IMPACT OF A CASHLESS ECONOMY IN KENYA

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DECLARATION

DECLARATION

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

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This Research Project has been submitted for examination with my approval as the Supervisor.

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LIST OF SYMBOLS/ABBREVIATIONS

EFT Electronic Funds Transfer

CP Card Payments

MT Mobile Transactions

GDP Gross Domestic Product

KShs Kenyan Shillings

ABSTRACT

This study aims to look at the suitability of adopting a cashless economy on Kenya's economy. The objectives of this study are to find the short-term relationship between cashless payments in Kenya and the country's GDP and their overall long run effects. The first objective of looking at the short-term relationship is observed through a Vector Autoregressive model (VAR). The long run relationship of cashless payments and Kenya is observed through a Vector Error Correction Model (VECM) which also compliments the short-term relationships. The variables included in the VAR and VECM are card payments, mobile transactions and electronic fund transfers as independent variables and Real GDP as the dependent variable. Granger Causality was used to check on the causality between the different variables.

1 INTRODUCTION

1.1 Background Information

A cashless economy is defined as an economy where cash transactions are kept at the bare minimum or monetary transactions are mainly done through electronic means rather than physical cash. These electronic means of payments include credit cards, debit cards, ATM cards, prepaid cards, charge cards and mobile money transfer services. Digital currencies such as Bitcoin are also considered as electronic means of payments with some enterprises accepting them as payment (Umlauft, 2018).

The world has advanced greatly in terms of technology which has brought about innovation in paying systems (Tee & Ong, 2016). This has led to the introduction of different forms of electronic payments. Globalization and many economies mostly being free enterprises have also increased the adoption of new payment systems and how banks generally deal with money. Electronic payments have allowed most developed countries to adopt cashless means of payments mainly through cards (Humphrey, 2004). The Diffusion of Innovation theory (DOI) analyses the effect of cashless payments on an economy by explaining how change in payment means has been brought by innovation.

The Diffusion of Innovation *(DOI)* theory was put forward by Everett Rogers in 1962, and states that innovation is diffused to members of a social system through different adopter categories rather than it is happening simultaneously (Rogers, 1995). According to DOI, the adoption of a new idea or innovation is brought about by interaction between individuals through interpersonal networks. In this setting, diffusion is the expansion of cashless payments within an economy where consumers seek the best means of transaction while businesses seek new profit opportunities (Tee & Ong, 2016). Diffusion of cashless payments depend on how quickly the society is willing to adopt cashless transactions through different stages of innovation processes hence the consequences of the adoption of cashless payments differs in different society.

Development of new payment means have made cash not to be an optimal means of payment. Cash has been associated with many costs and risks which include printing, insurance, storage, guarding, counterfeit cash, theft and spread of contagious diseases. Despite this, cash remains the most used means of payment in the world since people are still greatly attached to notes and coins and doubt digital alternatives of payments (G4S, 2018). Cash is still favoured as a means of payment since it is more friendly in terms of usage, it is

comprehensive, more trusted since it does not depend on intermediation of third parties to use, reliable and accessible (Markus, Godfrey, Michael, & Mohammad, 2019).

Introduction of a cashless economy revolutionises the basic running of an economy through changing how trade is carried out. A cashless economy poses so many benefits which are: increased efficiency in the monetary system through simplifying payments, reduction in crime due to lack of physical cash to steal, vices such as money laundering and tax evasion are easily curbed due to the paper trail and costs of handling physical cash are reduced (Ebipanipre & Uyoyou , 2013), (Preeti & Manvi , 2017) & (Adu, 2016).

1.1.1 World profile

Diffusion of cashless systems can be seen around the world with many countries taking major steps towards going cashless. Nigeria adopted a cashless policy in 2012 where it looked forward to transforming the country into a cashless economy and it is still heading towards its full potential of being a cashless economy. (Central Bank of Nigeria, 2011). Rwanda has also set a target of going cashless by 2024 and electronic payments are now more than ever being advocated for in the country (Nuwagaba, 2014).

In 2018, less than 2 percent of payments were made via cash in Sweden which is the best example of a country that is headed towards being a cashless economy (The Riskbank of Sweden, 2019). Also, according to G4S (2018), Sweden is the only European country to show a consistent decline in cash circulation of from 2012 to 2018. In the United Kingdom, cashless payments surpassed cash payments in 2016 (G4S, 2018).

Cash Payments in South Korea accounted for only 20 percent of total payments in 2018 with the country looking forward to going cashless by putting trials on eliminating coins from money circulation (The Korea Times, 2019). Trials have been kept in place where customers would receive change of minor denominations (coins) on their prepaid cards hence eliminating the need of coins. China is also transforming its payment system since it had the highest growth in cashless payments among countries in Asia in 2017. This was brought about by the growth in mobile payments through use of QR codes and money payment applications such as We chat pay and Alipay (G4S, 2018).

As the diffusion process continues, it is evident that countries are adopting cashless payments with other countries putting measures in place that would contribute to them going cashless. Other countries have acknowledged the importance of going cashless through clear monetary

policies that promote cashless transactions, but little has been done in Kenya in terms of going cashless. (Wainaina, 2016)

1.1.2 Profile of the Kenyan Economy

Kenya is considered the financial and economic hub in East Africa. Its nominal Gross Domestic Product, (GDP), as of 2019 was at Kshs. 9,740.4 billion (Kenya National Bureau of Statistics, 2020). GDP growth over the past decade has averaged at 5.5 percent and the main sectors contributing to economic growth are Agriculture, manufacturing sector and the services sector (Kenya National Bureau of Statistics, 2020). Kenya has not been left behind in adopting electronic means of payment with cashless transactions being carried out through prepaid cards, charge cards, credits cards, debit cards and mobile payments (Kenya Financial Sectors Regulators, 2019).

Kenya leads in mobile money transfer services in Africa and is a frontier in the mobile payment sector which has been brought about by M-Pesa. In 2007, Safaricom launched M-Pesa, the first mobile money transfer service in Kenya, accessible to Safaricom users from ordinary mobile phones through their Safaricom sim cards. It has had a great expansion since its introduction. By the end of 2009 it had been nine million registered users, which was about 40% of Kenya's adult population at the time (Safaricom, 2009). The introduction of M-pesa caused a huge shift in money transfer behaviours among the Kenyan population and is tabulated in Graph 1. In 2019, Safaricom had 26 million registered users and has the biggest share (82.43%) of the mobile money transfer market (Communications Authority of Kenya, 2019).

Mobile transactions had a total value of KShs 3,984 billion in 2019 up from KShs 3,638 billion in 2018. Payment by cards is also on the rise with them having a transaction value of KShs. 1.39 trillion in 2018 up from KShs. 1.35 trillion in 2017 (Kenya Financial Sectors Regulators, 2019). The cashless transactions in Kenya have been tabulated in detail in Table 1, Table 2, Table 3 and Table 4.

In Kenya cash is still the main mode of payment. Kenya's new generation currency, which is phasing out its old currency, costs KShs. 15 billion to print which is really a huge cost on the Kenyan economy (Tanui, 2018). Economists have looked at the some of the costs of printing the new currency as avoidable especially with other means of payment being made readily available to the public. If cashless transactions were promoted to the publics, the cost of printing the new currency would have been reduced.

The diffusion process in terms of cashless payments is ongoing in Kenya as can be seen with the rise in cashless transactions. It is evident that Kenya has the qualities of becoming a cashless economy, yet it is still surprising that there has been little advocation for Kenya to become a cashless economy or even a cash lite economy.

1.2 Problem Statement

The mode of payment used in an economy should be the cheapest, most convenient and promote smooth running and growth of the economy. Cash has been argued to be expensive hence not the best mode of payment. Its costs come from transportation, security, storage and its printing (FSD Kenya ; Bankable Frontier Associates, 2012). Cashless payments could revolutionize and upgrade the basic infrastructure of commerce and how trade is carried out within an economy. They reduce transactions costs on different economic activities hence offer an advantage for consumers, businesses and the economy at large. Oyewole et al. (2013) argued that switching to cashless payments will boost commerce and economic growth in Nigeria. Omotunde et. al. (2013) found that the introduction of a cashless economy in Nigeria had given the country a boost in economy growth.

Nigeria only incorporated use of bank transfers, cheques and card payments in its cashless policy while its mobile money transfer services are not that well developed. Generally, Bank transfers, card payments and cheques have relatively low effects on the economy in developing countries (Omotunde, Tunmibi, & Afaha, 2013). This is because majority of the population in developing countries have limited access to banking services that facilitate the mentioned method of payments. Kenya has a greater potential to excel at cashless transactions due to wider usage of mobile transactions while also incorporating other means of electronic payments. So, it leads to the question, why has Kenya not transformed into a cash lite economy and started advocating for a cashless economy? Are cashless payments better for the Kenyan economy and what impact would introducing a cashless economy in Kenya have?

With the background information provided, this paper is dedicated to examining the impact of introducing a cashless economy in Kenya. The main purpose of this research would be finding out the impact of adopting a cashless economy on Kenya's economy.

1.3 Research Objectives

The general objective of this research would be to establish a relationship between a cashless economy and the Kenyan economy hence the objectives are:

i. To establish the nature of relationship between the Kenyan economy and cashless payment systems
ii. To identify the long run relationship between the cashless payment systems and the Kenyan economy.

1.4 The significance of the research:

The relationship between cashless payment systems and the Kenyan economy would help in formulation of policies especially by the Central Bank of Kenya that would ensure the growth and wellbeing of the financial sector and the economy at large. The study will also help in planning of strategies for the economy.

2 LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1 The Diffusion of innovation Theory

Everett M. Rogers developed the diffusion in innovation theory (DOI) in 1962. The theory argued how over time an idea or product gains momentum and diffuses through a population and the result is the population adopting the new idea or product. The diffusion of the idea does not happen simultaneously in the population but rather it happens in a time sequence and the population can be classified into adopter categories (Rogers, 1995). The adopter categories are categorised into: Innovators, Early adopters, Early Majority, Late Majority and Laggards. The categories show the progressive movement of the idea from its inception until it reaches the whole population.

The adoption of cashless transactions within a society simply illustrates the diffusion process through transforming of the economy to a cashless economy from a cash-based economy. The speed of adoption of the cashless economy is subject to the adopter categories. (Fox, 1987) stated that during the 1960's and 1970's, the adoption of electronic fund transfer would serve as a substitute for cheques and cash as the primary mode of payment in the United States. Today, cashless modes of payments have continued to increase and will continue to increase as the diffusion process continues (Tee & Ong, 2016).

The diffusion of innovation theory informs this study through predicting the overall growth of cashless payments in Kenya. Cashless payments have continued to grow and penetrate the country hence the new innovations in payment systems will reach widespread use in the future and slowly replace inefficient modes of payments.

2.2 Empirical Literature

According to Ajayi and Ojo (2006), a secure, affordable, and convenient mode of payment is required for the development of a strong economy. This prerequisite was supported by empirical research which found out that a cashless payment system has a positive relationship with economic growth (Newstead, 2012). Newstead's argument was based on comparing the relationship between adoption of cashless payments and GDP growth for Russia, Brazil and China. This informs this study that there might be a positive relationship between cashless payments and GDP growth in Kenya.

Omotunde et. al. (2013) also argued that a well-built payment system will have little reliance on physical cash, and this greatly boosts national economic growth. Their study utilized primary data collected in Nigeria through questionnaires. After analysis most of the respondents agreed going cashless in Nigeria would result in decrease in unemployment, reduction in cash related crime, reduction in corruption and embezzlement and increase in foreign investment.

With increased globalisation and the growth of technology countries have come up with new ways of integrating new technologies in the financial sector especially through payments. Markus et. al. (2019) argues that shifting to a cashless economy would boost the economies of developing countries by 3% and developed ones by 1%. The arrival at this argument was through the analysis of introducing cashless payments in developing countries and developed ones which included: USA, Sweden, UK, Saudi Arabia, United Arab Emirates, Australia and Singapore. The results of this study are tabulated in Graph 2.

Most developed countries of the world are moving to electronic payment means and leaving behind cash transactions and this is mainly done through card payments (Humphrey, 2004) The study arrived at the above conclusion by looking at U.S consumer payment patterns. People in developed countries are moving to electronic payments especially cards because majority of the population in developed countries have bank accounts hence making the application of ATM cards, debit cards and credit cards easier. In developed countries peoples are also encouraged to apply for credit cards as soon as they turn the majority age and build their credit base, hence increasing cashless transactions. Financial technologies (Fin tech) companies also improve cashless transactions since cashless transactions is the best way, they can offer their services.

Cashless means of payments greatly reduce business costs since records can be traced electronically so less spending on paper records and postage. Customer retention is improved cause customer details are retained electronically which makes it easier for the customers to revisit an e-commerce site because their information is already stored with the business (Hord, 2005)

As pointed out before one of the major reason cash is not one of the best method of payments is because it is a costly means. FSD and BFA (2012) assessed that there are two major ways to reduce cost of cash in Kenya. First is through reducing the movement of cash in and out of

a specified geographical area and increasing recirculation which is hard to control since inflow and outflow of money from an area is hard to predict let alone control. The second is through increasing direct electronic means of payment to reduce usage of cash. For the prevalence of a cashless economy more channels of direct electronic means of payment should be introduced throughout the economy.

Kenya is the leading in mobile money transfers. Mobile money transfers and services in Kenya are an important aspect of the country going cashless since Kenya are still growing in card payments. Mobile money services continue to deepen financial inclusion and have had a growth since the introduction of the M-pesa in 2007, which was the first mobile money transfer service in the country.

Card transactions are on the rise in Kenya, but still mobile money transactions are leading. Debit cards are still the major cards used in Kenya followed by credit cards the prepaid cards. The main threat of electronic payments is cybersecurity threats. Since electronic payments are connected through information technology, a cyber-attack on one end could result in major losses due to the interconnectedness of the payment systems and transactions. The Central Bank of Kenya has taken many steps to prevent and educate stakeholders on this risk such as the Guidance Note on Cybersecurity in 2017.

FSD (2012) argue that the major determinant of the growth of cashless transactions in Kenya are the rural areas. Penetration of current information technology in rural areas and hence technology advancement in payment systems is very low hence this will be a big determinant in moving towards a cashless economy. Rural areas fall in a special category especially when the Central Bank is coming up with monetary policies that affect money supply.

2.3 Summary of literature review

The Diffusion of Innovation theory argues that overtime digital cashless payment will diffuse into a society and gain momentum and widespread use and replace less efficient ways of making payments. Due to innovation in cashless payments in the recent past it is relevant to study the effects of fully adopting such innovation on a country.

2.4 Research gap

Existing literature on cashless systems in Kenya have only looked at the most suitable ways in which the country can go cashless (FSD Kenya ; Bankable Frontier Associates, 2012).

There is little research on the impact of fully going cashless in Kenya. This study therefore aims to look at the impact of Kenya going fully cashless.

3 METHODOLOGY

3.1 Introduction

This study aims to look the impact of adopting a cashless system in Kenya by looking at the effect of mobile transactions, card payments and electronic fund transfers on the Real Gross Domestic Product of Kenya. Values of mobile transactions, card payments and electronic fund transfers are used as a proxy for the cashless economy.

3.2 Research design

Experimental research design is most suitable in tackling the objectives to be met by this study. Causal relationships are best established by experimental research design. Experimental research design employs quantitative past data of independent and dependent variables to draw reasonable conclusions for a particular study (Ojmarrh, 2015).

3.3 Theoretical Foundation

The Diffusion of Innovation theory is the anchor of this study. The theory argues that an idea diffuses in a society overtime and gains momentum and hence ends up being adopted by the society. The idea in this case are cashless payment systems and their penetration in the Kenyan society.

3.4 Data

The data used in this research is secondary time series data. The data is quarterly data and covers a period spanning from 2009 to 2019. The data is macro data with all variables being denoted in KShs. Billions. Data for card payments, mobile payments and electronic fund transfers are obtained from The Central Bank of Kenya. Data for Kenya's real GDP is obtained from the Kenya National Bureau of Statistics.

3.5 MODEL

This study attempts to check on the suitability of a cashless economy on Kenya's economy through the short-term and long run effects. The data selected to be used is a multivariate time series and so is subject to stationarity analysis and causality analysis. The methodology will follow a vector autoregressive model whose underlying empirical equations are specified as follows:

$$RGDP_t = \alpha_1 + \alpha_{2\rho}\sum_{\rho=1}^{k} MT_t + \alpha_{3\rho}\sum_{\rho=1}^{k} CP_t + \alpha_{4\rho}\sum_{\rho=1}^{k} EFT_t + \varepsilon_t$$

$$MT_t = \alpha_1 + \alpha_{2\rho}\sum_{\rho=1}^{k} RGDP_t + \alpha_{3\rho}\sum_{\rho=1}^{k} CP_t + \alpha_{4\rho}\sum_{\rho=1}^{k} EFT_t + \varepsilon_t$$

$$CP_t = \alpha_1 + \alpha_{2\rho}\sum_{\rho=1}^{k} RGDP_t + \alpha_{3\rho}\sum_{\rho=1}^{k} MT_t + \alpha_{4\rho}\sum_{\rho=1}^{k} EFT_t + \varepsilon_t$$

$$EFT_t = \alpha_1 + \alpha_{2\rho}\sum_{\rho=1}^{k} RGDP_t + \alpha_{3\rho}\sum_{\rho=1}^{k} MT_t + \alpha_{4\rho}\sum_{\rho=1}^{k} CP_t + \varepsilon_t$$

whereby $RGDP_t$ is the real gross domestic product for Kenya at time t, *MTt* is the total value of Mobile Payments from Kenya at time t, *CPt* is the total value of card payments transaction in Kenya at time t and *EFTt* is the total value of electronic fund transfers in Kenya at time t. k is the optimal lag length recommended by Information Criteria used.

3.5.1 Lag selection

The model lag selection will be carried out through Criteria which Akaike Information Criterion (AIC), Hannan–Quinn information criterion (HQ), Schwarz information criterion (SIC) and Akaike's Final Prediction Error Criterion (FPE). The common recommended lag will be used.

3.5.2 Descriptive statistics

A short summary of the data being used will be given for the different variables through their means, variance, standard deviation, skewness and their plots.

3.5.3 Unit root test

Before running any model or analysis, the data will be subjected to stationarity or unit root test. The Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1981) unit root test will be used for the stationary analysis.

3.5.4 Causality Test

The model will employ the use of Granger causality test to check on the significant causality between the variables. Granger causality analysis helps in identifying which variables predict another variable hence allowing for checking on long run effects (Granger, 1969).

3.5.5 Cointegration Test

The model will employ the Johansen Cointegration test. The Johansen Cointegration test is done through the log likelihood functions two different models. One model contains the cointegrating equations while the other model does not contain any cointegrating equation. The lags that must be included in the model must be specified before the test is carried out.

The test is carried out subsequently with similar hypothesis in relation to the number of cointegrating relationships.

3.5.6 Vector Error Correction Model (VECM)

In case of the presence of cointegrating variables an error correction model will be used. The VECM will be modelled as follows:

$$\Delta RGDP_t = \Phi_1 + \beta_{2\rho}\sum_{\rho=1}^{k} \Delta MT_{t-\rho} + \beta_{3\rho}\sum_{\rho=1}^{k} \Delta CP_{t-\rho} + \beta_{4\rho}\sum_{\rho=1}^{k} \Delta POS_{t-\rho} + \varphi_t\acute{\varepsilon}_{t-1} + \mu_{it}$$

$$\Delta MT_t = \Phi_1 + \beta_{2\rho}\sum_{\rho=1}^{k} \Delta RGDP_{t-\rho} + \beta_{3\rho}\sum_{\rho=1}^{k} \Delta CP_{t-\rho} + \beta_{4\rho}\sum_{\rho=1}^{k} \Delta EFT_{t-\rho} + \varphi_t\acute{\varepsilon}_{t-1} + \mu_{it}$$

$$\Delta CP_t = \Phi_1 + \beta_{2\rho}\sum_{\rho=1}^{k} \Delta MT_{t-\rho} + \beta_{3\rho}\sum_{\rho=1}^{k} \Delta RGDP_{t-\rho} + \beta_{4\rho}\sum_{\rho=1}^{k} \Delta EFT_{t-\rho} + \varphi_t\acute{\varepsilon}_{t-1} + \mu_{it}$$

$$\Delta EFT_t = \Phi_1 + \beta_{2\rho}\sum_{\rho=1}^{k} \Delta MT_{t-\rho} + \beta_{3\rho}\sum_{\rho=1}^{k} \Delta CP_{t-\rho} + \beta_{4\rho}\sum_{\rho=1}^{k} \Delta RGDP_{t-\rho} + \varphi_t\acute{\varepsilon}_{t-1} + \mu_{it}$$

Where β_i are the estimated parameters, k is the ideal length of lags as used in the Johansen test. The parameter φ is the vector error correction term and is used to check for the long run equilibrium relationship of our different equations which is done on by checking the sign of the error correction term and its significance.

4 EMPIRICAL RESULTS

4.1 Descriptive Statistics

Variable	*Mean*	*Variance*	*Standard Deviation*	*Skewness*
Real GDP	980.6081	21170.84	145.502	0.2535769
Mobile Transactions	611.4235	80655.37	283.9989	0.01110327
Card Payments	108.6703	343.937	18.54554	-0.01803078
Electronic Fund Transfers	122.5295	877.9927	29.63094	0.1027577

All variables above had 44 observations. From Variances of the variables, Mobile transactions has a wider spread from its mean followed by Real GDP, Electronic Fund Transfers and Card Payments, respectively.

From the skewness most variables are symmetrical and have normal distributions since the skewness of all variables lie between -0.5 and 0.5. Real GDP, Mobile Transactions and Electronic Fund Transfers are positively skewed hence their tails are inclined to the right side of their distribution while Card Payments is negatively skewed hance has a tail inclined to the left side of its distribution.

4.2 Variable Plots

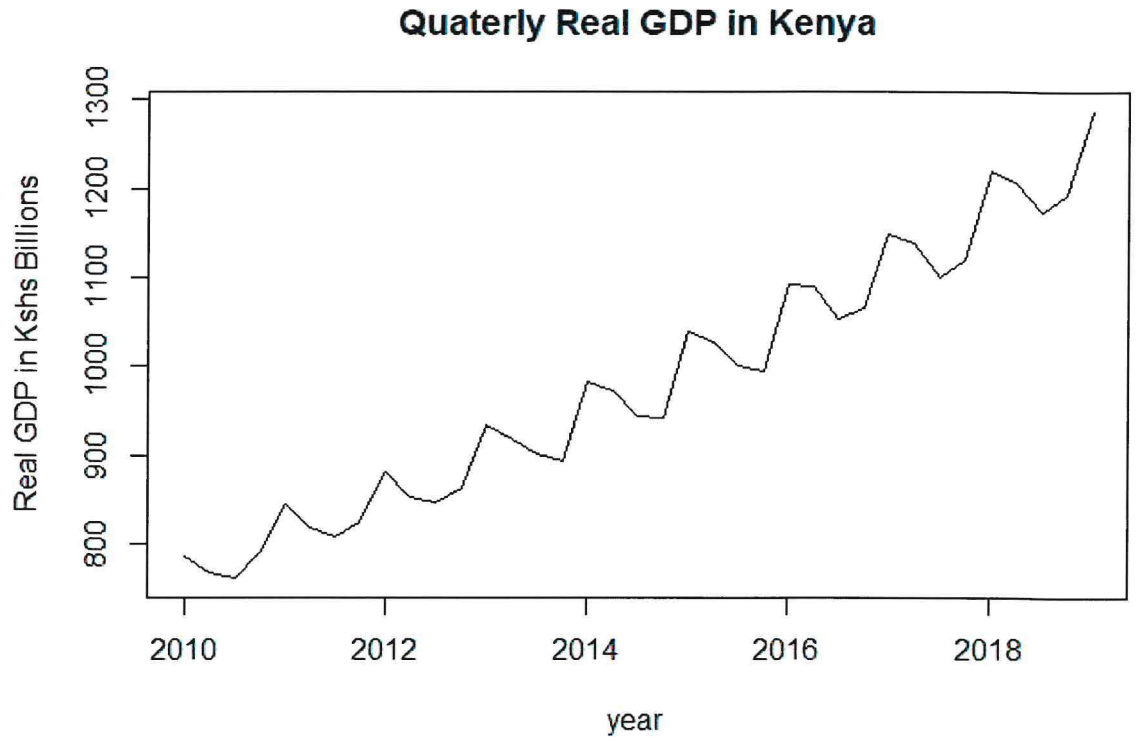


Figure 4.1

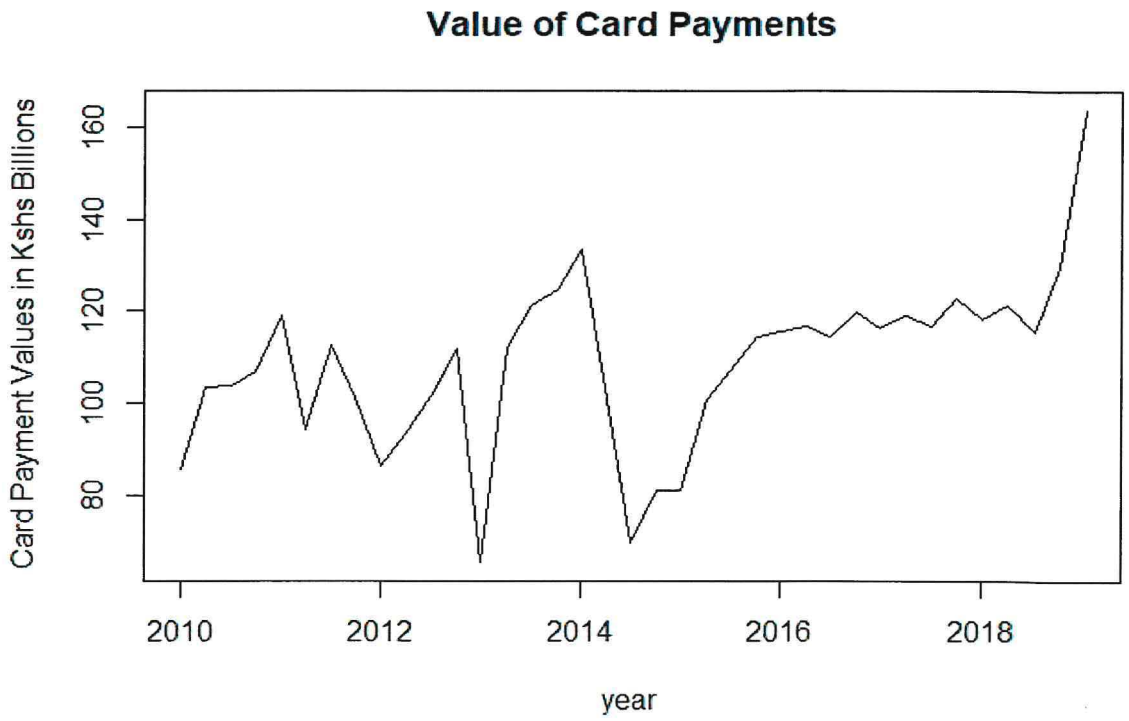


Figure 4.2

Figure 4.1 and 4.2 above show the quarterly time trend in Kenya Kenya's Real GDP and Card Payments, respectively. Kenya's Real GDP shows seasonality and has an overall trend of increasing. Card payments show no clear trend and no seasonality.

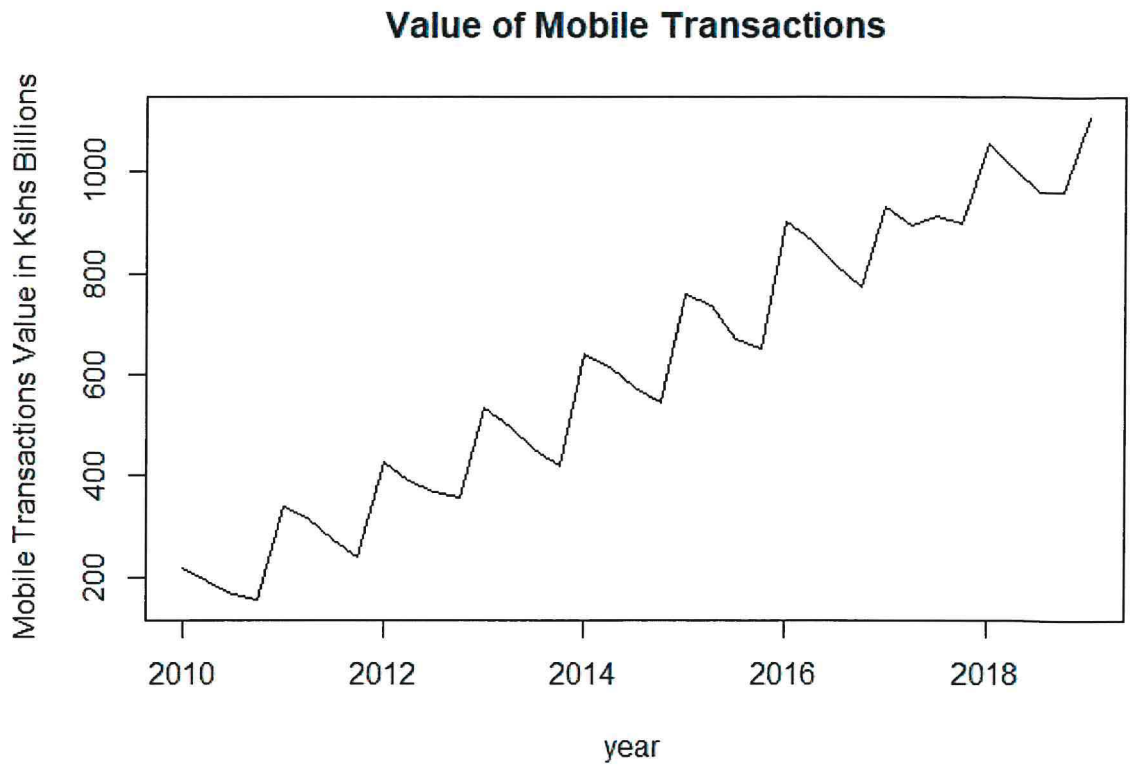


Figure 4.3

Figure 4.3 shows the quarterly time trend the value of mobile monetary transaction values. It has seasonality with an overall increasing trend.

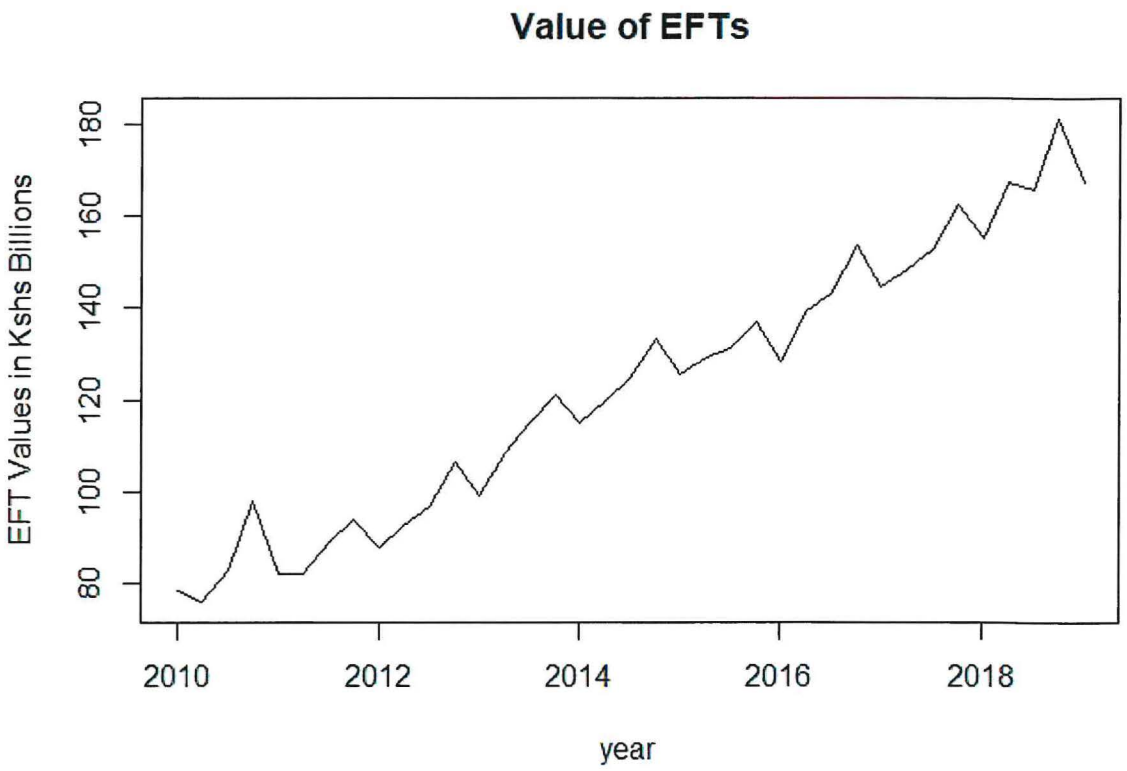


Figure 4.4

Figure 4.4 shows the quarterly time trend the value of Electronic Fund Transfers (EFTs) values. It has an overall increasing trend.

4.3 Unit Root Test through Augmented-Dickey Fuller Test

Variable	***P-Value before differencing***	***P-value after 1st Differencing***	***P-value after 2nd Differencing***
Real GDP	0.99	0.01268	0.01
Mobile Transactions	0.9476	0.2658	0.01
Card Payments	0.188	0.01478	0.01
Electronic Fund Transfers	0.4056	0.3064	0.01

All the variables were all non-stationary. After taking the first differences mobile transactions and electronic fund transfers were still not stationary with both having P-values greater than 0.05. After taking the 2nd differences all variables are stationary. Hence the variables were integrated of order 2.

4.4 Lag Selection

The lag selection is carried out through Criteria which Akaike Information Criterion (AIC), Hannan–Quinn information criterion (HQ), Schwarz information criterion (SIC) and Akaike's Final Prediction Error Criterion (FPE).

AIC(n) – 6

HQ(n) – 6

SIC(n) – 6

FPE(n) – 7

Akaike Information Criterion, Hannan–Quinn information criterion, and
Schwarz information criterion returned a value of 6 while Akaike's Final Prediction Error Criterion returned a value of 7.

The lag selection found a common factor of 6 which would recommend an optimal lag of 6.

4.5 VAR Results.

Explanatory Variables	***Real GDP Coefficient***	***Mobile Transactions coefficient***	***Card Payments coefficient***	***Electronic Fund Transfers coefficient***
RGDP (-1)	-0.669279 (0.0581) ***	1.64689 (0.4507)	-0.02838 (0.9745)	0.098210 (0.55922)
RGDP (-2)	-0.451072 (0.2925)	0.37103 0.9040	1.96953 (0.1822)	0.256945 0.31927
RGDP (-3)	-0.380370 (0.3989)	-1.20898 (0.7187)	2.92241 0.0916 ***	0.320256 0.26085

RGDP (-4)	0.393191 (0.3657)	-0.79833 (0.8028)	3.85594 0.0381 **	0.354819 0.20432
RGDP (-5)	0.297964 (0.3669)	-2.08500 (0.4110)	2.64776 0.0512 ***	0.162662 0.41240
RGDP (-6)	0.073769 (0.6591)	-0.30261 (0.8138)	1.48890 0.0430 **	0.220772 0.07898 ***
MT (-1)	0.193462 (0.0240) **	-1.21459 (0.0456) **	0.32714 (0.1418)	0.022465 0.53518
MT (-2)	0.029771 (0.8003)	-2.28900 (0.0553) ***	-0.07089 0.8540	0.005974 0.93310
MT (-3)	-0.089543 (0.5952)	-2.11971 (0.1533)	0.03157 0.9536	-0.032500 0.74771
MT (-4)	0.011718 (0.9412)	-1.27044 (0.3341)	-0.63631 0.2636	-0.119399 0.25804
MT (-5)	-0.208059 (0.2084)	-1.05123 (0.3843)	-0.16549 0.7347	-0.090920 0.34149
MT (-6)	-0.039158 (0.7248)	-0.14283 (0.8676)	-0.36045 0.3488	-0.143215 0.08518 ***
CP (-1)	-0.055603 (0.3942)	-0.06613 (0.8908)	-0.71671 0.0200 **	0.094201 0.05628 ***
CP (-2)	-0.364601 (0.0143) **	-0.39474 (0.5937)	-0.74987 0.0600 ***	-0.035032 0.54739
CP (-3)	0.141446 (0.0908) ***	0.62988 (0.2718)	-0.54914 0.0585 ***	-0.011900 0.77390
CP (-4)	-0.119873 (0.1486)	-0.13951 (0.8019)	-0.50142 0.0850 ***	0.050884 0.27979
CP (-5)	-0.266575 (0.0136) **	0.14218 (0.7868)	-0.70422 0.0276 **	0.089416 0.08080 ***
CP (-6)	-0.155747 (0.0525) **	0.32412 (0.5048)	-0.38097 0.1117	0.076879 0.09080 ***
EFT (-1)	0.986582 (0.0596) ***	1.29375 (0.6821)	0.75670 0.5750	-1.135211 0.00781 *
EFT (-2)	2.638268	1.08074	0.01287	0.042684

	(0.0108) **	(0.8239)	0.9950	0.91035
EFT (-3)	-0.836205 (0.2685)	-10.15909 (0.1147)	0.79044 0.7302	0.219628 0.60821
EFT (-4)	-0.478190 (0.4277)	-7.54551 (0.1473)	-4.69331 0.0577 ***	-0.262548 0.46986
EFT (-5)	-0.005837 (0.9895)	-3.69822 (0.3151)	-1.32663 0.3855	0.203577 0.46489
EFT (-6)	-0.983233 (0.0849) **	-5.20475 (0.1948)	-3.50249 0.0686 ***	-0.325984 0.28122
CONST	0.973576 (0.2714)	2.10527 (0.7402)	-1.56697 0.5655	-0.096459 0.84535
R^2	0.9996	0.9962	0.9732	0.9963

*Significant at 1%. **Significant at 5%. ***Significant at 10%

When Real GDP was taken as the dependent variable the first lag of mobile transactions together with the second lag, fifth lag and sixth lag of card payments are determined to be statistically significant at 5%. In addition, the second and sixth lag of EFTs had a significant effect on Real GDP at a significance level of 5%. The first lag of real GDP, the third lag of card payments and the first lag of EFT were also found to be statistically significant but at a significance level of 10%.

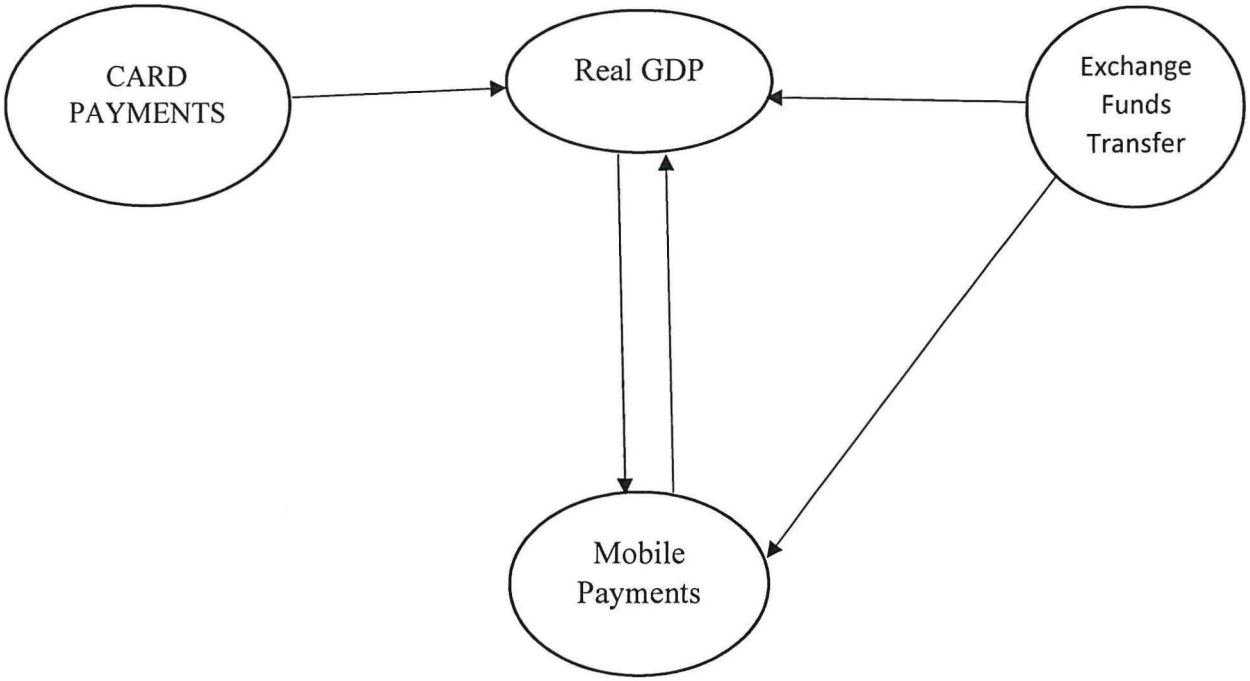
When Mobile Transactions was taken as the dependent variable only the first lag of Mobile transactions is determined to be statistically significant at 5%. The second lag of mobile was also statistically significant at a significance level of 1%.

When Card Payments was taken as the dependent variable the fourth lag and sixth lag of Real GDP are found to be statistically significant at 5%. In addition, the first lag and fifth lag of card payments are statistically significant at 5%. The third lag and fifth lag of GDP are found to be statistically significant at 10%. Also, the second, third and fourth lags of Card Payments with the fourth and sixth lags of EFT are found to be significant at 10%.

Finally, EFTs were taken as the dependent variable the sixth lag of Real GDP, the sixth lag of Mobile transactions, the first lag, fifth lag and sixth lag of card payments are found to be statistically significant at 10%. The first lag of EFTs is also found to be significant but at 1%.

4.6 Granger Causality

Below is a figure of the casual relationships between Real quarterly GDP, Card Payments, Mobile Payments and Exchange fund transfer values.



P-Values for Granger Causality Test

Explanatory Variables	Real GDP	Mobile Transactions	Card Payments	Electronic Funds Transfers (EFTs)
Real GDP		0.01403 **	0.1468	0.7957
Mobile Transactions	0.04051 **		0.9371	0.223
Card Payments	0.03269 **	0.4828		0.8841
Electronic Funds Transfers	0.04997 **	0.01218 **	0.7878	

**Significant at 5%.

From the results above, mobile transactions, card payments and EFTs have a significant causal relationship with Real GDP. EFTs also had a causal relationship with mobile transactions. There is mutual causality between mobile transactions and Real GDP.

The Granger causality reported was observed for the period used by this study (2009 to 2019) hence cannot be said for other time periods.

4.7 Johansen Cointegration

Number of cointegrating relationships	*Test Statistic*	*Critical Value At 10%*	*Critical Value At 5%*	*Critical Value At 1%*
At most 3	1.81	7.52	9.24	12.97
At most 2	32.96	13.75	15.67	20.20
At most 1	57.65	19.77	22.00	26.81
None	509.89	25.56	28.14	33.24

At 95% level of significance, it is established that there are at most 2 cointegrating relationships in the model because the test statistic of 32.96 which is higher than the 5% significance level.

4.8 Vector Error Correction Model (VECM) Results

Explanatory Variables	*Real GDP Coefficient*	*Mobile Transactions coefficient*	*Card Payments coefficient*	*Electronic Fund Transfers coefficient*
RGDP (-1)	0.6416 (0.7411)	15.4788 (7.5854) ***	-8.2829 (3.1382) **	-0.9764 (0.4484) ***
RGDP (-2)	-0.0020 (0.6436)	12.1231 (6.5880)	-7.8140 (2.7256) **	-0.8333 (0.3895) ***
RGDP (-3)	-0.5539 (0.4771)	7.5342 (4.8837)	-6.2505 (2.0205) **	-0.6142 (0.2887) ***
RGDP (-4)	-0.3064 (0.3023)	3.8392 (3.0947)	-3.5584 (1.2803) **	-0.3454 (0.1829)
RGDP (-5)	-0.0671 (0.1166)	0.5116 (1.1933)	-1.4074 (0.4937) **	-0.2171 (0.0705) **
MT (-1)	-0.0497 (0.1051)	0.1830 (1.0763)	-1.4919 (0.4453) **	0.1762 (0.0636) **
MT (-2)	0.0486 (0.0845)	-0.8137 (0.8646)	-1.0412 (0.3577) **	0.2228 (0.0511) *
MT (-3)	0.0489 (0.0767)	-1.2030 (0.7855)	-0.3127 (0.3250)	0.2434 (0.0464) *
MT (-4)	0.1392	-0.9413	-0.3324	0.1704

	(0.0579) ***	(0.5929)	(0.2453)	(0.0351) *
MT (-5)	0.0017	-0.6099	0.0583	0.1212
	(0.0505)	(0.5174)	(0.2141)	(0.0306) *
CP (-1)	0.6579	-2.5686	2.0751	-0.2340
	(0.1992) **	(2.0394)	(0.8437) **	(0.1206)
CP (-2)	0.3304	-2.2389	1.6168	-0.2471
	(0.1624) ***	(1.6622)	(0.6877) ***	(0.0983) **
CP (-3)	0.4788	-1.4835	1.1185	-0.2548
	(0.1255) *	(1.2847)	(0.5315) ***	(0.0759) **
CP (-4)	0.3927	-1.0124	0.8644	-0.1839
	(0.0909) *	(0.9301)	(0.3848) ***	(0.0550) **
CP (-5)	0.1526	-0.3862	0.3560	-0.0787
	(0.0508) **	(0.5205)	(0.2153)	(0.0308) **
EFT (-1)	-1.9043	-2.2063	-2.5366	-0.8127
	(0.6734) **	(6.8931)	(2.8518)	(0.4075) ***
EFT (-2)	0.8815	1.0171	-1.6370	-0.6807
	(0.7598)	(7.7771)	(3.2175)	(0.4598)
EFT (-3)	0.5144	-0.8647	2.5132	-0.1816
	(0.5958)	(6.0991)	(2.5233)	(0.3606)
EFT (-4)	0.4309	-1.3286	0.6901	-0.2092
	(0.3641)	(3.7269)	(1.5419)	(0.2203)
EFT (-5)	0.7249	0.3772	1.5528	0.1728
	(0.2388) **	(2.4443)	(1.0112)	(0.1445)
ECT	-0.6277	0.8720	-2.1529	0.2869
	(0.2146) **	(2.1227)	(1.0071) ***	(0.1085) **
CONST	1.0050	3.0450	-1.1997	-0.0789
	(0.6051)	(6.1941)	(2.5626)	(0.3662)

*Significant at 1%. **Significant at 5%. ***Significant at 10%

The short run effects in the model are captured through the individual lag coefficients. In the Real GDP equation, the fourth lag of mobile transactions, the fifth lag of EFTs and all lags of Card payments have significant positive effects on real GDP while the first lag of EFTs has a significant negative effect on real GDP.

In the Mobile transaction equation only the first lag of Real GDP has a significant effect on Mobile transactions with its effect being positive. In the Card payments equation, all lags of Real GDP have a significant negative effect on card payments. Also, the first two lags of

mobile transaction have a significant negative effect on card payments. The first to fourth lags of card payments have positive significant effects on card payments.

Finally, in the EFTs equation, the first, second, third and fifth lag of real GDP have negative significant effects on EFTs while all lags of mobile transactions have positive significant effect on EFTs. The second, third, fourth and fifth lags of Card payments have negative significant effects on EFTs. The first lag of EFTs also has a significant effect on EFTs.

The long run effects are shown through the Error Correction Term (ECT). The Real GDP equation and Mobile transaction have significant negative coefficients on the ECTs hence are stable systems. The error correction term of the Real GDP equation is statistically significant at 5% and shows a speed of adjustment of 62.77% to the equilibrium. The error correction term of the Mobile Transactions equation is not statistically significant hence not different from 0. The error correction term of the Card Payments equation is negative and statistically significant at 10% hence as high speed of adjustment of 215%. The error correction term of electronic fund transfers is positive and significant at 5% hence disturbances in this system also causes it to move away from the equilibrium hence it is not a stable system.

5 SUMMARRY, CONCLUSION AND RECCOMENDATIONS

This study set out to investigate the impact of adopting a fully cashless payment system in Kenya in the short-term and in the long run. This was done through establishing a proxy of cashless payments in Kenya comprising of mobile money transactions, card payments and exchange fund transfers and looking at their effect on Kenya's real GDP. A VAR, VECM and Granger causality were employed for carrying out the analysis.

5.1 Conclusion

Empirical research had shown that cashless payments systems influenced GDP. To establish the nature between cashless payment systems and GDP this study employed the use of Granger Causality. From the Granger Causality it was evident that all independent variables (Mobile Transactions, Card Payments and EFTs) granger cause real GDP hence lags of all independent variables cause the current value of GDP. This justified the Cashless economy proxy adopted in the model with the cashless payments systems have a role in determining economic performance or real GDP. Mobile transactions and Real GDP Granger caused each other.

The adoption of a cashless system will have a significant impact on Real GDP in both the short run and in the long run. In the short run the adoption of one mode of cashless payment will affect the adoption of another mode of cashless payment. Card payments have the most significant impact on real GDP the short run. Kenya has been at the forefront of mobile cashless transactions in the world and it would be a major move to push the country into going cashless through all forms of cashless payments especially increasing card payments.

In the long run the adaptation and integration of these modes of cashless payments will reflect on the economic growth, hence a policy that promote cashless policy will affect the economy after a given period and not immediately. The long run effects would have a stable effect on the economy with Real GDP adjusting to current conditions of the cashless payments systems.

5.2 Recommendations

Results from the analysis carried out in this study show that Card payments will have the major effect on real GDP in the short run. In the short run more emphasis should be placed on card payments in terms of policies by the Kenyan Government. From the VECM, the effects of a major policy change will take a while before showing up in the long run. Hence there is

need for the Kenyan government to encourage change in payment systems through policy change.

5.3 Areas for further research

A recommendation for further research can be done in two approaches. One is through the replication of this study using more available data on cashless payments to obtain better understanding on the effects of the independent variables on Real GDP. is the effect of cash payments on GDP to reflect on the better payment system. The second approach would be the incorporation of more cashless payment systems such as cheques and the use of different models to check if the empirical results would differ or concur.

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7 APPENDIX

Table 1

Mobile Money Transfers in Kenya

Service Provider	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19
Total Number of Agents	129,357	158,777	180,657	266,022	290,432
Total Number of Transactions (Sending and Withdrawal)	-	-	1,809,060,843	2,419,728,996	3,113,444,578
Total Value of Transactions (Sending and withdrawal) in KES	-	-	4,621,335,817,397	7,216,119,374,092	8,452,390,769,012
Total Number of Mobile payments	-	-	1,117,558,719	1,778,332,875	2,276,659,139
Total Value of Mobile Payments in KES	-	-	2,353,437,167,416	4,603,841,510,286	7,148,459,944,348

Source: Communications Authority of Kenya (2019).

Table 2

Number of Mobile Money Subcribers in Kenya

Operator	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19
Safaricom PLC (Mpesa)	21,338,328	17,120,278	22,624,298	23,946,174	26,900,772
Telkom Kenya Limited (T-Kash)	192,531	193,831	194,445	63,023	76,061
Airtel Networks limited (Airtel Money)	3,119,812	4,853,869	1,530,645	3,619,415	3,681,194
MobiKash	1,714,170	1,772,466	1,772,466	-	-
Mobile Pay Limited (Tangaza)	503,556	503,556	87,786	90,442	94,416
Finserve Limited (Equitel Money)	873,643	1,860,647	1,864,838	1,959,009	1,882,440
Total Number of Subscribers	**27,742,040**	**26,304,647**	**28,074,478**	**29,678,063**	**32,634,883**

Source: Communications Authority of Kenya (2019).

Table 3:

Payment Cards Usage in Kenya

End December	No. of Cards (Mn)	No. of ATMs	No. of POS Terminals	Transactions	
				Volume (Mn)	Value (KSh Mn)
2015	13.2	2,718	22,230	20.1	121,821
2016	14.8	2,658	30,133	21.6	121,423
2017	15.4	2,825	35,466	19.1	124,844
2018	17.9	2,833	44,874	19.1	125,877

Source: Kenya Financial Sector Stability Report 2018

Table 4:

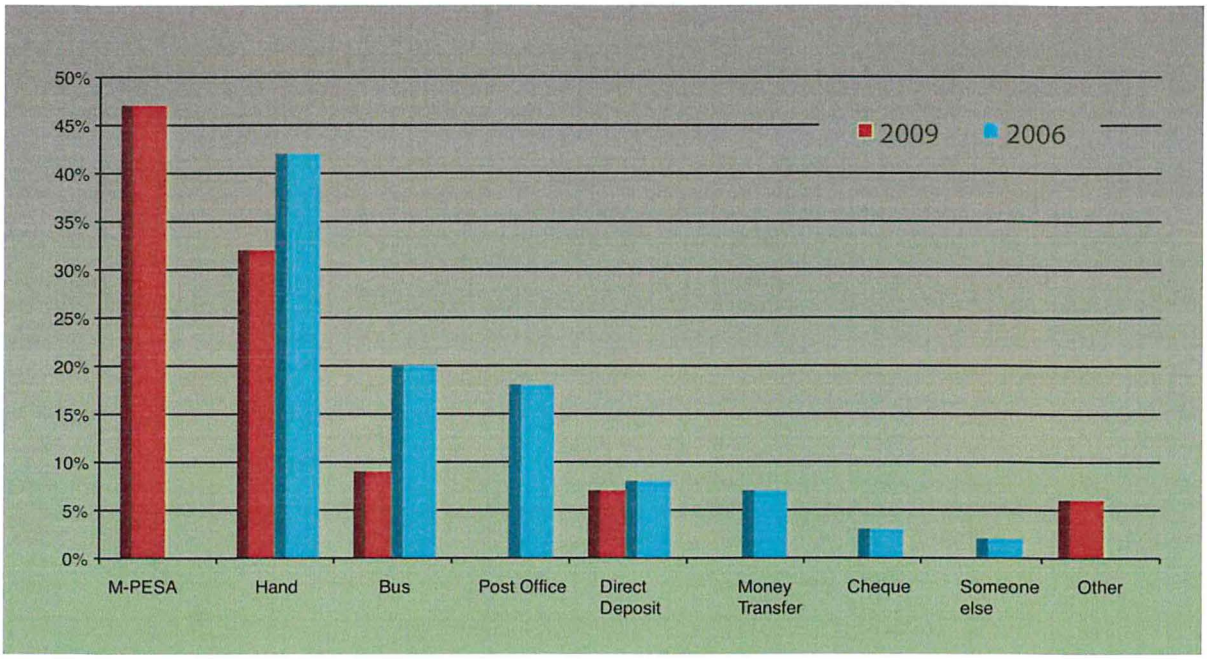
Mobile Money Transfers in Kenya

Period (January – December) / Year	2014	2015	2016	2017	2018
Number of agents	123,703	143,946	165,908	182,472	223,9310
No. of Active Mobile money accounts (millions)	24.02	26.75	31.99	30.68	31.63
No. of Mobile money transfer accounts (millions)	25.8	28.6	34.9	37.4	47.70
No. of mobile money transactions (millions)	911.3	1,114.20	1,331.00	1,543.50	1,740.00
Total transactions value (KSh. billions)	2,371.80	2,816.10	3,355.10	3,638.50	3,984.38
Average value per transaction (KSh)	2,602.66	2,527.46	2,520.74	2,357.30	2,290.00

Source: Kenya Financial Sector Stability Report 2018

Graph 1:

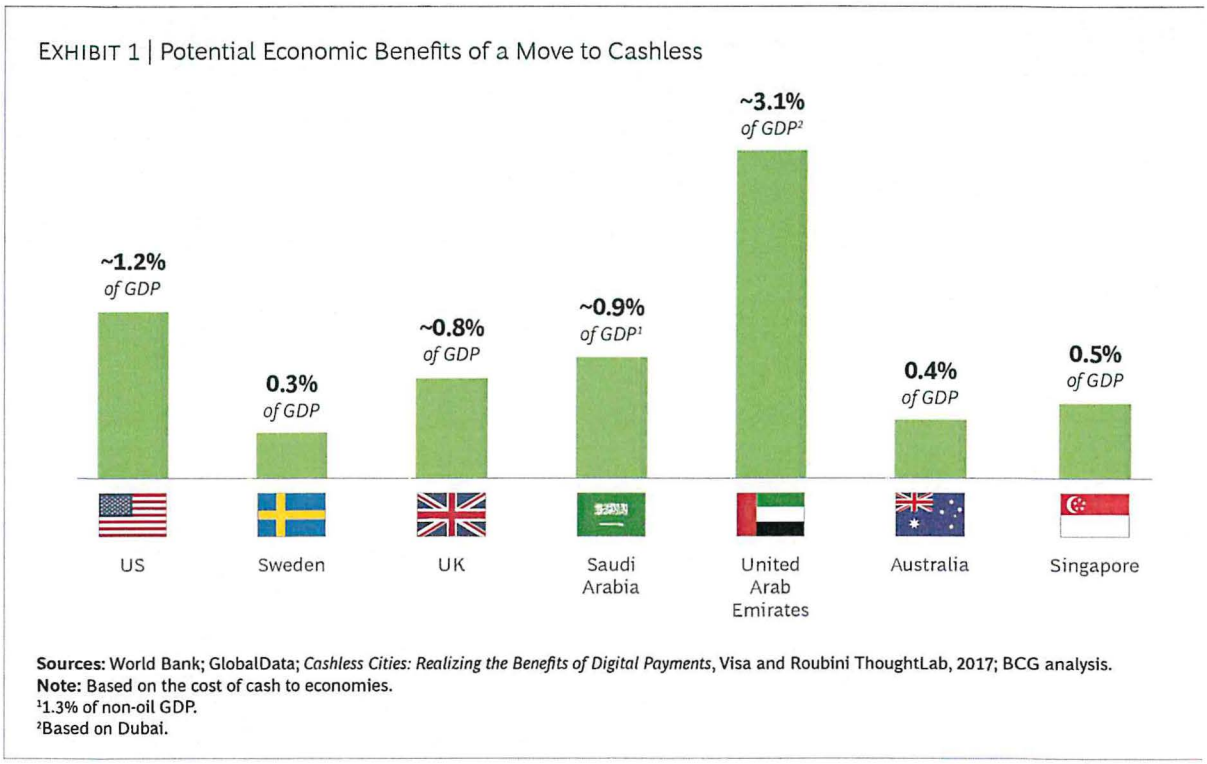
Money Transfer Behaviour in Kenya After Introduction of M-pesa



Source: FSD-Kenya (2006) and FSD-Kenya (2009)

Graph 2

Benefits of Digital Payments to Economies



Source: BCG analysis: (Markus, Godfrey, Michael, & Mohammad, 2019)