The Impact of Financial Literacy on Macroeconomic Outcomes in Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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ABSTRACT

This study examines the relationship between financial literacy and macroeconomic outcomes in Kenya, specifically on GDP growth, income inequality, inflation, and stock market stability. Despite Kenya's strides in financial inclusion, a significant gap remains in the analysis of the understanding of financial services and the broader economic impacts the informed decisions drawn from the better understanding have. Utilizing a quantitative approach, the study employs Instrumental Variables (IV) regression models, namely both the Two-Stage Least Squares (2SLS) and Limited Information Maximum Likelihood (LIML). This is to address endogeneity concerns and assess the causal link between financial literacy and key macroeconomic indicators. The results show that financial literacy significantly impacts stock market stability and income inequality but has a minimal direct impact on GDP growth and inflation in the short term. The study concludes by highlighting the importance of financial literacy programs, particularly in reducing income inequality and enhancing market stability. Moreover, the study should offer policy recommendations for integrating financial education into Kenya's economic framework. Future research should explore the long-term effects of financial literacy and its indirect pathways to economic growth.

List of abbreviations

- **2SLS**: Two-Stage Least Squares
- **CBK**: Central Bank of Kenya
- **GER**: Gross Enrolment Rate
- **Gini**: Gini Coefficient
- **IV**: Instrumental Variables
- **LIML**: Limited Information Maximum Likelihood
- **PISA**: Programme for International Student Assessment
- **RSE**: Residual Standard Error
- **UIS**: UNESCO Institute for Statistics
- **Wu-Hausman**: Wu-Hausman Test (Endogeneity Test)

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1. INTRODUCTION

1.1 Background

In an era where economic stability and growth are pivotal, financial literacy emerges as a cornerstone of sustainable development. The ability to understand and manage financial matters is not merely a personal asset but a societal necessity, influencing a range of macroeconomic outcomes. According to the OECD (2018), financial literacy encompasses the knowledge, skills, attitudes, and behaviours required to make informed financial decisions that contribute to personal well-being and, by extension, national economic health. However, inadequate financial literacy can lead to suboptimal financial behaviours, with potentially far-reaching consequences for broader economic stability, GDP growth, and income distribution.

Kenya, like many developing economies, grapples with significant economic challenges. Despite strides in financial inclusion, particularly through mobile banking innovations like M-Pesa, the country faces a low gross national savings rate—only 12.7% of GDP in 2020, significantly below the Sub-Saharan African average of 18.9% (World Bank, 2021). Additionally, the Gini coefficient, which measures income inequality, remains high at 0.48, signalling deep-seated disparities in income distribution.

While financial services have become more accessible, financial literacy in Kenya lags behind. In 2021, although 82.9% of adults had access to financial services, only 38% were considered financially literate (Central Bank of Kenya, 2021). This disparity suggests that the availability of financial services does not automatically translate into effective use, highlighting a critical gap in the country's financial ecosystem.

Several studies have investigated financial literacy within Kenya, often focusing on its role in enhancing financial inclusion and influencing individual financial behaviour. The FinAccess Household Survey (2021) revealed that individuals with higher financial literacy are more likely to engage with formal financial institutions (Central Bank of Kenya, 2021).

Beyond Kenya, studies in Zimbabwe, Nigeria and Ghana have further illustrated the broader economic implications of financial literacy. Murendo and Mutsonziwa (2017) found that financial literacy positively affects savings decisions in Zimbabwe, indicating that improved financial education could lead to higher savings rates. Akinola (2019) established a link between financial literacy and economic growth in Nigeria, noting that higher financial literacy

contributes to better savings and investment decisions, driving economic expansion. Similarly, Anang, Boadu, and Agyemang (2020) in Ghana demonstrated that financially literate households are more capable of managing debt, saving, and investing, leading to greater economic stability.

In Kenya, Wambua and Kibati (2020) extended this analysis, finding that financial literacy contributes to economic resilience by enabling households to make better financial decisions, thereby enhancing economic stability at the microeconomic level. These studies collectively underscore the critical role that financial literacy can play in shaping economic outcomes across Sub-Saharan Africa.

Despite these insights, a significant research gap remains. While the relationship between financial literacy and individual financial behaviour is well-documented, the impact of financial literacy on broader macroeconomic variables, such as GDP growth and income inequality, has not been thoroughly explored in Kenya. This gap is particularly pressing given Kenya's ongoing economic challenges. Enhancing financial literacy could be a powerful lever for addressing these issues, yet the lack of empirical research specifically linking financial literacy to macroeconomic outcomes in Kenya leaves this potential largely untapped.

1.2 Problem Statement

Kenya’s economy faces several persistent challenges, each of which poses significant barriers to achieving sustainable growth and stability. Among these challenges are low savings rates, high income inequality, and economic vulnerability—factors that collectively hinder the country's development.

Low savings rates, which were recorded at just 12.7% of GDP in 2020 (World Bank, 2021), limit the availability of domestic capital needed for investment in key areas such as infrastructure, businesses, and innovation. This shortage of savings forces Kenya to depend on foreign capital to finance its growth, exposing the country to external economic shocks, such as fluctuations in global interest rates or changes in investor sentiment. Moreover, low savings rates mean that households and businesses have less financial resilience, leaving them more vulnerable during economic downturns.

High income inequality is another pressing issue, with Kenya’s Gini coefficient standing at 0.48 (World Bank, 2021). This high level of inequality not only exacerbates social tensions but also impedes economic growth. When wealth is concentrated among a small segment of the

population, the majority have limited access to opportunities for education, healthcare, and financial services, which are crucial for improving their economic circumstances. This inequality also weakens overall consumer demand, as lower-income households have less disposable income to spend, which in turn slows economic growth.

Adding to these challenges is Kenya's **economic vulnerability**, which is partly due to its reliance on a few key sectors, including agriculture, tourism, and remittances. Agriculture alone accounts for approximately 33% of GDP and employs about 70% of the rural population (World Bank, 2021). However, this sector is highly susceptible to external factors such as climate change, fluctuating global commodity prices, and political instability. Tourism, another critical sector, contributes about 8.8% to GDP but is vulnerable to global economic conditions and security concerns. Remittances, which account for about 3% of GDP, also expose the economy to external risks, particularly changes in the global Labour market. This reliance on a limited number of sectors makes the economy more susceptible to shocks, leading to broader economic instability.

Despite the clear importance of addressing these issues, there is a notable gap in empirical research that directly examines the impact of financial literacy on macroeconomic outcomes in Kenya. While financial literacy has been shown to enhance personal financial management and increase engagement with formal financial institutions (Murendo & Mutsonziwa, 2017; Central Bank of Kenya, 2021), its potential to influence broader economic outcomes—such as GDP growth, income distribution, and economic resilience—remains underexplored.

This research seeks to fill this gap by Analysing the relationship between financial literacy and macroeconomic outcomes in Kenya. By exploring how financial literacy influences key economic indicators, this study aims to provide insights that could inform the development of targeted financial education programs. Such programs could not only improve individual financial well-being but also contribute to the broader goals of enhancing economic resilience, reducing income inequality, and fostering sustainable economic growth in Kenya.

1.3 Research Objectives

1. To assess the impact of financial literacy on macroeconomic outcomes such as GDP, income inequality and market stability in Kenya.

1.4 Significance of the study

This study is significant as it addresses a critical gap in the understanding of the direct relationship between financial literacy and macroeconomic outcomes in Kenya. Financial literacy has long been recognised as important in personal financial management. However, the empirical analysis of its broader impact on national economic indicators remains underexplored, particularly within the Kenyan context. The findings of this study are expected to provide valuable insights that can guide policymakers in designing targeted financial education programs. Additionally, this study emphasises the importance of supporting both the access and understanding of financial services to facilitate effective use of financial services. Moreover, this study highlights the potential of financial literacy to mitigate issues of income inequality. In summary, through a better understanding of financial literacy and its effects on key economic indicators, this research aims to provide policymakers with the tools necessary to cultivate a financially literate population as with improved financial decision, individuals and businesses are more likely to engage in practices that foster long-term economic stability, growth, and innovation.

2. LITERATURE REVIEW

2.1 Introduction

This chapter examines the impact of financial literacy on economic outcomes, structured into three sections. The first section delves into the theoretical frameworks that link financial literacy with economic s and outcomes. The second section critically evaluates the empirical studies that have examined the effects of financial literacy, highlighting both the findings and the methodologies employed. The final section synthesizes the key insights from the theoretical and empirical literature, identifies gaps in the current research, and outlines the areas that warrant further investigation.

2.2 Theoretical literature

Financial literacy is defined as a "combination of awareness, knowledge, skill, attitude and necessary to make sound financial decisions and ultimately achieve individual financial wellbeing" (OECD, 2018).

According to the PISA (2012) Financial Literacy Framework, financial literacy can be broken down into three:

A. **Financial Knowledge**

- This encompasses an understanding of financial principles and concepts, such as interest rates, inflation, and diversification. Lusardi and Mitchell (2014) emphasize that financial knowledge is a strong predictor of financial behaviour.

B. **Financial Behaviour**

- Financial involves the actual financial practices individuals engage in, such as saving, investing, and budgeting. Studies by Hilgert, Hogarth, and Beverly (2003) show a positive correlation between financial literacy and responsible financial behaviour.

C. **Financial Attitudes**

- These are the personal beliefs and values that influence financial decision-making. Atkinson and Messy (2012) argue that financial attitudes, such as the propensity to save and risk tolerance, are crucial components of financial literacy.

This study builds on several theoretical frameworks to understand the impact of financial literacy on macroeconomic outcomes.

Keynesian Aggregate Demand-Aggregate Supply Model

The Keynesian AD-AS Model serves as the bridge between microeconomic and macroeconomic analysis for this paper. This model examines total spending (aggregate demand) and total production (aggregate supply) in an economy, illustrating their interaction in determining overall economic output and price levels.

Aggregate Demand

Aggregate Demand (AD) is the total demand for goods and services in an economy at varying price levels, represented by the equation:

$$AD = C + I + G + (X - M)$$

where:

C is Consumption: Total household spending on goods and services.

I is Investment: Total business spending on capital goods and household spending on new housing.

G is Government Spending: Total government expenditure on goods and services.

X is Exports: Goods and services produced domestically and sold abroad.

M is Imports: Goods and services produced abroad and purchased domestically.

Financial literacy plays a crucial role in shaping the components of aggregate demand influencing both individual and collective economic behaviours.

Components of aggregate demand are influenced by financial literacy in the following ways:

Consumption (C)

Consumption, the largest component of aggregate demand, represents all private expenditures by households on goods and services. It is influenced by factors such as income levels, interest rates, and consumer confidence. Financial literacy enhances consumption behaviour by helping individuals create and adhere to budgets, understand credit, and avoid unmanageable debt. This knowledge fosters balanced consumption,

reducing the likelihood of financial losses and economic instability due to excessive spending (Mankiw, 2019). Conversely, prudent consumption driven by financial literacy can lead to sustained economic growth by stimulating demand for goods and services, which encourages production, job creation, and economic expansion (Case, Fair, & Oster, 2017).

Investment (I)

Investment refers to the purchase of goods that are used to create future wealth, influenced by business expectations, interest rates, and technological advancements. Financial literacy encourages prudent investment decisions by helping individuals and businesses understand the costs and returns associated with borrowing and investing. It also promotes diversification, leading to more stable returns and a focus on long-term growth rather than short-term gains (Blanchard, 2017). Increased investment capacity, spurred by financial literacy, boosts production, job creation, and overall economic activity, further driving aggregate demand (Mankiw, 2019).

Government Spending (G)

Government spending, which encompasses all expenditures on goods, services, and public projects, is vital for stimulating economic activity, especially during downturns. Financial literacy indirectly influences government spending through public understanding of fiscal policy. A financially literate electorate is more likely to advocate for responsible government spending, demand transparency, and support policies that promote economic stability. This informed public opinion can lead to more efficient resource allocation and better governance, ensuring that government spending contributes positively to economic health and long-term growth (Krugman & Wells, 2018; Stiglitz & Rosengard, 2015).

Net Exports (X-M)

Net exports, the difference between a country's exports and imports, are influenced by factors such as exchange rates and global economic conditions. Financial literacy shapes consumer and business behaviours that impact trade balances. For consumers, financial literacy can encourage the purchase of domestically produced goods, thereby reducing imports and improving the trade balance. For businesses, financial literacy aids in making informed decisions about entering international markets, managing foreign exchange risks, and optimizing supply chains. This can enhance the competitiveness of domestic products

and contribute positively to the country's net exports (Samuelson & Nordhaus, 2010; Feenstra & Taylor, 2017).

Aggregate Supply

Aggregate Supply (AS) reflects the total output of goods and services that firms are willing and able to produce at different price levels. Factors influencing aggregate supply include:

- **Labour:** Availability and productivity of the workforce.
- **Capital:** Availability of physical capital and infrastructure.
- **Technology:** Technological advancements that enhance productivity.
- **Future Price Expectations:** (Dornbusch, Fischer, & Startz, 2018).

Financial literacy significantly influences various factors that drive aggregate supply, including labour, capital, technology, and future price expectations. Understanding how financial literacy impacts these components helps explain its broader economic implications.

Labour

The productivity and availability of labour are crucial determinants of a country's production capacity and economic output. Financial literacy enhances labour market outcomes by influencing decisions related to education, career choices, and retirement planning. Financially literate individuals are more likely to invest in education and skill development, leading to higher earnings and better job opportunities. This investment in human capital boosts labour productivity, contributing to a more robust aggregate supply. Moreover, financially literate individuals are better equipped to navigate career changes, entrepreneurship, and retirement, making the labour market more flexible and dynamic, which further supports economic growth (Goldin & Katz, 2008; Heckman & Mosso, 2014).

Capital

Capital, including machinery, tools, and technology, is essential for increasing productivity and driving long-term economic growth. Financial literacy plays a critical role in how individuals and businesses accumulate and utilize capital. It enables informed decisions about capital investments, such as purchasing new equipment or expanding facilities, thereby optimizing capital structure, and improving returns on investment. Additionally, financial literacy encourages diversification, leading to a resilient capital base that sustains economic activity even during periods of uncertainty. On a broader scale, financially

literate populations enhance the efficiency of capital markets, increasing liquidity and ensuring that capital flows to its most productive uses, which strengthens aggregate supply (Acemoglu & Robinson, 2012; Zingales, 2015).

Technology

Technology is a key driver of productivity and economic output, allowing businesses to produce more with fewer inputs. Financial literacy influences the adoption and development of new technologies by helping businesses and individuals make informed decisions about investing in innovation. Understanding the potential returns and risks associated with new technologies leads to better resource allocation and competitiveness, boosting aggregate supply. Moreover, financially literate individuals are more likely to invest in technology and continuously upgrade their skills to keep pace with technological advancements, contributing to a more dynamic and productive economy (Brynjolfsson & McAfee, 2014; Autor, 2015).

Future Price Expectations

Future price expectations play a significant role in shaping economic behaviour. Financial literacy equips individuals and businesses with the tools to understand and act upon these expectations, whether related to inflation trends, economic policies, or global market conditions. For businesses, financial literacy aids in strategic planning, including pricing, inventory management, and investment decisions, based on anticipated price changes. For individuals, financial literacy influences consumption and investment behaviours, helping them manage risks associated with price fluctuations through tools like hedging and forward contracts. This understanding contributes to more stable economic outcomes, supporting a balanced aggregate supply and demand (Mankiw, 2019; Blanchard, 2017).

The AD-AS model effectively illustrates the critical role of financial literacy in linking microeconomic behaviours with broader macroeconomic outcomes. By enhancing consumption and investment decisions, financial literacy drives aggregate demand, contributing to GDP growth and economic stability. On the supply side, financial literacy improves labour productivity, capital allocation, and technological adoption, reinforcing the economy's output capacity. Ultimately, financial literacy serves as a key mediator, ensuring that individual and firm-level decisions aggregate to support sustainable economic growth, resilience, and long-term stability. This underscores the importance of financial literacy as a

foundational component in shaping both individual financial well-being and the overall health of the economy.

However, the model also implicitly acknowledges the potential for endogeneity, where economic outcomes (e.g., GDP growth, unemployment rates) might influence individual financial behaviours, including savings and investment decisions that are shaped by financial literacy. For example, as the economy grows, individuals may experience higher incomes. This increase in income could make it easier for people to invest in financial education, thereby improving financial literacy. Additionally, economic growth might lead to higher tax revenues, allowing governments to invest more in public education and financial literacy programs. This, in turn, raises the general level of financial literacy in the population. Understanding this bidirectional relationship is crucial for accurately analysing the impact of financial literacy on macroeconomic outcomes.

Human Capital Theory

Human Capital Theory, developed by Becker (1976, 1993) and Schultz (1969), posits those investments in education, skills, and knowledge—including financial literacy—enhance individual productivity and economic outcomes. Unlike the AD-AS model, which primarily focuses on the interaction between aggregate demand and supply to explain macroeconomic outcomes, Human Capital Theory emphasizes the role of individual investments in human capital as a driver of economic growth and productivity.

Financial literacy, as a specific form of human capital, is crucial in shaping individual economic behaviour, which in turn impacts broader macroeconomic outcomes. Investments in financial literacy enable individuals to make informed decisions about saving, investing, borrowing, and consumption, thereby enhancing their personal economic stability and productivity. This individual-level improvement contributes to a more efficient allocation of resources within the economy.

At the macroeconomic level, widespread financial literacy can lead to higher aggregate savings rates, increased investment in productive assets, and more prudent borrowing practices. These behaviours collectively bolster economic stability and growth. For instance, higher savings rates expand the pool of capital available for investment in infrastructure, technology, and businesses, driving economic expansion and job creation. Prudent borrowing reduces the risk of financial crises caused by excessive leverage, contributing to long-term economic stability.

Furthermore, financial literacy enhances the efficiency of financial markets. When individuals have a better understanding of financial products and markets, they are more likely to participate, increasing market liquidity and lowering the cost of capital. This greater participation leads to more accurate asset pricing, reduced transaction costs, and more efficient capital allocation—critical factors for sustained economic growth.

Financial literacy also contributes to resilience during economic downturns. Individuals who understand the importance of saving for emergencies, managing debt, and diversifying investments are better equipped to navigate economic shocks, reducing the overall impact of recessions on the economy. This resilience supports faster economic recovery and more consistent long-term growth.

However, this theory also opens up the possibility of endogeneity, where improved economic conditions might lead to greater investments in human capital, including financial literacy. As economies grow and become more complex, the demand for financial knowledge increases, potentially leading to a feedback loop where macroeconomic improvements foster higher financial literacy, which in turn further stimulates economic growth.

In summary, while the AD-AS model explains how financial literacy affects macroeconomic outcomes through aggregate demand and supply, Human Capital Theory underscores the importance of financial literacy as an investment in human capital that enhances individual productivity and economic behaviour. Through targeted financial education initiatives, societies can improve financial literacy, thereby supporting macroeconomic stability, growth, and sustained economic prosperity.

Behavioural Economics

Behavioural Economics examines how cognitive biases and heuristics—mental shortcuts that individuals use to make decisions—impact financial decision-making. Traditional economic theories, like those underlying the AD-AS model and Human Capital Theory, often assume that individuals act rationally, making decisions that maximize their utility. However, Behavioural Economics reveals that individuals frequently deviate from rationality due to cognitive biases such as overconfidence, loss aversion, and anchoring (Thaler & Sunstein, 2008). These biases can lead to suboptimal financial decisions, such as under-saving for retirement, over-borrowing, or misallocating investments.

Unlike the AD-AS model, which focuses on aggregate economic outcomes driven by rational behaviours, and Human Capital Theory, which emphasizes the role of education and skills in

improving productivity, Behavioural Economics delves into the psychological factors that distort decision-making. Financial literacy plays a critical role in mitigating the effects of these cognitive biases. By enhancing individuals' understanding of financial concepts and improving their decision-making skills, financial literacy can help reduce the influence of biases. For example, financially literate individuals are more likely to recognize and counteract present bias (favouring immediate gratification over long-term benefits) and overconfidence, which might lead to overly concentrated investments.

At the microeconomic level, reducing cognitive biases through financial literacy leads to better financial decisions, such as more prudent borrowing, effective budgeting, and thoughtful investing. These improved behaviours contribute to greater financial stability for individuals and households. As these behaviours become more widespread, their positive effects aggregate, influencing macroeconomic outcomes. For instance, a population that saves more and manages debt effectively contributes to a more stable financial system, reducing the likelihood of crises caused by widespread defaults or excessive risk-taking.

On a macroeconomic scale, the impact of financial literacy extends beyond individual behaviour to influence market stability and economic policy. A financially literate population is more likely to support sound economic policies that promote stability and growth, such as fiscal responsibility in managing public debt. Moreover, when a significant portion of the population is financially literate, financial markets tend to become more efficient, with asset prices reflecting true underlying values, reducing volatility, and fostering long-term stability.

Behavioural Economics also suggests that financial literacy can be a powerful tool for policymakers. By designing policies that account for cognitive biases and aim to improve financial literacy, governments can enhance the effectiveness of economic policies. For example, automatically enrolling individuals in retirement savings plans, while allowing them to opt-out, can significantly increase savings rates by leveraging the bias towards inertia.

This field also suggests potential endogeneity, where economic environments might influence the prevalence of certain cognitive biases. For instance, during economic downturns, individuals might become more risk-averse, affecting their financial decisions, and highlighting the need for greater financial literacy. Conversely, as financial literacy increases, it can mitigate these biases and promote more stable economic outcomes, creating a cyclical relationship that complicates the causal analysis of financial literacy’s impact on macroeconomic stability.

In conclusion, Behavioural Economics underscores the importance of addressing cognitive biases in financial decision-making. Financial literacy is key to reducing these biases, leading to better financial decisions at the individual level and more stable, efficient outcomes at the macroeconomic level. By fostering a financially literate population, societies can enhance market stability, support sound economic policies, and ultimately achieve more sustainable economic growth.

2.3 Empirical Literature

The empirical literature highlights significant findings related to the impact of financial literacy on economic behaviours and outcomes in various contexts. However, a clear research gap exists regarding the specific impact of financial literacy on macroeconomic outcomes such as GDP, income inequality, and market stability in Kenya. While some studies implicitly suggest the potential for financial literacy to influence macroeconomic factors through frameworks like the AS-AD model, Human Capital Theory, and Behavioural Economics, these connections have not been explicitly tested.

For instance, Lusardi and Mitchell's (2007) seminal study on financial literacy and retirement planning provided a foundational understanding of this implicit relationship. The study aimed to assess whether individuals with higher financial literacy were more likely to engage in retirement planning and, consequently, save more effectively. Using data from the Health and Retirement Study (HRS) in the U.S., Lusardi and Mitchell employed **probit regression analysis** to explore the relationship between financial literacy and retirement planning. Their findings indicated that financially literate individuals were significantly more inclined to plan for retirement, leading to higher savings rates. This study underscored financial literacy as a pivotal factor in fostering effective saving behaviours, with broad implications for economic stability. However, a potential criticism of the study lies in its reliance on self-reported data, which could introduce biases that might affect the robustness of the findings.

Building on this foundation, Grohmann, Klühs, and Menkhoff (2018) extended the examination of financial literacy's impact to the context of developing countries. Their study focused on how financial literacy influences household saving and investment behaviours across various developing nations, including those in Africa. Utilizing data from a World Bank survey, the researchers conducted cross-sectional and longitudinal analyses, applying **multivariate regression models** to assess the impact of financial literacy on savings and investment behaviours. The study concluded that higher financial literacy was associated with

increased savings and greater participation in formal financial markets, suggesting that financial literacy can promote financial inclusion and enhance economic resilience in developing economies. Nonetheless, the diverse socio-economic contexts of the countries studied imply that the effectiveness of financial literacy programs may vary widely, raising concerns about the generalizability of the findings. This study implicitly touches on broader macroeconomic outcomes, but these connections, such as those to aggregate demand (AD) and aggregate supply (AS), remain underexplored. Additionally, while the study suggests that financial literacy can drive economic resilience, it also hints at the reverse causal relationship where improved economic conditions could lead to higher levels of financial literacy by providing greater access to financial education and resources.

In the African context, Murendo and Mutsonziwa (2017) conducted a significant study in Zimbabwe, exploring the relationship between financial literacy and household savings behaviour. This research aimed to determine whether financial literacy positively influenced the savings decisions of households in Zimbabwe. Using data from the Fin Scope Consumer Survey, the authors employed **logistic regression analysis** to investigate how financial literacy impacts savings behaviour. Their findings revealed a positive correlation between financial literacy and savings, indicating that individuals with higher financial literacy were more likely to save and use formal financial institutions. This study highlighted the potential of financial literacy to enhance financial stability at the household level in Zimbabwe. However, the study's focus on a single country with specific socio-economic challenges may limit the applicability of its conclusions to other contexts. The findings also suggest a potential for broader macroeconomic impacts, aligning with Human Capital Theory, where enhanced financial literacy contributes to higher productivity and economic growth, though this connection is not explicitly made. The reverse causal relationship is also relevant here, as higher economic growth and improved financial conditions could further enhance financial literacy through better access to education and financial services.

Similarly, Akinola (2019) investigated the relationship between financial literacy and economic growth in Nigeria. The objective of this study was to explore how financial literacy contributes to economic growth by influencing savings, investment, and financial behaviours. Akinola utilized **panel data regression analysis** with fixed effects to assess the impact of financial literacy on economic growth across different states in Nigeria over time. The study found that higher financial literacy levels were positively associated with increased savings rates and investment in productive assets, which in turn drove economic growth. However, the study

acknowledges that varying levels of financial infrastructure and economic development across Nigerian states could influence the outcomes, suggesting that further research is needed to refine these findings. The potential for causality and reverse causality between financial literacy and economic outcomes is also implied, as economic growth could, in turn, enhance financial literacy through increased access to education and financial services. This aligns with the AS-AD model, where increased savings and investment lead to greater capital accumulation and shifts in aggregate supply, though this relationship is not explicitly tested.

Klapper, Lusardi, and Van Oudheusden (2015) expanded the focus to a global perspective, examining the role of financial literacy in mitigating the effects of the 2007-2008 financial crisis. The study utilized data from the Standard & Poor's Global Financial Literacy Survey, employing **cross-sectional analysis** to explore the relationship between financial literacy levels and financial behaviours during the crisis. Their findings indicated that higher financial literacy was associated with fewer instances of panic selling and less severe declines in stock markets, suggesting that financial literacy is crucial for enhancing market stability during crises. However, the cross-sectional nature of the study complicates the establishment of causality, as other factors like financial infrastructure may also influence these outcomes. This observation underscores the need for further research, particularly in emerging markets like Kenya, where the relationship between financial literacy and market stability during economic shocks has not been thoroughly examined. The potential for reverse causality is also present, where market stability and economic confidence could drive higher levels of financial literacy.

In the context of the COVID-19 pandemic, Aprea and Wuttke (2020) examined how financial literacy influenced market behaviour. Using a combination of **survey data and time-series analysis** of market behaviours, the study found that financially literate individuals were less likely to engage in panic-driven financial decisions, such as mass withdrawals from the stock market. This behaviour contributed to market stability during the pandemic, as these individuals were more likely to maintain their investments, thereby reducing market volatility. However, the unique nature of the pandemic presents challenges in generalizing these findings to other economic shocks. The findings from this study are particularly relevant to the Kenyan context, where the impact of financial literacy on market stability during such crises remains underexplored. This aligns with Behavioural Economics, where financial literacy mitigates irrational behaviours in financial markets, thus stabilizing the economy. It also suggests a reverse causal relationship, where a stable economic environment could promote higher levels of financial literacy by encouraging individuals to engage more deeply with financial systems.

The recent study by Bucci (2023), titled *"Financial Literacy, Human Capital, and Long-Run Economic Growth,"* is a notable attempt to explore these relationships more directly, examining the causal pathways between financial literacy and economic growth, income distribution, and financial market stability. This underscores the need for similar research in the Kenyan context. Addressing these gaps would provide valuable insights into how enhancing financial literacy could contribute to broader economic development and stability in Kenya.

2.4 Conclusion

The empirical literature reviewed demonstrates a robust body of research linking financial literacy to various economic behaviours and microeconomic outcomes, such as savings, investment, and financial stability. Studies like those by Lusardi and Mitchell (2007) and Grohmann, Klühs, and Menkhoff (2018) provide foundational insights into how financial literacy influences individual and household financial decisions across different contexts. However, a significant research gap persists concerning the specific impact of financial literacy on macroeconomic outcomes, particularly in the context of Kenya.

While there are implicit connections in the literature suggesting that financial literacy could influence broader economic variables such as GDP growth, income inequality, and market stability, these connections have not been explicitly tested. Theoretical frameworks like the AS-AD model, Human Capital Theory, and Behavioural Economics offer promising avenues for exploring these relationships in more detail. Recent work by Bucci (2023) has begun to address these questions, examining the causal links between financial literacy and long-term economic growth, but further empirical investigation is necessary, especially in emerging economies like Kenya.

Addressing these gaps in the literature is crucial. By explicitly linking financial literacy to macroeconomic outcomes, researchers can provide policymakers with the evidence needed to design effective financial education programs that not only improve individual financial well-being but also contribute to broader economic development and stability. Such research would be particularly valuable in the Kenyan context, where the economy faces challenges related to low financial literacy, high income inequality, and economic vulnerability. Therefore, future studies should aim to empirically test these relationships, providing a clearer understanding of how enhancing financial literacy could drive sustainable economic growth and reduce inequality in Kenya.

3. METHODOLOGY

3.1 Research Design

This study employs a quantitative research design, using an Instrumental Variables (IV) regression model to investigate the impact of financial literacy on macroeconomic outcomes in Kenya. The IV regression is chosen to address potential endogeneity issues, particularly reverse causality, where macroeconomic outcomes may influence financial literacy levels, rather than the other way around. This approach allows for a more accurate estimation of the causal relationship between financial literacy and key macroeconomic indicators such as GDP growth, market stability, and income inequality.

3.2 Conceptual Framework

This study's conceptual framework is designed to explore the relationship between financial literacy and key macroeconomic outcomes—GDP growth, income inequality, and market stability—in Kenya. The framework acknowledges the potential endogeneity of financial literacy, where it not only influences these macroeconomic variables but is also influenced by them, creating a dynamic interplay.

3.2.1 Core Relationships

Financial Literacy as an Independent Variable: Financial literacy is posited as a critical factor that shapes economic behaviours at both the individual and macroeconomic levels. It influences GDP growth by enhancing the efficiency of savings, investment, and consumption decisions. Individuals with higher financial literacy are better equipped to make informed financial decisions, leading to increased capital accumulation, higher productivity, and, ultimately, economic growth.

Furthermore, financial literacy has the potential to reduce income inequality. By enabling individuals across different income levels to make sound financial decisions, access formal financial markets, and manage their resources effectively, financial literacy can mitigate the disparities in income distribution.

Market stability is another macroeconomic outcome linked to financial literacy. In times of economic turbulence, financially literate individuals are less likely to engage in panic-driven

behaviours such as mass withdrawals or selling off assets, which can exacerbate market volatility. Thus, financial literacy contributes to a more stable and resilient financial system.

3.2.2 Endogeneity and Feedback Loops

The conceptual framework also recognizes the endogeneity of financial literacy. Macroeconomic outcomes like GDP growth, income inequality, and market stability can, in turn, influence the levels of financial literacy within a population. For instance, as the economy grows and becomes more stable, there may be greater access to education and financial services, which can improve financial literacy. Conversely, high income inequality might limit access to financial education, thereby reducing overall financial literacy levels.

This dynamic interplay is critical in understanding the full impact of financial literacy on the economy and vice versa. The feedback loops between financial literacy and macroeconomic outcomes suggest a bidirectional relationship that needs to be carefully Analysed to avoid biased estimates and draw meaningful conclusions.

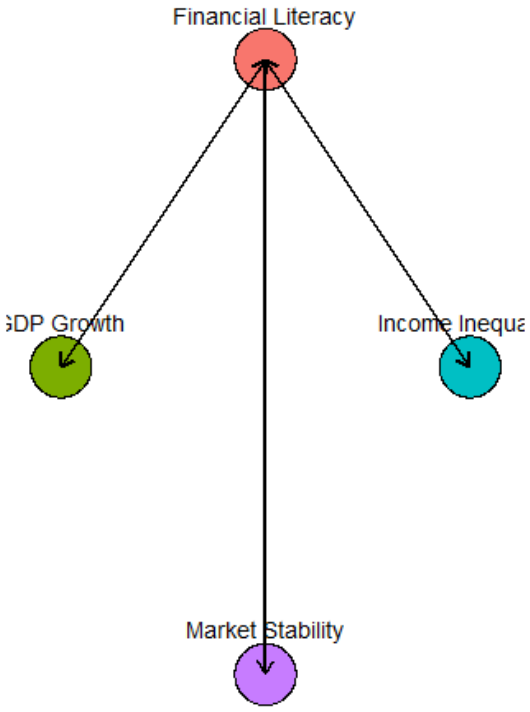

Figure 1: The causal relationship between financial literacy and macroeconomic indicators

3.3 Data Collection

3.3.1 Data sources

The study will use secondary data from various reliable sources:

- **Financial Literacy Data:** Data on financial literacy levels in Kenya will be obtained from surveys such as the FinAccess Household Survey (Central Bank of Kenya, 2021) and any relevant global financial literacy surveys.
- **Macroeconomic Data:** Data on GDP growth, inflation rates, income inequality (Gini coefficient), market stability (e.g., stock market indices), and other relevant macroeconomic indicators will be sourced from the World Bank, the Kenya National Bureau of Statistics (KNBS), and the Central Bank of Kenya (CBK).
- **Control Variables:** Additional variables such as education levels, employment rates, and access to financial services will be included as controls to account for other factors influencing macroeconomic outcomes.

3.3.2 Data Collection Procedure

The secondary data will be collected from the aforementioned sources and compiled into a dataset for analysis. The data will cover a period of 2006 - 2021 to capture both short-term and long-term trends. Where possible, the data will be disaggregated by demographic factors such as age, gender, and region to allow for a more detailed analysis of the impact of financial literacy across different segments of the population.

3.4 Variables and Measurement

3.4.1 Dependent Variables

The study will examine the following macroeconomic outcomes as dependent variables:

- **GDP Growth Rate:** Measured as the annual percentage change in Gross Domestic Product (GDP).
- **Market Stability:** Measured using indicators such as stock market indices, volatility measures, and financial market resilience.
- **Income Inequality:** Measured by the Gini coefficient, which quantifies the distribution of income across the population.

3.4.2. Independent Variable

- **Financial Literacy:** This will be measured using a composite index derived from survey data, which may include scores on financial knowledge, financial behaviour, and financial attitudes.

3.4.3 Instrumental Variables

Given the potential endogeneity between financial literacy and macroeconomic outcomes, appropriate instrumental variables (IVs) will be identified. These IVs must be correlated with financial literacy but uncorrelated with the error term in the regression model. Possible IVs could include:

- **Historical education access rates:** As proxies for long-term financial literacy trends.
- **Geographic factors:** Such as proximity to financial institutions or educational facilities.
- **Government financial education policies:** Implementation dates of major financial education initiatives.

3.4.4 Control Variables

Control variables will include:

- **Education Levels:** Average years of schooling or literacy rates.
- **Employment Rates:** Unemployment rate or labour force participation rate.
- **Access to Financial Services:** Percentage of the population with access to banking or mobile money services.

3.5 Data Analysis

3.5.1 Instrumental Variable (IV) Regression

The primary analytical technique used in this study will be IV regression, which addresses potential endogeneity by using instrumental variables that are correlated with the endogenous explanatory variables (financial literacy) but not with the error term. The IV regression model can be represented as:

1. First stage:

$$Financial\ Literacy = \pi_0 + \pi_1 Instrumental\ Variable + \pi_2 Control\ Variables + u$$

Equation 1: First stage IV regression

2. Second Stage

$$Y = \alpha + \beta_1 Predicted\ Financial\ Literacy + \beta_2 Control\ Variables + \varepsilon$$

Where:

Y represents the macroeconomic outcome (e.g., GDP growth, market stability, income inequality).

α is the intercept.

β_1 is the coefficient representing the impact of the predicted financial literacy variable from the first stage.

β_2 is the coefficient for the control variables.

ε is the error term.

Equation 2: General second stage IV regression

3.5.2 Diagnostic Tests

To ensure the reliability and validity of the IV regression models, several diagnostic tests will be conducted:

- **Instrument Relevance:** The F-statistic from the first stage regression will be used to evaluate the strength of the instruments.
- **Overidentification Test:** The Sargan or Hansen test will be applied to check whether the instruments are uncorrelated with the error term and thus valid.
- **Endogeneity Test:** The Durbin-Wu-Hausman test will be conducted to confirm whether the IV approach is necessary by testing the presence of endogeneity.

3.6 Ethical Considerations

Since this study relies on secondary data, the primary ethical considerations involve the proper citation of data sources and ensuring the data used is obtained from reliable and credible

sources. Additionally, confidentiality will be maintained when handling any data that includes personal or sensitive information.

3.7 Limitations

The study may face limitations related to the availability and quality of data, particularly in identifying strong and valid instruments for the IV regression. Furthermore, the reliance on secondary data may limit the ability to capture all relevant variables, and the cross-sectional nature of some data may not fully account for changes over time.

3.8 Conclusion

The methodology outlined in this chapter provides a robust framework for Analysing the impact of financial literacy on macroeconomic outcomes in Kenya. By employing an IV regression model to address potential endogeneity, this study aims to produce reliable and unbiased estimates that contribute valuable insights into how financial literacy can drive economic growth, enhance market stability, and reduce income inequality.

4.DATA COLLECTION, EMPIRICAL RESULTS AND ANALYSIS

4.1 Introduction

In this chapter we will go over how the data was collected, how the data was processed and analysed, and finally the findings originating from the study are presented.

4.2 Data Sources

The data for the required analysis was hard to come by as datasets were sparse and scattered with few credible data points. To combat this, the study utilizes secondary data from well-established and credible sources filling in holes between datasets. The data spans from the year 2006 to 2021.

For **financial literacy data**, the secondary document of choice was the **FinAccess Household surveys** conducted every three years in Kenya. Each survey was an improvement on the previous and hence more information could be gleaned with each passing year. Additionally, key **educational data** required was scant. This data was synthesized from the **FinAccess Household surveys – Literacy rates** and **Access to Secondary Schooling** acting as a proxy to **Access to Educational Institutions –** combined with **UIS statistics** from **UNESCO** for **Primary Gross Enrolment Rate (GER)Percentage.** The Ministry of Education report 2022 provided for key data in **Secondary Gross Enrolment Rate (GER)** %. For **stock market volatility,** data was aggregated from the **Mendeley database** from 2007 to 2021. However, macroeconomic outcome data, such as data on **GDP growth, inflation rates, unemployment rates,** were easier to come by from the years 2006 to 2021 from the World Bank dataset. The Gini coefficient measures required were derived from the **Standardized World Income Inequality Database (SWIID).**

In summary, the key data sources include:

- **Financial Literacy Data**: Extracted from the **FinAccess Household Surveys 2006, 2009, 2013, 2016, 2019**.
- **Macroeconomic Data**: Sourced from **the World Bank** covering GDP growth, inflation rates, and unemployment rates.
- **Income Inequality Data**: The **Standardized World Income Inequality Database (SWIID)** provides Gini coefficient measures to evaluate income distribution trends.

- **Stock Market Stability Data**: Obtained from the **Mendeley dataset** and the Nairobi Securities Exchange (NSE), focusing on stock market indices and volatility measures.
- **Control Variables**: Additional indicators such as literacy rates and education levels are included from **UNESCO and other international databases**.

4.3 Data Cleaning and Processing

Before the analysis was conducted, extensive data cleaning and processing was required due to the missing data points to enhance accuracy and reliability. These were the measures applied:

1. **Filtering and Selection**
   The data was restricted to observations from 2006 to 2021 to maintain consistency across variables.
2. **Handling Missing Data**
   The missing data points were addressed using linear interpolation where appropriate and cross-validated against multiple imputation techniques.
3. **Standardization and Scaling**
   Key economic indicators (e.g., GDP growth, inflation, and financial literacy scores) were converted into percentage values for uniformity.
4. **Variable Transformation**
   The Financial Literacy Index (FLIndex) was constructed using by combining measures of financial knowledge, behaviour, and attitude constructed through extensive analysis of the data.

4.3.1 Instrument Variables

Financial Literacy Index (FLIndex)

The FLIndex was instrumented using knowledge of financial products and terms as a proxy to Financial Knowledge, saving and borrowing trends as a proxy to Financial Behaviour and attitudes toward financial products and services as proxies for Financial Attitude. These three measures were indexed between 0 and 1 and the average taken to form the Financial Literacy Index.

Primary Gross Enrolment Rate (GER%) and Secondary Gross Enrolment Rate (GER%)

Education plays a pivotal role in shaping financial literacy by improving comprehension, numeracy, and decision-making skills thus making access to education a relevant instrument

as higher access to education more likely leads to improved comprehension, improved numeracy, and improved decision-making skills. It is valid as financial outcomes are not directly influenced by access to education but indirectly through financial literacy. Primary Gross Enrolment Rate and Secondary Gross Enrolment Rate was used as a proxy to access to education.

The Primary and Secondary Gross Enrolment Rate are both educational indicators that measured the total enrolment in the primary and secondary school level of education respectively regardless of age and is expressed as a percentage of the official school-age population for that level of education. It is used as a proxy indicator for access to education as a higher GER% indicates better access to education through more student enrolments whilst a lower GER% indicates barrier to enrolment hence worse off access to education.

Financial Access (% by institution)

More financial institutions in a region provide greater exposure to financial services. This encourages financial learning. Households or individuals in areas with better financial access are more likely to engage with the financial tools thus improving their understanding over time making this variable relevant. However, institutional financial access is largely determined by policy makers and financial institution rather than personal financial literacy making this a valid instrument.

4.3.2 Control Variables

Literacy Rates (% of literate adults in Kenya).

Higher literacy improved comprehension of financial concepts as those who can read and understand texts are more likely to grasp financial concepts such as budgeting, saving, and interest rates. Additionally, literacy is required for financial literacy as financial materials, contracts, and banking services require basic literacy skills. Finally, if omitted, literacy might confound the results as literate individuals are naturally more likely to be financially literate.

Unemployment Rates (% of labour force unemployed).

Unemployed individuals may have fewer financial interactions as those without income may not actively engage with banking, investment, or credit markets, potentially reducing their financial literacy. Additionally, high unemployment may reflect economic instability, affecting financial literacy due to reduced access to financial resources. However, high unemployment

might encourage tighter financial control, necessitating an increase in financial literacy to cope with uncertain financial positions.

4.4 Regression Methodology

4.4.2 Two-Staged Least Squares (2SLS)

A Two-Stage Least Squares **Instrumental Variables (IV) Regression** was employed to assess the relationship between financial literacy and macroeconomic outcomes. The IV approach was selected due to the potential endogeneity issues in the relationship between **financial literacy and economic indicators**.

Stage 1: First Stage Regression

Financial Literacy Index (FLIndex) was estimated as a function of its instruments and control variables:

$$FLIndex = \beta 0 + \beta 1 Primary\ GER + \beta 2 Financial\ Access + \beta 3 Literacy\ Rates + \beta 4\ Unemployment\ Rate + \epsilon$$

Stage 2: IV Regression

Using the predicted values of **FLIndex**, separate IV regressions were run for the following dependent variables:

1. **GDP Growth (%)**
2. **Inflation Rate (Average Annual %)**
3. **Stock Market Volatility (%)**
4. **Income Inequality (Gini Dispersion)**

Equation 3:First stage IV Regression including control and instrumental variables

The general IV model structure:

$$\boldsymbol{Y = \alpha + \delta FLIndex\hat{} + \varepsilon}$$

Where:

- $\boldsymbol{Y}$ represents each dependent variable (**GDP growth, Inflation rate, Stock Market Volatility, Gini Dispersion**).
- $\boldsymbol{FLIndex}$^is the predicted **Financial Literacy Index** from the first-stage regression.
- $\boldsymbol{\alpha}$ is the constant term.
- $\boldsymbol{\delta}$ represents the estimated impact of **Financial Literacy** on the dependent variable.
- $\boldsymbol{\varepsilon}$ is the error term.

Equation 4: Generalised second stage IV regression with predicted Financial Literacy Index

4.4.3 Limited Information Maximum Likelihood IV regression model

This, abbreviated as LIML, is an estimation method used in Instrumental Variable (IV) regression. LIML differs from 2SLS in the way it estimates the parameter as it uses a maximum likelihood approach. It is less sensitive to weak instruments and small sample sizes. It also provides a more robust framework for testing and correcting endogeneity because it incorporates likelihood-based diagnostics.

This regression model was applied to the check on the regressions that would bring up invalid instrumental variables.

4.4.4 Diagnostic tests

1. **Wu-Hausman test**: This confirms that the instrumental variables are exogenous (valid). It is important as endogeneity introduces bias in estimating the effect of financial literacy on stock market volatility.
   - Hypotheses:
     - Null Hypothesis (H_0): The IVs are exogenous (Valid)
     - Alternative Hypothesis (H_1): The IVs are endogenous (invalid)
     - A p-value of ($p>0.05$), we fail to reject the null hypothesis and a p-value of ($p<0.05$), we reject the null hypothesis.
2. **Sargan test (Overidentification test):** This confirms that the instrumental variables only explain the endogenous variable and are not correlated with the error term of the main regression.
   - Hypotheses:
     - Null Hypothesis (H_0): The IVs are valid and uncorrelated with the error term.

- Alternative Hypothesis (H_1): At least one IV is invalid and correlated with the error term.
- A p-value of ($p>0.05$), we fail to reject the null hypothesis and a p-value of ($p<0.05$), we reject the null hypothesis.

3. **Anderson-Rubin Test**: This tests the significance of the endogenous variable on the dependant variable.
   - Hypotheses:
     - Null Hypothesis (H_0): The coefficient of the independent variable is not significant.
     - Alternative Hypothesis (H_1): The coefficient of the independent variable is significant.
     - A p-value of ($p>0.05$), we fail to reject the null hypothesis and a p-value of ($p<0.05$), we reject the null hypothesis.

5. REGRESSION RESULTS, DISCUSSION AND RECOMMENDATIONS

5.1 First Stage Regression

5.1.1 Initial First Stage Regression

The First Stage regression estimates Financial Literacy Index (FLIndex) as a function of Primary GER%, Financial Access, Literacy Rates, and Unemployment Rate through a multiple linear regression model. Below is a table summary of the results.

Variable Name	Coefficient	Std. Error	t-value	p-value	Interpretation
(Intercept)	0.97287	0.89424	1.088	0.302154	
Financial Access	0.53943	0.11337	4.758	0.000771	Highly Significant and positive
Unemployment Rate	6.737623	3.11918	2.044	0.068166	Significant and positive
Primary GER%	0.22420	0.18892	1.187	0.262759	Not Significant
Secondary GER%	0.08927	0.10075	0.886	0.396401	Not significant
Literacy Rates	-3.46651	2.45312	-1.413	0.187988	Not significant

Table 1:Initial First Stage Regression

Financial Access

Based off these results, higher financial access **significantly increases** financial literacy. This implies that individuals with greater access to financial services (e.g., banking, credit, savings) develop stronger financial literacy skills as they are more likely to engage with such services, improving their understanding over time.

Unemployment Rate

These results indicate that higher unemployment is associated with higher financial literacy. Potentially, this could be as a result of unemployed individuals engaging more in financial planning and budgeting to cope with economic uncertainty and manage scarce resources and improve financial decision-making, hence increasing financial literacy.

Primary GER%

The results indicate that Primary Gross Enrolment Rate does not significantly impact financial literacy. This may be due to basic schooling not being sufficient to develop financial knowledge as financial education is not necessarily embedded in primary school curricula. This makes early education less relevant to financial literacy.

Secondary GER%

The results indicate that Secondary Gross Enrolment Rate does not significantly impact financial literacy. This may be due to the specific skills, such as budgeting, investing, and saving, not being part of the general secondary education curriculum.

Literacy Rate

This variable has a weakly significant relationship with financial literacy. It has an unexpectedly negative relationship suggesting that higher literacy rates may not directly translate to financial literacy. This may imply that simply being literate does not necessarily mean one understands complex financial concepts; general education does not always include financial education.

5.1.2 Final First Stage Regression

Given the tests of significance in the initial First Stage regression, Literacy Rates and Primary GER% were dropped as variables and another First Stage Regression was carried out. The table below is a summary of the final First Stage Regression.

Variable	**Estimate**	**Std. Error**	**t- value**	**p-value**	**Interpretation**
(Intercept)	-0.17957	0.04747	-3.783	0.00228	
Financial Access	0.50170	0.08315	6.034	0.0000421	Highly Significant and positive
Unemployment Rate	1.98829	0.73557	2.703	0.01809	Significant and positive

Table 2: Final First Stage Regression

Financial Access

As was the case in the initial First stage regression, higher financial access significantly increases financial literacy.

Unemployment Rate

As was the case in the initial First stage regression, higher unemployment is associated with higher financial literacy.

Model Fit

The first-stage regression model is strong with a high R^2 and a high adjusted $R^{2.}$ This means the independent variables explains the variance in the dependent variable; it has strong explanatory power. In addition to this, it has significant predictors and a low residual error. This indicates Financial Access and Unemployment Rate are valid predictors of Financial Literacy (FLIndex). The low Residual Standard Error (RSE) indicates that the fitted values of the FLIndex are close to the observed FLIndex values.

Statistic	**Value**	**Interpretation**
Multiple R^2	0.9239	Strong fit.
Adjusted R^2	0.9122	Strong fit.
F- statistic	78.94	Highly significant. Instruments are strong
p-value	$5.349*10^{-8}$	
Residual Standard Error	0.02077	Good fit

Table 3: First stage Model Fit

5.2 Second Stage Regression

5.2.1 GDP Growth and Financial Literacy

Model Specification:

The relationship between GDP growth and financial literacy is modelled as:

$$\boldsymbol{GDP\ growth = \alpha + \delta FLIndex\hat{} + \varepsilon}$$

Where:

GDP Growth: The annual GDP growth rate (The dependent variable)

FLIndex^: The Financial Literacy Index (Independent variable)

α: The intercept term

δ: The coefficient representing the effect of financial literacy on GDP growth

ε: The error term

Equation 5: GDP growth against Financial Literacy

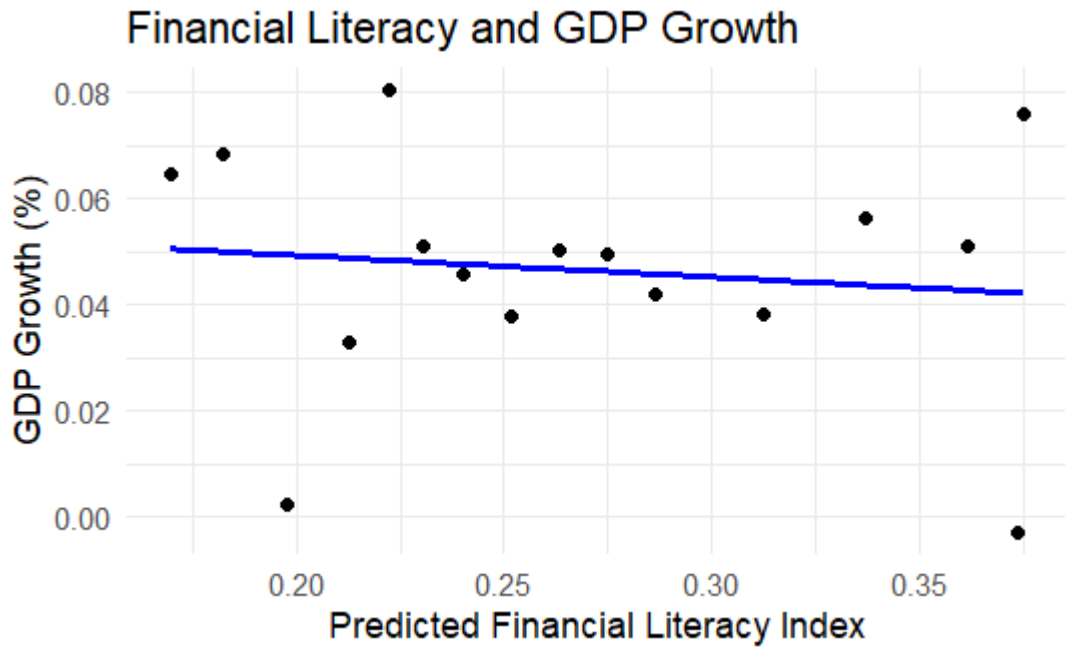

Figure 2: GDP Growth against Predicted Financial Literacy Index

Variable	Estimate	Std. error	t-value	p-value	Significance
Intercept	0.05751	0.02457	2.340	0.0346	
FLIndex	-0.04075	0.08902	-.0458	0.6541	No significant effect

Table 4: GDP growth and financial literacy regression

Key:

- * Significant at $p < 0.05$
- ** Significant at $p < 0.01$
- *** Significant at $p < 0.001$

Test	df1	df2	Statistic	p-value	Interpretation
Wu- Hausman	1	13	0.10	0.757	IVs are exogenous (valid)
Sargan	1	NA	0.00	0.989	No Overidentification issues (valid)

Table 5: Valid check on the second stage regression

Hypothesis

Null Hypothesis (H_0): $\delta = 0$, indicating that there is no significant relationship between financial literacy and GDP growth.

Alternative Hypothesis(H_1): $\delta \neq 0$, indicating that there is a significant relationship between financial literacy and GDP growth.

According to the analysis on the dataset provided, we fail to reject the null hypothesis(H_0). The hypothesis test suggests that financial literacy has no significant direct impact on GDP growth in the dataset.

Discussion of the results

The Wu-Hausman Test confirmed that the IVs are exogenous and are not correlated with the error term. The Sargan Test confirmed that there were no overidentification issues. This means that the instruments explain only the endogenous variable (financial literacy).

The lack of significance suggests that GDP growth may not be driven directly by financial literacy in this specific dataset. It may be driven indirectly through savings rate, investment decisions, entrepreneurship, and consumer confidence etc. Further analysis including these pathways might indicate the true impact of financial literacy on GDP growth.

Additionally, it may mean that in the short-term, financial literacy may have a negligible effect on GDP growth. In the long-term, individuals and firms have time to apply new financial knowledge and behaviours allowing for financial literacy to translate measurably into GDP growth.

5.2.2 Inflation and Financial Literacy

Model Specification:

$$\boldsymbol{Inflation\ rate = \alpha + \delta FLIndex\hat{} + \varepsilon}$$

Where:

Inflation rate: The dependent variable

FLIndex^: The Financial Literacy Index (Independent variable)

α: The intercept term

δ: The coefficient representing the effect of financial literacy on GDP growth

ε: The error term

Equation 6: Inflation rates against predicted financial literacy

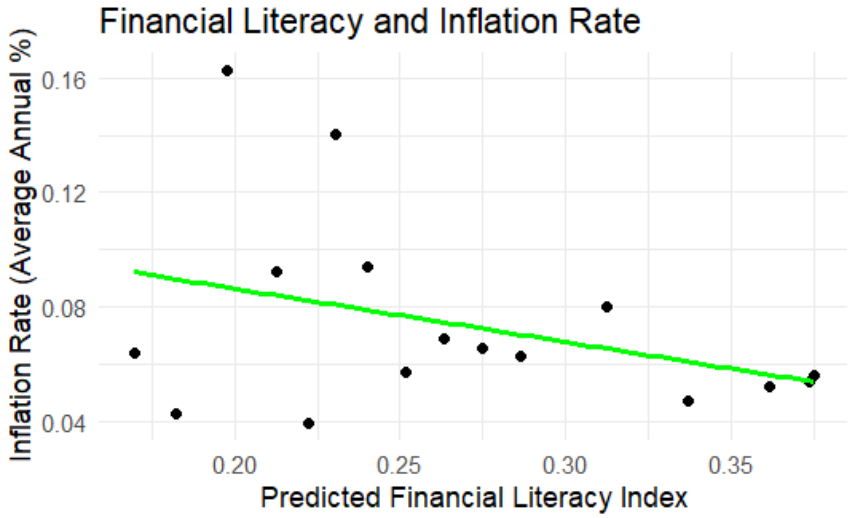

Figure 3: Inflation rate against predicted Financial Literacy Index

Variable	Estimate	Std. error	t-value	p-value	Significance
Intercept	0.1236	0.0353	3.503	0.00352	
FLIndex	-0.1862	0.1279	-1.456	0.16735	No significant effect

Table 6: Inflation and financial literacy regression

Test	df1	df2	Statistic	p-value	Interpretation
Wu- Hausman	1	13	0.19	0.670	IVs are exogenous (valid)
Sargan	1	NA	0.03	0.862	No Overidentification issues (valid)

Table 7: Diagnostic check on second stage regression

Hypothesis

Null Hypothesis (H_0): $\delta = 0$, indicating that there is no significant relationship between financial literacy and inflation rate.

Alternative Hypothesis(H_1): $\delta \neq 0$, indicating that there is a significant relationship between financial literacy and inflation rate.

According to the analysis on the dataset provided, we fail to reject the null hypothesis(H_0). The hypothesis test suggests that financial literacy has no significant direct impact on inflation rate in the dataset.

Discussion of results

The Wu-Hausman Test confirmed that the IVs are exogenous and are not correlated with the error term. The Sargan Test confirmed that there were no overidentification issues. This means that the instruments explain only the endogenous variable (financial literacy).

The relationship lacked significance implying that financial literacy does not directly drive changes in inflation; inflation may not be directly impacted by individual or collective financial literacy levels. While the direct effect is not significant, the indirect effects of financial literacy on inflation through savings rates, reduced borrowing and informed decision making should be explored further. Finally, financial literacy might not immediately affect inflation rates in the short-term. Long term analysis should be carried out with an expansive dataset should be carried out.

5.2.3 Stock Market Volatility and Financial Literacy

Model specification:

$$\boldsymbol{Stock\ Market\ Volatility = \alpha + \delta FLIndex\hat{} + \varepsilon}$$

Where:

Stock market volatility: The dependent variable

FLIndex^: The Financial Literacy Index (Independent variable)

α: The intercept term

δ: The coefficient representing the effect of financial literacy on GDP growth

ε: The error term

Equation 7: Stock market volatility against predicted financial literacy

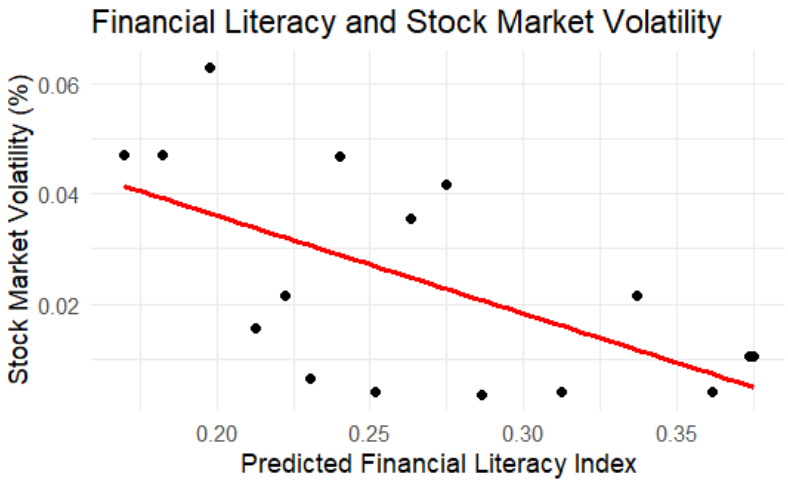

Figure 4: Stock market volatility against Predicted Financial Literacy Index

Variable	Estimate	Std. error	t-value	p-value	Significance
Intercept	0.07151	0.01742	4.104	0.00107	
FLIndex	-0.17734	0.06312	-2.810	0.01392	Significant effect (*)

Table 8: Stock market volatility and financial literacy regression

Test	df1	df2	Statistic	p-value	Interpretation
Wu- Hausman	1	13	0.271	0.611	IVs are exogenous (valid)
Sargan	1	NA	0.749	0.387	No Overidentification issues (valid)

Table 9: Diagnostic test for stock market volatility and financial literacy regression

Hypothesis

Null Hypothesis (H_0): $\delta = 0$, indicating that there is no significant relationship between financial literacy and average stock market volatility.

Alternative Hypothesis(H_1): $\delta \neq 0$, indicating that there is a significant relationship between financial literacy and average stock market volatility.

According to the analysis on the dataset provided, we reject the null hypothesis(H_0). The hypothesis test suggests that financial literacy has a **significant direct impact** on average stock market volatility in the dataset.

Discussion of results

The Wu-Hausman Test confirmed that the IVs are exogenous and are not correlated with the error term. The Sargan Test confirmed that there were no overidentification issues. This means that the instruments explain only the endogenous variable (financial literacy).

The relationship between stock market volatility and financial literacy is direct and negative confirming the hypothesis put forth in this paper. It means that higher financial literacy reduces stock market volatility. This implies that a more financially literate population may make informed investment decisions leading to less price fluctuations due to more stable market behaviour.

5.2.4 Income Inequality and Financial Literacy

5.2.4.1 Two-stage Least Squares IV regression model

Model Specification:

$$\boldsymbol{Gini\ dispersion = \alpha + \delta FLIndex\hat{} + \varepsilon}$$

Where:

Gini dispersion: Measure of income inequality (The dependent variable)

FLIndex^: The Financial Literacy Index (Independent variable)

α: The intercept term

δ: The coefficient representing the effect of financial literacy on GDP growth

ε: The error term

Equation 8: Gini dispersion against predicted financial literacy

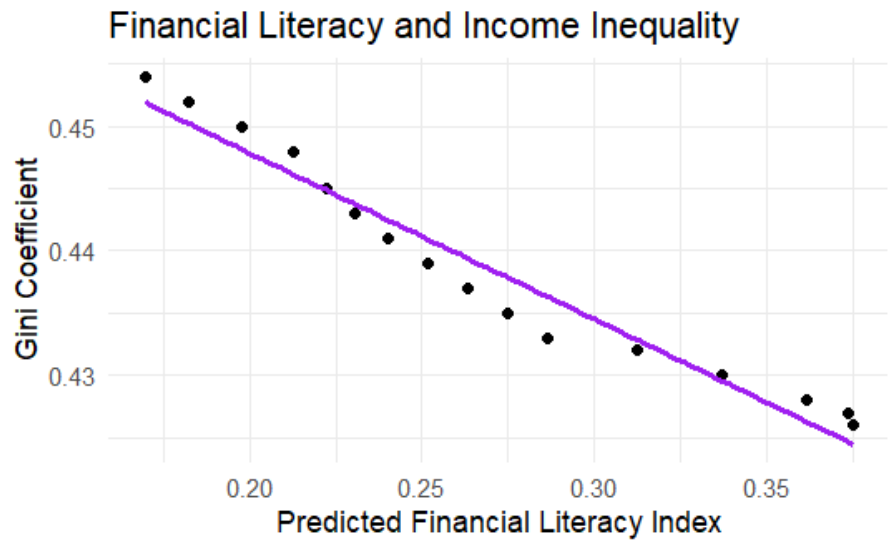

Figure 5: 2SLS Regression of Gini dispersion against Predicted Financial Literacy Index

Variable	Estimate	Std. error	t-value	p-value	Significance
Intercept	0.474562	0.003971	119.507	<0.001	
FLIndex	-0.133509	0.014385	-9.281	<0.001	Significant (***)

Table 10: Gini dispersion and financial literacy IV regression

Test	df1	df2	Statistic	p-value	Interpretation
Wu- Hausman	1	13	32.346	$7.45*10^{-5}$	IVs are endogenous (invalid)
Sargan	1	NA	6.478	0.041	Overidentification issues (invalid)

Table 11: Diagnostic test for Gini dispersion and financial literacy IV regression

Given that for Income inequality the instrumental variables proved to be endogenous and overidentification was present, another Instrumental Variable regression technique was

explored.

5.2.4.2 Limited Information Maximum Likelihood IV regression model.

Model Specification:

$$\boldsymbol{Gini\ dispersion = \alpha + \delta \text{FLIndex\^{}LIML} + \varepsilon}$$

Where:

Gini dispersion: Measure of income inequality (The dependent variable)

$\text{FLIndex}^{\text{LIML}}$: The Financial Literacy Index (Independent variable)

α: The intercept term

δ: The coefficient representing the effect of financial literacy on income inequality

ε: The error term

Equation 9: Gini dispersion against LIML financial Literacy

These are the results of the LIML IV regression for Gini coefficient.

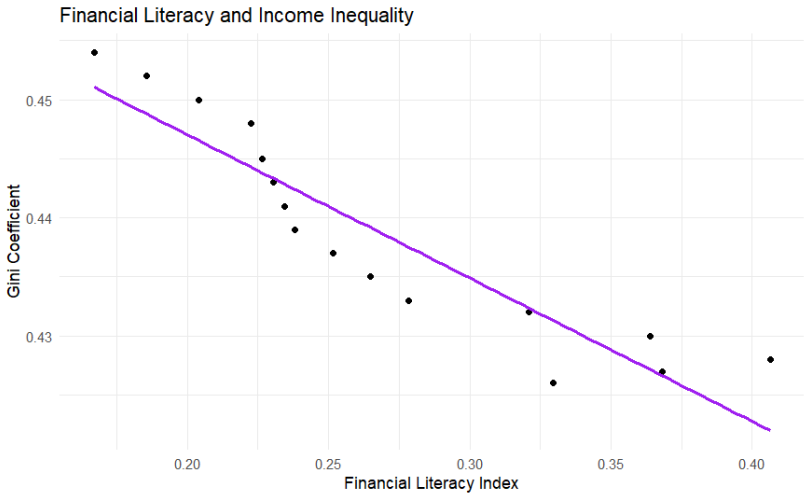

Figure 6: LIML regression for Gini dispersion against Financial Literacy

First Stage Regression		
F-statistic	P=0.00344	Indicates strong instruments
Adjusted R-squared	0.6485	Instruments and controls explain about 64.58% of FLIndex variability

Table 12: First stage LIML regression tests

Name	Coefficient	p-value	Comment
LIML Coefficient	-0.16223	0.001004	Significant (**)

Sargan Test		0.21865	Instruments are valid
Anderson-Rubin test		$7.809*10^{-10}$	Strong evidence of a significant relationship

Table 13: Gini dispersion and financial literacy LIML IV regression

Hypothesis

Null Hypothesis (H_0): $\delta = 0$, indicating that there is no significant relationship between financial literacy and Income inequality.

Alternative Hypothesis(H_1): $\delta \neq 0$, indicating that there is a significant relationship between financial literacy and Income inequality.

According to the analysis on the dataset provided, we reject the null hypothesis(H_0). The hypothesis test suggests that financial literacy has a **significant direct impact** on income inequality.

Discussion of results

For the 2SLS, the Wu-Hausman Test confirmed that the IVs were endogenous. This means the IVs may have been correlated with the error term. The Sargan Test confirmed that there was an overidentification issues meaning that the instruments did not only explain the endogenous variable (financial literacy). In contrast, the LIML regression provided for valid instruments as the Sargan test confirmed no overidentification issues were present.

Going on the results of the LIML regression, financial literacy has a significant direct and negative impact on income inequality. This agrees with the hypothesis put forth in this paper. This implies that financial literacy gives individual tools and skills to improve their financial situation narrowing the gap between different financial classes.

6: POLICY IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSION

6.1 Introduction

The findings indicate that financial literacy has a significant impact on stock market stability and income inequality, while it has limited direct impact on GDP growth and Inflation Rates. This may because the mechanisms in which financial literacy effects GDP growth and Inflation rates are indirect such as savings rates, consumption behaviour, investment decisions. Furthermore, the aggregate effects of financial literacy may not be felt in the short term but in the long term. Future research should investigate these indirect pathways and the long-term effects of financial literacy.

6.2 Policy Implications

The findings suggest a nuanced role of financial literacy in economic outcomes. While financial literacy does not directly drive GDP growth nor affects inflation rates, it plays a critical role in stabilizing stock markets and reducing income inequality. This implies that policymakers should focus on financial literacy as a policy tool for fostering broader economic stability.

Financially literate individuals make more informed decisions, reducing the speculative behaviour that often leads to market volatility. With greater knowledge of market dynamics, investors are less prone to panic selling during downturns or irrational optimisms during market booms. Therefore, policymakers - the Kenyan Government in this case - ought to develop regulatory frameworks mandating financial literacy programs for investors, especially retail investors. Moreover, they should encourage partnerships between formal and informal financial institutions such as banks, saccos, and chamas, and educational bodies to promote investor education. In addition, investment tools with user-friendly interfaces that provide educational resources should be explored.

Furthermore, financial literacy empowers individuals with tools and skills to effectively manage finances, save, invest, and accumulate wealth. By understanding budgeting, credit management, and investment opportunities, financially literate individuals can overcome systemic barriers to wealth accumulation. Therefore, in addition to increasing access to financial services and institutions, policy makers should target financial literacy initiatives toward underserved populations and low-income communities. Moreover, financial education

should be integrated into social programs aimed at economic inclusion so as to bridge the gap of income inequality.

6.3 Recommendations for Implementation

Financial literacy should be introduced as a core subject from an early age its principles in future generations. Integrating financial literacy into school curriculums at primary, secondary, and tertiary education levels. It equips young people with foundational skills such us budgeting, saving, and understanding credit, ensuring they make informed financial decisions. It ensures that they are better prepared to handle real-world financial responsibilities such as saving for major life events or avoiding financial pitfalls. Furthermore, educated students can contribute positively to the economic stability of the country by practicing sound financial behaviour as they enter the workforce. Finally, early education shapes attitudes towards money, savings attitude, reduction in impulsive spending etc.

Employees are often faced with stress financially due to a lack of understanding on debt management, investments, and retirement planning. Workplace financial programs provide the knowledge and tools to mitigate this stress. It provides skills and tools that ensure employees are less distracted by personal financial issues thus increasing their productivity. Moreover, by offering workshops on savings, investments, and debt management, employers empower their employees to build wealth and achieve long-term, financial stability.

Many individuals usually underestimate the amount of savings required for retirement or lack the required knowledge to plan effectively. Educational campaigns can close this gap, reducing the dependency on government programs like pensions and social welfare.

6.3.1 Enhancing Financial Literacy Measurement and Data Collection

Financial literacy should be explicitly tested in subsequent **FinAccess Surveys** to track progress and inform policy decisions through the "Big Three" financial literacy questions that were introduced by Annamaria Lusardi and Olivia S. Mitchell in their 2006 paper, "Financial Literacy and Planning: Implications for Retirement Wellbeing." Additionally, a dedicated **national education statistics database** should be created for Kenya to centralize and improve access to data on **financial literacy, education levels, and financial inclusion** trends.

6.3.2 Further Investigation into Financial Literacy's Influence on GDP Growth and Inflation

The current study revealed no statistically significant direct impact of financial literacy on GDP growth and inflation. However, future research could explore ***the gaps within the study to produce more robust and updated conclusions.***

For starters, financial literacy may impact GDP growth and inflation in non-linear ways, where its effects become apparent only beyond a certain threshold of financial literacy levels. Future studies could analyse variations in financial literacy's impact at different levels of economic development, using quantile regressions or interaction models to determine if its influence wanes or strengthens at higher stages of economic development.

Additionally, financial literacy may influence GDP growth and inflation indirectly through factors such as:

1. **Investment Rates**: Financially literate populations may be more likely to engage in more informed and hence productive investments, which spurs economic growth.
2. **Household Savings Behaviour**: Increased financial literacy may lead to higher savings rates, contributing higher rates of capital accumulation and increased economic stability.
3. **Consumer Spending Patterns**: Financial knowledge may shape how individuals respond to inflation, influencing aggregate demand which impacts GDP.

Future studies should apply mediation analysis to evaluate these pathways.

Furthermore, financial literacy may have a stronger impact on specific economic sectors (e.g., entrepreneurship, small business growth, digital financial inclusion). Future research should conduct sectoral-level studies to see how financial literacy impacts economic productivity in different industries.

Given the limited dataset available, 16 observations (years) were taken. This may not be enough to derive the long-term effects of Financial Literacy on macroeconomic outcomes. Therefore, a longitudinal study over multiple decades could capture long-term trends in how financial literacy shapes macroeconomic indicators.

Finally, comparing Kenya's financial literacy and its economic impact with countries of similar economic structure (e.g., other developing economies) can reveal best practices for policy improvements.

6.4 Conclusion

The study underscores the importance of financial literacy in promoting economic stability, particularly in reducing stock market volatility and income inequality. However, its direct impact on GDP growth and inflation remains minimal, necessitating complementary economic policies.

To maximize the benefits of financial literacy, policymakers, financial institutions, and educational organizations must collaborate to integrate financial education into the socio-economic framework. Incorporating financial literacy programs, leveraging digital tools, and ensuring inclusive financial access are essential steps for fostering sustainable economic growth and wealth equity.

This research highlights the need for further exploration into the broader impact of financial literacy on macroeconomic indicators, especially as the financial landscape evolves due to digital finance and globalization. Future studies could focus on longitudinal analyses to evaluate the lasting effects of financial literacy initiatives and identify effective strategies for enhancing financial knowledge across diverse populations.

APPENDIX

A.1 Initial 1st Stage 2SLS Regression

```
##
## Call:
## lm(formula = FLIndex ~ `Primary GER%` + `Financial access` +
##     `Literacy rates` + `Unemployment Rate(%)`, data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.037805 -0.009725 -0.002963  0.006537  0.049776
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)              1.58899    0.87211   1.822  0.09573 .
## `Primary GER%`           0.08652    0.19663   0.440  0.66844
## `Financial access`       0.45928    0.11678   3.933  0.00234 **
## `Literacy rates`        -4.33552    2.37694  -1.824  0.09541 .
## `Unemployment Rate(%)`   7.98871    3.10497   2.573  0.02592 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02242 on 11 degrees of freedom
## Multiple R-squared:  0.9046, Adjusted R-squared:  0.8699
## F-statistic: 26.07 on 4 and 11 DF,  p-value: 1.46e-05
```

A.2 Final 1st Stage 2SLS Regression

```
##
## Call:
## lm(formula = FLIndex ~ `Financial access` + `Unemployment Rate(%)`,
##     data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.045455 -0.008908 -0.001400  0.006771  0.044878
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)             -0.17957    0.04747  -3.783  0.00228 **
## `Financial access`       0.50170    0.08315   6.034 4.21e-05 ***
## `Unemployment Rate(%)`   1.98829    0.73557   2.703  0.01809 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02077 on 13 degrees of freedom
## Multiple R-squared:  0.9239, Adjusted R-squared:  0.9122
## F-statistic: 78.94 on 2 and 13 DF,  p-value: 5.349e-08
```

A.3 2nd Stage Regression for GDP Growth

```
##
## Call:
## ivreg(formula = `GDP growth (%)` ~ FLIndex | `Unemployment Rate(%)` +
##     `Financial access`, data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.046873 -0.006996  0.002949  0.013847  0.032304
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.05751    0.02457   2.340   0.0346 *
## FLIndex     -0.04075    0.08902  -0.458   0.6541
##
## Diagnostic tests:
##                  df1 df2 statistic  p-value
## Weak instruments   2  13     78.94 5.35e-08 ***
## Wu-Hausman         1  13      0.10    0.757
## Sargan             1  NA      0.00    0.989
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02323 on 14 degrees of freedom
## Multiple R-Squared: 0.02208, Adjusted R-squared: -0.04777
## Wald test: 0.2095 on 1 and 14 DF,  p-value: 0.6541
```

A.4 2nd Stage Regression for Inflation rate

```
##
## Call:
## ivreg(formula = `Inflation rate (Average Annual %)` ~ FLIndex |
##     `Unemployment Rate(%)` + `Financial access`, data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.046404 -0.012282 -0.007032  0.011099  0.077050
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.1236     0.0353   3.503  0.00352 **
## FLIndex      -0.1862     0.1279  -1.456  0.16735
##
## Diagnostic tests:
##                  df1 df2 statistic  p-value
## Weak instruments   2  13     78.94 5.35e-08 ***
## Wu-Hausman         1  13      0.19    0.670
## Sargan             1  NA      0.03    0.862
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03337 on 14 degrees of freedom
```

```
## Multiple R-Squared: 0.1198,  Adjusted R-squared: 0.05693
## Wald test: 2.121 on 1 and 14 DF,  p-value: 0.1674
```

A.5 2nd Stage Regression for Average stock Market Volatility

```
##
## Call:
## ivreg(formula = `Average Stock Market Volatility %` ~ FLIndex |
##     `Unemployment Rate(%)` + `Financial access`, data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.025225 -0.012045  0.004541  0.010066  0.027557
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.07151    0.01742   4.104  0.00107 **
## FLIndex     -0.17734    0.06312  -2.810  0.01392 *
##
## Diagnostic tests:
##                  df1 df2 statistic  p-value
## Weak instruments   2  13    78.936 5.35e-08 ***
## Wu-Hausman         1  13     0.271    0.611
## Sargan             1  NA     0.749    0.387
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01647 on 14 degrees of freedom
## Multiple R-Squared: 0.3533,  Adjusted R-squared: 0.3071
## Wald test: 7.893 on 1 and 14 DF,  p-value: 0.01392
```

A.6 2nd Stage Regression for Gini coefficient

```
##
## Call:
## ivreg(formula = Gini_disp ~ FLIndex | `Unemployment Rate(%)` +
##     `Financial access`, data = data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0045488 -0.0038185  0.0004813  0.0023213  0.0077091
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.474562   0.003971 119.507  < 2e-16 ***
## FLIndex     -0.133509   0.014385  -9.281 2.33e-07 ***
##
## Diagnostic tests:
##                  df1 df2 statistic  p-value
## Weak instruments   2  13    78.936 5.35e-08 ***
## Wu-Hausman         1  13    32.346 7.45e-05 ***
## Sargan             1  NA     4.194   0.0406 *
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.003753 on 14 degrees of freedom
## Multiple R-Squared: 0.8448,  Adjusted R-squared: 0.8337
## Wald test: 86.14 on 1 and 14 DF,  p-value: 2.334e-07
```

A.7 LIML Regression for Gini Dispersion

```
[1] "LIML Results for: Gini_disp"
##
## Call:
## ivmodel(Y = Y, D = D, Z = Z, X = X)
## sample size: 16
## _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
##
## First Stage Regression Result:
##
## F=8.99634, df1=3, df2=10, p-value is 0.0034401
## R-squared=0.7296495,   Adjusted R-squared=0.6485444
## Residual standard error: 0.02124176 on 13 degrees of freedom
## _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
##
## Sargan Test Result:
##
## Sargan Test Statistics=3.040521, df=2, p-value is 0.21865
## _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
##
## Coefficients of k-Class Estimators:
##
##               k Estimate Std. Error t value Pr(>|t|)
## OLS     0.00000 -0.10131    0.02528  -4.007 0.001740 **
## TSLS    1.00000 -0.14740    0.03345  -4.407 0.000855 ***
## Fuller  1.11601 -0.15505    0.03550  -4.368 0.000916 ***
## LIML    1.21601 -0.16223    0.03759  -4.316 0.001004 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
##
## Alternative tests for the treatment effect under H_0: beta=0.
##
## Anderson-Rubin test (under F distribution):
## F=266.0725, df1=3, df2=10, p-value is 7.8091e-10
## 95 percent confidence interval:
##  [-0.441660603473665, -0.0922102038560808]
##
## Conditional Likelihood Ratio test (under Normal approximation):
## Test Stat=796.0573, p-value is < 2.22e-16
## 95 percent confidence interval:
##  [-0.282739853864939, -0.109599644430275]
```

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