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The Impact of Exchange Rate Misalignment on Investment in Ghana

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Summary
This thesis investigates whether exchange rate misalignments have any effect on investment in Ghana. In particular, the thesis investigates the factors that determine the real exchange rate equilibrium and then calculates exchange rate misalignments. Using data from 1980 to 2020 and the Autoregressive Distributed Lag Model, the thesis revealed that misaligned exchange rates (undervaluation) have a positive impact on investment in Ghana. In addition, gross domestic product had a significant impact on investment. In terms of the determinants of the real effective exchange rate, the study found that external debt, gross domestic product, and interest rates all have a significant impact on the real effective exchange rate in Ghana. The implications for policy based on the study's findings is the need for policies that ensure Ghana's exchange rate follows a sustainable equilibrium path and undervaluation strategies to encourage investment.

Keywords:*Real effective exchange rate, Investment, External debt, Exchange rate Misalignment*

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I. Introduction

The increasing level of globalization and the interconnectedness of financial markets around the world demonstrate how important it is to understand how various macroeconomic variables interact with one another. The exchange rate is one of the most influential factors on an economy, its level and flexibility influence resource allocation and growth. Exchange rates affect the decisions made by importers and exporters, stock market investors, bankers, economic institutions, businesses, policymakers, and tourists in developed and developing economies (Toulaboe, 2006). This variable reflects the economy's stance as well as being a key variable in the conduct and implementation of economic policies (particularly monetary and exchange rate policies, growth, external balance, etc.). Most economies, particularly those that rely heavily on imported commodities, have made the exchange rate a key macroeconomic variable. This is because these imported commodities are priced in foreign currency, so a rise in the exchange rate implies that domestic consumers will have to pay more. Hence, exchange rate stability is required for financial system stability and monetary policy (Gachoki et al. 2019).

The issue of exchange rate misalignment has recently gained prominence in the global literature. Misaligned exchange rate is the unobservable difference between the exchange rate and its equilibrium levels (Edwards, 1997). Understanding the dynamics of exchange rate misalignments is critical because an overvalued exchange rate is regarded as a greater threat in an economy than an undervalued exchange rate. When an exchange rate is overvalued or undervalued, it appreciates or depreciates above or below its equilibrium path (Gachoki et al. 2019). Furthermore, an overvalued currency reduces export competitiveness by reducing the incentive to import in the importing country. If this trend continues, exports will fall behind imports, reducing national output and impacting other macroeconomic variables. It is not surprising, then, that certain Asian countries, including China, Taiwan, and the Republic of Korea, purposefully designed undervaluation strategies to grow their economies through international trade (Tipoy, 2016). Misalignment, in addition to being an indicator of an impending crisis and macroeconomic instability, reflects the level of risk emanating from the country.

Over the last two decades, Ghana's exchange rate with major trading currencies such as the US dollar is deteriorating while increasing at the same time. Ever since Ghana changed its currency from pounds sterling to the Cedi (July 1965), the country's cedi has continually depreciated against major currencies like U.S dollar, Euro, and the British pounds (Agyemang-Adjei, 2019). The rate of the depreciation of the Ghanaian cedi against the US dollar is illustrated in Fig 1. According to statistics, the figures between 2016 and June 2022 were 4.26, 4.71, 4.83, 5.65, 5.82, 6.15and 8.00, respectively (BoG, 2022).

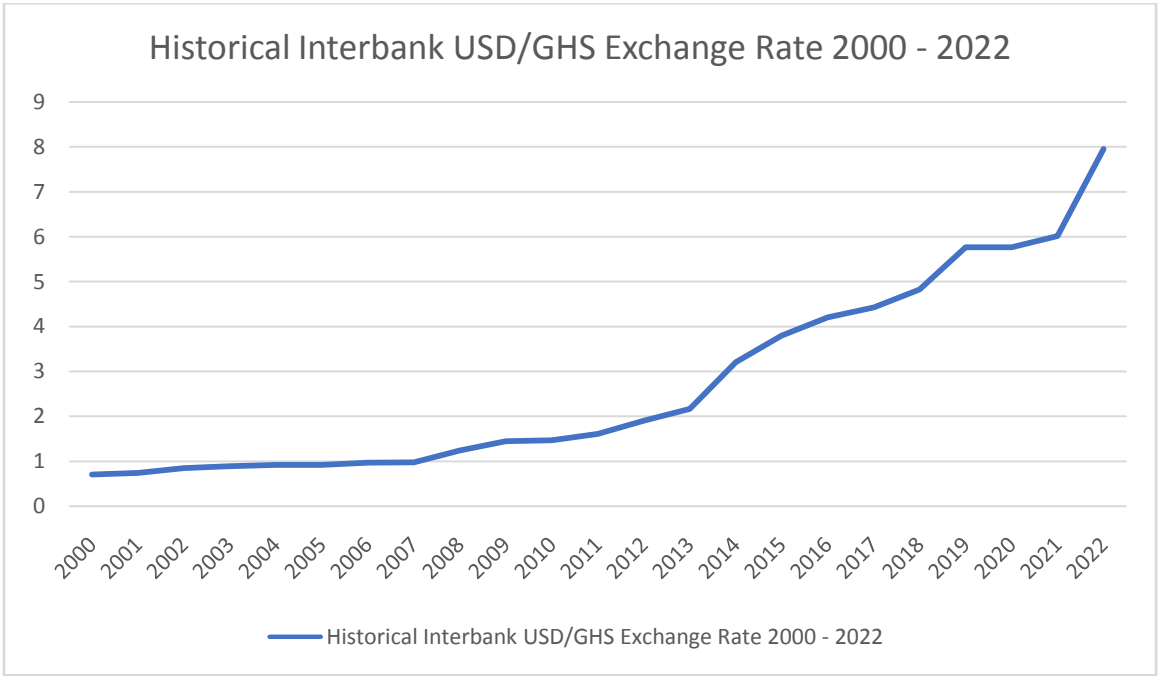

Figure 1. Historical Interbank USD/GHS Exchange Rate 2000-2022

One of the reasons why countries, particularly developing nations, seek to attract investment is because of the positive spill over effects. Nevertheless, investors are most hesitant to invest in economies with weak structures coupled with deteriorating macroeconomic variables. As previously stated, a misaligned exchange rate has negative effects on an economy, particularly if it is overvalued. Given the importance of exchange rates in international investment portfolios and the fact that the Ghanaian cedi has been depreciating for some time, as shown in Fig 1, most notably during the COVID-19 outbreak, this is cause for concern for a developing country like Ghana, which is heavily reliant on investment, particularly from abroad, for its development projects. On this premises it is crucial to determine further whether misalignments of exchange rate have any impact on investment in Ghana. This insight would aid monetary authorities in determining how best to stabilise exchange rate in order to stimulate investment and, in turn, economic growth.

The goal of this study is to examine the factors that determine equilibrium exchange rate and then calculate exchange rate misalignments.The study then proceeds to investigate the impact of exchange rate misalignment on investment in Ghana. The thesis reported herein is unique as it is the first paper, to the best of the author's knowledge, to empirically examine the impact of exchange rate misalignment on investment in Ghana. This thesis makes two significant contributions to the existing literature. As said before, this thesis is the first empirical study to examine the impact of exchange rate misalignment on investment in Ghana. Second, the thesis introduces determinants of the real effective exchange rate (i.e., external debt and debt servicing) that have not hitherto been studied extensively in Ghana. Overall, this thesis is extremely pertinent because it has substantial policy implications.

In this regard, the rest of the thesis is organised as follows. Section 2 is devoted to a theoretical and empirical analysis. The third section describes the paper's methodology and briefly describes the data and their respective sources. Section 4 provides a discussion on the empirical results obtained. The final section concludes the thesis and offers major policy suggestions.

II. Literature Review

2.1 Theoretical Review

One of the earliest methods for determining the real exchange rate equilibrium was the Purchasing Power Parity (PPP) theory. This theory, on one hand, assumes that the equilibrium exchange rate remains constant over time. Empirical evidence from studies such as (Driver and Westaway, 2005; Macdonald, 2000; Rogoff 1996; and Saayman, 2007) suggests that the mean reversion of the exchange rate to a constant level is low or non-existent, giving rise to the widespread belief that the PPP does not hold in the short run. Also, the PPP only looks at the effects of monetary factors on exchange rate changes (Edwards, 1989; Ghura and Grennes, 1993), ignoring the effects of non-monetary or "real" factors.

Several approaches to determining and estimating equilibrium exchange rates have arisen to address the inadequacies of the PPP method, including the Fundamental Equilibrium Exchange Rate (FEER) and the

Behavioral Equilibrium Exchange Rate (BEER). Williamson (1994) proposed the first estimation strategy. According to him, the FEER describes the exchange rate required to simultaneously attain internal and external equilibrium. Internal equilibrium is reached when the economy has full employment and low inflation. External equilibrium is reached when the current account position is at a significant and sustainable level over a medium-term horizon, after controlling for resource inflows and foreign debt (Williamson, 1994).

The next notable method of estimating equilibrium exchange rate is the BEER rooted by Clark and MacDonald (1998). This method allows the consideration of cyclical movements of the real exchange rate. The BEER relates the behavior of the exchange rate movements in specific macroeconomic fundamentals unlike the FEER that assumes macroeconomic balance and external sustainability. Thus, the idea behind the FEER is normative because it involves making ad hoc decisions about the size of important factors. On the other hand, the BEER has no normative bias and is based on statistics Hossfeld (2010). According to the Clark and MacDonald (1998), the theoretical foundation of the BEER approach can be traced back to risk-adjusted uncovered interest rate parity (UCIP) as follows:

$$E_t[\Delta s_{t+k}] = (i_t - i_t^*) - c_t \quad \text{..... (1)}$$

Where s_t denotes the price of a unit of foreign currency,

i_t is the nominal interest rate

c is the risk premium with a time-varying parameter

$E_t[.]$ denotes the rational expectations operator based on information at time t

Δ represents the first difference operator

t+k represents the first difference operator

* represents foreign variables

Changing the variables from nominal to real, the inflation differential $E_t[\Delta s_{t+k} - \Delta s_{t+k}^*]$ deducted from both sides of the equation (1). Hence, the new equation becomes:

$$q_t = E_t[q_{t+k}] - (r_t - r_t^*) + c_t \quad \text{..... (2)}$$

Where $r_t = i_t - E_t[\Delta p_{t+k}]$ and $r_t^* = i_t^* - E_t[\Delta p_{t+k}^*]$ represents the domestic foreign real interest rate respectively.

q_t is the real exchange rate defined as $q_t = e_t + p_t^* - p_t$; e_t represents the nominal exchange rate, p_t and p_t^* represent domestic and foreign prices respectively.

As shown in Equation (2), the real exchange rate is a function of the expected future real exchange rate, the real interest rate differential, and the risk premium. The theory holds that the unobservable future real exchange rate, $E_t[\Delta q_{t+k}^*]$ is determined by the long-run macroeconomic fundamentals Z_t. The equilibrium exchange rate is denoted as $\bar{q}$ and assumed to be equal

$$E_t[q_{t+k}] = E_t[\beta' Z_t].$$

The BEER approach was chosen as the theoretical framework for the study because it has been shown to be a consistent method for determining equilibrium exchange rate values and is widely used in most empirical studies Tipoy (2016).

2.2 Empirical Review

The misalignment of the real exchange rate is generally viewed as a crucial investment factor. According to a number of studies (Toulaboe, 2006; Elbadawi et al. 2012; Ali et al. 2015; Nubukpo, 2017; Conrad and Jagessar, 2018; NjindanIyke, 2018 among others) an overvaluation or undervaluation of the exchange rate especially in developing countries leads to a decrease or increase in economic growth. Since investment is a channel for economic growth, an overvaluation of the exchange rate will inevitably reduce investment in developing countries. Few studies have investigated the effect of misalignment of the exchange rate on investment. Noor (2010) and Kreko and Oblath (2019) are among the researchers who have attempted to accomplish this.

Noor (2010) analysed the effect of misaligned exchange rates on export competitiveness and foreign investment in Malaysia using quarterly data from 1991Q1 to 2008Q4. The study hypothesised that deviations from the equilibrium exchange rate and sustained misalignments resulting from overvaluation would diminish a nation's competitiveness. Using cointegration and the vector error correction model, the analysis showed that exchange rate misalignments have a negative impact on exports at both aggregated and disaggregated levels, indicating that the impacts of misalignments are typically asymmetric. In addition, the study indicated that

misalignments discourage foreign investment. The study concluded that exchange rate management is essential for increasing the export competitiveness of both Malaysian exports and foreign investment.

Kreko and Oblath (2019) analysed the relationship between economic growth and real exchange rate misalignments in the European Union from 1995 to 2016. The study followed the traditional definition of exchange rate misalignment as deviations from levels associated with the economic development of EU nations. The study utilised the pooled OLS and dynamic panel methodologies and discovered that, overvaluation has a statistically significant and negative effect on export market shares and private investments demonstrating that both the competitiveness and investment channels play a role in the relationship between growth and RER misalignments.

Other than exchange rate misalignments, other determinants of investment were briefly examined in the study. Among the studies examined were the following: (Frimpong and Marbuah, 2010; Ayentimi et al. 2012; Eshun et al. 2014).

Frimpong and Marbuah (2010) investigated the determinants of private sector investment in Ghana utilizing the ARDL estimation method.The short-run model's significant determinants were identified as public investment, inflation, interest rate, openness, real exchange rate, and a constitutional rule regime. In the long run model, inflation, real output, external debt, real interest rate, openness, and real exchange rate all had a significant impact on private investment. The study recommends policies aimed at boosting private sector investment.

Ayentimi et al. (2012) examined private investment in Ghana from 1960 to 2010 using time series data. The cointegration and error correction models were used in the study to determine the long-term and short-term relationships between the variables. In Ghana, the findings revealed a significant relationship between inflation, exchange rate, public investment, GDP, trade openness, aid, credit, and external debt in both the short and long run.

Eshun et al. (2014) research on the financial determinants of private investment in Ghana using the ARDL technique on annual time series data from 1970 to 2010 revealed that private investment declines in both the short and long run if the real interest rate is high and investors face severe financing constraints when credit is scarce to the sector. The study suggested that financial restrictions be lifted so that the private sector has easy access to credit.

It is evident from the empirical review that there are gaps in the literature pertaining to exchange rate misalignments and investment not only in Ghana but globally. As a result, research into this phenomenon will fill gaps in the literature and as previously stated, direct policymakers on how to increase investment by implementing appropriate exchange rate policies.

III. Methodology

3.1 Model Specification

To achieve the study's objectives, two models are used. First, a model for determining equilibrium real effective exchange rate is specified, followed by a model for determining the impact of exchange rate misalignment on investment. The first model is justified by the premise that exchange rate misalignment can be calculated once the equilibrium determinants of REER have been established, hence the need to estimate determinants of REER. The following model was developed to investigate the determinants of Ghana's equilibrium exchange rate based on theory and the missing gaps in the literature.

$$REER_t = f(ED_t, DS_t, GDP_t, INF_t, INT_t, GOVEXP_t) \quad \text{..... (3.1)}$$

To examine the impact of exchange misalignment on investment in Ghana the following model was further developed.

$$INV_t = f(MISER_t, INT_t, REER_t, GDP_t, INF_t) \quad \text{..... (3.2)}$$

Equations (3.1) and (3.2) are expressed in log liner estimable form as follows:

$$\ln REER_t = \beta_0 + \beta_1 \ln ED_t + \beta_2 \ln DS_t + \beta_3 \ln GDP_t + \beta_4 \ln INF_t + \beta_5 \ln INT_t + \beta_6 \ln GOVEXP_t + \varepsilon_t \quad \text{.. (3.3)}$$

$$\ln INV_t = \beta_0 + \beta_1 \ln MISER_t + \beta_2 \ln REER_t + \beta_3 \ln GDP_t + \beta_4 \ln INT_t + \beta_5 INF_t + \varepsilon_t \quad \text{..... (3.4)}$$

where REER, INV, MISER, ED, DS, GDP, INT, INF, and GOVEXP represent real effective exchange rate, investment, exchange rate misalignment, external debt, debt servicing, gross domestic product per capita, interest rate, inflation, and government expenditure respectively. The explanatory variables selected for the REER and INV model were chosen to produce the most reliable results in terms of their a priori expectations

and the significance of the various parameters. In addition, establishing a long run relationship and ensuring that the model meets all the model's assumptions of normality, serial correlation, heteroscedasticity, and structural stability influenced the variable selection.

3.2 Sources of Data

All the data utilized is annual time series data from 1980 to 2020 compiled from two primary sources. Data on the real effective exchange rate (REER), external debt (ED), and debt service (DS), gross domestic product (GDP), inflation (INF), and government expenditure (GOEXP) were obtained from the World Bank's online database of World Development Indicators (WDI). The data on the interest rate (INT) was obtained from the IMF's International Financial Statistics. Data on exchange rate misalignments were computed by the author. The sample period and variables for this study were chosen based on availability of data.

3.3 Variable Definitions

Real Effective Exchange Rate: Real effective exchange rate is defined as the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (WDI, 2022). Real depreciation of the exchange rate increases the profitability of export-oriented industries, thereby boosting investment in these industries. Depreciation of the exchange rate, on the other hand, raises the price of imported capital goods, which reduces investment in import-dependent production sectors. Hence, the effect of real exchange rate on investment is ambiguous.

WDI (2022) defines investment as expenditures on additions to the economy's fixed assets plus net changes in the level of inventories. The fixed assets include land improvements, the acquisition of plant, machinery, and equipment, and the construction of social amenities, whereas inventories are goods held by businesses to meet temporary or unanticipated fluctuations in production or sales, as well as "work in progress (WDI, 2022)."

Gross Domestic Product: GDP at purchaser's prices is the total of the gross value added by all resident producers in the economy, plus any product taxes and minus any subsidies not included in the product value (WDI, 2022).

Interest Rate (INT): It is simply defined as the expected rate of return on an investment, which is roughly the prime rate or bank rate. There are differing opinions regarding the impact of real interest rates on investment, particularly in developing nations. According to the neoclassical investment model, real interest is a significant component of the user cost of capital and has a negative impact on investment. However, McKinnon-Shaw's complementary hypothesis predicts a positive effect of the interest rate on investment. This is because a higher interest rate increases bank credit flow, thereby facilitating the formation of capital and investment. The impact of interest rates on investment is also ambiguous.

Real exchange rate (RER) misalignment, which is the deviation of the actual real exchange rate from its equilibrium, is common in developing economies. Studies indicate that RER misalignment may have negative economic consequences, including a decrease in economic growth, exports, and export diversification, as well as an increase in the probability of currency crises and political instability. The impact of exchange rate misalignment on investment is ambiguous.

Inflation (INF): Inflation is the persistent rise in the general price level of goods and services, or the loss of purchasing power per unit of currency measured by the Consumer Price Index (WDI, 2022). Inflation is expected to have a negative relationship with investment.

In this study, **government expenditure** is defined as payments made by the government for goods, services, and fixed assets. This includes all current government purchases of goods and services (including compensation of employees). It also includes the majority of national defense and security spending but excludes government military spending that is part of government capital formation (WDI, 2022).

External Debt: The World Bank defines government external debt as "the sum of public and publicly guaranteed long-term debt, private non-guaranteed long-term debt, use of IMF credit, and short-term debt (WDI, 2022)."

Debt service is the sum of long-term debt principal repayments and interest paid in money, goods, or services; short-term debt interest paid; and short-term debt principal repayments repurchases and charges (WDI, 2022).

3.4 Estimation Strategy

3.4.1 Unit Root Tests

To avoid spurious regression results, the study employs the ADF and PP unit root tests to test for the stationarity of the variables. The ADF test specifies a null hypothesis that "the series has a unit root," as opposed to the alternative hypothesis that "the series does not have a unit root and is therefore stationary. If the computed ADF test statistic is less than the critical value of 5%, the null hypothesis is not rejected. If the ADF test statistic exceeds its corresponding 5% critical value, the null hypothesis of the presence of a unit root is rejected and the

alternative hypothesis is accepted. The Phillips-Perron test was used in addition to the ADF test to verify the factors' stationarity.

3.4.2 ARDL Cointegration Framework

The study discovered numerous models and estimation techniques that can be used to analyze the relationship between dependent and explanatory variables. The ARDL estimation technique was deemed the most appropriate estimation technique for the study due to the stationarity characteristics of the variables and the small sample size. In addition, the ARDL modeling approach can capture the relationship between time series data with sufficient lags (Pesaran and Shin, 2003). Moreover, according to Pesaran and Shin (2003), an error correction term (ECT) can be derived through a simple linear transformation. The ARDL model accounts for both short run and long run relationships and avoids stationarity issues with time series data. Based on these assumptions, this study uses the ARDL estimation method described by Pesaran et al. (2001) to model the factors that affect exchange rate misalignments and investment in Ghana.

$$LnREER_t = \beta_{1,i} + \sum_{i=1}^{n} \beta_{2,i} LnX + \pi_2 ECT_{t-i} + \varepsilon_t \quad \text{..... (3.4)}$$

$$LnINV_t = \beta_{1,i} + \sum_{i=1}^{n} \beta_{2,i} MISERX + \sum_{i=1}^{n} \beta_{3,i} LnX + \pi_2 ECT_{t-i} + \varepsilon_t \quad \text{..... (3.5)}$$

Where :

REER = Real effective exchange rate.

INV = Investment

X = vector of control variables, part of the explanatory variables, which includes the variables of past REER and INV, external debt, external debt service, inflation, interest rate, gross domestic product, and government expenditure.

ECT = error correction term,

t is time script and

$\boldsymbol{\varepsilon_t}$ = residual error term.

3.4.3 ARDL Bounds Testing Procedure

To estimate the long-run relationship between dependent variables and its covariates, this study employs the ARDL Bounds test method. The bounds test specifies the null hypothesis that there is no long-term relationship between the variables. The bounds test statistic is compared to two ranges of critical values: I(0) for the upper bound and I(1) for the lower bound. If the bounds test statistic exceeds the 5% critical upper and lower bounds, a long-run relationship exists.

3.4.4 Exchange Rate Misalignment

The second step involved calculating the misalignment of the exchange rate. Following the studies of Tipoy (2016) and Amoah (2017) exchange rate misalignment for Ghana is calculated as follows:

$$MISER_t = (e_t) - (\theta_t) \quad \text{..... (3.6)}$$

Where;

e_t is the real effective exchange rate (REER).

θ_t is the estimates of equilibrium real effective exchange rate (EREER).

REER for sustained fundamental or real factor values (included in equation 5). The study used the Hodrick and Prescott (1992) H-P filter widely used in the literature to capture the smooth path of the trend component by minimizing the square of its second difference. Following the literature misalignment is then calculated by subtracting the actual REER from the equilibrium REER.

According to the authors positive values of misalignment indicate undervaluation whiles negative values of misalignment indicate overvaluation.

3.4.5 Diagnostic Testing

Model diagnostic tests are required before the estimated model can be used for analysis and policy recommendations. Among the diagnostic tests performed were the Breusch-Pagan-Godfrey test for heteroscedasticity, the Breusch-Godfrey Serial Correlation LM test for serial correlation, the Jacque-Berra test for normality, and the Ramsey RESET Test for structural stability of the model. This test determines the stability of the regression equation over time. When the estimated model passes all the above-mentioned stability tests, it is deemed suitable for analysis and policy recommendations.

IV. Results And Discussions

4.1 Descriptive Statistical Analysis

This section examines the data distribution using mean, median, and standard deviation. Table 1 also includes the variables' minimum and maximum values.

Table 1. Descriptive statistics of the variables, 1980-2020

Variables	Obs	Mean	Std. Dev.	Min	Max
lnREER	41	5.02772	0.949715	4.162606	8.166343
LnINV	38	21.5596	1.246353	18.8403	23.46812
LnED	41	3.946503	0.575906	2.804577	4.937625
LnDS	41	1.255473	0.732814	-0.211971	2.376727
LnGDP	41	23.81097	0.603139	22.93379	24.86202
LnINF	41	2.474179	2.482469	-2.944755	5.72353
LnINT	41	3.052865	0.376501	2.351375	3.806662
LnGOVEXP	41	2.260759	0.233523	1.76837	2.728386
LnMISER	41	-3.03E-14	0.318795	-0.845230	1.418566

Source: Results were obtained from EViews 10

The average real effective exchange rate in Table 4.1 was 5.02%, while the average investment rate was 21.55 percent. External debt averaged 3.94%. Compared to the norms of a developing nation, this number is extremely high. In contrast, external debt service and GDP averaged 1.25 percent and 23.81 percent, respectively, during the study period. The average GDP confirms the slow growth rate of the economy, which can be attributed to the government's poor economic management and the persistent depreciation of the cedi. Furthermore, the average rates of inflation, interest rates, and government spending were 2.47 percent, 3.05 percent, and 2.26 percent, respectively. Misalignment of exchange rates was the last thing that was looked at, and its average was the lowest of all the variables. The inflation rate had the highest standard deviation among all the variables, followed by investment. Again, the standard deviation for investment is very high when compared to the mean, indicating a high coefficient of variation. The remaining variables had standard deviations of less than one, indicating a low coefficient of variation. All variables had a different range of variation between their maximum and minimum values. Table 4.1 shows that investment had the highest minimum and maximum variables. The minimum value of external debt was the lowest.

4.2 Unit Root Test Results

Most economic time series data are not stationary in their plane form, making them vulnerable to coefficient inconsistency and leading to incorrect empirical results. To circumvent this obstacle, the ADF and PP tests were utilized to examine the stationarity properties of the variables. Results are presented in the Appendix. The variables are either stationary at the levels or after first differencing. Therefore, it is evident that the variables have demonstrated a case of mixed I(0) and I(1) integration order. To determine the existence of long-term associations between the real effective exchange rate and its covariates, as well as investment and its covariates, the study uses the bounds testing method proposed by Pesaran et al. (2001).

4.3 ARDL Bounds Test of Cointegration for REER

The presence of a long-run relationship is investigated using the ARDL bounds test for cointegration. The null hypothesis is defined as the absence of cointegration among the variables in opposition to an alternative hypothesis that suggests otherwise. Table 2 summarizes the results of the bounds test.

Table 2. ARDL Bounds Test of Cointegration

Pesaran et al., (2001)		
	I0 bound	**I1 bound**
At the 1% significance level:	3.15	4.43
At the 5% significance level:	2.45	3.61
At the 10% significance level:	2.12	3.23
Calculated *F*-statistic	27.56550*** (N=6)	

**** denotes rejection of the null hypothesis of no co-integration at the 1% significance level. N=number of regressors. Results were obtained from EViews 10.*

At a significance level of 1%, the F-statistic value of 27.56 is greater than the upper bound critical value of 4.43. Therefore, the null hypothesis of no long-run relationship is rejected, implying that there is a long-term relationship between the variables.

4.4 Long Run Estimates for EREER

The long run relationship among the variables is estimated using the ARDL model (2, 3, 2, 0, 4, 4, 0). The Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC) were used to select the model,

and the results are shown in Table 3. After estimating the long-run model coefficients, the error correction term, which measures the rate of adjustment, is estimated. The ECM coefficient of -0.809 indicates that in the long run, approximately 81 percent of deviations from equilibrium can be adjusted within a year.This is due to the high speed of adjustment, which explains why it takes very little time for equilibrium to be restored following a shock to the system.

Table 3. ARDL Long Run Estimation Result

Panel A: Estimated Long Run Coefficients

Variable	Coefficient	Standard Error	T-Ratio	P-value
lnED	-0.643381***	0.170694	-3.769214	0.0019
lnDS	0.137427	0.105973	1.296810	0.2143
lnGDP	-0.542976*	0.266654	-2.036258	0.0598
lnINF	0.004135	0.083690	0.049407	0.9612
lnINT	0.336897*	0.187526	1.796529	0.0926
lnGOVEXP	0.181022	0.143704	1.259686	0.2270
C	18.238538	6.459864	2.823362	0.0128
ECT	-0.808947***	0.085506	-9.460704	0.0000

Panel B: Residuals Diagnostics Test Results

$F_{Auto}(1,14) = 0.331290[0.5740]$

$F_{RESET}(1,14) = 0.079063[0.7827]$

$\chi^2_{Norm} = 3.322328[0.1899]$

$F_{HETERO}(21,15) = 0.328330[0.9903]$

*Note: *, **,*** represent statistical significance at 10%, 5% and 1% respectively. The regression model is based on the conditional error correction model (ECM) estimated using Equation (2) and an ARDL (2, 3, 2, 0, 4, 4, 0) with the dependent variable LnREER. Panel B of Table 3 contains the diagnostic test statistics* F_{Auto}, F_{RESET}, χ^2_{Norm} and F_{HETERO} *for the Breusch-Godfrey Serial Correlation LM, Ramsey RESET, Jarque-Bera Normality, and Breusch-Pagan-Godfrey Heteroskedasticity Tests. Results were obtained from EViews 10.*

According to results in Table 3, government external debt has a negative impact on the real effective exchange rate. The co-efficient of 0.64 implies a 0.64% decrease in REER, causing the Cedi to appreciate. This occurs when government-borrowed funds are invested in productive sectors that have the potential to stimulate economic growth and the ability to attract investors. The findings appear to support the Keynesian and the Neokeynesians school of thought's claim that external debt has neither short run nor long run negative effects on the economy because investments are created through these debts. The findings of the study contradict the studies of Kouladoum (2018) and Aderemi et al., (2020) who found an external debt leads to the depreciation of the naira.

The co-efficient of debt servicing was positive however, not significant. This implies that a 1% increase in DS increases REER by approximately 0.14%, resulting in the depreciation of the cedi. Although borrowing is an easy way for the government to obtain funds for development projects, the benefits of borrowing may be eroded by the high debt service costs of the country. Since the debt must be repaid in foreign currency, more cedis will be required to exchange foreign currency. This causes REER to rise while the cedi falls in value, resulting in a depreciation of the cedi. The study's findings are consistent with the findings of Aderemi et al. (2020), who discovered that debt servicing causes the naira to depreciate.

The co-efficient of economic growth (GDP) in the long run was statistically significant. Hence, a percentage increase in GDP will cause REER to decrease by -0.54%, thus leading to an appreciation of the Cedi. This is because economic growth encourages investors to invest in a nation, which ultimately leads to a currency appreciation. The study's findings concur with those of Fidora et al. (2017); Fosu (2017); Agyemang-Adjei (2019); Gachoki*et al.* (2020)), who discovered a depreciating influence of government expenditure on the real effective exchange rate. Nonetheless, the study's findings contradict those of (Kwakye (2012); Kouladoum (2018); Aderemi et al. (2020)).

Also, the long run of interest rate was positively related to REER and was significant at 10% level of significance. A percentage increase in interest rate will cause REER to increase by 0.34%, resulting in the depreciation of the cedi. If domestic interest rates tend to rise relative to the rest of the globe, it is believed that market participants have already factored in predicted inflation rate hikes. In this situation, it is anticipated that the domestic currency will lose value due to inflation's depreciation effect.

The long run inflation coefficient of inflation was insignificant at 1% level of significance. A percentage increase in inflation will cause REER to increase by 0.004%, resulting in a Cedi depreciating. Although the findings confirm to the a priori expectation it was not significant.

The coefficient for government expenditure was statistically not significant. A one percent increase in government expenditure causes 0.18% depreciation in Ghana's exchange rate. The cedi's depreciation because of

increased government spending can be explained by an increase in spending on tradable goods. Ghana is an importer, importing most of its consumer goods. More domestic currency will be required to accomplish this. This causes the currency of the foreign country to appreciate, which causes the cedi to depreciate.

Based on the diagnostic results presented in Panel B in Table 3, the model passed all diagnostic tests, including the normality test, serial correlation test, stability test, and heteroscedasticity test. The CUSUM and CUSUMSQ of recursive residuals for testing the stability of the regression coefficient showed that the statistics remained within the critical limits at a significance level of 5%; therefore, we cannot reject the null hypothesis and conclude that all coefficients are stable. Diagrams are shown in the Appendix.

4.5 The Impact of Exchange Rate Misalignment on Investment

The impact of exchange rate misalignment on investment in Ghana is investigated in this section of the thesis. The study computes Ghana's exchange rate misalignment following Tipor (2016) and Amoah (2016) studies as specified in equation (3.6). Figure 2 in the appendix illustrates the misalignment of the exchange rate for Ghana. The real effective exchange rate has appreciated and depreciated over time. Significant overvaluation occurred in 1984 and 2007. The overvaluation from 1983 can be attributed to the government's Economic Recovery Programs andStructural Adjustment Programs During this time, the government devalued the cedi in relation to the US dollar and the British pound. Since then, the REER has been undervalued, despite some relative improvement. However, due to unfavourable terms of trade, the undervaluation of REER worsened in 1999. The redenomination of the cedi also contributed to the exchange rate overvaluation in 2007. As a result, there was a sharp shift from undervaluation to overvaluation. In general, it can be concluded that REER continues to deviate from its equilibrium path. The next part of the thesis investigates whether misaligned exchange rates have any effect on investment.

4.6 ARDL Bounds Test of Cointegration for INV

The bounds test is used first to determine whether there is a long-run relationship between investment and exchange misalignment. Table 4 displays the results of the bounds.

Table 4. ARDL Bounds Test of Cointegration

Pesaran et al., (2001)		
	I0 bound	I1 bounds
At the 1% significance level:	3.41	4.68
At the 5% significance level:	2.62	3.79
At the 10% significance level:	2.26	3.35
Calculated *F*-statistic	6.080282*** (N=5)	

**** denotes the rejection of the null hypothesis of no co-integration at 1% level of significance, N=number of regressors. Results were obtained from EViews 10.*

Table 4 shows that the F-statistic value for lnINV and its covariates was 6.080, which was greater than the upper bound 1 percent value of 4.68, indicating that the null hypothesis of no long run relationship between lnINV and its covariates is rejected.

4.7 Long Run Relationship between Exchange Rate Misalignment and Investment

This section investigates the long run relationships between investment and its covariates. The bounds test for cointegration among variables was established in the previous section, justifying the use of the ARDL estimation approach. Based on the AIC and SIC criteria, the ARDL (3, 1, 1, 0, 2, 0) model is selected. Results are shown in Table 5.

Table 5. ARDL Long Run Estimation Result

Panel A: Estimated Long Run Coefficients				
Variable	**Coefficient**	**Standard Error**	**T-Ratio**	**P-value**
lnMISER	1.375017***	0.441727	3.112819	0.0051
LnREER	-0.410074	0.326123	-1.257424	0.2218
LnGDP	1.956747***	0.289922	6.749220	0.0000
lnINT	0.064582	0.152231	0.424238	0.6755
LnINF	-0.041687	0.098416	-0.423582	0.6760
C	-23.417447	7.550298	-3.101526	0.0052

Panel B: Residuals Diagnostics Test Results

F_{Auto} (2,20) = 1.044881[0.3702]

F_{RESET} (1,21) = 0.144225[0.7079]

χ^2_{Norm} = 1.072039[0.585073]

F_{HETERO} (12,22) = 1.56207[0.3693]

*Note: *, **,*** represent statistical significance at 10%, 5% and 1% respectively.. The regression model is based on the conditional error correction model (ECM) estimated using Equation (3) and an ARDL (3, 1, 1, 0, 2, 0) with the dependent variable LnINV. Panel B of Table 5 contains the diagnostic test statistics* F_{Auto} , F_{RESET} , χ^2_{Norm} and F_{HETERO} *for the Breusch-Godfrey Serial Correlation LM, Ramsey RESET, Jarque-Bera Normality, and Breusch-Pagan-Godfrey Heteroskedasticity Tests. Results were obtained from EViews 10.*

At the 1% level of significance, the coefficient of exchange rate misalignment was positive and significantly related to investment. The above finding confirms the a priori expectation of a positive relationship between exchange rate misalignment and investment. A 1% increase in exchange rate misalignment (undervaluation) results in a 1.37% increase in investment. The findings confirm the significance of exchange rate misalignment in determining investment in developing nations, such as Ghana. This implies that undervaluation of the cedi leads to increase in investment.One possible reason for this is that when a country's currency is undervalued, foreign investors can get more cedis for their currency, which they can use to buy land, factories, or other assets in the country.The findings of the study, however, contradicts the study of Kreko and Oblath (2019).

The long run co-efficient of the real effective exchange rate was found to be negative however, not significant. This implies that a 1% increase in REER will result in a 0.41% decrease in investment. Real exchange rate is a significant factor in determining investment, as it affects the real cost of imports. Depreciation or devaluation of the cedi raises the real cost of importing capital goods, thereby decreasing the profitability of the private sector, and possibly decreasing investment. This will drastically reduce investment in import-reliant industries. The findings contradict the studies of Frimpong and Marbuah (2010), who found a positive relationship between the real effective exchange rate and investment.

Furthermore, Table 5 shows that, at the 1% level of significance, gross domestic product had a positive and significant effect on investment, which corresponds to the study's a priori expectation. As a result, a 1% increase in GDP leads to a 1.96% increase in investment. The findings indicate that when output rises, businesses will invest in new capital, more jobs will be created, and individual incomes will rise.

The ARDL model results also revealed a positive relationship between interest rate and investment however, no significant relationship was established. The positive coefficient implies that a 1% increase in interest rates leads to a 0.06% increase in investment. The findings support McKinnon-Shaw's complementary hypothesis which states that an increase in the interest rate will increase investment if the higher interest rate increases the flow of bank credits, thereby facilitating capital formation and, thus, investment. The findings contradict the of studies (Ayentimi et al., 2012; Eshuan et al., 2014; and Agidew, 2014) that show that interest rates have a negative effect on investment.

Finally, inflation from the ARDL estimation output revealed a negative relationship between inflation and investment. Although the findings conform to the apriori expectation of the study inflation was not a significant determinant of investment. As a result, as inflation rises by one percent, investment falls by 0.04%. In general, inflation serves as an indicator of price instability in the economy. The result indicates that inflation exerts a negative influence on investment in Ghana in the long run. The findings are consistent with those of Eshuan et al. (2014) and Agidew (2014), who discovered a negative relationship between inflation and investment. However, contrary to the findings of Frimpong and Marbuah (2010), who found a positive relationship between inflation, and investment, the current study demonstrates an inverse relationship.

4.8 Results of the Short Run ARDL Model

After the long-run model coefficients are estimated, the error correction model coefficients are estimated. If the error correction term, which measures the speed of adjustment, is negative and less than one, then it is significant. In this study, the ECM coefficient of -0.881 indicates that approximately 88.1% of deviations from equilibrium can be adjusted in the long run within a year. This is due to the high speed of adjustment, which explains why it takes very little time for equilibrium to be restored following a shock to the system.

Table 6. Estimates of the Short-run Error Correction Model

Estimated Long Run Coefficients				
Variable	**Coefficient**	**Standard Error**	**T-ratio**	**P-value**
D(LNINV(-1))	0.498855***	0.149889	3.328171	0.0031
D(LNINV(-2))	0.417080***	0.136579	3.053771	0.0058
D(MISER)	2.662172**	1.111728	2.394626	0.0256
D(LNREER)	-1.709743	1.001233	-1.707637	0.1018
D(LNGDP)	1.725250***	0.436469	3.952740	0.0007
D(LNINT)	0.090477	0.172096	0.525737	0.6043
D(LNINT(-1))	0.602010***	0.154736	3.890550	0.0008
D(LNINF)	-0.036755	0.087444	-0.420332	0.6783

CointEq(-1)	-0.881693***	0.152826	-5.769255	0.0000

*Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively. Results were obtained from EViews 10.*

Dritsakis (2011) posits that short run changes from the long run equilibrium can be caused by shocks to any of the model's variables.

The first and second lags of investment were positively and significantly related to past values of investment, according to Table 6. Consistent with the long-run results, exchange rate misalignment was positive and statistically significant, with an elasticity coefficient of 2.66. In the short run, a percentage increase in exchange rate misalignment (undervaluation) leads to a 2.66 percent increase in investment. Real effective exchange rate was negatively related to investment, which was similar to the long run results.

The GDP coefficient was found to be positively and significantly associated with short-run investment, implying that a percentage increase in GDP will result in a 1.72 increase in investment. Similar to the long run result, interest rates and the first lag were positively related to investment, however the first lag of inflation was the only significant determinant of inflation in the short run. In addition, inflation was negatively related to investment however, not significant. As a result, an increase in inflation discourages investment.

According to the results presented in Panel B in Table 6, the model passed all diagnostic tests, including the normality test, serial correlation test, stability test, and heteroscedasticity test. The diagnostic tests confirmed the CUSUM and CUSUMSQ stability tests. Diagrams are shown in the Appendix.

V. Conclusions And Policy Implications

5.1 Conclusions

The significance of exchange rates to economic growth and development cannot be overemphasised. However, no empirical studies on exchange rate misalignment and investment have been conducted in Ghana. The study's objective was to examine the impact of exchange rate misalignment on investment in Ghana. Before achieving this objective, the study examined the determinants of Ghana's real effective exchange ratewith a particular emphasis on external debt and debt servicing, which have received less research attention in the Ghanaian context. The theoretical BEER model formed the basis of the real effective exchange rate model, and this was estimated using the ARDL estimation technique. External debt, GDP, and interest rate were the significant determinants of real effective exchange rate. In terms of misalignment, the cedi was mostly overvalued in 1984 and 2007, according to the study. The study uncovered a positive and significant impact of exchange rate misalignment (undervaluation) on investment in Ghana. In addition, GDP was established as a significant investment factor.

5.2 Policy Implications

According to the study's findings, a lack of prudent debt management measures will cause the cedi to depreciate.Therefore, the government should ensure that the level and growth of external debt remain at a minimum. They can accomplish this by strengthening domestic revenue mobilization and ensuring that borrowed money are channelled into productive economic sectors that can generate returns to offset debt servicing and principal, which depreciate the cedi.

The detrimental effects of misaligned exchange rates on investment point to serious underlying structural or macroeconomic issues in the country. Although the government must prioritize exchange rate control measures and policies, it should also devise and implement policies that promote the export industry, especially. The conventional export of raw commodities should be replaced by the export of semi-processed goods and a broader selection of non-traditional goods. This will inevitably increase the price of Ghana's exports and its international trade competitiveness. Specifically, this can be accomplished via revitalizing the agricultural sector. According to the Ghana Statistical Service, vast quantities of rice and oil are imported into the country. To achieve this reduction in importation, there is the need to increase production of agriculture commodities that can be supported by national climates to reduce the importation of such commodities.

Finally, the positive effect of economic growth on investment indicates policies that should be facilitated to boost growth. To accomplish this, the government must spearhead projects and policies that improve the transportation system and industry, improve communication technology, provide sustainable energy and water, waste management, and build and renovate ports and harbors, as these facilities are required to attract investment into Ghana.

5.3 Limitation and Implications for Future Research

Although this study achieved its objectives with sound findings and made significant contributions to the existing literature on the Ghanaian exchange rate, it did have some limitations.As stated in the study's methodology, the researcher estimated the exchange rate and investment ARDL models using the combination of variables that produced the best results, contingent upon passing the various diagnostic tests. Variables with a

theoretical impact on exchange rate and investment that were not examined in this study can be explored in future research.

As with all original research, replication of this study would serve as a check on the validity and reliability of the present findings. Considering this, the researcher has provided both the detailed ARDL estimation output and the data sources used to arrive at the results. In addition, all estimation commands from the Eviews software are included.

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