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Table of Contents:

Sustainable Development and Economic Growth: A Reality or an Oxymoron?

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Abstract

The word "sustainable" is on everyone's lips and every publication; however, it is over-and misused as a trend for marketing and profit purposes, sometimes unethically for "greenwashing". This distortion creates an obstacle in creating a more sustainable world and leads authors to describe sustainable development and economic growth as oxymorons. This paper describes the relationship between sustainable development and economic growth and explains how sustainability reporting, particularly management, governance and social disclosures (GRI 100), could effectively stimulate economic growth. However, to reach a sustainable model, the paper recommends a mental and theoretical transformation in economic growth's perception to move from profit maximisation to optimisation. Finally, the manuscript calls to intensify research in this direction for a sustainable transformation of our society.

Keywords: Sustainable Development, Economic Growth, Profit Optimisation, Ethical Dimension, Environmental Pillar

Introduction
1. Sustainable Development and Economic Growth

Sustainability has been conceived as a development model to ensure generations' constant economic growth (Eisenmenger et al. 2020). The Bruntland Commission first defined It in 1987 as "development that meets the

needs of the present generations without compromising the ability of future generations to meet their own needs" (UN General Assembly 1987). The definition has conceptualised the three-dimensional model with the pillars (Figure 1), where sustainability balances economic growth, social well-being and environmental protection.

Albeit somewhat vague, this concept has been widely adopted at high institutional levels to maintain economic advancement and progress while respecting high ethical standards, growing collective social responsibility, and protecting the environment's long-term value. Further, the Intergovernmental Panel on Climate Change (IPCC) has retained sustainable development fundamental for adapting our sectors to climate change uncertainty (IPCC 2001).

In another way, Adam Smith has founded his "free market" theory on moral behaviour and judgment for society's best interest (The theory of moral sentiments). However, capitalism lacked moral responsibility in practice, and decision-making exclusively sought profit maximisation at the expense of society's interests. Therefore, instead of profit maximisation, the sustainability model suggests an optimisation model to generate growth, internalising social well-being and environmental benefits to adding this missing ethical dimension, missing in the classical economic theory. Consequently, and according to the sustainability model, economic growth is intrinsically embedded in the sustainable development of organisations, but it also seeks to upsurge social and ecological ethics. This manuscript will describe the relationship between sustainable development and economic growth. The following section will represent the tools available for the sustainable model to create value and growth that reporting systems disclose as indicators for reporting.

Figure 1: The sustainability model with the three-dimensional pillars.

2.   Tools for Sustainable Growth

In practice, given the global interest in sustainability, the scientific community has proposed several sustainable decision-making, monitoring and evaluation tools. Indeed, several sustainability frameworks and standards recognised internationally, based on a set of three-dimensional indicators (economic, social and environmental), help quantify business progress achieved in terms of sustainability. These tools also contribute to the United Nations Sustainable Development Goals (UN-SDGs) by integrating common indicators. In particular, SDG 8, decent work and economic growth, promotes sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Sustainable decision-making and monitoring and evaluation tools are formally disclosed transparently in the non-financial reporting to inspire companies to develop a responsible business approach. The major non-financial reporting guidelines include:

- Global Reporting Initiative (GRI Sustainability Reporting Standards);
- The Organisation for Economic Co-operation and Development (OECD Guidelines for Multinational Enterprises);
- UN Global Compact (Communication on Progress);
- International Organisation for Standardisation: Guidance on social responsibility (ISO 26000);
- The IIRC International Framework (International Integrated Reporting Council).

According to the United Nations, 89% of chief executives believe these tools are fundamental for companies' economic growth, and 90% feel personal responsibility (United Nations Global Compact; Accenture Strategy 2016). However, various studies have highlighted the existence of a social or environmental "legitimacy seeking" strategy behind this ethical responsibility (Christmann and Taylor 2006).

Despite the dominance of profit-seeking and legitimacy-seeking of corporate sustainability strategies (Schaltegger and Hörisch 2017), sustainability reporting includes valuable tools to build up companies' resilience to market uncertainties and the impacts of climate change. The dominant sets of disclosures include social and environmental disclosures and governance and management, which will be discussed in the following sections.

2.1. Environmental Management

The classical economic theory has recognised the trade-offs between economic growth and the environment and their correlation. Since the 1980s, many authors have raised the importance of environmental management for economic growth, especially for rural areas that intensively depend on natural resources for survival and development (Warford and Schramm 1987). Further, environmental assets contribute directly and indirectly in supporting economic activities (e.g. risk management, services provided, etc.). More recently, authors have addressed the importance of managing the environment and natural resources for growth and sustainable development (Costa 2021; Goosen 2012).

However, achieving sustainable economic growth requires the internalisation of negative externalities, which has been shown to reduce environmental and social impacts (Folkens et al. 2020; Eidelwein et al. 2018; García-Gusano et al. 2018). According to the literature, a complete decoupling of productive systems from environmental impacts by adopting innovative solutions to increase resources efficiency (Costa and Matias 2020; Everett et al. 2010).

2.2. Human Resources Management

A growing number of scientific evidence reveals an association between the human resources management approach adopted and any entity's high commitment and performance outcomes (Buller and McEvoy 2012; Guest 1997). The integration of sustainability in an entity's management model increases social responsibility and, consequently, employees' well-being and performances (Stofkova and Sukalova 2020), directly correlated to economic growth (Uysal 2017; Vlad et al. 2012).

The characteristics of sustainable human resource management, according to Stankevičiūtė and Savanevičienė (2018), can be countless, all based on fairness, equality, health, safety, well-being and development. Sustainable human resource management has changed the approach towards employees from a mere input factor for production (to be exploited) to a resource with potential; employers should empower to motivate and express the maximum of their performances (Conger 2003). These characteristics require continuous and consistent attention to the following aspects:

- A selection procedure;
- A continuous follow up to assess weaknesses and opportunities;
- Design development programmes to increase skills and tools to overcome transform weaknesses in opportunities;
- Retribution and incentives;
- A balance between work and personal life;
- Procedures to prevent behaviour distortion and to encourage and protect those who expose such practices.

2.3.   Governance

The notion of participation in decision-making or collective decision-making is as old as the democracy concept. However, it has always been associated with political thinking until the last few decades, when it emerged across many disciplines. This multi-disciplinary challenge arose with the growing expectations to influence citizens' decisions in sectors that could directly or indirectly interest or affect them (Chhotray and Stoker 2009). Therefore, the governance concept seeks to understand the way collective decision-making is built and its participatory implementation to ensure the governors' accountability to the governed (Schneider 1999).

In the private sector, Ong and Djajadikerta (2018) revealed a significant positive correlation between corporate governance, based on stakeholder theory, and sustainability, adopting a newly developed reporting index – Ong et al. (2016) Index – in a study investigating companies operating in the Australian resources industry. Similar scientific results revealed the importance of governance in different case studies to improve companies' sustainability (Costa 2021; Thistlethwaite and Menzies 2016; Krechovská and Procházková 2014). Furthermore, the effect of governance on economic growth has been abundantly assessed in both public and private sectors, and all studies confirmed a positive correlation [Gelb et al. 2019; Hadj et al. 2018; Liu et al. 2018; Emara et al. 2016).

Further, to bring long-term development, shared economic value to business and society, and innovative competitive advantage, successful governance strategies seek to implement effective stakeholder engagement to

depict the material topics to determine the sustainability issues (Nair 2019; Camilleri 2015). Finally, sustainable governance confers balance, agility and adaptability to systems strengthening responses in crises such as COVID-19 (Janssen and van der Voort 2020).

2.4. Risk Management

The priority of the sustainability model is value creation rather than risk management. However, organisations retain that risk management helps monitor and manage risks and identify opportunities to impact value creation (Willumsen 2019).

Implementing risk management in a sustainability model is a newly emerging risk area, still unclearly approached (Schulte 2018). It requires a widening of the context analysis to align it with the three sustainability pillars, i.e. economic, social, and environmental (Anderson 2006), to design, deploy appropriate responses, measure and control progress of related risk-averse actions. Therefore, sustainability risk management helps identify and prevent emerging issues, increasing the business model's robustness and generating reputation, competitiveness and growth.

It is no surprise that the pandemic from the COVID-19 pandemic had a tremendous impact on the achievement of the goals in general and the economic growth in particular (SDG 8). Still, according to the United Nations (UN-SDG 2021), the economic recovery is underway (Figure 2), and risk management helps reduce trade-offs between different priorities and objectives (OECD 2020).
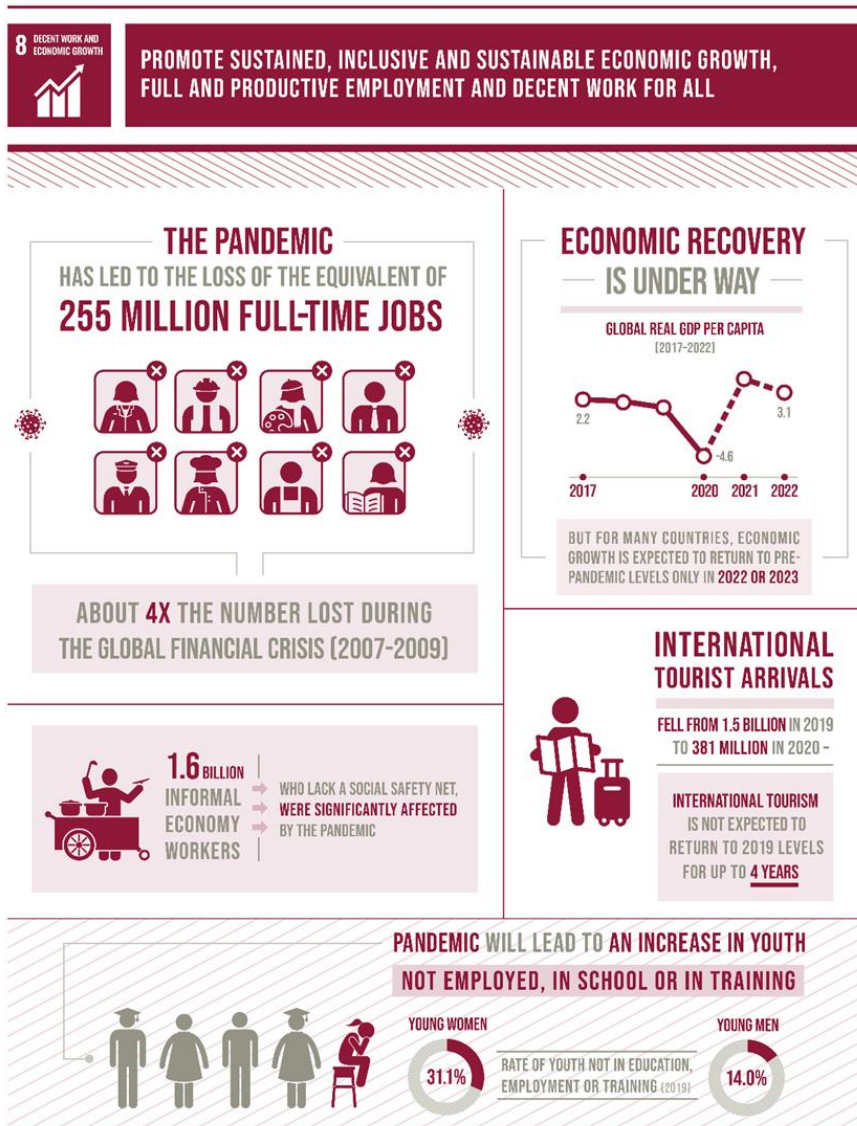
Figure 2: Overview of the impact of the pandemic from the
COVID-19 on economic growth.

Conclusion

Nowadays, the word "sustainable" is on everyone's lips and on every publication, which, on one side, is good news. However, it is sad to know that it is over-and misused as a trend for marketing and profit purposes (Macellari

et al. 2021), sometimes unethically for "greenwashing", when people have no o little idea what the word actually means, which constitutes a constraint towards creating a more sustainable world.

However, this manuscript showed a positive correlation found in the literature between sustainable development and economic growth; it also described the tools available in sustainability reporting for businesses and institutions to create growth in implementing the sustainable model (Figure 3). Therefore, sustainable development and economic growth is indeed a reality and is not at all an oxymoron. Yet, we need a theoretical and mental transformation to regard economic growth as profit optimisation rather than profit maximisation with ethical and social constraints, including social equity, well-being, security, natural capital development, and climate change mitigation. These are broad moral and social themes relevant for any business or institution in any location; other local topics could be applicable in specific conditions for sustainable development and should not be underestimated.

Finally, this manuscript highlighted the importance of sustainability thematics such as human resources management, environmental management, governance and risk management in generating economic. Some available literature supports this opinion, but scientific evidence still needs to be incremented with quantitative studies. Therefore, this opinion paper calls to intensify research in this direction for a sustainable transformation of our society.

Figure 3: Schematic representation of tools available
for sustainable businesses and institutions.

Conflicts of Interest: The author declares no conflict of interest.

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Moderating Effect of Illiquidity on The Relationship Between Momentum and Equity Returns in The Kenyan Capital Markets

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Abstract

This paper sought to examine the moderating effect of illiquidity on the relationship between momentum and equity returns in the Kenyan capital markets. Previous studies have shown that illiquidity has a time-varying effect on momentum strategies, but little is known whether illiquidity has a moderating effect on the relationship between momentum and equity returns in Kenyan capital markets. A longitudinal research design was used for this study to examine the causal inference. Data comprised of monthly transactions on the 20 equities used in the formulation of the NSE 20 share index over the period between Jan 2009 and up to March 2018 which formed 111 data points. ADF and PP results showed that Returns and momentum are stationary at levels while illiquidity was stationary at first difference. The error correction term was negative and statistically significant with or without the moderator. Results indicate that without a moderator percentage increase in momentum is linked to a 0.0000313% increase in returns in the short run. The study further shows that the effect of momentum on equity returns is moderated by illiquidity using a t-test. R^2 changed from 0.427 to 0.4337 indicating a change of 0.006 at 0.05% significant level suggesting that illiquidity moderates the relationship between momentum and equity returns in the Kenyan capital markets.

Keywords: Illiquidity, Momentum, Equity Returns

Introduction

Globally capital markets play an important role in promoting economic activity worldwide by facilitating and diversifying firms' access to finance, (Association of Chartered Certified Accountants, 2012). In the period between 2009-2014, capital markets have experienced a period of unprecedented change primarily due to a wide-ranging post-crisis regulatory regime and a challenging macro-economic environment (Wyman, 2014).

Illiquidity refers to the inability to transact large quantities of assets and or securities due to a shortage of interested buyers, (Dalgaard, 2009). Illiquidity can also be defined as the degree of friction in a given exchange market, where there is a measurable extent of the cost of exchange, agents' price distortion, and movements (Amihud, Mendelson & Pedersen, 2005). Momentum on the other hand refers to the tendency of assets with good or bad recent performance to continue overperforming or underperforming in the near future, (Vayanos and Woodley 2013).

Momentum is the tendency of assets with good or bad recent performance to continue overperforming or underperforming in the near future, (Vayanos and Woodley 2013). Moskowitz, *et. al*, (2013), define momentum as the tendency of investments, in every market and asset class, to exhibit persistence in their relative performance for some time. One of the reasons for momentum is that higher returns are compensation for some unique risk associated with investments that have recently outperformed, (Moskowitz, *et. al* 2013). The second reason is the existence of momentum seems to challenge the efficient market hypothesis that past price behavior provides no information about future behavior. In other words, momentum is associated with some inefficiency in markets, perhaps due to investor behavior (Moskowitz, *et. al* 2013).

The empirical literature has provided evidence of returns attributed to momentum in international markets, (Fama and French, 2012; Choi, 2014; Muhairi, 2011; Norieka and Barauskas, 2010; Nguyen and Fraulo, 2010; Gutierrez *et.al*, 2004; Konokonglu, 2010; Nørregård, 2008; Gaunt and Schinider, 2012) except Japan (Fama and French, 2012). Choi, (2014) asserts that alternative strategies constructed by the physical momentum achieve expected better returns and reward–risk measures than those of the traditional contrarian strategy on a weekly scale. Winners on the other hand continue to outperform losers, with performance persistence continuing for periods of three to twelve months which indicates the occurrence of momentum in the short-run (Muhairi, 2011) and strongest around the 6–12-month mark (Gaunt and Schinider, 2012). Gutierrez *et.al*, 2004 posits that momentum profits increase as the lagged market return increases and at high levels of lagged

market returns, the profits diminish but are not eliminated. In conclusion, Gutierrez *et.al* (2004) argue that momentum strategies depend critically on the state of the market and that momentum profits are reversed in the long run.

Capital markets play a vital role in Africa's future. The continent's financial markets have remained resilient and innovative amid slowing worldwide growth after the synchronized upturn of 2017. However, they remain fragmented and shallow compared to their equivalents in Latin America and Asia (Adesina, 2018). Kenyan equities were ranked the fourth-best performer as a group in 2013, according to the global indices of the US-based index provider *Morgan Stanley Capital International (MSCI).* The MSCI Kenya Index increased 43.58% on the year, fourth-best among country indexes, after Bulgaria (91.55%), United Arab Emirates (UAE) (79.02%), and Argentina (68.97%). The performance declined in 2014, to 23.38%; 2015 (-18.34%); 2016(1.11%), increased in 2017 to 35.97% and a decline again in 2018 (-12.51%) and in 2019 the performance was 48.73% (MSCI Kenya Index, 2020) indicating a mixed performance of the equity market. Kenya's Market Capitalization accounted for 26.1 % of its Nominal GDP in Dec 2019, compared with a percentage of 23.6 % in the previous year. (CEIC, 2020) This is a dismal performance noting that a Stock market capitalization of about 50 percent of GDP and more is an indication of a well-developed stock market. Previous years also present performance below50%, for instance in 2009(29.1%), 2010(36.8%), 2011(23.4%), 2012(29.8%), 2013(40%), 2014(42.6%), 2015(32.6), 2016(27.5%) and 2017(30.8%) (World Bank, 2020).

According to the Capital Market Authority Kenya (CMA) 2018, in the quarter to June 2018, average quarterly equity market liquidity stood at 2.17 percent, compared to 1.83 percent registered in the quarter to March 2018, indicating a 0.34% decrease in turnover ratio in the equities market mainly attributable to a 22.91 decrease in turnover between Q1/2018 and Q2/2018, this shows how Kenya like other emerging market economies is characterized by a capital market with low liquidity levels averaging between seven percent and nine percent per annum between 2016 and 2018, this is also evident during the period 1993 to 2019 where the average period was 4.95% which is way below the global average of 26.20% (World Bank, 2020).

Empirical evidence has shown that the profitability of the momentum trading strategy strongly varies with the state of market illiquidity, consistent with behavioural models of investors' expectations. (Avramov *et.al*,2013; Aziz and Ansari, 2014; Orlov, 2016; Butt and Virk, 2017) it therefore would be interesting to further clarify whether illiquidity has a moderating effect on the relationship between momentum and equity returns in the Kenyan capital market.

1. Hypothesis
The following hypothesis was tested
H$_a$,   illiquidity has no moderating effect on the relationship between momentum and equity returns.

1.1.   Review of Literature
One of the important characteristics of an efficient market is the ease with which financial assets can be traded (Lo and Khandani, 2009). Liquidity is related to the ease of trading security, several extensions of the neoclassical framework have been proposed to account for trading activity since the standard frictionless asset-pricing models cannot address the issue directly, (Lo and Khandani, 2009). For example, the seller of a hard-to-trade asset may incur an inventory cost that arises because a buyer may not be present at the time a seller needs to cash out, and the seller may be forced to enter into a transaction with a designated market maker. The market maker will charge the seller a fee by giving the seller an amount less than the fair price of the security to take on the risk of holding that security until a buyer is found, (Lo and Khandani, 2009).

According to Reilly and Brown, (2013) Illiquidity is a risk factor in determining returns. Risk factors are all the factors that contribute to a given degree to the returns of the stock, their effect is beta specific. The main risk factors in determining stock returns are business risk, financial risk (leverage), liquidity (Illiquidity) risk, exchange rate risk, and country (political risk). Amihud, Mendelson and Pederson, (2005) contends that liquidity as a concept is complex, and argues various sources of illiquidity; one of the sources of illiquidity is exogenous cost such as brokerage fees, order-processing costs, or transaction taxes. Every time security is traded, the buyer and/or seller incur a transaction cost; in addition, the buyer anticipates further costs upon a future sale, and so on, throughout the life of the security. Amihud, Mendelson and Pederson, (2005) further posits another source of illiquidity as demand pressure and inventory risk. Demand pressure arises because not all agents are present in the market at all times, which means that if an agent needs to sell a security quickly, then the natural buyers may not be immediately available. As a result, the seller may sell to a market maker who buys in anticipation of being able to later lay off the position. The market maker, being exposed to the risk of price changes while he holds the asset in inventory, must be compensated for this risk – a compensation that imposes a cost on the seller (Amihud, Mendelson, and Pederson, 2005).

Another source of illiquidity according to Amihud, Mendelson, and Pederson, (2005) is the difficulty of locating a counterparty who is willing to trade particular security, or a large quantity of a given security. Further, once a counterparty is located, the agents must negotiate the price in a less than

perfectly competitive environment since alternative trading partners are not immediately available. This search friction is particularly relevant in over-the-counter (OTC) markets in which there is no central marketplace. Amihud, Mendelson and Pederson, (2005) conclude that trading security may be costly because the traders on the other side may have private information for example, the buyer of stock may worry that a potential seller has private information that the company is losing money, and the seller may be afraid that the buyer has private information that the company is about to take off. Then, trading with an informed counterparty will end up in a loss. Costs of illiquidity should affect securities prices if investors require compensation for bearing them and also liquidity varies over time, risk-averse investors may require compensation for being exposed to illiquidity and as such investors need to know them while designing their investment strategies and if liquidity costs and risks affect the required return by investors, they affect corporations' cost of capital and, hence, the allocation of the economy's real resources, (Amihud, Mendelson, and Pederson, 2005).

Various authors (Glosten and Milgrom (1985), Easley and O'Hara (1987), and Easley, Hvidkjaer, and O'Hara (2002), Amihud, Mendelson, and Pedersen (2005)) have developed the view of transaction cost causing illiquidity, moreover, the literature on the impact of illiquidity on asset prices seems to divide into two distinct perspectives; one approach posited by (Amihud and Mendelson (1986), Eleswarapu and Reinganum (1993), Eleswarapu (1997), and Aragon (2004)) argued that liquidity as just another deterministic characteristic of security such as a transaction cost, and because economic agents' preferences are based on an asset's net return, net of transaction costs, assets with higher costs must offer a higher gross expected return, ceteris paribus. Alternatively, Chacko (2005), argued that if trading costs exist but are not time-varying, the buyer or seller of security can incorporate these costs into his decision-making process, and such costs should have no first-order effects on asset prices in equilibrium, in line with this reasoning, Vayanos (1998) and Vayanos and Vila (1999) argued that illiquidity-related costs can only be a second-order determinant of asset prices since bid-offer spreads are so small relative to typical equilibrium risk premia. Further models by Pastor and Stambaugh (2003) and Acharya and Pedersen (2005) examined the systematic nature of illiquidity risk and posited that illiquidity should not matter in equilibrium because agents would simply reduce the impact of such costs by adjusting their portfolios less frequently. In conclusion, Hasbrouck (2005), noted that the extent to which agents do this is unclear since observed levels of trading volume are much higher than those predicted by standard equilibrium asset-pricing models. But if trading costs are time-varying and unknown in advance, then their impact on equilibrium

asset prices can be more substantial because of the additional risks they impose on investors if such risks were not diversifiable or readily insurable.

Empirically, various authors find a significant positive effect of bid-ask spreads in explaining cross-sectional stock returns. However, there is limited literature on the moderating effect of illiquidity on the relationship between momentum and equity returns in the Kenyan Capital Market.

Momentum is one of the most debated yet the most popular factor influencing equity market returns, (Srivastava *et. al,*2019) Momentum as defined by Berger et.al (2009) is the tendency of investments, in every market and asset class, to exhibit persistence in their relative performance for some time. When applied to stock picking, momentum is about relative performance among stocks, and not about overall trends in the market. It works whether a market is in an upswing or downswing. Momentum can be used to identify securities likely to outperform, making it a powerful investment tool. It is also negatively correlated to value investing, making it an effective diversification component. Regardless of investment philosophy, virtually all investors can expect improved risk-adjusted returns by including momentum (Berger et.al 2009).

According to (Gosalia and Lefebvre, 2013) momentum is the rate of acceleration of a security's price or volume. The idea of momentum in securities is that their price is more likely to keep moving in the same direction than to change directions. In technical analysis, momentum is considered an oscillator and is used to help identify trend lines. Once a momentum trader sees acceleration in a stock's price, earnings or revenues, the trader will often take a long or short position in the stock in the hope that its momentum will continue in either an upward or downward direction. This strategy relies on short-term movements in a stock's price rather than fundamental value, and it is not recommended for novices. The existence of momentum leads to the momentum effect.

Jegadeesh and Titman (1993) presented evidence of momentum patterns in stock prices, which create an opportunity for investors to earn significant profits by buying past (winner stocks) that have performed relatively well (high returns) over the past three to twelve months and selling past (loser stocks) that have performed relatively poorly (low returns) over the past three to twelve months.

If stock prices either overreact or underreact to information, then profitable trading strategies that select stocks based on their past returns will exist. DeBondt and Thaler (1985) documented that past losers over three- to five-year periods outperform past winners over the subsequent three to five years. Jegadeesh (1990) and Lehmann (1990) found that losers over the past one week to one month outperform winners over the next one week to one month. These studies of very long-term and very short-term returns find

profitable contrarian strategies and generally led to the conclusion that stock prices overreact to information. (Jagadeesh and Titman, 2011).

In international Markets, Chan, Hameed, and Tong (2000) found the momentum effect existed in the national stock market indices of 23 countries for the period 1980 to 1995. Nine are from the Asia-Pacific, eleven are from Europe, and two are from North America (Canada and the U.S.), where the difference between the returns of winner and loser portfolios is at least 0.25 percent per week. Bhojraj and Swaminathan (2001) further confirmed the qualitative results by Chan, Hameed, and Tong (2000) for their total sample of 38 countries over the period 1975 to 1999 result, where strong momentum is evident up to three quarters after the portfolio formation date, with winners outperforming losers significantly by 1.40% to 2.33% per quarter over the next 3 quarters. Bacmann, Dubois, and Isakov (2001) documented the profitability of momentum strategies in member countries of the G-7 i.e., USA, Canada, Japan, the UK, France, Germany, and Italy. While Griffin, Susan, and Martin (2003) find that momentum profits for Asia are decidedly weaker than those around the world, particularly for Europe. Momentum strategies exhibit a unique pattern of seasonality in January. Many of the well-known strategies such as long-horizon and short-horizon return reversals, the size effect, and the book-to-market effect are significantly stronger in January than in any other calendar month. In contrast, Jagadeesh and Titman found that the momentum strategy earns negative returns in January, but earns significantly positive returns in every calendar month outside of January.

A potential source of momentum profits is cross-sectional dispersion in expected returns. Intuitively, since realized returns contain a component related to expected returns, securities that experience relatively high returns in one period can be expected to have higher than average returns in the following period. Momentum strategies can also benefit from a positive serial correlation in factor returns. With a positive serial correlation, large factor realizations in one period will be followed by higher-than-average factor realizations in the next period. The momentum strategy will tilt towards high beta stocks following periods of large factor realizations, and hence it will benefit from the higher expected future factor realizations (Jegadeesh and Titman 2011).

Momentum profits can also potentially arise if stock prices react to common factors with some delay. Intuitively, if stock prices react with a delay to common information, investors will be able to anticipate future price movements based on current factor realizations and devise profitable trading strategies. Jegadeesh and Titman (1995) showed that in some situations such delayed reactions will result in profitable contrarian strategies, but in other situations, it will result in profitable momentum strategies. Momentum strategy with individual stocks is more profitable when the ranking period and

holding period are not contiguous than when they are contiguous. When the holding period and the ranking period are contiguous, the profits to the momentum strategy are attenuated by the negative serial correlation in returns induced by the bid-ask spreads, and by the short-horizon return reversals. In contrast, industry momentum profits entirely disappear for the six-month ranking period when the ranking period and the holding period are not contiguous. The industry momentum seems to benefit from the positive first-order serial correlation in portfolio returns while the individual stock momentum is reduced by short-horizon return reversals (Jagadeesh and Titman, 2011).

1.2.   Empirical literature

Avramov *et.al* (2013) studied time-varying momentum payoffs and illiquidity using data spanning from 1926 to 2011 for all common stocks listed on NYSE, AMEX, and NASDAQ obtained from the Centre for Research in Security Prices (CRSP). They found out that the profitability of the momentum trading strategy strongly varies with the state of market illiquidity, consistent with behavioural models of investor's expectations. Periods of high market illiquidity are often followed by low, and often massively negative, momentum payoffs. The predictive power of market illiquidity uniformly exceeds that of competing for state variables, including market states, market volatility, and investor sentiment, and is robust in both in- and out-of-sample experiments as well as among large-cap firms. Market illiquidity also captures the cross-sectional dispersion in momentum payoffs implemented among high versus low volatility stocks. Focusing on the most recent decade, while momentum profitability is non-existent unconditionally, it regains significance in periods of low market illiquidity, and market illiquidity similarly affects the profitability of the earnings momentum trading strategy.

Chen (2016) studied the semi-varying momentum payoffs and illiquidity. The researcher obtains raw data from Thomson DataStream of all stocks listed on the FTSE All-Share index. The sample spans the period 1990-2013. The author extracts datatype including daily market value (share price multiplied by the number of ordinary shares in issue); return index (a theoretical growth in value of a share-holding over a specified period); and unadjusted closing price. At the end of each month, the total number of shares outstanding, the return index, and the market value of each stock are obtained. Stocks are kept if they existed for at least three years before the year start. Chen (2016) found that periods of high market illiquidity are followed by low momentum profits, and very often negative returns. In the presence of aggregate illiquidity, the power of the competing state variables (for example, the down-market condition) disappears. The study also captures significant momentum crashes and the increase of liquidity risks during the financial

crisis and concludes illiquidity shocks predict both momentum and value investment returns.

Aziz and Ansari (2014) studied momentum and illiquidity premium in the Indian stock market, using data from the Centre for monitoring the Indian Economy (CMIE). The sample consisted of daily and monthly data for S&P BSE500 stocks over the period April 2000 to March 2012. They found out that price momentum strategy could be enhanced by conditioning on past illiquidity. Illiquid winners outperform liquid winners by an average of 2.7% per month. Compared with momentum, the illiquidity effect is more pronounced. Further evidence presented a significant illiquidity premium in India for the period 2000-2012. A momentum strategy that buys previous six-month winners and sells losers earns substantial returns for the next six months. They conclude that exploring the alternate liquidity proxies and momentum strategy may shed light on the dynamic interaction between illiquidity and momentum.

Orlov (2016) empirically examined the effect of equity market illiquidity on the excess returns of currency momentum and carry trade strategies. The sample consists of end-of-month observations of spot exchange rates, one-month forward exchange rates, and corresponding bid-ask spreads for the period from January 1976 to January 2014. Results show that equity market illiquidity explains the evolution of currency momentum strategy payoffs, but not carry trade. Returns on currency momentum are low following months of high equity market illiquidity. However, in the recent decade, illiquidity positively predicts the associated payoffs. The findings withstand various robustness checks and are economically significant, approximating in value to one-third of average monthly profits.

Butt and Virk (2017) studied momentum profits and time-varying illiquidity effect, the collected data from daily and monthly files for all common stocks with share code 10 or 11 listed on NYSE, AMEX, and NASDAQ or the period of July 1963- December 2012. Their show that the contemporaneous effect of systematic illiquidity dominates the opposite prediction of lagged systematic illiquidity and retains its significance even if variables capturing the time-varying exposures of momentum returns to market risk are included in the analysis.

From the preceding studies on momentum and illiquidity, these studies conclude that illiquidity has a time-varying effect on momentum strategies, however, none of the study has looked at the moderating effect of illiquidity on momentum, and therefore this study seeks to fill this gap.

2.   Methodology

Longitudinal research design was used for this study to examine the causal inference that can be made in certain cases by analyzing data collected

over set time span which offers researchers the opportunity to gauge trends. Purposively, the study used monthly transactions on the 20 equities used in the formulation of the NSE 20 share index over the period between Jan 2009 and up to March 2018, which formed 111 data points. The stocks in the index were used because they represent a particular portion of the broader market and an index is imaginary portfolio of securities, furthermore they actively trade daily in the exchange, therefore, giving a true picture of the market. The period of 9 years and 3 months was selected and would capture milestones that affect the capital market, including the financial crisis of 2008, change of governance over this period, and the financial recession in 2009-2011.

This study adopted Amihud (2002) illiquidity model to measure illiquidity, which uses the average ratio of daily absolute stock return to its Shillings trading volume. This absolute price change against trading volume can be interpreted as the price impact flow.

$$ILLIQ_i = Monthly\ Average\ Daily\ Returns \left[\frac{Absolute\ value\ (Stock\ return)}{Shillings\ Volume}\right]$$

Momentum indicator the relative strength indicator (RSI) was used, developed by Welles Wilder (1978) It is a momentum indicator, or oscillator, that measures the relative internal strength of a stock or market against itself, instead of comparing one asset with another, or a stock with a market. The formula for the RSI is as follows:

$$RSI = 100 - \frac{[100]}{1 + RS} \dots \dots \dots \dots \dots . 3.9$$

where RS = the average of x days' up closes divided by the average of x days down closes

2.1.   Model specification
The following model was used

$$R_{i,t} = \gamma_t + \gamma_t \widehat{\beta_{P,t-1}} + \gamma_t Size_{i,t-1} + \gamma_t B/M_{i,t-1} + \gamma_t ILLIQ_{i,t-1} + \gamma_t MOMENT_{i,t-1} + \gamma_t ILLIQ.MOMENT_{i,t-1} + \varepsilon_{i,t}.$$

Where: -

$R_{i,t}$: denotes the excess return of stock i of month t.

$\widehat{\beta_{P,t-1}}$: denotes stock beta, which is the same for all stocks in the portfolio P using the data for the previous 12 months.

$Size_{i,t-1}$: is the log of market value of equity for month $t-1$.

$B/M_{i,t-1}$: is the book value over market value for month $t-1$.

$ILLIQ_{i,t-1}$: is the measure of illiquidity of the stock i of month $t-1$. Amihud Ratio was used for this measure.

$MOMENT_{i,t-1}$: is the measure of momentum of the stock i of month $t-1$ Relative Strength Index was used as a measure for momentum.

$\varepsilon_{i,t}$: is the error term where $\varepsilon_t \sim IId(0, \sigma_\varepsilon^2)$

$\gamma_t ILLIQ.MOMENT_{i,t-1}$ is the Moderator Variable.

3.   Results and Discussion

We present results first without the moderator and later after including the moderator to measure the change in R^2 to confirm the presence of moderation. The unit root test results are shown in table 4.1

Table 4.1 Unit Root Test Results Without Moderator

Variables	Augmented Dickey-Fuller (ADF) Test		Phillips Perron (PP)Test	
	At levels			
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
	t-Statistic	t-Statistic	t-Statistic	t-Statistic
RETURNS	-4.7999**	-4.7768**	-8.1793**	-8.2914**
	(0.0001)	(0.0009)	(0.0000)	(0.0000)
BETA	-1.5218	-2.1997	-1.564	-2.2792
	(0.5190)	(0.4847)	(0.4975)	0.4413
SIZE	-0.8134	-2.1307	-2.0771	-2.6242
	(0.8107)	(0.5221)	(0.2543)	(0.2707)
PRICE_BOOK	-1.6597	-1.6527	-1.6987	-1.6918
	(0.4488)	(0.7654)	(0.4291)	(0.7485)
ILLIQ	-2.6921*	-2.971	-8.4297**	-8.9247**
	(0.0787)	0.1453	(0.0000)	(0.0000)
MOMEN	-5.5404**	-5.5241**	-6.9163**	-7.0439**
	(0.0000)	0.0001	(0.0000)	(0.0000)
	At first difference			
ΔBETA	-10.3554**	-10.3305**	-10.3554**	-10.3305**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ΔSIZE	-5.6554**	-5.4347**	-10.3988**	-10.3739**
	(0.0000)	(0.0001)	(0.0000)	(0.0000)
ΔPRICE_BOOK	-10.3572**	-10.3096**	-10.3572**	-10.3096**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ΔILLIQ	-14.6094**	-14.5361**	-31.5872**	-31.3414**
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
ΔMOMEN	-8.1658**	-8.0981**	-21.304**	-21.1394**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: - The Null hypothesis is that the series has a unit root. For ADF and PP the Probability based on MacKinnon (1996) one-sided p-values. Lag Length based on AIC. (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. The parenthesized values represent the probability while Δ denotes the first difference

Results in Table indicate based on the ADF and PP that not all the variables are stationary at levels, interestingly RETURNS and MOMEN are stationary at levels in both ADF and PP where their p-values at order zero are less than 0.05. Using the PP test the variable ILLIQ is stationary at *I(0)* leading

to the rejection of the null hypothesis. For the other variables we accept the null hypothesis $\delta = 0$, these variables have to be differenced that is integrated of order one *I(1)*to achieve stationarity. At the first difference, all the variables in both ADF and PP test have p values less than 0.05 confirming that they are stationary and therefore rejecting the null hypothesis ($\delta = 0$) that there is a unit root in the variables.

To test whether there is a co-integration relationship between the variables, the Johansen cointegration test was used. Table 4.2 shows the results

Table 4.2 Johansen Cointegration test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.435847	187.0324	125.6154	0.0000
At most 1 *	0.419553	124.6376	95.75366	0.0001
At most 2	0.246221	65.34642	69.81889	0.1080
At most 3	0.162159	34.53693	47.85613	0.4727
At most 4	0.094233	15.25190	29.79707	0.7635
At most 5	0.030858	4.463782	15.49471	0.8628
At most 6	0.009562	1.047222	3.841466	0.3061

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.435847	62.39476	46.23142	0.0005
At most 1 *	0.419553	59.29122	40.07757	0.0001
At most 2	0.246221	30.80949	33.87687	0.1113
At most 3	0.162159	19.28503	27.58434	0.3928
At most 4	0.094233	10.78811	21.13162	0.6684
At most 5	0.030858	3.416560	14.26460	0.9152
At most 6	0.009562	1.047222	3.841466	0.3061

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

Table 4.3 Normalized cointegrating equation

RETURNS	BETA	SIZE	PRICE_BOOK	ILLIQ	MOMEN
1.000000	0.007835	0.000976	0.008866	4884.185	0.000117
	(0.00316)	(0.00339)	(0.00264)	(1876.09)	(6.0E-05)

From Table 4.2 the null hypothesis of no cointegration ($r = 0$) against the alternative of presence of one or more cointegrating vector is rejected at the 5 % level of significance in both techniques (trace test and maximum eigenvalue). This implies there exist a long run relationship between RETURNS BETA SIZE PRICE_BOOK ILLIQ MOMEN. Based on this finding the study applied Vector Error Correction Model of RETURNS BETA SIZE PRICE_BOOK ILLIQ MOMEN. **Table 4.3** shows the normalized cointegrating equation results which implied that in the long run all the variables have a positive impact on the returns of equities in the Kenyan capital market.

3.1.   Vector Error Correction Model (VECM)

Table 4.4 (see appendix I) shows results of Vector Error Correction estimates. The following equation was derived for error correction model

$\Delta Returns_t$ = -0.464557ect_{t-1} − 0.218114$\Delta Returns_{t-1}$ − 0.005332$\Delta Beta_{t-1}$ +

$\qquad\qquad$ *(-5.49213)* $\qquad\qquad$ *(-1.51922)* $\qquad\qquad$ *(1.02977)*

0.003129$\Delta Size_{t-1}$ - 0.007217$\Delta Pricetobook_{t-1}$ +
(0.56563) $\qquad\qquad$ *(-1.59003)*

458.6135$\Delta Illiq_{t-1}$ + 0.0000313$\Delta Momen_{t-1}$ + 0.0000881.

(4.4)
(0.61869) $\qquad\qquad$ *(0.55459)*

Table 4.4 (see **Appendix I**) demonstrates that the variables are statistically insignificant at a 5% level apart from the error correction term as shown in equation 4.4 that represents the short-term relationship of the variables.

The coefficient of the Error Correction term is negative and statistically significant, indicating there is the convergence of short-run adjustment dynamics toward the long-run equilibrium. This further demonstrates that the previous year's deviation from the long-run equilibrium is corrected in the current year at an adjustment speed of 46.7%. *Ceteris Paribus* a percentage increase in BETA is associated with 0.005332 percent decrease in RETURNS in the short run. A percentage increase in SIZE will lead to a 0.003129% increase in Returns in the short run, further a percentage increase in Price to Book Ratio is linked to a 0.007217% decrease in returns in the short-run. A percentage increase in ILLIQ is associated with a 458.61% increase in Returns in the short-run and in the case of MOMEN a percentage increase in MOMEN is linked to a 0.0000313% increase in returns in the short run.

Table 4.5. Least Square output for long run model

D(RETURNS) = C(1)*(RETURNS(-1) + 0.0078346283094*BETA(-1) +
0.000975898618098*SIZE(-1) + 0.0088655 9207795*PRICE_BOOK(-1)
+ 0.00937022076007*ASYM(-1) + 4884.18524418*ILLIQ(-1) +
0.000116792829385*MOMEN(-1) - 0.0507708888377) + C(2)
*D(RETURNS(-1)) + C(3)*D(BETA(-1)) + C(4)*D(SIZE(-1)) + C(5)
*D(PRICE_BOOK(-1)) + C(6)*D(ILLIQ(-1)) + C(7)
*D(MOMEN(-1)) + C(8)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.464557	0.084586	-5.492134	0.0000
C(2)	-0.218114	0.143569	-1.519222	0.1319
C(3)	-0.005332	0.005178	-1.029766	0.3056
C(4)	0.003129	0.005533	0.565626	0.5729
C(5)	-0.007217	0.004539	-1.590028	0.1150
C(6)	458.6135	741.2629	0.618692	0.5375
C(7)	3.13E-05	5.65E-05	0.554591	0.5804
C(8)	8.81E-05	0.000261	0.337054	0.7368
R-squared	0.427175	Mean dependent var		0.000136
Adjusted R-squared	0.381349	S.D. dependent var		0.003439
S.E. of regression	0.002705	Akaike info criterion		-8.908354
Sum squared resid	0.000732	Schwarz criterion		-8.686133
Log likelihood	494.5053	Hannan-Quinn criter.		-8.818235
F-statistic	9.321658	Durbin-Watson stat		1.979641
Prob(F-statistic)	0.000000			

For Long-run coefficient the following equation was estimated.

$$ECT_{t-1} = 1.00000 Returns_{t-1} + 0.007835 Beta_{t-1} + 0.000976 Size_{t-1} +$$
$$\quad\quad\quad\quad\quad\quad (2.48029) \quad\quad\quad\quad (0.28803)$$
$$0.008866 Price to Book_{t-1} + 4884.185 Illiq_{t-1} +$$
$$(3.36190) \quad\quad\quad\quad\quad (2.60338)$$
$$0.000117 Momen_{t-1} - 0.050771$$
$$(1.95410)$$

……………………………………………………………………. (4.5)

Table 4.5 convey that the long-run coefficient C (1) is negative and significant which shows long-run causality between Returns and the independent variables (BETA, SIZE, PRICETOBOOK, ILLIQ and MOMEN). The adjusted R-squared is 0.381329, which means that 38.13% of the model is explained by the independent variables. Durbin Watson static is greater than the R^2 stipulating that the model is free from serial correlation hence not spurious.

To establish the moderating effect of illiquidity on the relationship between momentum and equity returns in the Kenyan Capital markets.

The study carried out a unit root test to check for non-stationarity and cointegration tests to check for long-run relationship between the variables in the presence of a moderator variable.

3.2.   Unit root Tests

The Augmented Dickey fuller tests and Phillips Perron tests were used to test for non-stationarity. **Table 4.6** shows the summary at levels and first difference.

Table 4.6 Unit Root Tests with Moderator

Variables	Augmented Dickey Fuller (ADF) Test	Phillips Perron (PP)Test
	Intercept	Intercept
	t-Statistic	t-Statistic
RETURNS	-4.7999** (0.0001)	-8.1793** (0.0000)
BETA	-1.5218 (0.5190)	-1.564 (0.4975)
SIZE	-0.8134 (0.8107)	-2.0771 (0.2543)
PRICE_BOOK	-1.6597 (0.4488)	-1.6987 (0.4291)
ILLIQ	-2.6921* (0.0787)	-8.4297** (0.0000)
MOMEN	-5.5404** (0.0000)	-6.9163** (0.0000)
ILLIQ.MOMEN	-2.7988 (0.0618)	-9.1934** (0.0000)
ΔRETURNS	-5.1919** (0.0000)	-21.8464** (0.0000)
ΔBETA	-10.3554** (0.0000)	-10.3554** (0.0000)
ΔSIZE	-5.6554** (0.0000)	-10.3988** (0.0000)
ΔPRICE_BOOK	-10.3572** (0.0000)	-10.3572** (0.0000)
ΔILLIQ	-14.6094** (0.0000)	-31.5872** (0.0001)
ΔMOMEN	-8.1658** (0.0000)	-21.304** (0.0000)
ΔILLIQ.MOMEN	-15.030** (0.0000)	-40.087** (0.0001)

Notes: - The Null hypothesis is that the series has a unit root. For ADF and PP the Probability based on MacKinnon (1996) one-sided p-values. Lag Length based on AIC. (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. The parenthesized values represent the probability while Δ denotes the first difference

Table 4.6 shows that not all variables are stationary at levels with the exception of Returns and Momentum. However, at first difference all variables become stationary.

3.3.   Johannsen Tests with Moderator
Johansen cointegration test was also performed, and the results are as shown below.

Table 4.7 Johannsen test with moderator Variable

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.542852	264.0296	159.5297	0.0000
At most 1 *	0.429688	178.7101	125.6154	0.0000
At most 2 *	0.383166	117.4987	95.75366	0.0007
At most 3	0.247039	64.83482	69.81889	0.1171
At most 4	0.158084	33.90700	47.85613	0.5069
At most 5	0.093213	15.15076	29.79707	0.7702
At most 6	0.030504	4.485342	15.49471	0.8608
At most 7	0.010119	1.108609	3.841466	0.2924

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.542852	85.31949	52.36261	0.0000
At most 1 *	0.429688	61.21141	46.23142	0.0007
At most 2 *	0.383166	52.66390	40.07757	0.0012
At most 3	0.247039	30.92781	33.87687	0.1081
At most 4	0.158084	18.75624	27.58434	0.4335
At most 5	0.093213	10.66542	21.13162	0.6806
At most 6	0.030504	3.376733	14.26460	0.9186
At most 7	0.010119	1.108609	3.841466	0.2924

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From Table 4.7 the results demonstrate at least one cointegrating equation and therefore the null hypothesis of no cointegration ($r = 0$) against the alternative of the presence of one or more cointegrating vectors is rejected at the 5 % level of significance in both techniques (trace test and maximum

eigenvalue). Having confirmed the presence of a cointegrating equation, a vector error correction model was estimated this time including the moderator variable ILLIQ.MOMEN to examine the moderation effect. The change in R^2 was then used to assess moderation. A significant change in R^2 was adjudged to confirm moderation

Table 4.8 Least Square output for long run model with moderator

D(RETURNS) = C(1)*(RETURNS(-1) + 0.00281199974309*BETA(-1) + 0.00123778043701*SIZE(-1) + 0.000812860571612*PRICE_BOOK(-1)- 61863.4152791*ILLIQ(-1) - 0.000430629055031*MOMEN(-1) + 1196.59569215*ILLIQMOMEN(-1) + 0.0058897907757) + C(2)*D(RETURNS(-1)) + C(3)*D(BETA(-1)) + C(4)*D(SIZE(-1)) + C(5)*D(PRICE_BOOK(-1)) + C(6)*D(ILLIQ(-1)) + C(7)*D(MOMEN(-1)) + C(8)*D(ILLIQMOMEN(-1)) + C(9)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.850480	0.153815	-5.529232	0.0000
C(2)	-0.042726	0.153063	-0.279142	0.7807
C(3)	0.001656	0.005437	0.304592	0.7613
C(4)	0.002252	0.005515	0.408352	0.6839
C(5)	-0.000247	0.004689	-0.052780	0.9580
C(7)	-23189.56	7708.984	-3.008122	0.0033
C(8)	-0.000169	6.88E-05	-2.459382	0.0157
C(9)	437.9330	144.4993	3.030693	0.0031
C(10)	0.000154	0.000261	0.588000	0.5579

R-squared	0.433923	Mean dependent var	0.000136
Adjusted R-squared	0.382461	S.D. dependent var	0.003439
S.E. of regression	0.002703	Akaike info criterion	-8.901856
Sum squared resid	0.000723	Schwarz criterion	-8.654944
Log likelihood	495.1512	Hannan-Quinn criter.	-8.801724
F-statistic	8.431982	Durbin-Watson stat	1.990402
Prob(F-statistic)	0.000000		

Table 4.8 indicates the long-run model inclusive of the moderator ILLIQ.MOMEN the results demonstrate coefficient C(1) is negative and significant which shows long-run causality between Returns and the independent variables (BETA, SIZE, PRICETOBOOK, ILLIQ, MOMEN and ILLIQ.MOMEN). A *t*-test of the regression coefficient associated with the *ILLIQxMOMENT* interaction term is one way to determine if there is statistical moderation. The regression coefficient associated with the interactive effect of Illiquidity and Momentum on equity returns was significant at 0.05 level (γ_t= 1196, *t statistic* = 3.030693, *p* = 0.0031) The significant finding suggests that the effect of momentum on equity returns is affected by or *moderated by*, Illiquidity (i.e., there was significant moderation). The R- squared was 0.433923 indicating that 43.3% of the model

is explained by independent variables. Further R^2 change of 0.006 i.e., 0.4339-0.427 was significant at a 0.05% level. Therefore, the null hypothesis that illiquidity moderates the relationship between momentum and equity returns were accepted. From the preceding results, the study confirmed that illiquidity moderates the effect of momentum on equity returns in that presence of illiquidity increases the effect of momentum on equity returns. This is consistent with a study by Chen (2016) who found that periods of high market illiquidity are followed by low momentum profits, and very often negative returns. This can be attributed to increased transaction costs which affect the probability of momentum strategy. The study is also consistent with (Orlov, 2016) who agreed that that equity market illiquidity explains the evolution of currency momentum strategy payoffs. Absalonsen and Vas (2014) attributed a stronger momentum effect in small stocks to due to illiquidity which means that their bid to spread is higher since they tend to be traded less which makes them harder to close position.

Conclusion

This paper examined the moderating effect of illiquidity on relationship between momentum and equity returns. First, the study established that momentum affects equity returns before and after including the moderator, the two variables are cointegrated, indicating that they move together in the long-run, while experiencing short-lived deviations from the long-run relationship. The Error Correction Model (ECT) is significant and negative indicating that although the relationship between momentum and equity returns experiences the short-run e ephemeral deviations, the system reverts to its long-run equilibrium position.

Secondly, the null hypothesis tested was accepted at a 0.05 %, $p = 0.0031$ significant level drawing inference that illiquidity moderates the relationship between momentum and equity returns in Kenyan Capital markets significantly. By conditioning past illiquidity an investor may be able to earn significant returns by applying momentum strategy, this goes to show the effect of illiquidity as a moderator variable on the relationship between momentum and returns.

Based on these findings fund managers while using momentum strategies in their portfolio construction should focus more on analysing the behaviour of illiquidity over the past year to maximize equity returns. The use of technology motivates the investor to identify the momentum opportunities that exist within the capital market therefore, further studies should be carried out to determine whether technology moderates or mediates the relationship between momentum and equity returns.

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APPENDIX
Table 4.4: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1
RETURNS(-1)	1.000000
BETA(-1)	0.007835
	(0.00316)
	[2.48029]
SIZE(-1)	0.000976
	(0.00339)
	[0.28803]
PRICE_BOOK(-1)	0.008866
	(0.00264)
	[3.36190]
ILLIQ(-1)	4884.185
	(1876.09)
	[2.60338]
MOMEN(-1)	0.000117
	(6.0E-05)
	[1.95410]
C	-0.050771

Error Correction:	D(RETURNS)	D(BETA)	D(SIZE)	D(PRICE_BOOK)	D(ILLIQ)	D(MOMEN)
CointEq1	-0.464557	0.854680	0.558914	-2.521559	-3.33E-05	-1095.149

	(0.08459)	(2.16524)	(1.53667)	(2.46151)	(9.0E-06)	(231.064)
	[-5.49213]	[0.39473]	[0.36372]	[-1.02440]	[-3.69599]	[-4.73958]
D(RETURNS(-1))	-0.218114	-0.570376	-6.850325	1.297570	3.91E-05	937.3972
	(0.14357)	(3.67511)	(2.60823)	(4.17797)	(1.5E-05)	(392.191)
	[-1.51922]	[-0.15520]	[-2.62643]	[0.31057]	[2.55513]	[2.39016]
D(BETA(-1))	-0.005332	0.010541	-0.034713	-0.012713	1.50E-06	-22.65109
	(0.00518)	(0.13255)	(0.09407)	(0.15068)	(5.5E-07)	(14.1448)
	[-1.02977]	[0.07952]	[-0.36902]	[-0.08437]	[2.71696]	[-1.60138]
D(SIZE(-1))	0.003129	-0.010192	0.045127	0.026134	-9.59E-07	15.95879
	(0.00553)	(0.14163)	(0.10051)	(0.16101)	(5.9E-07)	(15.1137)
	[0.56563]	[-0.07196]	[0.44897]	[0.16232]	[-1.62588]	[1.05591]
D(PRICE_BOOK(-1))	-0.007217	0.001122	-0.003642	0.002831	9.30E-07	-23.02738
	(0.00454)	(0.11619)	(0.08246)	(0.13208)	(4.8E-07)	(12.3988)
	[-1.59003]	[0.00966]	[-0.04416]	[0.02144]	[1.92073]	[-1.85723]
D(ILLIQ(-1))	458.6135	-25081.06	6718.917	-417.5052	-0.484982	1377787.
	(741.263)	(18975.0)	(13466.5)	(21571.3)	(0.07904)	(2024919)
	[0.61869]	[-1.32180]	[0.49893]	[-0.01935]	[-6.13590]	[0.68042]
D(MOMEN(-1))	3.13E-05	0.000349	0.001974	-0.000245	-8.10E-09	-0.446504
	(5.6E-05)	(0.00145)	(0.00103)	(0.00164)	(6.0E-09)	(0.15434)
	[0.55459]	[0.24121]	[1.92339]	[-0.14905]	[-1.34409]	[-2.89301]
C	8.81E-05	-0.002241	0.003452	-0.002613	8.34E-09	0.258679
	(0.00026)	(0.00669)	(0.00475)	(0.00761)	(2.8E-08)	(0.71405)
	[0.33705]	[-0.33494]	[0.72701]	[-0.34357]	[0.29910]	[0.36227]
R-squared	0.427175	0.018193	0.096048	0.045380	0.454423	0.382425

Adj. R-squared	0.381349	-0.060352	0.023732	-0.030989	0.410777	0.333019
Sum sq. resids	0.000732	0.479514	0.241519	0.619715	8.32E-12	5460.789
S.E. equation	0.002705	0.069247	0.049145	0.078722	2.88E-07	7.389715
F-statistic	9.321658	0.231626	1.328170	0.594220	10.41153	7.740463
Log likelihood	494.5053	141.0707	178.4481	127.0922	1491.436	-367.9773
Akaike AIC	-8.908354	-2.423315	-3.109139	-2.166829	-27.20067	6.917015
Schwarz SC	-8.686133	-2.201094	-2.886918	-1.944608	-26.97844	7.139237
Mean dependent	0.000136	-0.002218	0.003597	-0.002752	1.32E-10	0.398411
S.D. dependent	0.003439	0.067247	0.049738	0.077530	3.76E-07	9.048384

Determinant resid covariance (dof adj.)	5.89E-27
Determinant resid covariance	3.22E-27
Log likelihood	2241.803
Akaike information criterion	-39.84960
Schwarz criterion	-38.12121

Standard errors in () & t-statistics in [ ]
Source: Research Data, 2019

Agricultural Output, Government Expenditure and Economic Growth in Nigeria: A Gregory-Hansen Cointegration Test with Structural Breaks

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Abstract

The agricultural sector at large plays a significant role in augmenting economic growth, serves as a source of income to the people, provides food to the teeming population, serves as a source of raw materials to the industries and provides foreign exchange to the country, etc. The current study investigates the short-run and long-run relationship among agricultural output, Government expenditure, and Economic growth in Nigeria using annual time series data from 1985 to 2019. The Zivot-Andrew unit root test indicates that gross domestic product, agricultural output, and exchange rate are stationary at first difference while government expenditure is stationary at level. The Gregory-Hansen test with structural break has confirmed the existence of a cointegration relationship among the variables employed. The Autoregressive Distributive Lag (ARDL) model with break indicates that, in the short-run agricultural output has a negative and statistically insignificant effect on real gross domestic product Nigeria, government expenditure has a positive and statistically significant effect on real gross domestic product in Nigeria, and the exchange rate has a positive and statistically significant effect on real gross domestic product in Nigeria. The break-point coefficient has positive and statistically significant. The long-run result shows that agricultural output has a positive effect on the real gross domestic product in Nigeria, government expenditure has a positive effect on real gross domestic product in Nigeria,

and the exchange rate has positive effects on the real gross domestic product in Nigeria. The break coefficient shows positive and statistically significant. The study recommends that the Nigerian government should reduce the lending rate on agriculture and provide incentives to the farmers, this will encourage farmers to borrow and consequently, agricultural output will increase and the Nigerian government should increase its expenditure on agriculture to boost the sector and achieve higher economic growth.

Keywords: Agricultural output, Government expenditure, Economic growth

1.   Introduction

The agricultural sector at large plays a significant role in augmenting economic growth, serves as a source of income to the people, provides food to the teeming population, serves as a source of raw materials to the industries and provides foreign exchange to the country, etc. A country's agricultural sector is expected to play a particularly important role in development performance. At the start of development, the agricultural sector typically constitutes the largest segment of economic activity in a developing country. Its contribution to employment is even larger than its share of output. Its performance determines the well-being of a large fraction of the population. It serves as a source of various resources that can be transferred to other faster-growing sectors in the economy. It affects both economic well-being and equity, largely due to its share size (Udoh, 2011).

Agriculture has been defined as the production of food and livestock and the purposeful tendering of plants and animals, (Ahmed, 1993). He stated further that agriculture is the mainstay of many economies and it is fundamental to the socio-economic development of a nation because it is a major element and factor in national development. In the same view, Okolo (2004) described the agricultural sector as the most important sector of the Nigerian economy which holds a lot of potentials for the future economic development of the nation as it had done in the past. Notwithstanding the enviable position of the oil sector in the Nigerian economy over the past three decades, the agricultural sector is arguably the most important sector of the economy.

The role of the government in economic management is performed through the formulation and implementation of economic policy generally and fiscal policy in particular. As recognized by the new growth theory, public spending is an important factor for self–sustaining productivity gains and long-term growth. For instance, government expenditure can contribute to agricultural growth (and hence poverty alleviation), it has indirectly created rural non-farm jobs and increased wages. The real significance of government development lies in the fact that it imparts a greater amount of "trickle-down"

benefits for the poor in the growth process than growth alone. While economic growth alone often reduces poverty only by increasing mean consumption, government expenditure on agriculture reduces poverty both by increasing the mean of consumption and improving the distribution of income (Fan, Zhang, and Zhang, 2000). Public spending (e.g., budget) is one of the most direct effective instruments used by governments to promote agricultural growth and poverty reduction. Public spending at the federal level and sub-national level follows a basic structure of recurrent spending and capital spending. This spending structure is characterized by different expenditure categories depending on the ministry, department or agency (Ihugba, Chinedu and Njoku, 2013).

The main objective of the paper is to investigate the short-run and long-run relationship between agricultural output, government expenditure, and economic growth in Nigeria and to offer policy recommendations based on the findings of the paper. The originality of this paper can be seen in two ways, firstly, it considered structural breaks of the series which none of the previous studies has taken into account. Secondly, in terms of the variable the current study used general government expenditure and agricultural output independently unlike previous studies that used government expenditure on agriculture as a single variable. The rest of the paper is organised as follows: literature review, methodology in which the objectives of the paper could be achieved, presentation and analysis of the empirical findings, and the final section concludes the paper.

1.2.   Overview of Agricultural Sector in Nigeria

Before the discovery of the oil boom of the 1970s, the importance of agriculture to the economic development of Nigeria is enormous because agriculture was the main source of food and employment for a sizeable number of people. It also provides raw materials for industries, income for an individual and the government. For instance, in the 1960s, more than 80% of the rural population of Nigeria was engaged in one type of agricultural activity or the other and between 1963 and 1964, the sector contributed as much as 65% of the nation's Gross Domestic Product (GDP) (Muftau and Gafar, 2003; Aina, 2015). Total expenditure on agriculture, as percentages of overall expenditure, fluctuated from 4.57 percent in the 1986-1993 periods through an average of 4.51 percent per annum in 1994-1998 to 3.53 percent in 1999-2005, reflecting the government's intensified efforts to reduce its size. Intense efforts at down-sizing also showed up in declines in the ratio to GDP of this component of public expenditure. As a percentage of GDP, it was 4.38 percent between 1986 and 1993, but thereafter, declined to remain at less than 1.0 percent from 1993 to 2005 (CBN, 2006). Capital expenditure on agriculture exhibited a similar trend. As a percentage of overall expenditure, it was 4.33

percent per annum in 1986-1993 but declined to an annual average of 2.37 percent between 1999 and 2005. The total budgetary allocation for the agricultural sector for Central and State governments in 2016 was N196.3 billion representing 1.6 percent of their N12.3 trillion budget, while N254 billion was allocated representing 1.8 percent of their total budget of N13.5 trillion for the year 2017. From 1992-2016 the budget to the agricultural sector was less than 4% except for 2001 with 5.69%, 2005 4.44% and 2009 7.33% of the total budget (CBN, 2017).

As a ratio of GDP, capital expenditure in agriculture rose impressively from 1.45 in 1970-1979 to 4.32 percent in the years 1980 to 1985. It, however, stayed at less than 1.0 percent between 1994 and 2005. Similarly, per capita expenditure on agriculture was N127.27 and N289.11, respectively, in 1994-1998 and 1999-2005. On the other hand, the agricultural sector of the economy did not attract significant foreign private investment. The distribution of cumulative foreign private capital flow by types of activity between 1970 and 2007 reveals that the agricultural sector lagged behind other major sectors (such as mining, manufacturing and services) in terms of share of total foreign private capital. The highest share of total foreign private capital recorded by the agricultural sector was 4.1 percent of total foreign capital flow in 1978 (CBN, 2008).

As a result of the low level of investment in the agricultural sector, output has fluctuated widely and productivity has also declined. On average, the sector grew at the rate of 11.4 per annum between 1960 and 2008. Further analysis of the performance of this sector indicates that the highest annual growth rates were recorded in the 1970s and 1980s, at 13.2 percent and 29.2 percent respectively. During the 1990s, the growth rate dropped to 3.4 percent. It rose at an annual growth rate of 6.9 percent during the period 2000-2005, and at 4.2 percent during the period 2005-2008.

Recently those roles seem to elude the country because of neglect resulting from the discovery of oil and the oil boom of the 1970s; the global economic crisis of the nation's terms of trade, and the continuous decline in government finance to the sector (Ijaiya and Ijaiya, 2003). Nigeria has diverse agro-ecological conditions that can support a variety of farming models. However, successive administrations over the years neglected agriculture and failed to diversify the economy away from overdependence on the capital-intensive oil sector. Nigeria, which was the largest net exporter of agricultural produce (groundnuts 42%, palm oil 27%, soya beans 28%, and cocoa 18% in the 1960s, now spends over 1.2 trillion importing palm oil, canned beans and other food items (Akintola, 2011). The country has, however, the potentials to return to its previous position if adequate attention is given to agricultural growth.

Policy through finance and the provision of rural infrastructure. This policy should aim at establishing a system of sustainable agricultural financing schemes and programmmes that could provide micro-credit facilities (Aina, 2015). Sadly, the small-holder farmers in Nigeria lack access to inputs to increase productivity, income and reduce poverty (Alpuerto et al, 2009). Despite numerous laudable agricultural programmes like the Agricultural support scheme of 2006, FADAMA Development Programmes, and Agricultural Credit Guarantee Scheme Fund among others, productivity has not improved (Oriola, 2009 and Ewetan et al, 2017).

2. Empirical literature

Several empirical studies have examined the impact of agricultural output on economic growth and government expenditure on economic growth in Nigeria and other countries in the world but the review of the literatures indicate inconsistency of the findings, example in the work of Chijioke and Amad (2020) examined the effects of government infrastructural expenditure on economic development in Nigeria using time series data. The study employed weighted least square and used gross domestic Product, spending on agriculture and natural resources, spending on transport and communication, spending on education and spending on healthcare delivery. Findings from the study revealed that governments spending on transport, communication, education, and health infrastructure have significant effects on economic growth; spending on agriculture and natural resources infrastructure recorded a significant inverse effect on economic growth in Nigeria. An element of fiscal illusion was observed in the government spending on agriculture and natural resources indicating that the government is not contributing as much as the private sector in spending on agriculture and natural resources infrastructure in Nigeria.

Abubakar, Yusuf, and Abdulmalik, (2020) examined the impact of state government expenditure on agricultural growth in Kogi state from 2000-2018 using time series data. The study employed Vector Autoregressive (VAR) Model and includes crop production, state government capital expenditure, and government recurrent expenditure. The result from VAR Model revealed that there is no significant relationship between government capital expenditure and agricultural growth in Kogi State. Similarly, the study also discovered that there is no significant relationship between recurrent expenditure and agricultural growth in Kogi State.

Idoko and Jatto (2018) examined the relationship between government expenditure on agriculture and economic growth in Nigeria from 1985- 2015. The study employed multiple regression analysis and Johansen co-integration test, variables used in the study include Real Gross Domestic Product, Government Expenditure on Agriculture, Capital Formation,

Commercial Bank Credit to Agriculture, and Domestic Savings. The multiple regression results of the study revealed that there exists a positive and significant relationship between government expenditure on agriculture and economic growth in Nigeria. The insignificant nature of domestic savings estimates was implicative on the fact that the domestic savings in the country did not contribute to economic growth, and there is a need for it to be encouraged to prevent difficulties among small-scale farmers in accessing soft loans, and purchasing adequate and mechanized farming tools.

Diyoke, Yusuf and Demirbas (2017) investigated the impact of government expenditure on economic growth in some selected countries in Sub-Saharan Africa (SSA) using panel data. Generalized Methods of Moments (GMM) was adopted in the study and gross domestic product, export, investment, government expenditure, interest rate and oil export were used as variables. The result of the study shows a long-run relationship amongst the variables used in the study. Government expenditure, investment and oil exports were equally found to have impacted growth in the region. Although, government expenditure has not contributed positively to economic growth in the region as it was negatively signed.

Aina and Omojola (2017) examined the effect of government expenditure on agricultural sector performance in Nigeria between 1980 and 2013. The study employed Ordinary Least Squares and Error Correlation Mechanism (ECM) methods, variables used in the study are; Agricultural Production Output, Government Capital Expenditure on Agriculture and Government Recurrent Expenditure on Agriculture. The regression coefficient of interest rate impacted significantly on agricultural sector output and the coefficient of the exchange rate is rightly signed. The long-run dynamic result shows that the coefficient of government expenditure on agriculture variable is rightly signed as well as the check variables (interest and exchange rates). There exists a long-run relationship among the variables.

Al Fawwaz (2016) measured the impact of government expenditures on economic growth in Jordan during the period between 1980-2013 using time series data. The study employed the Ordinary Least Squares (OLS) regression technique and includes the gross domestic product, total government expenditure, capital government expenditure, and recurrent government expenditure as variables in the model. The results indicate that there is a positive impact for both total government expenditure and current government expenditure on economic growth. The study recommends that capital government expenditure should be directed mainly to current productive economic activities to stimulate activities in the economic sectors.

Abbas, Yuansheng Abdul and Luan (2016) examined the impact of government expenditure on the agricultural sector and economic growth in Pakistan over the period 1983-2011. Variables used in the study include gross

domestic product, agriculture and government expenditure and employed the Johansen Co-integration test and Ordinary Least Squares (OLS) technique. The results of the Johansen Cointegration test showed that there exists a long-run relationship between government expenditure on agriculture, agricultural output, and economic growth in Pakistan. On the other hand, the empirical results of regression analysis revealed that agricultural output, government expenditure have a significant influence on the economic growth of Pakistan. It was also found out that the agriculture sector is still confronting some challenges like inadequate funding, underdeveloped infrastructure, poor agriculture marketing, and shortage of irrigation.

Ebong, Ogwumike, Udongwo and Ayodele (2016) assessed the impact of government capital expenditures on economic growth in Nigeria during 1970 and 2012. The study employed the Ordinary Least Squares (OLS) model. These results were positive and statistically significant at the 5% level. The short-run impact of health capital expenditures on economic growth was 0.21, while the long-run impact was 0.16. These impacts were negative and insignificant. Expenditures on economic infrastructure had significant positive impacts on the growth of 0.28 in the short-run and 0.32 in the long run. Moreover, these expenditures do not crowd-out private investment. These results indicate that government expenditure on human capital development through the social services sector tended to promote economic growth unlike that on agriculture. Iheanacho (2016) examined the long and short-run relationship between public expenditure and economic growth in Nigeria from 1986-2014. The study used the Johansen cointegration and error correction approach and employed real gross domestic product per capita, recurrent expenditure, capital expenditure, and non-oil revenue as variables in the model. This study shows a negative and significant long-run relationship between economic growth (RGDPC) and recurrent expenditure coexists with a positive short-run relationship, highlighting the dual effects of recurrent expenditure on economic growth in Nigeria. For the capital expenditure, this study documents the negative and significant long-run effect of capital expenditure on economic growth in Nigeria.

Al Gifari (2016) examined the relationship between government expenditure and economic growth in Malaysia using panel data. The study employed a fixed-effect model and used GDP, trade openness, exchange rate, labour and capital as variables in the model. The result indicates that there is a negative correlation between government expenditure and economic growth in Malaysia for the last 45 years. Moreover, the classification of government expenditure indicates that only housing sector expenditure and development expenditure significantly contribute to lowering economic growth.

Ihugba, Chinedu and Njoku (2013) analyzed the relationship between Nigeria government expenditure on the agricultural sector and its contribution

to economic growth, Engle-Granger two-step modeling (ECM) procedure to co-integration based on unrestricted Error Correction Model and Pairwise Granger Causality test was employed in the analysis. The findings of the study indicate that agricultural contribution to GDP (Gross Domestic Product) and total government expenditure on agriculture are cointegrated in this study. The speed of adjustment to equilibrium is 88% within a year when the variables wander away from their equilibrium values. Based on the result of the Granger causality, the paper concludes that a very weak causality exists between the two variables used in this study.

Mapfumo, Mushunje, and Chidoko (2012) investigated how government expenditure on agriculture has affected economic growth in Zimbabwe from 1980 to 2009. Variables used in the study are; Gross Domestic Product (GDP), Government agricultural Expenditure, government expenditure on extension, research and development, and credit assistance, and the model employed is Ordinary Least Squares (OLS). Results from the empirical analysis provide strong evidence indicating that agriculture is an engine of economic growth. The results from this study suggest that spending more on agricultural research and development can improve economic growth and ultimately reduce poverty. However, it can also be concluded that insufficient government agricultural expenditure on extension and credit assistance adversely affected economic growth in Zimbabwe, based on the results of the study. Udoh (2011) examined the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970-2008. The study employed a bounds test and autoregressive distributed lag (ARDL) and used Agriculture, gross domestic product, Public expenditure, labour, and weather as variables in the model. The results of the error correction model show that an increase in public expenditure has a positive influence on the growth of agricultural output. However, foreign investment has an insignificant impact in the short run. Hence, it is recommended that policymakers should combine both private and public investment in a complementary manner to ensure that both short-run and long-run productivity of the agricultural sector is not undermined.

Iganiga and Unemhilin (2011) examined the effect of Federal government agricultural expenditure on the value of agricultural output using time series data. The study employed co-integration and the error correction model and includes total commercial credits to agriculture, consumer price index, annual average rainfall, population growth rate, food importation, and GDP growth rate. The study found that government capital expenditure was found to be positively related to agricultural output. With a one-year lag period, it shows that the impact of government expenditure on agriculture is not instantaneous. The policy import of the study is that investment in the agricultural sector is very imperative and this should be complemented with

monitored credit facilities. River basins and irrigation facilities should be provided to have all-year-round agricultural product food importation should be banned to encourage local producers and population control should be intensified in the rural setting to avoid the Malthusian Prediction of pestilence and strife.

3.   Methodology
3.1.   Model specification

The paper examines the short-run and the long-run relationship between agricultural output, government expenditure, and economic growth in Nigeria from 1985 to 2019. The functional form of the model is presented as follows:

$$RGDP = F(AGROUT, GOVEXP, \ EXRATE)\ldots\ldots\ldots\ldots\ldots(3.1)$$

Where

$RGDP_t = Real \ gross \ domestic \ product$, is measured as a proxy to economic growth and is the dependent variable in the model.

$\beta_1 AGROUT_t = Agricultural \ output$, is measured as total agricultural output percentage of GDP

$\beta_2 GOVEXP_t = government \ expenditure$, is measured as general government expenditure

$\beta_3 EXRATE_t = Exchange \ rate$, is measured as the official exchange rate

$\varepsilon_t = Error \ term$

3.2.   The Gregory and Hansen

The study used Gregory and Hansen test to measure the importance of structural breaks in the series, because ignoring the breaks in the series may lead to accepting the null hypothesis where it is supposed to be rejected.

The Gregory and Hansen (1996) technique extends Engle and Granger's (1987) procedure by allowing for a structural break in either the intercept or the intercept and the cointegrating coefficient at an unknown time. The proposed residual-based tests for the null hypothesis of no cointegration with a structural break against the alternative assumptions. They proposed the following four models to account for a single endogenous break:

Model 1: Level shift (C)

$$y_t = \ \alpha_0 + \ \alpha_1 \Phi_{t\tau} + \ \beta_1 x_t + \ \varepsilon_t \ , \ t = 1, \ldots, n \ \ldots\ldots\ldots\ldots\ldots(3.2)$$

Where $\Phi_{t\tau}$ is a dummy variable such that $\quad \Phi_{t\tau} = \begin{cases} 1 \ if \ t > n\tau \\ 0 \ if \ t \leq n\tau \end{cases}$

And $\tau \ \epsilon \ (0, \ 1)$ denotes the relative timing of the break point. In model 1, the structural break affects the intercept only; α_0 is the intercept before the break and α_1 is the change in intercept at the time of the break.

Model 2: Level shift with a trend (C/T)

$$y_t = \ \alpha_0 + \ \alpha_1 \Phi_{t\tau} + \ \varphi_1 t + \ \beta_1 x_t + \ \varepsilon_t \ , \ t = 1, \ldots, n \ \ldots\ldots\ldots\ldots(3.3)$$

In model 2 the break affects only the intercept however it contains a trend.
Model 3: Regime shift where slope and intercept coefficients change (C/S)

$$y_t = \alpha_0 + \alpha_1 \Phi_{t\tau} + \beta_1 x_t + \beta_2 x_t \Phi_{t\tau} + \varepsilon_t \, , \ t = 1, \dots, n \quad \dots\dots\dots\dots(3.4)$$

In model three the structural breaks affect both the intercept and the slope coefficient. β_1 is the cointegrating slope coefficient before the shift and β_2 is the change in the cointegrating slope coefficient at the time of the break.
Model 4: Regime shift where intercept, slope coefficients and trend change (C/S/T)

$$y_t = \alpha_0 + \alpha_1 \Phi_{t\tau} + \varphi_1 t + \varphi_2 t \Phi_{t\tau} + \beta_1 x_t + \beta_2 x_t \Phi_{t\tau} + \varepsilon_t \dots\dots\dots(3.5)$$

For each of the above models, unit root tests are performed on the residual's series, ε_t, using ADF^*, z_α, and z_t tests. Gregory and Hansen (1996) propose the following tests: Gregory and Hansen have tabulated critical values by modifying the Mackinnon (1991) procedure. The null hypothesis of Gregory and Hansen tests is that there is a unit root in the residuals and hence there is no cointegration while the alternative hypothesis is that there is no unit root in the residuals and hence there is cointegration with a single unknown break. The null hypothesis is rejected if the statistic ADF^* is smaller than the corresponding critical values. The test statistics can also be measured using the Philip test statistics that are denoted as Z^*_α and Z^*_t. The above four Gregory and Hansen cointegration models can be extended to occupy more than one explanatory variable.

3.3.   Stability Test

Having estimated the error correction model for Nigeria's economic growth, we then proceed to investigate the stability of the model. This is done based on the CUSUM and CUSUMSQ tests of Brown et al (1975).
The CUSUM test statistic is given as:

$$W = \sum_{j=k+1}^{t} \frac{\hat{e}_j}{\hat{\sigma}_\epsilon} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.6)$$

Where $\hat{e}_j$ is the recursive residual and $\hat{\sigma}_{\epsilon_\epsilon}$ is the standard deviation of the recursive residual, defined as

$$\hat{\sigma}_\epsilon = \sqrt{\left(\frac{1}{T-K} \sum_{t=1}^{T}(\epsilon_t - \hat{\epsilon})^2\right)} \dots\dots\dots\dots\dots\dots \ (3.7)$$

For robustness, the cumulative sum of squares test is also applied.

$$S_t = \frac{\left(\sum_{r=k+1}^{t} w_r^2\right)}{\left(\sum_{r=k+1}^{t} w_r^2\right)} \dots\dots\dots\dots\dots \ (3.8)$$

Where w_t is the recursive residuals computed for $t=k+1,\dots,T$. The expected value of under the hypothesis of parameter constancy is:

$$E(S_t) = (t - k)(T - k) \dots\dots\dots\dots\dots\dots\dots\dots(3.9)$$

Which goes from zero at *t=k,* to unity at *t=T*. The significance of the departure of S from its expected value is assessed by reference to a pair of parallel straight lines around the expected value.

The G-Hansen model is specified as

$$RGDP_t = \alpha_0 + \alpha_1\Phi_{t\tau} + \beta_1 AGROUT_t + \beta_2 GOVEXP_t + \beta_3 EXRATE_t + \varepsilon_t \quad .... (3.10)$$

$$RGDP_t = \alpha_0 + \alpha_1\Phi_{t\tau} + \varphi_1 t + \beta_1 AGROUT_t + \beta_2 GOVEXP_t + \beta_3 EXRATE_t + \varepsilon_t \quad ......(3.11)$$

$$RGDP_t\ \alpha_0 + \alpha_1\Phi_{t\tau} + \beta_1 AGROUT_t + \beta_{11} AGROUT_t\Phi_{t\tau} + \beta_2 GOVEXP_t + \beta_{22} GOVEXP_t\Phi_{t\tau} + \beta_3 EXRATE_t + \beta_{33} EXRATE_t\Phi_{t\tau} + \varepsilon_t ....(3.12)$$

$$RGDP_t\ \alpha_0 + \alpha_1\Phi_{t\tau} + \varphi_1 t + \varphi_2 t\Phi_{t\tau} + \beta_1 AGROUT_t + \beta_{11} AGROUT_t\Phi_{t\tau} + \beta_2 GOVEXP_t + \beta_{22} GOVEXP_t\Phi_{t\tau} + \beta_3 EXRATE_t + \beta_{33} EXRATE_t\Phi_{t\tau} + \varepsilon_t ....(3.13)$$

3.4.   ARDL Model

The study employed Auto Regressive Distributive Lag (ARDL) model to examine the short-run and long-run relationship among agricultural output, government expenditure, and economic growth in Nigeria.

The Auto-Regressive Distributive Lag (ARDL) model is specified as

$$\Delta RGDP_t = \mu + \sum_{i=1}^{n-1} a_i \Delta RGDP_{t-1} + \sum_{i=0}^{m-1} \beta_i \Delta AGROUT_{t-i} + \sum_{i=0}^{m-1} Y_i \Delta GOVEXP_{t-i} + \sum_{i=0}^{m-1} u_i \Delta EXRATE_{t-i} + \sum_{i=0}^{m-1} \delta_i \Delta DUMMY_{t-i} - \pi\hat{e}_{t-1} + \varepsilon_t ......(3.14)$$

If $\pi = 1$ then 100% of the adjustment takes place within a single period (instantaneous/full adjustment). If $\pi = 0$ then there is no adjustment. Thus, any other value is interpreted accordingly; a value of π closer to *1* implies quick adjustment, and a value closer to 0 implies slow adjustment. To select the most fitted model lag length are chosen automatically by Akaike Information Criterion (AIC).

The null and alternative hypothesis for bound test concerning the cointegration test is:

Ho: $a_i = \beta_i = Y1 = u_i = v_i = \omega_i = 0$ (No long-run relationship).

H1: $a_i \neq \beta_i \neq Y1 \neq u_i \neq v_i \neq \omega_i \neq 0$ (there is long-run relationship).

4. Empirical Results and Discussion
4.1 Descriptive statistics

Table 4.1 Descriptive statistics

Statistics	LRGDP	LAG	LGOVEXP	LEXRATE
Mean	11.10368	1.370589	0.463422	1.045153
Median	10.97948	1.368689	0.327040	1.040582
Std. Dev.	0.429461	0.067048	0.349668	0.016752
Skewness	0.181718	0.850690	0.117599	0.161013
Kurtosis	1.390506	3.992772	1.461127	1.393292
Jarque-Bera	3.970397	5.658759	3.534195	3.915931
Probability	0.137353	0.059049	0.170828	0.141145
Observations	35	35	35	35

Source: Computation using E-views 10.

Table 4.1 shows the result of descriptive statistics of the study, it indicates that the standard deviations of the variables employed are not far away from their means except real gross domestic product (0.429461). The skewness of the distribution shows positive values and less than one of all the variables employed, which implies that these variables are skewed to the right and are normally distributed. For kurtosis all the variables are normally distributed because are less than 3 or equal to 3, this means that these variables are normally distributed. The Jarque-Bera test for normality is also estimated. The result indicates the rejection of the null hypothesis of all the variables employed because their p-value is greater than 5% which means that are normally distributed.

4.2. Unit Root Test
4.2.1 Augmented Dickey-Fuller (ADF), Phillips Perron (PP)
The study estimated the unit root test of both Augment Dickey-Fuller and Phillips Perron to identify the order of integration of the variables under study.

Table 4.2 Augmented Dickey-Fuller (ADF), Phillips Perron (PP)

Variables	Test at level		Test at first difference	
	ADF test	PP test	ADF test	PP test
LRGDP	-2.602396	-2.585308	-4.763321	-4.760462
LAG	-1.747286	-2.220994	-6.784276	-7.132749
LGOVEXP	-2.260509	-2.299674	-5.772793	-5.786270
LEXRATE	-2.620702	-2.605862	-4.833686	-4.829056

Source: Computation using E-views 10.

Table 4.2 presents the result of Augment Dickey-Fuller and Phillips Perron unit root tests, the tests show that all the variables under ADF and PP tests are stationary at first difference i.e. are I(1) process.

4.2.2   Zivot and Andrew Unit Root Test

Table 4.3 Zivot-Andrew Unit Root Test

Variables	Level		First difference	
	Statistics	Break point	Statistics	Break point
LRGDP	-2.645311	2014	-6.149535	1994
LAG	-4.610839	2002	-5.428843	2005
LGOVEXP	-6.065023	2004	-	-
LEXRATE	-2.705277	2014	-6.324122	1994

Source: Computation using E-views 10.

Table 4.3 indicates inconsistent results with the traditional unit root test shown in table 4.2. Evidence from the Zivot-Andrew unit root test indicates that real gross domestic product, agricultural output and exchange rate are stationary at the first difference, the break dates are 1994, 2005 and 1994 while government expenditure is stationary at the level and the break date is 2004. Conclusively, considering breaks in the series is very important, because it may lead to accepting the Null hypothesis of the unit root test when it should have been rejected.

4.3.   Gregory-Hansen cointegration test

Table 4.4 Gregory-Hansen cointegration test

Models	ADF *	Break point	Zt*	Break point	Zα*	Break point
C	-5.88	2007	-5.92	2011	-35.46	2011
C/T	-5.23	2011	-5.31	2011	-30.87	2011
C/S	-6.95	2005	-6.74	2010	-43.22	2010
C/S/T	-6.85	2010	-6.96	2010	-40.59	2010

Source: Computed using Stata 14.

The result from table 4.4, indicates a cointegration among the variables employed, sticking to ADF statistics because the lower the value the better model and is higher than the critical value at 5%, Taking the break date to be 2011. Therefore, we can reject the null hypothesis of no cointegration. The test does suggest that considering a structural break in the cointegration vector is important and needs to be taken care of in the specification of real gross domestic product functions in Nigeria.

4.4.   Results of Autoregressive Distributed Lag (ARDL) model

As a result of unit root and bound tests conducted in the study which suggests the use of the ARDL model. The appropriate model (number of lags) is selected automatically using Akaike Information Criterion (AIC) which is seen as a more robust model. Below, both short-run and long-run parameters of the model are presented.

4.4.1. Short-run Relationship

Below the result of short-run parameters of the ARDL model is presented. AIC suggests a (3, 4, 3, 3, 3) model after testing for up to 2500 different models.

Table 4.5 Short-run parameters of the ARDL model

Variables	Coefficient	Std. Error	t-Statistic	Prob.
Δ(LGDP(-1))	0.348150	0.161262	2.158916	0.0562
Δ(LGDP(-2))	0.610325	0.153792	3.968500	0.0026
Δ (LAG)	-0.005511	0.007629	-0.722323	0.4866
Δ (LAG(-1))	0.018910	0.008810	2.146313	0.0574
Δ (LAG(-2))	-0.019247	0.008797	-2.187819	0.0535
Δ (LAG(-3))	0.015497	0.009580	1.617593	0.1368
Δ (GOVEXP)	0.002546	0.000412	6.183764	0.0001
Δ (GOVEXP(-1))	-0.001872	0.000517	-3.620123	0.0047
Δ (GOVEXP(-2))	-0.000548	0.000326	-1.680921	0.1237
Δ (LEXRATE)	0.472502	0.106000	233.2539	0.0000
Δ (LEXRATE(-1))	-0.567338	4.003643	-2.139885	0.0580
Δ (LEXRATE(-2))	-0.392924	3.813816	-3.914516	0.0029
Δ (DUMMY)	0.015937	0.002696	5.911306	0.0001
Δ (DUMMY(-1))	-0.023941	0.004388	-5.455761	0.0003
Δ (DUMMY(-2))	-0.010683	0.002969	-3.597893	0.0049
Prob(F-statistic)	0.000000			
R-squared	0.999790			
Adjusted R-squared	0.999579			
Serial correlation	0.0117			
Heteroscedastics	0.2558			
Normality	0.747430			
Ramsey test	0.0000			

Source: Computation using E-views 10.

The result from table 4.4 indicates positive and significant autoregressive of dependent variable i.e. GDP at lag 1 and lag 2 in the short-run, it shows that real gross domestic product depends largely on itself in the short run. The agricultural output itself depicts a negative and statistically insignificant effect on the real gross domestic product Nigeria in the short-run, at lag 1 and 3 indicate a positive while at lag 2 shows a negative effect. Government expenditure itself indicates a positive and statistically significant effect on the real gross domestic product in Nigeria in the short-run, at lag 1 shows negative effect on real gross domestic product in Nigeria. The exchange

rate shows a positive and statistically significant effect on real gross domestic product in Nigeria in the short run, at lag 1 and 2 show a negative and statistically significant effect on the real gross domestic product in Nigeria. The break-point coefficient itself indicates a positive and statistically significant, this means that the break-point has a significant impact in this model, at lag 1 and 2 indicate negative but statistically significant. The p-value of F-statistics indicates (0.000000), which means that agricultural output, government expenditure, and exchange rate have a 100% significant influence on the real gross domestic product in Nigeria.

The R-squared and its adjusted value are very high 0.999790, this implies that 99% change in real gross domestic product is explained by agricultural output, government expenditure and exchange rate in Nigeria. The model passed post estimation tests such as Heteroscedasticity and normality test, as their probability values are greater than 5%.

4.4.2. Long-run and Error Correction Result

As a result of the bound test, which confirms the existence of a long-run relationship among the variables of interest.

Table 4.6 ARDL Cointegration and Long-run form Results

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LAG	0.005966	0.009393	0.635155	0.5396
GOVEXP	0.003205	0.000354	9.044047	0.0000
LEXRATE	0.472289	0.084977	290.9346	0.0000
DUMMY	0.022422	0.002444	9.173767	0.0000
CointEq(-1)	-0.798100	0.262932	-3.035385	0.0000

Source: Computation using E-views 10.

The result from table 4.5 indicates that agricultural output has a positive but statistically insignificant impact on gross domestic product in Nigeria in the long run, this is in line with economic apriori expectation which confirmed the positive impact of agricultural output on the real gross domestic product in Nigeria. The positive finding is similar to the findings of Abbas et al (2016) and Mapfumo et al (2012). Furthermore, Government expenditure indicates a positive and statistically significant impact on the real gross domestic product in Nigeria in the long run, this implies that one unit increase in government expenditure will bring about a 0.003% increase in the gross domestic product in Nigeria, this in line with apriori expectation which proved that government expenditure impacted positively on the real gross domestic product in Nigeria. The positive finding is similar to the findings of Idoko et al, (2018), Abbas et al (2016), and Al Fawwaz (2016) while countering the finding of Al Gifari (2016). The exchange rate shows a positive and statistically significant effect on the real gross domestic product in Nigeria in the long run, by implication N1 increase in the exchange rate will cause 0.47%

increases in the real gross domestic product in Nigeria. Furthermore, the break coefficient shows a positive and statistically significant, by implication considering the break in the model is very significant.

The error correction term (ECT) meets all the theoretical and statistical requirements both in the sign and size. The ECT coefficient is -0.798100 and significant at 5%, which indicates that 79.81% of the disequilibrium due to the shock in the previous years is adjusted back to the long-run equilibrium in the current year.

4.4.3. Stability

A stability test of the model is employed to ensure the data generating process is compatible with the estimated coefficient of the model.
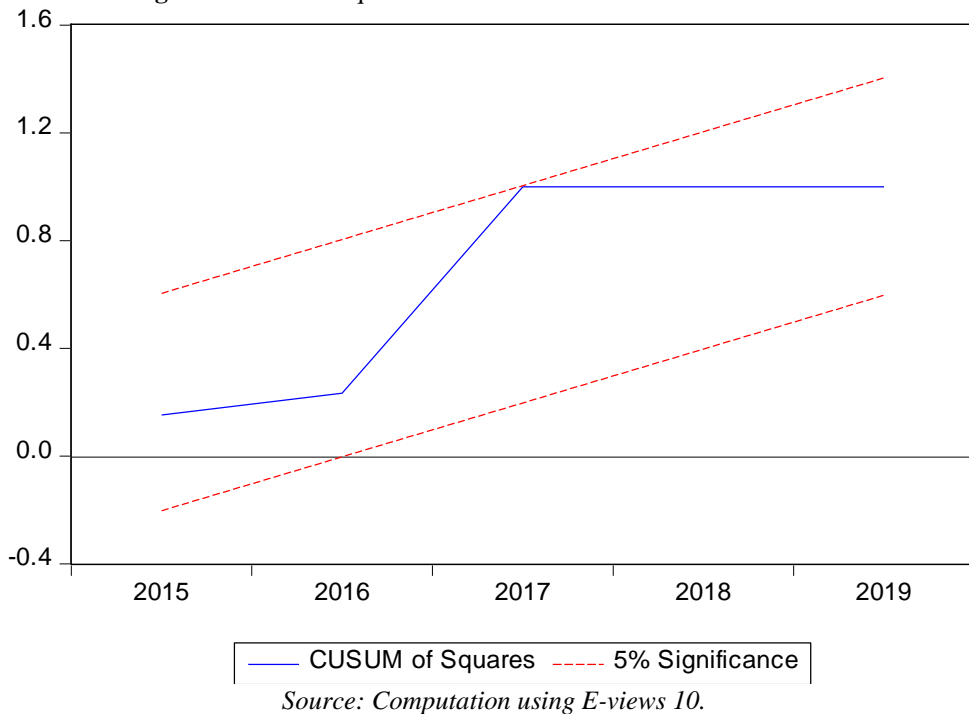
Figure 4.1 Cusum Pot Recursive Residual of ARDL model
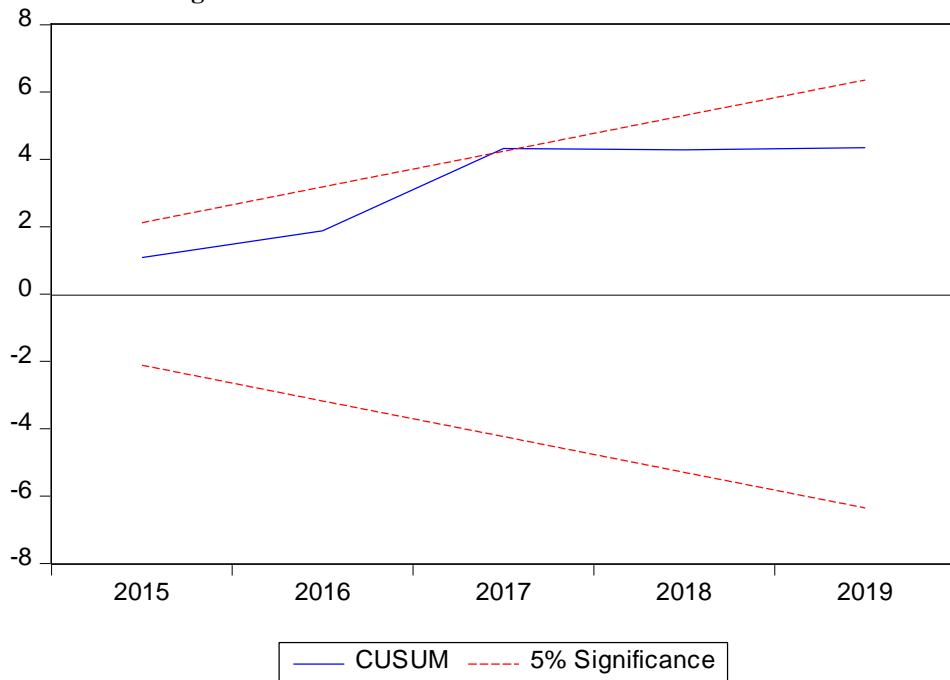
Source: Computation using E-views 10.

From Figure 4.1, the CUSUM plot is within a 5% level of significance, this means that the model is stable. This shows that there is no chance of having spurious regression.

Figure 4.2 Cusum Square Plot Recursive Residual of ARDL Model

Source: Computation using E-views 10.

From Figure 4.2, the CUSUM plot is within a 5% level of significance, this means that the model is stable. This shows that there is no chance of having spurious regression.

Conclusion and Recommendation

The paper investigates the relationship between agricultural output, government expenditure, and economic growth in Nigeria using annual data from 1985 to 2019. The Auto-Regressive Distributive lag (ARDL) model with structural break is used in the analysis. The Gregory-Hansen cointegration with break has confirmed the existence of cointegration among the variables employed. The long-run result indicates that agricultural output has a positive but statistically insignificant effect on the real gross domestic product in Nigeria, government expenditure has a positive and statistically significant effect on the real gross domestic product in Nigeria, and the exchange rate has a positive and statistically significant effect on the real gross domestic product in Nigeria. The break coefficient shows a positive and statistically significant. The error correction term (ECT) indicates that 79.81% of the disequilibrium due to the shock in the previous years is adjusted back to the long-run equilibrium in the current year. Conclusively, the paper recommends that the Nigerian government should reduce the lending rate on agriculture and provide incentives to farmers, by so doing farmers will be encouraged to

borrow and consequently agricultural output will increase via the multiplier effects. Government should provide infrastructural facilities such as good roads, pipe-borne water, and electricity to increase agricultural output and finally higher economic growth could be achieved. The Nigerian government should increase its expenditure on agriculture to boost the sector and achieve higher economic growth.

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Effect of Exchange Rate Misalignment on Bilateral Trade Between Kenya and European Union: 2000-2016

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Abstract

The exchange rate is an important variable in international trade because a country's competitiveness is determined by the expectations on how trade reacts to its movements. To orient the economy outwards, Kenya has pursued various measures from the 1990s to the 2000s. Kenya also signed up for nonreciprocal trade with the European Union under the Cotonou agreement. Despite the export-oriented efforts, Kenya's trade has remained skewed towards imports and a widening trade deficit which seems to follow the weakening of the Kenya shilling. The main policy dilemma therefore, is how imports accelerated in an environment of unhindered European Union market access, hence the motivation of this study. The study adopted a dynamic modeling approach since previous and present values affect exchange rate and trade. The results show that the economic fundamentals drive the real exchange rate. In terms of misalignment, the exchange rate is overvalued to a maximum of 5.9 percent and undervalued up to 5.2 percent. The estimated misalignment hurts imports but has a positive, statistically insignificant effect on exports. The results of this study suggest that the monetary authority should ensure the exchange rate remains stable and within the 6 percent range while monitoring all the underlying determinants. Additionally, hedging instruments should be made available and affordable to traders.

Keywords: Misalignment, trade flows, exports, imports

1.   Introduction

A country's exchange rate is the domestic currency expressed in terms of a foreign currency. The rate frequently varies at the foreign exchange markets. It is an essential variable in the economic processes both from a descriptive and policy perspective. Due to its administrative simplicity, it has emerged as a significant tool in the arsenal of economic management policies. Thus, a country's exchange rate affects the actual economic variables and monetary variables. The stability of a country's exchange rate and its level relative to its equilibrium level affects the growth and volume of trade (Bahmani, Harvey & Hegerty, 2012). A country's exchange rate is a crucial variable because trade reacts to fluctuations that alter the structure of prices and incentives in trading activities hence the whole economy. For instance, exports of developing countries decline with exchange rate movements while those of developed countries remain unaffected (Mukherjee & Pozo, 2007).

The effect of the exchange rate movement on trade varies from countries and regions. Empirical studies record a higher exchange rates volatility in developing countries of Latin America and Africa compared to Asia. Also, volatility in developing countries is four times that of developed countries. Other studies show that the magnitude of volatility depends on the degree of flexibility of the exchange rate regime. Countries operating flexible exchange rate regimes experience twice the volatility experienced in countries operating hard pegs or fixed regimes regardless of their development status (Calderon, Chong & Loayza, 2002). Generally, developing countries exhibit three times more exchange rate volatility than their developed counterparts. The high volatility in developing countries is blamed on the lack of management resources. Where the resources exist to relieve the risk effects, in the short run, they are too complicated and not all round hence limited in their functions. The application of such tools is also hindered by their cost, especially to small firms, particularly in the case of high volatility (Hutchet-Bourdon & Korinek, 2011). Therefore, unless traders hedge themselves in the forward market, they have to bear exchange rate risk on commitments to pay or receive foreign currency in the future.

Among the reasons a country's real exchange rate (RER) can move upward is the appreciation of the nominal exchange rate, the depreciation of other countries' currencies, or a greater rate of domestic inflation rate relative to a foreign counterpart (Balassa, 1964). The remedy to the resultant price competitiveness loss would be to reduce the domestic inflation rate or currency depreciation as compensation for its relatively higher costs. However, inflation is not the only reason for an exchange rate adjustment in developing countries. For instance, policymakers in developing countries may

be aligning the domestic economy to changes in the international market, such as a decline in export earnings which negatively affect the balance of payments. Policymakers have had an extensive debate over the suitable level of a country's exchange rate. According to Bird (1998), a multilateral agencies standard posits that a country's exchange rate should favor the growth of exports and be consistent with normal and expected capital flows over the medium-term current account position.

Exchange rate misalignment is represented by the deviation of the real exchange rate from its long-run equilibrium path, which distorts the comparative advantage -the core of the Ricardian theory of international trade. Arize, Osang and Slottje (2008) argues that failure to include a variable that captures the influence of exchange rate risks such as exchange rate misalignment in a study of international trade determinants may yield a bias of potentially mis-specified results. According to Edwards (1997), the operational definition of the real exchange rate is given by: $RER = \frac{EP_T}{P_{NT}}$

where *RER* is the real exchange rate, *E* is the exchange rate, P_T is the world price of tradeable (proxied by wholesale prices), and P_{NT} is the price of non-tradeable (proxied by a domestic price index). Thus, the unobservable gap between the exchange rate and its equilibrium level is the exchange rate misalignment. The exchange rate can be overvalued or undervalued if it appreciates or depreciates over or under its equilibrium path. Exchange Misalignment is associated with markets where the actual exchange rate cannot adjust to changes in the underlying economic fundamentals. The causes of exchange rate misalignment are unsustainable monetary and fiscal policy alongside unsustainable trade and exchange control policies.

A correctly aligned exchange rate is an important issue in developing countries where their chief foreign exchange earner is agriculture as the engine of the economies, especially in employment. While the government's manufacturing sector in these countries is protected, their agricultural enterprises remain largely exposed (Csermely, 1994). The problem can be compounded when currencies in developing countries become overvalued, reducing the profitability of agricultural tradeable and negatively affecting agricultural performance. Therefore, a steady exchange rate is a crucial variable in the growth of a country's trade.

Arguably, a country's RER misalignment has a dual effect. It enhances the profits to traders and is an incentive to non-traditional and potential goods of exports that may encounter increased barriers of entry due to a disproportionately highly valued currency (Calamitsis, Basu & Ghura, 1999). An overvalued exchange rate is considered a more significant threat to an economy than an undervalued exchange rate. Imports are encouraged while exports are undermined in an overvalued exchange rate environment because

competitiveness is lost by reducing the incentives of the importing country to import (Gaalya, Edward & Eria, 2017). If this situation persists, exports decrease relative to imports. This resultant increase in imports requires the additional foreign exchange and may lead to increased borrowing to reduce foreign exchange reserves. Thus, it is key to determine when an overvaluation of the exchange rate occurs as this is considered the leading cause of economic damage.

One crucial indicator of a country's economic vulnerability is exchange rate misalignment (Lugaiyamu, 2015). A persistent exchange rate overvaluation is regarded as a precursor to a crisis and reflects unsustainable macroeconomic policies in the economy. Conversely, a persistent undervaluation could cause the economy to overheat. This further exerts pressure on domestic prices and misallocation of resources between tradeable and non-tradeable sectors. Rodric (2008) suggests that, by carefully crafting an exchange rate undervaluation, China, Taiwan, Tanzania, and Uganda seem to have resolved or cushioned themselves against the weak institutions' constraint. Although most countries outside Sub-Saharan Africa have dealt well with overvaluation, the exchange rate is overvalued due to inappropriate and inconsistent policies. For instance, while a stable undervalued exchange rate is a viable policy for economic growth in developing countries, maintaining the policy long enough can have negative repercussions and, therefore, become insufficient (World Bank, 2012). The experience from the high-performing East Asian "success stories" countries shows that a sound exchange rate induced competitiveness is one of the "winning strategies" in an export-oriented world.

The equilibrium *RER* exists when the relative price of tradeables to nontradeables is such that it leads to a simultaneously internal and external equilibrium. A country's exchange rate can be affected by variable changes that affect the country's internal and external equilibriums. These include the world price of exports, import tariffs, and real interest rates. In addition to the real exchange rate, all the real variables that determine a country's internal and external equilibrium are real exchange rate fundamentals, whose current and expected future values affect the real exchange rate equilibrium (Edwards, 1989). The external fundamentals include international terms of trade, international transfers, foreign aid flows, and the world's real interest rates. The internal fundamentals are categorized into decisions related to policy and those that are unrelated to policy. The policy-related fundamentals include import tariffs and quotas, export taxes, exchange and capital controls, and composition of government expenditure (Naseem, Tan & Hamizah, 2009). The non-policy fundamentals include technological progress.

Over time, researchers have considered more fundamental determinants of the exchange rate in their studies. Theoretically, there is a

positive correlation between the actual oil price and the exchange rate (Lugaiyamu, 2015). Because oil imports cannot be substituted by domestic residents with other locally produced energy sources, disposable income is reduced by increasing the price of oil. Consequently, the demand for domestic goods falls, which leads to a decline in prices; hence the real exchange rate depreciates. The level of net foreign assets (NFA) affects the current account in two opposing ways. A negative association between NFA and the current account can exist where a country remains solvent due to high NFA, which leads to longer-term trade deficits. In addition, higher net foreign income flows accrue to economies with high NFA; hence, the NFA and current account balances are positively related.

1.1 Kenya's Exchange Rate and Trade with European Union

Kenya's foreign exchange market was liberalized in the 1990s in a gradual movement to a floating exchange rate regime from a fixed to a floating exchange rate regime. The liberalization in independent Kenya began in 1963 to 1982 with a fixed exchange rate regime, a crawling peg period from 1983 to 1993, and in 1993, and eventually embracing a floating exchange rate regime. A dual exchange rate that lasted up to 1993 was preceded by a crawling peg period from 1982 to 1990. However, the exchange rate misalignment triggered the abandonment of the dual exchange rate. The environment of floating the exchange rate was characterized by enormous depreciation such that in 1993 there were three episodes of exchange rate devaluation.

By 2016, Kenya's key export destination was Africa accounting for 40.6 percent of total exports. The leading exports included tea, coffee, horticulture, apparel, and clothing. Exports amounting to 24.5 percent of the total exports went to Europe, with the bulk of it destined to European Union (EU). Asia remained the single dominant source of Kenya's imports accounting for 66.8 percent of total imports in value, in 2016 (Republic of Kenya 2017). Kenya's key imports include motor cars and parts, veterinary and human medicine, agrochemicals, rubber, steel and iron products, fuels and lubricants, computing equipment, electrical and electronic equipment sourced from EU as the largest market origin (Nkoro & Uko, 2016). Furthermore, Kenya-EU trade is second only to COMESA by rank. Kenya's primary export destinations are France, Germany, the United Kingdom, and the Netherlands. E.U. imports primary agricultural goods from Kenya such as fruits, vegetables, and cut flowers and account for approximately 90 percent of total exports value.

The nonreciprocal agreement (Cotonou, 2000) allowed the EU to maintain preferential access to the European market by the African, Caribbean, and Pacific (ACP) countries, in return for reduced customs duties for European exports. For the East African Community (EAC) member

countries, this agreement formally came to a close in 2014 and was supposed to be succeeded by the Economic Partnership Agreements (EPAs). The new agreement seeks to establish a Free Trade Area (FTA) between EU and ACP countries in their economic groupings. The ACP countries must open up their markets to EU products while considering their diverse needs and differentiated levels of development. Based on this arrangement, countries were expected to open up market access only when they were ready.

The year 2014 marked the end of the nonreciprocal trade arrangement between E.U. and its ACP partners. This trade framework guided by Yaoundé, Lomé, and Cotonou agreements ended in 2007 when the World Trade Organization terminated the second waiver. The waiver had permitted the EU to differentiate trade engagements with the ACP partners from the other developing countries. Consequently, it was a requirement for ACP countries for the first time to engage in reciprocal, though asymmetric trade agreements with a developed and major trading partner while their regional integration was basically in a formative stage. The EPAs were to be negotiated at a regional level as development tools in building strong regional markets, enhancing trade and investment, facilitating the integration of ACP economies in the global economy, and motivating deeper economic reforms. Additionally, they were meant to ensure unlimited, immediate, fully liberalized ACP market access to the EU market and opened the services market.

However, it was evident to the least developed ACP partners that there was no meaningful gain from the EU market access since 2001. They also feared losing import duty revenues, unfair competition from subsidized European agriculture, and crowding small businesses from an already weak manufacturing sector due to competition from Eurozone products. In addition, they were faced with a no-deal with the EU that meant they would have been worse off by competing with all other developing countries in the absence of Cotonou preferences. The latitude of the agreement was revised to include trade in goods only with a commitment to have services negotiations in the future. Compared to the ACP-EU agreement, the EPAs included more products. A relaxation of the rules of origin allowed countries to source products from neighbouring countries, transform them locally, and still qualify for exports to the E.U. (World Bank, 2012).

The EPAs have also had challenges because possibilities favour some regions more than others and failure to address administrative customs cooperation. Further, liberalization was to be phased over at 25 years. Due to the sensitivity of agricultural products, the sector was not subject to liberalization. Despite the envisaged gains from the ACP-EU and the proposed EPAs, these agreements do not consider the nature of trade in commodities and the outcomes of such market openness on developing countries. Kenya's

trade flows, for instance, present a unique production structure in the agriculture and manufacturing sector where agricultural exports are primarily bound to the E.U while the industrial goods are headed to the region (World Bank, 2012).

1.2.   Kenya's Exchange Rate Misalignment and trade

Exchange rate misalignment, which characterized the period of the dual exchange rate from 1990 to 1993 in Kenya, led to the abandonment of the official exchange rate. Adopting the flexible exchange rate was expected to raise the price of exportable relative to non-tradeable, thereby motivating exports through the interplay of market forces of demand and supply for foreign exchange (Mwega, 2014). Figure 1. shows the trend of Kenya's exchange rate and trade balance with EU between January 2000 and 2016. This period is important because the ACP-EU Partnership Agreement was signed in 2000 for 20 years, covering 2000 to 2020 and allowing nonreciprocal access of ACP goods to the EU market.

Figure 1. Kenya's Exchange Rate and Trade Balance With EU
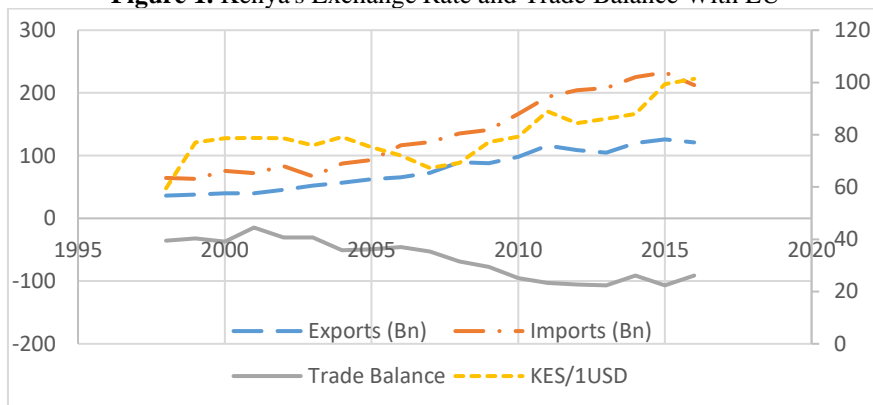
Source: Author's compilation using data from Central Bank of Kenya statistics (2000-2016)

Between 2000 and 2004, imports and exports between Kenya and EU moved closer together. EU Imports dipped in 2003 due to slowed growth in the Euro region from 0.9 percent in 2002 to 0.5 percent in 2003. Although exports and imports increased between 2004 and 2008, the trade deficit widened from 0.82 percent GDP in 2004 to 10 percent in 2012. This could be explained by a boost in household spending due to an improved labor market that saw unemployment drop by 8 percent since 2001 (Republic of Kenya 2007). Beyond 2009 imports accelerated, and the trade deficit between Kenya and EU expanded. The growth of exports in 2010 was attributed to Spain, Italy, Belgium, and the United Kingdom markets, where exports increased by 34.9, 34.6, 22.7, and 4.5 percent, respectively, in 2010. As a single market, the exports to the EU rose by 7.3 percent. They accounted for 24.1 percent of the

total export earnings in 2010, partly due to increased horticultural, fish exports and global prices (Republic of Kenya 2012). However, this could not match airplane imports, and other aircraft, electrical generating sets, and rotary converter that tripled in 2010. The notable dip in exports in 2013 was due to a fall in international prices for tea, coffee, and horticultural products. The poor weather pattern also led to a fall in the total value of marketed output in tea, cut flowers, fruits, and coffee (Republic of Kenya 2014). The country's export structure has remained constant, with the same raw agricultural goods exported and a fixed set of countries.

Between 2000 and 2004, Kenya's exchange rate stabilized at around 80 KES/USD. This was trailed by a 15 percent appreciation from 2004 to 2007 when the annual average dropped from 79.2 to 67.3 KES/USD. The improved macroeconomic environment of 2004-2007 that characterized the NARC government can be attributed to the appreciation of the Kenya Shilling (KES), which reduced Kenya's competitiveness and encouraged imports to compete with local output. A depreciation from 2008 onwards followed this appreciation credited to the 2007/08 global financial crisis, among other external shocks. In 2011, the exchange rate appreciated briefly due to a gradual monetary policy tightening aimed at stabilizing the exchange rate (Republic of Kenya 2012). In 2014, the KES weakened against the USD by 2.1 percent. This depreciation happened against a fall in oil prices, increased diaspora remittances, and a $2 billion injection from floating off the Eurobond. According to the Republic of Kenya (2015), the depreciation was due to the strengthening of the Dollar; declining international visitors that deteriorated tourism earning; and a widening trade deficit. For the given merchandise imports, Kenya's oil imports account for over 20 percent of the total. Kiptui and Kipyegon (2008) argued that the increased oil prices in the world market could have been transmitted to domestic prices hence depreciating the local currency.

The period between 2000-2016 saw the exchange rate appreciate and depreciate at various times. Oiro (2015) argues that these episodes were accompanied by wild exchange rate fluctuations, leading to the high exchange rate volatility, mainly driven by inflation and trade deficit. Other researchers observed that Kenya's exchange rate had been misaligned with changing extents (Kiptui & Kipyegon, 2008). Therefore, the main policy dilemma is how imports accelerated in an environment of unhindered EU market access through the ACP agreement and liberalization of the exchange rate, whose aim was to improve exports. Due to this dilemma and the fact that trade between Kenya and EU in expressed in USD, it is necessary to investigate the relationship between the KES exchange rate and her trade with EU. Such a study would inform future trade agreements between Kenya and a bigger

economy, especially in negotiations between Kenya and E.U. in the EPA framework.

1.3. Research Questions

The main aim of the study was to answer the following research questions:

i. What is the extent of Kenya's exchange rate misalignment?
ii. What is the effect of exchange rate misalignment on bilateral trade flows between Kenya and EU?

2.0. Review of Related Literature

2.1. The Monetary Theory - The *Dornbusch Sticky Prices* Model

The model argues that in the presence of an expansionary monetary shock, the exchange rate overshoots in the short term and reverts to its long-run equilibrium path. The model assumes a small economy operating in a flexible exchange rate, with sticky short-term prices and rational expectations in the goods market. Given a monetary policy change such as an increase in interest rate, the goods, and financial market adjust to the new equilibrium. However, equilibrium is reached first in the financial market since prices are sticky in the goods market. Ultimately, when the goods and services prices progressively respond to the new equilibrium, the exchange rate overshoots in the short run, creating excess volatility. The model can be derived as:

$$m_t - p_t = \gamma y_t - \theta i_t \text{ domestic money market equilibrium} \quad 2.1$$
$$m_t^* - p_t^* = \gamma y_t^* - \theta i_t^* \text{ foreign money market} \quad 2.2$$
$$s_t = p_t - p_t^* \text{ purchasing power parity (PPP)} \quad 2.3$$
$$i_t - i_t^* = E_t s_{t+1} - s_t \text{ uncovered interest rate parity (UIP)} \quad 2.4$$

Where: m_t and m_t^* are the domestic and foreign money supply, p_t and p_t^* are the domestic and foreign price levels, y_t and y_t^* are the domestic and foreign incomes, i_t and i_t^* represent domestic and foreign interest rates, and s_t is the nominal exchange rate all in their natural log. $E_t s_{t+1}$ is the expectation of s_{t+1} at time t, γ is the income elasticity of demand, and θ is the coefficient of adjustment of the present exchange rate to its long-term price. Combining 2.2 and 2.3 and substituting the PPP yields:

$$s_t = m_t - m_t^* - \gamma(y_t - y_t^*) + \theta(i_t - i_t^*) \quad 2.5$$

Let $F_t = m_t - m_t^* - \gamma(y_t - y_t^*)$ represent domestic and foreign countries money supply and prices, respectively. Substituting UIP into 2.5: $s_t = F_t + \theta(E_t s_{t+1} - s_t)$ 2.6

Assuming rational expectations and no bubble solution s_t can be solved as:

$$s_t = \frac{1}{1+\emptyset} \sum_{j=0}^{\infty} \left(\frac{\emptyset}{1+\emptyset}\right)^j E_t \left[\sum_{j=0}^{\infty} F_{t+j}\right] \quad 2.7$$

Equation 2.7 is a relationship between the sum of expected future fundamentals such as money supply shocks, money demand shocks, and

productivity shocks, among others, and the exchange rate. F_t includes both observable and unobservable components of the macroeconomic fundamentals. This is the monetary approach foundational model used in forecasting exchange rates. The sticky-price model assumes that exchange rates do not change simultaneously as the underlying macroeconomic variables. The model was extended by Siregar (2011) using the Behavioral Equilibrium Exchange Rate (BEER) approach and the concept of uncovered interest rate parity:

$$i_t - i_t^* = E_t(e_{t+1}) - e_t \qquad 2.8$$

e_{t+1} is the expected value of the nominal exchange rate in period t for $t+1$ period and e_t represents the nominal exchange rate in period t. $i_t - i_t^*$ represents the local and foreign interest rate differential. By subtracting the expected inflation from both sides of equation 2.8 transforms the nominal interest rate parity into the real interest parity.

$$(E_t(p_{t+1}) - p_t) - (E_t(p_{t+1}^*) - p_t^*) = E_t\Delta p_{t+1} - E_t\Delta p_{t+1}^* \qquad 2.9$$
$$\text{leads to } Eq_{t+1} - q_t = r_t - r_t^* \qquad 2.10$$

where Eq_{t+1} is the real exchange rate at period t for period $t+1$, q_t is the observed real exchange rate, p_t and p_t^* are the domestic and foreign prices respectively, r_t and r_t^* are the domestic and foreign interest rates at period t, where $r_t = i_t - E_t(\Delta p_{t+1})$ and $r_t^* = i_t^* - E_t(\Delta p_{t+1}^*)$, Δp_{t+1} and Δp_{t+1}^* is the change in domestic and foreign prices, respectively. From 2.10: $q_t = $

$$Eq_{t+1} - (r_t - r_t^*) \qquad 2.11$$

This implies that the observed real exchange rate can be expressed in the expected real exchange rate and real interest rate differential. In other words, equilibrium real exchange rate can be estimated from the BEER approach by incorporating long-run economic fundamentals and short-run interest rate differential expressed as:

$$q_t^{rer} = f(F_t, r_t - r_t^*) \qquad 2.12$$

Where F_t is the observable and unobservable components of the fundamentals derived in 2.7.

2.2. The Elasticity Theory

The Elasticity theory predicts how the devaluation of a country's currency affects the balance of payments and the ideal conditions for the devaluation. The approach assumes that devaluation can improve the balance of payments starting from a balance of payment equilibrium point. However, for devaluation to function successfully, the total price elasticity of domestic and foreign demand for imports in absolute terms has to increase. When a country devalues a currency, it improves the balance of payments under ideal (Marshall-Lerner) conditions (ML-C). As a devaluation of the exchange rate implies a decrease in export prices, they increase in quantity. Concurrently, the price of imports increases, shrinking their demand. The import and export price elasticity results from the greater export volume at lower prices and

fewer imports. If export prices are elastic, the export demand will exceed the price decrease, therefore growing the general receipts from exports. The elasticity approach has undergone many improvements and modifications towards explaining international trade, particularly in the structural economic estimation of price and income elasticities of imports.

Hacker and Hatemi (2004) linearized the elasticity theory by postulating that imports are a function of relative prices (R.P.) and the size of the economy (Y). $M_d = M_d(RP_m, Y)$ 2.13
M_d is the imports demand, RP_m is the relative price of imports, and Y is the domestic income of the importing country. Supposing e is the nominal exchange rate, then the relative price of imports can be written as: $RP_m = e\frac{P_x^*}{p} = e\frac{P^*}{P}.\frac{P_x^*}{P^*}$ 2.14

P and P* are the domestic and foreign prices, respectively, e is the nominal exchange rate, subscript x shows the goods were exports in the foreign country such that $\frac{P_x^*}{P^*}$ is the relative price of exports in the foreign country denoted RP_x^*. Let E be $e\frac{P^*}{P}$ (the real exchange rate). Substituting in 2.14:
$$RP_m = E.RP_x^*$$ 2.15
Substituting 2.15 into 2.13: $M_d = M_d(E, RP_x^*, Y)$ 2.16

2.3.   Empirical Literature Review

There exist several empirical studies estimating exchange rate misalignment and its effect on trade. Kiptui and Ndirangu (2015) studied misalignment in Kenya using BEER and found that the equilibrium RER is closely associated with its long-run equilibrium level. However, Musyoki et al. (2012) found that the exchange rate was more often overvalued. Mwega (2014) sought to investigate this over-valuation in Kenya after adopting a floating exchange rate regime. Further, he argues that the equilibrium real exchange rate is an unobservable variable and must be indirectly obtained from the underlying macroeconomic variables. Contrastingly, the results showed no significant deviation of the real effective exchange rate from its estimated equilibrium rate.

Ibrahim (2014) found that between 1960 and 1985, Nigeria's real effective exchange rate was above its long-run level and below between 1986 and 2013. Similarly, Juthathip (2009) estimated misalignment in developing Asian countries and concluded that the RER was persistently overvalued in the build-up to the 1997/98 crisis. Further, the results showed that exports had a negative relationship with exchange rate misalignment. The author notes that when an RER depreciation is associated with a significant misalignment, it could positively impact exports.

Olimov and Sirajiddinov (2008) analyzed the effect of exchange rate misalignment in Uzbekistan and found that the real exchange rate misalignment depressed exports. The results showed that import demand price elasticity was between –0.78 and –0.83. Sidek (2011) divided a sample (1991Q1-2008Q3) into a high and low misalignment regime, respectively. The computed misalignment was incorporated alongside foreign income and relative prices in a standard export demand equation using an autoregressive framework and estimated using least squares. The study concluded that exchange rate misalignment below 8.88 percent has no significant effect on exports.

Imbs and Isabelle (2011) estimated the aggregate export and import price elasticities by applying a Constant Elasticity of Substitution (CES) demand system using annual data between 1995 and 2004. The simulated study concluded that exports had a positive relationship with relative prices. Barno, Ondaje and Ngwiri (2011) argue that this positive relationship between exports and their relative prices is possible in countries that export goods that the importing country cannot substitute easily. In another study, Ekanayake, Thaver, and Plante (2012) studied South Africa - E.U. trade by employing the error-correction model and ARDL bounds testing technique to cointegration. They found that relative prices affected imports negatively, while national income enhanced imports.

3.0. Theoretical Framework
3.1. Determination of Equilibrium Exchange Rate
Following the sticky prices, monetary theory researchers use a small set of macroeconomic fundamentals to define Z_t in 2.12. These include terms of trade, trade openness, technological changes, government expenditure, and real interest rate. Centered on the stock-flow consistent model, the link between macroeconomic fundamentals and the real exchange rate takes the form:

$$rer^* = f(tot, prod, gov, open) \qquad\qquad 3.1$$

Where *tot* is the terms of trade, *prod* is technological changes as a proxy for productivity, *gov* is government expenditure, and *open* is trade openness. rer^* is the estimated real exchange rate proxied by the real effective exchange rate.

3.2. Real Exchange Rate Misalignment and Trade Flows
Equation 2.16 is analogous to the international trade's modified two-country standard model, which relates imports to relative prices of imports, domestic real income, and foreign exchange reserves. The foreign exchange reserves show how export earnings can cover import demand since export earnings are a significant source of foreign reserves. Therefore, expressed as:

$$M_d = M_d(E, RP_x^*, Y, FX) \tag{3.2}$$

Similarly, the foreign country's demand for imports (the domestic exports) can be expressed as: $M_d^* = M_d(E, RP_x, Y^*)$ (3.3)

3.3. Empirical Model Specification
3.3.1. Determining Kenya's Exchange Rate Misalignment

Two steps were followed to derive exchange rate misalignment: first was the estimation of equilibrium RER following the developed theoretical framework:

$$reer_t^* = f(tot_t, prod_t, gov_t, open_t, nfa_t, tar_t, oil_t) \tag{3.4}$$

Due to the use of semi logs, the model can be specified in its multiplicative form as:

$$reer_t^* = \beta_0 nfa^{\beta_1} e^{\beta_2 prod_t} \quad e^{\beta_3 gov_t} e^{\beta_4 tar_t} e^{\beta_5 oil_t} e^{\beta_6 open_t} e^{\beta_7 tot_t} e^{\varepsilon_t}$$
$$\tag{3.5}$$

Where *tot* is the terms of trade, *prod* represents an improvement of productivity due to technological change, and *gov* is government expenditure, *open* is the degree of trade openness, *nfa* is the net foreign assets, *tar* is tax revenue, and *oil* is the world brent oil prices. The computation of the exchange rate misalignment (*Mis*) was the second step involved, which followed Mwega (2014):

$$Mis = \frac{(ERER - REER)}{REER} * 100 \tag{3.6}$$

Where *ERER* is the equilibrium real exchange rate, and *REER* is the real effective exchange rate.

3.3.2. The Effect of Exchange Misalignment on Trade Flows

The misalignment variable developed in equation 3.6 is incorporated in equations 3.2 and 3.3, respectively. From the literature reviewed, the degree of trade openness (Open) was found to influence the level of imports and exports such that: $M_d = M_d(E, RP_x^*, Y, FX, Mis, Open)$ (3.7)

$$M_d^* = M_d(E, RP_x, Y^*, Mis, Open) \tag{3.8}$$

Which are specified as:

$$m_t = \propto_0 Y_t^{\propto_1} RP_t^{\propto_2} Open_t^{\propto_3} e^{\propto_4 FR_t} e^{\propto_5 Mis_t} e^{\propto_6 REER_t} e^{\varepsilon_t} \tag{3.9}$$

$$X_t = \propto_0 Y_t^{*\propto_1} RP_t^{\propto_2} Open_t^{\propto_3} e^{\propto_4 Mis_t} e^{\propto_5 REER_t} e^{\varepsilon_t} \tag{3.10}$$

Where M_t, X_t represents the value of imports and exports at time *t*, Mis_t denotes a measure of exchange rate misalignment. An increase in real income increases imports holding prices and tastes constant, and therefore the coefficient for local income Y^{local} is expected to be positive. Conversely, a rise in real income of the trading partner results in more significant exports to

those partners; hence its coefficient is expected to be positive. The effect of exchange rate misalignment is ambiguous, as shown by various studies. Therefore, the signs for β_3 and α_4 are the subject of the study. The real exchange rate depreciation makes imports expensive, so its coefficient is expected to be negative for imports and positive for exports. The coefficient for trade liberalization (openness) is presumed to be positive.

A rise (fall) in the relative price of exports makes domestic goods less (more) competitive than foreign goods causing the demand for exports to fall (rise). However, the monetarists view that changes in relative prices of traded and non-traded goods improve exports. The main issue should not be the results but the transmission channel of the effects. The relative effect of the increase in the directly quoted exchange rate level leads to an increase in exports. Therefore, *a priori*, the expected sign of *β1*, which measures Kenyan exports competitiveness relative to the world export prices, will be positive. According to economic theory, a rise in the relative cost of imports depresses the demand for imports. Thus, the expected sign of the coefficient is negative. Following Ekanayake, Thaver, and Plante (2012), higher real foreign reserves encourage imports, and therefore the expected sign is positive.

3.4.   Data Analysis and Estimation

According to Engel and Granger (1987), the long-run relationship between two or more variables is checked by cointegration. As a pre-test to avoid spurious regression results, a cointegration test should be considered. Models (3.6), (3.9), and (3.10) were augmented to implement the ARDL bound test approach as:

$$reer_j = c + \sum_{i=1}^{p} \propto_i \Delta reer_{t-i} + \sum_{i=1}^{p} \partial_i \Delta tot_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta prod_{t-i} + \sum_{i=1}^{p} \delta_i \Delta gov_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta open_{t-i} + \sum_{i=1}^{p} \eta_i \Delta nfa_{t-i} + \sum_{i=1}^{p} \theta_i \Delta tar_{t-i} + \sum_{i=1}^{p} \mu_i \Delta oil_{t-i} + \lambda_1 reer_{t-1} + \lambda_2 tot_{t-1} + \lambda_3 prod_{t-1} + \lambda_4 gov_{t-1} + \lambda_5 open_{t-1} + \lambda_6 nfa_{t-1} + \lambda_7 tar_{t-1} + \lambda_8 oil_{t-1} + \varepsilon_t$$

3.11

$$\Delta M_j = c + \sum_{i=1}^{p} \theta_i \Delta M_{t-i} + \sum_{i=1}^{p} \propto_i \Delta GDP_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta open_{t-i} + \sum_{i=1}^{p} \partial_i \Delta reer_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta FX_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta RP_{t-i} + \sum_{i=1}^{p} \delta_i \Delta Mis_{t-i} + \lambda_1 M_{t-1} + \lambda_2 open_{t-1} + \lambda_3 reer_{t-1} + \lambda_4 FX_{t-1} + \lambda_5 RPM_{t-1} + \lambda_6 Mis_{t-1} + \lambda_7 GDP_{t-1} + \varepsilon_t$$

3.12

$$\Delta X_j = c + \sum_{i=1}^{p} \theta_i \Delta X_{t-i} + \sum_{i=1}^{p} \propto_i \Delta GDP_{t-1}^f + \sum_{i=1}^{p} \gamma_i \Delta RP_{t-i} + \sum_{i=1}^{p} \partial_i \Delta reer_{t-i} + \sum_{i=1}^{p} \sigma_i \Delta Open_{t-i} + \sum_{i=1}^{p} \delta_i \Delta Mis_{t-i} + \lambda_1 X_{t-1} + \lambda_2 open_{t-1} + \lambda_3 reer_{t-1} + \lambda_4 RPX_{t-1} + \lambda_5 Mis_{t-1} + \lambda_6 GDP_{t-1}^f + \varepsilon_t$$

3.13

The calculated *F*-statistic for the joint significance of lagged variables was used to test for cointegration between the variables in models (3.11) to (3.13). The two sets of the adjusted critical value bound as I(0) and I(1) as lower and upper bound, respectively, were adopted as prescribed by Pesaran Shin and Smith (2001). According to the bounds test, if the lower bound is above the computed *F*-statistic, then regardless of whether the variables are I(0), I(1), the null hypothesis of no cointegration cannot be rejected. In case the upper bound is below the computed *F*-statistic, then the null hypothesis is rejected. The cointegration results are considered inconclusive if the computed *F*-statistics fall amid the two bounds.

4.0.   Results

This chapter is divided into sections consisting of descriptive statistics, tests result of time series properties, and diagnostic tests on estimated models.

4.1.   Descriptive Statistics

Table 1: Descriptive Statistics

Variable	Mean	Minimum	Maximum
Foreign Reserves (F.R.) (KES Billion)	299.38	61.30	818.30
Gross Domestic Income (GDP)- Kenya (KES Billion)	705.16	242	1,929.30
Gross Domestic income –EU (GDP foreign) (Billion Euros)	3,101.08	2,368.10	3,740.20
Government expenditure (Gov) % of GDP	0.83	0.18	3.03
Net Foreign Assets (NFA) (KES Billion)	251.62	58.50	591.90
Crude Oil Prices (Oil) (USD/Barrel)	64.92	19.34	122.48
Imports from EU (M) (KES Billion)	22.83	10.27	40.11
Exports to EU (X) (KES Billion)	17.82	7.54	31.08
Tax Revenue (TAR) (%) of GDP	0.43	0.14	1.06
Relative Prices of Imports (RPM) ratio of domestic import prices to world import prices	0.09	0.05	0.11
Relative Prices of Exports (RPX) ratio of domestic export prices to world export prices	0.03	0.02	0.04
Real Effective Exchange Rate (REER)	78.59	58.17	109.88
Trade Openness (Open) (X+M) (%) of GDP	15.73	9.07	30.01
Terms of Trade (ToT) ratio of export prices to import prices	0.43	0.30	0.64
Productivity (Prod) (%) gross capital investment to GDP	19.34	16.20	22.5

Source: Author's computations.

Kenya's GDP ranged from KES 242 billion in 2000Q2 to KES 1,929.3 billion in 2016Q2, with a mean of KES 705.2 billion between 2000 and 2016. The GDP value increased drastically from KES 343.5 billion in 2008Q4 to KES 701.9 billion in 2009Q1 due to a change of the base year from 2001 to 2009 in the System of National Accounts (Republic of Kenya 2015). The mean foreign national income was 3,101.081 billion euros with a minimum of 2368.1 and a maximum of 3740.2. The EU GDP grew persistently between 2000 and 2016, with a notable dip in 2008 attributed global financial crisis of 2007 - 2010.

Government expenditure has been on an upward trend averaging 83 percent of national income with a maximum of 303 percent in Q2 of 2013. The 2013/14 fiscal year was the first year of devolution marked with massive government transfers towards forming and setting up devolved government authorities. While government expenditure remained relatively stable between 2000 and 2007, it has accelerated since then. National foreign exchange reserves averaged KES 299.38 billion between 2000 and 2016, with a minimum of 61.3 billion and a maximum of 818.3billion. A country's National foreign exchange reserves indicate the country's capacity to import and is calculated at the prevailing exchange rate were highest in 2016 Q2 at KES 818 billion and lowest in 2000 Q1 at KES 61 billion.

4.2. Unit root, Cointegration, and Diagnostic tests

Data stationarity or non-stationarity is primarily determined before regression analysis. It eliminates the danger of finding significant regression results from unrelated data if a non-stationary data series is utilized in regression analysis. Spurious results may be obtained by including non-stationary variables in regression models. The *R*-square values and *t*-statistics do not follow the normal distributions and can be widely inflated. If non-stationary time series are used in a regression model, the results may show a significant relationship where none exists. The use of time-series data makes it necessary to establish the stationarity or non-stationarity of the data. ADF and P.P. tests are associated with low power against stationary near unit root processes. Therefore, Kwiatkowski Phillips, Schmidt and Shin (KPSS) was more appropriate.

The results show that Foreign exchange reserves, local, national income, foreign national income, real effective exchange rate, terms of trade, net foreign assets, productivity, the relative price of imports, tax revenue, world oil prices, trade openness, exports, and imports were stationary at the first difference I(1) while government expenditure, exchange rate misalignment, and the relative price of exports were I(0). Since none of the variables integrated order two I(2), the ARDL technique was most appropriate

since it does not require the same order of integration, and none of the variables should be integrated of order I(2).

Since the variables were integrated of order I(0) and I(I), the ARDL bounds test was considered the most appropriate method to test for cointegration. The bounds test results for all the models used are summarized in Table 2. The computed *F*-statistics were matched with the bounds critical values at the optimal lags (k). Co-integration was established in REER, exports, and Imports models since the *F*-statistics was above the upper bound.

Table 2. ARDL Bounds Test

REER

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	4.659491	7
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Imports

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	4.703397	6
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Exports

Test Statistic	Value	k
F-statistic	5.325480	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Author's computations.

To ensure consistent and unbiased regression results, various diagnostic tests, including normality test using Jarque Bera statistics, serial correlation Breuch-Godfrey Lagrange Multiplier (L.M.) test, autoregressive conditional heteroskedasticity (ARCH) test, RESET test for model specification, and CUSUM test for parameter constancy were conducted.

Table 3. Residual Properties

| **Exports Equation**			
Type of test	**Test statistic**	**Test statistic value**	**Prob**
Normality test-Histogram	Jarque-Bera	3.19	0.20
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	4.26	0.11
Heteroskedasticity Test: ARCH	Obs*R-squared	0.34	0.55
Imports Equation			
Type of test	**Test statistic**	**Test statistic value**	**Prob**
Normality test-Histogram	Jarque-Bera	0.57	0.75
Breusch-Godfrey Serial Correlation LM Test	Obs*R-squared	2.04	0.10
Heteroskedasticity Test: ARCH	Obs*R-squared	1.25	0.26
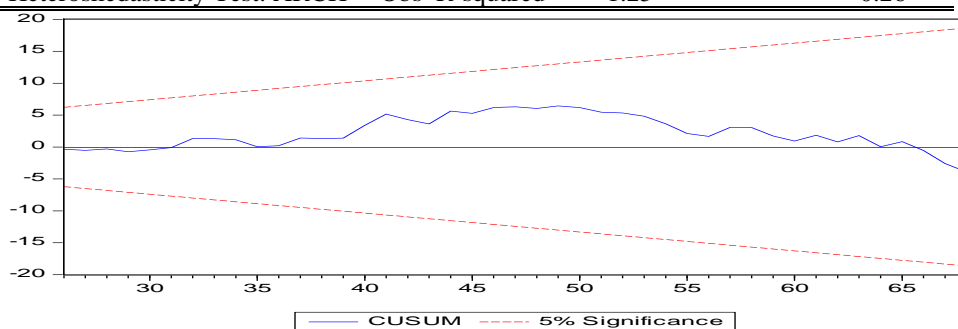
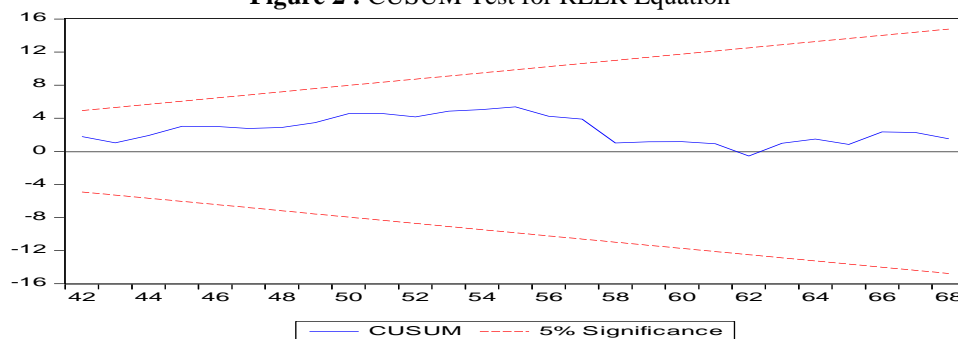**Figure 2 :** CUSUM Test for REER Equation

Figure 3 : CUSUM Test for the Import Equation

4.4. Determining the Extent of Kenya's Real Exchange Rate Misalignment

Model 3.11 was estimated, and the ARDL long-run coefficients of the determinants of exchange rate are presented in Table 4.

Table 4: Long-Run effects of Economic Fundamentals on Real Effective Exchange Rate

Dependent Variable – log of Real Effective Exchange Rate		
Explanatory Variable	**Coefficient**	**Standard Error**
Government expenditure	0.071	0.05
Log of Net Foreign Assets	0.415**	0.17
Log of Productivity	0.354***	0.13
Tax Revenue	-0.119	0.09
Oil Prices	-0.001***	0.00
Openness	0.015**	0.01
Terms of Trade	0.004**	0.00

*** , **, and *, denote significance at 1%, 5% and 10% levels respectively.

Source: Author's computations.

From the results, macroeconomic fundamentals determine the real effective exchange rate except for government expenditure and tax revenue. The coefficients on government expenditure and tax revenue were positive and negative respectfully but statistically insignificant at any level. The results show that a one percent increase in the net foreign assets depreciates the REER by 0.41 percent. According to economic theory, the exchange rate positively correlates with shocks on the net foreign asset position. This Effect results from the transfer effect where the transfer of external wealth into the domestic economy has a strong positive relationship with the exchange rate in the long run.

A one percent productivity improvement leads to a 0.35 percent depreciation of the REER. In theory, increased productivity leads to a real exchange rate appreciation. However, according to Balassa and Samuelson (1964), the effect depends on whether the productivity is traded or non-traded. While the expected result was an appreciation, productivity can also bring a real exchange rate depreciation if the resultant offer effect is greater than the income effect. According to Edwards (1989), an increase in technical progress in developing countries depreciated the real exchange rate because their main traded sector is the agricultural sector, and the rate of technological progress is slow.

A unit percent increase in the prices of world brent oil leads to a 0.1 percent appreciation of the REER. Kenya is a net importer of oil, and the bulk of imports comprises oil, and the country's non-tradeable sector is more significant than the tradeable sector. Any upward movement in oil prices puts increasing pressure on local prices to go up, appreciating the exchange rate. An increase in openness favors the more robust economy, in this case, E.U. thus more imports than exports. The increased imports lower the price of tradeable goods in the domestic economy. According to purchasing power parity theory, tradeable goods become cheaper to foreigners depreciating the local currency. The results show that openness constrains policymakers'

incentives to stabilize the domestic currency in real terms. Similar results by Nkalu, Urama and Asogwa (2016) in Nigeria indicate that trade openness was a significant variable and contributed up to 59 percent to the depreciation of the Naira.

About the terms of trade, a one percent increase in terms of trade leads to a 0.4 percent depreciation of the REER. According to Imed and Christophe (2003), the effect of terms of trade on the real exchange rate is theoretically ambiguous. It depends on the relative magnitude of the substitution effect and income effect. The results exhibit an indirect substitution effect which induces a variation of the demand of the non-tradeable goods where terms of trade improvement provide currency resources necessary to produce more non-tradeable goods. The long-run estimates of the economic fundamentals were then used to obtain the fitted values of the equilibrium real exchange rates (ERER). The exchange rate misalignment (Mis) was hence computed following Mwega (2014) as: $Mis = \left(\frac{ERER-REER}{REER}\right) * 100$. The ERER is the estimated equilibrium exchange rate proxied by the fitted values. Figure 4 plots the misalignment values in percentages.

Figure 4. Real Exchange Rate Misalignment
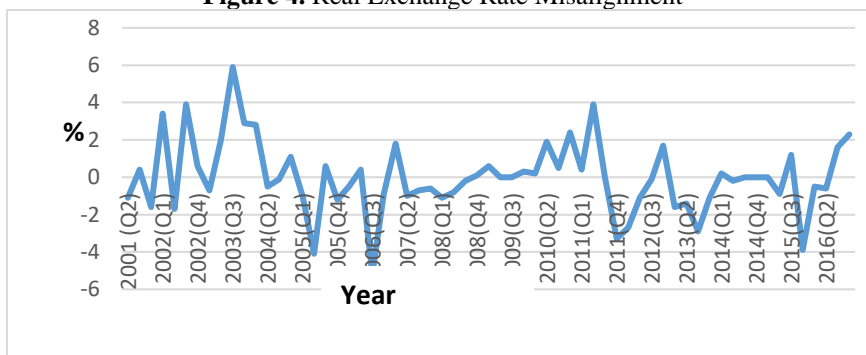
Source: Author's computations

The period between 2001 to 2004 and 2009 to 2011 shows significant overvaluation of Kenya's exchange rate. The change in government in 2003 could be attributed to the low misalignment between 2004 and 2008 and the prolonged exchange rate appreciation. The exchange rate misalignment in the period considered was 5.9 percent overvaluation. The maximum undervaluation was 5.2 percent. The real exchange rate is misaligned, but within the 6 percent range, the results are similar to Kiptui and Ndirangu (2015), who found that Kenya's exchange rate misalignment was within 10 percent of its equilibrium level.

4.5.   The Effect of Exchange Rate Misalignment on Bilateral Trade Flows between Kenya and E.U.

Table 5. Long-run Effects of Exchange Rate Misalignment on trade flows

Explanatory variables	Dependent Variable			
	Log of Imports		Log of exports	
	Coefficients	Standard Error	Coefficient	Standard Error
Log of Real GDP	0.489**	0.164		
Log of real GDP foreign			10.058***	4.203
Relative Prices	-0.499***	3.137		
Log of Relative Prices			0.915***	0.160
Foreign Reserves	0.023	0.005		
Misalignment	-0.131**	0.060	0.035	0.004
Log of trade Openness	0.305	0.241	0.378***	0.342
Real Effective Exchange Rate	-0.029***	0.018		
Log of Real Effective Exchange Rate			1.054	0.660

[***], and [**], denote significant levels at 1%, and 5% respectively.

Source: Author's computations

A one percent increase in Kenya's GDP increases imports by 0.49 percent. A country's imports depend on its level of income such that the higher the level of income (holding prices of imports and consumer tastes constant), the greater the imports. Gaalya, Edward, and Eria (2017) found that imports in the EAC members are income inelastic (concentrated between 0.4 and 0.07). Further, GDP per capita has a higher influence on consumer goods than capital and intermediate goods, explaining the low-income elasticity. For foreign income, a unit increase in foreign income increases exports by 10 percent. According to Gaalya *et al.* (2017), GDP per capita has a higher influence on consumer goods than capital and intermediate goods. Kenya's exports to E.U. are mainly consumer goods which could explain the high elasticity of income.

A unit increase in relative prices of imports reduces Kenya's imports by 49 percent. Since Kenya's imports from E.U, China has offered an alternative avenue to source for motor vehicles and accessories, human medicine and agricultural chemicals, steel and iron products, rubber, computers and accessories, veterinary products, fuels and lubricants, and electrical and electronic equipment, Therefore, an increase in import prices likely causes Kenya to shift imports from E.U. to alternative markets such as China. In 2000, imports from China amounted to a paltry KES 7.76 billion while imports from E.U. amounted to KES 75.65 billion. In 2016, imports from China amounted to KES 337.45 billion while imports from E.U. amounted to KES 212.57 billion (Republic of Kenya 2004, and 2019).

Regarding relative prices of exports, the coefficient of 0.915 is positive and statistically significant at a 1 percent level implying a one percent increase in relative prices of the exports raises Kenya's exports to E.U. by 0.9 percent. Imbs and Isabelle (2011) argue that the response of exports due to relative price changes depends on the willingness of the consumer to substitute domestic and foreign goods. In the case of good in-substitutability, an increase in price does not adversely affect exports. These results indicate that Kenya's exports to E.U. are non-substitutable. According to Barno, Ondaje and Ngwiri (2011), Kenya is among the world's producers of specialty vegetables. In addition, globalization has seen changes in consumer food demand where consumers are considering all year-round food supplies produced by extensive agricultural techniques with a strong ethical component. This has led to consumers considering quality over price. The results reflect the reality where Kenya's green beans are among the world's best while snow peas have replaced Asian vegetables in the world market.

A one percent increase in misalignment reduced imports by 13 percent. The results show that Kenyan importers are risk-averse, and being a developing country with no structured foreign exchange, the avenue for hedging is either expensive, impossible, or both. The exchange rate misalignment coefficient of 0.035 for exports is positive and statistically insignificant similar to Ibrahim (2014). Sidek (2011) indicated that any misalignment has no statistical significance on exports below 8.88 percent. Juthathip (2009) notes that the insignificance of the export coefficient can be explained by the lack of diversification in Kenya's goods for exports because diversification increases the significance and magnitude of the misalignment coefficient. Trade openness has a positive but insignificant coefficient for imports. According to Manni (2012), although greater trade openness is expected to enhance a country's imports and exports, it does not imply both must increase. However, for Kenya's exports to the E.U., the trade openness coefficient implies a one percent increase in trade openness increases exports by 0.378 percent. The small magnitude could be explained by the limited number of countries Kenya trades within the E.U. and the lack of diversification of her trade goods. Results indicate that one unit of depreciation decreases imports by 2.9 percent. Theoretically, depreciation of the domestic exchange rate against a foreign currency makes imports expensive and exports competitive.

Conclusion

Kenya's exchange rate can be considered closely aligned to its long-run macroeconomic fundamentals. The actual RER rate had more episodes of undervaluation during the study period than overvaluation. The misalignment

was detected and was within a 6 percent deviation from the long-run equilibrium level.

The study also examined the effect of exchange rate misalignment among other economic variables on imports and exports between Kenya and E.U. From the results, exchange rate misalignment inhibits Kenya's imports from E.U. while it did not affect exports. Therefore, Kenyan exports are not diversified, reducing the significance and magnitude of the effect on exports. Additionally, Kenyan importers are risk-averse and reduce their activities with increased exchange rate misalignment. In small economies, hedging instruments are not available, and where they are available, they are costly or complex to apply in small firms.

In line with economic theory, domestic income enhanced imports. According to the East Africa Community (EAC) member states, the income elasticity is concentrated between 0.4 and 0.07. Further, the results show a high foreign income elasticity implying that Kenya's imports are capital and intermediate goods, which exhibit low-income elasticity. The exports are consumer goods characterized by higher elasticity. Similar to other developing countries, Kenya's exports respond well to changes in trading partners' incomes. In particular, fresh food products have a high-income elasticity of demand in higher-income markets such as the E.U. Consequently, it represents an important opportunity for Kenyan exporters since fresh fruits and vegetable exports account for the bulk of all food and agricultural exports to the E.U. The results show that Kenya's exports respond positively to an increase in relative prices of exports which shows in substitutability of imported goods to locally produced goods in the E.U. It can be concluded that Kenya's exports are specialties in E.U., especially French beans, snow peas, and cut flowers.

Although trade openness improves imports and exports, the coefficient was only significant for exports meaning the nonreciprocal trade arrangement between Kenya and E.U. under the ACP framework favors E.U. However, the magnitude was tiny typical of developing countries because they have a limited number of export goods and are of raw materials nature and a small menu of export destinations in E.U. Therefore, the EU-ACP non reciprocal agreement failed to consider the trade patterns between the partners. Kenya has not gained significantly from this agreement.

Research Limitations and Areas of Future Research

The study limited the scope to the Effect of exchange rate on trade flows between Kenya and E.U. Therefore, further research should be pursued for other economic blocks such as EAC, COMESA, and other emerging trade destinations like China. Also, researchers should evaluate the EPAs trade arrangement along with some of the findings from the study.

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Transition à la Parentalité et Fonctionnement Conjugal chez les Couples Infertiles en Tunisie

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Résumé

Objectif.-Evaluer l'impact de l'adoption sur le fonctionnement conjugal des couples infertiles. Méthode.-L'échantillon est composé de 146 participants hétérosexuels (73 couples) répartis en un groupe avec enfant adoptif (GAEA) composé de 30 couples infertiles vivant une parentalité adoptive et deux groupes contrôles ; le groupe avec enfant biologique (GAEB) composé de 30 couples fertiles ayant accès à la parentalité biologique et le groupe sans enfant (GSE) qui comprend 13 couples infertiles sans enfants. Résultats : Le GAEA semble éviter moins la proximité que les deux groupes contrôles et apparaît plus anxieux face à l'abandon uniquement par rapport au GAEB. Il utilise significativement plus la communication mutuelle mais uniquement par rapport au GSE et rapporte davantage des comportements de "Demande-Retrait" par rapport aux deux groupes témoins. De plus, Il est plus satisfait sur le plan conjugal que les deux groupes contrôles. Conclusion: L'étude offre une meilleure compréhension des changements au sein des couples infertiles devenant parents par voie d'adoption et ouvre plusieurs pistes d'investigation.

Mots-clés: Parentalité adoptive, évènements stressants, attachement, communication, ajustement dyadique

Transition to Parenthood and Marital Functioning Among Infertile Couples in Tunisia

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Abstract

The aim of this study is to assess the impact of adoption on the marital functioning of infertile couples. The sample is composed of 146 heterosexual participants (73 couples) divided into a group with adopted children (GWAC) made up of 30 infertile couples living in adoptive parenthood and two control groups; the group with biological child (GWBC) made up of 30 fertile couples with access to biological parenthood and the childless group (GWC) which includes 13 infertile couples without children. The GWAC seems to avoid proximity less than the two control groups and appears more anxious about abandonment only in relation to the GWBC. He used mutual communication significantly more but only in relation to the GWC and reported more "Request-Withdrawal" behaviors compared to the two control groups. In addition, he is more marital satisfaction than the two control groups. The study offers a better understanding of the changes in infertile couples becoming parents by adoption and opens several tracks of investigation.

Keywords: Adoptive parenting, stressful events, attachment, communication, dyadic adjustment

Introduction

La transition à la parentalité est un évènement très important « voire un moment charnière dans la vie d'un couple » (Zeghiche, & deMontigny, 2014, p3). En Tunisie, les données empiriques quant aux effets de la transition à la parentalité sur la relation conjugale sont presque absentes plus particulièrement concernant l'adoption malgré la grande importance des pratiques adoptives par les couples infertiles.

En Tunisie comme dans tout le Maghreb, l'adoption d'enfants est un sujet « étonnamment peu investi » et les quelques sources scientifique se limitent en « une modeste production de juristes, de quelques historiens, psychologues et sociologues et d'une seule anthropologue » (Barraud, 2008, p.2). La majorité des recherches s'est plutôt intéressée à la qualité de la relation conjugale lors de la transition à la parentalité chez des couples capables de procréer ou chez des couples infertiles mais qui ont réussi à devenir parents grâce à une procréation médicalement assistée. L'objectif de la présente étude

est d'examiner la parentalité adoptive et ses effets sur différentes dimensions de la relation conjugale chez les couples tunisiens.

Transition à la parentalité

La transition à la parentalité est considérée comme une crise parce qu'elle amène le couple à modifier sa relation pour englober un système de trois personnes, à accepter qu'une relation co-parentale s'ajoute à sa relation conjugale et faire des réajustements pour garder l'équilibre de cette dernière (Frascarol, Darwiche, & Favez, 2009).

La période suivant la naissance de l'enfant chez les parents biologiques et celle de l'élaboration du processus de parentalité chez les parents adoptifs deviennent des événements stressants (Vinay, Brenot-Bergeret, Rosenblum, & Genty, 2014). Chez ces derniers, l'adoption est, dans la plupart du temps, la conséquence d'un autre évènement stressant qui est l'infertilité. Cependant, ces deux évènements demeurent de nature différente. L'infertilité est un évènement négatif (triste) brusque et inattendu, et en lien avec un problème de santé, alors que l'adoption, étant une solution à ce problème, constitue un évènement positif (heureux) survenant par le propre choix du couple et produisant des changements dans sa vie conjugale et influençant son fonctionnement et sa stabilité.

Le modèle de fonctionnement du couple Vulnérabilité-Stress-Adaptation (VSA) développé par Karney et Bradbury (1995) peut être utilisé pour vérifier et expliquer le fonctionnement conjugal lors de la transition à la parentalité, puisqu'il décrit les changements au plan de la qualité et de la stabilité des unions à travers les trois dimensions indépendantes l'une de l'autre : les vulnérabilités personnelles, les évènements stressants et les processus adaptatifs du couple. En effet, selon ce modèle les vulnérabilités (variables personnelles), seules ou en combinaison avec les évènements stressants (facteurs externes), à travers les processus adaptatifs (variables interpersonnelles), prédiront la satisfaction conjugale (qualité de la relation), elle-même prédictrice de la stabilité de l'union du couple (poursuite ou rupture de la relation).

Transition à la parentalité et Attachement

La transition à la parentalité peut générer des bouleversements et réaménagements sur le plan individuel et dyadique (Favez, 2013). En fait, combinée à des facteurs de vulnérabilité chez les partenaires, la transition à la parentalité peut avoir des impacts sur leur fonctionnement du couple. Ces facteurs sont de type intra personnel tels que les attitudes, les caractéristiques de la personnalité, le jeune âge des conjoints (ou leur immaturité), et des facteurs de type inter personnels tel que les styles d'attachement.

La théorie de l'attachement a été élaborée par Bowlby (1969-1982) pour étudier la relation affective entre le petit enfant et la ou les principales personnes qui en prennent soin (figures d'attachement). Il s'agit d'un mécanisme de survie qui pousse l'enfant à adopter des comportements lui permettant de se rapprocher de son donneur de soin lorsqu'une menace de danger (réelle ou imaginaire) se présente à lui afin d'aller chercher de la protection. La qualité et la consistance des soins reçus en enfance, c'est-à-dire la manière dont la ou les figures d'attachement décodent et répondent aux besoins de l'enfant contribueront au développement des modèles internes opérants à l'égard de soi et d'autrui (Ainsworth, Blehar, Waters, & Wall, 1978). Ces modèles d'interaction appris influenceront positivement le désir de proximité à l'âge adulte ou inversement provoqueront une tendance à être anxieux, une recherche incessante d'approbation ou encore un sentiment de rejet ou d'abandon et un évitement des relations intimes.

Dans la théorie de l'attachement adulte, la typologie quadrifide proposée par Bartholomew et Horowitz (1991) est actuellement la plus utilisée par la majorité des chercheurs de la communauté scientifique. Elle identifie quatre styles d'attachement (sécurisé, craintif, préoccupé et détaché) qui découle de l'interaction entre le modèle de soi (anxiété ou peur d'être abandonné) et d'un modèle de l'autre (évitement ou peur de l'intimité).

Le style d'attachement d'un individu peut subir des changements lorsque des évènements de vie importants les confrontent comme le fait de devenir parent, et ce, autant pour la parentalité biologique et la parentalité adoptive (Fonagy, 1999). Il peut y avoir une perte momentanée, une aggravation ou encore une réparation du sentiment de sécurité interne chez les nouveaux parents (Vinay et al., 2014). Ainsi, lors de la transition à la parentalité, leurs représentations par rapport à eux-mêmes et à leur interaction avec l'entourage peuvent en être influencées (Zittoun & Perret-Clermont, 2001 ; Santona & Zavattini, 2005).

Transition à la parentalité et Communication

Les habilités des couples au niveau de la communication et la résolution des problèmes ont été considérées comme des indicateurs de la satisfaction conjugale au cours de la transition à la parentalité (Cox, Paley, Burchinal, & Payne, 1999).

Certains auteurs soutiennent que la transition à la parentalité affecte la communication en diminuant les échanges positifs (Belsky & Kelly, 1994; Cowan & Cowan, 1994) ou en augmentant les conflits conjugaux (Belsky & Kelly, 1994 ; Cowan & Cowan, 1994; Shapiro, Gottman, & Carrère, 2000) ou encore en rendant la communication plus instrumentale et moins émotionnelle; Bigras & Paquette, 2000). D'autres auteurs (Provost & Tremblay, 1991) trouvent que l'arrivée de l'enfant n'engendre pas de profonds

problèmes chez les couples fonctionnels comme elle ne rapproche pas tellement les couples qui avaient des difficultés pré partum. Pour d'autres, elle peut rapprocher les couples distants (Feldman, 1971) comme elle peut créer un éloignement entre les partenaires (Cowan & Cowan, 1994). De façon générale, les couples avec enfant ont plus tendance à rapporter des difficultés de communication avec un évitement des conflits ou des affrontements négatifs, alors que les couples sans enfants interagissent davantage positivement (Bigras & Paquette, 2000).

Transition à la parentalité et satisfaction conjugale

Des résultats divergents ressortent quant à l'impact de la transition à la parentalité sur la satisfaction conjugale. En effet, pour certains la transition à la parentalité peut influencer négativement l'ajustement dyadique des couples en minimisant le romantisme au profit d'échanges plus axés sur les charges, les responsabilités, les obligations, les choix et les tâches (Bigras & Paquette, 2000 ; Bodenmann, 2003). Le temps consacré à l'enfant augmente et l'attention envers le conjoint et son travail diminue. Cette situation peut provoquer chez ce dernier un sentiment de jalousie et d'être éloigné de la triade, n'ayant plus la même attention et la même affection que celles avant l'arrivée de l'enfant (Savoy, 2003). D'autres trouvent que la transition à la parentalité peut influencer positivement l'ajustement dyadique en rendant les couples plus satisfaits par rapport aux couples sans enfant, en dépit un déclin transitoire de la satisfaction conjugale peut se produire pendant les premiers mois de l'arrivée de l'enfant (Lawrence, Cobb, Rothman, Rothman, & Bradbury, 2008 ; Tomlinson, 1996).

La présente étude vise examiner l'impact de la transition à la parentalité adoptive sur le fonctionnement conjugal chez les personnes infertiles en Tunisie. Elle s'appuie sur le modèle de fonctionnement du couple Vulnérabilité-Stress-Adaptation (VSA) développé par Karney et Bradbury (1995). Les représentations d'attachement (vulnérabilités personnelles), combinées à l'adoption (facteur de stress) seront liés à la satisfaction conjugale à travers le processus adaptatif de la communication. Chaque segment de ce modèle sera évalué dans la présente étude via la comparaison des couples infertiles devenant parents adoptifs (groupe expérimental) à des parents biologiques et des couples infertiles sans enfant (groupes contrôles). Ainsi, l'étude se propose de (1) vérifier d'abord le type d'attachement des couples infertiles avec enfant par rapport à celui des couples fertiles avec enfant et les couples infertiles sans enfant, (2) ensuite de déterminer la nature de la communication des premiers en comparaison aux deux autres groupes et enfin (3) d'identifier le niveau de la satisfaction conjugale chez les couples infertiles avec enfant par rapport à celui des deux groupes contrôles.

Méthode
Devis de la recherche

Il s'agit d'une étude transversale présentant un devis descriptif corrélationnel qui se base sur l'approche quantitative. Elle a pour but de vérifier si les représentations d'attachement, combinées au facteur de stress (un premier facteur de stress qui est explicite et en rapport avec la présence/absence d'un enfant dans le couple et un second facteur qui est implicite et en lien avec l'infertilité), sont liés à la satisfaction conjugale au travers le processus adaptatif de la communication.

Participants

L'échantillon total est composé de 146 participants (73 couples) âgés de 23 à 60 ans et mariés depuis au moins 2 ans. Il est subdivisé en un groupe expérimental appelé "Groupe Avec Enfant Adoptif" (GAEA) composé de 30 couples (60 personnes) infertiles qui ont eu accès à une parentalité adoptive de l'Institut National de Protection de l'Enfance (INPE) et sélectionnés sur la base de leur dossier selon des critères d'inclusions (couples de nationalité tunisienne, mariés depuis au moins deux ans, dont l'un des partenaires ou les deux souffre(ent) de problèmes de fertilité, l'âge des femmes variant entre 25 et 50 ans et celui des hommes entre 25 et 60 ans et qui ont obtenu une adoption de L'INPE d'au moins un enfant) et des critères d'exclusion (célibataires, divorcés, veufs(ves), couples remariés, mariés depuis moins de deus ans, ayant dans leur histoire de couple une grossesse et/ou des enfants légitimes, épouses âgées de moins de 25 ans et plus de 50 et époux âgés de moins de 25 ans et plus de 60 ans. Le groupe contrôle choisi aléatoirement est subdivisé en deux sous-groupes : le "Groupe Avec Enfant Biologique" (GAEB) **est** composé de 30 couples (60 personnes) fertiles vivant une parentalité biologique. Il est sollicité de diverses façons (p. ex., par l'entremise des collègues et amis) et le "Groupe Sans Enfant" (GSE) **est** composé de 13 couples (26 personnes) infertiles en phase de traitement de leurs problèmes de fertilité et n'ont jamais eu d'enfant. Ils ont été sélectionnés à partir d'une population consultant au centre de procréation médicalement assistée à l'hôpital Aziza Othmana.

Instruments de mesure

En plus du questionnaire de renseignements sociodémographiques, les participants ont complété trois instruments de mesure.

Le questionnaire des Expériences Amoureuses (Experiences in

Close Relationships « ECR » ; Brennan, Clark, Shaver, 1998 ; Lafontaine & Lussier, 2003) est composé de 36 items repartis en deux dimensions : l'évitement de l'intimité (18 items) et l'anxiété d'abandon (18 items) qui sont cotées sur une échelle de 1 à 7 points (fortement en désaccord

à fortement en accord). Lafontaine et Lussier, (2003) rapportent des coefficients de cohérence interrne élevé de 0,88 à la fois pour d'évitement de l'intimité et l'anxiété d'abandon. Dans la présente recherche, les coefficients de fidélité sont respectivement de 0,81 et de 0,79 pour les échelles de l'évitement de la proximité et de l'anxiété d'abandon.

Le questionnaire des patrons de communication (Christensen, & Sullaway, 1984 ; Lussier, 1995) permet d'évaluer la qualité de la communication des conjoints durant trois phases de conflits ; lorsqu'un conflit se présente (4 items), pendant que le couple en discute (18 items) et après la discussion (13 items). Il est composé de 35 items accompagnés d'une échelle de type Likert en 9 points, allant de très improbable (1) à très probable (9). Les réponses individuelles des conjoints permettent d'indiquer le niveau de probabilité d'interaction du couple lors de sa discussion d'un problème selon trois principales modes : les modes symétriques positifs (les deux partenaires expriment mutuellement leurs sentiments de manière positive : communication mutuelle, compréhension mutuelle, résolution mutuelle…), les modes symétriques négatifs (les deux partenaires expriment mutuellement leurs sentiments de manière négative ; menace mutuelle, blâme mutuel, repli mutuel…) et les modes asymétriques où il y a les jeux de rôles complémentaires et distincts dans un couple (l'un des partenaires critique pendant que l'autre se défend ; l'un des partenaires menace pendant que l'autre recule). La fidélité et la validité de ce test ont été démontrées dans plusieurs recherches comme celle de Brassard (2003) qui rapporte des coefficients oscillant entre 0,54 et 0,8. Dans la présente recherche, les coefficients alpha atteignent respectivement 0,79 (communication mutuelle), 0,70 (total demande/retrait), 0,57 (conjoint demande/répondant se retire), 0,61 (Répondant demande/ conjoint se retire), 0,66 (évitement mutuel) et 0,87 (communication négative).

L'ajustement dyadique est évaluée à l'aide de la version abrégée en quatre items (Sabourin, Valois , & Lussier, 2005) du dyadic adjustment scale (Spanier, 1976). Cette version corrèle significativement avec la version originale de 32 items ($r = 0,94$; Sabourin et al., 2005). Elle présente une bonne validité prédictive qui a été démontrée dans une étude longitudinale de trois ans portant sur la dissolution conjugale (Sabourin et al., 2005). Dans la présente recherche, la consistance interne est de 0,77.

Analyse et traitement des données

Différentes techniques d'analyses de données ont été utilisées. Pour les données sociodémographiques, ont été utilisées une ANOVA à mesures répétées pour le facteur Âge, une ANOVA simple pour le facteur durée de vie commune, le khi deux pour le niveau scolaire, la nature de parentalité, le type

d'infertilité et enfin le test *t* pour la durée de parentalité. Pour la vérification des hypothèses, l'analyse utilisée est l'analyse de variance à plan mixte ou ANOVA à mesures répétées qui s'applique en cas de présence de plusieurs variables dépendantes (mesures répétées) et plusieurs variables indépendantes. Ainsi, **les deux variables indépendantes** sont la présence/ absence de l'enfant ou (Groupe) ; il existe par ce fait trois groupes : Groupe Avec Enfant Adoptif (GAEA), Groupe Avec Enfant Biologique (GAEB) et Groupe Sans Enfant (GSE) et le couple (formé par Homme/Femme) ou (Sexe). **Les variables dépendantes** sont l'attachement amoureux, la communication et la satisfaction conjugale.

Il est à signalé que dans la présente étude, **l'attention est centrée sur les différences inter-sujets.** La vérification des hypothèses est basée sur les comparaisons entre les trois groupes. **Le «couple», facteur intra sujet s'est imposé dans les analyses.** Ainsi, les comparaisons multiples ont été utilisées pour tous les facteurs significatifs intergroupes et intragroupes mais **ne seront présentées et discutées que les résultats intergroupes.**

Résultats
Analyses statistiques descriptives

Les analyses descriptives relatives aux informations sociodémographiques montrent une différence significative entre GAEA et les groupes contrôles concernant *l'âge* (F(2,70) = 9,81, p<0,01); Le GAEA est significativement plus âgé que les deux groupes contrôles (absence de différence significative entre ces deux derniers), *le nombre moyen d'années de vie commune* (F(2,70)=5,089, p<0,01); Le GAEA rapporte un plus grand nombre moyen d'année de vie commune uniquement par rapport au GSE (la différence est aussi significative entre le GAEB et le GSE), *le niveau de scolarité* (χ^2 (4)=28,73, p < 0,001) ; Le pourcentage du niveau primaire est le plus élevée chez le GAEA (43,33%) par rapport au GSE (35,41) et le GAEB (21,66). De même pour le niveau secondaire, la proportion du niveau de scolarité secondaire du GAEA (43,33) semble presque égale par rapport à celle du GSE (42,30) mais élevée à celle du GAEB (29,99%) alors que le niveau de scolarité supérieur est le plus bas chez le GAEA (13,33), par rapport au GSE (30,76) et au GAEB (48,33). *Le nombre moyen d'années de parentalité* (t (58)= (-5,31), p < 0,001) dans le GAEA ne dépasse pas les 5 années (*M* =1,97; *ÉT* =1,159), alors qu'il s'étale jusqu'à 24 ans pour le GAEB (*M* = 8,27; *ÉT* = 6,389). De plus, *la nature de la parentalité* (χ^2 (2) = 56,12, p < 0,001) est significativement différente. Tous les participants dans le GAEB ont eu accès à une parentalité biologique, tandis que dans le GAEA, 17 couples ont eu recours à une adoption et 13 couples ont fait une tutelle officieuse. Enfin, *le type d'infertilité* (χ^2 (8)=76,60, p < 0,001) diverge entre les groupes. Le GAEA a une proportion d'infertilité masculine plus dominante (36,66%) par

rapport à (23,07%) chez le GSE. Ce dernier possède des proportions d'infertilité féminine (53,48%) et mixte (23,07%) plus élevées que celle du GAEA qui sont respectivement de (43,33%) et (13,33%).

Analyses statistiques inférentielles

Il est à rappeler que cette étude est une étude inter-comparative entre trois groupes qui vise à vérifier l'impact de la transition à la parentalité sur les couples. De ce fait, **seuls les résultats entre les groupes seront discutés dans la section interprétation.**

L'analyse de variance à mesures répétées a été calculée pour les deux dimensions « Anxiété d'abandon » et « Evitement de proximité » du questionnaire sur l'attachement. Les résultats de l'analyse de la première dimension sont présentés dans le tableau 1.

Tableau 1 : Analyse de variance à mesures répétées des résultats des trois groupes de participants à l'échelle d'«anxiété d'abandon»

Variables	Source de variation	dl	Carré moyen	*F*	η^2
Anxiété D'abandon	Groupe	2	3,699	6,362**	0,154
	Erreur	70	0,581		
	Sexe	1	4,431	9,189**	0,116
	Sexe X Groupe	2	0,641	1,330	0,037
	Erreur	70	0,482		

Note. η^2 = taille de l'effet.
*p < 0,05. **p < 0,01. ***p < 0,001.

L'analyse montre que la valeur *F* est significative pour la variable «Sexe» (les femmes ont une moyenne d'anxiété abandonnique (4,83) plus élevée que celle des hommes (4,41)) et la variable « groupe » (le GAEA présente une moyenne d'anxiété d'abandon (4,81) supérieure à celle du GAEB (4,36) et à celle du GSE (4,69)).

Des comparaisons multiples (test de Bonferroni) ont été appliquées aux deux facteurs principaux «Sexe» et «Groupe» afin de mieux localiser les différences. Elles montrent pour le facteur principal « Sexe » que la moyenne d'anxiété abandonnique des femmes dans le GAEA (5,05) est plus élevée que celle de leur conjoint (4,57), elle est de même chez les femmes du GAEB (4,46) et celles du GSE (4,99) par rapport à leur époux (4,27) et (4,39). Aussi, les hommes du GAEA ont une moyenne (4,57) plus élevée que celle des hommes du GAEB (4,27) et celle des hommes du GSE (4,39). Les femmes du GAEA possèdent elles aussi une moyenne d'anxiété à l'abandon (5,05) plus élevée que celle des femmes du GAEB (4,46) et celle des femmes du GSE (4,99).

Pour le facteur principal « Groupe », les comparaisons multiples montrent que la différence de l'anxiété d'abandon existe uniquement entre le

GAEA et le GAEB et qu'aucune différence significative n'a été trouvée entre le GAEA et le GSE, ni entre ce dernier et le GAEB.

Les résultats de l'analyse de la deuxième dimension « Evitement de proximité » présentés dans le tableau 2 montrent un effet significatif du facteur «Sexe» qui selon lequel les femmes ont une moyenne d'évitement de proximité (2.24) plus faible que celle des hommes (2,44), et un effet significatif du facteur « Groupe » qui selon lequel la moyenne d'évitement de proximité chez le GAEA (2,09) est inférieure à la moyenne du GAEB (2,43) et à celle du GSE (2,50).

Tableau 2 : Analyse de variance à mesures répétées des résultats des trois groupes de participants à l'échelle d'évitement de proximité

Variables	Source de variation	dl	Carré moyen	F	η^2
Évitement de proximité	Groupe	2	2,287	5,078**	0,127
	Erreur	70	0,450		
	Sexe	1	1,229	5,270*	0,070
	Sexe X Groupe	1	0,153	0,657	0,018
	Erreur	70	0,233		

Note. η^2 = taille de l'effet.
*p < 0,05. **p < 0,01. ***p < 0,001.

Les comparaisons multiples (test de Bonferroni) appliquées aux deux facteurs principaux « Sexe » et « Groupe », montrent pour le facteur principal « Sexe » que la différence entre les hommes et les femmes concernant l'évitement de proximité existe dans les trois groupes. En effet, la moyenne d'évitement de proximité des hommes dans le GAEA (2,24) est plus élevée que celle de leur conjointe (1,95), elle est de même chez les hommes du GAEB (2,57) et les hommes du GSE (2,52) par rapport à leur épouse (2,30) et (2,48). Chez les hommes, la moyenne d'évitement de proximité la plus élevée est celle du GAEB (2,57), puis celle du GSE (2,52) et enfin celle du GAEA (2,24). Chez les femmes, la moyenne la plus élevée est la moyenne du GSE (2,48) puis celle du GAEB (2,30) et enfin celle du GAEA (1,95).

Pour le facteur principal « Groupe », les comparaisons multiples montrent que la différence de l'évitement de proximité existe entre le GAEA et le GAEB aussi bien qu'entre le GAEA et le GSE alors qu'aucune différence significative n'a été trouvée entre le GAEB et le GSE. Cette différence est plus importante entre les femmes du GAEA et les femmes du GSE qu'entre les premières et celles du GAEB. Elle est aussi plus importante entre les hommes du GAEA et les hommes du GAEB qu'entre les premiers et ceux du GSE.

Bref, pour l'effet « Groupe », la différence d'anxiété d'abandon n'est significative qu'entre le GAEA et le GAEB ; le premier présente plus d'anxiété d'abandon que le deuxième. La différence d'évitement de proximité est significative entre le GAEA et les deux groupes contrôles ; Le premier

présente moins d'évitement de proximité que le GAEB et le GSE. En somme, la première hypothèse qui stipule que le GAEA présente une plus faible anxiété d'abandon et un plus faible évitement de l'intimité par rapport aux deux groupes contrôles est partiellement confirmée. En effet, bien que les couples infertiles qui ont eu accès à une parentalité adoptive semblent éviter moins la proximité que les couples des deux groupes contrôles, ils sont plus anxieux face à l'abandon que le GAEB et ne semblent pas avoir de différence avec le GSE.

Pour la deuxième hypothèse, trois de six dimensions du questionnaire de patron de communication ont été retenues pour vérifier trois comportements ; le comportement de la communication mutuelle à travers la dimension « Communication Mutuelle », le comportement de demande-retrait via les dimensions « Total Demande-Retrait » et enfin le comportement d'évitement grâce à la dimension « Evitement Mutuel ». Les résultats de l'analyse des deux premières dimensions sont présentés dans les tableaux 3 et 4.

Tableau 3 : Analyse de variance à mesures répétées des résultats des trois groupes de participants à l'échelle de « Communication Mutuelle ».

Variables	Source de variation	dl	Carré moyen	F	η^2
Communication Mutuelle	Groupe	2	336,209	4,877*	0,122
	Erreur	70	68,937		
	Sexe	1	11,802	0,540	0,008
	Sexe X Groupe	2	43,621	1,995	0,054
	Erreur	70	21,861		

Note. η^2 = taille de l'effet.
*p < 0,05. **p < 0,01. ***p < 0,001.

Tableau 4 : Analyse de variance à mesures répétées des résultats des trois groupes de participants à l'échelle « Total Demande-Retrait ».

Variables	Source de variation	dl	Carré moyen	F	η^2
Total Demande-Retrait	Groupe	2	295,189	4,137*	0,106
	Erreur	70	71,346		
	Sexe	1	8,800	0,529	0,07
	Sexe X Groupe	2	13,682	0,822	0,023
	Erreur	70	16,651		

Note. η^2 = taille de l'effet.
*p < 0,05. **p < 0,01. ***p < 0,001.

L'analyse ne montre pas d'effet significatif du facteur « Sexe », ni de l'interaction « Sexe » X « Groupe » pour les trois dimensions. Pour le facteur « Groupe », les résultats montrent, pour les deux dimensions « Communication Mutuelle » et « Total Demande-Retrait », une différence significative uniquement entre le GAEA et le GSE (absence de différence entre le GAEA et le GAEB et entre ce dernier et le GSE) alors que pour la dimension « Évitement Mutuel », aucune différence significative n'a été indiquée entre les trois groupes.

Un test de comparaison multiple (Bonferroni) a été appliqué au facteur « Groupe » pour les deux premières dimensions. Il s'est avéré que l'effet « Groupe » est dû au fait que le GAEA rapporte davantage de communication mutuelle que le GSE (38,73 et 32,95 respectivement, p < 0,05) et plus de comportement demande-retrait respectivement (38,63) et (33,65).

Ainsi, la deuxième hypothèse qui stipule que le GAEA a moins de difficulté de communication que les deux groupes contrôles, autrement dit, il a plus de communication mutuelle et moins de comportements de demande-retrait et d'évitement que les deux autres groupes, est partiellement confirmée. Les personnes du GAEA utilisent significativement plus la communication mutuelle mais uniquement par rapport au GSE. Toutefois, elles ne semblent pas posséder moins de comportements « Demande-Retrait », au contraire, elles ont significativement davantage ces comportements par rapport au GSE. Enfin, elles ont des comportements d'évitement mutuel qui ne diffèrent pas de ceux des groupes contrôles.

Les analyses pour la troisième hypothèse qui stipule que le GAEA a une satisfaction conjugale supérieure à celle des deux groupes contrôles figurent dans le tableau 5 et montrent des effets significatifs du « Sexe », du « Groupe » et de l'interaction entre « Sexe » et « Groupe » entre le GAEA et les deux groupes contrôles (aucune différence significative n'existe entre le GAEB et le GSE).

Tableau 5 : Analyse de variance à mesures répétées des résultats des trois groupes de participants à l'échelle d'ajustement dyadique forme abrégée (DAS)

Variable	Source de variation	dl	Carré moyen	F	η^2
Ajustement dyadique	Groupe	2	63,126	7,436***	0,175
	Erreur	70	8,490		
	Sexe	1	11,443	5,137*	0,068
	Sexe X Groupe	2	10,474	4,702**	0,118
	Erreur	70	2,228		

Note. η^2 = taille de l'effet.
*p < 0,05. **p < 0,01. ***p < 0,001.

Afin de localiser les différences pour chaque facteur, le test de Bonferroni a été appliqué.

L'effet significatif « Sexe » indique qu'il existe une différence entre la moyenne d'ajustement dyadique des hommes par rapport à celle des femmes; la première (18,17) est plus élevée que la deuxième (17,57). La moyenne des hommes du GAEA (19,03) est légèrement faible à celle de leur épouse (19,33). La moyenne des hommes du GAEB (17,73) est légèrement élevée par rapport à la moyenne de leur femme (17,46) et la moyenne des hommes du GSE (17,76) est plus élevée que celle de leur partenaire (15,92).

L'effet significatif du "Groupe" indique que le GAEA possède une satisfaction conjugale (19,18) plus élevée à celle du GAEB (17,59) et celle du GSE (16,84) (alors qu'aucune différence significative n'existe entre le GAEB et le GSE).

L'effet d'interaction significatif entre « Sexe » et « Groupe » indique que la différence entre le GAEA et les deux groupes contrôles est très forte chez les femmes que chez les hommes; les femmes du GAEA présentent une satisfaction conjugale plus importante par rapport aux femmes du GAEB et davantage plus importante par rapport au GSE. Par contre, les hommes du GAEA possèdent une satisfaction conjugale plus élevée que celle du GAEB et du GSE. Ces deux derniers ont une satisfaction conjugale presque identique.

La troisième hypothèse est confirmée. Les couples avec enfant adoptif sont plus satisfaits que les couples avec enfant biologique et les couples sans enfant.

Discussion

La présente recherche visait à examiner l'impact de la transition à la parentalité adoptive sur le fonctionnement conjugal chez les personnes infertiles. Ses objectifs étaient de :

1. vérifier le type d'attachement des couples infertiles avec enfant par rapport à celui des couples fertiles avec enfant et les couples infertiles sans enfant,
2. déterminer la nature de la communication des premiers en comparaison aux deux autres groupes,
3. d'identifier le niveau de la satisfaction conjugale chez les couples infertiles avec enfant par rapport à celui des deux groupes contrôles.

Les résultats obtenus montrent que les personnes vivant une transition à la parentalité adoptive diffèrent sur plusieurs variables en ce qui concerne leurs données sociodémographiques. D'abord, *l'âge* est assez avancé chez le GAEA par rapport aux deux groupes contrôles. Ce résultat confirme celui trouvé par Laaribi et al. (2009) dans une étude tunisienne sur le profil psychosocial de la famille adoptive en consultation de pédopsychiatrie selon lequel l'âge moyen des pères adoptifs était de 45 ans au moment de l'adoption (avec des extrêmes allant de 30 ans à 60 ans) et que celui des mères était de

38 ans (avec des extrêmes allant de 24 ans à 58 ans). Ensuite, *le niveau scolaire* primaire est le plus dominant chez le GAEA avec un pourcentage élevé (50%) chez les femmes alors que pour les hommes, le niveau primaire existe avec une forte intensité mais le niveau secondaire est encore plus élevé avec une proportion de 56,66% des cas. Ceci ne rejoint pas le résultat trouvé par Laaribi et al. (2009) qui montre que le niveau scolaire de type primaire est prédominant chez les deux partenaires avec un pourcentage de 54,5% des cas pour les pères et 40,9% des cas pour les mères. Enfin, l*e niveau socio-économique et la profession des participants* des trois groupes n'ont pas été pris en considération parce que la majorité des personnes des deux groupes contrôles n'ont pas divulgué cette information et, par conséquent, la comparaison entre les groupes ne pourrait être réalisable. Toutefois, les données socio-économiques du GAEA montrent que plus de la moitié de cet échantillon (78,33 %, n= 47) possède un revenu mensuel net situé entre 300 DT et 2000 DT. Une grande proportion (43,33%) de l'échantillon, constituée uniquement de femmes n'ont aucun revenu. Par conséquent, 56,66 % des femmes et 100% des hommes possèdent un revenu mensuel. Ceci confirme le résultat trouvé par Laaribi et al. (2009) concernant une majorité (59%) des hommes qui sont des journaliers et infirme celui concernant la majorité des femmes (59,1%) est sans profession.

En ce qui a trait à la première hypothèse, il était prévu que le GAEA présente une faible anxiété et un faible évitement, autrement dit, un type d'attachement sécurisant, alors que les résultats mettent en relief un évitement faible et une anxiété élevée qui s'apparentent à un type d'attachement insécurisant. Ce résultat concorde avec celui de l'étude de Vinay et al., (2014) qui démontre que l'arrivée de l'enfant marque un changement dans le style d'attachement des parents, elle déstabilise le sentiment de sécurité interne qui fournit un modèle d'attachement sécurisé et elle les dirige vers des modèles d'attachement davantage insécurisés.

L'attachement insécurisant est observé dans les trois groupes avec d'un côté une forte intensité chez le GAEA par rapport aux GAEB ; les différences sont significatives entre eux pour les deux dimensions avec plus d'anxiété d'abandon et moins d'évitement de proximité chez le premier groupe et d'un autre côté une faible intensité chez le GAEA par rapport au GSE. La moyenne d'anxiété abandonnique du premier ne diffère pas de celle du GSE mais la moyenne d'évitement de proximité est plus faible chez le GAEA par rapport au GSE.

Il est possible que les personnes du GAEA veulent plus d'indépendance, essaient de réduire leur peur d'être abandonnées et leur sentiment de ne plus être aimées. Il se peut aussi qu'elles se sont tournées vers l'adoption parce qu'elles ne supportent plus la « solitude » et ont besoin de plus d'attention. Devenus parents, ces couples sont plus sensibles à leur

nouveau statut et leur nouvelles tâches. Selon la littérature, les parents adoptifs élaborent des représentations autour de leur rôle parental et du lien parent-enfant en référence à leurs propres modèles relationnels de l'enfance. Ils rapportent des thèmes de « proximité relationnelle » ou « d'intimité » par rapport au thème de « disponibilité » chez les parents biologiques (Fonagy, 1999).

Pour la deuxième hypothèse, contrairement à ce qui était attendu, les résultats montrent que le GAEA utilise plus de communication mutuelle et des comportements de demande-retrait » que le GSE, mais cette différence ne ressort pas avec le GAEB (ni entre ce dernier et le GSE).

La communication mutuelle chez les couples adoptifs ne semble pas être altérée par la transition à la parentalité contrairement aux résultats trouvés par des auteurs (Belsky & Kelly, 1994) qui indiquent que devenir parent diminue les interactions positifs entre les partenaires. Les échanges des parents adoptifs ne sont pas affaiblis après l'arrivée de l'enfant mais leurs comportements de demande-retrait se trouvent plus élevés par rapport à ceux des couples sans enfant. Des auteurs (Belsky & Kelly, 1994 ; Shapiro et al.,2000) mentionnent que l'arrivée de l'enfant peut produire des problèmes de communication liés à une augmentation des conflits conjugaux et une baisse de satisfaction.

Les couples du GAEA ne diffèrent pas des couples des deux groupes contrôles sur le plan d'évitement mutuel contrairement à ce qui était montré dans la documentation (Jordan & Revenson, 1999); les personnes infertiles en traitement utilisent plusieurs stratégies d'adaptation et davantage l'évitement que les couples fertiles.

Bref, la communication chez le GAEA semble parfois efficace et parfois déficiente parce que le patron de communication utilisé regroupe à la fois un mode de communication symétrique positif (communication mutuelle) et un mode asymétrique (l'utilisation indifférenciée du patron demande-retrait à l'intérieur du couple, telle que perçue par le répondant).

Les analyses dans la troisième hypothèse montrent que les couples avec enfant adoptif sont plus satisfaits que les couples avec enfant biologique et les couples sans enfant. Ce résultat rejoint celui trouvé par Galhardo, Cunha et Pinto-Gouveia (2011) qui montre que l'ajustement dyadique est plus élevé chez les couples candidats à l'adoption par rapport aux couples infertiles et les couples fertiles. La différence de l'ajustement dyadique est plus importante entre le GAEA et le GSE qu'entre le premier et le GAEB. Ce résultat concorde avec celui trouvé par Weaver, Clifford, Douglas et Robinson (1997) qui ne montre pas de différence significative entre les couples infertiles qui ont échoué la fécondation in vitro (FIV) ou le transfert intrafallopien des gamètes (TIFG) et le groupe témoin qui a réussi l'un des deux traitements.

Le GAEA semble plus satisfait que le GAEB. Le moment de devenir parent semble jouer un rôle dans la satisfaction conjugale en dépit de la durée de parentalité. Les couples infertiles sont devenus parents après des années de traitements et d'attente et la moyenne de la durée de la parentalité adoptive ne dépasse pas 1,97 an en comparaison aux couples fertiles qui ont eu leur premier enfant dans les premières années de mariage et vivent une parentalité depuis en moyenne 8,27 ans. Ce résultat concorde avec celui trouvé par Lemieux en 2008 qui montre qu'une parentalité très récente (survenant entre 2 ans à 6 ans de formation du couple) est vécue avec beaucoup de stress et avec un rythme accéléré par rapport à une parentalité qui vient après plus de 7 ans.

Conclusion

La présente recherche offre une meilleure compréhension des changements au sein du couple. Elle a l'avantage non seulement d'apporter de nouvelles connaissances et des données auprès d'une population spécifique constituée de couples infertiles qui ont eu recours à une parentalité adoptive mais aussi de disposer d'un échantillon de couples varié (couples fertiles avec enfants, couples infertiles avec enfants et couples infertiles sans enfants) afin de contraster différentes situations comme le fait d'avoir un enfant ou non mais en plus de pouvoir comparer la présence d'un enfant chez des parents adoptifs à celle chez des parents biologiques. Elle permet de documenter le profil psychosocial de la famille adoptive en Tunisie à travers les différentes caractéristiques sociodémographiques des parents adoptifs et ouvre plusieurs pistes d'investigation pour les futures études qui viseront à fournir de nouvelles réflexions et à mieux identifier les problématiques associées au fonctionnement conjugal des couples aux prises avec des problèmes de fertilité.

Une recherche longitudinale pour déterminer l'évolution des représentations d'attachement, de l'ajustement dyadique et de la communication chez les personnes infertiles qui ont eu accès à une parentalité adoptive serait intéressante. De même, des analyses qualitatives basées sur des entrevues cliniques pourraient être complémentaires aux analyses quantitatives et apporter de nouveaux éléments de compréhension d'où l'importance d'enrichir le travail par les entretiens cliniques et d'autres types d'outils d'investigation (p. ex., les méthodes projectives). Par ailleurs, le terme adoption dans cette recherche a regroupé l'adoption et la tutelle officieuse. Les couples qui ont accueilli un enfant dans le cadre de l'adoption pourraient avoir des résultats différents de ceux qui ont eu recours à la tutelle officieuse. Il serait intéressant dans les futures recherches de faire des comparaisons entre les deux types de parentalité adoptives. Il serait aussi pertinent de refaire cette étude avec des couples infertiles qui ont terminé le traitement de leurs

problèmes de fertilité et d'approfondir les recherches sur les caractéristiques de nouveaux types de parentalité à travers une étude comparative entre la parentalité biologique, la parentalité adoptive et la « parentalité médicalement assistée ».

Déclaration d'intérêt
L'auteure déclare n'avoir aucun lien d'intérêt en relation avec cet article.

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Déterminants de l'Usage du Transfert d'Argent Mobile par les Utilisateurs d'Internet Mobile au Mali

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Résumé

Le présent papier analyse les principaux déterminants de l'utilisation des services de transfert d'argent mobile par les internautes maliens en situation mobile. Les données collectées auprès de 1739 individus utilisateurs d'Internet mobile de l'étude du groupe de recherche en économie solidaire et industrielle (GRESI) ont été utilisées. Après avoir implémenté le modèle Logit qui est un modèle de régression binomiale, les résultats montrent qu'avoir un niveau d'instruction inférieur au niveau secondaire, avoir un âge compris entre 15-35 ans et la cherté du coût de connexion jouent négativement sur la probabilité d'utiliser le mobile money via Internet mobile au Mali. Tandis que le revenu, la zone de résidence urbaine, les compétences en informatiques et les professions : ouvrier, entrepreneur, commerçant et agriculteur influencent positivement l'utilisation des services de transfert d'argent mobile par le truchement d'Internet mobile.

Mots-clés: Internet mobile, Transfert d'argent mobile, Mali

Determinants of Mobile Money Transfer Usage by Mobile Internet Users in Mali

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Abstract
        This paper analyses the main determinants of the use of mobile money transfer services by Malian Internet users in a mobile situation. Data collected from 1739 individual mobile Internet users of the study by the solidarity and industrial economy research group (GRESI) were used. After having implemented the Logit model which is a binomial regression model, our results show that having an education level below secondary level, having an age between 15-35 years old and the high cost of connection have a negative impact on the probability of using mobile money via mobile Internet in Mali. While income, urban area of residence, computer skills and occupations: worker, entrepreneur, trader and farmer positively influence the use of mobile money transfer services through the mobile internet.

Keywords: Mobile internet, Mobile Money Transfer, Mali

Introduction
        L'utilisation d'Internet à des fins commerciales a commencé au milieu des années 90. De cette période jusqu'à nos jours, Internet n'a jamais cessé de se développer au plan de l'adoption et des usages. Toutes les zones du monde ont connu en un quart de siècle des taux de croissance en termes d'adoption d'Internet significatifs. Pour preuve, le continent Africain qui enregistre les taux de croissance d'adoption les plus faibles par rapport aux autres zones du monde enregistrait un taux d'adoption de 28,6 % en 2019 contre 2,7 % en 2005 (UIT, 2019). Les usages d'Internet sont aussi spectaculaires. Des usages traditionnels (messagerie, recherche d'information et surf) à ses débuts, Internet connaît des usages multiples et complexes à cette ère du web social considéré comme l'antichambre du web 3.0 dont la généralisation a donné naissance à Internet des objets (IdO).
        Le développement des usages d'Internet n'a pas laissé la communauté scientifique indifférente. Elle a étudié les différents usages faits d'Internet

dans le monde et sous différents angles dans le but d'éclairer les décideurs politiques et les entrepreneurs afin d'assurer un développement harmonieux de cette invention. Déjà Ruzgar (2005) a mené une enquête en ligne auprès de 720 étudiants des différentes facultés de l'université Marmara en Turquie. L'objectif visé par cette enquête était d'avoir le point de vue des étudiants sur les usages suivants Internet : fréquences d'utilisation d'Internet, les raisons pour lesquelles ils utilisent Internet et l'impact d'Internet sur leur vie à travers les différents usages d'Internet. Les résultats obtenus par le chercheur permettaient de soutenir que les mails occupaient le peloton de tête des usages d'Internet par les étudiants qui sont suivis par les recherches relatives aux travaux de cours et près de 50 % des étudiants estimaient qu'Internet à la maison augmenterait leurs moyennes annuelles. Dans la même dynamique Zillien & Hargittai (2009) ont exploré l'impact des statuts socio-économiques et les contextes d'usages sur les activités en lignes des internautes en Allemagne. Leurs résultats ont montré que les internautes disposant un statut élevé font des activités en lignes améliorant le capital humain ce qui n'est pas le cas des utilisateurs relevant du bas statut. Cela conduit à des différences en termes d'usages consécutives aux statuts socio-économiques. Simsim (2011) a étudié aussi les préférences des internautes saoudiens relativement aux éléments suivants : le temps de connexion, les systèmes de communication et les attributs des techniques de connexion. Ses principaux résultats ont prouvé que les mails représentent les principales utilisations d'Internet par la majorité des participants. Les jeunes utilisateurs ont utilisé plus les forums de discussions et les jeux que les vieux. Une augmentation du débit et de la qualité de l'accès à Internet était considérée comme plus importante que la baisse de prix de connexion. Le mode de connexion DSL est le mode de connexion le plus utilisé que les autres. Martínez-Domínguez & Mora-Rivera (2020) ont identifié les facteurs socio-économiques et démographiques qui stimulaient l'adoption et l'usage d'Internet en milieu rural du Mexique. Leurs résultats relatifs aux usages d'Internet diffèrent en fonction de l'âge, du niveau d'éducation, du type d'emploi exercé et de la situation géographique. Les jeunes utilisaient Internet pour les activités de divertissement tandis que ceux qui sont plus âgés utilisaient Internet pour s'informer, pour communiquer et pour réaliser des activités de e-commerce.

Des études sur les usages d'Internet relatives à l'Afrique aussi ont été menées. Milek & Gillwald (2011) se sont basés sur une enquête conduite auprès d'individus et des ménages dans 17 pays africains entre 2007-2008. Leur papier a apporté une estimation empirique des dimensions genre en termes d'accès et d'usages des TIC. Un des principaux résultats de leurs études soutenaient que les femmes pauvres ou illétrées ou ayant des statuts professionnels identiques à ceux des hommes ont donc des niveaux d'accès et d'usages des TIC plus faibles. Une année plus tard, Quarshie & Ami-Narh

(2012) ont revu l'adoption et le niveau de pénétration d'Internet au Ghana et ont aussi évalué l'usage courant fait d'Internet par différents travailleurs. Les résultats de leur étude ont montré que 45,6 % des gens utilisaient fréquemment Internet pour des objectifs éducatifs, 33,75 % utilisaient fréquemment Internet pour s'informer et 6,35 % des gens l'utilisaient fréquemment dans le commerce. Penard, et al. (2013) ont cherché à comprendre les facteurs qui stimulaient ou entravaient l'adoption et l'usage d'Internet en Afrique. Pour atteindre leurs objectifs les auteurs ont utilisé une approche microéconomique basée sur les données relatives aux ménages camerounais. Leurs résultats relativement aux usages faits d'Internet ont montré des différences d'usages en termes de genre, d'âge et de niveau d'éducation: les moins de 21 ans utilisaient Internet pour se divertir (jeux), les plus âgés l'utilisaient pour la recherche d'informations (locales et internationales). Les utilisateurs ayant un niveau d'études supérieures et compétents en informatique l'utilisaient pour des buts professionnels (recherche d'infos) et moins pour des usages de divertissement.

Sur le plan de l'usage des services mobile money, nous pouvons affirmer que cet usage a été amplement documenté dans plusieurs recherches antérieures à la nôtre. Ces recherches ont presque toutes mis l'accent sur l'usage fait du mobile money par le truchement des réseaux d'opérateurs de téléphonie mobile. Elles ont abordé différents angles d'études de l'usage du mobile money ayant comme principal médium les réseaux mobiles de télécommunication. Les premières études ont analysé le lien entre développement des réseaux de téléphonie mobile et développement de l'usage du mobile money (Jenkins, 2008 ; Jack & Suri, 2011 ; Maurer, 2012 , Suri, 2017). A la suite de celles-ci, suivront des études visant à analyser l'apport du mobile money utilisé toujours via les réseaux de téléphonie mobile dans la lutte contre l'exclusion financière (Mothobi & Grzybowski, 2017 ; Economides & Jeziorskic, 2017 ; N'dri & Kakinaka, 2020). Enfin, nous notons deux études faites toutes les deux en 2018. Ces deux études ont cherché à faire un focus sur le triptique réseaux de téléphonie mobile, usage de l'Internet mobile et inclusion financière respectivement pour l'Afrique et les huit (08) pays de l'Association sud-asiatique pour la coopération régionale (ASACR). Elles ont conduit aux mêmes résutats. A savoir que la croissance de l'Internet et du téléphone mobile induit une croissance de l'inclusion financière (Evans, 2018) ; (Lenka & Barik, 2018).

A ce stade de l'exposé il est utile de signaler que beaucoup de papiers ont été publiés sur la thématique des usages du mobile money et celle de l'Internet mobile. Mais force est de constater que ces thématiques ont été abordées généralement de manière séparée. Mêmes dans les quelques rares études où elles ont été abordées ensemble ; les auteurs les ont analysées avec une troisième thématique, celle de l'inclusion financière. Bref, une analyse sur

d'éventuels liens entre utilisation de l'Internet mobile et le mobile money dans le cas spécifique du Mali et même de l'Afrique subsaharienne semble être inexistante dans la littérature scientifique.

Faire une étude analytique sur de tels liens est opportun pour les raisons suivantes : (1) taux de pénétration d'Internet mobile sans cesse croissant au Mali ; (2) accès aux services de mobile money via Internet plus convivial et plus rapide (3) existence d'une interface web[1] composée d'icônes facilitant l'usage des services de mobile money pour tous les utilisateurs et surtout plus pour les utilisateurs analphabètes dans un pays comme le Mali où le taux brut de scolarisation au fondamental 2 est estimé en 2020 à 50,4% (Ministère de l'Education Nationale, 2021).

A partir d'un tel descriptif, la présente étude vise à analyser les principaux déterminants de l'usage du mobile money[2] au Mali par les utilisateurs d'Internet mobile. Car l'utilisation d'Internet mobile comme médium d'usage des services de mobile money peut contribuer à la vulgarisation du mobile money auprès du grand public ce qui par ricochet peut conduire au développement de services connexes tels que par exemple l'inclusion financière.

Le papier est organisé comme suit : la première section présente le mobile money au Mali. La deuxième section est consacrée à la méthodologie adoptée. La troisième section discute les principaux résultats de la recherche. La quatrième section présente la conclusion.

1.   Le mobile money au Mali

Le service de transfert d'argent mobile a commencé à être implémenté en Afrique subsaharienne au début des années 2000. La Zambie fut le premier pays d'Afrique subsaharienne à implémenter le service de mobile money en 2004 (BearingPoint, 2015). Dans la même année, l'opérateur de téléphonie mobile Safaricom a aussi lancé le service de transfert d'argent mobile labélisé M-PESA[3] au Kenya (Kirui O. , Okello, Nyikal, & Njiraini, 2013). Six ans après la Zambie et le Kenya, l'opérateur Orange Mali SA a lancé en 2010 au Mali le premier service de transfert d'argent mobile dénommé Orange Money (Orange Mali SA, 2021).

Dans la suite, une présentation du mode de fonctionnement des services de transfert d'argent mobile dans le cas malien sera faite et celle-ci

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[1] Voir dans les annexes une présentation comparée de l'interface web (web application) accessible via Internet mobile et l'interface de l'opérateur mobile (accessible en mode hors ligne) dans le cas de l'offre de mobile money faite par la société Orange Finances Mobiles Mali (OFMM).

[2] Il est utilisé dans cet article de manière interchangeable les deux terminologies suivantes : mobile money et transfert d'argent mobile.

[3] M=mobile ; PESA signifie argent dans le Kiswahili.

sera suivie par un focus succinct sur le marché malien du transfert d'argent mobile côté offre et côté demande.

1.1.   Fonctionnement du mobile money au Mali

La fourniture de services financiers sur mobile peut se faire suivant deux modèles distincts à savoir : le modèle bancaire et le modèle non bancaire (BearingPoint, 2015). Dans le modèle bancaire, les banques commerciales contractent un accord avec les opérateurs télécoms pour fournir les services bancaires sur le téléphone mobile de leurs clients. Ce modèle semble être plus adapté aux pays où le taux de bancarisation est déjà élevé. Tandis que le modèle non bancaire est mis en œuvre par un établissement ne disposant pas de licence bancaire mais qui propose des services financiers mobiles.

Au Mali, c'est le modèle non bancaire qui est implémenté pour offrir les services de transfert d'argent mobile ou mobile money. Même avec ce modèle dit non bancaire le système bancaire est incontournable dans le but de rendre viable l'offre de services financiers mobiles. Car ces services quel que soit le prestataire, leurs implémentations exigent l'implication à la fois des banques et des réseaux mobiles de télécommunications. Une telle évidence est clarifiée à travers la description sommaire qui est faite des relations pouvant exister entre les principaux acteurs intervenant dans la fourniture du mobile money au Mali présentée ci-dessous.

L'offre des services de mobile money aux consommateurs finals au Mali exige la coopération entre au moins cinq (05) principaux acteurs qui sont : La Banque Centrale, la firme émettrice de monnaie électronique (EME), les banques de second rang, l'entreprise de réseaux mobiles de télécommunications et les distributeurs agréés de services de mobile money.

Ci-dessous sont décrites succinctement les relations pouvant exister entre ces principaux acteurs intervenant dans l'offre de services de mobile money dans le cas du Mali.

1.1.1. La monnaie électronique et le franc CFA

Tout le fonctionnement du mobile money est basé sur les transferts des unités de valeurs (UV). Les unités de valeurs ou UV sont des titres de créances qui ont une valeur nominale de 1F CFA. L'unité de valeur est émise par un établissement émetteur de la monnaie électronique (EME) autorisé par la banque centrale.

$$1 UV = 1\ FCFA$$

Les unités de valeur (UV) sont en réalité de la monnaie électronique émise par une entreprise autorisée par la banque centrale à l'émettre. Ce type de monnaie est défini par la Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO) comme une valeur monétaire représentant une créance sur l'établissement émetteur qui est :

- stockée sous une forme électronique, y compris magnétique ;
- émise sans délai contre la remise de fonds d'un montant qui n'est pas inférieur à la valeur monétaire émise ;
- et acceptée comme moyen de paiement par des personnes physiques ou morales autres que l'établissement émetteur.

En fin 2019 au Mali, deux fournisseurs de services financiers numériques sont agréés par la Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO). Il s'agit de la société Orange Finances Mobiles Mali (OFMM) qualifiée par la BCEAO d'émetteur de monnaie électronique (EME) et l'opérateur des télécommunications Moov Africa Malitel (BCEAO, 2019). La société Orange Finances Mobiles Mali (OFMM) utilise le réseau mobile de télécommunications Orange Mali SA et commercialise son offre labélisée Orange Money. Quant à l'opérateur des télécommunications Moov Africa Malitel, il commercialise son offre de services financiers numériques sous le nom commercial Moov Money. Cette offre a été lancée en 2014 par ledit opérateur (AMRTP, 2019).

1.1.2. Principaux acteurs du mobile money et leurs relations dans le cas du Mali

L'Emetteur de Monnaie Electronique (EME) est un établissement de monnaie électronique habilité à émettre des moyens de paiement sous forme d'unités de valeur (UV) électroniques en contrepartie des fonds reçus.

Les unités de valeurs sont créées sur la plate-forme de l'émetteur avec l'accord de la BCEAO, contre le versement du montant équivalent dans un compte bancaire appelé « compte séquestre ». A tout instant, le solde de ce compte doit être égal à la quantité de monnaie électronique en circulation. Ce compte peut avoir plusieurs sous comptes logés dans différentes banques de second rang ou banques commerciales des huit (8) pays de l'Union Economique et Monétaire Ouest Africaine (UEMOA). La BCEAO peut à tout moment procéder à des vérifications. Cette vérification est faite de façon inopinée et fréquente, c'est le rôle de régulateur de la BCEAO.

Après la création des unités de valeurs (UV) par l'entreprise émettrice de monnaie électronique (EME) ; la distribution des services aux consommateurs finals est principalement assurée par des distributeurs agréés[4].

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[4] Ces distributeurs au Mali sont aussi appelés Masters. Ce sont ces Masters qui gèrent directement les points de vente qui sont à leur tour en contact direct avec les consommateurs ou clients. Chaque point de vente est affilié à un seul Master, qui est le seul habilité à l'alimenter en UV. Cela permet à l'entreprise émettrice de monnaie électronique (EME) de tracer le parcours des UV du Master jusqu'au Point de Vente et facilite aussi le partage des différentes commissions entre Masters et gérants des points de vente. Et rend rapide aussi le

Ceux-ci sont des entreprises accréditées par l'entreprise émettrice de monnaie électronique (EME) pour la vente des Unités de Valeur. Les distributeurs agréés peuvent se procurer des unités de valeurs auprès de l'EME sans valeur ajoutée car l'EME leur revend les unités de valeur au taux de 1UV=1FCFA pour commercialisation[5]. Une fois que les Masters ont les UV en leur possession, ils distribuent aux points de vente en fonction de leurs besoins. La distribution est faite par des cartes SIM ou puces téléphoniques spécialisées. Toutes les transactions de l'EME aux clients sont techniquement assurées et sécurisées par un ou des réseaux mobiles de télécommunication. Et Chaque transaction est précédée par un SMS indiquant le montant reçu ou envoyé.

Il est important de noter que du début du processus jusqu'au point de vente il y a pas de création de valeur ajoutée. La création de valeur ajoutée débute à la suite d'opérations de dépôts ou de retraits effectuées par les clients au niveau des différents points de vente des UV. La valeur ajoutée créée est repartie automatiquement entre les différents acteurs qui sont intervenus dans la distribution via le système de partage de manière automatique. Il s'agit de l'entreprise émettrice, le réseau mobile de télécommunication, les distributeurs agréés et les gérants des points de vente[6].

1.2.   L'économie du mobile money au Mali en 2019

Ce point présente le marché malien du mobile money. Il présente successivement les côtés offre et demande de mobile money.

1.2.1.   Le côté offre du marché du mobile money

Le marché du mobile money au Mali est dominé côté offre par deux fournisseurs de services financiers numériques à savoir Orange Finances Mobile Mali (OFMM) et Moov Africa Malitel. Les services offerts par ces établissements émetteurs de monnaie électronique peuvent être classés en cinq (05) principales catégories de services : la gestion de compte ; le transfert d'argent, achat de crédit/forfait Internet, les services financiers, et enfin les

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règlement des litiges pouvant survenir lors des transactions surtout entre clients et gestionnaires des points de vente.

[5] Les commissions cumulées des masters et des agents de distribution varient entre 33,5 % et 36,72 % des montants de transferts. Cette clé de répartition donne à son tour entre 9,95 % et 11% des montants de transfert aux Masters et le restant aux agents distributeurs soit entre 23,5 % à 25,72 % des frais de transfert.

La recette de l'EME (dans le présent cas OFMM) et l'opérateur de réseau mobile (Orange Mali SA) varie entre 63,27 % et 66,5 % des frais de transfert.

[6] Voir en annexes le tableau récapitulatif de partage de commission de l'entreprise émettrice de monnaie électronique Orange Finances Mobiles Mali (OFMM)

paiements marchands. Les parts de marché[7] enregistrées par Orange Finances Mobile Mali (OFMM) et Moov Africa Malitel sur le marché du mobile money en fin 2019 sont estimées respectivement à 66 % et 34 %. Les clients d'Orange Finances Mobile Mali ont été estimés à 4 636 653 tandis que ceux de Moov Africa Malitel ont été estimés à 2 389 794 en fin 2019 (AMRTP, 2020). Le fournisseur de services financiers numériques à savoir Orange Finances Mobile Mali (OFMM) est le plus implanté au Mali avec 27.000 distributeurs estimés en 2018 par la BCEAO et le fournisseur de services numériques Moov Africa Malitel disposait à la même date 17 000 distributeurs (BCEAO, 2018).

La gestion de compte

La gestion de compte comprend deux principaux services qui sont gratuits à savoir : le dépôt d'argent et le retrait d'argent. Ces deux services peuvent être faits auprès de n'importe quel distributeur agréé d'un émetteur de monnaie électronique et cela sans aucun engament. Le dépôt d'argent consiste à déposer de la liquidité soit dans son propre compte mobile money soit dans celui d'un autre client ayant préalablement souscrit aux services de mobile money d'un établissement émetteur de monnaie électronique. Le solde maximal du compte ne peut dépasser un montant plafond de 1 500 000 F CFA au Mali.

Le transfert d'argent

Au Mali, les deux émetteurs de monnaie électronique intervenant sur le marché du mobile money peuvent proposer trois types de transfert d'argent : le transfert national, le transfert intra régional et le transfert inter-émetteur.

Le transfert national permet à un client détenteur d'un compte de mobile money de transférer de l'argent de son compte vers le compte d'un autre client du même émetteur de monnaie électronique. Ce service n'est pas gratuit[8].

Le transfert inter émetteur permet au client d'un EME donné de transférer de l'argent sur le compte d'un client d'un autre EME. Ce type de transfert est rendu possible grâce l'interopérabilité entre réseaux de télécommunications des différents émetteurs de monnaie électronique (EME). Le retrait du montant envoyé se fait obligatoire auprès d'un distributeur agréé de l'EME expéditeur[9].

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[7] Les parts de marché ici sont estimées à partir des nombres de clients de chaque offreur de service comptabilisés en fin 2019.

[8] Par exemple la société OFMM tarifie 50 F CFA par transfert quel que soit le montant à transférer.

[9] Un tel service chez OFMM est BEKA TRANSFERT (*qui veut dire en français le transfert pour tous*). Les frais de transfert pour ce service varient entre 60 F CFA et 5.700 F CFA pour des montants de transfert compris entre 5 F CFA et 200.000 F CFA.

Le transfert intra région ou transfert inter Etat permet à un client d'un EME d'un pays donné de transférer l'argent sur le compte mobile money d'un autre client résidant dans un autre pays de la sous-région. Un tel transfert n'est possible que s'il y a interopérabilité entre les réseaux de télécommunications des deux pays[10].

Les achats de crédit téléphonique/forfait Internet

Les services d'achats de crédit/forfait Internet permettent à l'abonné aux services de mobile money d'acheter des crédits de recharges téléphoniques ou de forfaits d'Internet à partir du montant disponible dans son compte mobile money. Il peut soit alimenter son propre numéro d'appel soit celui d'une tierce personne utilisant le même réseau de télécommunications que lui. Les achats de crédits ou de forfaits à partir du compte mobile money ne nécessite aucun frais supplémentaire.

Les paiements marchands

Le mobile money rend possible le règlement de diverses transactions commerciales. Ces transactions peuvent être des achats de divers biens et services tels que : le règlement des factures d'eau et d'électricité, les réabonnements TV, les frais de scolarité, les billets de concert ou d'autres activités culturelles et sportives. Ces divers paiements marchands n'exigent aucun autre frais supplémentaire en plus du montant toutes taxes comprises du bien ou du service acheté.

Les services financiers

Les services financiers via les comptes de mobile money sont rendus possibles grâce à l'établissement d'accords de partenariat entre les entreprises émettrices de monnaie électronique (EME) et des institutions financières bancaires et de microfinance. Ces partenariats permettent aux détenteurs de comptes de mobile money d'accéder sans frais supplémentaire aux différents services que peuvent proposer les institutions financières classiques tels que : les opérations d'épargne, de prêt, de consultation de solde de compte bancaire, de virements entre compte mobile money et compte bancaire.... Toutes ces opérations sont exécutées à partir du téléphone portable du client.

Ces services de transfert d'argent mobile ou mobile money sont accessibles avec (mode online) ou sans connexion Internet (mode hors ligne). Son fonctionnement avec connexion Internet passe par l''utilisation d'une

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[10] Dans le cas de la société OFMM, le transfert intra région peut se faire entre le Mali, la Côte d'Ivoire et le Sénégal. Il est important de noter que dans chacun de ces pays opère l'opérateur de réseaux mobiles de télécommunications ORANGE. Le montant maximal de transfert autorisé pour le service de transfert intra région est de 1.000.000 F CFA. Les frais de prestations varient entre 1.000 F CFA et 9.000 F CFA.

application mobile que les utilisateurs installent sur leurs smartphones. Par le truchement de cette application, ils peuvent accéder à tous les services de transferts d'argent mobile disponibles.

Son fonctionnement sans Internet s'appuie sur les réseaux de télécommunication mobile. A partir de son téléphone portable, le client de l'EME peut exécuter tous ses services en mode hors ligne en utilisant simplement l'interface mise à sa disposition par le réseau mobile de télécommunications qui assure l'ubiquité des services de mobile money proposés par l'EME.

1.3.1. La demande de mobile money

Ce côté du marché de transfert d'argent mobile au Mali est occupé principalement par les ménages c'est-à-dire des consommateurs individuels dudit service. Ces derniers[11] accèdent aux services proposés par les établissements émetteurs de monnaie électronique via leurs téléphones portables après avoir souscrit auprès d'eux.

Le service mobile money enregistrait en fin 2019 un taux de pénétration de 35 % au Mali (AMRTP, 2020). A la même date, les comptes mobiles money actifs étaient estimés à 7 026 447 clients. Ce chiffre représentait une hausse de près de 13 % par rapport à l'année 2018 qui enregistrait 6 226 371 clients. Il est à noter que depuis le lancement de ce service au Mali en 2010 jusqu'en 2019, l'évolution de la demande en termes de clients est dynamique. Cet état de fait ressort du graphique présenté ci-dessous. Sur le graphique nous notons que les taux de croissance ont été sur la période 2014-2019 supérieurs à 12% sauf pour l'année 2018 pour laquelle le taux de croissance est estimé à 7,27%. La croissance record de la demande du service de mobile money pour la période est enregistrée en 2015 avec un accroissement estimé à 70,49 %.

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[11] L'ouverture d'un compte Orange Money est gratuite, elle se fait chez les distributeurs agrées et distribuant le service Orange Money.

Figure 1: Représentation graphique de la dynamique de la demande de service de mobile money
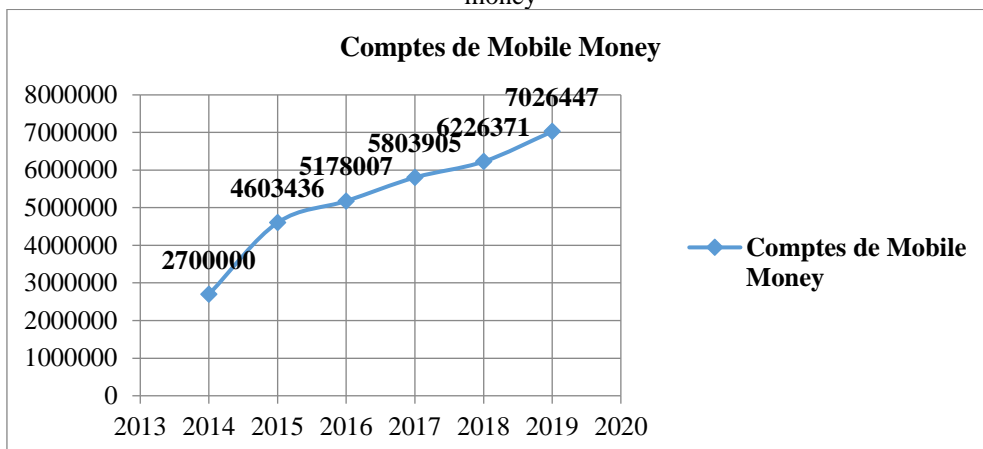
Source : rapport d'activité 2019 de l'AMRTP.

Le volume des transactions financières à savoir les opérations de retrait, de transfert et de paiement via les plateformes mobiles money (Orange money et Moov money) ont atteint en fin 2019 un montant record de 103,045 milliards de F CFA. Ce montant représente une hausse de 142% par rapport au volume de 2018 estimé à 42,496 milliards de F CFA. En termes de chiffres d'affaire des opérateurs, le marché du mobile money représente 16 fois plus que le marché de la voix et 3 fois plus que celui de l'Internet mobile (AMRTP, 2020). Les transactions financières sont dominées par les opérations de retrait de cash soit 82% du volume total. Les opérations de paiement via les plateformes mobiles money représentent 12% du total des transactions financières réalisé en 2019 au Mali. Et les opérations de transferts représentent 6 % du volume total des transactions financières.

2.   Données et Méthodologie

Cette section abordera succinctement la source des données et la méthodologie adoptée.

2.1.   Source de Données

Les données utilisées dans cette recherche proviennent de l'enquête menée en octobre 2020 par le Groupe de Recherche en Économie Solidaire et Industrielle (GRESI). Le GRESI a utilisé une méthode d'échantillonnage et de collecte de données très rigoureuse. Pour ce faire, une stratification géographique a été utilisée pour scinder le Mali en cinq zones géographiques distinctes. Ces (05) cinq zones géographiques distinctes sont les suivantes : l'Ouest (Kayes et Koulikoro), le Sud (Sikasso), le Centre (Ségou et Mopti), le Nord-Est (Tombouctou, Gao et Kidal) et enfin le District de Bamako. Ainsi,

les données sont exclusivement collectées dans six chefs-lieux de régions (Kayes, Koulikoro, Ségou, Sikasso, Mopti et Tombouctou) et le district de Bamako, soit huit (08) localités en tout. Pour des raisons de sécurité, les chefs-lieux de région de Gao, de Kidal, de Ménaka et de Taoudéni n'ont pas fait l'objet de collecte de données.

Après cette stratification géographique, deux critères non exclusifs furent utilisés pour le choix des chefs-lieux d'enquêtes. Pour le premier critère, il est retenu le taux de pénétration d'Internet[12]. Ainsi, en l'absence de taux de pénétration distincts pour Internet mobile et Internet fixe, il a été fait recours au taux de pénétration d'Internet (au sens large) des différentes régions[13] et disponibles dans le rapport de l'Enquête Modulaire et Permanente auprès des Ménages (EMOP) réalisée en 2019 (INSTAT, 2019). Toutefois, dans le rapport d'activités 2018 de l'Autorité Malienne de Régulation des Télécommunications et Postes /TIC (AMRTP/TIC), il est signalé que le taux de pénétration national d'Internet mobile représente 95% du taux global de pénétration de l'Internet (fixe et mobile) (AMRTP, 2018).

Le second critère de choix de la région abritant le chef-lieu d'enquête est la taille des populations des localités concernées[14]. Ainsi, il est choisi automatiquement dans toutes les zones géographiques, la région classée première démographiquement en 2009. Si les chefs-lieux de région démographiquement peuplés présentent aussi les taux de pénétration d'Internet les plus élevés nous n'avons plus ajouté d'autres régions. Par contre, dans les zones géographiques où le chef-lieu est démographiquement peuplé enregistre le taux de pénétration le plus faible, nous avons ajouté le chef-lieu de région qui enregistre le taux de pénétration d'Internet le plus élevé de la zone géographique.

Au regard, de l'objectif du présent papier qui consiste à analyser les déterminants du mobile money par les utilisateurs d'Internet mobile au Mali. Il a été tiré dans la base de données du GRESI constituée des utilisateurs et des non utilisateurs d'Internet mobile, un effectif de 1739 individus ayant fait usage d'Internet mobile pour constituer la base de cette étude Les variables retenues sont relatives aux facteurs sociodémographiques (genre ; âge ; statut matrimonial ; milieu de résidence ; statut professionnel ; niveau d'études, le

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[12] Ce vocable englobe la pénétration de l'Internet au sens large c'est-à-dire l'Internet mobile et l'Internet fixe. Il est à noter que les statistiques de l'INSTAT n'établissent (en tout cas jusqu'en fin 2019) pas des taux de pénétration distincts pour chacun des deux (02) types d'accès à Internet.

[13] Nous signalons que le taux de pénétration de l'Internet n'est pas disponible aussi au niveau chefs-lieux de régions. Nous avions utilisé le taux de pénétration au niveau région, soit *P* ce taux.

[14] Les statistiques relatives aux différentes aux chefs-lieux de régions sont issues du RGPH 2009.

revenu mensuel), aux compétences en Informatique (formation en informatique), à l'utilisation des services de transferts mobiles via l'Internet mobile et aux tarifs de connexion à Internet mobile (Penard, Mukoko, Poussing, & Tamokwe, 2013 ; Cissé & Keita, 2020).

2.2.   Méthodologie adoptée

Le recours à un modèle de régression linéaire simple ou multiple est inapproprié lorsque la variable dépendante est qualitative, car défaillant. Dans ce cas, l'identification des facteurs expliquant l'usage du mobile money par les utilisateurs d'Internet mobile va nécessiter le recours à un modèle plus adéquat. Ainsi, en se basant sur les caractéristiques de la variable dépendante (nature : qualitative et modalités : deux), les modèles binaires paraissent les plus appropriés. En effet, dans ces modèles les variables dépendantes qualitatives binaires traduisent la présence ou l'absence d'un évènement probabiliste (Keita, 2015).

Dans la pratique, deux types de modèle sont généralement utilisés, *les modèles Probit et Logit*. En effet, la fonction de répartition de l'erreur du modèle Probit suit une loi normale centrée réduite et celle du modèle Logit suit une loi de type logistique (Bourbonnais, 2018). Ainsi, nous pouvons déduire, d'une part, que l'une des différences entre ces deux modèles se situe au niveau de leur fonction de répartition et d'autre part, au niveau de leurs variances des écarts aléatoires. La variance des écarts aléatoires du modèle Probit normalisé est l'unité (**1**) alors que celle du Logit est $\boldsymbol{\pi^2/3}$ (Doucouré, 2015).

Dans cette recherche, le choix du modèle s'est porté sur le modèle Logit qui est un modèle de régression binomiale. Ce choix se justifie par le fait que le modèle Logit offre l'avantage à plusieurs alternatives d'interprétations (notamment les signes des coefficients, les effets marginaux et les odds ratios) des résultats. Aussi, il permet d'attribuer aux événements « extrêmes » une probabilité plus forte que la distribution normale (Hurlin, 2003)**.**

Dans cette recherche, on souhaite identifier les facteurs expliquant l'usage du mobile money par les utilisateurs d'Internet mobile au Mali. Pour cela, supposons qu'un individu i (avec $i = 1,2, ... I$) retire une utilité pour ses choix j (avec $j = 1,2, ... J$) pris individuellement. Cette utilité notée U_{ij} se subdivise en deux parties : une partie déterministe (V_{ij}) qui est fonction des différentes variables observables et une seconde partie appelée le terme aléatoire (le vecteur ε_{ij}) qui est fonction des facteurs inobservables susceptibles d'influencer la décision finale de l'individu.

Ainsi, la fonction d'utilité s'écrit :

$$U_{ij} = V_{ij} + \varepsilon_{ij} \qquad (1)$$

La règle de décisions pour chacun des i individus est de sélectionner l'alternative j qui maximise sa fonction d'utilité U_{ij}. Pour cela, on construit une variable binaire (Y_i) qui prend 1 si l'individu utilise le mobile money via l'Internet mobile et 0 sinon. Ainsi, dans tout ce qui suit, Y_i sera codée de la manière suivante :

$$y_i = \begin{cases} 1 \text{ si l'individu i utilise du mobile money via l'Internet mobile} \\ 0 \text{ sinon} \end{cases}$$

$$(2)$$

Sous les conditions de maximisation des utilités individuelles en présence d'un choix binaire, Mcfadden (1973) montre que :

$$P(Y_i = 1) = P_i = \frac{exp\,(V_i)}{1+exp\,(V_i)} \text{ et } P(Y_i = 0) = (1 - P_i) = \frac{1}{1+exp\,(V_i)}$$

$$(3)$$

P_i : désigne la probabilité d'utiliser le mobile money via l'Internet mobile en fonction d'un vecteur de variables explicatives X_i : $V_i = \beta'X_i$

β': désigne le vecteur constant des paramètres à déterminer. Ainsi, l'estimation s'effectue en maximisant la fonction de vraisemblance L :

$$L\,(Y_i, X_i, \beta) = \prod_{i=1}^{n} \left[\frac{1}{1 + exp\,(\beta'X_i)}\right]^{1-Y_i} \left[\frac{exp\,(\beta'X_i)}{1 + exp\,(\beta'X_i)}\right]^{Y_i}$$

3. Présentation et discussion des principaux résultats de l'estimation

Cette rubrique présente dans un premier temps les principaux résultats issus de l'estimation du modèle utilisé. Puis suivra la discussion de ces résultats dans un point distinct.

3.1. Présentation des principaux résultats issus de l'estimation

Le tableau 1 ci-dessous présente les résultats de l'estimation économétrique du modèle Logit de l'usage du mobile money au Mali par les utilisateurs d'Internet mobile. Il est subdivisé en quatre (04) colonnes: colonne des variables (faisant ressortir les noms des variables utilisées dans l'estimation); colonne des coefficients (donnant une idée de la sensibilité des variables exogènes sur la variable dépendante) ; colonne des effets marginaux et colonne des P-Value (donnant une idée du degré de significativité des variables estimées aux différents seuils).

Ainsi, les résultats de cette estimation montrent les facteurs explicatifs de l'usage du mobile money par les utilisateurs d'Internet mobile au Mali. Les variables genre et nombre d'enfants ne sont pas significatives. Par contre, les

variables âge, niveau d'étude, situation matrimoniale, zone de résidence et la profession ont au moins une modalité significative.

Tableau 1: Résultats de la régression du modèle Logit

Variables	Coefficient	Effet marginal (dy/dx)	P-Value (P>|Z|)
Genre (Homme)	0,123	0,023	0,323
Âge			
15-35 ans	-0,271*	-0,051	0,072
36-45 ans	0,007	0,001	0,965
46 ans et plus (réf.)			
Niveau d'étude			
Aucun	-0,607***	-0,106	0,001
Primaire	0,093	0,018	0,617
Secondaire	-0,293*	-0,054	0,070
Supérieur (réf.)			
Nombre d'enfant	0,0403	0,008	0,209
Situation matrimoniale			
Célibataire	-1,718***	-0,316	0,000
Marié (e)	-1,396***	-0,258	0,002
Veuf (ve)	-1,183***	-0,162	0,003
Divorcé (e) (réf.)			
Zone de résidence (Urbaine)	1,084***	0,166	0,000
Profession			
Fonctionnaire	0,268	0,053	0,189
Ouvrier	1,345***	0,304	0,000
Étudiant	-0,139	-0,030	0,485
Entrepreneur	0,689***	0,148	0,009
Commerçant	0,882***	0,188	0,000
Agriculteur	1,545***	0,361	0,003
Autres (réf.)			
Revenu	0,000002***	0,0000004	0,002
Formation en Informatique (oui)	0,923***	0,173	0,000
Tarif de l'Internet mobile (Cher)	-0,412***	-0,080	0,001
Constante	-1,368**		0,012
Nombre d'observation	1739		
Log likelihood	-904,32002		
Pseudo R²	0,1324		
LR chi2 (20)	276,06		

Source : Construction des auteurs
Note : ***, **,* et réf. désignent respectivement la significativité aux seuils de 1%, 5%, 10% et la modalité de référence.

3.2.   Discussion des principaux résultats

Comme déjà signalé supra que la présente étude est inédite dans le sens où elle analyse les principaux déterminants de l'usage du mobile money par les utilisateurs d'Internet mobile. Dans la suite de cette section nous allons situer les résultats obtenus par rapport aux usages faits d'Internet mobile par les utilisateurs d'Internet mobile d'une part et d'autre part les situer par rapport aux liens entre développement des usages du mobile money et développement des réseaux de téléphonie mobile.

Les résultats de la présente recherche montrent que les principales variables socioéconomiques expliquent significativement l'usage du mobile money par les utilisateurs d'Internet mobile. Spécifiquement la probabilité d'usage du mobile money baisse de 5,1% quand les utilisateurs d'Internet mobile sont âgés de 15 à 35 ans. Par contre la probabilité de l'usage du mobile money augmente de 0,1% quand l'âge de l'utilisateur d'Internet mobile est compris entre 35 et 45 ans. Ces résultats permettent de soutenir que les internautes de cette tranche d'âge sont plus succeptibles d'utiliser le mobile money via Internet mobile que les plus jeunes. Une mise en perspective de ces trouvailles avec celles des études antérieures surtout celles relatives à l'usage d'Internet mobile permet de soutenir que les jeunes sont plus enclins à utiliser l'Internet mobile pour des fins de loisirs et de divertissements. Tandis que les internautes plus âgés l'utiilisent pour s'informer, pour communiquer et pour réaliser des activités de e-commerce. Ces résultats avaient été confirmés par les auteurs suivants : Ruzgar (2005) ; Simsim (2011) ; Penard, et al. (2013) et Martínez-Domínguez & Mora-Rivera (2020).

Pour ce qui concerne le niveau d'étude, les résultats vont dans le sens des études antérieures faites sur les usages de l'Internet mobile. Ces résultats soutenaient que le niveau d'usage d 'Internet est corélé positivement avec le niveau d'études (Zillien & Hargittai 2009) ; (Milek, Stork, & Gillwald, 2011) ; (Quarshie & Ami-Narh, 2012) et (Cissé & Keita, 2020). Les résultats obtenus dans cette étude vont dans ce sens aussi pour ce qui concerne l'usage du mobile money via l'Internet mobile. Pour preuve, l'effet marginal des utilisateurs d'Internet mobile n'ayant aucun niveau d'étude est de $-0,106$. Ce qui laisse entendre que pour cette catégorie d'utilisateurs, la probabilité d'utiliser le mobile money via Internet mobile baisse de 10,6%. Alors que cette même probalité d'usage du mobile money ne baisse que de 5,4% pour ceux qui ont un niveau d'étude secondaire soit près de deux (02) fois moins. Incontestablement, l'usage du mobile money via Internet mobile augmente quand le niveau d'étude augmente aussi.

Les résultats en lien avec le statut matrimonial mettent en lumière que la probabilité de non utilisation du mobile money par les utlisateurs d'Internet mobile est la plus forte pour les utilisateurs célibataires qui ont un effet marginal estimé à $-0,316$. Tandis que la probabilité d'usage baisse seulement

de 16, % parmi les veufs soit la moitié de la probabilité estimée pour les célibataires. Une confrontation de ces résultats à ceux des études antérieures permet de mettre en exergue l'effet réseau confirmé dans Zillien & Hargittai (2009) et Penard, et al. (2013). Cet effet de réseau doit sûrement être à l'œuvre dans le cas aussi des utilisateurs d'Internet mobile célibataire plus que chez les autres utilisateurs de la même catégorie. Ces résultats soustendent que ces derniers n'entretiennent pas assez de réseaux de transfert, d'achat et de vente avec leur entourage, à l'international et dans la zone rurale.

La zone de résidence influence positivement et très significativement la chance d'utiliser le mobile money via Internet mobile. Nos résultats montrent que la probabilité d'usage du mobile money via Internet mobile augmente de 16,6% quand l'utilisateur d'Internet vit en milieu urbain. Une telle probabilité d'usage du mobile money via Internet mobile dans le cas précis du Mali peut être expliquée par l'accès aux technologies et à la centralisation de la plupart des services de transferts en zone urbaine qu'en zone rurale. Au Mali selon le rapport du groupe de recherche en économie solidaire et industrielle (GRESI) le taux d'adoption d'Internet mobile en milieu rural était estimé en fin 2020 à 15% (GRESI, 2021) contre 85% en milieu urbain. Une autre explication plausible de ce résultat réside aussi dans le fait que le milieu rural malien est beaucoup plus pauvre que le milieu urbain. L'argument en faveur d'une telle assertion est donné par l'Institut National de la Statistique (INSTAT) du Mali, en mai 2020 cet institut a estimé l'incidence de la pauvreté en milieu rural à 52% de la population pendant que celle du milieu urbain était estimée à 30,2% (INSTAT , 2020). Car le lien entre revenu et usage du mobile money est formellement établi dans la présente étude. Même si la probabilité d'usage parmi les utilisateurs d'Internet mobile disposant de revenu est faible. Ce résultat peut être mis en perspective avec ceux obtenus par Zillien et Hargittai (2009) dans le cas de l'Allemagne. Les auteurs ont montré que les internautes présentant un statut élevé font des activités en lignes améliorant le capital humain ce qui n'est pas le cas des utilisateurs relevant du bas statut.

Les résultats montrent que toutes les professions retenues dans la présente étude (ouvrier, entrepreneur, commerçant, agriculteur et fonctionnaire) contribuent positivement et significativement à la probabilité d'usage du mobile money via Internet mobile au Mali. Leurs contributions atteignent le maximum dans le cas des agriculteurs avec une probabilité d'usage qui atteint 36,1% pour ces derniers. Ce résultat tire toute sa légitimité dans le cas du Mali par le fait que l'usage du mobile money via Internet mobile est considéré comme un moyen rapide et efficace par la plupart des ouvriers, entrepreneurs, commerçants et agriculteurs maliens pour l'exécution de leurs opérations de retrait ou de dépôts de cash. Ce résultat sur le plan de l'usage de l'Internet va dans le même sens que Quarshie & Ami-Narh (2012). Ces deux

auteurs ont soutenu que pour les travailleurs ghanéens 6,35 % utilisent fréquemment l'Internet dans le commerce.

Les résultats indiquent aussi que les individus ayant fait une formation en informatique voient leur probabilité d'usage du mobile money augmenter de 17,3% par rapport à ceux qui n'ont pas fait de formation. Le lien positif entre compétences en informatique et usages de l'Internet a été établi aussi dans Pénard & Poussing, (2010) et Penard, et al, (2013).

Kongaut et Bohlin (2016) signalaient que les niveaux des tarifs des services des technologies de l'information et de la communication (TIC) jouent un rôle capital dans leurs processus d'adoption et d'usage dans le cas de la Suède. Dans les études antérieures visant les déterminants de l'adoption et des usages des TIC il a été toujours démontré qu'un tarif élevé fait baisser la probabilité d'adoption et d'usage des TIC. Par exemple, Cissé et Kéita (2020) ont montré dans un papier visant à analyser les principaux déterminants de l'adoption de l'Internet mobile par les consommateurs maliens que la probabilité d'adoption dudit service baissait de 64,5% quand le tarif d'Internet mobile est jugé cher par les utilisateurs potentiels dudit service. La présente recherche qui vise à analyser les principaux déterminants de l'usage du mobile money par les utilisateurs de l'Internet mobile au Mali a confirmé une telle tendance quant aux liens entre cherté du prix et probabilité d'usage. Les résultats montrent que dans le cas d'espèce la probabilité d'usage du mobile par les utilisateurs d'Internet mobile au Mali baisse de 8% quand les tarifs sont jugés élevés par les usagers d'Internet mobile.

La discussion présentée supra a permis de situer nos résultats par rapport aux résultats d'études antérieures orientées vers les usages de l'Internet mobile en Afrique et dans le reste du monde. Force est de constater que nos résultats ne pouvaient être situés spécifiquement par rapport à l'usage du mobile money via Internet mobile. La principale explication à cette situation réside dans le fait que l'usage du mobile money via Internet mobile est un usage très récent. Cela explique grandement la rareté de papiers spécifiques sur la problématique soulevée dans la présente étude. Nonobstant cette difficulté, nos résultats ont pu être discutés. Et il ressort de manière claire des résultats obtenus que, l'usage du mobile money via Internet mobile est expliqué significativement par les mêmes principaux déterminants pouvant expliquer habituellement les usages des services des technologies de l'Information et de la communication (TIC) dont la proue est occupée par l'Internet.

Conclusion

L'objectif général de cet article était d'analyser les principaux déterminants de l'utilisation des services de transfert d'argent mobile par les

utilisateurs maliens d'Internet mobile. Pour ce faire, la recherche a implémenté le modèle Logit qui est un modèle de régression binomiale.

Les résultats de la présente étude soutiennent que l'usage des services de transfert d'argent mobile (mobile money) par les utilisateurs d'Internet mobile au Mali est significativement expliqué par les principaux déterminants socioéconomiques et professionnels d'une part et les compétences en informatique et TIC d'autre part. Spécifiquement, les résultats dégagent que la probabilité d'usage du mobile money via Internet mobile au Mali augmente quand le niveau d'étude des utilisateurs augmente. En plus du niveau d'étude, le lieu de résidence explique aussi la probabilité d'usage dudit service. Les résultats soutiennent que la probabilité d'usage du mobile money augmente de 16,6% auprès des utilisateurs résidant en milieu urbain. L'usage du mobile money est aussi expliqué par le statut professionnel. La probabilité d'usage à tendance a augmenté auprès de tous types de travailleurs jusqu'à atteindre 36,1% si les utilisateurs sont des agriculteurs et 30,4% pour les ouvriers. Ces deux groupes de travailleurs sont les travailleurs les moins inclus financièrement au Mali. Les tarifs des services de mobile money aussi font partie des principaux déterminants qui expliquent son usage dans le cas du Mali avec une probabilité d'usage qui baisse de 8% quand les utilisateurs potentiels trouvent que les prix des services sont élevés.

Les résultats de la présente étude montrent que les principaux déterminants de l'usage des services de mobile money sont quasiment identiques à ceux qui déterminent l'usage des services des technologies de l'information et de la communication (TIC) ayant à leur tête Internet. Ils montrent aussi que l'usage du mobile money via l'Internet mobile présente un réel potentiel dans un pays comme le Mali surtout auprès des agriculteurs et des ouvriers. Tout en sachant que ces derniers font partie des catégories de personnes les moins incluses financièrement au Mali, une nouvelle étude dont l'objectif serait d'analyser la meilleure manière d'inclure financièrement ces exclus de l'inclusion financière par le biais du mobile money ne peut être considérée comme une opportunité salutaire à investiguer.

Usage du mobile money en situation hors ligne.

Usage du mobile money en utilisant Internet via une application web (cas de la société Orange Finances Mobile Mali)
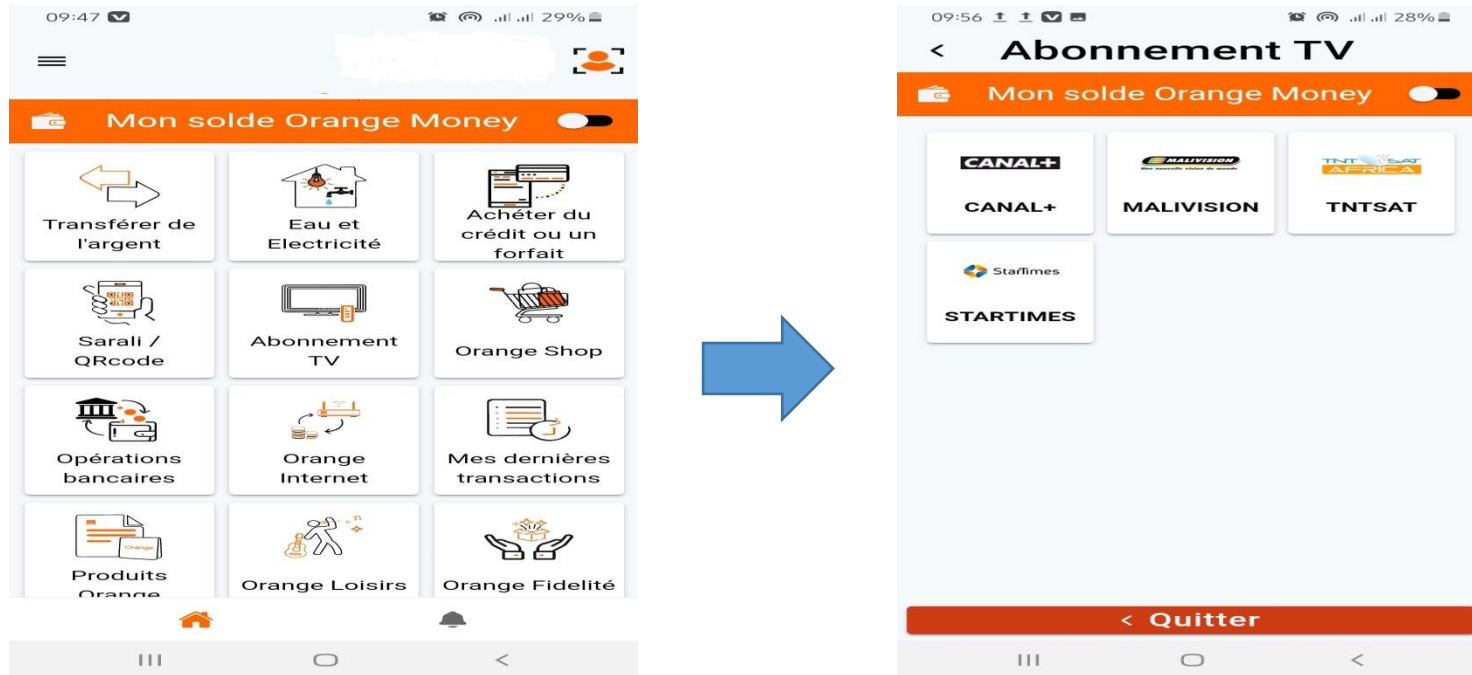
La comparaison des deux modes d'usage du mobile money permet de faire les constats suivants :

(1) Les interfaces de l'application web sont plus conviviales que celles qui s'affichent en situation hors ligne ;

(2) Pour avoir le même service (à savoir « abonnement TV »), le mode d'usage hors ligne du mobile money exige de la part du client trois (03) requêtes successives qui conduisent à l'affichage successif des trois écrans présentés ; tandis que dans le cas de l'usage en ligne le client fait deux (02) requêtes qui conduisent à l'affichage des deux

écrans présentés pour ce cas. Donc, l'usage du service mobile money via Internet est moins chronophage que celui du mode hors ligne.

(3) Les interfaces de l'usage hors ligne du mobile money sont exclusivement composées de chiffres et de lettres (moins accessibles aux analphabètes) alors que celles de l'application web accessibles en ligne sont composées de lettres et d'icônes représentatives des différents services disponibles (donc plus accessibles aux analphabètes).

(4) En plus pour lancer une requête en mode hors ligne le client est obligé de taper le code chiffré associé au service alors qu'en mode d'usage en ligne le client fait sa requête en cliquant simplement sur l'icône souhaitée.

Figure 2: Présentation des relations entre les acteurs impliqués dans la fourniture du service Orange Money.
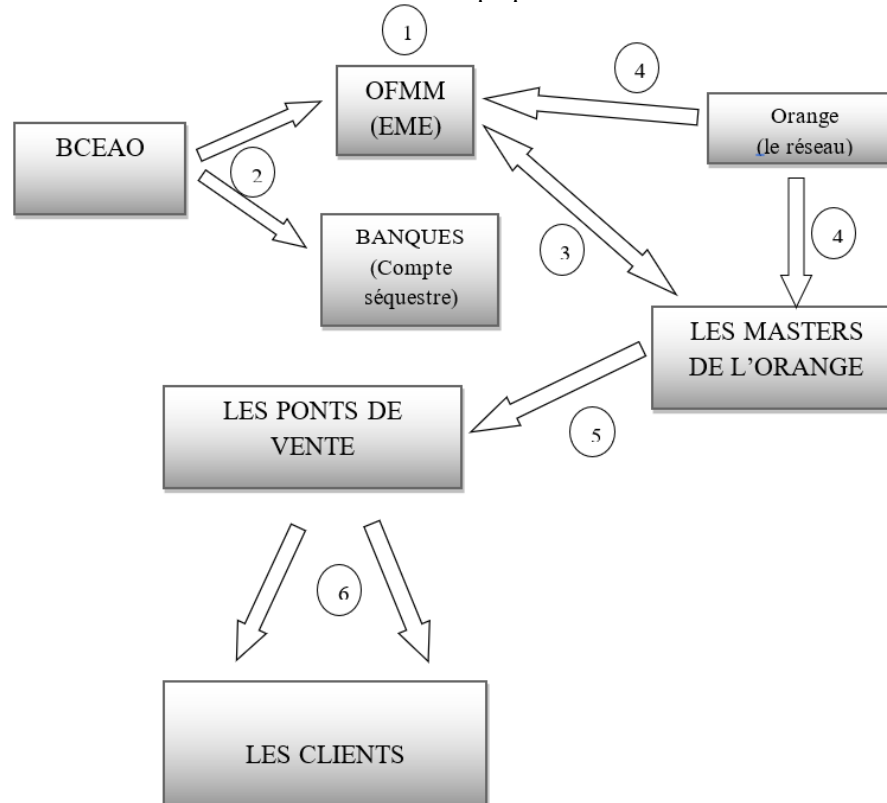
La figure 2 ci-contre présente les principaux participants à l'offre de mobile money suivant le modèle économique de la société Orange Finances Mobile Mali (OFMM). Elle détaille la chronologie d'enchainement des opérations de dépôt (cash in) et de retrait (cash out) en partant du point (1) jusqu'au point (6) où le client abonné aux services de mobile money fait ses opérations auprès des distributeurs agréés appelés points de vente sur la figure.

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Long-run Effects of Market Risk Factors on Bank Performance in the SSA Banking System

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Abstract

The study assesses the long-term effects of market risk factors on bank performance in the Sub-Saharan Africa banking system. The article identifies the most influential market risk factor and the most affected bank performance factors in the long term. It covers 40 countries with 350 commercial banks for ten years. The analysis uses dynamic fixed-effects models (ARDL-DFE).
The results demonstrated that non-performing loans are the most influencers affecting bank performance factors in the long run. Furthermore, the results show that return on average assets is the most bank performance factor affected mainly by market risks, especially the NPLs in the long run. Finally, the findings surprisingly proved mutual interactions and cointegration movements among bank market risk factors and bank performance measures in the long run. These findings can assist central banks in supervising and regulating SSA commercial banks and inspire regional bank managers in reducing market risks and sharpening long-run performance strategies through resource reallocating.

Keywords: Bank, Performance, Risk, Loans, Africa

Introduction

"Caring bank market risks is caring for bank performance."

Every business involves risks. However, bank operations are engaged in a high degree of risk-taking behavior due to lending activities. Bank operations require certain wisdom and accuracy with a certain degree of intelligent analysis as those operations deal with significant investments. Mostly, those substantial investments may not necessarily come from bank ownership. Then, the leveraged investment and the credit volume offered to the customers determine the crucial part of bank risks. These two activities make the intermediation institutions in riskier firms operating in high business risk mainly when analysed from the default rate side (Eichengreen et al., 2012).

The bank risk-taking behavior has been studied using different types of bank risks measures/metrics: market risks factors (credit growth risks, loan loss provision/reserves risks, and non-performing loans risks), operational risks (Belkhir et al., 2019). From another point of view, bank risks can be classified as systematic and unsystematic (Simpson, 2007). Other authors used business risks, country risks, or legal and environmental bank risks to categorise the bank risks (Greuning & Bratanovic, 2009; Weber, 2012). Thus, for top managers and investors, understanding the dangers of engaging in business and deciding on credit volume and investment portfolio is critical for bankers, investors, and the whole society. Moreover, mastering long-run market risk factors and their effects on bank performance is also crucial for business and risk management.

The market risks represent a part of bank risk factors. Those market risk factors can be analysed from a different point of view based on the authors' research objectives. Some researchers identified their macroeconomic and bank-specific determinants of market risks separately: non-performing loans by (Fofack & Fofack, 2005; Khemraj & Pasha, 2009; Mpofu & Nikolaidou, 2018; Saba et al., 2012; Škarica, 2014); loan loss reserves by (Isa et al., 2018; Saurina, 2009; ul Mustafa et al., 2012; Z. Wang et al., 2019); and credit growth by (Tan, 2012; Vithessonthi, 2016).

However, this study will not assess their determinant. Instead, it will use all these three variables together in the same model as risk measures to evaluate their long-run effect on bank performance. Therefore, the bank market risks will be assessed as a whole of bank systemic risks. Performance factors will be proxied by two return variables (ROAA, ROAE) and one intermediation cost (NIM). Then, on the one hand, the bank performance will be systematically assessed separately in each model (as dependent variables) to evaluate their different changes and check how they are differently affected by market risk factors.

On the other hand, the study will compare the performance coefficients, determine the most influential among all bank market risk factors, and identify the most affected among the three bank performance factors. A new comparison will be made to ensure which bank performance factor is highly affected by market risk factors in the long run. And finally, this paper intends to prove that the bank performance factors have a mutual effect for the long run. As far as we know, these long-run effects and most influential market risk factors, mutual influences of bank performance, and comparison of the most affected among factors in the banking system may not have been studied previously.

Hereafter, our five research questions were formulated: do the bank market risk measures affect all the bank performance proxies in the long run? Which is the most influential among bank market risk metrics in the long run? Which bank performance factor is mostly affected by market risk in the long run? Is there any long-run mutual effect among bank performance factors? And finally, can we confirm that caring bank market risk is caring bank performance in the long run?

Two hypotheses have been developed from the above questions: three general and three specific. The first general hypothesis is stated as follows *"The market risk measures affect bank performance differently."* From this, we deduct two particular approaches: the first one is that *"the NPLs are the most influential among bank risk-taking metrics, in the long run."* The second hypothesis is that *"the returns on assets are the most affected by NPLs among bank performance proxies, in the long run as well."*

The second general hypothesis is stated as follows: *"in the long run, there are mutual influences among bank performance proxies."* The specific theory formulated from that second general hypothesis is that: "*The effect of returns on average assets is considered to be higher than the effect of return on average equity, in the long run*." Then the third general and concluding hypothesis is formulated as follows: *"caring bank market risk factor is caring bank performance, in the long run."*

This paper is therefore organised as follows: After this introductory part, the following part is about the literature review on bank risk performance. The third part is concerned with the methodology (econometric models and statistical tests used), data source, and variables description. The fourth and last part discusses the results and the findings before the concluding portion.

1.   Literature review

Since the '90s, several banks have experienced business downturns, and different financial institutions have experienced losses due to various crises (Murphy, 2008). These crises have negatively affected the total bank credit volume and reduced the bank performance consequently (Fassin &

Gosselin, 2011; Lane & Milesi-Ferretti, 2011; Önder & Özyıldırım, 2013): In Europe, for instance, Fortis as the principal Benelux business group (Fassin & Gosselin, 2011; Nguyen & Qian, 2014); recently in 2008, in the US particularly, the lemon brother bank (Ivashina & Scharfstein, 2010; Johnson & Mamun, 2012).

But one study found that liquidity, capital adequacy, and profitability were negatively associated with credit risk but insignificant statistically (Tehulu & Olana, 2014). Other studies have analysed loan growth's effect on bank profitability: credit growth is positively associated with bank profitability (Dang, 2019), while Fahlenbranch investigates why fast loans predict poor bank performance (Fahlenbrach et al., 2018). In this point of view, the author converges with some authors who worked on bank risk and proved how credit growth increases bank risks(Amador et al., 2013; Foos et al., 2010). A study done in Vietnam showed how lending increases loan loss reserves and decreases the capital ratio the following year, while banks' profit is positively associated with loan growth for the long and short term (Dang, 2019). For Jijun Niu, rapid loan growth is correlated to higher valuations in moderate banks but not in big banks (Niu, 2016).

Jolevski found a negative correlation between return on equity, return on assets, and non-performing loans. The author concludes that the real sector's profitability affects the fluctuations of non-performing loans considerably (Jolevski, 2017). While analysing NPL determinants, Rachman concludes that bank profitability and net interest margin (NIM) are included among those determinants (Rachman et al., 2018). These findings converge with some other authors who worked on NPLs determinants. (Ghosh, 2015; Klein & Weill, 2018).

A relationship between credit growth, non-performing loans, and bank profitability was found in the Japan Banking system. The same study demonstrated a significant positive association between non-performing loans and credit growth. However, he added that they have no impact on bank profit. He concluded that the rise in bank credits intensifies NPLs and does not lead to considerable gain (Vithessonthi, 2016). Conversely, our findings find a substantial effect between NPLs and ROAA in the long run. A study on the association between the loan loss provision (LLP) and bank performance showed a positive impact of LLRs on bank profitability(ul Mustafa et al., 2012). One more study found that NPLs were negatively and significantly correlated to the ROAA and the net loans to deposit ratio (Dicevska et al., 2018). In Bangladesh commercial banks, one study proved that NIM is highly determined by the credit risk factors, especially loan loss reserve and non-performing loans (Rahman et al., 2015).

In Nigeria, determinants of bank profitability showed that non-performing loans affect negatively and significantly the bank performance

(Owoputi et al., 2014). However, in Ghana, another study demonstrated that bank performance is positively associated with credit risk proxied by loan loss (Gyamerah & Amoah, 2015). In Kenya, loan loss provision was found to be statistically significant to the profitability of Kenya commercial banks (Sawe, 2011).

3.   Methodology, variables, and data source.
3.1.   Data source and variables
3.1.1.   variable descriptions
In the initial model, we used both regional and bank-specific variables. The Macroeconomic variables are TGE, INLAT, and DGPGR. The INLAT represents inflation as a consumer price index, and DGPGR denotes the gross domestic product growth. Then, the TGE represents the total government expenses and the CPSB, the bank's credit to the private sector. All these four variables have been downloaded from the world bank database. Other remaining bank-specific variables were taken from bank Focus, Bureau Van Dijk, and are as follows: NIM represents the net interest margin. At the same time, ROAA and ROAE characterise the average assets and equity return. The LLR is the loan loss reserves/provisions, and the NPLs represent the non-performing loans. These variables used the ratios already calculated and available in the bank Focus database.

3.1.2. Data source and sample size.

Table1: Study scope and share of the sample size.
Figure 1: sample size by region
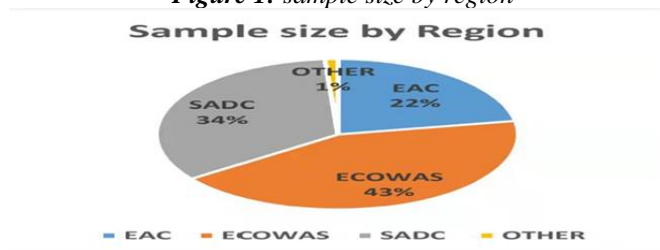
Table1: Study scope and the sample size.

	Regions	State members	States	Obs.	%
	EAC	Burundi, Kenya, Tanzania, Rwanda, Uganda and South Soudan	6	770	22.13
	ECOWAS	Beˊnin, le Burkina Faso, le Cap Vert,la Coˆ te d'Ivoire, la Gambie, le Ghana, la Guineˊe, la Guineˊe Bissau, le Libeˊria, le Mali, le Niger, le Nigeˊria, la Sierra Leone, le Seˊneˊgal et le Tgo,.	15	1,490	42.82

S S A	SADC	Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar-car, Malawi, Mauritius, Mozambique, Namibia, Sey-Chelles, South Africa, Tanzania, Zambia, and Zimbabwe	16	1,180	33.91
	Other	Ethiopia and Djibouti	3	40	1.15
		Total	40	3,480	100

Source: Author computation

Table2 is a short panel data (larger N and small T) covering ten years from 2010 to 2019, and this panel is a cross-sectional and times series combination. In this study, 40 countries are concerned as sample size, with 350 banks operating in the SSA region. The study covers ten years and uses 3480 observations from 350 banks. The region encompasses three central communities: EAC (East African Community), SADC (South African development community), and ECOWAS (economic community of West African countries). The ECOWAS region is the first with 15 states (43% of the coverage sample). The SADC is second with 16 states (34% of the total sample size). The EAC comes in the third position with six countries (22% of the sample size). The other countries represent 1.15%, with three states. The calculated ratios were downloaded from the two abovementioned sources that we organised, cured, and uploaded for model and test analysis in the Stata system. The logarithm form of data was used to avoid the inflated standard error.

3.1.3. Descriptive statistics.

Table 2 for Descriptive statistics.

Variables	Obs	Mean	Std. Dev.	Min	Max
ROAE	1952	2.286	1.492	-3.353	8.449
NPL	1340	2.113	1.335	-5.739	8.332
LLR	1441	1.568	1.328	-7.844	7.612
FD	3051	2.9	.748	1.308	10.602
ED	1902	2.082	3.024	-.919	19.012
TGE	3480	2.991	.064	2.81	3.036

Source: Author computation

Table1 summarises the variables used in this study. It shows the number of observations, the mean, the standard deviation, minimum and maximum. The three first bank-specific variables have almost the same standard deviation (1.492, 1.335, and 1.328), and even their mean does not vary too much. However, the ED has the highest standard deviation (3.024) while TGE has the lowest. This difference can be explained because the total

government expenses do not vary too much with the time in SSA countries. However, the highest standard deviation for ED is explained because the GDP growth among countries varies with the time among SSA countries.

3.2. Methodology

3.2.1. *Preliminary tests: correlation and unit-roots test.*

The preliminary correlation test among variables is conducted with the Pearson correlation matrix (Pearson, 1901). This matrix evidences the linear relationship between in the used model. The second test is unit-roots. The test is essential to check for non-stationary. There are many tests for panel data (Im et al., 2003; Levin et al., 2002; M. H. Pesaran et al., 1999). For simplicity, we performed only the IPS test (which assumes that the slopes are heterogeneous) and the ADF-Fisher test, which work well with the unbalanced panel data. Fisher-type unit-root test also includes AR parameter, panel means, and time trends. This test generates four statistics (P, Z, T, and PM) (Harris & Tzavalis, 1999).

3.2.2. *General ARDL model*

The ARDL model, called the autoregressive distributed lag model, is an OLS (ordinary least square). This model is appropriate for the time-series dataset and has different advantages. The model is broadly recognised for the cointegration analysis in the time series dataset. As in our case study, the ARDL model is mainly efficient for a small sample size. Another key benefit of this ARDL modelling method is that it does not care whether the regressors are (0) or I (1). Once again, ARDL allows a considerable number of lags. Moreover, it will expand a dynamic error correction model that organises short and long-run effects with unbiased estimates, as it considers all long-run data. The generalised form of the ARDL (p, q) model is specified as follow:

$$Y_t = \gamma o_i + \sum_{i=1}^{p} \delta i \sum_{i=1}^{p} \delta i \ Y_{t-1} + \sum_{i=0}^{q} \beta'i \sum_{i=0}^{q} \beta'i \ X_{t-1} + \varepsilon_{it} \qquad \textbf{(1)}$$

3.2.3. *ARDL-PMG, MG, and DFE models*

The ARDL method uses different techniques (pooled mean group (PMG), mean group (MG), or dynamic fixed effect (DFE). These techniques are appropriate based on the aim of this research and are suitable for a small panel data set (T<N) with 40 cross-sections and ten times series.

ARDL-PMG estimators are flexible whether variables exhibit I(0), I(1), or a mixture of both (Pesaran and Shin 1998) and can take care of such heterogeneity with PMG-DFE techniques. Additionally, this method has the power to capture the interesting variable dynamics in both the long and short-run (H. H. Pesaran & Shin, 1998).

The pooled mean group method uses the averaged and pooled coefficients of cross-sectional units. It allows the long-run effects' restriction

to be the same across all the panels. However, it permits the short-run effects across panels to be country-specific (heterogonous) as caused by differences in country-specific policies.

Contrary to the MG method allowing heterogeneity in both long and short-run relationships, the DFE (Dynamic Two-Way Fixed Effect) technique allows homogenous in the short-run and is selected based on a comparison of the best estimations results of Hausman tests between PMG, MG, and DFE (M. H. Pesaran et al., 1999; M. H. Pesaran & Smith, 1995). Furthermore, the slope, speed of adjustment, and short-run coefficient are restricted with DFE methods to exhibit homogeneity across countries.

Theen, the ARDL-DFE error correction model is re-parameterized as follow;

$$\Delta Y_{it} = \Theta_i \; [Y_{i,t-1} - \Lambda_i X_{i,t}] + \sum_{j=1}^{p-1} \xi_{ij} \sum_{j=1}^{p-1} \xi_{ij} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \beta' \sum_{j=0}^{q-1} \beta'_{ij} \Delta X_{i,t-j} + \varphi_i + \varepsilon_{it}$$

(2)

$\Theta_{i=}$ -(1-δi), represents the speed's adjustment coefficient, is expected to be negative. Λ_i is a long-run relationship vector. ECT = [$Y_{i,t-1} - \Lambda_i X_{i,t}$]; is representing the error correction term. $\xi_{ij}\xi_{ij}$ and $\beta'\beta'_{ij}$ represent the short run dynamic coefficients. From equations (2), then we can obtain DFE models specified as follows:

$$\Delta lnROAE_{it-1} = \sigma[lnROAE_{it-1} \; \lambda'_i X_{it}] + \sum_{j=1}^{P-1} \beta_{ij} (\Delta ROAE) \sum_{j=1}^{P-1} \beta_{ij} (\Delta ROAE)_{i,t-j} + \sum_{j=0}^{q-1} \delta_j \sum_{j=0}^{q-1} \delta_j (\Delta lnX)_{t-j} + \varphi\varphi_i + \varepsilon_{it}$$

(3)

$$\Delta lnROAA_{it-1} = \sigma[lnROAA_{it-1} \; \lambda'_i X_{it}] + \sum_{j=1}^{P-1} \beta_{ij} (\Delta ROAA) \sum_{j=1}^{P-1} \beta_{ij} (\Delta ROAA)_{i,tj} + \sum_{j=0}^{q-1} \delta_j \sum_{j=0}^{q-1} \delta_j (\Delta lnX)_{t-j} + \varphi\varphi_I + \varepsilon_{it}$$

(4)

$$\Delta lnNIM_{it-1} = \sigma[lnNIM_{it-1} \; \lambda'_i X_{it}] + \sum_{j=1}^{P-1} \beta_{ij} (\Delta NIM) \sum_{j=1}^{P-1} \beta_{ij} (\Delta NIM)_{i,t-j} + \sum_{j=0}^{q-1} \delta_j \sum_{j=0}^{q-1} \delta_j (\Delta lnX)_{t-j} + \varepsilon_{it}$$

(5)

4. Empirical results and discussions
4.1. Unit roots and correlation matrix results

Table 3 for unit roots results

Tests	unit-root tests			
I(0)/I(1)	Im-Pesaran-Shin test (IPS)		ADF-Fisher Test	
	At level	At first difference	At level	Atfirst difference
FD	-26.420	-10.357***	-7.1436	-7.143***
ED	1.601***	-38.480***	0.4967	0.169***
ROAE	-6.220 **	-1.816***	-15.468***	-19.614***
NPLs	-1.065	3.1463***	-5.5628	-6.628***
LLR	-2.447***	9.0540 ***	-1.449***	-13.971***
TGE	− 6.063	0.55***	-16.453***	-18.654***

| ROAA | 2.51*** | −3.68*** | -11.132*** | -22.515*** |
| NIM | -0.29 | -40.775*** | -30.326*** | -7.371*** |

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Table2 presents the unit-roots results for the variables. At level, four variables are only significant for the IPS test, while at the first difference, all variables are significant. For the ADF-Fisher test, which summarizes all the tests, the variables are significant at the first difference. The overall results imply that the series are all stationary at first difference. Nevertheless, Cointegration analysis was done through the plotted graph 1 and 3. Correlation analysis was also done to check whether there is no linear dependency among the repressors. Details on correlation analysis results can be checked in Tables 1, 2, and 3 of appendix A.

4.2.   Empirical results and discussions

First of all, all the three speeds of adjustment are negative for all three regressions. The negative sign implies and exhibits the long-run effect among studies variables. Secondly, the results showed that few bank performance variables are affected in the short-run compared to the long-run effects. Similarly, the ROAE is affected by NPLs for the short term, at a 5% significance level, ceteris paribus. Lastly, among the macroeconomic variables, only GDPGR is the one which can affect NIM and ROAA respectively in the long run at 5% and 10% significant level, ceteris paribus. In the short run, the bank risk factors affect only one bank performance variable: ROAA: The ROAA is negatively and significantly affected by CPSB, at a 1% significant level, ceteris paribus. In the same way, the ROAA is significantly and positively affected by the LLR, at a 1% significant level, ceteris paribus.

However, the bank risk factors considerably influence the bank performance factors in the long run: the NPLs are the most influential bank risk factors that significantly and positively affect the ROAA ceteris paribus, at a 1% significant level. Conversely, NPLs impact negatively and significantly the ROAE and NIM ceteris paribus, at a 1% significant level.

Table 5: *Long and Short run ARDL-DFE results*

Models		Model 1: ROAA		Model 2 : ROAE		Model 3: NIM	
Period	Vars	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Long -	ROAA	-	-	1.397*** (.400)	3.49	.062 (.125)	0.50
	ROAE	.164*** (.039)	4.17	-	-	.025 (.034)	0.74
	NIM	.173 (.274)	0.63	.233 (.563)	0.42	-	-

Run	NPL	*1.034*** (.049)*	*-6.94*	*-.732*** (.035)*	*-2.69*	*-.139** (.005)*	*2.35*
	LLR	*-.723*** (.152)*	*-4.74*	*-.633** (.347)*	*-1.82*	*.034 (.107)*	*0.37*
	CPSB	*-.227*** (.075)*	*-3.02*	*.275*** (.162)*	*1.69*	*.087** (.046)*	*1.89*
	GDP	.039* (.004)	8.18	-.517 (.849)	-0.61	-.481** (.260)	-1.85
	TGE	-.074 (.182)	-0.41	.496 (.326)	1.52	-.158 (.098)	-1.60
Short - Run	ECT	-.843*** (.063)	-13.38	-1.01*** (.052)	-19.35	-.931*** (.122)	-7.61
	ROAA	-	-	.135 (.246)	0.55	-.022 (.067)	-0.34
	ROAE	.003 (.008)	0.41	-	-	-.008 (.014)	-0.63
	NIM	-.131 (.168)	-0.78	-.038 (.450)	-0.09	-	-
	NPL	*-.296*** (.048)*	*-6.11*	*.143** (.151)*	0.95	.007 (.041)	0.19
	LLR	*.296*** (.052)*	5.64	.323 (.246)	1.31	.047 (.067)	0.70
	CPSB	.070 (.045)	1.56	-.227 (.121)	-1.88	.018 (.033)	0.54
	GDP	.039 (.004)	8.18	.140 (.650)	0.22	.185 (.175)	1.05
	TGE	.086 (.118)	0.34	-.305 (.244)	-1.25	.042 (.066)	0.63

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.
The standard errors are in between paratheses.

The LLR is the second influential bank risk factor in the long run: LLR impacts negatively and significantly the ROAE and ROAA ceteris paribus, at a 1% significant level. Moreover, the LLR effect on ROAA and ROAE is significant at short- and long-run levels. NPLs also affect negatively and significantly NIM, at a 1% significant level, ceteris paribus. The third and last bank risk factor affecting bank performance is the CPSB. The ROAA is affected negatively and significantly at 1% significant level, ceteris paribus by CPSB, while ROAE is influenced positively and significantly at 1% significant level, ceteris paribus by CPSB. NIM is impacted significantly and positively at a 5% significant level, ceteris paribus by CPSB.

Finally, there *is a long-run mutual effect among bank performance factors*: for the long-run, ROAA impacts positively and significantly (**1.397**) ROAE at a 1% significant level, ceteris paribus. Conversely, in the long run, ROAE influences positively and significantly (**.164**) ROAA at a 1% significant level, ceteris paribus.

The ARDL_DFE long-run results summary

This table summarises only the long-run results. Three models with three bank performance factors as dependent variables were developed. Each model includes the three market risks measures (see from model3 to model5). Each bank performance factor plays the role of becoming an independent variable of other bank performance variables.

Tabe 6: Long-run coefficients comparison.

Models	Model 1: ROAA		Model 2 : ROAE		Model 3: NIM	
Variables	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
NPL	1.034*** (.109)	-6.94	-.732*** (.272)	-2.69	-.139** (.081)	-1.75
LLR	-.723*** (.152)	-4.74	.633** (.347)	-1.82	.034 (.107)	0.37
CPSB	-.227*** (.075)	-3.02	.275*** (.162)	1.69	.087** (.046)	1.89

Note: ***, **, and * indicate statistical significance level at the 1%, 5%, and 10% respectively. The standard errors are in between paratheses.

Thus we can deduct some inferences from these results analysis: Firstly, in the long run, the NPLs are the most influencers of bank performance variables than LLR and CPSB. The second conclusion is that ROAA is the most affected by market risk factors and the most significant in the long run. The third deduction from these results is that even though there is a mutual influence in the long run between ROAA and ROAE, the effect of ROAA on ROAE is considerably higher than the effect of ROAE on ROAA. (1.397 against 0.164).

Then, these results confirm our three general and specific hypotheses: all market risks measures/metrics affect different bank performance proxies. That deduction permits us to make the last confirmation assuming that: *"caring bank mark risk is caring bank performance*. Furthermore, these results analysis and deductions have some additional meaning. If the enormous amount of bank returns are from ROAA, the real state/assets absorb a considerable part of the bank's capital and investments. Conversely, suppose the small amount of banks' returns are generated by equities; in that case, it implies that banks are less engaged in traditional activities, which are the primary function of the commercial banks (Valentseva, 2017). On the banks'

side, this strategy is safe on the one hand but not beneficial for SSA societies on the other hand, which primarily relies on small businesses as most developing countries (Beck et al., 2008; Du Toit & Neves, 2007). Many businesses, especially SMEs in developing countries, need more intermediaries institutions to channel the funds from those who have surplus to those in need, as documented by Enterprise survey data and publications from the World Bank (Nizaeva & Coşkun, 2018; Y. Wang, 2016).

Playing safer while relying much more on ROAA returns than ROAE returns is not a bad strategy. However, the banking system may experience a decrease in liquidity that can affect the whole banking system. Then that effect can be viral and provoke a regional financial crisis (see references in the literature review). It is better to have a balanced return system and bank activities/operations equilibrium for a sustainable banking system. That can be done through the central bank's market risk regulation and supervision. Those tools can inspire commercial banks' decision-making on credit volume reallocation.

4.2.   Effect analysis through graphs.
4.2.1. *Positive Cointegration movements in Bank risk and bank Performance Factors in SSA banking system (figure1)*
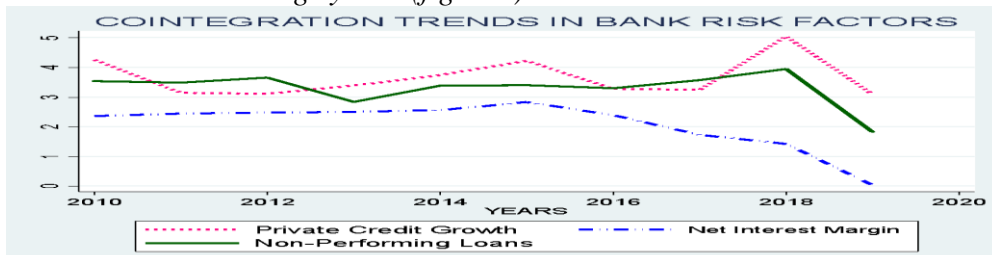

Figure1 illustrates the negative cointegration among the bank market risk metrics. From 2010, we observe that CPSB is trending downwards up to 2011 and take and stability up to 2012. In that same period, NPLs are trying to raise a little bit. From 2012, both bank market metrics take the opposite direction: CPSB rises to 2015 while NPLs decline for one year. Then it takes stability for one year, up to 2016. From 2016, they both start with opposite directions up to 2018, where they both take a decline in the same direction. However, NIM followed their rising trends quickly, from 2010 to 2015. Then took a decrease from that period up to 2017, where it considerable decline up to 2019. This figure converges with the Dynamic Fixed Effect regression results' long-run results (see tble5).

4.2.2. *Inverse correlation (NPLs & ROAE, figure2) and Cointegration movements (LLR & ROAE, figure3) and bank Performance Factors*
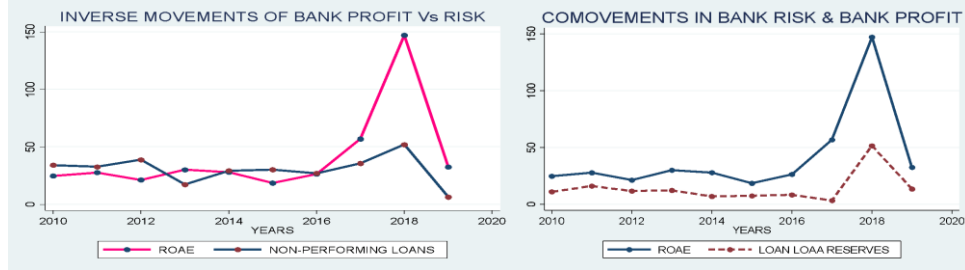

Figure3 represents a perfect and positive cointegration between ROAE and LLR. From 2010 up to 2019, the two variables exhibit perfect positive correlation movements. This figure corroborates the long-run regression results presented in the regression results (see table5). Furthermore, it justifies the bounds results obtained in the table4. Nevertheless, from figure5, we observe some weak negative trends between NIM and LLR. From 2010 to 2016, NIM trends rise while LLR trends are declining. From there, LLR takes a sharp and quick rise and declines while NIM keeps falling from 2015 up to 2019. These two variables exhibit opposite correlations.

4.3. Model robustness and post estimation.

Tests	Ho	Ha	Chi2	Results and Decision
Model 1 ROAE				
Durbin-Watson	No serial correlation	Serial correlation	d-statistic (15, 3479)	1.999202: Can not reject Ho
Breusch-Godfrey LM test	No serial correlation	Serial correlation	0.001	0.9812 Can not reject Ho
White's test	Homoskedasticity	unrestricted heteroskedasticity	3479.00	0.0000 Can not reject Ho
Cameron & Trivedi's decomposition of IM-test	Homoskedasticity	Heteroskedasticity	3479.00	0.0000 Can not reject Ho
	Additional tests	Skewness	827.52	0.0000
		Kurtosis	1.69	0.1933
		Total	4308.21	0.0000
Model 2 ROAA				
Durbin-Watson	No serial correlation	Serial correlation	d-statistic (16, 3479)	2.00375: Can not reject Ho
Breusch-Godfrey LM test	No serial correlation	Serial correlation	0.012	0.9118 Cannot reject Ho

White's test	Homoskedasticity	unrestricted heteroskedasticity	3479.00	0.0000 Can not reject Ho
Cameron & Trivedi's decomposition of IM-test	Homoskedasticity	Heteroskedasticity	3479.00	0.0000 Can not reject Ho
	Additional tests	Skewness	522.39	0.0000
		Kurtosis	3.23	0.0723
		Total	4004.62	0.0000
Model 3 NIM				
Durbin-Watson	No serial correlation	Serial correlation	(15, 3479) =	2.001914 Can not reject Ho
Breusch-Godfrey LM test	No serial correlation	Serial correlation	0.003	0.9549 Can not reject Ho
White's test	Homoskedasticity	unrestricted heteroskedasticity	3479.00	0.0000 Can not reject Ho
Cameron & Trivedi's decomposition of IM-test	Homoskedasticity	heteroskedastic	3479.00	0.0000 Can not reject Ho
	Additional tests	Skewness	647.02	0.0000
		Kurtosis	1.42	0.2328
		Total	4127.45	0.0000

This table summarises the results of the Homoskedasticity and serial correlation tests for the three models developed in this study. The following tests were tested; Durbin-Watson's null hypothesis states no serial correlation against the alternative of serial correlation. Breusch-Godfrey LM test: the null hypothesis states no serial correlation against the alternative. White's Heteroskedasticity test and Cameron & Trivedi's decomposition of IM-test for Skewness and Kurtosis were also tested. The results showed no serial correlation in the three models, and the models are homoscedastic. These results corroborate the correlation matrix of no correlation among independent variables (see table1, 2 and 3 in appendix A).

Conclusion

The main objective was to determine the most influential market risk factor on the one hand and the most affected among bank performance proxies in the long run on the one hand.

Based on these results obtained from ARDL-DFE and discussion on results, this study confirmed hypotheses. It made three conclusions: first, market risk factors affect bank risk differently. Secondly, non-performing loans are the most influential market risk. Finally, the return on average asset is the most affected bank performance factor.

These results and conclusions are corroborated and supported by findings of non-performing loans on bank performance conducted with individual approach (Chimkono et al., 2016; Etale et al., 2016).

Policy implications:

This study offers a clear view of how the central banks from different countries can advise, supervise, and regulate banks and financial institutions by controlling market risk factors and then mitigating bankruptcy and financial crisis in the region.

Furthermore, the study can help top-level managers of local, regional, and merged banks to mitigate market risks through long-run performance strategies by adjusting and relocating their investments based on the findings presented in this study.

Further research may check the possible relationship between bank performance proxies and other categories of bank risk metrics. For instance, more analysis can check whether long-run effects exist between operational bank risk factors and bank performance proxies or systematic and unsystematic market risks metrics.

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Appendix: Matrix of correlations

Variables	ROAE	NPL	LLR	ED	FD	TGE
ROAE	1.000					
NPL	-0.238	1.000				
LLR	-0.194	0.611	1.000			
FD	-0.033	-0.039	0.037	1.000		
ED	0.020	0.085	-0.008	-0.057	1.000	
TGE	-0.105	0.135	0.104	-0.093	0.180	1.000

Variables	ROAA	NPL	LLR	ED	FD	TGE
ROAA	1.000					
NPL	0.125	1.000				
LLR	0.085	0.105	1.000			
FD	0.092	0.400	-0.060	1.000		
ED	0.119	0.337	0.071	0.043	1.000	
TGE	1.000	0.125	0.085	0.092	0.119	1.000

Variables	ROAA	NPL	LLR	ED	FD	TGE
ROAA	1.000					
NPL	0.125	1.000				
LLR	0.085	0.105	1.000			
FD	0.092	0.400	-0.060	1.000		
ED	0.119	0.337	0.071	0.043	1.000	
TGE	1.000	0.125	0.085	0.092	0.119	1.000

AppendixB: Components plus residuals (ROAE Vs NPLs and ROAA Vs LLR)