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The Study on the differential Impact of Exchange Rate Fluctuations on Imports and Exports Trade in the Republic of Congo

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Abstract

The paper purpose is to determine the impact of exchange rate fluctuation imports and exports in the Republic of Congo during 1999-2019 based on ARDL model.

VAR model were used to test the differential impact on Impulse response and variance analysis.

ARDL model results shows a positive influence on export products up to 38% while the exchange rate impact on import at 60% with a R2 of 41% and 29% on export. Impulse response shows that exchange rates responded positively to imports and negatively to exports.

Keywords: *Exchange rate fluctuations, Imports and Exports trade, Asymmetric effects, ARDL model, VAR model.*

1. Research background

This paper on the impact of exchange rate fluctuation on imports and exports has attracted the attention of many writers in most developed and some developing economies (Yue & Constant, 2010; Abidin et al., 2016; Pablo & Yomar, 2019). Like many African countries, the economic development of Congo is closely tied to the behavior of international trade (Akyuz & Gore, 2011).

The impact of exchange rate fluctuation on imports and exports has attracted the attention of many writers in most developed and some developing economies (Yue & Constant, 2010; Abidin et al., 2016; Pablo & Yomar, 2019). Like many African countries, the economic development of Congo is closely tied to the behavior of international trade (Akyuz & Gore, 2011).

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1.1. Research purpose

This paper determines the impact of Congolese exchange rate fluctuations on imports and exports. This paper develops an empirical study illustrates the nature of the relationship between exchange rate fluctuations, and imports and exports.

1.2. Research model

We use Autoregressive distributed lag model (ARDL) estimator to study the relationship between exchange rate fluctuation on different types of products on imports and exports in Congo and analyze data in this thesis.

The ARDL goal is to see what impact a given change in a variable would have upon the future values of the variables in the system or examines the relationship between the variables.

2. Literature review

The exchange rate and imports – exports relationship which form the point of this study, rest on a simple theoretical basis. A lot of studies have been done in association to exchange rate ambiguity and degree of export whether optimistic.

Eka (2020) investigated the impact of Chinese exports on the growth rate of 49 Sub-Saharan African countries between 2003 to 2017. Using panel data, the study shows that Chinese exports have avery small but positive significance on the economic growth rate of African countries.

Arshad et al. (2020) performed a study to examine the relationship between Brexit and volatility and the London stock exchange's effectiveness. The result indicates that the stock volatility is lower, and the efficiency of the stock becomes worse.

Bekes and Harasztosi's (2020) critiques of the export led growth hypothesis and proponents of the imported led growth hypothesis are suggesting that economic growth may have come from increased productivity due to imports, which enhance domestic economic activities and cause an import led growth as well as growth led export. Theoretically, the importation of intermediate and capital goods (machinery, technological equipment, ...) which are productive factors, could enhance economic growth in the long run.

Alphonse M. (2021) used data between 1980 and 2016 from Congo with the ordinary least squares method to see the type of relationship that exists between exchange rate and domestic exportation. The results show that exchange rate and savings significantly and positively affect Congolese exports.

Ma et al. (2019) & Li et al. (2020) study a large sample of Chinese exporters, finding that the presence of financial constraints dampens the impact of the depreciation of the bilateral exchange rate on the exports to that country, reducing export value to the existing destination market, the number of products exported and the probability of entering a new destination market.

According Ma et al. (2019) and Li et al. (2020), studying the link between financial constraints and exports, but from which our analysis differs along several dimensions. From a theoretical perspective, we do not consider the impact of exchange rate fluctuations on credit constraints, as explicitly recognized in the background underpinning the analysis of Ma et al. (2019), who explicitly refer to the channel of transmission identified by Chaney (2016), or in the theoretical model of Li et al. (2020), who assume that the probability that a firm repays its loans decreases as the exchange rate depreciates. Instead, we assume that credit constraints are taken as given and study how their presence may affect the export decisions of firms.

3. Analysis of some import products from 2014 to 2020

Imports of Meat and edible offal show an increasing trend from 2014 and 2019. Second, they are growing slightly from 2019 to 2020. Meat and edible offal are the most imported product over the whole period.

Fish imports evolve sinusoidal over the entire period with an annual average of 45.692 billion Central African francs.

With an annual average of 38.934 billion Central African Francs, imports of medicines show a slightly downward trend over the entire period.

Fish imports are down in the first and fourth quarters of 2018 and 2019, compared to a slight increase in the middle of each year. Like Meat and edible offal, imports of Fish in the first quarter of 2020 take precedence over those of the first quarter of previous years.

In addition, they are down 29.48% in the third quarter of 2020 to increase by 5.21% in the following quarter.

Imports of Froment's and Metals showed a slight increase from 2014 to 2020, with a minimum of 16.530 billion Central African Francs in 2016.

For Rice imports, there is a growing trend between 2014 and 2020, with a maximum value of 24.429 billion Central African Francs in 2017 and an annual average of 15.421 billion Central African Francs.

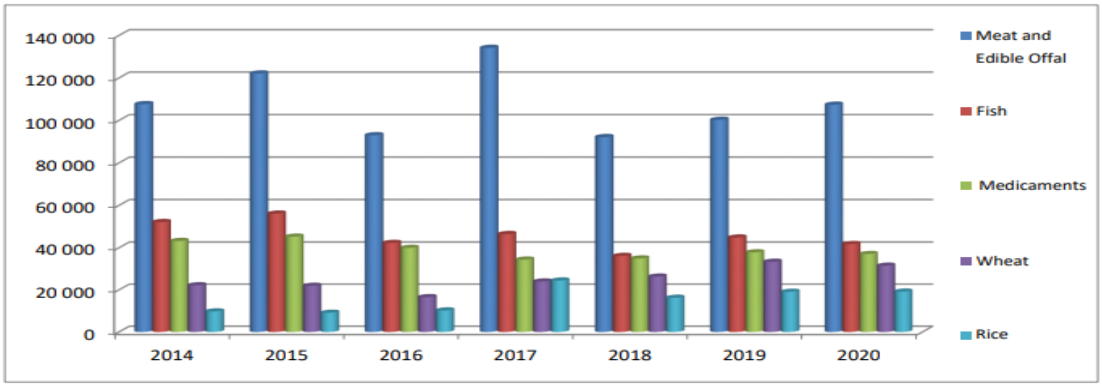

Figure 3.1: Analysis of some import products in the Republic of Congo from 2014 to 2020

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Source: world bank

4. Analysis of some exports products from 2014 to 2020

There was a decreasing trend in crude oil exports from 2014 to 2016, followed by a rebound in 2017 with a peak in 2018, to show a gradual decline until 2020.

Raw wood exports are increasing from 2014 to 2018, then declining until 2020. In addition, there was a growing trend in exports of Sawn wood over the entire period.

Compared to the previous three products, exports of sugar and cement are relatively low. However, there has been a continuous trend in cement exports and a discontinuous trend in sugar exports.

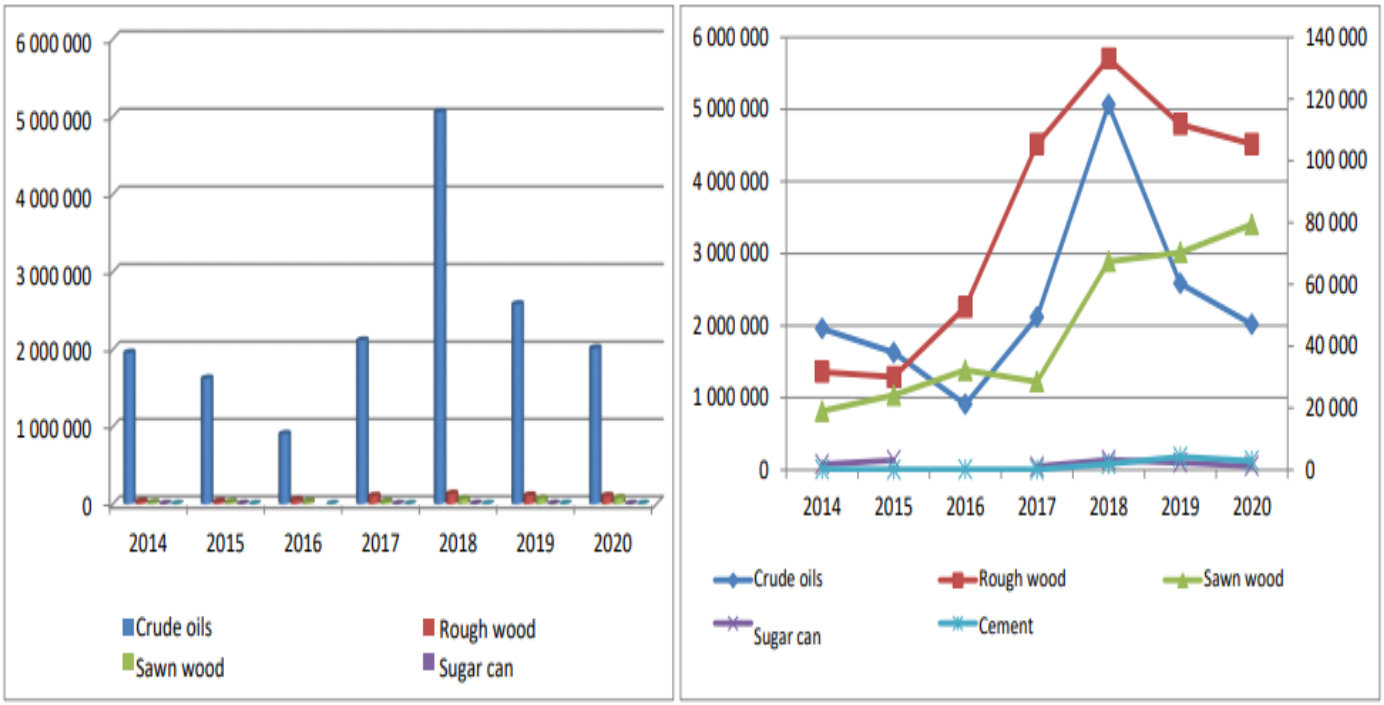

Figure 4.1: Analysis of some export products from 2014 to 2020

5. Model building

5.1. ARDL Model to design

1. For the evaluation of the impact of Exchange rate fluctuations on products price in imports in Congo, we developed the following model:

$$\text{InIMP}_t = \beta_0 + \beta_1 \text{InGDP}_t + \beta_2 \text{InINFL}_t + \beta_3 \text{InEXRIMP}_t + \beta_4 \text{InICPI}_t + \beta_5 \text{IGDP}_t + \mu 1t \quad (5\text{-}1)$$

2. For the evaluation of the impact of Exchange rate fluctuation on products price in exports, we developed the following model:

$$\text{InEXP}_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 \text{InINFL}_t + \alpha_3 \text{InEXREXP}_t + \alpha_4 \text{InICPI}_t + \alpha_5 \text{InIGDP}_t + \mu 1t \quad (5\text{-}2)$$

Where:

- Y_i = represent the dependent variables

- $\beta' = (\beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5)$ the vector of the coefficients to be estimated

- μ_i = The error term

5.2. VAR Model to design

This study used a structural relationship between determinants of exchange rate fluctuations export earnings based on Goldstein and applied by Chowdhury (1993) and Arize et al., (2000). According to Brooks (2008), the model was popularized in econometrics by Sim (1980) as a natural generalization of univariate auto-regressive model.

VAR model that is used for this thesis is stated below:

$$y_{1t}=\beta_{10}+\beta_{11}y_{1t-1}+\beta_{12}y_{1t-2}+\lambda_{11}y_{2t-1}+\lambda_{12}y_{2t-2}+\delta_{11}y_{3t-1}+\delta_{12}y_{3t-2}+\mu_{1t} \quad (5\text{-}3)$$

$$y_{2t}=\beta_{20}+\beta_{21}y_{1t-1}+\beta_{22}y_{1t-2}+\lambda_{21}y_{2t-1}+\lambda_{22}y_{2t-2}+\delta_{21}y_{3t-1}+\delta_{22}y_{3t-2}+\mu 2t \quad (5\text{-}4)$$

$$y_{3t}=\beta_{30}+\beta_{31}y_{1t-1}+\beta_{32}y_{1t-2}+\lambda_{31}y_{2t-1}+\lambda_{32}y_{2t-2}+\delta_{31}y_{3t-1}+\delta_{32}y_{3t-2}+\mu_{3t} \quad (5\text{-}5)$$

Where Y_{1t}=Import Y_{2t}=Export Y_{3t}=Exchange rate μ=error term

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Table 5.1: Descriptive Statistics

Variable	Variable name	Explanation
IMP	Import	goods and services brought from abroad
EXP	Export	goods produced in one country shipped to another country for further trade.
GDP	Gross Domestic Product	Year over year growth rate, reflects economic growth
INFL	Inflation	the ratio of Gross Domestic Product in current local currency
REER	Real Effective Exchange Rate	the value of currency which can be compared to another currency
ICPI	International Consumer Price Index	goods + services that consumers purchase change in price.
IGDP	International Gross Domestic Product	Chinese GDP

Table 5.1 show the descriptive statistics of the study variables that were used to investigate the impact of exchange rate fluctuations on products price imports and exports in the Republic of Congo from 1999 to 2019. The minimum and maximum values of the factor during the study periods display a large of variance across trade.

By relying on the static model of the study by Khemakhem (2013), Rancière et al. (2006), Senouci (2012), Onaolapo (2015), Zenasni (2014), Al-Qudah (2017), Okpara et al (2018), Lonzo et Kabwe (2015), Pinshi (2017a, 2017b) et Ilunga (2018), and Bassanini and Scarpeta (2001) who talk about the impact of the exchange rate on economic growth using GMM in their study, our model will econometrically be estimated as follows:

1) For the evaluation of the impact of exchange rate fluctuation on products price in imports in Congo, βwe developed following model:

$$\mathrm{InIMP_t} = \beta_0 + \beta_1 \mathrm{InGDP_t} + \beta_2 \mathrm{InINFL_t} + \beta_3 \mathrm{InEXRIMP_t} + \beta_4 \mathrm{InICPI_t}$$

$$+\beta_5 \mathrm{IGDP_t} + \mu 1\mathrm{t} \qquad (5\text{-}6)$$

2) For the evaluation of the impact of Exchange rate fluctuations on products price in exports, we developed following model:

$$\mathrm{InEXP_t} = \alpha_0 + \alpha_1 GDP_t + \alpha_2 \mathrm{InINFL_t} + \alpha_3 \mathrm{InEXREXP_t} + \alpha_4 \mathrm{InICPI_t} + \alpha_5 \mathrm{InIGDP_t} + \mu 1\mathrm{t} \qquad (5\text{-}7)$$

6. Robust test

6.1. Robust test for Euro Exchange rate fluctuation impact on import trade

The study regression results stability was checked regarding the impact of exchange rate fluctuations on Congolese import trade. The test results of the impact of exchange rate fluctuations on Congolese import trade are robust and credible.

Table 6.1: Robust test for the import trade in the Republic of Congo

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMP(-1)	0.161	0.102	0.231	0.001
GDP	0.025	0.717	1.144	0.002
INFL	0.078	0.073	2.309	0.000
INFL(-1)	0.458	0.171	2.828	0.001
EXRF	0.003	3.479	1.731	0.000
EXRF(-1)	0.007	0.550	1.228	0.000
ICPI	0.625	0.413	1.176	0.012
IGDP	0.081	0.014	0.014	0.007
IGDP(-1)	0.055	0.283	1.364	0.001
C	0.078	0.414	2.071	0.024
R-squared: 0.60				
Adjusted R-squared: 0.41				
Durbin-Watson stat: 1.78				
Prob (F-statistic): 0.0000				
***, ** and * indicates significance at 1%, 5% and 10% statistical levels respectively.				

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6.2. Robust test for Euro Exchange rate fluctuation impact on export trade

This study replaces the exchange rate fluctuations (EXRF) with the Congolese currency and the US dollar exchange rate instead of the Congolese currency and the euro exchange rate to check the stability of the regression results regarding the impact of exchange rate fluctuations on Congolese export trade. The study test results of the impact of exchange rate fluctuations on Congolese export trade are robust and credible.

Table 6.2: robust test for the export in the Republic of Congo

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXP01(-1)	1.080	7.611	1.311	0.000
GDP	0.107	1.337	0.451	0.001
GDP(-1)	0.862	0.011	2.834	0.003
INFL	0.192	1.332	0.651	0.005
INFL(-1)	0.268	2.906	9.266	0.000
EXRF	0.004	2.503	2.178	0.000
EXRF(-1)	0.001	1.733	1.497	0.003
ICPI	0.972	1.332	0.435	0.002
ICPI(-1)	1.008	6.332	1.588	0.000
IGDP	0.291	2.817	7.221	0.000
IGDP(-1)	-0.279	1.155	-2.448	0.000
R-squared: 0.38				
Adjusted R-squared: 0.29				
Durbin-Watson stat: 1.61				
Prob (F-statistic): 0.0000				
(***) significance at 1%; (**) significance at 5%; (*) significance at 10%				

7. Empirical test of the asymmetry effect of exchange rate fluctuations import and export: based on VAR Model

7.1. AR Roots Graph

According to both figures 7.1 view of the roots characteristic polynomial, the reciprocal of the module of our AR roots for import and export are allocated in the circle, from which it can be judged that the VAR system is stationary or valid.

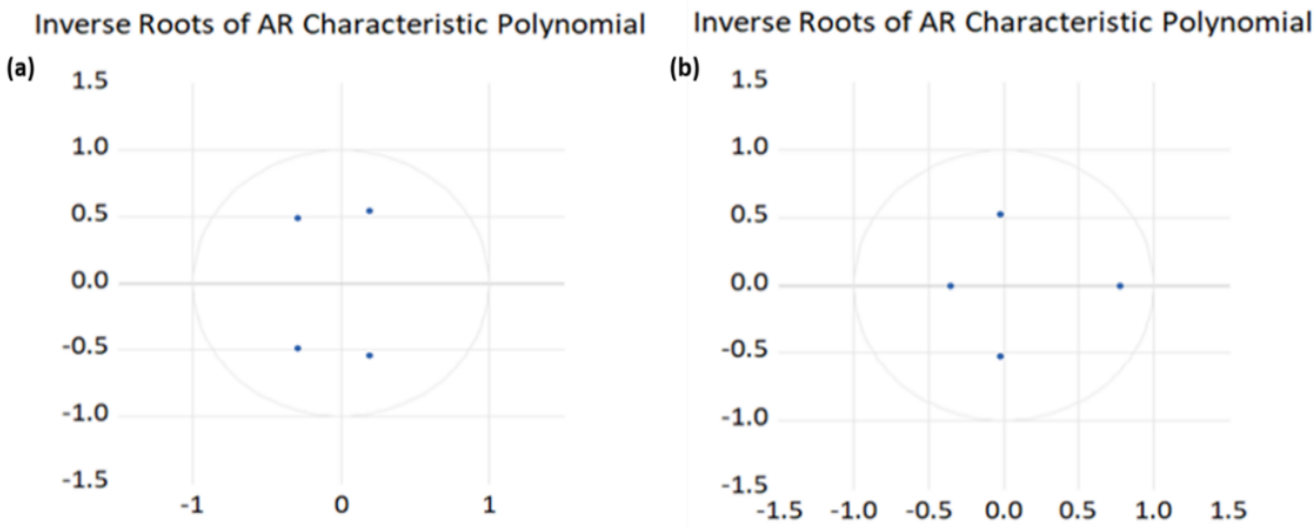

Figure 7.1: AR Roots Graph on (a) Imports and (b) Exports

7.2. Asymmetry effect test: based impulse response

The response on Imports: A one SD shock innovation) to exchange rate fluctuation initially has no noticeable impact on imports in periods 1 and 3. From the 3rd period, the response gradually declines until the 5th period. Beyond the 5th period it starts to increase till 7th period. Imports

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rises above its steady state value and remains in the positive region. We can conclude that imports shock to exchange rate will have asymmetric impact on imports both in the short run and long run.

The response of exports : it initially increases exports, this positive response increase from 2nd to 3rd period before it decrease to 4th period when it hits its steady state value. Beyond the 5th period, the response gradually declines until the 8th period. We conclude than the exchange rate will have a positive impact on export both in the short and long run.

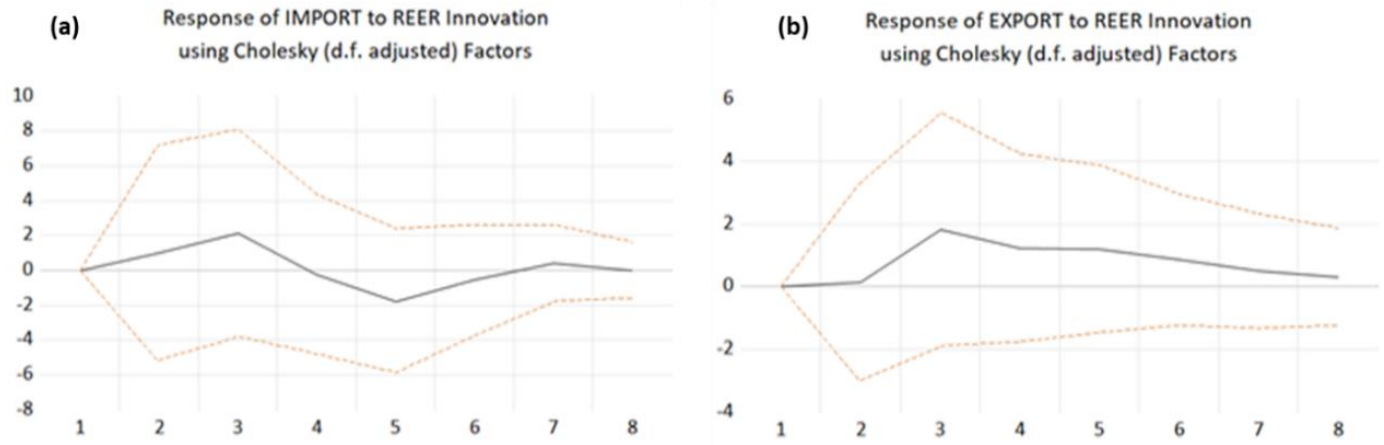

Figure 7.2: Impulse Response (a) Import to EXR and (b) Export to EXR

7.3. Asymmetry effect test: based variance decomposition

The Variance decomposition of import (a) in the first period shows that none of the other variables for example export and exchange rate could explain any variation on import. The variance decomposition of export (b) panel shows that in the first period import contribute to variability in export (4.8 per cent) while exchange rate could not explain variability in export. After 10 periods, import accounts for 16 per cent of the forecast error's variation while exchange rate accounts for 0.38 per cent.

From this the driving force behind export is import. The above thus explains that exchange rate accounts less in the variation of import and export. Exchange rate in Congo do not have much impact on imports and exports.

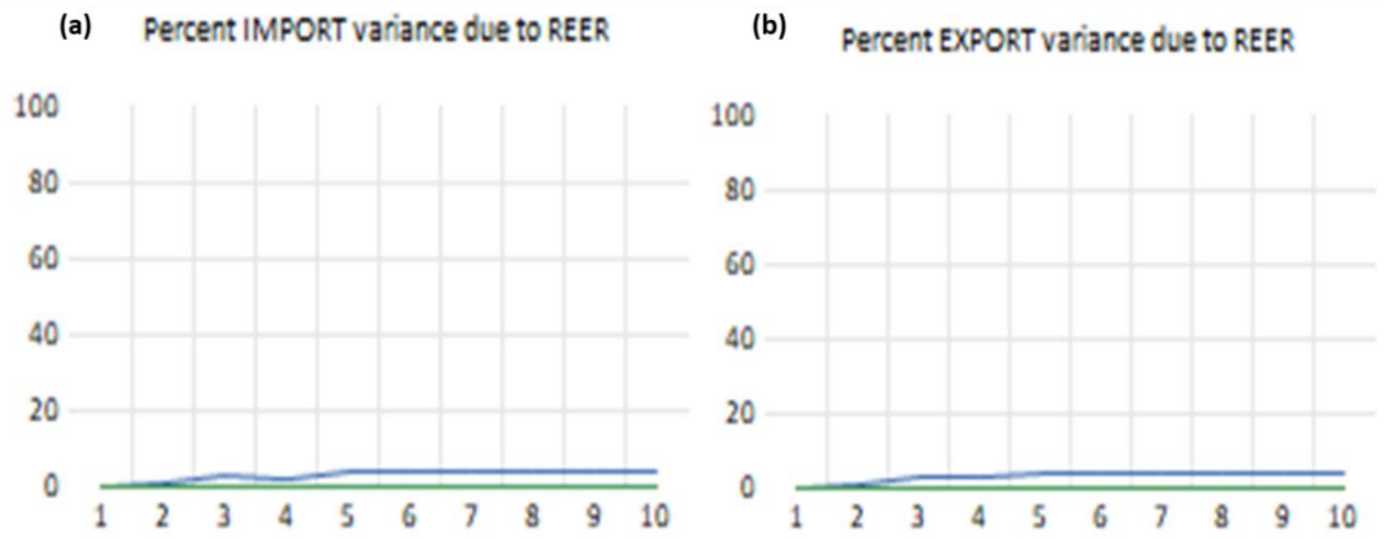

Figure 7.3: Variance decomposition (a) import and (b) export

8. Conclusion

The exchange rate fluctuations are problem of many economic systems, which can be made better through different policy analysis. Research was done and revealed that exchange rate fluctuation is significantly and positively associated in both imports and exports, which can be controlled if favored export and import policies be encouraged. The imports provide more choices to consumers because they are usually manufactured and cheaper than any domestically equivalent produced product. Import help consumers manage their strained household budgets.

- A rising level of imports and a growing trade deficit can have a negative effect on a country's exchange rate.
- Higher inflation can also impact exports by having a direct impact on input costs such as materials and labor.

9. Recommendations for further studies

The paper recommends other papers to build on the study findings by incorporating the omitted variables like exchange in the Republic of Congo.

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For further studies, other sectors of the economy could be investigated in further studies. Also, constrained by the availability of data, the study was limited to the time frame of 1999-2019. This paper data period could be updated in further studies. The independent variables employed in this study were the exchange rate. Other variables could be included in further studies such as money supply and oil revenue.

This study would be of benefit to several. The findings of this study would provide information to guide their management decisions following the impact of exchange rate fluctuation in Congo for a strong import and export. It would equip them with the necessary knowledge for taking the necessary action to protect the performance of their organizations.

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