion as a means to formalizing the informal sector.

Furthermore, given that policies addressing financial inclusion tend to include both fiscal and monetary policy, and that fiscal, monetary and exchange rate policies affect financial inclusion indicators, an investigation that looks at the three policy initiatives jointly can provide a more holistic understanding.

8. Policy Implications

The purpose of this thesis is to investigate the relationship between financial inclusion and monetary policy with the purpose of tailoring policy recommendations. The purpose of this section is to reflect on the research and empirical analysis conducted and translate it into actionable policy recommendations.





Infographics (1) and (2) – referenced above for summary – encapsulated the context in which the theoretical framework of this thesis operated. Infographic (1) highlights *where* financial exclusion halts or dampens the effects of monetary policy: the households' demand insensitivity to interest rate changes on the demand side, and the SMEs pricing insensitivity to exchange rate changes in the supply side. This insensitivity causes policy makers to exaggerate their policy in order to reach the desired effects. The exaggerated policy overburdens the financially included, resulting in over all economic decline.

Policy makers are aware of this handicap, yet, until a decade ago there were no tangible policies in Egypt addressing it. Egypt has had a large informal sector since the 1950s, with its effects well researched and document on national GDP, financial stability and foreign investors' perception. As of 2010, Egypt has extended special interest in financial inclusion as both an instrument and a goal of sustainable growth, as part of its Vision 2030 initiative. Among the policies drafted were policies addressing financial access and usage.

Infographic (2) highlights the distinction between the financially included and the excluded, and within the excluded those excluded voluntarily and those excluded involuntarily. The involuntarily excluded should by the main beneficiary of financial inclusion policy. As the infographic and the literature indicate, the most cited reasons of financial exclusion is Access, onerous documentation, discrimination or bias, high

fees/commissions/collateral and lack of financial awareness. The policies presented in this section will thus focus on these constraints.

Policy presentation will take the form of two matrices. The first matrix will contrast the proposed policy with the CBE and national instructions as of date, this will illustrate the gaps in policy that will require CBE or other policy bodies' attention. The matrix will further be color coded into *Access* policies and *Usage* policies. The second matrix outlines the beneficiaries of policy as well the timeframe postulated for its implementation.

Matrix 1:
Juxtaposing Policy Recommendation With Existing Initiatives

	Policy Recommendation	**Relevant CBE Circular / National initiative**
1	Increase access by investing in ITMs, mobile branches and other digital access channels	Not yet addressed
2	Tailor digital access channel so that they are easy to use and understand by the average user. Avoiding excessive use of Jargon and other technical terms	Not yet addressed
3	Promote accessibility for users with special needs. E.g. voice commands for the vision impaired, braille versions of official documents, lowering ITMs to be accessible by wheelchair users, having at least one branch in a metropolitan area that caters to the hard of hearing.	Partially addressed by *Circular 1/11/2021* (Accessibility for special needs clients)
4	Permit agent banking to allow banks to reach remote areas without incurring the cost and risk	Not yet addressed
5	Authorize more financial products via Egypt Post – particularly for Micro and Small enterprises – to facilitate business banking in remote areas. Additionally, the Egypt post is public good, as a result costs of service is highly subsidized.	Not yet addressed
6	As the research indicates that deposits is the more conducive financial inclusion factor to financial stability, develop more tailored deposit solutions with reduced commissions and no minimal balance requirements.	*Circular 6/4/2017* *Circular 12/4/2018* *Circular 29/7/2021* (FI week, accounts are opened for free *only* during that week of events)
7	Market tailored products to youth, women, entrepreneurs and special needs individuals to promote utilization.	*Circular 29/7/2021* (specific events for women and youth)
8	readdress MSMEs lending in terms of collateral requirements, turnaround time and credit worthiness inspection to address the predatory lending in the sector.	Partially addressed by *Circular 15/10/2020* (SMEs documentation requirements)
9	MSMEs lending should be removed from business banking departments, and rather have their own	Not yet addressed

	dedicated departments in Branches Hubs to better cater to the community and better train relationship managers for the needs and challenges of MSMEs	
10	Promote financial literacy by both informative campaigns in banks and adding it to the education of youth, either as part of social studies in secondary school students or orientation week in college students.	Partially addressed by : *Circular 6/4/2017* *Circular 12/4/2018* *Circular 29/7/2021* (Banks offer some financial literacy during authorized financial inclusion events)
11	Promote youth accounts by lowering minimum accounts opening age to sixteen years old – via national ID. Youth accounts will have limited functionality and reduced costs to integrate youth in the culture of banking.	Not yet addressed
12	Reduce the prevalence of cash transactions by setting a maximum limit of cash transactions in all retailers.	Not yet addressed
13	Promote financial inclusion and reducing the informal economy by requiring all governmental and utilities payments to be digital, wither via bank's digital wallets, ATMs or POS.	Not yet addressed
14	Promote financial literacy in MSMEs by offering nonfinancial services that consult and explain legal and financial requirements to them at an accessible language	Not yet addressed
15	Address MSMEs tax aversion by announcing a grace period of about 12 to 18 months to register with an authorized bank for financial and regulation literacy course. At the end of the course MSMEs can issue the required legal documents for the first time for free.	Not yet addressed
16	Address banks bias against financial inclusion clients by creating a national fund that acts as a collateral of Financial inclusion assets and liabilities. Thereby reducing banks' cost of funds, and mitigating predatory lending in this sector	Not yet addressed
17	Promote lending in the household sector by creating group loans where a group of lenders can borrow a larger sum of money and act as collateral to one another. Thereby addressing default risk.	Not yet addressed
18	CBE must incorporate agile SOP to keep up with digital products and FinTechs in the area. Additionally, avail training to telecos, agent banking and FinTechs on regulatory oversight, AML and CFT	Partially addressed by *Circular 17/7/2019* (AML and CFT communication) and *Circular 15/10/2020*. (SMEs documentation requirements)

*Legend: **Green** refers to financial access and financial literacy policies; **Blue** refers to financial utilization policies*

The matrix above illustrates eighteen proposed policies. Of the eighteen, ten policies were deemed to promote financial *utilization* and eight were deemed to directly promote

financial *access*, it is important to not that by virtue of promoting financial utilization, the policy inadvertently promotes financial access. Additionally, of the eighteen only six are addressed or partially addressed by a current initiative, or about one third. This highlights the gaps in policy in promoting financial inclusion in the Egyptian economy.

The policies presented serve to benefit the MSMEs, households and the overall economy. The matrix below presents the policies along with the perceived time frame for implementation, as well the perceived beneficiary of the policy.

Matrix 2:
Policies Beneficiaries and Implementation Time Frame

Time Frame	Policy Number and Summary	SMEs	Households	National Economy
Short Term (1 year to 18 Mts)	2. Improve accessibility and language of digital access channels	✓	✓	
	3. Promote accessibility of special needs clients		✓	
	7. Market and tailor products directly to marginalized community	✓	✓	
	9. MSMEs should be removed from business banking and addressed via branches hubs	✓		
	12. Set a maximum for cash transactions			✓
	18. Implement agile SOP			✓
Mid-term (18 Mts to 5 years)	1. Increase access through ATMs / ITMs	✓	✓	
	4. Permit agent banking to reach remote areas	✓	✓	
	6. Develop deposit solutions tailored for financial inclusion		✓	
	8. Readdress MSMEs lending	✓		

	10. Promote financial literacy by incorporating it in education curriculum		✓	
	11. Promote youth accounts		✓	
	14.Promotes MSMEs financial literacy by offering consulting services	✓		
	17. Create group loan solutions		✓	
Long terms (>5 Years)	5. Authorize business banking through Egypt Post	✓		
	13. Mandate all government payments and utilities to be paid via authorized digital channels			✓
	15. Address MSMEs aversion to tax collection by availing literacy courses, followed by time limit to attain legal documents	✓		✓
	16. Create fund to act as collateral for financial inclusion lending			✓

Orange *reflects short term policies;* ***Blue*** *reflects mid-term policies and* ***Red*** *reflects long term policies*

The matrix above re-orders the eighteen policies presented in terms of the beneficiary and time frame. Of the eighteen, nine address SMEs, and nine address households. Though the matrix outlines five that pertain to the economy as a whole, it is important to reiterate that all policies facilitating financial inclusion will eventually affect the overall economy. In terms of time frame, six are estimated to take between a year to eighteen months, eight are estimated to require between eighteen months and five years and four are estimated to need more than five years to be fully implemented.

The policies above address financial inclusion from a high level and in a holistic manner. Yet, it is important to emphasize that financial inclusion will require the interaction of monetary, fiscal and exchange rate policy to truly bring about sustainable growth. In fact, several of the policies presented, such as the creation of a fund to act as a collateral for financial inclusion lending, are *fiscal* policies rather than monetary policies. The fact that increased financial inclusion portends more efficient monetary policy transmission should not exclude the impact of fiscal and exchange rate policy to bring about increased inclusion. Ultimately, all macroeconomic indices are connected and correlated to some extent.

In lieu of a concluding remark, it is important to mention that even if financial inclusion does not bring about exponential growth in the economy, financial access and financial autonomy is a human right inseparable from human dignity. Financial inclusion policy tends to fall on the shoulders of banks and other financial institutions, who are, first and foremost, for-profit-organizations. As a result, financial inclusion policy are viewed in terms of bottom-line profit margins. This dehumanizes the issue and treats those vulnerable communities as means to an end. Financial inclusion – though must pass through regulated financial channels – is a humanitarian national issue, and thus must be addressed with the required delicacy, understanding and patience. These characteristics will decide the rate of success of any suggested policy.

Works Cited

Allen, F., Demirgüç-Kunt, A., Klapper, L. F., and Martinez Peria, M. S. (2012). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *World Bank Policy Research Working Paper* (6290).

Allen, F., Demirguc-Kunt, A., Klapper, L., & Martinez Peria, M. S. (2016). The foundations of Financial Inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation, 27*, 1-30. doi:10.1016/j.jfi.2015.12.003

Alliance for Financial Inclusion. (2011). Retrieved from https://www.afi-global.org/

Al-Said, H., Al Said, M., Zaki, C., (2011), Small and Medium Enterprises Landscape in Egypt: New Facts from a New Dataset, *International Journal of Financial Research*, 12(3), pp-124 - 144

Aras, A., (2017). Financial Regulatory Issues for Financial Inclusion, *United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Working Paper*

Ashraf N., Karlan D., Yin W. (2006). Tying Odysseus to the Mast: Evidence From a Commitment Savings Product in the Philippines. *Q. J. Econ*. 121:635-672

Baduel J. D., Berton, F., S. Mocetti, A. Presbitero and M. Richiardi. (2018). "Banks, Firms, and Jobs." *Review of Financial Studies* 31:2113–56.

Bastia, Tanja. "The Migration-Development Nexus: Current Challenges and Future Research Agenda." *Migration, Society and Economic Development*, vol. 7, no. 7, 2013, pp. 464–477., doi:10.1111/gec3.12055.

Beegle, K., Dehejia, R. H., & Gatti, R. (2003). *Child Labor, Income Shocks, And Access To Credit* (Policy Research working paper No.3075). Washington, DC: World Bank. Retrieved from: http://hdl.handle.net/10986/18222

"Central Bank of Egypt." *Central Bank of Egypt Circulars*, https://www.cbe.org.eg/en/BankingSupervision/Pages/Circulars.aspx.

Chakraborty, I. (2010). Financial development and economic growth in India: An analysis of the post-reform period. *South Asia Economic Journal*, 11(2), pp. 287-308.

Demirguc-Kunt, Asli, and Ross Levine. "Finance, Financial Sector Policies, and Long-Run Growth." *Policy Research Working Papers*, vol. 4, no. 2, 2008, pp. 275–300., doi:10.1596/1813-9450-4469.

Demirguc-Kunt, Asli, and Leora Klapper. "Measuring Financial Inclusion : The Global Findex Database." *The World Bank Open Knowledge*, ser. 6025, Apr. 2012, pp. 2–61. *6025*.

Demirguc-Kunt, Asli, et al. “Financial Inclusion and Legal Discrimination Against Women : Evidence from Developing Countries.” *World Bank Open Knowledge*, ser. 6416, Apr. 2013, pp. 2–47. *6416*, https://openknowledge.worldbank.org/handle/10986/15553.

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution. *The World Bank.*

Diniz, E., Birochi, R. and Pozzebon, M. (2012). Triggers and barriers to financial inclusion: The use of ICT-based branchless banking in an Amazon county. *Electronic Commerce Research and Applications*, 11(5), pp. 484-494.

Dittus, Peter, and Michael U. Klein. “On Harnessing the Potential of Financial Inclusion.” *SSRN Electronic Journal*, ser. 347, May 2011, pp. 1–25. *347*, doi:10.2139/ssrn.1859412.

Donovan, K. P. (2012). Mobile money, more freedom? The impact of M-PESA’s network power on development as freedom. *International Journal of Communication*, 6, pp. 23.

Evans, Olaniyi. “The Effectiveness of Monetary Policy in Africa: Modelling the Impact of Financial Inclusion.” *Iranian Economic Review*, vol. 20, no. 3, 2016, pp. 372–337. *ResearchGate*.

Fungáčová, Z., & Weill, L. (2015). Understanding financial inclusion in China. *China Economic Review, 34*, 196-206. doi:10.1016/j.chieco.2014.12.004

Gali, J. J.; Lopez-Salido, D.; and Vallez, J. (2004). Rule-of-thumb consumers and the design of interest rate rules. *Journal of Money, Credit and Banking*, 36(4), 739–763.

Gregor, J. Melckin A., Melckin M., (2019). Interest Rate Pass-Through: A Meta-Analysis of Literature. Washington DC: *World Bank Group*

Han, Rui; Melecky, Martin. (2013). Financial Inclusion for Financial Stability : Access to Bank Deposits and the Growth of Deposits in the Global Financial Crisis. Policy Research Working Paper; No. 6577. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/16010 License: CC BY 3.0 IGO

Hannig, A. and Jansen, S. (2010). Financial Inclusion and Financial Stability: Current Policy Issues. *ADBI Working Paper Series*, No. 259. December 2010, Asian Development Bank Institute.

Honohan, P. (2004). *Financial Sector Policy and the Poor: Selected Findings and Issues* (Working paper No. 43). Washington, DC: World Bank. ISBN:0-8213-5967-3

Honohan P. (2008). Cross-Country variation in household access to financial services. *Journal of Banking and Finance*. 32. May.2493-2500.

Jang, B. Y., Benicio D., Chiyaba G., (2014). Enhancing Financial Inclusion in Zambia, *IMF Working Paper*

Jones P. A. (2008). From Tackling Poverty to Achieving Financial Inclusion – the Changing Role of British Credit Unions in Low Income Communities. *The Journal of Socioeconomics*, 37(6), 2141-2154

Khan, H. R. (2011). Financial inclusion and financial stability: Are they two sides of the same coin? *Address at BANCON 2011*, Chennai.

Kumar, N. (2011), "A non-parametric approach to financial inclusion analysis through postal network in India", *International Journal of Research in Commerce, Economics and Management*, Vol. 1 No. 5, pp. 19-24.

Lapukeni, Angella F. "The Impact of Financial Inclusion on Monetary Policy Effectiveness: The Case of Malawi." *International Journal of Monetary Economics and Finance*, vol. 8, no. 4, 2015, pp. 361–384.

Lenka, Sanjaya K, and Arun K Bairwa. "Does Financial Inclusion Affect Monetary Policy in SAARC Countries?" *Cogent Economics and Finance*, vol. 4, no. 1, 7 Jan. 2016, pp. 1–8., doi:10.1080/23322039.2015.1127011.

Leyshon, A. and Thrift, N. (1993). The restructuring of the UK financial services industry in the 1990s: A reversal of fortune? *Journal of Rural Studies*, 9, pp. 223–241.

Liew,V. (2004). Which Lag Selection Criteria Should We Employ? *Economics Bulletin*, vol. 3, pp-1-9

Mahendra, S D. (2006). "Financial Inclusion: Issues and Challenges." *Economic Political Weekly*, vol. 41, no. 41, ser. 14, pp. 4310–4313. *14*.

Mbutor, M. O. and Uba, I. A. (2013). The Impact of Financial Inclusion on Monetary Policy in Nigeria. *Journal of Economics and International Finance*, 5(8), 318-326.

Mehrotra, A., and Yetman, J. (2014). Financial inclusion and optimal monetary policy. Bank for International Settlements, *BIS Working Paper*, No. 476. BIS. Basel.

Mehrotra, A.N. and Yetman, J. (2015). Financial Inclusion-Issues for central banks. *BIS Quarterly Review*, pp. 43–57.

Mounir, H. (2020, June 30). *Daily News Egypt*. Retrieved from https://dailynewsegypt.com/2018/03/11/president-rejuvenated-smes-launching-egp-200bn-initiative/

Ngalawa, H.P.E (2009). "Dynamic Effects of Monetary Policy Shocks in Malawi". *Paper presented at the 14th Annual Conference of African Economics Society, pp- 8-10*

Noureldin, D., El Abadi, H., Abdelraouf, N., (2019). Inflation Dynamics in Egypt: Structural Determinants Vs. Transitionary Shocks. *Egyptian Center for Economic Studies Working Paper* No. 201, pp-1-37

Oxford Business Group. (2021, January 10). How Egypt's banking sector is coping with covid-19. Retrieved November 05, 2021, from https://oxfordbusinessgroup.com/news/how-egypt-s-banking-sector-coping-covid-19

Pesaran, M. H., and Shin, Y.(1999). ―An autoregressive distributed lag modelling approach to cointegration analysis‖. In S. Strom (Ed.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). ―Bounds testing approaches to the analysis of level relationships‖. Journal of Applied Econometrics 16.

Rahman, A. (2014, May). The Mutually Supportive Relationship Between Financial Inclusion and Financial Stability, Issue: 1 (Report by the Alliance for Financial Inclusion; AFI). Retrieved from: https://www.afi-global.org/sites/default/files/publications/afivp1-11.pdf

Rashdan, A. and Eissa, N. (2019). The Determinants of Financial Inclusion in Egypt. *International Journal of Financial Research*, 11(1), pp. 123–136.

Rosengard, J. K. and Prasetyantoko, A. (2011). If the banks are doing so well, why can't I get a loan? Regulatory constraints to financial inclusion in Indonesia. *Asian Economic Policy Review*, 6(2), pp.273-296.

Said, H. E., Said, M. A., & Zaki, C. (2013). Access to finance and financial problems of smes: Evidence from Egypt. *International Journal of Entrepreneurship and Small Business*, *20*(3), 286. https://doi.org/10.1504/ijesb.2013.056891

Sarma, M. (2008). Index of financial inclusion. *Indian Council for Research on International Economics Relations.*

Sarma, M. and Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, 23(5), pp. 613-628.

Sarma, M. (2012). Index of Financial Inclusion – A measure of financial sector inclusiveness. *Berlin Working Papers on Money, Finance, Trade and Development.* July, 2012. 1-34.

Sayed, M. N., Abbas, N. A., & Touny, M. A. (2020). The Impact of Financial Inclusion on GDP Growth in Egypt. *Scientific Journal for Economics and Commerce*, *3*, 379–400.

Sherrif, M., "The Relationship Between Financial Inclusion and Monetary Policy Transmission: The Case of Egypt." *IISES International Academic Conference*, 21 May 2019, pp. 63–87., doi:10.20472/IAC.2019.045.014.

Sinclair, Stephen, (2001). Financial Exclusion: An Introductory Survey. Edinburgh: *Centre for Research into Socially Inclusive Services*

Srinivasan, N. (2007). Policy issues and role of banking system in financial inclusion. *Economic and Political Weekly*, pp. 3091-3095.

Srinivasan, Janaki, and Jenna Burrell (2015). "On the Importance of Price Information to Fishers and to Economists: Revisiting Mobile Phone Use among Fishers in Kerala." *Information Technologies & International Development*, vol. 11, no. 1, 10 , pp. 57–70.

Soliman, M. (2020). EGYPT'S INFORMAL ECONOMY: AN ONGOING CAUSE OF UNREST. *Journal of International Affairs*, *73*(2), 185–194. https://www.jstor.org/stable/26939974

Unnikrishnan, R. and Jagannathan, L. (2015). Unearthing global financial inclusion levels and analysis of financial inclusion as a mediating factor in global human development. *Serbian Journal of Management* 10 (1), pp. 19 – 32.

UNHCR. (2020). Retrieved from https://www.unhcr.org/globalreport2019

Varghese, George, and Lakshmi Viswanathan (2008). "Financial Inclusion: Opportunities, Issues and Challenges." *Theoretical Economics Letters*, vol. 08, no. 11, pp. 1935–1942., https://doi.org/10.4236/tel.2018.811126.

Villasenor, J., Lewis, R., and West, D. (2017). The 2017 Brookings Financial and Digital Inclusion Project Report - building a secure and inclusive global financial ecosystem. Center for Technology Innovation at Brookings. retrieved from: https://brookings.edu/research/the-2017-brookings-financial-and-digitalinclusion-project-report.

Appendix

1. VAR Model

VAR Lag Order Selection Criteria
Endogenous variables: D_FX D_IR D_LHH D_LP D_TOTDEPHH D_TOTDEPP D_M2...
Exogenous variables: C
Date: 10/03/21 Time: 13:12
Sample: 2004Q1 2020Q4
Included observations: 59

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-1145.349	NA	13171897	39.09659	39.37829*	39.20655
2	-1033.229	190.0348*	2627557.*	37.46538*	40.00068	38.45506*
3	-977.4975	79.34628	3902002.	37.74568	42.53458	39.61507
4	-921.6034	64.42022	7084561.	38.02046	45.06296	40.76956

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

Figure 16 -VAR Lag Length Selection. Author's Output Via EViews 12

VAR Lag Exclusion Wald Tests
Date: 10/03/21 Time: 13:16
Sample (adjusted): 2004Q3 2019Q4
Included observations: 62 after adjustments

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	D_FX	D_IR	D_LHH	D_LP	D_TOTDEPHH	D_TOTDEPP	D_M2	INF	Joint
Lag 1	7.288595 [0.5058]	36.82327 [0.0000]	33.00301 [0.0001]	4.499227 [0.8095]	6.522973 [0.5889]	5.728498 [0.6776]	2.524384 [0.9606]	241.3610 [0.0000]	482.8207 [0.0000]
df	8	8	8	8	8	8	8	8	64

Figure 17 - Lag Exclusion Wald Test. Author's Output Via EViews 12

Roots of Characteristic Polynomial
Endogenous variables: D_FX D_IR D_LHH D_LP D_TOTDEPHH D_TOTDEPP D_M2 INF
Exogenous variables: C
Lag specification: 1 1
Date: 10/03/21 Time: 13:22

Root	Modulus
0.702446 - 0.036334i	0.703385
0.702446 + 0.036334i	0.703385
0.515467	0.515467
0.073246 - 0.285356i	0.294607
0.073246 + 0.285356i	0.294607
0.141328 - 0.001308i	0.141334
0.141328 + 0.001308i	0.141334
-0.063480	0.063480

No root lies outside the unit circle.
VAR satisfies the stability condition.

Figure 18 - Roots of Characteristic Polynomial. Author's Output via EViews 12

VAR Residual Serial Correlation LM Tests
Date: 10/03/21 Time: 13:24
Sample: 2004Q1 2020Q4
Included observations: 62

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	81.37348	64	0.0704	1.315413	(64, 225.7)	0.0753
2	77.87329	64	0.1140	1.249838	(64, 225.7)	0.1208

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	81.37348	64	0.0704	1.315413	(64, 225.7)	0.0753
2	145.9875	128	0.1321	1.160477	(128, 229.0)	0.1652

*Edgeworth expansion corrected likelihood ratio statistic.

Figure 19- VAR Autocorrelation Test. Author's Output via EViews 12

Slight autocorrelation at the 10%, but as we assume significance at the 5%, we reject H0, no serial correlation

Component	Jarque-Bera	df	Prob.
1	0.000975	2	0.9751
2	0.957612	2	0.6195
3	3.620873	2	0.1636
4	1.737323	2	0.4195
5	4.034543	2	0.1330
6	1.703436	2	0.4267
Joint	12.0547	12	0.1920

*Approximate p-values do not account for coefficient estimation

Figure 20- VAR Heteroskedasticity Test. Author's Output via EViews 12

Joint Probability exceeds 5%, we reject H0, no Homoscedasticity

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.850535	270.8002	159.5297	0.0000
At most 1 *	0.557727	152.9571	125.6154	0.0004
At most 2 *	0.395075	102.3758	95.75366	0.0162
At most 3 *	0.369208	71.21147	69.81889	0.0386
At most 4	0.257994	42.64315	47.85613	0.1415
At most 5	0.233161	24.14250	29.79707	0.1945
At most 6	0.103346	7.682822	15.49471	0.4999
At most 7	0.014722	0.919558	3.841465	0.3376

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.850535	117.8431	52.36261	0.0000
At most 1 *	0.557727	50.58129	46.23142	0.0161
At most 2	0.395075	31.16436	40.07757	0.3508
At most 3	0.369208	28.56833	33.87687	0.1885
At most 4	0.257994	18.50064	27.58434	0.4540
At most 5	0.233161	16.45968	21.13162	0.1991
At most 6	0.103346	6.763264	14.26460	0.5175
At most 7	0.014722	0.919558	3.841465	0.3376

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 21 -VAR Cointegration Test, Author's Output via EViews 12

Vector Error Correction Estimates
Date: 11/07/21 Time: 05:19
Sample (adjusted): 2005Q2 2020Q2
Included observations: 61 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
INF(-1)	1.000000
D_TOTDEPP(-1)	-14.27005 (1.96398) [-7.26589]
D_TOTDEPHH(-1)	-34.72163 (7.15250) [-4.85447]
D_LP(-1)	6.638402 (2.52127) [2.63296]
D_LHH(-1)	-7.898301 (1.98400) [-3.98100]
D_M2(-1)	70.67831 (9.80507) [7.20834]
D_IR(-1)	3.917882 (1.22859) [3.18894]
D_FX(-1)	-11.30447 (1.64301) [-6.88033]
C	-57.39515

Error Correction:	D(INF)	D(D_TOTD...	D(D_TOTD...	D(D_LP)	D(D_LHH)	D(D_M2)	D(D_IR)	D(D_FX)
CointEq1	-0. 355757	0.064502	0.017244	0.016009	0.025529	0.011239	-0.007840	0.079717
	(0.10733)	(0.02359)	(0.00949)	(0.01572)	(0.00767)	(0.00887)	(0.01192)	(0.02437)
	[-3.33159]	[2.73485]	[1.81639]	[1.01818]	[3.32704]	[1.26754]	[-0.65778]	[3.27166]
D(INF(-1))	0.330119	-0.670170	0.019781	-0.338779	-0.013184	-0.156672	0.173884	-0.350547
	(0.13304)	(0.29254)	(0.11776)	(0.19502)	(0.09517)	(0.10998)	(0.14784)	(0.30222)
	[2.48142]	[-2.29087]	[0.16798]	[-1.73716]	[-0.13853]	[-1.42452]	[1.17613]	[-1.15990]
D(D_TOTDEPP(-1))	-0.040439	0.196191	0.349468	0.736913	0.212475	0.236372	-0.019343	1.242887
	(0.14710)	(0.32347)	(0.13021)	(0.21564)	(0.10524)	(0.12161)	(0.16348)	(0.33418)
	[-0.27490]	[0.60652]	[2.68395]	[3.41734]	[2.01902]	[1.94367]	[-0.11832]	[3.71924]
D(D_TOTDEPHH(-1))	-0.742085	1.481088	0.337517	1.695127	0.198183	0.542464	-0.170473	2.875851
	(0.49125)	(1.08022)	(0.43482)	(0.72012)	(0.35143)	(0.40612)	(0.54592)	(1.11597)
	[-1.51062]	[1.37110]	[0.77622]	[2.35395]	[0.56393]	[1.33574]	[-0.31227]	[2.57699]
D(D_LP(-1))	0.182160	-0.406073	0.294833	0.272554	0.073691	0.188843	0.106489	0.688817
	(0.16773)	(0.36883)	(0.14847)	(0.24588)	(0.11999)	(0.13866)	(0.18640)	(0.38104)
	[1.08602]	[-1.10097]	[1.98587]	[1.10850]	[0.61412]	[1.36187]	[0.57129]	[1.80774]
D(D_LHH(-1))	-0.044367	-0.127856	0.075722	0.235453	-0.185304	0.024214	0.193291	0.344717
	(0.18301)	(0.40242)	(0.16199)	(0.26827)	(0.13092)	(0.15129)	(0.20338)	(0.41574)
	[-0.24243]	[-0.31772]	[0.46746]	[0.87767]	[-1.41538]	[0.16005]	[0.95041]	[0.82916]
D(D_M2(-1))	0.895362	-3.599304	-1.689090	-3.692698	-0.717994	-1.663673	0.231045	-6.018551
	(0.80395)	(1.76785)	(0.71161)	(1.17852)	(0.57514)	(0.66463)	(0.89344)	(1.82636)
	[1.11370]	[-2.03598]	[-2.37362]	[-3.13333]	[-1.24837]	[-2.50314]	[0.25860]	[-3.29538]
D(D_IR(-1))	0.044800	0.165353	-0.048567	-0.125645	-0.085356	-0.010202	-0.299573	-0.298931
	(0.13133)	(0.28879)	(0.11624)	(0.19252)	(0.09395)	(0.10857)	(0.14595)	(0.29834)
	[0.34112]	[0.57258]	[-0.41780]	[-0.65265]	[-0.90851]	[-0.09396]	[-2.05261]	[-1.00197]
D(D_FX(-1))	-0.048287	0.474048	-0.086812	-0.217694	0.019133	-0.074782	-0.254505	-0.286946
	(0.12414)	(0.27299)	(0.10988)	(0.18198)	(0.08881)	(0.10263)	(0.13796)	(0.28202)
	[-0.38896]	[1.73653]	[-0.79003]	[-1.19623]	[0.21543]	[-0.72865]	[-1.84474]	[-1.01746]
C	0.034513	0.029037	0.058299	0.110323	0.066364	0.048193	-0.249533	0.063381
	(0.41444)	(0.91133)	(0.36684)	(0.60753)	(0.29649)	(0.34262)	(0.46057)	(0.94149)
	[0.08328]	[0.03186]	[0.15892]	[0.18159]	[0.22383]	[0.14066]	[-0.54179]	[0.06732]
R-squared	0.231187	0.437105	0.414290	0.468191	0.392427	0.452734	0.317521	0.430398
Adj. R-squared	0.095514	0.337771	0.310929	0.374342	0.285208	0.356157	0.197083	0.329880
Sum sq. resids	531.6671	2570.785	416.5449	1142.487	272.1005	363.3636	656.6109	2743.787
S.E. equation	3.228753	7.099828	2.857892	4.733045	2.309828	2.669228	3.588137	7.334831
F-statistic	1.704006	4.400337	4.008200	4.988790	3.660061	4.687830	2.636394	4.281793
Log likelihood	-152.5921	-200.6586	-145.1494	-175.9230	-132.1618	-140.9834	-159.0299	-202.6450
Akaike AIC	5.330890	6.906839	5.086866	6.095835	4.661043	4.950276	5.541964	6.971967
Schwarz SC	5.676934	7.252884	5.432911	6.441880	5.007088	5.296321	5.888009	7.318011
Mean dependent	2.91E-17	0.022819	0.058638	0.153650	0.048822	0.060101	-0.200054	0.124786
S.D. dependent	3.394955	8.724560	3.442817	5.983734	2.732057	3.326563	4.004365	8.960117

Determinant resid covariance (dof adj.)	2610321.
Determinant resid covariance	623184.5
Log likelihood	-1099.391
Akaike information criterion	38.93086
Schwarz criterion	41.97606
Number of coefficients	88

Figure 22 - VECM Outputs, Author's Output via EViews 12

Dependent variable: INF

Excluded	Chi-sq	df	Prob.
D_FX	2.457632	1	0.0922
D_IR	0.324629	1	0.5688
D_LHH	0.068943	1	0.7929
D_LP	0.179876	1	0.6715
D_TOTDEPHH	10.31733	1	0.0013
D_TOTDEPP	3.858906	1	0.0728
D_M2	6.972168	1	0.0083
All	33.46280	7	0.0000

Dependent variable: D_FX

Excluded	Chi-sq	df	Prob.
D_IR	2.424081	1	0.1195
D_LHH	0.103959	1	0.7471
D_LP	0.170717	1	0.6795
D_M2	0.002009	1	0.9642
D_TOTDEPHH	7.47E-05	1	0.9931
D_TOTDEPP	0.073179	1	0.7868
INF	0.045861	1	0.8304
All	3.273931	7	0.8586

Dependent variable: D_IR

Excluded	Chi-sq	df	Prob.
D_FX	2.008575	1	0.1564
D_LHH	0.182750	1	0.6690
D_LP	1.080784	1	0.2985
D_M2	0.317311	1	0.5732
D_TOTDEPHH	1.994749	1	0.1578
D_TOTDEPP	0.209016	1	0.6475
INF	1.555624	1	0.2123
All	8.269362	7	0.3094

Dependent variable: D_LHH

Excluded	Chi-sq	df	Prob.
D_FX	9.049888	1	0.0026
D_IR	0.099468	1	0.7525
D_LP	1.248351	1	0.2639
D_M2	2.921263	1	0.0874
D_TOTDEPHH	1.886736	1	0.1696
D_TOTDEPP	0.196948	1	0.6572
INF	0.474937	1	0.4907
All	23.66897	7	0.0013

Dependent variable: D_LP

Excluded	Chi-sq	df	Prob.
D_FX	0.420633	1	0.5166
D_IR	0.400388	1	0.5269
D_LHH	0.465685	1	0.4950
D_M2	1.336898	1	0.2476
D_TOTDEPHH	0.715258	1	0.3977
D_TOTDEPP	2.571873	1	0.1088
INF	0.004038	1	0.9493
All	4.295026	7	0.7452

Dependent variable: D_M2

Excluded	Chi-sq	df	Prob.
D_FX	0.477946	1	0.4894
D_IR	1.272521	1	0.2593
D_LHH	0.015954	1	0.8995
D_LP	0.019022	1	0.8903
D_TOTDEPHH	0.015952	1	0.8995
D_TOTDEPP	0.006072	1	0.9379
INF	0.069008	1	0.7928
All	1.956657	7	0.9622

Dependent variable: D_TOTDEPHH

Excluded	Chi-sq	df	Prob.
D_FX	0.246500	1	0.6196
D_IR	0.712453	1	0.3986
D_LHH	0.035316	1	0.8509
D_LP	0.050450	1	0.8223
D_M2	0.004609	1	0.9459
D_TOTDEPP	0.005768	1	0.9395
INF	1.638272	1	0.2006
All	3.888405	7	0.7925

Dependent variable: D_TOTDEPP

Excluded	Chi-sq	df	Prob.
D_FX	0.280046	1	0.5967
D_IR	1.744517	1	0.1866
D_LHH	0.118690	1	0.7305
D_LP	0.082838	1	0.7735
D_M2	0.259972	1	0.6101
D_TOTDEPHH	0.494921	1	0.4817
INF	0.393501	1	0.5305
All	4.900558	7	0.6721

Figure 23- Granger Causality, Author's Output via EViews 12

Vector Autoregression Estimates
Date: 10/03/21 Time: 13:14
Sample (adjusted): 2004Q3 2019Q4
Included observations: 62 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	D_FX	D_IR	D_LHH	D_LP	D_TOTDEPHH	D_TOTDEPP	D_M2	INF
D_FX(-1)	0.015747	0.204377	-0.235971	-0.116722	-0.054851	-0.140898	-0.071657	0.174715
	(0.29413)	(0.14421)	(0.07844)	(0.17997)	(0.11048)	(0.26625)	(0.10365)	(0.11145)
	[0.05354]	[1.41724]	[-3.00830]	[-0.64856]	[-0.49649]	[-0.52919]	[-0.69134]	[1.56842]
D_IR(-1)	0.472404	0.599076	-0.025520	0.117473	0.096194	0.362762	0.120613	0.065503
	(0.30342)	(0.14876)	(0.08092)	(0.18565)	(0.11396)	(0.27465)	(0.10692)	(0.11497)
	[1.55695]	[4.02718]	[-0.31538]	[0.63276]	[0.84407]	[1.32080]	[1.12806]	[0.56976]
D_LHH(-1)	-0.136499	-0.088729	0.327550	0.176767	-0.029883	0.132023	0.018843	-0.042118
	(0.42335)	(0.20756)	(0.11290)	(0.25903)	(0.15901)	(0.38321)	(0.14918)	(0.16041)
	[-0.32243]	[-0.42749]	[2.90127]	[0.68241]	[-0.18793]	[0.34451]	[0.12631]	[-0.26257]
D_LP(-1)	0.197117	-0.243162	0.142150	0.214559	0.040248	-0.124292	0.023187	0.076665
	(0.47707)	(0.23390)	(0.12723)	(0.29191)	(0.17919)	(0.43185)	(0.16812)	(0.18076)
	[0.41318]	[-1.03961]	[1.11730]	[0.73503]	[0.22461]	[-0.28782]	[0.13792]	[0.42412]
D_TOTDEPHH(-1)	0.011074	-0.887370	-0.469425	0.663143	0.094636	-0.816077	-0.057036	-1.559657
	(1.28150)	(0.62829)	(0.34175)	(0.78411)	(0.48134)	(1.16001)	(0.45159)	(0.48556)
	[0.00864]	[-1.41236]	[-1.37359]	[0.84573]	[0.19661]	[-0.70351]	[-0.12630]	[-3.21206]
D_TOTDEPP(-1)	0.096687	-0.080114	-0.042300	0.350718	-0.010196	0.026401	0.009814	-0.184642
	(0.35742)	(0.17523)	(0.09532)	(0.21869)	(0.13425)	(0.32353)	(0.12595)	(0.13543)
	[0.27052]	[-0.45718]	[-0.44379]	[1.60371]	[-0.07595]	[0.08160]	[0.07792]	[-1.66612]
D_M2(-1)	-0.083075	0.511874	0.844804	-1.311247	0.047264	0.855433	0.166759	1.854338
	(1.85344)	(0.90870)	(0.49428)	(1.13406)	(0.69616)	(1.67773)	(0.65313)	(0.70227)
	[-0.04482]	[0.56330]	[1.70917]	[-1.15624]	[0.06789]	[0.50987]	[0.25532]	[2.64049]
INF(-1)	-0.041737	0.119179	0.035819	0.007578	0.093698	-0.110668	0.018042	0.841298
	(0.19490)	(0.09555)	(0.05198)	(0.11925)	(0.07320)	(0.17642)	(0.06868)	(0.07385)
	[-0.21415]	[1.24725]	[0.68916]	[0.06354]	[1.27995]	[-0.62730]	[0.26269]	[11.3924]
C	2.035295	0.705485	1.082885	2.425532	2.279341	4.521593	3.016580	1.181512
	(3.67636)	(1.80243)	(0.98041)	(2.24944)	(1.38085)	(3.32783)	(1.29551)	(1.39298)
	[0.55362]	[0.39141]	[1.10452]	[1.07828]	[1.65067]	[1.35872]	[2.32849]	[0.84819]
R-squared	0.120895	0.409952	0.383743	0.078248	0.109587	0.097542	0.045464	0.819949
Adj. R-squared	-0.011800	0.320889	0.290723	-0.060884	-0.024814	-0.038678	-0.098616	0.792771
Sum sq. resids	2869.389	689.7180	204.0667	1074.243	404.8090	2351.131	356.3146	411.9472
S.E. equation	7.357949	3.607429	1.962222	4.502080	2.763676	6.660402	2.592859	2.787936
F-statistic	0.911074	4.602909	4.125377	0.562403	0.815372	0.716062	0.315548	30.17013
Log likelihood	-206.8505	-162.6578	-124.9049	-176.3935	-146.1389	-200.6752	-142.1833	-146.6808
Akaike AIC	6.962920	5.537348	4.319512	5.980436	5.004481	6.763717	4.876879	5.021960
Schwarz SC	7.271697	5.846126	4.628290	6.289214	5.313258	7.072494	5.185657	5.330738
Mean dependent	1.523441	-0.267684	3.932914	2.416427	3.747420	3.380501	3.663539	11.58694
S.D. dependent	7.314918	4.377512	2.329915	4.370985	2.730012	6.535216	2.473750	6.124323

Determinant resid covariance (dof adj.)	697030.3
Determinant resid covariance	198758.2
Log likelihood	-1081.989
Akaike information criterion	37.22544
Schwarz criterion	39.69566
Number of coefficients	72

Figure 24 - VAR Model Output. Author's Output via EViews 12

	D_FX	D_IR	D_LHH	D_LP	D_TOTDEPHH	D_TOTDEPP	D_M2	INF
D_FX	1	0.54328555...	0.29806595...	0.87666654...	0.85884541...	0.37474133...	0.79442836...	0.45631708...
D_IR	0.54328555...	1	0.23505369...	0.48576430...	0.40706645...	0.17175150...	0.39441695...	0.37790208...
D_LHH	0.29806595...	0.23505369...	1	0.24815906...	0.31301876...	0.05413554...	0.21143317...	0.18079653...
D_LP	0.87666654...	0.48576430...	0.24815906...	1	0.86619462...	0.38210607...	0.83857691...	0.43902684...
D_TOTDEPHH	0.85884541...	0.40706645...	0.31301876...	0.86619462...	1	0.33210904...	0.87640372...	0.36680138...
D_TOTDEPP	0.37474133...	0.17175150...	0.05413554...	0.38210607...	0.33210904...	1	0.69415517...	0.33285332 ...
D_M2	0.79442836...	0.39441695...	0.21143317...	0.83857691...	0.87640372...	0.69415517...	1	0.29907923...
INF	0.45631708...	0.37790208...	0.18079653...	0.43902684...	0.36680138...	0.33285332 ...	0.29907923...	1

Figure 25 - Correlation Matrix, Author's Output via EViews 12

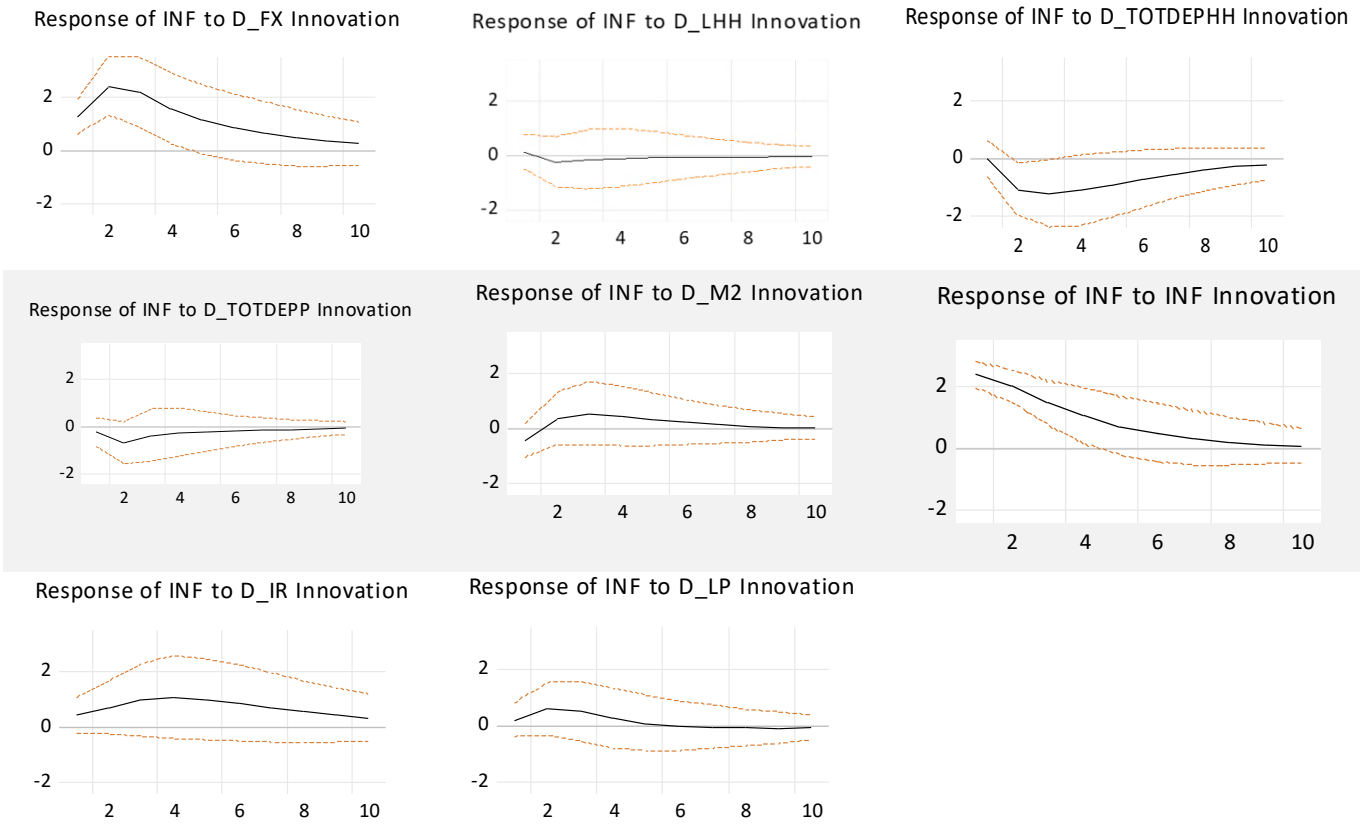


Figure 26 - Full IRF, Author's Output via EViews 12

2. ARDL Model

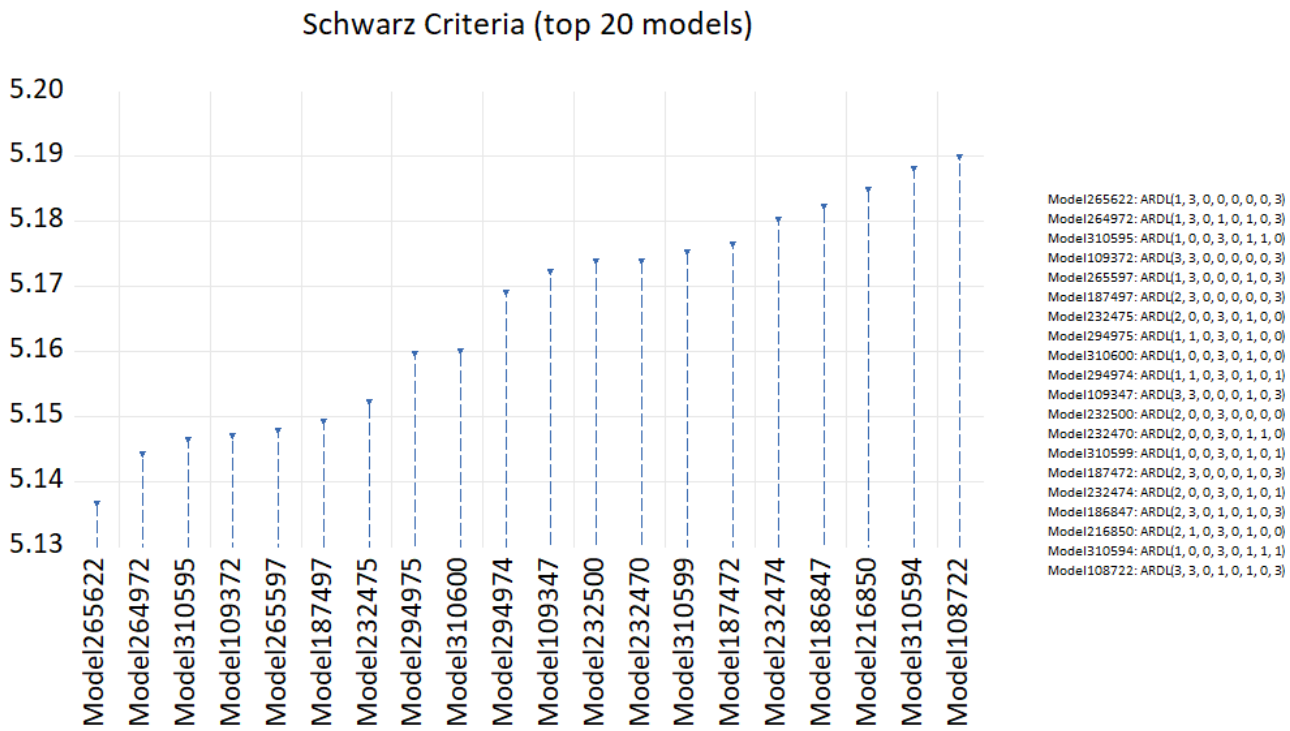


Figure 27 - SIC Lag Selection for ARDL model. Author's Output via EViews 12

Dependent Variable: INF
Method: ARDL
Date: 10/03/21 Time: 16:57
Sample (adjusted): 2005Q1 2019Q4
Included observations: 60 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): D_FX D_IR D_M2 D_LHH D_TOTDEPHH D_LP D_TOTDEPP
Fixed regressors: C
Number of models evaluated: 312500
Selected Model: ARDL(1, 3, 0, 0, 0, 0, 0, 3)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF(-1)	0.584722	0.070732	8.266704	0.0000
D_FX	0.295123	0.105919	2.786311	0.0078
D_FX(-1)	0.099747	0.055373	1.801346	0.0784
D_FX(-2)	0.093016	0.057823	1.608615	0.1147
D_FX(-3)	0.174248	0.057165	3.048151	0.0038
D_IR	-0.073729	0.099873	-0.738225	0.4642
D_M2	-0.853626	0.632630	-1.349328	0.1840
D_LHH	-0.107496	0.157427	-0.682828	0.4982
D_TOTDEPHH	-0.005799	0.057312	-1.964938	0.0485
D_LP	0.278090	0.165816	1.677105	0.1005
D_TOTDEPP	-0.007695	0.114269	-0.067337	0.9466
D_TOTDEPP(-1)	-0.097284	0.054573	-1.782655	0.0814
D_TOTDEPP(-2)	-0.096904	0.055833	-1.735589	0.0895
D_TOTDEPP(-3)	-0.200200	0.050678	-3.950431	0.0003
C	5.228186	1.317392	3.968590	0.0003

R-squared	0.905046	Mean dependent var	11.80150
Adjusted R-squared	0.875505	S.D. dependent var	6.109054
S.E. of regression	2.155507	Akaike info criterion	4.586247
Sum squared resid	209.0795	Schwarz criterion	5.109833
Log likelihood	-122.5874	Hannan-Quinn criter.	4.791050
F-statistic	30.63683	Durbin-Watson stat	1.733370
Prob(F-statistic)	0.000000		

Figure 28 - Short Run output of ARDL model

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 4 lags

F-statistic	1.059330	Prob. F(4,41)	0.3889
Obs*R-squared	5.620119	Prob. Chi-Square(4)	0.2294

Figure 29 - ARDL LM Test, Author's Output via EViews 12

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	7.867247	10%	1.92	2.89
k	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9
Actual Sample Size	60	Finite Sample: n=60		
		10%	2.044	3.104
		5%	2.373	3.54
		1%	3.129	4.507

Figure 30 - Bounds Test, Author's Output via EViews 12

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_FX	1.594434	0.410651	3.882699	0.0003
D_IR	-0.177541	0.242892	-0.730947	0.4686
D_M2	2.055555	1.434801	1.432641	0.0589
D_LHH	-0.258852	0.374769	-0.690698	0.4933
D_TOTDEPHH	-0.069989	1.119138	-1.964267	0.0414
D_LP	0.669648	0.404041	1.657378	0.1044
D_TOTDEPP	-0.931167	0.368211	-2.528898	0.0150
C	12.58962	2.472710	5.091425	0.0000

Figure 31 - Long Run Dynamics, Author's Output via EViews 12

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D_FX)	0.295123	0.039786	7.417812	0.0000
D(D_FX(-1))	-0.267263	0.061009	-4.380714	0.0001
D(D_FX(-2))	-0.174248	0.045664	-3.815901	0.0004
D(D_TOTDEPP)	-0.007695	0.044796	-0.171768	0.8644
D(D_TOTDEPP(-1))	-0.297103	0.054186	-5.483078	0.0000
D(D_TOTDEPP(-2))	-0.200200	0.041848	-4.784000	0.0000
CointEq(-1)*	-0.415278	0.045475	-9.131967	0.0000

R-squared	0.697302	Mean dependent var	0.015000
Adjusted R-squared	0.663034	S.D. dependent var	3.421565
S.E. of regression	1.986176	Akaike info criterion	4.319580
Sum squared resid	209.0795	Schwarz criterion	4.563920
Log likelihood	-122.5874	Hannan-Quinn criter.	4.415155
Durbin-Watson stat	1.733370		

Figure 32 - ECM Output, Author's Output via EViews 12

After identifying the co-integrating vectors, the error correction model is estimated to provide both short-run dynamics and long run relationship of the variables of a single model. As reported in figure # in the Appendix, the implied error correction model shows that the coefficient of the ECM term is -0.41, which is statistically significant at the 1% level. This coefficient represents the speed of adjustment parameter, so the -0.41 implies a moderate rate of mean reversion to equilibrium. This presented in juxtaposition with the VAR's VECM CointEq1 term, which had a coefficient of -0.3557. the magnitude of error correction is comparable in the two models, highlighting the speed of adjustment in the economy.

Table 15: All VAR Specifications

Spec.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Variables	Inf, d_lhh, d_lp, d_totdepp, d_totdephh	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_fx	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_ir, d_fx	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2, d_fx	Inf, d_fx, d_m2, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_fx, d_ir, d_m2
Lag Length	1	1	1	1	1	1	1	1	1
Sig. variables	d_lp =0.39*** d_totdephh= -0.29** d_totdepp= -0.144**	d_lp=0.359** d_totdephh=-0.321* d_totdepp=-0.141**	d_totdephh=-0.50* d_totdepp=-0.135**	d_totdephh=-1.306*** d_totdepp=-0.16* d_m2=1.79***	d_totdephh=1.320*** d_totdepp=-0.16* d_m2=1.77***	d_totdephh=-0.49* d_totdepp=-0.13**	d_totdephh=-1.577*** d_totdepp=-0.18* d_m2=1.87***	d_m2=0.44*	d_fx=0.174* d_totdephh= -1.559*** d_totdepp= -0.18* d_m2= 1.85*** Inf=0.84***
Adj R2	76%	76%	77%	78%	78%	77%	79%	75%	79%
F – Stat	41.017	34.4	35.4	38.5	33.2	30.1	34.8	49.1	30.17
SC	26.43	32.1	31.9	28.3	34.12	33.6	33.9	21.29	39.6

*Shaded specification is selected as the **main** model*

** significant at 10%*
*** significant at 5%*
**** significant at 1%*

b. The ARDL Models

Table 16: All ARDL Specifications

Specs	1	2	3	4	5	6	7	8	9
Variables	Inf, d_lhh, d_lp, d_totdepp, d_totdephh	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_fx	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_ir, d_fx	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_m2, d_fx	Inf, d_fx, d_m2, d_ir	Inf, d_lhh, d_lp, d_totdepp, d_totdephh, d_ir, d_fx, d_m2
Lag Length	2,0,0,0,3	1,0,1,0,3,0	1,0,0,0,3,3	2,0,0,0,1,3	1,0,1,0,1,0,3	1,0,0,3,1,0,3	1,0,0,0,3,3,0	2,0,0,3	1,3,0,0,0,0,3
Sig. SR variables	d_totdepp = -0.11* (-1) = -0.18*** (-3) = -0.21***	d_lp(-1)= 0.17** d_totdepp= -0.111* (-1) = -0.14** (-3)=-0.18*** d_ir=0.19**	d_totdepp= -0.14*** (-1)=-0.95* (-3)=-0.18*** d_fx=0.26** (-1) = 0.1* (-3)=0.15***	d_lp=0.29** d_totdephh= -0.57** d_m2(-1)= 0.99*** d_m2(-3)= 0.56***	d_lp=0.27** d_totdephh (-1)= -0.79*** d_m2(-1)= 0.87*** (-2)=0.29* (-3)=0.49***	d_totdepp= -0.14*** (-3)=-0.18*** d_totdephh= -0.53* (-1)=-0.44* d_fx=0.32*** (-1)=0.24** (-3)=0.30***	d_totdepp(-1)= -0.162* (-3)=-0.14*** d_fx=0.25*** (-1)=0.1* (-3)=0.15***	d_fx=0.27*** d_m2=0.44** (-1)=0.34*** (-2)=0.27* (-3)=0.60***	Inf (-1)= 0.58*** d_fx=0.295*** (-1)=0.099* (-3)0.17*** d_totdephh= -0.05** d_totdepp (-1)= -0.097* (-2)=-0.097* (-3)=-0.2***
Bounds Test	7.026***	8.147***	9.802***	6.36***	7.259***	9.29***	8.87***	12.164***	7.867***
Sig. LR variables	D_totdepp= -1.011***	d_totdepp= -0.78** d_ir= 0.6**	d_totdepp= -0.55** d_fx=1.5***	d_lp=0.77*	d_lp=1.29** d_ir=0.47**	d_totdepp= -0.51* d_totdephh= -2,84** d_fx=2.42***	d_totdepp= -0.88*** d_fx=1.42***	d_fx=0.65*** d_m2=1.85***	d_totdepp= -0.93*** d_totdephh= -0.06** d_fx=1.59*** d_m2=2.05*
Coint. Coeff.	-0.301	-0.32	-0.38	-0.377	-0.372	-0.344	-0.41	-0.42	-0.41
R2	83%	84%	87%	85%	86%	88%	87%	86%	87%
F – Stat	33.04	32.7	35.5	31.13	30.91	32.0	33.28	47.03	30.63
SC	5.18	5.15	5.018	5.16	5.14	5.06	5.05	4.92	5.109

*Shaded specification is selected as the **main** model*

** significant at 10%*
*** significant at 5%*
**** significant at 1%*

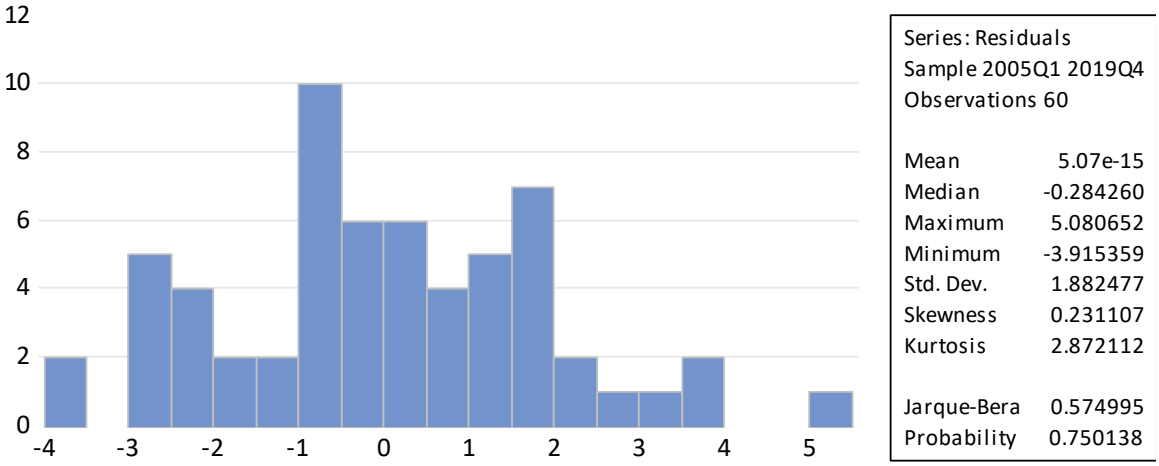


Figure 33- ARDL Residuals Normality Test, Author's Output via EViews 12

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.117467	Prob. F(14,45)	0.0482
Obs*R-squared	15.47826	Prob. Chi-Square(14)	0.0887
Scaled explained SS	8.149792	Prob. Chi-Square(14)	0.8814

Figure 34 - ARDL Heteroskedasticity Test, Author's Output Via EViews 12

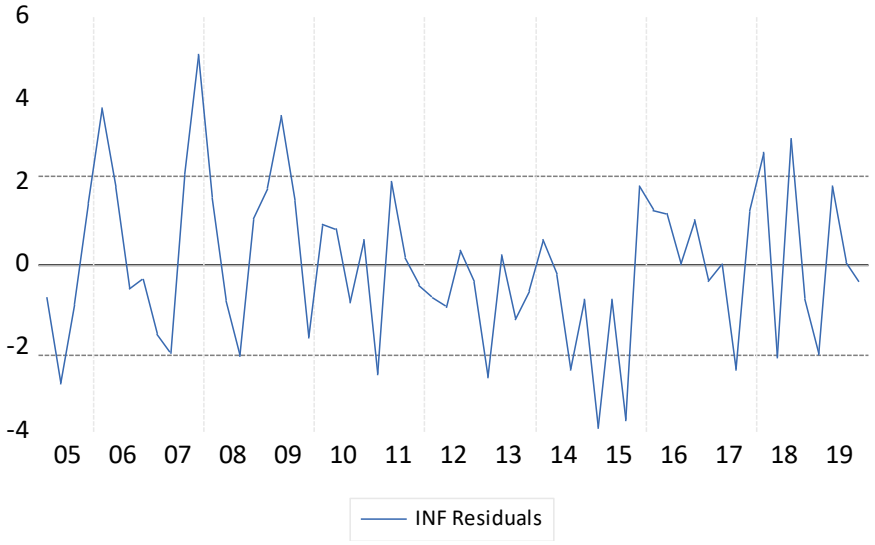


Figure 35 - ARDL Residuals Graph, Author's Output via EViews 12