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THE IMPACT OF EXCHANGE RATE, INTEREST RATE, AND INTERNATIONAL TRADE IN SELECTED SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC) COUNTRIES: AN ARDL APPROACH

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Abstract

This study focuses on the impact of exchange rates, interest rates, and international trade in 12 selected Southern African Development Community (SADC) countries. The lack of studies from Africa that investigated the impact between exchange rate, interest rate, and international trade served as a catalyst for this study. Additionally, this study employed the autoregressive distributed lag (ARDL) method to examine the impact of exchange rate, interest rate, and international trade for the period 2000 to 2021. Therefore, using the ARDL technique, the study found a significant negative impact between exchange rate and interest rate in the long run, while international trade had a positive but insignificant impact. Due to the negative exchange rate findings, this study concludes that the SADC countries must develop strategies to promote international trade, reduce trade deficits, and encourage economic growth. On the other hand, this study contributes to the intricate interplay of exchange rates, interest rates, and international trade in SADC by providing insights for policymakers to enhance economic stability and long-term growth ultimately benefiting the region's economy and society.

Keywords: ARDL, Exchange Rate, Interest Rate, International Trade, SADC

JEL Classification: F14, F4, E4

1. Introduction

Organizations' exposure to exchange rates is primarily driven by their involvement in global operations through international trade. Changes in exchange rates can impact trade value and interest rates. Hedging techniques can help minimize risk. However, foreign exchange risks can also affect local organizations, even if they only use domestic currency for trade. In addition, local macroeconomic drivers indirectly impact exchange rates. According to Simakova (2017) and Bernoth and Herwartz (2021) it is important to recognize that various organizations, regardless of their direct financial exposure, can still be vulnerable to fluctuations in foreign exchange rates.

Numerous empirical studies have found that the unpredictability of exchange rates has a detrimental effect on international trade. The magnitude of this effect depends on a variety of variables, such as the economic amalgamation, availability of hedging instruments, and the manufacturing formation (e.g., Cushman, 1983; Auboin and Ruta, 2013; Serenis and Tsounis

2014; Edwards (2019); Bussière *et al.* 2020). In addition, studies such as those of Soleimani and Chua (2014), Kong, Peng, Ni, Jiang, and Wang (2021), and Simakova (2017) found a positive correlation between international trade and exchange rate exposure in the short run. In contrast, studies such as that of Yarmukhamedov, (2007) and Larch *et al.* (2019) found no statistically significant impact between exchange rates and international trade.

While previous researchers have already investigated the impact of exchange rates on international trade, this paper goes beyond existing studies by extending the research to cover a specific geographic area encompassing 12 countries within the SADC. There are several compelling reasons that make the SADC an attractive and suitable region for conducting this analysis. A sizeable economic bloc made up of Angola, Botswana, the Republic of Tanzania, Comoros, Madagascar, Mozambique, Mauritius, Namibia, Eswatini, Seychelles, South Africa, and Zambia has a variety of economic institutions, resources, and market conditions. Due to this diversity, it is possible to investigate how interest and exchange rates affect international trade in a rich and diversified framework. These countries also share a common border and have democratic economies that have effectively made the shift to market economies. The reform process has had a significant impact on the SADC countries' economic structures, participation in international trade, capital markets, and exchange rate policies, among other things. This paper contributes to the current evidence by incorporating the interest rate dimension, further enhancing the understanding of the impact between exchange rates and international trade. This paper is prompt, as evidenced by the fact that 12 of the sampled countries are already SADC members. Therefore, the SADC region's economy depends heavily on international trade, which also has larger advantages that promote the progress of regional cooperation. As a result, it appears that the impact of exchange rates and interest rates on international trade in the sample countries is significant.

Auboin and Ruta (2011) established that the regression coefficient links exchange rate exposure and international trade. In their pilot study, Auboin and Ruta (2013) adhered to this assumption, elucidating the connection between exchange rates and international trade by examining the influence of currency misalignments on international trade flows. Furthermore, Simakova (2017) emphasized the persistent utilization of the market approach to identify foreign exchange exposure, accompanied by several methodological advancements. This approach has been consistently applied across diverse geographic regions and timeframes. The aim of this paper is to evaluate the impact of exchange rates and interest rates on international trade in the SADC. Most of the empirical studies investigated the relationship between exchange rate and international trade outside Africa (e.g., Nicita *et al.* 2014; Abbas *et al.* 2014; Jayachandran, 2013; Cao-Alvira, 2014; Soleymani and Chua, 2014). There are few empirical studies investigated the relationship between exchange rate and international trade in Africa (e.g., Ikechi and Nwadiubu, 2020; Omojimite and Akpokodje, 2010), but they indicate mixed results. In addition, the author has no knowledge of empirical studies investigating exchange rate and interest rate impact on international trade. This paper comprehensively tackles the critique directed at prior studies concerning the relationship between exchange rates and international trade. Unlike those studies that predominantly employ cross-sectional analysis and overlook the temporal dimension of both dependent and explanatory variables, this paper considers the temporal aspect to offer a more robust analysis. Hence, this paper adopts an ARDL approach, effectively combining data across various countries and time periods, thereby enhancing estimation efficiency. Moreover, this paper takes into consideration the impact of the last financial crisis, enabling the examination of the persistency of exchange rate and interest rate exposure. As a result, this paper significantly contributes to the scientific discourse in this field and addresses the existing gap in the literature concerning exchange rates, interest rates, and international trade exposure in the SADC.

With the aim of providing a comprehensive understanding of the examined field, the following section undertakes a thorough review of pertinent theoretical and empirical literature. Furthermore, the subsequent section of this study delves into the methodology employed and outlines the process of estimating the results. In conclusion, the final section of this study presents significant conclusions and provides valuable recommendations.

2. Theoretical and empirical literature

The theoretical literature on exchange rates, interest rates, and international trade is mostly based on traditional theories of industrial organization. One of the hypotheses is purchasing power parity (PPP), which was first suggested by Cassel in 1916. The PPP states that the exchange rate between two currencies reaches a state of balance when their domestic buying capabilities are equal at that rate of exchange. According to the Purchasing Power Parity (PPP) principle, the exchange rate between two countries' currencies allows for the conversion of one currency into another in order to buy the same quantity of goods and services in both countries. Moreover, the purchase power parity hypothesis asserts that the exchange rate is impacted by other factors, such as inflation rates, international trade, and interest rates. This notion is supported by the theoretical work of Jiang *et al.* (2016) and Lyke and Odhiambo (2017), which suggests that the PPP theory can be a useful framework for formulating exchange rates and other macroeconomic adjustment strategies. Building upon this hypothesis, Smith (1976) introduced the concept of international trade, which argues that factors of production are not easily adaptable between countries, extensive information is readily available regarding international trade prospects, and conventional imports and exports are the principal methods of exchanging goods and services across international boundaries. To be more precise, international trade occurs when a foreign company purchases goods or services that are produced more inexpensively in another country.

The liquidity theory of interest rates suggests that interest rates are determined by the interaction between the supply and demand of money in an economy (Diamond and Rajan, 2001). The origin of this theory can be attributed to the research conducted by British economist John Maynard Keynes in his publication "The General Theory of Employment, Interest, and Money" in 1936. Keynes (1936) posited that the interest rate is determined by the interaction between money supply and money demand. According to Keynes (1936), individuals tend to choose liquidity, since it provides them with a sense of security and flexibility. Based on liquidity theory, an increase in the interest rate leads to a higher cost of holding money. As a result, individuals choose to reduce their money holdings and instead invest in interest-bearing assets such as bonds or other financial instruments (Keynes, 1936). Consequently, when the demand for money decreases and there is an excess supply of money, interest rates are pushed downward (Mohr, 2015). In contrast, a decrease in the interest rate reduces the cost of storing money, causing people to choose to hold a larger amount of money instead of investing in assets that generate low returns. Increased demand for money leads to an increase in interest rates (Foucault *et al.* 2013). Furthermore, the liquidity theory of interest rates emphasizes the importance of monetary factors and emphasizes the central bank's authority in influencing interest rates through its control over the money supply (Vayanos and Wang, 2013). Moreover, according to liquidity theory, changes in the money supply and people's preferences for holding liquid assets can have significant effects on interest rates (Keynes, 1936).

Africa, despite having abundant natural resources, is behind the rest of the world in international trade and economic growth, even though international trade is crucial for the progress of African countries (Moudatsou and Garcia, 2022). Nwagu (2022) posited that political instability, economic stability, inflation rate, and weak exchange rate are the key determinants of limited growth in international trade. These findings contradict the hypothesis of international trade, which emphasizes the specialization of factors of production across countries, resulting in a global increase in production. This specialization, in turn, guarantees the accessibility of commodities to all countries. Dubravka and Sira (2015) and Bordo and James (2019) argued that the choice to engage in international trade is progressively shaped by macroeconomic policies arising from elements such as political circumstances, exchange rates, and inflation. These variables are expected to continue to have a significant impact on international trade in the future.

In contrast, Kang and Dagli (2018) employed the dynamic gravity model to examine yearly data from 2001 to 2015 for 72 economies in the Philippines. They found a positive relationship between the real exchange rate and export volume prior to the global financial crisis. Following the global financial crisis, a detrimental correlation was shown between the real exchange rate and the export volume. According to the study by Collins *et al.* (2016), the

exchange rate has a notable influence on Nigeria's currency (Naira), resulting in reduced economic growth and an increased unemployment rate. According to Collins *et al.* (2016), slower economic growth in Nigeria resulted in negative outcomes such as unemployment, depreciation of foreign currency, and a high inflation rate. Furthermore, Collins *et al.* (2016) argued that an increase in the demand for foreign currency might lead to a decrease in the exchange rate. This, in turn, can make domestic goods and services more competitive in the international market and increase the cost of foreign assets for domestic enterprises.

In addition, Keho (2017) highlighted that an increase in international trade could have negative effects on economic growth, such as a decrease in the value of the currency rate and a high rate of inflation. Furthermore, Keho (2017) noted that participating in international trade can have a negative effect on economic growth, particularly for countries that produce low-quality goods. Referring to Nwafor's research (2018), it is evident that an excessive demand for foreign currency can lead to a decrease in the exchange rate of a country. This, in turn, makes domestic goods and services more affordable for international trade, while foreign assets become relatively expensive for domestic companies to market internationally.

On the other hand, Asteriou *et al.* (2016) examine the effect of exchange rate on international trade for Mexico, Indonesia, Nigeria, and Turkey using both the Granger causality tests and the autoregressive distributed lag (ARDL) for the period 1995-2012. Based on their study Asteriou *et al.* (2016) found that there is no relationship between exchange rate and international trade activities except in Turkey. In addition, short-term results reveal that there is a significant causal relationship from exchange rate to international trade. Furthermore, the study of Asteriou *et al.* (2016) revealed no interest in the investigation of the interest rate effects on international trade; hence, this study contributed by introducing the interest rate dimension on international trade and more in particular in Africa, where less has been done on international trade, interest rate, and exchange rate.

In summary, in their paper, Mehtiyev *et al.* (2021) investigated the impacts of exchange rates on international trade in the European Union (EU) using correlation analysis for the period 2008-2020. Mehtiyev *et al.* (2021) found that the exchange rate significantly impacts the trade balance in terms of imports and exports. Additionally, the study of Mehtiyev *et al.* (2021) stressed that exchange rate volatility is a hindrance that affects trade activities both directly and indirectly. However, the study of Mehtiyev *et al.* (2021) revealed no interest in examining the impact of interest rates on international trade; therefore, this study has made a valuable contribution by examining the impact of interest rates on international trade, particularly in Africa, where limited research has been conducted on the relationship between international trade, interest rates, and exchange rates.

3. Data and Methodology

3.1. Data

The objective of this research is to investigate the correlation between exchange rates, interest rates, and international trade by employing the Autoregressive Distributed Lag (ARDL) approach in 12 countries within the Southern African Development Community (SADC). The study will use annual data that spans from 2000 to 2021. This study relies exclusively on the World Bank's world development indicators as its data source. The ARDL technique allows for an examination of the possible effects and interactions of exchange rates, interest rates, and international commerce in the SADC region. This study examined three variables: the exchange rate, the interest rate, and international trade. The selection of these variables was based on their possible interrelationship. The precise measures utilized for each variable were as follows: official exchange rate (local currency units per US dollar), period-measured exchange rate for interest rate, and trade percentage of gross domestic product for international trade. This approach is similar to other empirical research, such as that carried out by Obansa *et al.* (2013).

Latief and Lefen (2018) emphasized the influence of exchange rates on a country's capacity to attract foreign direct investment (FDI) and participate in international trade. Latief and Lefen (2018) discovered that a negative exchange rate impedes foreign direct investment (FDI) and international trade, while a positive exchange rate is linked to higher levels of foreign capital

inflows. Table 1 provides a concise overview of four main unit root tests carried out in Stata: LLC, IPS, ADF-Fisher chi-square, and PP-Fisher chi-square. The experiments were conducted using three distinct terms of the deterministic option: no trend, intercept with trend, and individual intercept. The summary indicates that both the interest rate and the exchange rate demonstrate first-order integration, indicating that they become stationary when the first difference is taken. However, international trade exhibits zero-order integration, indicating that it remains constant at the given level. These findings indicate that the variables exhibit cointegration, as they do not display stationarity at the same level. Moreover, the substantial coefficients in the long-term equations provide further evidence of cointegration among the variables. Tables 2 and 3 present descriptive data and correlations for the variables under investigation, namely EXC (exchange rate), INTR (interest rate), and INTT (international trade). The variables exhibit weak correlations, suggesting multicollinearity is not a serious problem. Finally, the models were assessed for cross-sectional dependence using the Pesaran test. The test results, which are not statistically significant, indicate that the cross sections are independent and not significantly interdependent.

Table 1. Panel unit root tests - output summary

Variable	No trend	Intercept and Trend	Individual Intercept	Decision
Panel Unit Root Test Using the LLC				
EXC	-9.5977***	-7.6957***	-7.7846***	I(1)
INTR	-9.4827***	-4.6681***	-6.1387***	I(1)
INTT	-1.0565***	-0.4026***	-2.2299***	I(0)
Panel Unit Root Test Using IPS				
EXC	-	-5.9894***	-6.5418***	I(1)
INTR	-	-2.7681***	-5.2847***	I(1)
INTT	-	-0.3289***	-1.4226***	I(0)
Panel Unit Root Test Using ADF to Fisher Chi-Square				
EXC	125.7540	82.1052	93.0984	I(1)
INTR	114.578	53.1775	76.7258	I(1)
INTT	19.8568	25.6847	29.0168	I(0)
Panel Unit Root Test Using PP – Fisher Chi-Square				
EXC	141.0840	89.5114	97.3846	I(1)
INTR	136.7740	62.6395	90.0521	I(1)
INTT	20.5627	26.6329	31.9471	I(0)

Notes: ***, **, * indicates that the null hypothesis of unit root tests is rejected at 1%, 5%, and 10%, respectively. All the tests are at first difference (unless otherwise indicated). Probabilities for all the tests assume asymptotic normality except for Fisher tests, which are computed using the asymptotic Chi-square distribution. EXC is the exchange rate, INTR is the interest rate, and INTT is the international trade.

Source: Author's own computations

Table 2. Correlation matrix

Variables	EXC	INTR	INTT
EXC	1,0000		
INTR	0.4146	1,000	
INTT	-0.3980***	-0.0459***	1.0000

Notes: ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's own computations

In contrast, Table 3 presents a concise overview of the descriptive statistics for the variable EXC, which represents the exchange rate. The calculated mean exchange rate is 382.76, which is comparatively lower than the average exchange rate seen in other similar developing market economies, as recorded by Moloi (2018). The lowest recorded exchange rate is 3.1108, which is a positive value. On the other hand, the maximum exchange rate recorded is 3829.9780, which could suggest a decline in Africa's trade surplus. Furthermore, the sample has a standard deviation of 780.4138 from the mean, indicating the extent of dispersion or variability in the EXC values.

Table 3. Summary of descriptive statistics

Variables	Obs.	Skewness	Kurtosis	Jarque-Bera	Prob.	Median	Mean	Std. Dev.	Range	Min.	Max.
EXC	264	2.4157	8.3462	571.1742	0.00	17.9803	382.7556	780.4138	3820.867	3.1108	3829.9780
INTR	264	3.1263	14.0856	1781.8430	0.00	13.4933	18.0669	15.5495	65.3512	1.0000	103.1602
INTT	264	1.1604	4.1660	74.2002	0.00	80.3432	85.9241	43.0871	201.0422	23.9809	225.0231

Notes: Obs is the number of observations. Std. Dev. Is the standard deviation. EXC is the exchange rate, whereas INTR is the interest rate, and INTT is the international trade.

Source: Author's own computations

The variable INTR had an average value of 18.0669 of GDP. Of the African countries studied, one country had the lowest INTR contribution to GDP, which was measured at 1.0000. On the other hand, the highest percentage of INTR measured was 103.1602. The sample mean of the INTR values has a standard deviation of 15.5495, which means the degree of variability in the INTR values is around the average.

In contrast, the INTT variable, which is a crucial independent variable, has an average value of 85.9241. On average, 85.92% of the gross national revenue for the African countries included in the analysis was derived from international trade. However, the average INTT mean for the African countries chosen is greater when compared to a combined index of similar research conducted in emerging or developing markets. These studies showed a mean of 67.36% (Latief and Lefen, 2018). Among the countries included in the sample, the lowest contribution of INTT to gross national income is 23.9809, while the highest is 225.0231. The notable disparities found in the INTT values can be attributed to the volume of trade between Africa and China, which increased by 35% from 2020, reaching \$254 billion last year. This growth was mainly driven by a surge in Chinese exports to the African continent. The standard deviation of INTT is 43.0871, representing the degree of variability in the INTT values from the mean.

4. Empirical methods

The primary aim of this study is to examine the long-term co-integrating interactions among the variables being studied, using the ARDL bounds testing approach first introduced by Pesaran *et al.* (2001). Wehncke *et al.* (2022) highlighted that for investigations including several cross-sections and time series, the panel ARDL technique is more appropriate than the classic ARDL, which is restricted to a single time series. Therefore, in this investigation, we will use the panel ARDL model to determine the co-integration link between the dependent and independent variables. Furthermore, the advantage of employing the panel ARDL technique, as emphasized by Magwedere *et al.* (2021), is its ability to handle variables with varying levels of integration, as long as they are not integrated at an order greater than I(2). The panel ARDL technique is particularly helpful when dealing with variables that have different levels of integration.

Sultanuzzaman *et al.* (2018) argue that the ARDL model is particularly suitable for research using limited sample sizes. This approach offers the benefit of evaluating both long-term and short-term characteristics simultaneously, while also adding the impacts of variables from both time periods into the model. The researchers employed the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) / Schwartz Bayesian Criterion (SBC) in Stata to determine the most suitable lag lengths of the variables. By choosing the minimum value between these two criteria, they determine the best suitable lag length. To choose the most appropriate estimator, a Hausman test was performed due to the lack of an assumption of homogeneity between long-term parameters. This test helps determine the appropriate estimator to use among the pooled mean group estimator (PMG), the mean group estimator (MG), or the dynamic fixed effect estimator (DFE). Adams *et al.* (2016) have previously stated that the pooled mean group (PMG) estimator is the preferred choice when either the number of entities or cross-sections (N) or the number of time periods (T) is minimal.

The mean group estimator (MG) and the pooled mean group estimator (PMG) differ significantly. The PMG estimator, as described by Conterius *et al.* (2023), combines the characteristics of the MG estimator, such as averaging separate equations for each cross-section, to produce reliable estimates. Furthermore, as stated by Calderón *et al.* (2015), the PMG estimator considers the differences in error variances, short-run coefficients, intercepts, and

adjustment speed to long-run equilibrium values between countries (N), while assuming that long-run slope coefficients are the same for all countries. An examination is carried out on the effects of currency rate and interest rate on international trade in 12 chosen SADC countries from 2000 to 2021, using the subsequent equation. Both the ARDL and the vector error correction model (VECM) are used together to measure the rate at which adjustments occur when there is a lack of balance. This approach adheres to the methodology suggested by Pesaran *et al.* (1999) and is also corroborated by Nkoro and Uko (2016), Mensah *et al.* (2019), and Kong *et al.* (2021). The ARDL model is integrated with the VECM model to capture the effects of both the long- and short-term factors in the study. This integrated methodology allows for the determination of both the cointegrating relationship and the rate at which correction occurs in situations of imbalance. The proposed model adopts the following structure of an ARDL model in Equation 1.

$$EXC_{it} = \rho \sum_{j=1}^p \delta_{ij} EXC_{i,t-j} + \alpha \sum_{j=0}^q \beta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (1)$$

In this context, the variable EXC_{it} represents the dependent variable corresponding to group i at time t . $X_{i,t-1}$ represents the vector of explanatory variables for group i at time $t-1$. The term μ_i represents the fixed effect specific to each country, where j represents the country under study. The lag lengths are denoted by p and q . The coefficient δ captures the short-run effects of the dependent variable, while the coefficients β quantify the influence of the explanatory variables on the dependent variable. The error term ε_{it} accounts for the random shocks affecting the dependent variable for group i at time t . The model specifications specific to this study for the ARDL system of equations are presented in Equation (2). The expression of the ARDL error correction model is as follows.

$$EXC_{it} = \phi_i (EXC_{i,t-1} - \gamma_1 INTR_{i,t} - \gamma_2 INTT_{i,t}) + \rho - 1 \sum_{j=1}^p \delta_{ij} \Delta EXC_{i,t-j} + \alpha - 1 \sum_{j=0}^q \beta_{1i} \Delta INTR_{i,t-j} + \alpha - 1 \sum_{j=0}^q \beta_{2i} \Delta INTT_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

Here, Δ represents the first difference operator. EXC , $INTR$, and $INTT$ represent the exchange rate, interest rate, and international trade variables, respectively. γ represents the long-run coefficients of the independent variables, while δ and β are the short-run coefficients. ε_{it} denotes the error term, ϕ represents the speed of adjustment to the long-run equilibrium, and ECM_{t-1} represents the lagged error correction term. The variables i and t represent the country and period, respectively. To determine the appropriate lag order (p , q), criteria such as AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion) were utilized. Pre-test diagnostics were conducted in Stata to ensure that all variables were stationary at the first difference. The lagged and differenced variables in the ARDL model were used to examine both long-run and short-run relationships between the variables, aiming to identify any cointegrating relationships between them. In summary, prior to model estimation, pre-test diagnostics were performed to ensure variable stationarity at the first difference. The optimal lag length was determined using the AIC and SIC criteria.

5. Estimation results

An analysis was conducted on the influence of the exchange rate and interest rate on international trade in specific SADC countries, employing dynamic panel data models. Dynamic panel data models provide a multitude of benefits compared to aggregate time series data. An important benefit is their ability to conduct a more in-depth examination of microeconomic processes that could otherwise be distorted by biases caused by aggregation. Researchers can acquire a more comprehensive understanding of the variations in adjustment dynamics among different categories of countries by employing panel data. Furthermore, Ullah *et al.* (2018) highlighted the importance of considering the dynamics in the fundamental process to provide reliable estimates of different parameters, even if the coefficients of lagged dependent variables are not the main area of interest. To identify the most suitable latency, the researchers utilized Schwarz information

criteria (SIC) and chose the lag that produced the smallest value. This methodology guarantees that the model's efficacy is improved, resulting in more reliable and enlightening discoveries in the analysis.

The Hausman test was used to determine the appropriate model and evaluate whether to accept or reject the null hypothesis. The Hausman test results suggested that the pooled mean group (PMG) estimate methodology was the preferred method for running the ARDL and ECM models in the panel data for African countries. Therefore, our research will concentrate specifically on the results derived from the PMG technique. Cointegration in these models is established by the statistical significance of the error correction term. The results of the autoregressive distributed lag (ARDL) and error correction model (ECM) analyses, which demonstrate the long-term and short-term associations between the dependent variable EXC and the independent variables INTR and INTT, are displayed in Table 4.

The value of the error correction term (ECT) coefficient shown in Table 4 is -0.0126. This indicates that around 1.26 percent of the difference from equilibrium is rectified annually. Therefore, it takes approximately 79.37 years (1 divided by 0.0126) for alterations in INTR and INTT to completely impact EXC, thus restoring the system to a state of balance over an extended period of time. The long-term equation shows a statistically significant coefficient of -2.7269 for INTR, demonstrating a negative long-term correlation between EXC and INTR. This means that exchange rate variations within the SADC region have a detrimental effect on interest rates. These findings are consistent with the predictions made by the interest rate parity theory, suggesting that a reduction in exchange rates can impede the effectiveness of monetary policy in controlling interest rates, hence negatively impacting interest rates. More precisely, a modification in INTR results in a 2.73 percent decline in EXC over an extended period of time. It is crucial to recognize that while the exchange rate seems to affect the interest rate, its importance remains. The result of this study is in line with those of Hameed and Rose (2018), who found that the exchange rate has a negative and significant effect on interest rates in the Asian Development Bank Institute. Therefore, it may be inferred that the exchange rate indeed has an impact on the interest rate in the long run. Furthermore, this paper demonstrates that the interest rate exerts a detrimental and statistically significant influence on the exchange rate, but international trade has a beneficial and statistically significant effect on the exchange rate over a long run. Furthermore, the findings presented in Table 4 clearly indicate that in the short term, both the interest rate and international trade exert a significant influence on the exchange rate. These findings indicate that, in the short term, both interest rates and international trade have a negative and statistically significant effect on the exchange rate.

Table 4. ARDL and ECM results, with the dependent variable of EXC

	PMG D.EXC	MG D.EXC	DFE D.EXC
Long Run			
INTR	-2.7269*** (0.2390)	29.2176 (0.3730)	-21.3528*** (0.7710)
INTT	4.8946 (0.2550)	-1.8161*** (0.5710)	36.3776 (0.6640)
ECT (-1)	-0.0126*** (0.6130)	-0.0883*** (0.0630)	0.0082*** (0.6270)
Short Run			
D.INTR	-1.0633*** (0.7180)	-0.4502*** (0.8980)	-1.1414*** (0.3000)
D.INTT	-0.1605*** (0.8140)	-0.2568*** (0.7540)	0.2416 (0.5600)
Constant	34.0626 (0.0410)	32.5760 (0.0570)	36.9472 (0.1340)
N	252	252	252

Note: t-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%.

Source: Author's own computations

The error correction term (ECT) is presented in Table 5 with a coefficient of -0.1888, showing that around 18.88 percent of the departure from equilibrium is corrected on an annual basis. Therefore, it requires around 5.30 years ($1/0.1888$) for the effects of changes in EXC and INTT to completely influence INTR in the long term, resulting in the re-establishment of balance. The long-term equation shows a notable coefficient of -0.0030 for EXC, demonstrating a negative long-term correlation between EXC and INTR. This means that exchange rate variations within the SADC region have a detrimental effect on international trade. These findings are consistent with the predictions made by different growth theories, suggesting that a reduction in exchange rates can impede the progress of technology, innovation, and the accumulation of knowledge, hence negatively impacting international trade. More precisely, a modification in EXC leads to a 0.30 percent reduction in INTR over the long run. The result of this study is in line with those of Mehtiyev *et al.* (2021), who found that the exchange rate has a negative and significant effect on international trade in Azerbaijan. However, the long-term influence of INTT on interest rates is not statistically significant, although it shows a beneficial impact. Short-term findings indicate that the exchange rate has a favorable influence on the interest rate, although this impact lacks statistical significance. However, this study implies that international trade has a positive and statistically significant effect on interest rates in the short term.

Table 5. ARDL and ECM results, with the dependent variable of INTR

	PMG D.INTR	MG D.INTR	DFE D.INTR
Long Run			
EXC	-0.0030*** (0.3320)	-0.6542*** (0.1270)	-0.0016*** (0.8250)
INTT	0.0606* (0.0000)	0.2288 (0.5180)	0.0621* (0.6130)
ECT (-1)	-0.1888*** (0.0190)	-0.2001*** (0.0190)	-0.1263*** (0.0000)
Short Run			
D.EXC	0.1884 (0.0180)	0.3135 (0.0780)	-0.0028*** (0.4620)
D.INTT	0.0079*** (0.8180)	0.0087*** (0.7750)	-0.0064*** (0.7800)
Constant	0.9042 (0.3080)	1.2566 (0.5410)	1.0901 (0.4270)
N	252	252	252

Note: t-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%.

Source: Author's own computations

Table 6 shows the results of the ARDL and ECM models, demonstrating the relationship between the dependent variable, INTT, and the independent variables, EXC and INTR, in both the long- and short-term. In Table 6, the error correction term (ECT) displays a coefficient of -0.2996, which signifies an annual adjustment of around 29.96 percent toward achieving equilibrium. Therefore, it takes approximately 3.34 years (1 divided by 0.2996) for the effects of changes in EXC and INTR to completely influence INTT during the extended period, thereby bringing the system back to a state of balance. According to the long-run equation, both the exchange rate and interest rate (-0.0148 and -0.4307 respectively) have a significant and negative effect on international trade. This means that both the exchange rate and the interest rate within the SADC region have a detrimental effect on international trade. The results align with forecasts derived from multiple economic theories, suggesting that a reduction in exchange rates and interest rates can impede international trade. High or volatile exchange rates and interest rates can increase uncertainty for businesses engaged in international trade, affecting their investment decisions and trade flows, hence negatively impacting international trade. Furthermore, this suggests that policymakers in SADC countries must thoroughly assess the impact of monetary

and exchange rate policies on international trade while developing an economic strategy. More precisely, a modification in EXC leads to a reduction of 1.48 and 43.07 percent in INTT in the long run. The result of this study is in line with those of Ngondo and Khobai (2018), who found that exchange rate and interest have a negative and significant effect on international trade in South Africa.

The results presented in Table 6 clearly demonstrate that both exchange rate (EXC) and international trade (INTR) have a detrimental impact on international trade (INTT) in the long term in the 12 countries in the Southern African Development Community (SADC). Additionally, the findings indicate that both the exchange rate and interest rate have a long-term impact on international trade in the 12 SADC countries, indicating a significant correlation between these factors. Furthermore, Table 6 shows that in the short term, both EXC and INTR have beneficial effects on INTT, but these effects are not statistically significant. The short-run equation demonstrates a negligible but positive effect of both the exchange rate (0.2064) and the interest rate (1.8339) on international trade. More precisely, a modification in EXC leads to a 20.64 and 1.83 percent rise in INTT in the short term. According to the results presented in Table 6, it can be confidently concluded that both EXC and INTR have a beneficial impact on INTT in the short term throughout the 12 SADC countries.

Table 6. ARDL and ECM results, with the dependent variable of the INTT

	PMG D.INTT	MG D.INTT	DFE D.INTT
Long Run			
EXC	-0.0148*** (0.1140)	-0.9886*** (0.5460)	-0.0073*** (0.4840)
INTR	-0.4307*** (0.0170)	1.8136 (0.4170)	0.1732 (0.5040)
ECT (-1)	-0.2996*** (0.0000)	-0.4444*** (0.0000)	-0.2493*** (0.0000)
Short Run			
D.EXT	0.2064 (0.6070)	0.5145 (0.3880)	-0.0005*** (0.9610)
D.INTR	1.8339 (0.0190)	1.1296 (0.0100)	0.0664* (0.6960)
Constant	29.8363 (0.0030)	35.7966 (0.0010)	21.1743 (0.0000)
N	252	252	252

Note: t-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%.

Source: Author's own computations

7. Conclusion and recommendations

This study delves into examining the influence of exchange rates and interest rates on international trade within the SADC, encompassing a diverse sample of 12 African countries. Using the ARDL model, the investigation encompasses a comprehensive twenty-one-year timeframe, spanning from 2000 to 2021. Through our study, several significant discoveries were validated concerning the influence of exchange rates and interest rates on international trade within the 12 SADC countries. In terms of the relationship between exchange rate and interest rate when considering the exchange rate as the dependent variable, our study revealed a notable long-run negative impact between interest rate and exchange rate. Moreover, international trade exhibited a positive impact on the exchange rate, although this effect was statistically insignificant throughout the period from 2000 to 2021. In the short run, with exchange rate as the dependent variable, this paper demonstrates that both interest rate and international trade have a significant negative impact on the exchange rate.

Furthermore, when considering interest rate as the dependent variable, this study uncovered a significant long-run negative relationship between exchange rate and interest rate.

Additionally, international trade exerted a positive and significant impact on interest rate throughout the investigation period. In the short run, when the interest rate was considered the dependent variable, the study revealed that the exchange rate had a positive but statistically insignificant impact on the interest rate. On the other hand, international trade exhibited a positive and significant impact on the interest rate throughout the period from 2000 to 2021. The study concludes that exchange rate and international trade drives interest rates in the short run during the period of investigation.

In conclusion, when international trade was treated as the dependent variable, our study observed a substantial long-run negative impact on international trade from both exchange rate and interest rate in the SADC countries during the investigation period. Moreover, in the short run, when international trade was considered the dependent variable, this study identified a positive but statistically non-significant impact on international trade from both exchange rate and interest rate within the SADC countries during the investigation period. In summary, our findings indicate that in the short run, both exchange rate and interest rate foster international trade. However, in the long run, they act as hindrances to international trade.

This study presents crucial evidence regarding the influence of exchange rate fluctuations and interest rates on international trade in the 12 SADC countries, highlighting their significance in the context of development. The results emphasize the adverse long-run effect of the exchange rate on the interest rate, thereby emphasizing the importance of promoting international trade as a viable alternative. The findings suggest that INTT tends to track the trajectory of the exchange rate and interest rate, likely due to both factors serving as benchmarks for evaluating the risk associated with trade in a country. Consequently, it is essential for countries to prioritize the implementation of policies that support continuous international trade, foster a conducive environment for both domestic and international trade, and address the presence of restrictive trade barriers. By placing a high priority on fostering sustainable global trade, countries can effectively attract FDI, as economies displaying robust growth tend to be more appealing to foreign investors. Moreover, countries that experience substantial inflows of global trade are also likely to attract domestic investments from foreign sources. Considering the interconnection between exchange rates, interest rates, and international trade, it is imperative for SADC countries to adopt policies specifically designed to attract and promote international trade. Through these efforts, they can stimulate economic growth and cultivate a positive cycle of mutually reinforcing FDI and domestic investment, which are fundamental drivers of economic development.

SADC countries would benefit from aligning their exchange rate and interest rate policies with their national strategies to attract international trade and achieve their development and economic growth objectives. This recommendation is particularly significant as it challenges the conventional belief that developing countries should pursue complete economic sovereignty. By embracing a more interconnected approach, these nations can enhance their economic prospects and leverage international trade opportunities effectively. Additionally, it is crucial for researchers and scholars to delve deeper into understanding the specific channels through which exchange rate, interest rate, and international trade strategies impact economic activity. Conducting further research in this area will enable us to gain a more comprehensive understanding of the underlying dynamics and uncover valuable insights that can inform policy-making and decision-making processes. Ultimately, this enhanced knowledge will empower policymakers to make informed choices and implement more effective economic strategies for sustainable growth and development.

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Ethical Approval

Ethical conduct in research is crucial for maintaining intellectual integrity. Mouton (2011) and Tustin *et al.* (2005) define ethics as honorable, appropriate, and advantageous. Ethical considerations should be an integral part of daily research practice, guiding actions to uphold academic honesty. The researcher secured ethical clearance with study approval number #33860866.