

**RELATIONSHIP BETWEEN PROFITABILITY OF TECHNICAL
TRADING RULES AND CENTRAL BANK INTERVENTION ON
FOREIGN EXCHANGE MARKET IN KENYA**

BY

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DECLARATION

This project is my original work and has not been presented for degree in any other university.

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This project report has been forwarded with my approval as the university supervisor.

Signature.....Date.....

DR. SIFUNJO KISAKA

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DEDICATION

I dedicate this project to my parents Mr. and Mrs. Githumbi, sisters; Joyce, Rose, Esther and Nancy and friends; Stanley, Emelda and Daniel who have been my steady foundation of brainwave. They have given me the impel and the discipline to tackle any assignment with zealousness and strength of mind. To them I will always be grateful.

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LIST OF ABBREVIATIONS

CBK	-	Central Bank of Kenya
CB	-	Central Bank
DJIA	-	Dow Jones Industrial Averages
DM	-	Denmark
EMH	-	Efficient Market Hypothesis
FOREX	-	Foreign Exchange
JY	-	Japanese Yen
KSH	-	Kenya Shillings
NASDAQ	-	National Association of Securities Dealer Automated Quotation
NSE	-	Nairobi Securities Exchange
NYSE	-	New York Securities Exchange
OTC	-	Over the Counter
MA	-	Moving Average
SMA	-	Simple Moving Average
STR	-	Simple Trading Rule
TTRs	-	Technical Trading Rules
USA	-	United Nation of America

ABSTRACT

This study examined the relationship between Profitability of TTRs and CB intervention on Foreign Exchange Market in Kenya. The study duration was from July 1, 2011 to June 30, 2016. The study employed SMA rules factoring in and out the interest expense. Data was then analyzed using intervention of CB and then the intervention was removed and data was analyzed again. The harmonized sample t-test was used to profits from TTRs with and without interest rate costs and to with and without CB involvement profits.

The general result proved that profitability of TTRs is reduced when central bank's intervene on exchange markets. This result means when central bank is in the market, the speculators profits are reduced but not completely eliminated. The results also indicate that CB involvement decreases the volatility of profits from TTRs. From the finding also shows that not all CB involvement periods get to be know by traders but those days it's know speculators do not earn excessive return unlike on non-intervention periods.

The relationship between profitability of TTRs and CB involvement shows that mean variation in profits are both negative and are only statistically significant at 5% level from each other at a weekly interval. This means therefore that CB involvement in the FOREX market reduces profitability of TTRs significantly.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Technical trading rules are tools that use information based on price antique actions by analyzing prices through the use of charts in order to predict the trends of upcoming prices. Fama (1970) stated that prices reflect all private and public information in an efficient market and as such neither the technical analysis nor fundamental analysis can give the investor any undue benefit in the market. The basic reason of technical trading rule is prices are determined by demand and supply, that is a change in demand and supply results to variation in prices. Prices can be anticipated with charts and other technical tools. The rationale behind TTRs are to recognize trend changes in the early stages and reside in the position the trader have taken until there are enough indicators of a trend reversal (Pring, 2002).

Charles Dow's work in the late 1800s introduced the rule of technical trading. Its supporters fall out that in asset market the rule is practicable in different form and states. Taylor and Allen (1992) in the context of London era of floating exchange rate they concluded at short horizon of a week or less than a week, 90% of respondents conveyed they employed some chartist input, out of the 90%, 60% stated that economical fundamentals at least carries important information and them too should not be disregarded. Frankel and Rose (1994) stated that, Models grounded on fundamental standards such as real income money supplies, interest rates, inflation rates and balance on current account are some of the macroeconomic factors of exchange rates and based on their outcome they will never be successful in

amplification of exchange rate variation to foresee high percentages on short term or medium term occurrences.

Existence of surfeit returns has been widely studied using various technical TTRs in FOREX market (Dooley and Shafer 1983), Sweeney (1986), Levich and Thomas (1993), Osler and Chang (1995). However, there still exist a fusion of doubt and disapproval for the excess return in the market. Academics utters that one reason is the involvementbehavior of central bank in the marketplace which accounts as a minimumcontribution to the fraction of the effectiveness of TTRs (Dooley and Shafer, 1984; LeBron, 1999; Szakmary and Mathur, 1997; Neely, 1998). However, its proponent never made serious attempt to determine the relationship between profitability of TTRs and CB intervention on foreign exchange market in Kenya.

When central bank buys or sells foreign exchange in the FOREX market usually against their own currencies and guidelinesthis is referred as central bank intervention. CB themselves are not returnmaximizes but have other market objectives that may make them take position to loss their trades. Some of CB objectives are to maintain a market orderly condition, control inflation, and achieve macroeconomic goals like stability of prices and internal trade balance. When the exchange rate targets implied by these objectives are in-consistence with future market movement expectations, then there exist chances that speculations of profits in short-term will be inexistence. (Bhattacharya and Weller, 1997).

The relationship between Profitability of TTRsand CB intervention on FOREX Market in Kenya is significant since it will convey an understanding of why TTR excessive returns controvert the EMH.

1.1.1 Profitability of Trading Rule

The philosophy behind Technical rule is that the information reflected by the prices in the market is an incorporation of all public and private information which results to prices to move in a predictable directions since the past market history will always repeat itself. Murphy (1999) stated that the primary focus why technical analysis should be studied is because they analyze market actions with a reason to predict the future price trends by using graphical representations (Charts). According to Murphy (1999), Market action embraces three major principle that technicians can use to analyze the market that is open interest, price and volume (Open interest is applicable mostly in trading two derivatives that is options and futures). The phrase 'price action' is a fundamental part of the market that includes volume and open interest. Chartists approach the market believing that the end product is all they need to know and the cause is unnecessary. The vast strength of technical analysis is its flexibility to virtually any trading medium and time facet.

The importance of technical trading rules is to forecast the future prices of stocks, commodities, futures and other tradable securities based on past prices and performance of these securities. Murphy (1999) argues that it is devastating to want a balanced investment policy in an irrational world. The solitary apparatus to gauge the unreasonable (emotional) component current in all markets is technical analysis rules. Technical analysis are the main reasons for market movement since they are the market moving factor, for this reason they offer more emphasis why they should be watched.

The primary tools used in measuring profitability of trading rule are charts and technical indicators. Charts are graphical exemplifications of prices directions drawn

to indicate a specific time dimension. These charts have two axis which shows the time and price factors for example the X-axis represent time and Y-axis represents price. Charts are categorized in to line, bar and candlestick charts. Technical Indicators include a variety of measures of relative price such as market sentiment, fund flow and price momentum. The only challenge indentified with using technical trading indicators such as charts in measuring profitability is that Chartism some time works but not always meaning they a time can predict wrong prices since one cannot exactly tell when the market will be reversing.

1.1.2 Central Bank Intervention

Monetary authorities practice the role of bidding and asking of currency in the FOREX market in order to control the conversion rates (Central bank intervention). In Kenya for example central banks have been intervening in the FOREX market since early 1970s.

This act of Bid (ask) of central bank own currency in the FOREX market causes an amplification (Decrease) in the quantity of money in the flow hence raising (lowering) its own contribution to home currency. This actions by CB manipulates the conversion rate in a similar way as it would if it was the ordinary domestic open market activities. As a result the bidding and asking of the domestic bonds in order to reverse the outcome of FOREX operation on the domestic supply of money occurs (Edison, 1993). Normally, Central bank intervene during the dealing hours which differ with their own respective markets. Other than when and how to intervene CB have different goals why they intervene that is; to maintain price stability, to control trend schedule in exchange rate, to equilibrium its foreign exchange hold back and also to maintain orderly market conditions.

Several studies show that irrespective of the intervention being on public domain walls or not, the efficacy of CB intervention depends on the monetary procedures and framework. Tapia and Tokman (2004), for instance, considered the intervention effectiveness using both intraday data and daily data for Chile. They found that after 2001 public announcements, the announcement participated in a considerable function in the success of intrusion operations which varied all through the sample period. This was due to the changes in guideline set by CB. This gave a universal scrutiny that there exist unevenness associated with effectiveness of intervention. For example Barabás (2003), argued that it is logical to accept depreciation than appreciation. This provide a version of how Hungarian CB intervention lucratively conquered the firm corners of exchange rates group. However other studies do not support the above findings as they found a mixed output with respect of CB involvement effects on FOREX market Barabás (2003) for the Hungary, the Philippines and Czech Republic,, correspondingly.

1.1.3 Relationship between Profitability of TTR and CB Intervention

There exists uncertainty about the usefulness of Technical trading rule and their ability to give profitability outcomes in FOREX market. This is due to the extensive reactions that technical trading rule ignores fundamental principles which states that fundamental factors are somehow related to the relative prices. Several studies found out that a number of simple trading rules help to predict the prospective exchange rates helping traders to earn excess returns. Dooley and Shafer (1983), Taylor (1992), and LeBaron (1999) revealed that the Profitability of such as peak-and Through-progression rules and moving average rule are almost wholly due to central bank actively dominating in the FOREX market. The psychoanalysis of intrusion-reliant subsample suggest eras of central bank's intervention are enormously

profitable for trader using TTRs specifically by depending on the simple technical trading rules to foresee movement in the exchange rates where TTRs have subsequently to no important surplus proceeds for CB involvement-free periods (Lucke 2000).

Freidman's (1953), argues that the ability to stabilize the market have a connection with the CB intervention. Various studies have shown that returns gained from trading rules are above normal returns prior to intervention. This hypothesis therefore holds that sturdy and expected trends in FOREX market tend to cause CB intervention instead of intervention producing returns for technical traders. However, the hypothesis still leaves a room of possible outcome for a smart technical trader who is able to react to occurrence of intervention and adjust his position which will increase his profits. If this theory takes place then it means watching intervention have additional important information on the exchange rate future directions which is based on the information might not be reflected in the past and current rates (Neely and Weller, 1997).

1.1.4 Foreign Exchange Market in Kenya

The Kenya exchange rate up to 1974 was nailed to the UD Dollar but after a disconnection in devaluation, the peg was reversed to the special drawing rate. This was as a outcome of breakdown of the unchanging trade rate as a result of Bretton Woods's agreement that encouraged major currencies to be floated freely with fixed exchange rates. However in 1970s many countries (Including Kenya) changed the system of having a fixed exchange rate and they started floating their own currencies in open market. This made the value of a given currency to be based on market factor

such as economic stability of the currency's nation that is the value of the currency was to based on market factors.

Nations such as the England Bank, theCB of European, and the Federal Reserve (Kenya included), are frequentlyengaged in the Forex market. Same as the national governments and companies, do take part in the Foreign exchange market for their international trade payments,handling their foreign exchange reserves and operations. In Kenya just like other nations, CB play a significant role in the FOREX markets in Kenya. At the end of the day, CBK look forprivate target rates for their currencies or control the supply of money. Based on the very substantial FOREX reserve CB have, their intervention power is considerable. CBK is tasked with a vital role to ensure market conditions are orderly during the time of abnormal volatility in exchange rate and ensuring the inflationary of weakening currency is in control.

The major accomplices in the FOREX market in Kenya are commercial banks and foreign exchange bureaus. Few studies have been carried out on Foreign exchange market in Kenya with a major focus on efficiency for example Kurgat (1998), argues that in efficient market opportunities to arbitrage profits trim out. An efficient market exist where currency prices rapidly adjust to reflect all publically available (past, present and future) information; free transaction cost; a large pool of willing buyer and seller exist as well as a definite class and quantity of currencies to be traded is available. In developing countries FOREX market are weak form efficient. Studies have examined the efficiency of the FOREX market in Kenya (Kurgat, 1998; Ndunda, 2002; Muhoro, 2004, Kimani, 2007), the conclusion was that foreign exchange market in Kenya is inefficient and arbitrage profits exist.

1.2 Research Problem

Technical analysis is analyzing a currency's history on possible future behavior by studying people actions (or reaction) to things they know, think they know or have heard in order to have the ability to earn abnormal returns. Historically data can be used to identify patterns that predict security movements hence violating the random walk hypothesis and weak market efficiency. In respect to efficient market theorist, TTR cannot produce abnormal returns in an efficient market. However, the Kenyan FOREX market has not been tested to determine the relationship between profitability of TTRs and Central Bank Intervention on Foreign Exchange Market in Kenya. Though, in the current spans thorough academic explanation for the extensive use of TTR profitability and central bank intervention has been developed, For example, Battacharya and Weller (1997), studied Game Theory they found that CB is suppose to limit the abnormality of conversion rate that aimed to accomplish the set goals of bank arbitrates in the FOREX market. The role of banks is to ensure that the estimated outlays of intervention and the advantages achieved as a result of stabilizing exchange ratio trade-off around the expected results.

Studies have examined the efficiency of FOREX market in Kenya (Kurgat, 1998; Ndunda , 2002; Muhoho, 2004; Kimani, 2007), the conclusion was that FOREX market in Kenya is inefficient and arbitrage profits exist. Dooley and Shafer (1983), Corrado and Taylor (1986), Sweeney (1986), Friedman (1988), and Krizman (1993) found in foreign exchange market, there exist CB involvement which explains the TTRs profitability. LeBaron (1999) concluded that profits were generated by most trading rules on the day before U.S in-market intervention. There have been a limited

number of studies conducted in Kenya. Wafula (2012) studied the impact of central bank intervention on the TTRs in the FOREX market in Kenya. She found that the impact of CB involvement in the market is only felt at a monthly trading interval. Thus intervention does not significantly reduce profitability of TTRs and hence speculations. Okoth (2005) studied the profitability of contrarian strategies and found that the strategy offered profitable opportunities in the short run. Kimani (2007), studied the efficiency of FOREX market in Kenya and found that the Forex market in Kenya is inefficient. Due to Forex market inefficiency, this has made CBK to intervene in-order to create orderly market conditions in the way transactions are conducted. Though local studies concentrated on efficiency and profitability, proponent did not make many attempt on the relationship between profitability of TTRs and CB Intervention on FOREX Market in Kenya.

A study carried out in Kenyan foreign exchange market by Kurgat (1998) barbed out the ineffectiveness of the Kenyan FOREX market as result of existence of arbitrage chances. Result concluded that occasional arbitrage opportunity existed due to immediate risk free profits. However, the study is not current as it was done over 18 years ago. In addition, the study focused more on the market inefficiency. This study sought therefore to fill the existing gap by answering the question, what is the relationship between profitability of technical trading rules and Central Bank Intervention on Foreign Exchange Market in Kenya?

1.3 Objective of the Study

The objective of this study is to determine the relationship between profitability of technical trading rules and Central Bank Intervention on Foreign Exchange Market in Kenya

1.4 Value of Study

The present study on technical trading rule is very much appreciated on the grounds that it gives deep insight about the price and currency movement in the market. Harvey (1994) stated, the inadequate research on emerging capital markets in Africa and their latent to provide considerable portfolio diversification payback the want for auxiliary research on this area is needed. This study plays a major role such that we have a clear picture of market movements since it's more guided by the irrationality rather than rationality.

The study is invaluable to the commercial banks, investment banks, chartist, investors and regulators this helps them to hedge against risks and have a base to choose the right investment to optimize on returns based on the uptrend and downtrend price movements. To the academicians and scholarsthe findings of this study helps fill a knowledge gap and lay a platform upon which further research on technical trading ruleprofitabilityand central bank intervention on foreign exchange market can be done and also act as a source of reference materials to the scholars.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter reviews previous theoretical literature and empirical studies that have been done in an effort to expound more on relationship between Profitability of TTRs and CB intervention on FOREX Market in Kenya. It's structured as follows, part 2.2 looks at the theoretical literatures review. part 2.3 addresses the determinant of profitability, Section 2.4 discuss the literature review, Section 2.5 looks at the conceptual framework and lastly section 2.6 summarizes the chapter.

2.2 Theoretical Literature Review

There are several theories that seek to explain the relationship between Profitability of TTRs and CB intervention on Foreign Exchange Market. Below are various theories by renowned economists and they give the basis for this study.

2.2.1 Game Theory

According to Battacharya and Weller (1997), it's as a result of insider dealing about conversion rate, target trading with threat averse speculations and having confidential knowledge (Information) about the future spot rates that result to this confidential information in the FOREX market. The information relating to the exchange rate speculation can precisely deduce speculators' by central bank. However, for the intervention central bank is known partly by speculators since the divergence of conversion rate from the aimed value is limited by CB. In order to accomplish bank intervention goals in the FOREX market, the trade-off between the

benefits tired from alleviating the exchange rates around the target and the estimated costs of intervention is the utility function of banks. According to Game model, the sensitivity of intervention can result due to spot rate. This is as a result of symmetry on the future spots rate which can be predicted using some information from authorities about target current conversion rate which is as a result of equilibrium on spot exchange rate. When central bank purchases domestic currency due to intervention perverse response the domestic currency depreciates. This causes an increase in spot rate due to double effect on the level of currency speculative demand.

2.2.2 Behavioral Model

According to behavioral model, investors' perspectives are influenced by the market psychology such as overconfidence, motivation, desires, goals and errors. In the market, investors are faced with similar price information but how one investor responses differ from the other since same information tend to be interpreted differently. This means investors are irrational individuals and therefore the rational expectations that they are maximizing utility agents is not applicable to them. (Shefrin 2002). Emotions are the primary factors that drive the reactions in the market. Profitability and trends are affected by fear and greed which causes the valuation that drive the changes in the market. For example, if a trader purchase a stock at a given value Y, it's with certainty that prices will rise meeting his expectation. The vice versa also holds that is when the seller auctions a stock at price Y, he/she expects prices to go down (Turner 2007).

The primary propellant of prices in stock market is largely influenced by factors such as fear and greed. When you buy a stock at an entry point that's perfect point in the market and in few minutes' prices start to rise above the expectations and an inner voice convinces that the stock will even go further higher the temptation to reap more

will make you to add more money in your trading account so as to maximize returns.(Linlokken and Frolish, 2004; Turner, 2007).On the concept of fear, traders might be guided to impulsively put up for sale their shares. This therefore means if irrational behavior is detected in the market a trader can gain as a result of arbitrage opportunity. For this reasons, technical trading rules are premeditated to establish this illogicality when fear and greed seize in the market (Turner, 2007). Flourishing traders depend on identifying when the irrationality happens in the market and not on information such as fundamental factors or news.

2.2.3 Noisy Rational Expectation Model

Under standard model of efficient market hypothesis every agent in the market have a rational expectation and are utility maximizing agents. This means that the asset prices traded in the market reflects efficient information. This means that prices are always reflecting known information and changes to new information instantly. Based on this hypothesis, an attempt to study and analyst historical prices to forecast future prices direction would be of no essence since it's unattainable to do better than the market consistency since all information is already incorporated in prices and every information is valued equally by all agents (Fama, 1966). Under noisy rational expectations model, due to noise in the market, all the existing information is not fully mirrored in the current price equilibrium. Grossman and Stiglitz (1980) confirmed that you cannot assume markets in equilibrium are perfectly arbitrated when the information is costly to purchase it. Since to be informed or not informed is a trader decision to make. When prices carry information which seems otherwise purchasable or the information is too costly, traders may choose not to be informed due to the cost factors.

The structure of this model is based on Radner (1968), Green, (1977) and Lucas, (1972), on the expectations model. It looks at two sets of chattels a risky asset and a safe asset for every initial wealth a fundslimitation is distinct. For traders who trade on noise, they sell when prices fall and buy when prices rise. Traders try to identify continuous total risk aversion efficacy functions since traders are risk averse. Like the informed trader who observe signals uninformed trader observe prices, this is because after a repetitive watch the informed trader learn the relationship between the return on the risky assets and the observed prices which informs trades rational expectations. Noise traders have highly chances of succeeding as a group at long run irrespective of extreme risk consumption and taking and therefore able to use wealth to control market (De Long et al., 1991). Noisy rational expectation model suggest that if technical trading strategies that is selling as soon as prices fall and buying while prices rise are subject to noises and not on fundamental factors or news information then even at long run technical trading profits may be available.

2.3 Determinants of Profitability

TTRs are tools used by chartists to identify market entry and exit points with the aim of taking arbitrage opportunities. They are key FOREX tools that help traders to analyze past and current data in order to predict the future. They are significant because they help to smoothen data the 'noise' in the market. It is for this reason that technical traders watch them, analyze and take advantage of the price movements. Various factors influence profitability and are also related to trading. These includes Inflation rate, Interest rate, exchange rate and strength of economy.

2.3.1 Inflation Rate

A country currency is made less attractive due to high rate of inflation which make the currency to loss the real value due to inflation. This will therefore cause that currency to depreciate against major currencies and vice versa.

It is therefore important to stabilize the strength of a given economy against major currencies by ensuring the balance of payments are balancing this will help the nation currency to maintain its stability hence mitigating the inflation rates.

2.3.2 Interest Rate

Interest rate is an important macroeconomic determinant in profitability performance. The enticed capital towards currencies will have a high yield rates as long as there is full convertibility of the currency in capital account.

The returns in FOREX markets are affected when interest rate falls or rises. The significant of high interest rate is associated with higher market profitability in financial market based on the asset one holds.

2.3.3 Exchange Rate

The regime of a country exchange rate have an influence of the profits. The role of exchange rate is crucial in the level of trade particularly in open market economy.

Based on early decade exchange rate was determined by the Dollar, this made the currency to be inflexible and manipulative. With the floatation exchange regime the market forces are able to give a fair exchange rate.

2.3.4 Strength of Economy

The supply and demand of foreign currencies have a comparative relationship with the economical strength of a nation. When a country's economy grows at a high rate, the performance of balance of trade is expected to be better generally at long run.

This will in turn influence the currency demand in the market making it more attractive to buyers hence raising its value and vice versa for a weak economy. A strong economy is achieved through a good Growth Domestic Production.

2.4 Literature Review

Fama and Blume (1966) on their empirical study obtained facts behind the random walk theory and weak form market efficiency. Fama and Blume studied DJIA (Dow Jones Industrial Average) for a phase of six years for 30 individual stocks, they found out that only four (4) of thirty (30) studied securities after commissions had a affirmative return standard. Furthermore, in all the 30 securities only two securities provided the buy and hold strategy to be superior before commission and 28 proved to be inferior for the strategy. Van Horne and Parker studied NYSE 30 listed stocks over a similar period of six years and result show that no greater returns were earned on any applied trading rules that exceeded those of buy and hold strategy on similar index. Jensen and Benington (1970) investigated NYSE stocks from 1931-1965 using alternative TTRs, his findings further confirmed that TTRs do not outdo the buy and hold strategy. Alexander (1961) found information that strongly supported technical analysis after doing an extensive study. Lukac, Brorsen and Irwin (1988) looked at 12 future from several exchanges comprising agriculture, interest rates, and currencies during 1970's and 1980's. The study found substantiation that advocated certain trading systems produced substantial net returns in these markets. The study were

limited to, effort to mitigate snooping of data and the non-allocation of transaction costs.

Dooley and Shafer (1976, 1983) studied the rule of filter using daily spot rates for period between 1973- 1981 to determine trading profits. Calculation reflected the interest income and interest expense of short and long position and costs of transaction were included by means of using the quotations from foreign exchange market. For the filters ($x = 1, 3$ or 5 percent) which were the small sorts showed that for all the 9 currencies during the period of study they would have been profitable. The results of 10, 15, 20 and 25 percent filters were also reported. For the long filter more than one half of the sub-period they were profitable and the outcome was erratic than for the small filters. However, even with small filters there appeared to be elements of riskiness since at least one currency would generate losses during the sub-period of each filter trading rules. For this study however the author did not report any measure of economic or statistical significance of those profit. Sweeney (1980) used similar filter rule techniques on daily exchange rates for 10 currencies, sample period 1973-1980 and reached same conclusion of 0.5, 1, 2, 3, 4, 5 and 10 led to a case of more than 80% of trading profits. He concluded that in the 1st period filters that were profitable tended to be profitable also in the 2nd period under the assumption of exchange rate volatility was constant.

Szakmary and Mathur (1997), examined the connection between TR returns and proxies for CB involvement using monthly FOREX reserves. They found out of five, three conversation charges as well as USD/DM and USD/JY, swapping rule profit dissimilar than nil can be effusively beelucidated by sloping adjacent to the squall of involvement by CB. They speculated that profits from TTRs could be characterize a relocation from CB to technical traders. The bulletin occurrence of the statistics

applied by Szakmary and Mathur (1997), though limit evidence someone can pile for their implement.

LeBron (1999), provided further evidence on the involvement by the government in the FOREXmarket and profitability of technical trading models. Using data from 1979 to 1992 for the DM/YN exchange rate, he found that if days when Federal Reserve actively intervened in the market, there is a dramatic decline in the level and significance of technical trading profits. However, LeBron advised caution in the interpretation of these results, "It is not clear that the Federal Reserve causes inefficiencies in the foreign exchange market, or just happens to be around when they occur."

According to study of Kwon and Kish (2002), they compared the technical trading strategies and extrapolative aptitude of returns, they used extension of the experimental work of Brock et al. (1992), they used the NASDAQ indices and NYSE data up to 31st December, 1996, they sub-sampled the data into 3 periods (1962-1972, then from 1973-1984 and finally 1985-1996) for the NASDAQ index on a every day basis data from 2nd January 1973 to 31st December 1996 they sub grouped the sample into 2 periods (1973-1984 and 1985-1996). After the TTR application that had been used by Brock et al. (1992), the outcome found that when TTRs are used in various sub-samples, the model showed aptitude to forecast in the 1st and 2nd periods (i.e. 1962-1972 and 1973-1984), however, predictability in the 3rd period (i.e. 1985-1996) for NYSE index disappeared. For the NASDAQ index, the last sub-sample (i.e.1985-1996) shown that TTR were completely weak compared to the full period (1973-1996). This meant that information dissemination in the market have grow to be more proficient due to information technology development in the recent years. This elaborates that in small stocks TTRs are value much high than in large stocks.

Tian, Won and Guo (2002) studied the competence of financial markets and the return from TTRs applying to both developed market (USA Market) and emerging market (China stock market) which was to determine the market that has a better ability to increase returns and to forecast price changes using TTRs under different levels of market efficiency. To test their prediction they used data that carried on from 1991 for both stock indices (American and Chinese) and compared them using the simple trading rule of technical analysis. The finding shown that before 1975, there was achievability of TTRs and therefore ability to foresee price changes and excess returns. Due to increased efficiency in the USA market during 1975 to 1991, the TTRs were ineffective and could not predict changes in price using historical data. Whereas in the Chinese stock market, study supported the strategies of TTRs in their ability to predict changes and excessive returns during the period on study even with the trading cost.

Olwal (2005) studied empirical testing of the profitability of TTRs on growth and value stock listed at the NSE. This was to determine periods with positive and negative returns are predictable using trading rules. He applied simple and commonly used TTRs when applied to growth and value stocks listed in NSE during the period from 2006 to 2010. He used simple moving average methodology to test the profitability of TTRs in comparison with the buy-and-hold strategy; and SMA of 5, 10&20 TTRs to test for growth and value portfolios respectively. He found that trading rules are able to recognize periods with affirmative and pessimistic returns for both portfolios, the mean return subsequent a buy signals is depressing for all trading rules whereas it is positive subsequent to a sell signals.

Kimani (2007) studied the FOREX market efficiency in Kenya using the rational expectation model. She obtained the average monthly spot trade rate and 3 month forward payment of Euro, Great Britain pound, US dollar and 2 East African legal tenders from CBK. The phase sampled was from 1993 November to 2006 June, the period was based on the floatation of exchange rates in Kenya. Regression model was used to test FOREX market efficiency. The study reviewed that forward charges are not unprejudiced interpreter of the spot future rates for the sampled currencies. This recognized that contestants in the FOREX currency market in Kenya are not rational and are not risk-neutral, they conduct dealings on the bases of assumption rather than on calculation of potential behavior in the market and the market in existence is a weak form. The study did not consider the knowledge intensive approach (Technical Trading rules) which study the irrational behaviors and predict the future price direction.

Wafula (2012) studied the impact of CB involvement on the TTRs in the FOREX market in Kenya. The study covered the entire period of floating swap rate in Kenya from January 1993 to 2012. The sample period was from July 1, 2007 to February 29, 2012 this was as a result of level of downgrading of the exchange rate of the Kshs/USD. SMA rules was applied with and without interest rate cost. She concluded that the impact of CB interference in the market is only felt at a monthly trading interval. Thus involvement in the FOREX market does not significantly reduce profitability of TTRs and hence speculation. Since FOREX is subject to large exchange rate movements with or without intervention by central bank, interest rate costs do not eliminate the profitability of technical trading rules.

Kembe (2013), studied the impact of CB involvement on FOREX rate volatility in Kenya. The study examined the impact of CB involvement on the explosive nature of the US dollar, Euro and Great Britain pounds against Kenya shillings over a period of 2008 and 2011. He found that intervention operates generally reduce exchange rate volatility. However findings were based on periods when CB intervention was already known to the public but it is likely that some smart traders will learn that CB is in the market earlier than the time the story come into sight in the public domain.

2.5 Conceptual Model

The MA model is used to conceptualize the study. This is an arithmetical analysis that uses past data arrangement in an episode of series hence helping to smoothen away unsystematic fluctuations. The rules follow Lebron (1996) that compares the current price to past prices of MA. Using E_t as the Kshs/USD exchange rate returns at time t . The moving average Ma_t at time t is defined as:

$$Ma_t = \frac{1}{M} \sum_{i=0}^{m-1} E_{t-i} \dots \dots \dots 2.1$$

Where Ma_t is the moving average rule at time t

M is the length of the moving average. For the daily series, $M = 150$ and for the weekly $M = 30$.

E_t represents the exchange rate returns for Kshs/USD at time t

2.6 Summary of Literature Review

The pervasive use of technical analysis in FOREX market is puzzling for the reason that historical prices have important trading information or the information traders use to make decision are irrational. There are possibility that profitability of TTR contradict the EMH theory which states that based on publically available information, unusual profits cannot be derived from any trading strategy.

Unlike earlier studies, these studies have been characterized by sophisticated techniques like bootstrapping, momentum strategies, complex technical trading combination nonlinear exchange rate modeling and technical analysis on the other while other studies have examined profitability of TTR using high frequency data.

All the empirical studies reviewed on profitability of TTR models indicate that significant patterns exist in the market for spot exchange rates that technical traders can exploit hence market inefficiency. Though it is difficult to rationalize the finding, available evidence suggests that the CB involvement in the Forex market, irrational market participants and long term dependence could be the possible causes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The section covers overall methodology which was applied to bring out this study. In part 3.2 the design of the research used was discussed. Fragment 3.3 has two sub-section that is 3.3.1 looks at the population and 3.3.2 at the sample and sampling procedures. Section 3.4 discussed the data collection and data collection instrument. Section 3.5 details on the data analysis and has two sub-section 3.5.1 the conceptual model and 3.5.2 the analytical model.

3.2 Research Design

Quasi-experimental design was used to test trade rate dependence to exploit profits in the Forex market. The use of this design is because it allows to determine the actual patterns in the time series of exchange rates data hence able to develop trading rules.

For a trader who trades Forex currency can use the pattern generated to get a buy or sell signal hence able to make informed decisions. The use of quasi-experimental design was because trends in exchange rates can be optimized to earn profits. Given the control level on this activity is not that high as per the laboratory layout this makes the resign design appropriate for this study.

3.3 Population and Sample

These sub-section details the study population, sample and the sample procedure used in the study.

3.3.1 Population of the study

Mugenda and Mugenda (2005) population is universe. Population refers to a hypothetical set of people, object, event or entire group of members where a researcher generalizes the findings of the cram.

The study populationencompasses of the entire period of floating exchange rates from November 1993 to present. This was the period Kenya freed itself from pegging its barter rate on fixed trade rate and adopted the trade rate that allowed the market factor to determine it that is the demand and supply.

3.3.2 Sample and Sampling Procedures

A sample is a sub-set representation of a population. The sample data only covered the period starting 1st July, 2011 to 30th June 2016.The sample period wasgritty by the intensity of depreciation of the trade rate of the Kshs verses the major currencyUSD and the frequency of CBK involvement in the foreign exchange market.

This period allowed for determination of the relationship between Profitability of TTRs and CBintrusion on Forex Market in Kenya.

3.4 Data Collection and Data Collection Instrument

The study involved collecting of secondary data. This is the second hand records that is gathered from previously existing materials such as books, peer-reviewed journal articles, website and other relevant materials. The study used closing daily foreign exchange series. The data series is a representation of the Kshs/USD from 1st July, 2011 to 30th June, 2016. The choice of this currency was influenced by the fact that it is the major currency traded across the world and is commonly used in empirical research.

Interest rates data were the 91-days Treasury bill rates for Kenya government and 91-days Treasury bill rates for US government averaged over one month. The data accuracy was checked this was to ensure validity of daily data prices. Missing data series were checked to determine whether the data omitted could be traced. Where data was not available, the observation was assumed as a holiday break.

The core basis of information for the study were CBK published monthly bulletin, CBK web page and other sources which included scholarly materials since different scholars have written different materials on profitability, TTRs, central bank intervention and FOREX market in Kenya.

3.5 Data Analysis - Test of Profitability of Technical Trading

This section presented the test done to meet the objective of this study. Data analysis is the process of putting together figures and facts in effort to solve a research problem. The section presents the procedures used to test the ability to forecasting using simple TTR. Forecasts were examined over daily and weekly intervals. The rule compared the current price to past prices of moving averages. Using E_t as the Kshs/USD exchange rate returns at time t . The moving average Ma at time t is defined as:

$$Ma_t = \frac{1}{M} \sum_{i=0}^{m-1} E_{t-i} \dots \dots \dots 3.1$$

Where M is the length of the moving average. For the daily series, $M = 150$ and for the weekly $M = 30$.

A buy or sell signal S_t is defined as

$$S_t = 1 \text{ if } E_t \geq Ma_t \quad \text{or}$$

$$S_t = -1 \text{ if } E_t < M a_t \dots\dots\dots 3.2$$

To simplify the rule

Let $E_t = \text{Log}(E_t)$, and r_t, r_t^* be the domestic and foreign interest rates respectively. The dynamic returns Z_t from the trading strategy are defined as;

$$Z_t = S_t (E_{t+1} - E_t - (\log(1 + r_t) - \log(1 + r_t^*))) \dots\dots\dots 3.3$$

The values on the right hand side represents the log difference on the exchange rate corrected for the interest differential. The interest rate differential measures the gap in interest rates. This interest rate differential is used to create an expectation of the future exchange rates between the two currencies. This return is then multiplied by + 1 or - 1 depending on the buy or sell signal. This signals corresponds to zero cost strategy of borrowing in one currency for a long position. The weekly 91-day Treasury bill rates for Kshs/USD were used. The strategy was finally implemented with interest rate differential for completeness.

$$Z_t = S_t (E_{t+1} - E_t) \dots\dots\dots 3.4$$

Where E_{t+1} represents the current closing price and E_t is the previous closing price of the Kshs/USD.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The purpose of this study was to test the relationship between profitability of TTRs and CB intervention on Forex market in Kenya. The chapter is subdivided into the following section; section 4.2 looks at the summary statistics. Section 4.3 addresses the results of profitability and central bank intervention using tables. Section 4.4 summarizes the chapter findings.

4.2 Summary Statistics

Summary statistics for the log differences of the daily Forex series from July 1st, 2011 to June 30st 2016 representing 1,291 daily clarification of log differences.

Table 4.1 ExchangeRate Summary Statistics

Number	With Intervention (Returns)	Without Intervention (Returns)
Mean	9.1080×10^{10}	10.0641×10^{10}
Median	8.7804×10^6	7.84×10^6
Mode	.00000	.00000
Std. Deviation	.00000	.006475
Skewness	.075	-.918
Kurtosis	10.16	14.328
Range	.02398	.02446
Minimum	.08227	.065348
Maximum	.10625	.106830

The table displays features of relatively high frequency tradecharge. The mean returns with CBinvolvement is lower than the mean return without CB involvement. This means interference by CB reduces the profitability of TTRs. However, further test are required to experiment if the mean difference return is statistically significant. The standard deviation of with CB intervention is lower than without CB intervention, this means CB intervention decreases the volatility of returns hence exchange rate risk. The skewness returns with CB intervention are slightly positively skewed and skewed negatively without central bank intervention. This means intervention in FOREX market strengthen the Kshs/USD exchange rate.

The kurtosis of the return however, shows that CB intervention does not decrease events of excess trading returns on foreign exchange rate. This has been empirically examined, for example Sifunjo (2011) there is a chaotic tendencies in the foreign exchange market.

4.3 Profitability and Central Bank Intervention

Table 4.2 Trading Rule Tests with CB Intervention

Series	Returns with central bank intervention						
	N	Mean	Std	t-ratio	Sharpe	Trade fraction	p-value
Kshs Daily No interest	1291	0.124	0.81	2.41	2.95	0.031	0.0134
Kshs Daily interest	1291	0.092	0.81	2.62	1.43	0.031	0.0063
Kshs. Weekly No Interest	266	0.251	1.79	2.67	2.98	0.075	0.0063
Kshs. Weekly - interest	266	0.611	1.79	2.81	1.77	0.075	0.0032

Table 4.2 examines the dynamic trading returns for both daily and weekly trade rates with CBinvolvement in Forex market. The t-ratio test whether the mean returns are

nil. From the table the means clearly indicate vibrant strategies are statistically different from nil at any given significance level. The table also show even after adjusting for the IRD and changing from daily to weekly returns the results are not significantly affected. The mean return with no interest rate are high than mean return with interest rate. At the week trading level, the returns from TTRs are statistically significant than for the daily trading periods for both with and without interest cost. The sharpe ratios in the ranges of 2.98 - 1.43 are attained. The trade fraction indicate the portion of days on which CB involvement in the Forex market. The P-value represents the fraction of simulations generating the significance of the mean.

Table 4.3 Trading Rule Tests without CB Intervention

Series	Returns Without CB Intervention						
	N	Mean	Std	t-ratio	Sharpe	Trade fraction	p-value
Kshs Daily No interest	889	0.044	0.71	0.79	2.56	0.031	0.0004
Kshs Daily interest	889	0.051	0.72	1.26	0.87	0.031	0.0012
Kshs. Weekly - No Interest	85	0.144	1.74	0.654	2.56	0.075	0.0012
Kshs. Weekly - interest	85	0.032	1.72	1.65	0.898	0.075	0.0056

Table 4.3 shows the results of the profitability of TTRs without CB involvement in the Forex Market. The table also includes results of with and without interest cost for both daily and weekly trading series. The observed sample was represented by 889 since CB do not intervene in the market always and not every intervened period is recorded since some go un-noticed. On a daily trade the mean return without interference is lower than the mean return with interest rate. However comparing on a weekly trading interval the profitability of TTRs without CB intervention is high.

Table 4.4 Harmonized Sample Statistic Without CB Intervention.

		N	Mean	Std. Deviation	Std. Error Mean
Daily	Returns No interest	889	0.044	0.71	0.0004
	Returns with interest	889	0.051	0.72	0.0012
Weekly	Returns No interest	85	0.144	1.74	0.0012
	Returns with interest	85	0.032	1.72	0.0056

The table displays the statistic sample of harmonized profits of TTRs without CB involvement and with and without interest costs. The outcome indicates that profits with interest costs are lower than those with interest cost on the daily interval. On weekly interval returns with no interest are high than returns with interest costs.

Table 4.5 Harmonized Sample test without Central Bank Intervention

		Harmonized variation					Sig.
		Mean	Std. Deviation	Std. Error Mean	t	df	
Daily	Returns with i_t - Returns without i_t	.0259241	.0340712	.0001789	4.341	888	.000
Weekly	Returns with i_t - Returns without i_t	.0600413	.0674406	.0018067	6.714	84	.474

Table 4.5 shows the outcome of the harmonized sample test of variation in the returns from TTRs with and without CB involvement in the Forex market. The results shows that profits are statistically insignificant at 1% level from each other at weekly trading intervals.

Table 4.6 Sample Harmonizing Variation of Profitability of Technical Trading Rules with and without central Bank Intervention

Series		Harmonizing Variation					
		Mean	Std. Deviation	Std Error Mean	t- Stat	df	Sig
Daily	Returns with I - Returns without I	-00154	.03407	.0259	-.456	888	.650
Weekly	Returns with I - Returns without I	-00849	.06744	.0600	-2.180	84	.189

Table 4.6 displays the findings of harmonized variation in the profits obtained from TTRs with and without CB involvement in the Forex market. Results shows that mean variation in profits are both negative and are only statistically significant at 5% level from each other at a weekly interval. This means therefore that CB involvement in the Forex market reduces profitability of TTRs significantly.

4.4 Summary

STRs produce significant returns in Forex market. The findings above shows when CB is in the market, profits from TTRs are reduced but not eliminated. They also show when interest costs are factored in the profits are reduced. Interference also reduces the standard deviation of returns and the kurtosis. This means following CB involvement, profitability of TTRs reduces as the Forex risk is reduced. This means the profitability of TTRs and CB participation on Forex market in Kenya has a casual relationship. This result shows that same common factors may affect the profitability of TTRs and CB intervention.

The results also indicate that CB involvement decreases the volatility of profits from technical trading rules. From the finding also shows that not all CB intervention periods get to be know by traders but those days it's know speculators do not earn excessive return unlike on non-intervention periods.

The relationship between profitability of TTRs and CB intervention on Forex market in Kenya is clearly shown on weekly interval both with and without intervention and with and without interest cost (Sweeny, 1986; Schulmeister, 1987). Also TTRs appear to be more profitable during periods of high volatility (Cornell and Dietrich, 1987; Dooley and Shafer, 1983)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The chapter present the synopsis, conclusion and recommendation of the study. Section 5.2 summarizes the findings of the variables of the study. Section 5.3 discusses the conclusion obtained from data analysis. Section 5.4 looks at the limitation of the study. Finally section 5.5 shows suggestions for advance studies.

5.2 Summary of the Study

The study objective was to determine the relationship between profitability of TTRs and CB intervention on Forex market in Kenya. The study period was as at July 1, 2011 to June 31, 2016. The study used STR with and without interest cost. Data was then examine with and without CB intervention the t-test on the harmonized variation sample was applied to profits with and without interest cost and to profits with and without CB involvement.

The general result proved that profitability of TTRs is reduced when central bank's intervene on exchange markets. This result means when CB is in the market, the speculators profits are abridged but not entirely eliminated. However, Forex market differ from most other major asset markets.

The results also indicate that CB involvement decreases the volatility of profits from TTRs. From the finding also shows that not all CB involvement periods get to be know by traders but those days it's know speculators do not earn excessive return unlike on non-intervention periods.

The findings have show there exist a casual relationship between profitability of TTRs and CB intervention. The fact that STRs are able to generate statistically significantly returns with and without CB involvement presents a major challenge to the EMH.

5.3 Conclusion

The objective of this study was to determine the relationship between independent and dependent variable. Results shows that mean variation in profits are both negative and are only statistically significant at 5% level from each other at a weekly interval. This means therefore that CB involvement in the Forex market reduces profitability of TTRs significantly.

The results of the study were consistent with the alternative hypothesis thatthere is significant relationship between profitability of TTRs and CB intervention on Forex market in Kenya. Given the Kenyan Forex market is inefficient this gives a chance of arbitrage profits in the market. This means that the EMH does not hold on Forex market in Kenya.

When interest rate costs is included the profitability of TTRs is not eliminated. There is stillstatistically significant effect on the CB interventionon Forex market.

5.4 Limitation of the Study

The relationship between profitability of Technical Trading Rule and central bank intervention was examined on this study for the Kshs/USD exchange rate. However, there are numerous currencies that are traded on the FOREX market. An open question remains whether the results of this study can be used to test other market currencies.

As simple trading rule give excess profits in the FOREX market contradicts the EMH. In additional, the degree of these profits and the ability to adjust for transaction costs poses a bigger challenge to rational expectation model. Intervention and profits may be driven by similar factors hence the perceptible relationship might be spurious. This paper did not explore on other possible factors that can eliminate all possible causes of the relationship.

5.5 Policy Recommendation

The study examined the relationship between profitability of TTRs and CB intervention on Forex market in Kenya and aimed to bring additional knowledge on the FOREX market in Kenya with CB intervention. The study recommends that simple trading rule can be used to determine the profitability in the market.

The study further recommend that FOREX trading among Banks and institutional traders should be consistent and not only rely on periods of CB intervention but also on other sentimental reactions in the market such as noise, greed and fears.

The study also recommends the government to have an oversight authority that watches on how CB intervenes in Forex market in order to avoid market manipulation and inside dealings.

Policy makers should have a strong and founded research body that should look at why FOREX market in Kenya is not as aggressive as developed country and also should help Central Bank in coming up with regulations that govern Forex trading as its not currently regulated in Kenya.

5.6 Recommendation for Further Research

The study sought to determine the relationship between profitability of TTRs and CB intervention on Forex market in Kenya. There is need for further study to determine the central bank intervention on exotic currencies when simple trading rules are applied and if the excess returned generated by Major currencies have a significant return margin than exotic currencies.

From the findings the study recommends that an in-depth study should be conducted using high frequency programs so that central bank intervention can be detected even before it intervenes and the direction the market will take.

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