

ADFJ ISSN 2522 - 3186.

African Development Finance Journal

VOLUME 6 (II)

The Nexus between Exchange Rate and Composite Stock Price Index in Tanzania

James Daniel Chindengwike

Date Received: December, 02, 2023

Date Published: December, 20,2023

http://journals.uonbi.ac.ke/index.php/adfj
ISSN 2522-3186

The Nexus between Exchange Rate and Composite Stock Price Index in Tanzania

By: James Daniel Chindengiwke [1]

Abstract

This study evaluates the relationship between Tanzania's composite stock price index and exchange rate. The Bank of Tanzania and the Dar es Salaam Stock Exchange provided secondary data for this study. The Auto-Regressive Distributed Lag Model (ARDL) was used to model time series data. The composite stock price index was found to be highly influenced by the exchange rate, rising by 0.0424 percent for every 1% increase in the exchange rate. Additionally, this study suggests that future research employ annual data to obtain the several macroeconomic variables that are related to the composite stock price at the Dar es Salaam Stock Exchange. In addition to being critical to the government since the composite stock price is a significant indicator of economic performance, this is important to stockholders as a gauge for avoiding market losses. The study also recommends increasing a significant number of common findings.

Keywords: *Exchange Rate, Stock Price, Tanzania*

Introduction

For investors, businesspeople, and macroeconomic policymakers alike, understanding the relationship between exchange rates and composite stock values is essential. Policymakers, financial analysts, economists, and academics are all paying attention to this link because of how vital it is. This has led to numerous studies looking at the strength or extent of the correlation between stock prices and macroeconomic indices (Sigh, Mehta, & Varsha, 2011; Samadi, Bayani, & Ghalandari, 2012). Economic theory views composite stock prices as a crucial indicator of changes in economic activity; hence, the subject or topic has drawn more attention.

Many analysts throughout the world have also been motivated by the numerous arguments and contradictions surrounding the connection between macroeconomic conditions and the composite stock market. Research on the effects of macroeconomic factors on the capital market and the interconnected nature of the composite stock market has been used to support these conclusions. In growing capital markets in nations like China, Brazil, Russia, India, and the former Soviet Union, researchers discovered a positive correlation between the exchange rate and the composite stock market. The fact that there was no association between the performance of the composite stock market in the past and the present suggested that the BRIC region had subpar market performance (Hoque & Yakob, 2017). The results of a study conducted in three ASEAN nations (Singapore, Malaysia, and Indonesia) using panel least squares

[1]*Assistant Lecturer, St. John's University of Tanzania, Dodoma, Tanzania, Email:* chindengwikejames@gmail.com

regression techniques reveal that while inflation and currency rate have a significant impact on the composite stock market, money supply has a far smaller effect. Monetary policy needs to be adjusted in order to maintain a constant inflation rate (Jamaludin et al., 2017). Researchers in developing countries have found that the money supply and the composite stock market have a positive association, but that interest rates, inflation, and currency rates have a negative link with it (Aremo, 2020; Kirui, 2014; Ullah, 2017). The volatility of macroeconomic variables, including interest rates, currency exchange rates, inflation, and money supply, has an indirect impact on a corporation's portfolio value and composite stock.

For investors, businesspeople, and macroeconomic policymakers alike, understanding the relationship between exchange rates and composite stock values is essential. Policymakers, financial analysts, economists, and academics are all paying attention to this link because of how vital it is. This has led to numerous studies looking at the strength or extent of the correlation between stock prices and macroeconomic indices (Sigh, Mehta, & Varsha, 2011; Samadi, Bayani, & Ghalandari, 2012). Economic theory views composite stock prices as a crucial indicator of changes in economic activity; hence, the subject has drawn more attention.

Since its formation in 1996 and beginning operations in 1998, the Dar es Salaam stock market has expanded quickly. The various businesses that have been listed on the stock exchange serve as proof of this. However, when compared to other industrialised markets, the Dar es Salaam Stock Exchange (DSE) has a low market capitalization (Kapaya, 2020). Additionally, little is known about how well the capital market can reflect any new information that can affect returns. Because of this, the DSE's responses to macroeconomic factors differ significantly from those of the developed market. Although recent advancements in macroeconomic fundamentals are lacking in a developing country like Tanzania, changes in macroeconomic determinants have a wide variety of effects across the economic spectrum (Abdalla, 2014). Since investors can anticipate price fluctuations when investing in stocks, changes in a macroeconomic variable can have a significant impact on the composite stock market (Barakat et al., 2015).

Academics have recently started to discuss the stock market often (Ayub & Masih, 2013; Talla, 2013). A stock market is a crucial indicator of performance, a gauge of a nation's financial competitiveness, and an overall direction for the implementation of monetary policy (Talla, 2013). Listed firms place a high value on the price of their stock shares, which is a reliable measure of the overall financial health of the company because the higher the stock price, the more promising the company's prospects are. The value of a company's shares will determine if its long-term profitability can be sustained. In addition, the stock prices of the majority of firms vary, which causes losses for stockholders who used to buy the stock at a discount and sell it at a premium. Due to investors' fear of suffering losses, this has an impact on the company's ability to generate bigger profits. In order to prevent shareholder losses and to assure the future of their firm, it is necessary to understand the elements that influence the stock price or share price of the company (Ullah et al., 2017).

The study's findings help stockholders and other market participants identify the variables that influence the composite stock price index. Having the ability to estimate stock prices and make price predictions will allow them to determine when to buy and sell shares, which will help them foresee and minimize losses to investors. By focusing on the relationship between exchange rate and composite stock price index in Tanzania based on the degree of responsiveness of change in composite stock price attributed to the exchange rate and interest rate, the current study sought to close the existing gap.

Literature Review

For investors, businesspeople, and macroeconomic policymakers alike, understanding the relationship between exchange rates and composite stock values is essential. Policymakers, financial analysts, economists, and academics are all paying attention to this link because of how vital it is. This has led to numerous studies looking at the strength or extent of the correlation between stock prices and macroeconomic indices (Sigh, Mehta, & Varsha, 2011; Samadi, Bayani, & Ghalandari, 2012). Economic theory views composite stock prices as a crucial indicator of changes in economic activity; hence, the subject has drawn more attention.

Since its formation in 1996 and beginning operations in 1998, the Dar es Salaam stock market has expanded quickly. The various businesses that have been listed on the stock exchange serve as proof of this. However, when compared to other industrialised markets, the Dar es Salaam Stock Exchange (DSE) has a low market capitalization (Kapaya, 2020). Additionally, little is known about how well the capital market can reflect any new information that can affect returns. Because of this, the DSE's responses to macroeconomic factors differ significantly from those of the developed market. Although recent advancements in macroeconomic fundamentals are lacking in a developing country like Tanzania, changes in macroeconomic determinants have a wide variety of effects across the economic spectrum (Abdalla, 2014). Since investors can anticipate price fluctuations when investing in stocks, changes in a macroeconomic variable can have a significant impact on the composite stock market (Barakat et al., 2015).

Academics have recently started to discuss the stock market often (Ayub & Masih, 2013; Talla, 2013). A stock market is a crucial indicator of performance, a gauge of a nation's financial competitiveness, and an overall direction for the implementation of monetary policy (Talla, 2013). Listed firms place a high value on the price of their stock shares, which is a reliable measure of the overall financial health of the company because the higher the stock price, the more promising the company's prospects are. The value of a company's shares will determine if its long-term profitability can be sustained. In addition, the stock prices of the majority of firms vary, which causes losses for stockholders who used to buy the stock at a discount and sell it at a premium. Due to investors' fear of suffering losses, this has an impact on the company's ability to generate bigger profits. In order to prevent shareholder losses and to assure the future of their firm, it is necessary to understand the elements that influence the stock price or share price of the company (Ullah et al., 2017).

The efficient market hypothesis is a well-established and fundamental idea that asserts markets are systematic, represent all available information to investors, and are made by rational people. Sewell (2011) asserts that the stock market is well-designed to be efficient if the stock price accurately reflects all information that is currently known and the price is unaffected by the disclosure of pertinent information to experts and investors. The efficient market hypothesis is to blame for the global financial crisis because it exaggerates the severity of these occurrences, according to Ball (2009), who has made various objections to the theory. At the beginning of the twenty-first century, financial professionals started to believe that investors are not entirely rational and that the market cannot be predicted.

In China, Russia, and India, Tripathi and Kumar (2014) looked into the long-term correlation between stock prices and inflation. They found that while India and China had a positive association with inflation, stock indices had a significant negative relationship with it. Hassan and Sangmi (2013) looked into how macroeconomic factors affected the Indian stock market. They found that there is a significant correlation between India's macroeconomic variables, including inflation, stock prices, money supply, interest rates, and exchange rates. Talla (2013) conducted studies to look at how the stock market and exchange rate are impacted by macroeconomic factors. The consumer price index (a proximate measure of inflation), the exchange rate, the money supply, and the interest rate were the macroeconomic variables chosen. From January 1993 to December 2012, he collected data on a monthly basis. For analysis, he used the unit root test, multivariate regression, and Granger causality. Stock prices were shown to be considerably and negatively correlated with inflation, currency depreciation, and interest rates. Stock prices were also found to be significantly and negatively correlated with money supply and money supply growth. The association between macroeconomic data and the Indian stock market was examined by Pal and Mittal in 2011. From January 1995 to December 2008, data were gathered quarterly, and the link was examined using the Johansen co-integration method. The stock market index was discovered to have long-term relationships with a number of macroeconomic factors. The study also found a connection between inflation and the currency rate.

Kwofie and Ansah (2018) examined the relationship between monthly market returns in Ghana from January 2000 to December 2013 as computed from the GSE all-share index and data on inflation and exchange rates collected from the Bank of Ghana. The cointegration method and error correction parametrization of the ARDL (Autoregressive Distributed Lag) model were used to analyse this effect. The ARDL and its related error correction model were used to explain how Ghana's Composite Stock Price Index, inflation, and exchange rate are related. The analysis established a significant long-term relationship between GSE market returns and inflation. However, there was no short-term link between them. The exchange rate and GSE market returns were also found to be significantly correlated over both the long and short terms. The variables' long-term memory characteristics were investigated, and it turned out that they were a valuable quality for investors. It is influenced by inflation as well as the long-term impact of exchange rates on the Composite Stock Price Index.

According to Kirui et al. (2014), the objective of this study at Nairobi Securities Currency Limited was to assess how GHD, currency rates, Treasury bills, stock returns, and inflation are related. The study determined how each macroeconomic variable's response to shocks affected stock prices. Changes in each macroeconomic component were what affected Nairobi Securities Limited's stock return volatility. The Engle-Granger two-step method was applied to determine how stock returns and macroeconomic variables interacted. Leverage effects and the durability of NSE volatility were captured using the TTGARCH model.

The TGARCH model and the NSE model were both applied. The National Bureau of Statistics of Kenya provided the published time series, which covered the years 2000 to 2012.

Research Methodology

The Bank of Tanzania and the Dar es Salaam Stock Exchange provided secondary data for this study. The Auto-Regressive Distributed Lag Model (ARDL) was used to model time series data. While controlling for other factors like economic expansion, the model looked at Tanzania's nexus exchange rate and composite stock price index. Additionally, the reaction function's response to changes in the exchange rate on the composite stock price index was transformed using natural logarithms.

$$CP_t = \beta_0 + \beta_1 GDP_t + \beta_2 Ex_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots (1)$$

CP_t= Composite stock price index

GDP_t =Growth domestic product

Ex_t =Exchange rate

ε_t =Error term at time t

Results and Discussions

Figure 4.1 displays the time series plots for the Dar es Salaam stock market's growth in domestic product, composite stock price index, and exchange rate from 2010 to 2021. By eye inspection, the time series plots for the composite stock price index at the Dar es Salaam stock market reveal several patterns, including trends, irregularities, and cycles. The following time series components were noticed in the growth of the domestic product: seasonal components, irregular patterns, and cyclical patterns. In contrast, the exchange rate only displays a trend component and a few minor cyclical patterns. Exchange rates, GDP growth, and the composite stock price index all exhibit an upward trend over time, which indicates the presence of non-stationary random variables (i.e., non-constant mean and variance over time). As a result, this graph demonstrates that transformation is required in order to make the growth of the domestic product, composite stock price index, and exchange rate data stationary.

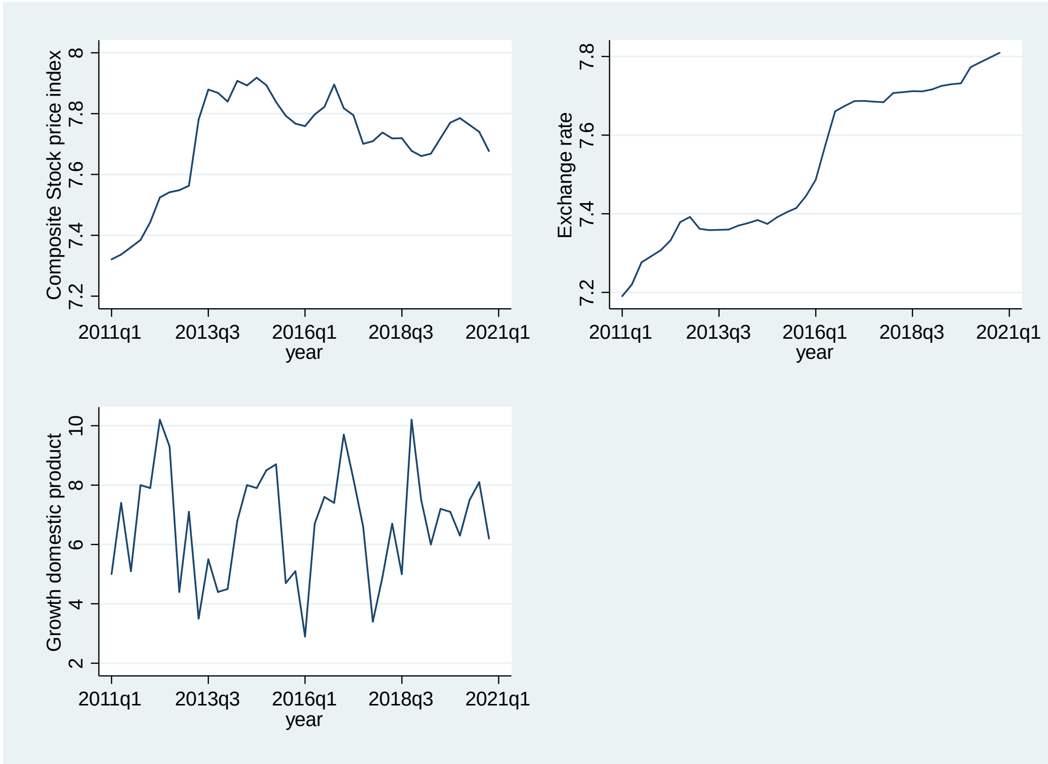

Figure 4. 1: Time series plot for growth domestic product, composite stock price index and exchange rate at Dar es Salaam stock market

Basic Descriptive Statistics

Since the growth of the domestic product, the composite stock price index, and the exchange rate all exhibit an upward trend over time, this suggests the presence of non-stationary random variables (i.e., a non-constant mean and variance over time). This graph demonstrates that in order to achieve stationary growth in domestic product, composite stock price index, and exchange rate data, transformation of the random variables must be used. For this study, 40 quarters of quarterly time series data from 2010 to 2021 were used. The GDP growth rate, the composite stock price index, and the interest rate are the three main factors in the study. The results of the developed, compiled, and illustrated descriptive statistics are shown in Table 4.1.

African Development Finance Journal http://journals.uonbi.ac.ke/index.php/adfj
December Vol 6 No.2, 2023 PP 148-166 ISSN 2522-3186

Table 4.1: Descriptive Statistics for growth domestic product, composite stock price index and exchange rate

Variable	Obs	Mean	Std. Dev.	Min	Max	
Exchange rate	l0	.888.599	358.023	.326.623	2463.844	112
Growth Domestics Product	l0	5.68	..847	2.9	.0.2	0.098
Composite stock price index	l0	2254.847	341.98	.511.386	2746.667	0.701
Ln(Exchange rate)	l0	7.526	191	7.19	7.809	.006
Ln(Growth Domestics Product)	l0	..857	304	..065	2.322	0.703
Ln(Composite stock price index)	l0	7.708	164	7.321	7.918	0.98

Source: STATA, 2023

The results for mean, standard deviation, maximum, minimum, and skewness for level data and natural logarithms converted data are shown in Table 4.11. The results in Table 4.11 demonstrate that there were few variations in the values of log (exchange rate), log (GDP growth), and log (composite stock price index) over the years for the transformed data. These variations can be seen by subtracting the maximum values from the minimum values of their respective variables. Exchange rate, GDP, and the composite stock price index are the three transformed random variables whose skewness is all negative. This shows that the extreme left tail is the main one. However, the extreme left tail of the distribution showed that there was non-normality present.

Matrix for correlation

In the beginning, the correlation matrix table was used to determine the pattern of the link between the dependent and explanatory variables. The two random variables' directions are displayed in this matrix. The multi-collinearity of the explanatory components may also be indicated via the correlation matrix. It may be close to 1, 0.0, or 1. If the values are close to 1, there is multi-linearity and a significant connection between the variables. There is a limited lack of multi-collinearity in the interaction between variables when values are as low as 0.0. Table 4.12 lists the outcomes of the matrix exam.

Table 4. 1: The correlation matrix table for composite stock price index, Exchange rate and growth domestic product

Variables	The composite stock price index	Exchange rate	Growth domestic product
The composite stock price index	1.000		
Exchange rate	0.368 (0.020)	1.000	
Growth domestic product	-0.033 (0.840)	0.104 (0.524)	1.000

Source (BOT and DSE,2021)

The results of the correlation analysis, which was used to determine the strength of the linear relationship between the explanatory variables and response variables, are presented in Table 4.12. Since the absolute coefficient of correlation between the composite stock price index and exchange rate was found to be greater than 0.05 and the p-value in the brackets was 0.000, which is below the 0.05 level of significance, the finding indicates that there was only a weak positive linear relationship between the two variables. This supports the research by Suriani et al. (2015), who found that the exchange rate significantly boosts the index of stock prices. The absolute coefficient of correlation, which is found to be less than 0.05, and the p-value in the brackets, which is below the 0.05 level of significance, both indicate that the null hypothesis that there is no linear relationship between the Composite Stock Price Index and Growth Domestic Product is rejected. The finding also demonstrates that there was a very weak negative linear relationship between the composite stock price index and growth in domestic product. These results support the notion that interest rates, domestic economic growth, and the composite stock price index are all negatively correlated.

Lag length selection

A lag selection is a first-applied criterion before evaluating the distributed autoregressive lag (ARDL) model or vector error correction model. In these studies, the maximum number of lags was determined using the following lag criteria: final predictive error (FPE), Hannan and Quinn Information Criterion (HQIC), Schwarz Bayesian Information Criterion (SBIC), and Akaike Information Criterion (AIC). Certain criteria must be met when deciding how many numbers of lag the random variable has. In order to avoid bias estimate Schwarz, the Bayesian Information Criterion (SBIC) was given precedence when selecting the maximum amount of lags because it has theoretical advantages over other selection criteria. Selection was prioritised using the Bayesian Information Criterion (SBIC) (Lütkepohl, 2005; Lütkepohl & Xu, 2012).

The maximum number of lags from each random variable utilised in the unit root test analysis is shown in Table 4.13. The general rule is to choose the maximum lag with the least value for each criterion.

Table 4.3: Lag length selection

Variable	lag	FPE	AIC	HQIC	SBIC
Exchange rate	0	0.03129	-0.62658	-0.61123	-0.5826
	1	0.000572	-4.62822	-4.59751	-4.54025
	2	.000423*	-4.92966*	-4.8836*	-4.7977*
	3	0.000436	-4.90074	-4.83933	-4.7248
	4	0.000461	-4.84663	-4.76986	-4.62669
Composite stock price index	0	0.014009	-1.43022	-1.41487	-1.38623
	1	0.002821	-3.03305	-3.00234	-2.94507
	2	.002667*	-3.08923*	-3.04318*	-2.95727*
	3	0.00282	-3.034	-2.97259	-2.85805
	4	0.002919	-3.0004	-2.92364	-2.78047
Growth domestic product	0	0.079309	0.303458	0.31881	0.347444
	1	0.000358	-5.09672	-5.06602	-5.00875
	2	0.000368	-5.06972	-5.02366	-4.93776
	3	0.000351	-5.11777	-5.05636	-4.94183
	4	.000296*	-5.28831*	-5.21155*	-5.06837*

Source (BOT and DSE,2021)

Since the values for the final predictive error (FPE), Hannan, Quinn Information Criterion (HQIC), Schwarz Bayesian Information Criterion (SBIC), Akaike Information Criterion (AIC), and Schwarz Bayesian Information Criterion (SBIC) at lag one were lower in that column compared to other values within the same column, Table 4.13 demonstrates that the exchange rates had two maximum numbers of lags. Because these selection criteria were less strict at lags 2 and 4, respectively, for the composite stock price index and growth domestic product, the composite stock price index displays lag 2 and growth domestic product displays lag 4.

Unit Root Test or Stationarity Test Results

For the time series data, the unit root or stationarity test was performed. This test is run to see if the time series data and the order in which the variables are integrated are stationary or non-stationary. A time series is stationary if its mean and variance remain constant across time. On the other hand, time series data are considered non-stationary if either the variance or the mean fluctuates with time, or if both. The unit root test is necessary because non-stationary variables give weak or meaningless results as a result of the trend in the data series. Accordingly, unit root testing is the initial step in the creation of the time series model. To determine if a series has a root unit, one common technique is the Dickey-Fuller augmented (ADF) test. The ADF criterion is acknowledged for having low test power nonetheless (Chin et al., 2008). The unit root test was complemented with Phillips' perron (PP) test procedures since the ADF test is frequently criticised for having insufficient power. It is feasible to discriminate between stationary series, series that look to be unit roots, and series for which tests do not indicate whether the series is stationary or integrated using the PP criterion, which is a superior criterion. Table 4.14, which contains the findings for the Phillips' Perron (PP) test and the Augmented Dickey-Fuller (ADF) tests, was prepared, compiled, and submitted.

Table 4. 2: Test for Stationarity both augmented dickey fuller test and Phillips's Perron

ADF Test					
Variable	**Level**		**First difference**		**order of integration**
	Test statistics	Critical value	Test statistics	Critical value	
Exchange rate	-0.365	-2.966	-4.419**	-2.972	I(1)
Growth domestic product	-4.515**	-2.972	-3.317 **	-2.969	I(1)
Composite stock price index	-2.731	-2.966	-4.856 **	-2.975	I(1)
The PP Test					
Variable	**Level**		**First difference**		**order of integration**
	Test statistics	Critical value	Test statistics	Critical value	
Exchange rate	-1.009	-12.948	-39.402 **	-12.884	I(1)
Growth domestic product	-25.779**	-3.682	-47.492**	-12.916	I(1)
Composite stock price index	-5.491	-18.152	-26.031**	-12.916	I(1)

It should be noticed that in table 4.14, the star (**) designates P values with less than a 5% threshold of significance. The null hypothesis of a root unit in the series and the alternative hypothesis of no root unit in the series are the foundations of the Dickey-Fuller (ADF) test. The unit root of the series is to be found stationary, and the series is to be concluded with no unit root if the ADF statistics are better than absolute asymptotic critical values (Judge et al., 1985). The exchange rate, growth domestic product, and composite stock price index were stationary following the first difference since ADF, according to Table 4.14 of the findings of the ADF unit root test. However, the results of the ADF unit root test in Table 4.14 show that there is no unit root for growth in the domestic product at the level of 5%, but that there is a unit root at the level of 1%: The root unit ADF data were included in some variables; therefore, the data were further examined using the superior Phillips's perron (PP) criterion. According to Gujarati (2011), Phillips's perron (PP) is a better criterion since it allows for the distinction between stationary series, unit root series, and non-unit root series in cases where tests do not reveal whether the series is stationary or integrated. The findings were collected, compiled, and provided in Table 4.14.

Co-integration Test

Cointegration aids in determining whether or not there is a long-term relationship between the variables that are present. The cointegration test is used before a stationary check, and the ideal lag length of variables is realised. This is done to choose between the VEC and VAR models to use after differentiation in order to achieve stability prior to re-entry in the case of stationary variables. The VEC model, also known as the Vector Correction Model (VECM), is appropriate if variables have a long-term connection or relationship. However, when both non-stationary I (1) and stationary I (0) variables are present, it is advisable to use the autoregressive distributed lag (ARDL) method described by Schaffer et al. (2013). According to Ghatak and Siddiki (2001), the ARDL model has a number of advantages, including the ability to be applied to small samples and the ability to be used regardless of the integration order to avoid the pre-test issue with the conventional cointegration method, which necessitates a comparable integration order. To ascertain whether the time series data are cointegrated or not, this study used the Johansen co-integration test based on homogenous integration orders. When the order of integration is not uniform, other cointegration tests such as the Gregory-Hansen test, cointegration border tests, and the Johansen test have traditionally been used.

Table 4.5: Johnsen Co-integration test

Null Hypotheses	Trace Statistics	Critical Value	Max-Eigen Statistics	Critical Value
$r = 0$	26.7426*	29.68	18.9404	20.97
$r \leq 1$	7.8022	15.41	7.3917	14.07
$r \leq 2$	0.4104	3.76	0.4104	3.76

Source (BOT and DSE,2021)

Table 4.15 shows both λmax and $\lambda trace$ tests rejected the null hypothesis of no co-integration (r = 0) against the alternative since the traced statistics were less than the absolute critical values. Similarly, all the statistics were less than the absolute critical values. Thus the conclusion that there was no long-run relationship between domestic product growth and composite stock price index.

Autoregressive distributed lag model employed to determine the effect of exchange on Composite stock price index in DSE

In this section, the result of regression analysis is presented then the diagnostic test is followed for the sake of testing the validity of the findings.

Table 4.3: The autoregressive distributed lag model employed to determine the effect of exchange rate on stock Composite stock price index in DSE

VARIABLES	(1) Ln(Composite stock price index)
L. Ln(Composite stock price index)	1.154***
	(0.164)
L2. Ln(Composite stock price index)	-0.310*
	(0.154)
Ln(exchange rate)	0.0424**
	(0.0084)
Ln(Growth domestic product)	-0.00789*
	(0.00438)
Constant	1.589***
	(0.509)
Observations	37
R-squared	0.878

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results of the autoregressive distributed lag model (ARDL) used to assess the influence of exchange rates on the composite stock price index at the Dar es Salaam stock market while minimising the impact of GDP are shown in Table 4.16. The results show that the interest rate and lag one of the composite stock price index were statistically significant in influencing the composite stock price index, while lag two of the composite stock price index and economic growth were not statistically significant in influencing the composite stock price index.

Lag one of the composite stock price index was statistically significant (p 0.01) and had a regression coefficient of 1.154 on the current composite stock price index. This suggests that, ceteris paribus, the current composite stock price index improves by 1.154% on average for every 1% increase in lag one of the composite stock price index.

With a regression coefficient of 0.0424, the exchange rate had a statistically significant (p 0.05) impact on the composite stock price index. This indicates that, ceteris paribus, for every percentage point increase in the exchange rate, the current composite stock price index rises by an average of 0.0424 percentage points. This backs up Suriani et al.'s (2015) research, which showed that both in the long and short terms, the exchange rate has a strong beneficial impact on the stock price index.

Diagnostics test

Before drawing any conclusions from the estimation results, a number of diagnostic tests were run to make sure the models were statistically sound and that they could be used for forecasting (Gujarati, 2011; Hanck et al., 2019; Hill et al., 2018). As a result, the following diagnostic tests were run to see if the empirical models were statistically sound and if the classical linear regression model could be used for forecasting. The Jarque-Berra (J-B) test was used to see if the residuals were normally distributed, then the Breusch-Godfrey LM test to calculate the Lagrange multiplier (LM) to check for serial autocorrelation, the heteroskedasticity test, and finally the CUSUM tests and CUSUM of squares test to see if the model was stable. It is crucial to keep in mind that estimating statistical models when the assumptions of the conventional linear regression model are violated might lead to skewed and inconsistent parameter estimations.

Breusch-Godfrey LM test for autocorrelation

If the error terms were serially associated in this study, it was determined using the Breusch-Godfrey Serial Correlation Test. In the serial correlation test, the alternative hypothesis is that the error terms are auto correlated, while the null hypothesis is that there is no serial correlation. The Breusch-Godfrey (B-G) critical value (CV) is typically 3.84 at a 5% significant level. Generally speaking, to avoid rejecting the null hypothesis that there is no serial correlation (i.e., B-G statistic 3.84), the computed Breusch-Godfrey F-statistic should be smaller than the critical value of 3.84 at the 5% significant level. Additionally, the computed matching P-value must be higher than 0.05 at the 5% significant level. The results of the Breusch-Godfrey serial correlation tests are shown in Table 4.8 and were compiled, summarised, and presented as described below.

Table 4. 4: Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	Df	Prob > chi2
1	0.642	1	0.4229

Source (BOT and DSE,2021)

The p-value is higher than the 5% level of significance used in this test, as shown in Table 4.8. As a result, at the 5% level of significance, the null hypothesis could not be disproved. The conclusion drawn from this is that serial autocorrelation of the regression residuals is not present. The Breusch-Godfrey Serial Autocorrelation results show that the data series did not violate the autocorrelation assumption as a result.

Test of the normality assumption

Table 4.9 demonstrates that the computed Jarque-Berra P-value is 0.0648, which is larger than 0.05 at a 5% significant level. As a result, if the estimated p-value is greater than a 5% level of significance, the null hypothesis cannot be ruled out. The regression residuals were found to have a normal distribution as a result. As a result, the data series do not deviate from the assumption of normal distribution, according to the findings of the Jarque-Berra normality test. Hill et al. (2018) assert that if the residuals follow a normal distribution pattern, the estimates' coefficients similarly follow a normal distribution pattern.

Table 4.5: Jarque-Berra statistics

Model	Chi2	Prob>Chi2
Model Four	4.590	0 .1402

Source (BOT and DSE,2021)

Test of Heteroscedasticity assumption

Table 4.19's findings show that the computed Breusch Pagan test for heteroscedasticity P-value is 0.167, which is greater than 0.05 (that is, 0.167> 0.05), at a 5% level of significance. As a result, the null hypothesis could not be ruled out at a level of significance of 5%. As a result, it may be inferred that the residual exhibits homoskedasticity, which means that the variance is constant.

Table 4.6: Test for Heteroscedasticity

Test for Heteroscedasticity				
Source		**chi2**	**df**	**P**
Heteroscedasticity	18.960	14	0.167	18.960
Skewness	8.880	4	0.064	8.880
Kurtosis	0.960	1	0.328	0.960
Total	28.800	19	0.069	28.800

Source (BOT and DSE,2021)

Model Stability Tests

The stability of the model's recursive estimations was then tested using the derived equations. In order to ascertain whether the regression model is stable, the CUSUM chart tests were used in this study. The alternative hypothesis asserts that the model is unstable for the CUSUM chart tests, while the null hypothesis claims that the model is stable. The cumulative sum (CUSUM) of residuals curves must typically lie within the dual standard of errors range at the 5% significant level in order to avoid rejecting the null hypothesis that the model is stable. CUSUM tests are run in this regard, and the output results are shown in figure 4.4.

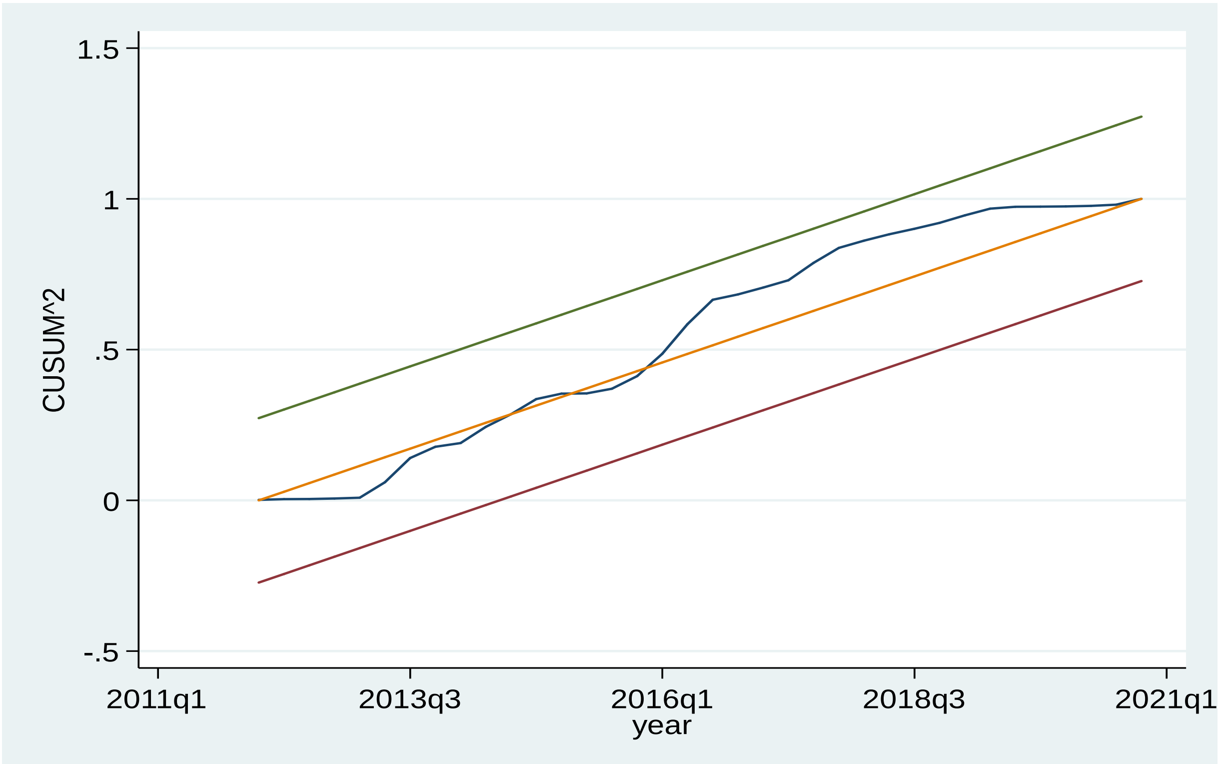

Figure 4.2: CUSUM of chart

The residuals curves are found to be within the dual standard of error range (between the upper and lower boundaries) at a 5% significance level, according to the results of Figure 4.4. These findings provided adequate support for the null hypothesis that the model is stable at a 5% level of significance. The residuals curve falls within the dual standard error range, supporting the hypothesis that the regression model is stable.

Conclusions and Recommendations

Based on this finding, the study came to the conclusion that a higher exchange rate significantly improves the composite stock price index at the Dar es Salaam stock exchange. Investors considering the Dar es Salaam stock currency should follow the technique of investing there based on currency rates. In order to avoid suffering a loss in the business, investors and shareholders at the Dar es Salaam Shares Market

Exchange should use these variables—exchange rate and interest—to choose whether to buy or sell a company's shares. Investors should sell their stock as a result of the larger gains they will receive when the exchange rate rises.

This study used the autoregressive distributed lag model; however, future research can use the interest rate and currency rate as exogenous variables to anticipate the composite stock price index in Tanzania using the autoregressive integrated moving average.

References

Ayub, A., & Masih, M. (2013). Interest rate, exchange rate, and stock prices of Islamic banks: A panel data analysis. *International Journal of Economics and Financial Issues*, *3*(4), 13–28.

Ball, R. (2009). The global financial crisis and the efficient market hypothesis: what have we learned? *Journal of Applied Corporate Finance*, *21*(4), 8–16.

Barakat, F. S. Q., Pérez, M. V. L., & Ariza, L. R. (2015). Corporate social responsibility disclosure (CSRD) determinants of listed companies in Palestine (PXE) and Jordan (ASE). *Review of Managerial Science*, *9*(4), 681–702.

Chin, W. W., Peterson, R. A., & Brown, S. P. (2008). Structural equation modelling in marketing: Some practical reminders. *Journal of Marketing Theory and Practice*, *16*(4), 287–298.

Ghatak, S., & Siddiki, J. U. (2001). The use of the ARDL approach in estimating virtual exchange rates in India. *Journal of Applied Statistics*, *28*(5), 573–583.

Gujarati, D. (2012). *Econometrics by example*. Macmillan.

Gujarati, D. N. (2011). *Econometrics by example* (Vol. 1). Palgrave Macmillan New York.

Hanck, C., Arnold, M., Gerber, A., & Schmelzer, M. (2019). Introduction to Econometrics with R. *University of Duisburg-Essen*.

Hassan, M. M. S., & Sangmi, M.-U.-D. G. (2013). *Macro-Economic Variables And Stock Prices*

Hoque, M. E., & Yakob, N. A. (2017). Revisiting stock market development and economic growth nexus: The moderating role of foreign capital inflows and exchange rates. *Cogent Economics & Finance*, *5*(1), 1329975.

Kapaya, S. M. (2020). Stock market development and economic growth in Tanzania: an ARDL and bound testing approach. *Review of Economics and Political Science*.

Kirui, E., Wawire, N. H. W., & Onono, P. O. (2014). Macroeconomic variables, volatility and stock market returns a case of Nairobi securities exchange, Kenya. *International Journal of Economics and Finance*, *6*(8), 214–228.

Kwofie, C., & Ansah, R. K. (2018). A study of the effect of inflation and exchange rate on stock market returns in Ghana. *International Journal of Mathematics and Mathematical Sciences*, *2018*.

Lütkepohl, H., & Xu, F. (2012). The role of the log transformation in forecasting economic variables. *Empirical Economics*, *42*(3), 619–638.

Pal, K., & Mittal, R. (2011). Impact of macroeconomic indicators on Indian capital markets. *The Journal of Risk Finance*.

Schaffer, M. E., Baum, C., Finlay, K., Kleibergen, F., Magnusson, L., & Stillman, S. (2013). *Stata software for econometric estimation and testing; avar, weakiv, actest, ivreg2h, ranktest, ivreg2*.

Sewell, M. (2011). History of the efficient market hypothesis. *Rn*, *11*(04), 4.

Suriani, S., Kumar, M. D., Jamil, F., & Muneer, S. (2015). Impact of exchange rate on the stock market. *International Journal of Economics and Financial Issues*, *5*(1S).

Tripathi, V., & Kumar, A. (2014). Relationship between Inflation and stock returns–evidence from BRICS markets using Panel Cointegration Test. *International Journal of Accounting and Financial Reporting*, *4*(2), 647–658.

Ullah, G. M. W., Islam, A., Alam, M. S., & Khan, M. K. (2017). Effect of macroeconomic variables on the stock market performance of SAARC countries. *Asian Economic and Financial Review*, *7*(8), 770.