THE RELATIONSHIP BETWEEN EXCHANGE RATE FLUCTUATIONS AND STOCK PRICES IN RWANDA STOCK EXCHANGE

BY:

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DECLARATION

I declare that this research project is my original work and has not been presented for the award of any master's degree or diploma in any other university.

SIGNED:…… **DATE**…….

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This research project has been submitted for the examination with my approval as the University Supervisor.

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DEDICATION

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LIST OF ABBREVIATIONS

BSE – Bombay Stock Exchange

CBK - Central bank of Kenya

CMA - Capital markets authority

CMAC - Capital Markets Advisory Council

EMH - Efficient Market Hypothesis

IPO - Initial public offer

IT - Information technology

NSE - Nairobi stock exchange

NBR- National Bank of Rwanda

NYSE - New York stock exchange

OTC - Over the counter trading

OLS- Ordinary List Squares

RSE - Rwanda Stock Exchange

RWF – Rwandese Francs

ABSTRACT

A lot of research has been done on the causal relationship between stock prices and the fluctuations of the exchange rate, which has concentrated on developed economies. Little research has been done on the least developed economies as they have nascent and shallow stock markets in comparison to the developed economies. As a result of globalization and financial cross border integration, majority of open economy countries have adapted a floating exchange system that depends on financial market fundamentals. This study has been done to establish the relationship between exchange rate fluctuations and stock prices in Rwanda. The study aims at informing both the financial regulators and potential investors on the dynamics of the effect between the stock and foreign exchange markets. In addition, the data used is secondary in nature, collected over a spun of three years on a monthly basis. The study adopts a causal relationship between exchange rate and stock prices applying Granger causality to test for co-integration between the two variables. Therefore, an econometric model is developed for the analysis and proposes that there is no long run relationship between the exchange rate and stock prices. Nevertheless, there exists a short run relationship between the two variables exhibiting a unidirectional relationship from the currency market to the stock market in Rwanda. It is further reported that there exists a strong relationship between the stock price index and exchange rate in Rwanda. Finally, the paper recommends that the exchange rate volatility should be controlled in the short run. The formulated financial market policies should enhance adequacy, capacity building and structure the currency environment to accommodate a wider set of a stable foreign exchange market. Thereby, enhancing financial efficiency and reduce information asymmetry.

CHAPTER ONE

1.1 Background of the study

There is a great relationship between the stock markets and the exchange rate, which is greatly related to the financial integration in the international markets. Stock prices are defined as the present value of the future cash flow of companies depending on performance of the economy. Exchange rates affect international competitiveness of a given country, thus influencing economic variables such as real income and output (Dornbusch and Fisher, 1980). Therefore, the appreciation or depreciation of local currency may lead to an increase or decrease respectively of the share market index. The appreciation of a local currency stimulates positively the market share of an import-dominated country and depresses that of export dominated currency (Pan et al., 2007).

Foreign exchange fluctuations induce foreign investors to become more risk averse to the impact of the former. This is attributable to the declining value of their investments associated with foreign exchange fluctuations. This leads to portfolio diversification of investments to stave off the effects of dwindling returns on investments. Returns on investments do not only depend on domestic economic performance of the asset but also on currency fluctuations. Therefore, appreciation of local currency results in investment gains, where as a depreciation decreases the gains.

1.1.1 Exchange Rate Fluctuations

Exchange rate fluctuations are a result of the floating exchange rate system that has been adopted by economies. In Finance, the rate at which one currency will be

exchanged for another is what is referred to as the exchange rate. This rate is influenced by several factors including inflation, supply and demand for the two currencies, political stability and economic performance, Interest rates, public debt, and so on. These factors are generally in a state of change; therefore currency values fluctuate from one moment to the next. Although in retrospect a currency's level is largely supposed to be determined by the underlying economy, the reverse occurs as huge movements in a currency can dictate the economy's fortunes.

This study will use the Rwandese francs (RWF)-US dollar to measure the exchange rate fluctuations. This will be measured on a monthly average at the National Bank of Rwanda. Nominal observations at the close of market from 2011 to 2013 will be gathered from the National Bank of Rwanda (NBR). The exchange rate is expressed in terms of the number of RWF per unit of US currency. Using this form of quotation is consistent with previous empirical studies (Granger 1969).

1.1.2 Stock Prices

For any investor the key issue when making an investment decision is what the expected returns are and if the investment is worthwhile. A share price is the value of a single share of a number of saleable stocks of a company, derivative or other financial asset. It represents a unit of ownership in a company, derivative or financial asset. A stock price is the present value of its future cash flows. The higher the cash flows the higher the stock price.

The stock prices will be measured using the daily (five days a week) closing prices of the stock price index. The index is chosen as it is considered to be Rwandan leading

share market indicator, representing the companies listed on the Rwandan Stock Exchange.

1.1.3 Effect of Exchange Rate Fluctuation on Stock Return

The relationship between stock prices and exchange rates has preoccupied the minds of financial analysts since they both play important roles in influencing the wealth creation of an investor and the development of a country's economy.

This issue received increased attention after the July 1997 East Asian crisis. During the crisis countries were affected in both currency and stock markets. If stock prices and exchange rates are related and the causation runs from exchange rates (x-factor) to stock prices (y-factor), then the crisis in the stock markets can be prevented by controlling the exchange rates. Moreover, developing countries can exploit such a link to attract or stimulate foreign portfolio investment in their own countries.

Similarly, if the causation runs from stock prices to exchange rates, then authorities can focus on domestic economic policies to stabilize the stock market. If the two markets are related, then investors can use this information to predict the behavior of one market, using the information on other market. It means that Investors can use this information for speculation and to increase their return on foreign investment but this would all depend on the Efficient Market Hypothesis (EMH) of the host country.

A linkage between stock prices and exchange rates is a popular view in financial analysis and a number of hypotheses suggest a causal relation between stock prices and exchange rates. Knowledge of the factors that influence the behavior of stock

prices and exchange rates has attracted the attention of policy makers, economists and the investment community for a long time. This is especially noteworthy since 1973 when many countries in the world adopted freely floating or flexible exchange rate systems.

According to Kurihara (2006) factors such as enterprise performance, dividends, stock prices of other countries, gross domestic product, exchange rates, interest rates, current account, money supply, employment, stock speculation and political stability of a country have an impact on the daily stock prices. Nevertheless, the increases of the world trade and capital movements have made the exchange rates to become one of the main determinants of business profitability and equity prices (Kim, 2003).

Ramasamy and Yeung (2005) suggest that the reason for this divergence is associated with the nature of the interaction between stock and currency markets. The latter is sensitive to the stage of the business cycle and wider economic factors, such as developments or changes in market structures within an economy. Therefore, the period of time in which the interaction between stock and currency markets is observed is critical to the end result.

1.1.4 Rwanda Stock Exchange

The Rwanda Stock Exchange's (RSE) central depository was recently inter-linked with other regional stock markets' depositories; a move many say will boost activity at the local stock market. The move is said to be long overdue considering that three out of the five companies trading on the local stock market are cross-listed. The development therefore gives them more opportunities to transact business compared

to the previous situation when they could spend months without trading a single share. It will now become easy to transfer shares across the Rwanda, Kenya, Uganda and Tanzania stock exchange markets. This new development necessitates a study of the causation between stock prices and exchange rates for prospective investors.

The Rwandan Stock exchange is a fairly new financial institution in the country established in January 2011. It operates under the supervision of the Capital Market Authority in Rwanda, previously known as the Capital Markets Advisory Council (CMAC). Given that stock exchange in Rwanda is fairly nascent it faces tremendous challenges at this time and age of financial integration, foreign exchange risk features prominent to any viable investment choice.

1.2 Research Problem

The relationship between stock returns and foreign exchange rates has drawn much attention from economists and financial analysts, for theoretical and empirical reasons. This is because they both play crucial roles in influencing the development of a country's economy. In addition, the relationship between stock returns and foreign exchange rates has frequently been used in predicting future trends for each other by investors who wish to capitalize on their returns.

The Rwandan stock exchange though quite nascent in its experience, has been characterized with a lot of inactivity over the few years it has been operational. Most foreign companies and investors have been shy at investing and listing due to the fluctuating exchange rates present. There is also a knowledge gap that presently exists on the dynamics of the operation of the stock market in Rwanda.

There is lack of consensus on the relationship between exchange rate and stock prices. Although theories suggest causal relations between stock prices and exchange rates, existing evidence on a micro level provides mixed results. Firstly, theorists fail to find a significant relationship between the exchange rate and stock returns. This was observed in Jorion (1990 and 1991) research on the US economy. Secondly, theorists have provided mixed conclusions on the relationship between exchange rate and stock returns. For example Branson (1983) observes both positive and negative relationship between stock prices and exchange rate as he concludes that the exchange rate plays a key role in balancing demand and supply of assets in the economy. Thirdly, Dornbusch and Fischer (1980) postulate a weak or no association between stock prices and exchange rate. This is observed as they treat exchange rate as the price of an asset determined by expected future exchange rate. Indeed, it is clear that there is a lack of theoretical and empirical consensus on this relationship and the direction of causation.

This research paper strives at examining the exchange rate sensitivity on stock prices in Rwanda, and if there is, how the country can take advantage of it to attract foreign direct investments to help grow its economy? Stock markets are affected by changes in both the interest rate and exchange rate but the degree of their impact varies widely. Reliable and realistic estimations of the sensitivity of stock returns to the changes in exchange rate is a crucial factor in exchange rate management and government policy implementation towards financial markets in the country.

1.3 Research Objective

To establish the effect of exchange rate fluctuation on stock returns at the Rwanda stock exchange.

1.4 Value of the Study

This research paper will provide vital information to potential investors who would like to invest in the Rwandan financial market by giving them an insight on the variables that they could use so as to maximize gains on investment returns. It will further provide information that will help individual investors and companies to be aware of the various variables that they can exploit so as to maximize incentives and cut a niche in the market.

Furthermore, this research paper will provide information that will help the government to develop policies and regulations that will enhance the growth of the financial market in Rwanda.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

There has been tremendous studies in the area of the relationship between exchange rate and stock prices around the globe, most of which have concentrated on the Western economies. This chapter majorly consists of theoretical and empirical literature review. It concludes with an overview of the literature reviewed

2.2 Theoretical Literature Review

The relationship between exchange rates and stock markets is explained through different theoretical models. Two of the commonly known theories are: flow oriented model and stock oriented model (portfolio balance approach).

2.2.1 Flow Oriented Model

The flow oriented model approach was described in Dornbusch and Fischer (1980). It argues that causality runs from exchange market to stock market. It further argues that currency movements directly affect international competitiveness. In turn, currency has an effect on the balance of trade within the country. This affects the future cash flows or the stock prices of firms. Stock prices, generally interpreted as the present values of future cash flows of firms, react to exchange rate changes and form the link among future income, interest rate innovations, current investment and consumption decisions (Dornbusch and Fischer, 1980).

The goods market hypothesis suggests that changes in exchange rates affect the competitiveness of multinational firms and hence their earnings and stock prices. A

depreciation of the local currency makes exporting goods cheaper and may lead to an increase in foreign demand and sales. Consequently, the value of an exporting firm would benefit from a depreciation of its local currency.

On the other hand, because of the decrease in foreign demand of an exporting firm's products when the local currency appreciates, the firm's profit will decline and so does its stock price. In contrast, for importing firms the sensitivity of firm value to exchange rate changes is just the opposite. An appreciation (depreciation) of the local currency leads to an increase (decrease) in the firm value of importing firms.

Additionally, variations in exchange rates affect a firm's transaction exposure. That is, exchange rate movements affect a firm's future payables (or receivables) denominated in foreign currency. For an exporter, an appreciation of the local currency reduces profits, while a depreciation of the local currency increases profits. Furthermore, exchange rate movements could affect stock prices because such movements will induce equity flows.

2.2.2 Portfolio Balance Approach

Portfolio balance approach or stock oriented models was developed by Branson et. al., (1977). In this approach, exchange rates, like all commodities, are determined by market mechanism (forces of demand and supply). A blooming stock market would attract capital flows, foreign investors and hence causes an increase in the demand of a country's currency and vice versa. As a result, rising stock prices are related to an appreciation in exchange rates. Moreover, foreign investment in a country's equity securities could increase over time due to the benefits of international diversification

that foreign investors would gain. In addition to returns, capital flows can be induced by less risky investment climate of a country.

An improvement in a country's investment climate (e.g., a stable political system, a fair legal system, financial openness and liberalization, etc.) will lead to capital inflows and a currency appreciation. Furthermore, movements in stock prices may influence exchange rates since investors' wealth and money demand may depend on the performance of the stock market. For example, during the time of a crisis (e.g., the 1997 Asian financial crisis), a sudden dislocation of asset demands may occur because of the herding behavior of investors or the loss of confidence in economic and political stability. This dislocation usually results in the shift of portfolio preference from domestic assets to assets denominated in other currencies, implying a decrease in the demand of money. This will lead to a decrease in the domestic interest rate and in turn lead to capital outflows. Consequently, the currency will depreciate (Panet al., 2007).

The stock-oriented model of exchange rates developed by Branson (1983) and Frankel (1983), it views exchange rates as equating the supply and demand for assets such as stocks. This approach determines exchange rate dynamics by giving the capital account an important role. Since the values of financial assets are determined by the present values of their future cash flows, expectations of relative currency values play a considerable role in their price movements. Therefore, stock price innovations may affect, or be affected by, exchange rate dynamics (Zhao, 2010).

2.3 Determinants of Stock Prices

In any country, the capital market is considered to be a very attractive and lucrative field for any investment. However, investors consider several things before they invest their funds in any particular securities. They survey companies share prices that are most likely to give them a higher return in form of dividends or capital gains on the disposal of the sales bought. The determinants of stock prices are discussed briefly below.

2.3.1 Exchange Rate Fluctuations

The continuing increases in the world trade and capital movements have made the exchange rates as one of the main determinants of business profitability and stock prices. Khalid and Kawai (2003) and Ito and Yuko (2004), claim that there exists a link between stock and currency markets. Furthermore, this link is argued to have propagated the Asian financial crisis in 1997. It is believed that the depreciation of the Thai currency led to the collapse of the stock market. To establish the causal linkages between returns in foreign exchange and stock markets, Abdalla and Victor (1997) find a unidirectional causality from exchange rates to stock returns in all the sampled countries, except for the Philippines. The study concentrated on emerging financial markets of India, Korea, Pakistan and the Philippines. It is evident from the literature reviewed that there is a positive relationship between the foreign exchange and stock prices.

2.3.2 Changes in Company Policy

The effects of dividend yield and dividend policy on stock prices and returns; was studied by Fisher and Myron (1973). They argue that the best method of testing the

effects of dividend policy on stock prices is to test the effects of dividend yield on stock returns. A company can influence the price of its shares by changing the dividend policy.

The popular argument is that the company can increase the value of its shares by increasing its payout ratio.Miller and Modigliani (1961) argue that a firm does not let its dividend policy affect its investment decision. By ignoring taxes and transactional costs, a firm's dividend policy does not affect the value of its shares. Differential shares on income and capital gains make shares of firms that pay low dividends more desirable, thus the firm can increase the value of its shares by reducing its payout ration. Therefore, a firm's policy strategies can either have a positive or negative effect on its share price. Thus caution should be employed when a listed firm changes its internal policies.

2.3.3 Inflation

Inflation in the economy is defined as the reduction of the purchasing power of a currency leading to higher consumer prices. This often slows sales and reduces profits. Higher prices will also often lead to higher interest rates. These changes will tend to bring down stock prices. Theory argues that stock prices are directly proportional to the level of prices in the economy. Therefore, an increase in inflation lead to an increase in common stocks to compensate investors for the money erosion in the economy.

Nevertheless, empirical studies demonstrate an inverse relationship between the inflation rate and stock returns (Famar and Schwert, 1977; Jaffe and Mandelker, 1976; Nelson 1976). The results of their studies indicate a negative relationship

between the expected inflation and the real stock market returns. However, these empirical studies concentrated on developed countries, especially the US and UK. Little research has been done on a cross-section of countries in this subject enquiry.

2.3.4 Economic and Political shocks

Globalization and financial integration over the recent past has increased the exposure to shocks of many developing countries leading to macroeconomic volatility. It is observed that these economies are subject to both internal and external shocks. Nevertheless, internal shocks are considered to be more harmful for the economy than external shocks. Internal shocks can be as a result of a natural disaster, macroeconomic mismanagement or political instability. Bailey and Chung (1995), in an empirical study in Mexico on the impact of the exchange rate fluctuations and political risks on the risk premium found out that there exists evidence of equity market premiums for risk exposure.

Beaulieu, Cosset and Essaddam (2005) studied the impact of political risk in Canada on the volatility of stock returns and found support for a close link between the two. Indeed, economic and political shocks have a remarkable effect on stock prices in an economy.

2.3.5 Changes in Economic Policies

A lot of research work has concentrated on the effect of monetary policy on stock prices. According to Chami, Cosimano and Fullerkamp (1999) inflation induced monetary expansion reduces the real value of a firm's assets thus acting as a tax on capital stock. This effect usually differentiates stocks from bonds and gives rise to

monetary transmission mechanism. Therefore, an expansionary monetary policy generates a decrease on the impact of the real stock and the respective stock prices.

Rapach (2001) provides another analysis on the effects of monetary supply shocks and macroeconomic shocks on the real stock prices. He observes that each macroeconomic shock has a significant effect on the real stock prices.

2.4 Empirical Literature Review

Muhammad and Rasheed (2000) studied four South Asian countries, including Pakistan, India, Bangladesh and Sri-Lanka, for the period January 1994 to December 2000. The results of this study show no short-run association between the variables for all four countries. There is no long-run relationship between stock prices and exchange rates for Pakistan and India as well. However, for Bangladesh and Sri-Lanka there appear to be a bi-directional causality between these two financial (Muhammad and Rasheed, 2000).

Bhattacharya and Mukherjee (2001) investigate the nature of the causal relationship between stock prices and macroeconomic aggregates in the foreign sector in India. The study tests the causal relationships between the BSE Sensitive Index (stock exchange) and the three macroeconomic variables, exchange rate, foreign exchange reserves and value of trade balance using monthly data for the period 1990-1991 to 2000-2001. The results suggest that there is no causal linkage between stock prices and the three variables under consideration.

Dimitrova (2005) studied the short run relationship between stock and currency markets in the U.S. and U.K. over the period January 1990 through August 2004. The

results supported his hypotheses about the expected signs of the two-way relationship. He made the case that, in the short run, an upward trend in the stock market may cause currency depreciation, whereas weak currency may cause decline in the stock market. To test these assertions, he used a multivariate, open-economy, short-run model that allows for simultaneous equilibrium in the goods, money, foreign exchange and stock markets in two countries. He found support for the hypothesis that a depreciation of the currency may depress the stock market. The stock market will react with a less than one percent decline to a one percent depreciation of the exchange rate. This also implies that an appreciating exchange rate boosts the stock market (Dimitrova, 2005).

In another study, Aydemir and Demirhan (2009) investigate the causal relationship between stock prices and exchange rates, using data from 23 February 2001 to 11 January 2008 in Turkey. In this study, national 100, services, financials, industrials, and technology indices was taken as stock price indices. The results of empirical study indicate that there is a bi-directional causal relationship between exchange rate and all stock market indices. While the negative causality exists from national 100, services, financials and industrials indices to exchange rate, there is a positive causal relationship from technology indices to exchange rate. On the other hand, negative causal relationship from exchange rate to all stock market indices is determined (Aydemir and Demirhan, 2009).

Kutty (2010) examined the relationship between stock prices and exchange rates in Mexico. The stock index data for this study is obtained from Dow Jones News and Retrieval provided by Dow Jones. It consists of weekly closing of Bolsa, Mexico's

equity index, a market capitalization weighted index of the leading 35-40 stocks. Mexican Peso per US dollar starting from the first week of January 1989 to the last week of December 2006 was obtained from the International Monetary Market. After eliminating some of the incompatible data, a total of 849 data points were generated. The Granger causality test shows that stock prices lead exchange rates in the short run, and there is no long run relationship between these two variables. This finding corroborates the results of Bahmani and Sohrabian (1992) conclusion, but contradicts the findings of other studies that reported a long-term relationship between exchange rates and stock prices (Kutty, 2010).

2.5 Summary of Literature Review

From the studies done it is clear that the direction of effect of exchange rates to stock prices differs and is dependent on the country a study is being carried out on. Nevertheless, there is lack of consensus on the relationship between exchange rate and stock prices. Although theories suggest causal relations between stock prices and exchange rates, existing empirical evidence on a micro level provides mixed results. It is therefore prudent that more work be done in a country of interest to know the kind of relationship that exists between the two variables whether the direction of causation is unidirectional or bi-directional.

Consequently, this research paper aims at extending the inquiry into the stock market and exchange rate relations in Rwanda where little has been done on the same. This aims at broadly bringing insight into the issue and to fill the gap in literature in a developing country context.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the overall approaches employed in this study. This includes a description of the research design, population, sample and sampling procedures and techniques, instrumentations, data collection procedures and data analysis.

3.2 Research Design

This study adopted a causal relationship design to test for the relationship between the Exchange rates and stock prices; the standard Granger (1969) test was employed. Granger causality is a statistical concept based on prediction. According to Granger causality, if past values of a variable **X** significantly contribute to forecast the value of another variable $\mathbf{Y_{t+1}}$ then **X** was said to Granger cause **Y** and vice versa. The main step for starting was to check for the stationarity of the original variables and then test co-integration between them. According to Granger, the test was valid if the variables are not co-integrated (Granger, 1986). The Augmented Dickey-Fuller (ADF) unit root test was applied to test for stationarity. In this study the Exchange rates was represented by the **X** variable and the stock prices by the **Y** variable.

3.3 Target Population

The target population consisted of all the 5 listed companies trading at the Rwanda stock exchange from the year 2011 to 2013 (see Appendix I).

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3.4 Data Collection

Secondary sources of data were used to ensure that the study was accurate and reliable. The research gathered data through the analysis of monthly bulletins and reports from the Rwandan CMA. This research project used monthly data of Exchange rate and Stock Exchange performance for the period Jan 2011-Dec 2013 for RSE. The study further used the US Dollar monthly average price as the exchange rate and all listed stock indexes as Rwandan Stock Exchange indicator.

3.5 Data Analysis

The data collected from the study was organized and analyzed according to the variables and objectives of the study using STATA Econometric Software. Descriptive statistics (total, frequencies and percentages) as well as illustrations (tables, graphs and charts) were used to present and summarize the data. The analysis was also done in narrative form.

3.5.1 Analytical Model

Granger Causality

Granger causality is a statistical hypothesis test used to determine whether one series is useful in forecasting another. It thus measures the ability of predicting future values of a time series using past values of another time series. Below is a representation of Granger causality test.

$$Y_t = \beta_0 + \sum_{k=1}^{M} \beta_k Y_{t-k} + \sum_{l=1}^{N-} \alpha_l X_{t-1} + U_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .1$$

$$X_t = \gamma_0 + \sum_{k=1}^{M} \gamma_k X_{t-k} + \sum_{i=1}^{N} \delta_i Y_{t-1} + V_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where:

$\mathbf{Y_t}$ – Represents the stock Prices.

$\mathbf{X_t}$ – Represents the Exchange Rate.

$\mathbf{U_t}$,$\mathbf{V_t}$ - Represents the mutually uncorrelated white noise errors.

t – Represents the time Period.

k and **i** – Represents the number of lags.

The null hypothesis was $\boldsymbol{\alpha_I = \delta_I = 0}$ for all **i's**.

Alternative hypothesis was $\boldsymbol{\alpha_I \neq 0}$ and $\boldsymbol{\delta_I \neq 0}$ for at least some ***i*'s**. If the coefficient $\boldsymbol{\alpha_i}$**'s** were statistically significant but $\boldsymbol{\delta_I}$**'s** were not, then **X** caused **Y** and vice versa. But if both $\boldsymbol{\alpha_I}$ and $\boldsymbol{\delta_I}$ were significant then causality was considered to run both ways.

In undertaking the analysis the first step was to check for the stationarity of the original variables and then test co-integration between them. According to Granger (1986), the test was valid if the variables are not co-integrated. The Augmented Dickey-Fuller (ADF) unit root test was used for this purpose. The ADF regression equations were:

$$\Delta Y_t = \propto_1 Y_{t-1} + \sum_{j=1}^{P} \gamma_j \Delta Y_{t-j} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

$$\Delta Y_t = \propto_0 + \propto_1 Y_{t-1} + \sum_{j=1}^{P} \gamma_j \Delta Y_{t-j} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

$$\Delta Y_t = \propto_0 + \propto_1 Y_{t-1} + \propto_2 t + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \varepsilon_t \ldots\ldots 5$$

$\boldsymbol{\varepsilon_t}$ was the white noise (stochastic element of the equation). The additional lagged terms were included to ensure that the errors are uncorrelated. The tests were based on the null hypothesis (**H_0**): Yt was not *I* (0). If the calculated DF and ADF statistics were less than their critical values from Fuller's table, then the null hypothesis (**H_0**) was accepted and the series were non-stationary or not integrated of order zero.

In the second step it was estimated the co-integration regression using variables having the same order of integration. The co-integration equation estimated by the OLS method was given as:

$$Y_t = a_0 + a_1 X_t + Z_t \ldots\ldots (6)$$

In the third step residuals (Zt) from the co-integration regression were subjected to the stationarity test based on the following equations:

(DF) $\Delta Z_t = \propto + \beta_0 Z_{t-1} + V_t \ldots\ldots (7)$

(ADF) $\Delta Z_t = \propto + \beta_0 Z_{t-1} + \sum_{i=1}^{n} \Delta Z_{t-1} + V_t \ldots\ldots (8)$

Where, $\mathbf{Z_t}$ was the residual from equation (6). The null hypothesis of non-stationarity was to be rejected if $\boldsymbol{\beta}$ is negative and the calculated DF or ADF statistics was less than the critical value from Fuller's table. That meant there is a long run stable relationship between the two variables. The causality between them was tested by the use of the error-correlation model. On the other hand, if the null hypothesis of non-stationarity was rejected and the variables are not co-integrated then the standard Granger causality test was appropriate.

The F-test was used to test the overall significance of the model and t test used to check the significance of the independent variable.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter comprises of three main segments, namely: data analysis, results analysis and finally a brief summary of the chapter.

The findings of this project are as presented below:

4.2.1 Descriptive Statistics

The descriptive statistics of stock price index and exchange rate are reported in table 4.1. Stock price has been calculated from the weighted monthly average stock price of the listed firms and the exchange rate is in Rwandese Francs vis-à-vis the dollar rate level.

Table 4.1 Statistical price index and exchange rate in summary form

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Price index	**30**	**303.90**	**134.10**	**177.71**	**589.15**
Exchange rate	**30**	**620.41**	**21.56**	**596.75**	**667.74**

Source: Research Findings

Table 4.1 reports the monthly mean, maximum and minimum monthly stock price index and the exchange rate in Rwanda.

4.2.2 Line graphs of exchange rate and stock prices in Rwanda

In order to visualize whether the mean of stock price index and the exchange rate dramatically increases or not over time a graphical approach has been used. This has been derived before the formal tests of unit root have been done. The graph below represents the weighted stock price index and exchange rate over time.

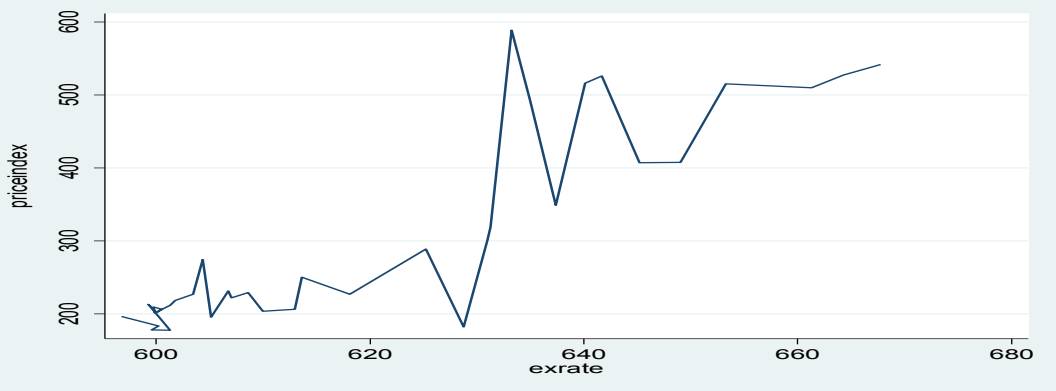
Figure 4.1 Line graph of price weighted index and exchange rate over time

Source: Research Findings

The formulation of line graphs of time series data provide a good guess on the existence of a unit root in the data series. If the graph possesses a continuous increasing or decreasing trend over time, then the time series under examination may contain a unit root in it. This is clearly indicated in the graph above.

It is also of equal importance to determine the graphical representation of the weighted price index verses the exchange rate. Therefore, the line graph is derived as shown below:

Figure 4.2 Line graph of stock price index verses exchange rate in Rwanda



Source: Research Findings

The graph above indicates that both variables i.e. the weighted stock price index and the exchange rate increase in Rwanda over time. This provides a hint on the existence of unit root in them.

4.3 Result analysis

Many published academic journals that use econometric models that examine the long run relationships between two variables in an economy suggest the use of co-integration models. Contrary, some researchers advocate the use of regression models that apply the use of level variables rather than their respective differences. Plosser and Schwert (1978) argue that time series regression models that are computed using levels of economic variables produce a strong relationship between them, characterized with a high coefficient of correlation (i.e.$\mathbf{R^2}$). Nevertheless, when the same model applies the adjusted differenced variables, their relationship becomes negligible.

When time series variables are non-stationary, using variables at levels may lead to a non-constant mean over time and produce residuals that are highly autocorrelated with low Durbin-Watson statistics (Granger and Newbold, 1974). For this reason it is highly recommended that models use differences of each variable until it becomes stationary before running the regression. In addition Plosser and Schwert (1978) points out that an un-differenced regression contains a non-stationary disturbance term that is not well behaved. Given this argument, when dealing with time series data, it becomes important to work with differenced economic data rather than data in levels. Therefore, it becomes prudent that this paper analysis uses stationarity test of the secondary data obtained for the Rwandan economy. This is discussed in the following section.

4.3.1 Stationarity test

Stationarity is important for statistical estimation. Applying the Least Square Regression on non-stationary variables produces misleading parameter estimates of the relationship between variables. According to Diebold and Kilian (1999) stationarity is important for forecasting as it informs of the models to build in order to make accurate predictions. Variables that increase over time are examples of non-stationary variables. Regressing non-stationary variables produces biased standard errors. This results in spurious regression, where a significant relationship is found where non really exists.

Apparently, from the derived graphs in section 4.1.2 above it is evident that the series is non-stationary, hence have a unit root in them. It thus becomes imperative that formal investigations be carried out through the application of Augmented Dickey

Fuller test. The lag length has been selected using the Akaike Information Criterion (AIC) (refer to appendix II). Inanov and Kilian (2001), argue that in the context of VAR models, the AIC tends to be more accurate with monthly data.

In ADF test the null hypothesis is the unit root in the series. Usually the null hypothesis is rejected when the derived test statistic lies outside the various significance levels i.e. 1% (0.01), 5% (0.05) and 10% (0.1) level of significance.

Griffiths, Hill and Carter (1993) argue that normal statistical properties of least squares only hold when the time series variables used are stationary. Therefore, non-stationary series of data requires that it be differenced before performing any noteworthy analysis. In this paper, the Augmented Dickey Fuller Test, ADF (1981) is used to test for unit roots. The findings are reported in appendix III.

In appendix III, the statistics report that the stock price index and the exchange rate in Rwanda contain unit root in them at all levels, as the ADF statistics of both does not exceed 1%, 5% as well as 10% critical values. In addition, it is observed that the price index and the exchange rate are non-stationary in the first difference and second difference respectively. Nevertheless, the price index is observed to be stationary in the third difference whilst the exchange rate becomes stationary in the fourth difference as their respective ADF statistics exceed all the critical values of 1%, 5% and 10%. Therefore, the price index is integrated of order 3 and the exchange rate is integrated of order 4, meaning they are stationary in the third and fourth difference respectively.

4.3.2 Results of Johansen Co-integration test

The Johansen Co-integration is used to determine the long run relationship between the stock price index and exchange rate in Rwanda. According to Lee and Boon (2007), Granger Causality test is usually run in the short-term relationship whilst the Johansen Co-integration technique is used to measure the long run relationship between variables.

Johansen test stipulates that variables must be non-stationary at level. Usually the null hypothesis is that there is no co-integration among variables. Therefore, the null hypothesis is rejected when the computed trace statistic is greater than the reported 5% critical value. This implies that there is no long run relationship between the variables. The null hypothesis is accepted when the computed trace statistic is less than the reported 5% critical value, implying the presence of a long run relationship between the variables. The results of the Johansen test are presented in table 4.3 below.

Table 4.2 Results of Johansen's Co-integration test on stock price indices and exchange rate

TRACE STATISTICS	5% CRITICAL VALUE	NUMBER OF COINTEGRATION
29.4033	15.41	0
6.5351	3.76	1

Source: Research Findings

As the trace statistic has not exceeded the computed 5% critical value in both observations, the Johansen co-integration rejects any co-integration relation between the market price index and the exchange rate in the sampled period. Therefore, it is deducted that the stock price index and the exchange rates do not move together in the long run. These findings are in line with the work of Lee and Boon (2007), who reported a short-term linear causality between the stock market and the exchange rate but no long run relationship between them. As the variables are not co-integrated this research paper proceeds to run the classical Variable Autoregressive model (VARM).

4.3.3 Results of Granger Causality test

As the findings above report a lack of long-run relationship between the price index and exchange rate, the granger causality is applied. This is done in order to check the direction of the causality that is prior not known. In this case, stock market returns and exchange rates are two series variables assumed to be related. There exists a theoretical justification of bi-directional relationship between the two variables. Therefore, the empirical investigation below determines the nature of this relationship.

The null hypothesis is that one series Granger causes the other series. In this case, the reported probability value is compared with the 5% level of significance (i.e. 0.05). This tests the null hypothesis of Granger causality between the two variables. The first hypothesis is that the exchange rate Granger causes the stock price index in Rwanda, whilst the second null hypothesis is that the stock price index Granger causes exchange rate in Rwanda.

Table 4.3 Results of Granger Causality test between stock price index and exchange rates

Null Hypothesis	Probability	Level of Significance	Conclusion
Exchange rate Granger causes price index	0.0000	0.05	Accept H_0
Price index Granger causes Exchange rate	0.356	0.05	Reject H_0

Source: Research findings

Table 4.4 reports that the causality runs from exchange rate market to the stock market while no causality exists from stock market to the exchange rate market in the short-run in Rwanda. The probability value of the null hypothesis of granger causality from exchange rate market to stock market is less than the 5% level of significance (i.e. 0.05). Thus the null hypothesis is accepted meaning that the exchange rate Granger causes the stock market price index. This result of Granger causality test reports that the causality runs from the currency market to the stock price index market in the Rwandan case. Therefore, a unidirectional relationship exists from currency market to the stock market.

4.3.4 Results of regression equation

Table 4.5 below represents the results of the OLS regression of the stock price index on the exchange rate.

Table 4.4 Results of the regression equation

Dependent Variable: Stock Price Index **(Y_i)**
Prob> F = 0.0000
Number of Observations = 33
Method: Ordinary Least Square

Variable (X_i)	**Coefficient (β_i)**	**Standard Error**	**t-Statistic**	**P > |t|**
PriceindexL1	0.3194	0.1823	1.75	0.091
PriceindexL2	-0.0996	0.1921	-0.52	0.608
PriceindexL3	0.1830	0.1781	1.03	0.313
Exrate	3.4765	1.2893	2.70	0.012**
Constant	-1968.743	738.748	-2.66	0.013**

R-Squared = 0.7926
Adj R-Squared = 0.7629
Root MSE = 65.767
Significance level: *p<0.10, **p<0.05, ***p<0.01

Source: Research Findings

The regression results above indicate that the coefficient of correlation (**R^2**) is 0.7626. This is the goodness of fit of the regression of the model. This means that the exchange rate explains approximately 76.3% of the stock price index in Rwanda. The adjusted **R^2** is approximately 76.3%, meaning that the addition of extra explanatory variables does not improve the model much as the later two are approximately the same.

In addition, it is observed that the coefficients of the three price indices lags (i.e. PriceindexL1, PriceindexL2 and Priceindex3) represented by β_1, β_2 and β_3 are statistically insignificant as their respective t-statistics are less than the standard 2. Therefore, they are not statistically significant in explaining the stock price in Rwanda. It is also observed that the y-intercept of the regression line is -1968.74. This result is statistically significant both in the 5% and 10% level of significance. This means that when the exchange rate is 0, the price index is -1968.74 Rwandese Francs, all factors held constant.

It is further observed that the exchange rate is statistically significant in explaining stock price index in Rwanda. This is both in the 5% and 10% levels of significance. This implies that on average an increase of the stock price index by a unit Rwandese Franc results in a 3.48 units of Rwandese/dollar rate in the Rwandan economy, all other factors held constant.

4.4 Interpretation of the findings

This chapter investigates the relationship between the exchange rate fluctuations and stock prices in Rwanda. The data used is secondary time series obtained from the Rwandan stock exchange and the econometric software Stata is used for the data analysis.

It is evident from the data graphical analysis that there exists unit root. This is explained by the continuous increase of the graphical representation of price index and exchange rate over time. Given that many empirical papers that examine the long-run relationship of economic variables use co-integrationmodels, this research

paper follows suit. To analysis the data it is important that an empirical stationarity testis done. The stationarity test finds out that unit root exists in the two variables under study. Furthermore, Akaike criterion is used to determine the optimal number of lags where 3 lags are selected. The ADF test is used to test for stationarity and it is established that the stock price index is stationary in the third difference and the exchange rate is stationary in the fourth difference. This means that the price index and exchange rates are integrated of order 3 and 4 respectively.

In addition, it is established that a long-term relationship does not exist between stock price index and exchange rate in Rwanda. This finding is deduced from the analysis of the Johansen co-integration test. Further testing of the Granger causality test is done in order to establish the direction of causality between the two variables under study in the short–run. The findings establish that there exists a unidirectional relationship from the currency market to the stock market in the Rwanda.

Finally, the results of the regression model of price index on exchange rate indicate that the lagged variables of stock price index are statistically insignificant in explaining the stock price in Rwanda. It is further established that the goodness of fit is quite high, meaning that there is a strong relationship between the stock price index and exchange rate in Rwanda. The exchange rate is statistically significant in explaining stock price index in Rwanda, all other factors held constant.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This empirical research paper has strived at determining both the short run and long run relationship between the stock price index and exchange rate fluctuations in Rwanda. To determine the long run relationship the Johansen Co-integration technique is used and for the short run relationship Granger causality test is applied. The empirical data used is monthly in nature, starting from January 2011 to December 2013. The findings indicate that causality runs from the currency market to the stock market in Rwanda. These findings are consistent with Sifunjo and Mwasara (2012) study on the Kenyan economy. The findings from empirical investigation indicate that causation should be necessary part of designing exchange rate policies.

5.2 Summary

The link between the stock market and exchange rates is very important in the financial market risk management process. In the long run, the findings of the empirical results reported do not support either the traditional or the portfolio approach towards the relationship between the stock market and the exchange rate. It supports the asset approach, which stipulates that there may not be any link between the two variables under study. The Johansen co-integration test results support the asset market theory that states that the exchange rate can be likened to an asset whose current price can be determined by its future discounted prices. Therefore, future exchange rate prices are captured by the current prevailing currency prices. These findings are consistent with those reported by Ratner (1993) and Nieh and Lee (2001).

Given that in Rwanda unlike other developed countries lacks derivative instruments used for hedging risks in the financial markets, the cost of risk management is evidently high. In addition, a high volatility foreign exchange market reduces price efficiency levels in the currency market. This leads to the escalation of uncertainty in the financial markets on the nature and extent of the market shock causing the foreign exchange volatility. If the volatility persists over a long period of time, the price adjustment process of stock prices disrupts the price recovery process in the market. Therefore, this persistent volatility leads to an increased perception of risks associated with foreign exchange market resulting in higher costs of capital. This results in the waning of investor confidence that results in the reduction of the sources of investments. These effects may also lead to the reduction of the financing capacity of investors in both markets.

5.3 Conclusion

It is generally concluded that exchange rate Granger causes stock price in Rwanda. This Granger causality from the exchange rate market to the stock market introduces a number of implications for individual investors, corporate investors, financial policy makers and the market intermediary agencies. Any sharp fluctuations in the stock prices caused by the fluctuations in foreign exchange rates would result in panic amongst various portfolio managers. This would result in waning confidence on stock markets resulting in the eventual liquidation of portions of their equity portfolios in an attempt to hedge against currency losses. The essential impact is the declining RSE index, which is an indicator of the bad trading condition in the stock market.

Listed companies in the Rwandan Stock Exchange (RSE) face similar challenges associated with volatility exchange rates attributable to exposure of the economy to foreign exchange risks. This results in increased operating and financing costs and ballooning bad debts. Listed companies that heavily rely on imports are likely to suffer from depreciation in the Rwandese Franc, which ultimately affects the earnings due the reliance on imports for their production process. Corporate profits are also reduced and are observed from the declining EPS. Therefore, high volatility results in a negative impact on the growth and development of the Rwandan Securities Exchange.

5.4 Recommendations for Policy

The findings of this study provide policy recommendations to regulators in Rwanda that in the long run, exchange rate volatility cannot be controlled through the stock market interventions. However, short run causality exists running from the exchange rate to stock markets in Rwanda. Therefore, financial market policy formulation is applicable in the short run.

To stave off the effects of foreign exchange volatility, the government through the National Bank of Rwanda should intervene in the foreign exchange market. Policies of the introduction of the derivatives in the market should be formulated in order to hedge against foreign exchange volatility in the market. This would greatly manage the risks in a cost efficient way thereby leading to an increase of the investor confidence and stability in the foreign exchange market. Particularly, instruments such as options and futures should be introduced in the Rwandan financial market.

This study is important to the government policy makers as it informs the sensitivity of cross-border trade volatility, from the currency market to the stock market. There is need for formulation of government policies that involve cross border asset effects. The government regulators should adequately consider the adequacy, capacity and structure of the currency regulatory environment to accommodate a wider and complex set of objectives of a stable foreign exchange market.

There is also a great need of the efficiency of information gathering and the dissemination of the same to the financial market. This will greatly reduce information asymmetry thus the financial market regulators are be able to assess the nature of the activities in the market at any given time. In addition, the financial regulators should strive at increasing the companies listed at the stock exchange, thus elevating the Rwandan bourse to global level. This would increase the financial intermediation process that is an externality effect of globalization and cross border financial integration. Thereby, this will enable global competitiveness that will attract foreign investments on the locally listed firms.

The government policy makers should strive at formulating policies that will enhance risk management. This should apply to all market participants including: corporations, financial intermediaries, investors and other market participants. The formulated risk management policies should address issues associated with robust internal controls, accountability structures and strict reporting of financial information. To enhance this the financial regulators should strive at creating awareness through the education of the various stakeholders.

Another recommendation derived from this study is the asset protection of small-scale investors. An insurance scheme should be established in order to protect the investments small market investors. Strict guidelines should be formulated to inform the market discipline of stockbrokers and agencies amongst other intermediaries to minimize the risk of loss of investments. This will enhance market integrity that will increase investor confidence and increase the returns on investments. This is also critical in reducing information asymmetry thereby enhancing stock market efficiency in Rwanda.

5.5 Limitations of the Study

This research is limited in terms of scope and needs further future research on the relationship between exchange rate and stock prices in Rwanda. Currently, there exist only five listed firms in the Rwandan stock exchange. There is need for more firms to be listed on the stock exchange in order to increase the sample size and empirical power of forecasting.

In other empirical research on the relationship between the stock market and the exchange rate, the number of years used in the analysis is usually large. This research encountered challenges of missing data that was either unreported or was not well documented over the three years studied. Future research should be done in order to address any biases that could have been encountered in the data analysis.

Finally, the econometric model used in the data analysis is reported to have some shortcomings. This research paper used the VAR estimation model. It is usually quite

sensitive to data manipulation. Future research should be done to address the shortcomings of this research study.

5.6 Areas of further Research

From the findings presented in this research paper, a number of areas are identified for further future research. This is as summarized below.

Firstly, there is need to study on the difference that exists between the predicted and actual weighted stock price index. This will bring insight on the possible explanation for this difference and the possible effects on the exchange rate level.

Secondly, it would be important to determine the effects of variations in the exchange rate on the different listed firms on the stock exchange. These firms include: the importing, exporting and domestic firms. This would bring proper understanding on the detailed evidence if these different firms were distinguishable.

Thirdly, it is prudent that the future research concentrates on the effects of hedging activities on the exchange rate level. This would investigate the effect of various hedging activities on the foreign exchange market. Consequently, this should follow the various economic transmission mechanisms so that it may be clear which channels can never be hedged or which channel is easily affected by the various hedging activities.

All these areas of research amongst others will enrich the presently existing theory and empirical understanding, thereby enhancing continuous knowledge on the interaction between the exchange rates and stock prices.

REFERENCES

Abdalla, I. S. A. and V. Murinde, 1997, Exchange Rate and Stock Price Interactions in Emerging Financial Markets: Evidence on India, Korea, Pakistan, and Philippines, Applied Financial Economics vol. 7, pp. 25-35.

Aydemir, O. and E. Demirhan (2009), The Relationship between Stock Prices and Exchange Rates, Evidence from Turkey*, International Research Journal of Finance and Economics*, vol. 23.

Bahmani, M. and A. Sohrabian (1992), Stock Prices and the Effective Exchange Rate of the Dollar, *Applied Economics* vol. 24 (4).

Bailey, W., and Y. P. Chung, 1995, Exchange rate fluctuations, political risk, and stock returns: Some evidence from an emerging market, *Journal of Financial and Quantitative Analysis,* vol. 30, pp. 541-561.

Beaulieu, M., Cosset, J. and Essaddam, N. (2005), The Impact of Political Risk on the Volatility of Stock Returns: The Case of Canada, *Journal of International Business Studies*, Vol. 36 (6), pp. 701-718.

Bhattacharya, B. and J. Mukherjee (2001), Causal relationship between stock market and exchange rate, foreign exchange reserves and value of trade balance: a case study for India.

Branson, W., H. Halttunen, and P. Masson, 1977, Exchange rates in the short run: The Deutschemark rate, European Economic Review, 10: 303-324.

Branson, W. H. (1983), Macroeconomic Determinants of Real Exchange Rate Risk, In R. J. Herring (Ed.), *Managing Foreign Exchange Rate Risk*, Cambridge, MA: Cambridge University Press: 29−45.

Chami R., Cosimano T. F. and C. Fullerkamp (1999), The Stock Market Channel of Monetary Policy, *IMF Working Paper*, No. 22.

Diebold, F. X. &Kilian, L. (1999), Unit Root Tests are Useful for Selecting Forecasting Models, *Journal of Business and Economic Statistics*, vol. 18, pp. 265-273.

Dimitrova, D. (2005), The Relationship between Exchange Rates and Stock Prices: Studied in a Multivariate Model, *Political Economy* vol. 14.

Dornbusch, R. and Fischer, S. (1980), Exchange Rates and the Current Account, *American EconomicReview*, vol. 70(5), pp. 960-971.

Fama, E. F. and Schwert G. W. (1977), Asset Returns and Inflation, *Journal of Financial Economics*, vol. 5, pp. 115-146.

Fisher, B. and Myron, S. (1973), The pricing options and corporate liabilities, *Journal of Political Economy*, vol. 81 (3), pp. 637-654.

Frankel, J. A. (1983), Monetary and Portfolio Balance Models of Exchange Rate Determination, In J. S. Bhandari and B. H. Putnam (Eds.). *Economic Interdependence and Flexible Exchange rates*, Cambridge, MA: MIT Press: 84-115.

Granger, C. J. (1969), Investigating Causal Relations by Econometric models and Cross-Spectral Methods, *Econometrica*37.

Granger, C.W. &Newbold, P. (1974), Spuriuos Regression in Econometrics, *Journal of Econometrics*, vol. 2, pp. 111-120.

Granger, C.W. 1986, Developments in the study of co-integrated economic variables, *Oxford Bulletin of Economics and Statistics*, vol. 48, pp. 213-228.

Inanov, V. &Kilian, L. (2001), Impulse Response Analysis in Vector Autoregressions with Unknown Lag Order, *Journal of Forecasting*, vol. 20, pp. 161-179.

Ito, T. and Yuko H. 2004. High-Frequency Contagion between the Exchange Rates and Stock Prices, *Working Paper 10448*, NBER, Cambridge, MA.

Jaffe, F. and Mandelker (1976), The Fisher Effect for Risky Assets: An Empirical investigation, *The Journal of Finance*, vol. 31 (2), pp. 447-458.

Jorion, P. (1990), The Exchange Rate Exposure of U.S. Multinationals, *Journal of Business* vol. 63, pp. 331-345.

Jorion, P. (1991), The Pricing of Exchange Rate Risk in the Stock Market, *Journal of Financial and Quantitative Analysis*, vol. 26, pp. 363-376.

Khalid, A.M., and Kawai, M. 2003, Was financial market contagion the source of economic crisis in Asia? Evidence using a multivariate VAR model, *Journal of Asian Economics* 14: 131- 156.

Kim, K. (2003), Dollar Exchange Rate and Stock Price: Evidence from Multivariate Cointegration and Error Correction Model, *Review of Financial Economics* vol.12.

Kurihara,Y. (2006), The Relationship between Exchange Rate and Stock Prices during the Quantitative Easing Policy in Japan, *International Journal of Business,* vol.11 (4).

Kutty, G. (2010), The relationship between exchange rates and stock prices: the case of Mexico, *North American Journal of Finance and Banking Research,* vol. 4, pp.4.

Lee, L.C and H.T. Boon (2007). Macroeconomic Factors of Exchange Rate Volatility, Evidence From Four Neighbouring ASEAN Economies. Studies in Economics and Finance, 24(4): 266-285.

Merton, H. M. and Franco M. (1961), Dividend Policy, Growth and Valuation of Shares, *The Journal of Business*, vol. 34 (4), pp. 411-433.

Muhammad, N. and Rasheed, A. (2000), Stock Prices and Exchange Rates: Are they related? Evidence from South Asian Countries.

Nelson, C. (1976), Inflation and Rates of Return on Common Stocks, *The Journal of Finance*, vol. 31 (2), pp. 471-487.

Ratner, M (1993). A Cointegration Test of the Impact of Foreign Exchange Rates on U.S Stock Market Prices.*Global Finance Journal*, vol.4, pp. 93-101.

Pan, M. S., Fok, R. C. W., and Liu, Y. A. (2007), Dynamic Linkages between Exchange Rates and Stock Prices: Evidence from East Asian Markets, *International Review of Economics and Finance,* vol.16, pp. 503-520.

Plosser I. C. &Schwert G. W. (1978). Money, Income and Sunspots: Measuring Economic Relationships and effects of differencing, *Journal of monetary economics*, vol.4, pp. 637-660.

Ramasamy, B. and Yeung, M. C. H. (2005), The Causality between Stock Returns and Exchange Rates: Revisited, *Australian Economic Papers*, Vol. 44, No. 2, pp. 162-169.

Rapach, D. E. (2001), Macro shocks and real stock prices, *Journal of Economics and Business,* vol.53 (1), pp. 5-26.

Ratner, M. (1993), A Cointegration Test of the Impact of Foreign Exchange Rates on U.S Stock Market Prices. *Global Finance Journal*, vol. 4, pp. 93-101.

Sifunjo, E. K. &Mwasara, A. (2012), The Causal Relationship between Exchange Rate and Stock Prices in Kenya, *Research Journal of Finance and Accounting*, vol. 3, no. 7.

Zhao, H. (2010), Dynamic Relationship between Exchange Rate and Stock Price: Evidence from China. *Research in International Business and Finance* 24: 103–112.

APPENDICES

Appendix I: Shows the listed firms in the Rwandan Stock Exchange

Number	Symbol	Company	Notes
1	**BRL**	Bralirwa	*Brewing, Bottling*
2	**KCB**	Kenya Commercial Bank Group	*Banking, Finance*
3	**NMG**	Nation Media Group	*Publishing, Printing, Broadcasting, Television*
4	**BOK**	Bank of Kigali	*Banking, Finance*
5	**UCHU**	Uchumi Supermarkets	*Supermarkets*

Source: Rwandan CMA

Appendix II: Shows the lag length selection using the various statistical criterion

Selection-order criteria

Sample: 2011m11 - 2013m12 Number of observations = 26

|lag |	LL	LR	df	p	FPE	AIC	HQIC	SBIC
| 0 |	-263.12	-	-	-	2.5e+06	20.39	20.42	20.49
| 1 |	-195.76	134.69	4	0.000	18889	15.52	15.60*	15.81*
| 2 |	-192.14	7.25	4	0.123	19591.8	15.55	15.69	16.03
| 3 |	-186.84	10.59	4	0.032	18048.5*	15.45*	15.64	16.13
| 4 |	-184.72	4.24	4	0.375	21548.2	15.59	15.85	16.47
| 5 |	-180.12	9.20	4	0.056	21711.3	15.55	15.86	16.61
| 6 |	-178.18	3.88	4	0.422	27662.6	15.71	16.07	16.97
| 7 |	-172.30	11.76	4	0.019	27164.5	15.56	15.98	17.01
| 8 |	-168.41	7.78	4	0.100	33094.5	15.57	16.04	17.22
| 9 |	-163.3	10.23*	4	0.037	40429.4	15.49	16.01	17.32
| 10 |	-159.46	7.68	4	0.104	64339.8	15.50	16.08	17.53

Source: Research findings

Appendix III: Shows the Results of unit root investigation (ADF test)

Variables	ADF test for unit root test in	Test Statistics	1% Level of Significance	5% Level of Significance	10% Level of Significance
Price index	Levels	0.013	-3.716	-2.986	-2.624
	First difference	-2.499	-3.723	-2.989	-2.625
	Second difference	-3.504	-3.730	-2.992	-2.626
	Third difference	-4.802	-3.736	-2.994	-2.628
Exchange rate	Levels	1.624	-3.716	-2.986	-2.624
	First difference	-1.191	-3.723	-2.989	-2.625
	l difference	-2.983	-3.730	-2.992	-2.626
	Third difference	-3.455	-3.736	-2.994	-2.628
	Fourth difference	-4.250	-3.743	-2.997	-2.629

Source: Research Findings