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Trade balance equilibrium, exchange rate volatility and optimality of exchange rate regime choice: An empirical investigation of emerging countries.

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Abstract

The real effective exchange rate holds significant importance as a crucial gauge of a nation's global competitiveness in the economy, thereby exerting a potent influence on the development of its foreign trade activities. In an imperfect economic system where instability is the rule and stability is the exception, exchange rate volatility can harm countries' trade balances, especially in emerging countries with less-developed financial markets. Against this backdrop, our article attempts to provide some answers to the problem of choosing the optimal exchange rate regime to mitigate the effect of exchange rate volatility on the trade balance of emerging countries. Our research used a dataset encompassing 13 emerging nations from 1990 to 2020. We point out that real effective exchange rate volatility was assessed using the GARCH (1.1) model. In contrast, the CS-ARDL model was employed to measure the degree of impact of exchange rate volatility on emerging countries' trade balances under each type of exchange rate regime adopted to ultimately deduce the optimal exchange rate regime for these countries. Our empirical findings substantiate the presence of a penalising effect of exchange rate volatility on the trade balance of our sample countries, which tends to disappear as we move from fixed to flexible and floating exchange rate regimes. We can therefore conclude that flexible exchange rate regimes, due to their stabilizing function, are the most advantageous in mitigating the effects of exchange rate volatility on emerging countries's trade balances.

Keywords: Trade balance ; Exchange rate regimes; Exchange rate volatility ; Emerging countries ; Panel data ; GARCH model; Panel CS-ARDL model.

Introduction

Since the 19th century, the global context has given the degree of integration of countries a key role in stimulating incomes and promoting growth. No economy can live in autarky and without trade relations with other economies. It must participate in world trade by importing and exporting to carry out its essential economic functions, namely production, income distribution, and national spending. Therefore, Special emphasis should be placed on the international trade flows and the balance of payments that tracks them, i.e., the trade balance. An economy experiencing a trade imbalance will encounter a decline in its terms of trade, which will be sustained by oscillations in its currency. These exchange rate shocks will subsequently exacerbate the trade deficit, thereby propelling the country into a vicious circle.

To improve the trade balance equilibrium, the authorities have two approaches to influencing the country's competitiveness. On one side, the internal approach relies on supply policies, such as affecting labor productivity or salaries, for example, by controlling inflation, lowering taxes (e.g., producers' part of social security contributions or profit tax), or easing rigid labor market conditions. On the other side, the external approach involves devaluing or depreciating the currency. This operation reveals the importance of quantifying the trade balance's short- and long-term reactivity to changes in the exchange rate for economic policy. Primarily, it enables us to confirm the existence of a stable long-term relationship between the exchange rate and the trade balance. In the absence of such a relationship, the depreciation of the exchange rate proves to be an ineffective instrument for enhancing the country's long-term competitiveness. Secondly, if there is a long-term relationship, it is essential to determine if depreciation is anticipated to have a consistent positive impact on the trade balance in the long terme. Thirdly, it would be desirable to quantify the magnitude of the improvement in the trade balance, as this would allow us to carefully evaluate the benefits of the trade balance against the costs of permanent depreciation.

It was to verify the nature of this relationship that this work was developed. Our study will focus on analyzing the impact of exchange rate volatility under different regimes on the trade balances of the following 13 emerging countries: Morocco, Tunisia, Egypt, South Africa, Turkey, Mexico, Thailand, Brazil, Jordan, Peru, Nigeria, Indonesia, and Bolivia, over the period from 1990 to 2020. The processing of this work will be divided into two distinct parts, the theoretical and the empirical. In the first one, our central attention will be devoted to the ongoing debate surrounding the impact of the choice of exchange rate regime and the consequent

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volatility in exchange rates on the trade balance. Subsequently, our empirical study will start in Section 3, where we will explicate the empirical approach utilized. Section 4 will be dedicated to presenting the empirical validation of the diverse steps involved in developing the Cross Sectional ARDL Panel model. In the final empirical section, Section 5, we will furnish the findings to address our research question by thoroughly examining the results of the CS-ARDL panel model.

1. Literature review

As for the relationship between the exchange rate/regime and the trade balance, The earlier research, such as Kreinin (1967) and Khan (1974), focused on examining the Marshall-Lerner condition, which claims that if the price elasticity of demand for imports and exports rises above 1 in absolute value, the trade balance can be improved in the long term (Marshall, 1923; Lerner, 1946). Nevertheless, even though the Marshall-Lerner condition was met, the trade balance persisted in its deteriorating trend (Bahmani-Oskooee, 1985). This change in perspective aroused the interest of researchers, who gradually abandoned the study of the Marshall-Lerner condition in favor of J-curve analysis.

Due to the J-curve effect, multiple empirical investigations have analyzed the impact of exchange rate variations on the short and long-term trade balance. The J-curve concept illustrates the evolution of a country's trade balance after a devaluation or depreciation. For instance, a devaluation would worsen the trade balance before eventually improving it. The J-curve hypothesis is partially associated with pre-existing trade agreements (Magee, 1973; Krueger, 1983). In the short-term term, it is imperative to adhere to and fulfill contractual obligations, leading to a scenario wherein the demand for costly imports and competitively-priced exports to international purchasers exhibits a relatively low degree of responsiveness to alterations in prices. Over time, when the newly signed contracts subsequent to a depreciation take effect and gain significance, a transition transpires whereby the prevailing trend is characterized by a rise in export volume and a decline in import volume. Consequently, the trade balance experiences an improvement.

In the first, short-term phase, devaluation/depreciation of the currency's value leads, through the price effect, to a widening trade deficit by making imports more expensive and exports relatively cheaper. In the second, medium-term phase, the quantity effect outweighs the price effect. On the one hand, the transmission of imported inflation through the exchange rate channel compels domestic consumers to curtail their import purchases. On the other hand, the decline in domestic goods prices stimulates demand for those goods, multiplying their exported quantities. A progressive decrease in the trade deficit is observed until the equilibrium point is reached. The third phase marks the long-term amplification of the quantity effects pre-explained in the second phase. Higher import prices and the attractiveness of domestic products tend to boost the trade balance.

But the question remains: Is the devaluation or depreciation effect shown by this J-curve trajectory always guaranteed? The answer is "no." This confirmation is supported by the critical elasticity theorem of Marshall-Lerner. In fact, even in the medium and long term, the fluctuations in the real exchange rate is expected to have a negative effect if the price elasticities are low. On the import side, the absence of a suitable substitute for the consumer causes local demand to be inelastic to increase import prices. As a result, higher prices for foreign products due to import restrictions can further inflate import costs. On the export side, when international trading partners have an unresponsive demand to the decrease in domestic prices or if the country is unable to increase its supply, it will not reap the advantages of a lower real effective exchange rate. So, in the absence of these elasticities, the country concerned will import the same quantity but at higher prices and export the same quantity at lower prices, which tends to widen its trade balance deficit. In this context, Reis Gomes and Senne Paz (2005) demonstrate that the trade balance can only be positively influenced by real exchange rate devaluations if the widely recognized Marshall-Lerner (ML) condition is met.

In a subsequent study by Petrovic and Gligoric (2010), it was established that depreciation of the real exchange rate produces a long-term enhancement in the trade balance. They further demonstrated the existence of the J-curve phenomenon in Serbia between 2002 and 2007. Other studies have found partial evidence of the phenomenon. Halicioglu (2008) conducted a study examining the period from 1980 to 2005 and found no evidence of a long-term relationship between the real exchange rate and the trade balance, which contradicts theoretical expectations. However, the study did observe the J-curve phenomenon in the short term. In contrast, other works have denied the J-curve phenomenon. It was the case for Yusoff (2010) in Malaysia from 1977 to 2001; Shahbaz et al. (2012) in Pakistan from 1980 to 2006. At the same time, other authors, such as Onakoya et al. (2019), have found an inversed J-curve in the Nigerian context from 1981 to 2016.

These observations collectively affirm that while the J-curve phenomenon may not have attained universal acceptance, there is a consensus regarding the significant role played by the exchange rate as a tool in achieving one of the objectives of economic policy (Kaldor's magic square), namely external equilibrium, and particularly the trade balance equilibrium.

Several studies have assessed the effect of the real effective exchange rate (REER) on the trade balance. Although the results were ambiguous, there is ample empirical evidence of a negative relationship between exchange rate volatility and international trade levels. In their research, Arize et al. (2000) examined the influence of real exchange rate volatility on exports in 13 less-developed countries. Their study shows a noteworthy negative effect of volatility on the movement of exports. In the same vein of ideas, Olimov and Sirajiddinov (2008) noted a negative relationship in which increased exchange rate volatility was linked to a decrease in both Uzbekistan's trade outflows and inflows, especially after the exchange rate regime reforms of 2001–2003. Subsequently, Vieira and MacDonald (2016) conducted an empirical study to examine the influence of real effective exchange rate (REER) volatility on export volumes. Additionally, they investigated the impact of the 2008 international financial crisis on a group of developing and emerging economies. Their study showed that an increase (decrease) in REER volatility reduces (increases) export volumes. Senadza and Diaba (2017) also presented results leaning toward the same perception. Applying the heterogeneous dynamic panel model to data from eleven sub-Saharan African economies, the authors found no significant effect of exchange rate volatility on imports. However, in the case of exports, a negative impact of short-term volatility was found.

As for the relationship between exchange rate regimes and trade balance, although fixed exchange rate regimes are often perceived as incapable of effectively adjusting current accounts, there is no clear empirical evidence to support this claim. While for some authors, fixed exchange rate regimes can benefit bilateral trade. According to Rose (2000), the adoption of a common currency with a significant trading partner produces a threefold increase in trade volume. Adopting a common currency eliminates uncertainties associated with exchange rates and reduces transaction costs between the two countries involved. Consequently, this fosters an environment where bilateral trade can flourish and experience an increase. Therefore, Countries that manifest a significant reliance on exports to a particular trading partner can potentially benefit from implementing a fixed exchange rate regime, wherein their domestic currency is linked to that of the prominent trading partner. These findings were confirmed by Jurzyk and Fritz-Krockow (2004) in a study of bilateral trade between 24 Caribbean and Latin American countries from 1960– to 2001. The authors proved that a credible fixed parity positively impacts bilateral trade.

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Nevertheless, according to Younus et al. (2006), adopting a floating exchange rate regime aimed to avoid the appreciation of the domestic currency. This overvaluation would reduce the competitiveness of exports and make it more difficult for import substitutes to compete. Islam (2002) argues that the key objective of adopting a floating exchange rate regime is to mitigate the risk of significant misalignments in the exchange rate, mainly to avoid any unanticipated appreciation of the real exchange rate that may have negative implications for export demand. While in other studies, there is no empirical evidence that the choice of exchange rate regime impacts the trade/current account balance (Chinn and Wei, 2013).

Upon reviewing the existing economic literature, it becomes evident that further research is necessary to examine the relationship between the exchange rate and the trade balance, considering the specific exchange rate regime adopted. This analysis is crucial in determining the optimal exchange rate regime for minimizing the impact of exchange rate volatility on the trade balance. In this context, several hypotheses can be tested :

Hypothesis 1*: Exchange rate volatility has a negative impact on emerging countries' trade balances.*

Hypothesis 2 : *The volatility of exchange rates in emerging countries is not reaching the level of being a destabilizing factor in these countries' trade balances.*

If the first hypothesis is confirmed, the following two assumptions must be verified:

Hypothesis 3*: The exchange rate regime is a determining factor in mitigating the impact of exchange rate volatility on the trade balance of emerging countries.*

Hypothesis 4*: The adopted exchange rate regime does not influence the relationship between exchange rate volatility and trade balance in the emerging countries context.*

Testing these hypotheses requires empirical investigation in the context of emerging countries. The following section outlines the empirical approach and model used for this purpose.

2. Methodology and data

In this section of our work, we will first outline the econometric model used to predict the impact of real exchange rate volatility on the trade balance in the context of 13 emerging countries (Morocco, Tunisia, Egypt, South Africa, Turkey, Mexico, Thailand, Brazil, Jordan, Peru, Nigeria, Indonesia, and Bolivia) for the period 1990 to 2020. Through an extensive review of the economic literature, we have been able to acquire empirical evidence about the influence

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of exchange rates on the trade balance based on the model inspired by the work of Bahmani-Oskooee (1985) and Rose and Yellen (1989). Although Magee (1973) is credited with the initial introduction of the notion, the testing approach proposed by Bahmani-Oskooee (1985) involved formulating a trade balance model and incorporating an exchange rate lag structure as a key determinant of the trade balance. Subsequently, Rose and Yellen (1989) proposed an alternative approach for testing the J-curve phenomenon using cointegration and error correction modeling techniques. Their method examined the relationship between currency depreciation and the trade balance, revealing a short-term deterioration in the trade balance followed by a long-term improvement. Our model is inspired by the work of Bahmani-Oskooee (1985) and Rose and Yellen (1989) :

$$Trade\ balance\ equilibrium = \alpha_0 + \alpha_1\ Exchange\ rate_{\ it} + \alpha_2\ Domestic\ Product/\ Income_{\ it} + \alpha_3\ Foreign\ Income_{\ it} + \varepsilon_{it} \qquad (1)$$

Adapting it to our case, our initial model becomes :

$$Trade\ balance\ equilibrium_{\ it} = \alpha_0 + \alpha_1\ Exchange\ rate\ volatility_{\ it} + \alpha_2\ Domestic\ Product/\ Income_{\ it} + \alpha_3\ Foreign\ Income_{\ it} + \varepsilon_{it} \qquad (2)$$

Below, Table 1 provides a summary of the information pertaining to each of the variables utilized in our study.

Table N°1 : Summary table of variables used

Variables	Measurements	Source	Observations
Trade balance	Exports/Imports	World Bank database	Annual observations from 1990 to 2020
REER Volatility	Real effective exchange rate (REER) volatility via GARCH Model	Bruegel database developed by Darvas (2021)	Monthly observations from 1990 to 2020
Domestic Product / Income	Nominal gross domestic product (GDP)	World Bank database	Annual observations from 1990 to 2020
Foreign Income	Foreign reserves in months of imports	World Bank database	Annual observations from 1990 to 2020

Note that: For "Exchange rate volatility" variable, we will annualize it by calculating the mean of each year before its integration into the model.

Source: Authors

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In the final equation of our model, we incorporate the exchange rate regime as an independent variable to examine the impact of the choice of exchange rate regime on this relationship. In our study, we have used the classification Ilzetzki et al. (2017) proposed. This classification database covers 194 countries from 1946 to 2020 and is regularly updated annually. The classification used is shown below (Table 2) :

Table N°2. Classification of exchange rate regime.

Exchange rate regime	IRR code
Fixed exchange rate regime (regime 1)	1,2,3,4
Intermediate exchange rate regime (regime 2)	5,6,7,8,9,10,11
Floating exchange rate regime (regime 3)	12,13,14,15

Source: Authors

The exchange rate regimes were arranged in ascending order of rigidity, starting with the most rigid to the most flexible. {1; 2; 3} = {Fixed; Intermediate; Float}.

After including this variable, the model becomes:

$$Log\,TB_{it} = \alpha_0 + \alpha_1\, L.log\,TB_{it} + \alpha_2\, Log\,REER\_Vol_{it} + \alpha_3\, EX\_Regime + \alpha_4\, log\,GDP + \alpha_5\, Foreign\_Res_{it} + \varepsilon_{it} \qquad (3)$$

The CS-ARDL panel model was utilized in our investigation, taking into account the distinctive peculiarities of our data. The theoretical foundation of this model is based on the panel auto-regressive distributed lags (Panel-ARDL) model, which was first proposed by Pesaran and Smith (1995) and subsequently improved and extended by Pesaran et al. (1999). The ARDL (p,q) model, as proposed by Pesaran and Shin (1996), can be expressed in the following manner:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \Phi_{i,j}\, Y_{i,t-j} + \sum_{j=0}^{q} \beta_{i,j}\, X_{i,t-j} + \varepsilon_{it} \qquad (4)$$

i refers to the country with $i = 1,2, \dots, N$. j is the number of time . t is the time dimension lags. X_{it} is the vector of explanatory variables. α_i represents the specific fixed effect of the individuals. p and q are lag orders, and ε_{it} is the disturbing component.

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To incorporate the adjustment coefficient and long-run dynamics, we reparametrize Equation (4) as follow :

$$\Delta Y_{it} = \alpha_i + \psi_i \left(Y_{i,t-1} - \lambda_i X_{i,t}\right) + \sum_{j=1}^{p-1} \Phi'_{i,j}\, \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{i,j}\, \Delta X_{i,t-j} + \varepsilon_{it} \quad (5)$$

where λ_i represents the long-run equilibrium relationship between Y_{it} and X_{it}. Φ' and β' denoting the short-run coefficients linked with its past values and the variables of interest X_{it}. However, the sign of ψ_i serves as an indicator of the presence of a long-term relationship between the variables. Moreover, it reflects the speed of adjustment, while simultaneously accounting for error corrections.

Chudik and Pesaran (2015) propose the utilization of Pesaran's (2006) common correlated effects (CCE) methodology as a suitable solution for addressing the issue of cross-sectional dependence in error terms inside panel autoregressive distributed lag (ARDL) models (CS-ARDL). As a result, the CCE estimator achieves consistency by including $Z = [\sqrt[3]{T}]$ lags of the cross-sectional averages. Moreover, to account for common factors, the CS-ARDL methodology effectively complements individual ARDL regressions by using additional lags of cross-sectional averages. The CS-ARDL model is presented in the following manner:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \Phi_{i,j}\, Y_{i,t-j} + \sum_{j=0}^{q} \beta_{i,j}\, X_{i,t-j} + \sum_{j=0}^{z} \omega'_{i,j}\, \bar{\varphi}_{t-j} + \varepsilon_{it} \quad (6)$$

with $\bar{\varphi}_{t-j} = (\bar{y}_{i,t-j}, \bar{x}_{i,t-j})$ given that: $\bar{y}_t = \sum_{i=1}^{N} \frac{y_{i,t}}{N}$ and $\bar{x}_t = \sum_{i=1}^{N} \frac{x_{i,t}}{N}$, and Z being the number of lags of the cross-sectional averages to be included. We can calculate the mean group estimates in the CS-ARDL approach as follows:

$$\widehat{\Phi}_{CS-ARDL,i} = \frac{\sum_{j=0}^{q} \hat{\beta}_{i,j}}{\sum_{j=1}^{p} \widehat{\Phi}_{i,j}} \quad (7)$$

In order to measure the volatility of exchange rates in the countries included in our study, we carried out a study similar to the one developed for a previous study analyzing the impact of exchange rate volatility on economic growth (Ameziane and Benyacoub 2022). First, we collected monthly historical data on real effective exchange rates (REER) developed by Darvas (2021). Then, in a second step, we calculated the Napier logarithm of the monthly rates for each REER to generate the series of daily returns. In the third and final stage of our study, we assessed the degree of volatility in the exchange rate of Real Effective Exchange Rates

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(REERs). This was performed by examining the conditional volatility using the GARCH (p,q) models, which were initially proposed by Engle (1982) and further developed by several researchers, including Bollerslev (1986) and Gourieroux and Monfort (1997). The aforementioned studies by Syarifuddin et al. (2014), Barguellil et al. (2018), and Ameziane and Benyacoub (2022) have demonstrated the efficacy of these models in assessing both exchange rate volatility and stock market indexes volatility. The GARCH (p, q) model can be expressed as follows:

$$\sigma_t{}^2 = \text{ɲ} + \sum_{i=1}^{P} \beta_i \, \sigma^2{}_{t-1} + \sum_{j=1}^{Q} \alpha_j \varepsilon^2{}_{t-j} \qquad (8)$$

where ɲ is the long-run volatility with: $\text{ɲ} > 0$; $\beta_i \geq 0$; $i = 1, \dots, p$ and $\alpha_j > 0$; $j = 1, \dots, q$.

We want to point out that all the steps involved in specifying the GARCH model used in this framework, as well as the results of the model validation tests, are set out in detail in a previous study analyzing the impact of exchange rate volatility on economic growth (Ameziane & Benyacoub 2022).

3. Empirical Analysis

In order to create and specify the CS-ARDL panel model, it is necessary to verify many preliminary requirements. These conditions include determining the integration order of the variables, ensuring panel homogeneity, assessing cross-sectional dependence, and confirming the presence of cointegration, particularly the existence of a long-term relationship between the variables.

3.1. Cross -Sectional Dependency Test

Pesaran (2015) introduced a cross-sectional dependence test, which serves as a technique for identifying and quantifying the level of cross-sectional dependence among individual units in panel data. The test is particularly useful when traditional panel data methods assume that observations are independent between units, but in reality, they may be correlated. Ignoring this dependence could lead to biased estimates of parameters and inaccurate calculations of standard deviations.

3.2. Homogeineity Test

The homogeneity test aims to determine whether the proportions observed in each subgroup are statistically similar or differ significantly. For this purpose, we will opt for the Swamy test

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(1970) and the Pesaran and Yamagata test (2008), the results of which are presented in the table below:

Table N°3. Results of homogeneity tests

Swamy Test		Pesaran and Yamagata Test	
Chi-2 (48)	2316.38 (0.000)	**Delta**	11.468 (0.000)
		Delta adj.	12.522 (0.000)

Source: Authors

The significance of the three test statistics (Chi-2 for the Swamy and Delta tests and Delta adj. for the Pesaran and Yamagata test) at the 1% threshold points to heterogeneity in the data-generating process

Table N°4. The results of the cross-sectional dependence test for the variables

	CD-test for cross-sectional dependence		
Variables	**CD-test**	***p*-Value**	**Average joint T**
Log TB	3.744	0.000	31.00
Log REER_Vol	2.262	0.024	31.00
Log GDP	44.886	0.000	31.00
Log Foreign_Res	43.32	0.000	31.00

Source: Authors

The significance analysis of the results shows the inferiority of the p-values concerning the 1% threshold for all the variables in our model, namely Log TB, Log REER_Vol, Log GDP, Log Foreign_Res. It refers to the presence of cross-sectional dependence in our panel data

3.3. Unit Root Test

To test the stationarity of the variables in our panel, we rely on the two Pesaran tests, namely the Pesaran et al. (2003) and Pesaran (2007) tests. Both are extensions of the Dickey-Fuller (DF) test, allowing us to consider dependency and cross-correlation between time series. The results of both tests are shown in the following table:

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Table 5. Unit root test results

	CIPS test		CADF test	
Variables	**At Level**	**First difference**	**At level**	**First difference**
Log TB	−2.827 *** (−2.44)	-	−2.827 *** (0.000)	-
Log REER_Vol	−3.446 *** (−2.44)	-	−3.446 (0.000)	-
Log GDP	-1.889 (−2.44)	−3.671*** (−2.45)	-1.889 (0.311)	−3.671*** (0.000)
Log Foreign_Res	−2.594 *** (−2.44)	-	−2.594 *** (0.001)	-

Source: Authors

Our two tests show the same stationarity results for Log BC, Log Volatility_TCER, and Log Res_change at the level. In contrast, the Log PIB variable is integrated into order 1. Our variables, therefore, verify the mixing condition of integration orders I(0) and I(1).

3.4. Cointegration Test

To test whether the set of variables in our model presents a common long-term relationship that can vary over time and space, we will use the cointegration test of Westerlund (2007). This test takes into account heterogeneity and cross-sectional dependence. The results are presented below:

Table 6. Results of the Cointegration test

Statistics	Value	Z-value	Robust *p*-value
Gt	−2.712	-3.530	0.000
Ga	−8.673	-0.498	0.010
Pt	−8.608	-2.945	0.010
Pa	−7.409	-1.792	0.040

Source: Authors

Our results show the significance of all Westerlund statistics at the 5% significance level. It confirms the presence of a long-term relationship/cointegration between our model variables.

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The validation of the four conditions necessary for employing the Panel CS-ARDL model has been accomplished. These conditions include the combined levels of integration of our variables (I(0) and I(1)), the identification of cross-sectional dependency, the recognition of heterogeneity within panel data, and the confirmation of long-term cointegration among variables.

The final step in our estimation is determining our model's appropriate/optimal number of lags. This phase is of paramount importance because by including the correct number of lags in a model, we can improve forecast accuracy. If we have too few lags, we risk not capturing all the long-term effects of the variables on the target variable. However, we risk catching noise and losing accuracy with too many lags. Based on the Akaike Information Method (AIC), the optimal number of lags for each country is shown in Table 8 (see Appendices)

Opting for the information criterion (AIC), we find that the most widespread lag for our proxy variables Trade Balance (TB), volatility of the real effective exchange rate (REER_Vol), gross domestic product (GDP), and foreign reserves (Foreign_Res) is 1,0,0,0 respectively. Hence, the optimal lag to include in our model is CS-PARDL (1 0 0 0)

4. Results and Discussion

The present part of our work is devoted to a close analysis of the results of our study and their examination in depth to answer our research questions and provide a clear and concise understanding of the phenomenon studied. Estimation of the CS-ARDL (1, 0, 0, 0) panel model revealed the following results:

Table 7. Estimation results for the CS-ARDL panel model by exchange rate regime

	Common correlated effects estimator–(CS-ARDL)								
	Fixed ERR			Intermediate ERR			Floating ERR		
variables	Coeff	Std. Err	p-value	Coeff	Std. Err	p-value	Coeff	Std. Err	p-value
	Short-run estimation								
L.Log TB	-0.23137777	0.286729	0.420	0.2215824	0.0681934	0.001 ***	0.1970615	0.163348	0.228
Log REER_Vol	-0.4187403	0.1901227	0.028 **	- 0.0622301	0.0469118	0.185	-0.0116033	0.293887	0.693
Log GDP	1.11978	0.6530435	0.086 *	0.1397671	0.3662783	0.703	0.5420914	0.3914001	0.066 *
Log Foreign_Res	0.3946958	0.1642906	0.016 ***	0.1238824	0.0552225	0.025 **	0.1454134	0.1583786	0.129
	Long-run estimation								
Log REER_Vol	-0.4590745	0.2808153	0.100 *	-0.0789736	0.0649913	0.224	-0.0796226	0.1119806	0.477
Log GDP	0.6815675	0.348773	0.050 **	0.1372827	0.5163667	0.790	0.1121218	1.01498	0.912
Log Foreign_Res	0.3107344	0.1155919	0.007 ***	0.1957126	0.0832798	0.019 **	0.1172357	0.1270872	0.096 *

Source: Authors

Note: ***, **, and * indicate the significance levels of 1%, 5%, and 10%, respectively.

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The following conclusions can be drawn based on the analysis of the estimation results obtained by the CS-ARDL (1,0,0,0) panel model.

- In the context of emerging countries adopting fixed exchange rate regimes :

In addition to the level of national output (GDP), the stock of foreign exchange reserves is a crucial determinant of the level of foreign trade. Each 1% increase in the stock of foreign exchange reserves improves the trade balance by 0.39% in the short term and 0.31% in the long term. This drop in the rate of contribution of reserves to the trade balance between the short and long term is justified by the commitment of those countries adopting fixed exchange rate regimes to defend the value of their national currencies via the foreign exchange reserve stock instrument, and to keep it at the declared/desired level.

As for the most crucial component of our study, the exchange rate, the empirical results show that the volatility of real effective exchange rates harms the trade balance of emerging countries. In the short term, a 1% increase in REER volatility worsens the trade balance by 0.42%. In the long term, this rate increases to 0.46%.

- In the context of emerging countries adopting intermediate/flexible exchange rate regimes :

For this category of countries, foreign reserves are the only determining factor in emerging countries' trade balance movements. Every 1% increase in reserves leads to a 0.12% reduction in exports relative to imports in the short term and 0.20% in the long term. We can therefore conclude that, unlike countries adopting fixed exchange rate regimes, the impact of improving the stock of foreign exchange reserves on the trade balance takes on an upward trend between the short and long term. It is essentially because the exchange rate no longer acts as a stabilizer for the currency's value and becomes the main shock absorber under flexible exchange-rate regimes.

In the context of intermediate exchange rate regimes, we note the insignificance of the coefficients at the thresholds (1%, 5% and 10%) in the short and long term, which points to the futility of the impact of real exchange rate volatility on the trade balance.

- In the context of emerging countries adopting floating exchange rate regimes :

Under floating exchange rate regimes, as with flexible/intermediate exchange rate regimes, exchange rate volatility does not affect the trade balance. On the other hand, the effect of an increase in the stock of foreign exchange reserves only appears in summary form in the long term, with a degree of impact of 0.12%.

Conclusions

It is now imperative to consider the liberalization and opening up of trade on a global scale as an unavoidable choice, as production is becoming increasingly globalized thanks to technological advances and the dismantling of production processes. As a result, international trade has become a central pillar of economic growth and a major source of wealth. It is crucial to devote sustained attention to the factors likely to boost foreign trade and to support them with appropriate monetary measures, notably by establishing an appropriate exchange rate regime.

This article aims to examine the impact of exchange rate volatility on the trade balance of emerging countries under each type of exchange rate regime to identify the optimal exchange rate regime. Two fundamental steps were required to address our problem: firstly, a preliminary phase focusing on one of the major contributions of our study, i.e. understanding the notion of exchange rate volatility, and secondly, the development of a proxy variable using the GARCH model, enabling us to summarize more information on the volatile behavior of the exchange rate. Then, in a second step, we validate our hypotheses using one of the most recent models in panel data analysis, the CS-ARDL model.

In summary, our study provides empirical evidence of the negative impact of real effective exchange rate volatility on emerging countries' trade balances (confirming hypothesis 1). Nevertheless, this impact is dissipated by making the exchange rate regime adopted more flexible (confirming hypothesis 3). In other words, the impact of exchange rate volatility on the trade balance disappears as we move from fixed to more flexible exchange rate regimes. Consequently, our findings support the literature review in favor of the effectiveness of exchange rate flexibility as a shield and shock absorber.

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Appendices

Table 8. The optimal lag choice for the CS-ARDL model

	Trade Balance	REER Volatility	GDP	Foreign Reserves
Morocco	1	1	0	1
Egypt	1	0	1	0
Tunisia	1	0	0	0
South Africa	1	1	1	0
Jordan	1	0	0	0
Turkey	1	1	1	0
Brazil	1	0	1	1
Thailand	1	0	0	1
Nigeria	1	1	1	0
Indonesia	1	1	0	1
Mexico	1	1	0	1
Peru	1	0	0	0
Bolivia	1	0	0	1
Optimal Lag	**1**	**0**	**0**	**0**

Source: Authors