Journal of Economics, Finance and Management (JEFM)
ISSN: 2958-7360
Vol. 3, No. 1, February 2024

Does Trade Openness and Inflation Rate Have Dynamic Interconnected Patterns? An Autoregressive Distributed Lag (ARDL) Model Co-integration Approach

L'ouverture commerciale et le taux d'inflation ont-ils des schémas dynamiques interconnectés ? Une approche de co-intégration par le modèle ARDL (Autoregressive Distributed Lag)

M. Elfan Kaukab
Department of Management
Faculty of Economics and Business
Universitas Sains Al-Qur'an – Wonosobo – Indonesia

Centre of International Trade and Sustainability Studies
GRI Institute – Purwokerto – Indonesia

Ali Akbar Anggara
Department of Management
Faculty of Economics and Business
Universitas Muhammadiyah Purwokerto – Purwokerto – Indonesia

Centre of International Trade and Sustainability Studies
GRI Institute – Purwokerto – Indonesia

Résumé : La relation entre l'ouverture commerciale et le taux d'inflation est une question controversée qui a fait l'objet d'une attention considérable de la part des responsables de la politique économique. Cette étude vise à examiner la relation entre l'ouverture commerciale et le taux d'inflation en Indonésie. Pour atteindre cet objectif, l'étude utilise un modèle de co-intégration autorégressif distribué (ARDL) pour analyser les données annuelles couvrant la période de 1985 à 2022. Les résultats du test de liaison confirment l'existence d'une relation à long terme entre les variables. Les résultats empiriques révèlent que l'ouverture commerciale est positivement associée à l'inflation à long terme. En revanche, le produit intérieur brut (PIB) réel et les investissements directs étrangers (IDE) exercent une influence négative sur le taux d'inflation à long terme. Ceci indique que le PIB et l'IDE sont des variables significatives dans la réduction du taux d'inflation. En outre, les résultats du modèle de correction des erreurs (ECM) sont statistiquement significatifs avec un signe négatif attendu. Cela suggère que le déséquilibre qui se produit dans le modèle peut être corrigé en moins de deux ans à un taux de 51% par an. Ces résultats soulignent la nécessité pour l'Indonésie d'améliorer les conditions initiales de l'ouverture commerciale. Cet objectif peut être atteint en soutenant et en encourageant le secteur des exportations, en diversifiant les exportations vers les marchés internationaux, en réduisant la dépendance à l'égard des exportations de matières premières et en développant l'infrastructure économique.

Mots-clés : Modèle autorégressif à lag distribué, taux d'inflation, ouverture commerciale, approche de co-intégration.

Abstract: The relationship between trade openness and the inflation rate is a contentious issue that has received considerable attention from economic policymakers. This study aims to examine the relationship between trade openness and the inflation rate in Indonesia. To achieve this objective, the study utilizes an autoregressive distributed lag model (ARDL) co-integration approach to analyze annual data covering the period from 1985 to 2022. The results of the bound test confirm the existence of a long-run relationship among the variables. Empirical findings reveal that trade openness is positively associated with inflation in the long run. Conversely, real gross domestic product (GDP) and foreign direct investment (FDI) exert negative influences on the inflation rate in the long run. This indicates that GDP and FDI are significant variables in reducing the inflation rate. Moreover, the results of the error correction model (ECM) are statistically significant with an expected negative sign. This suggests that disequilibrium occurring in the model can be corrected in less than two years at a rate of 51% per annum. These findings underscore the critical need for Indonesia to improve initial conditions for trade openness. This can be achieved through supporting and encouraging the export sector, diversifying exports into international markets, reducing reliance on raw material exports, and developing economic infrastructure.

Keywords: Autoregressive Distributed Lag Model, inflation rate, Trade Openness, Co-integration Approach.

Digital Object Identifier (DOI): https://doi.org/10.5281/zenodo.10702368

1. Introduction

The question of how trade openness can mitigate the consequences of inflation has been gaining importance over time, particularly as developed economies are typically classified as more open. However, the relationship between trade openness and inflation remains ambiguous and requires further clarification. Romer (1993) hypothesized a negative relationship between trade openness and inflation. However, Samimi et al. (2012) tested this hypothesis and found a positive relationship between trade openness and inflation when measured as the sum of exports and imports as a percentage of gross domestic product (GDP), which contradicts Romer's findings. Conversely, they found a negative association when trade openness was measured using a broader measure of economic globalization (the KOF index). Mahyar (2014) examined the causality between inflation and trade openness using a vector error correction model (VECM). The results confirmed a unidirectional relationship from inflation to trade openness, along with a positive correlation between inflation and trade openness.

Zakaria (2011) investigated the link between openness and inflation using empirical evidence from Pakistan. The findings indicated a positive relationship between openness and inflation. Similarly, in the case of India, Sahu & Sharma (2018) applied an autoregressive distributed lag (ARDL) model to investigate the relationship between trade openness and inflation. The results confirmed a positive association between trade openness and inflation in both the short and long run. Samimi et al. (2012) argued that in developing countries, achieving stable economic growth under noninflationary pressures is essential for macroeconomic policies. Consequently, inflation has garnered attention from decision-makers due to the uncertainty it generates and its expected negative effects on economic growth (Anggara et al., 2023). According to Moriyama and Naseer (2009), developing countries face challenges in predicting inflation due to deficiencies in available data and possible instability in structural standards.

During the period from the 1960s to the mid-2000s, Indonesia experienced economic instability, characterized by rising and volatile inflation rates. The reforms implemented during this period, such as devaluation and price and import controls, were ineffective (Suliman, 2012). Fischer et al. (2002) noted that Indonesia was one of 25 countries experiencing episodes of hyperinflation, with annual rates exceeding 100%. Since the 1960s, Indonesia has witnessed several successive economic problems, including a cumulative external debt, exchange rate volatility, and rising inflation rates. These issues, combined, have led to extreme deterioration in economic growth, the value of the home currency (Dewandaru and Anggara, 2023), a decline in foreign direct investment (FDI) inflows, and the collapse of the agriculture and industrial sectors. Consequently, it has become highly necessary for economic policymakers to adopt more open economic policies and prioritize the development of the agriculture and industrial sectors as prerequisites for stable economic growth and sustainable development (Anggara and Pramuka, 2020). These issues have attracted the attention of researchers such as Mohamed (2005), Alla et al. (2015), and Elfaki (2018).

Mohamed (2005) employed the Ordinary Least Squares (OLS) method to examine the effect of external debt on economic growth in Indonesia using annual data from 1978 to 2001. Real export earnings growth rates were used as a proxy to measure the strategy of export promotion, and the inflation rate was included as a variable for macroeconomic policy. The empirical results indicate a negative relationship between external debt and economic growth, confirming the predictions of economic theory. Additionally, the estimated results found a positive connection between economic growth and the growth rate of real export earnings, while past inflation showed a negative relation with economic growth. Alla et al. (2015) utilized the Ordinary Least Squares (OLS) method to test the effect

of selected economic determinants on foreign direct investment (FDI) in Indonesia using annual data from 1990 to 2013. The results revealed that transportation and communication, exchange rates, and oil exploration are the main determinants of FDI in Indonesia, while the growth rate in real gross domestic product (GDP) and trade openness showed an insignificant impact on FDI. Elfaki (2018) examined the impacts of the growth rate in real GDP, money supply, inflation, and trade openness on the exchange rate in Indonesia by applying an autoregressive distributed lag (ARDL) model from 1991 to 2016. The empirical results showed a negative relationship between the growth rate of real GDP and the exchange rate, indicating the appreciation of the home currency. Conversely, money supply, inflation rates, and trade openness showed a positive correlation with the exchange rate, explaining the depreciation of the home currency.

Focusing on trade openness with global markets represents a priority role for the government of Indonesia in achieving a positive correlation between economic growth and trade liberalization through stimulating exports. Additionally, the government plays an important role in enhancing the competence of foreign direct investment in economic growth by improving the investment environment (Eltaib and ELbeely, 2013). In late 2004, Indonesia experienced multiple economic difficulties, including the loss of its primary source of oil exports, which the government relied on to provide foreign exchange and bridge the gap in local demand for petroleum and its derivatives. This resulted in an increase in the trade balance deficit, a rise in the inflation rate due to import increases, and a deterioration of purchasing power for the Indonesian currency.

The contribution of this paper is to test the dynamic relationship between trade openness and the inflation rate based on Romer's hypothesis by applying an autoregressive distributed lag model (ARDL) to a co-integration approach in Indonesia from 1980 to 2022. For this purpose, the remainder of this paper is organized as follows : Section 2 is devoted to the related literature review. Section 3 considers the methodology, data, and model. Section 4 provides empirical results, and Section 5 concludes the paper.

2. Literature Review

2.1 Trade Opennes and Inflation Rate

The current global economic transformations have heightened the focus on the significance of economic integration to mitigate the effects of tariffs, imported inflation, and minimize the impacts of international economic fluctuations. Romer (1993) argued that caution should be exercised as economic collaboration and integration increase, especially outside more developed countries. An increase in integration levels in the absence of effective methods to address compatibility issues may result in a significant rise in inflation rates. Munir and Kiani (2011) documented that stringent monetary policy, coupled with fiscal unification, has contributed to decreasing the price level. Attention to inflation is not only essential for achieving equilibrium across all macroeconomic indicators, but also because rising inflation rates disproportionately harm the poor by reducing their consumption power. Lane (1997) mentioned various measures linking trade openness and inflation in non-trade sectors, such as the degree of imperfect competition, price rigidity, central bank independence standards, and political stability. Liberalization and economic integration offer significant opportunities for world economies to benefit from international trade, capital inflows, and the transfer of technology to enhance economic growth (Ajaz et al., 2016).

Kurihara (2013) examined the correlation between trade openness and inflation rates in some Asian countries and Organization for Economic Cooperation and Development (OECD) countries using the

Generalized Method of Moments (GMM) approach and panel data. The empirical results confirmed a positive relationship in both groups of countries, with the correlation being more robust in Asian countries. Tauci et al. (2009) investigated the link between trade openness and inflation in several developing countries, including Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Mexico, Paraguay, Peru, Turkey, and Uruguay, for the period 1980-2006. The estimated results indicated that trade openness has a positive impact on inflation, with other variables included in the study also showing a positive effect on inflation. In the eight Caribbean countries, Thomas (2012) tested the relationship between trade openness and inflation during the period 1980-2009 using dynamic ordinary least squares (DOLS). The results revealed that trade openness is positively associated with inflation, supporting the idea that Caribbean countries are susceptible to external shocks.

Kouton (2018) employed a nonlinear autoregressive distributed lag (NARDL) model to examine the relationship between trade and inflation, using empirical evidence from Côte d'Ivoire spanning 1970-2015. Trade was measured using the KOF globalization index. The results indicated a robust positive correlation between trade and inflation in the long run. In the short run, the correlation between trade and inflation appeared positive at one lagged value of the KOF globalization index and negative at the third lagged value. Zombe et al. (2017) applied the Toda-Yamamoto causality approach to investigate the causal relationship between inflation and trade openness, focusing on the empirical case of Zambia from 1985 to 2015. The results confirmed the existence of a two-way causal relationship, with a positive relation found between inflation and trade openness.

In contrast, Atabay (2016) investigated the connection between trade openness and inflation in Turkey, covering the period 1980-2011, using the ordinary least squares (OLS) method. The results revealed a negative relationship between trade and inflation. Lin (2010) employed quantile regression to test the link between trade openness and inflation using panel data from 1970 to 2007. The results confirmed a negative influence from trade openness on inflation as long as inflation is higher. However, trade openness had no impact in cases of lower inflation. In a different context, Munir et al. (2015) tested Romer's hypothesis of a negative relationship between trade and inflation for selected Asian countries using panel data from 1976 to 2010. The results of fixed and random effects models demonstrated the absence of a relationship between trade openness and inflation. This result was supported by Binici et al. (2012), who found an insignificant relationship between trade openness and inflation using empirical evidence from Organization for Economic Cooperation and Development (OECD) countries.

Yiheyis (2013) examined the link between trade openness and inflation for a group of 31 African countries, including Indonesia. The empirical results found a positive relationship between inflation and trade openness. For the case of Tunisia, Jedidia et al. (2019) used quarterly data in a nonlinear regression model to examine the relationship between the Consumer Price Index (CPI) inflation and trade openness. The results revealed that when the growth of trade openness was under 6.32%, the impact of trade openness on CPI inflation was negative. Conversely, a positive relationship between trade openness and CPI inflation was found when the growth of trade openness exceeded 6.32%. Lin et al. (2017) utilized the instrumental variable (IV) method and Two-Stage Least Squares (2SLS) technique for Sub-Saharan African countries to test the impact of trade openness on inflation. The estimated results indicated a negative relationship between international trade openness and inflation when there were variations in trade openness within the country.

Afzal et al. (2013) investigated the validity of Romer’s hypothesis using empirical evidence from Pakistan covering the period 1970-71 to 2008-9 by applying an autoregressive distributed lag (ARDL) model to cointegration. They used various measures for trade openness, such as exports as a ratio of Gross Domestic Product (GDP), imports as a ratio of GDP, and trade as a ratio of GDP. The results

found a negative relationship between inflation and trade openness in both the short and long run, with this reverse relationship being stronger in the short run. The causality test results indicated a two-directional causality relationship running between inflation and all trade openness measures in the long run, while a two-directional causality relationship in the short run was found running between inflation and trade openness when measured by the import to GDP ratio. Ada et al. (2014) applied the vector error correction model (VECM) approach to examine the impact of trade openness on inflation in Nigeria using annual data covering the period 1970-2010. The results revealed a negative relationship between trade openness and inflation. The findings of the Impulse Response Function (IRF) detected that inflation responded positively to the shock in trade openness in just two periods, while the period after the second showed a negative response overall for the remaining periods.

Similarly, Mukhtar (2012) tested Romer's hypothesis by utilizing multivariate cointegration and the vector error correction model (VECM) approach with empirical data from Pakistan in the period 1960-2007. The empirical results confirmed the existence of a negative relationship between inflation and trade openness in the long run as predicted by Romer's hypothesis. Sepehrivand and Azizi (2016) examined the impact of trade openness on inflation among D-8 member countries based on Romer's theory by applying regression methods to panel data. The results indicated that trade openness has a significant and positive relationship with inflation, contradicting Romer's theory. Salimifar et al. (2015) investigated the impacts of trade openness on the inflation rate in the short run and long run using empirical data from Iran from 1973-2010 by applying an autoregressive distributed lag (ARDL) model cointegration approach. The empirical evidence indicated a negative relationship between trade openness (excluding oil) and the inflation rate.

Babatunde (2017) applied the nonlinear autoregressive distributed lag (NARDL) model cointegration approach to examine the link between trade openness and inflation for the Nigerian economy in the period 1980-2015. The empirical results showed a significantly positive relationship between trade openness and inflation in the long run, while in contrast, trade openness was negatively associated with inflation in the short run. Additionally, Ajaz et al. (2016) applied the nonlinear autoregressive distributed lag (NARDL) model cointegration approach to test the connection between inflation and trade openness using empirical data from the Indian economy from 1970-2014. The estimated results indicated the existence of a positive relationship between inflation and openness in both the short run and long run.

3. Methods

This study used autoregressive distributed lag (ARDL) model to cointegration approach have been developed by Pesaran and Shin (1999) to analyze the long run relationship between trade openness and inflation in Indonesia and to estimate error correction model (ECM) during 1980-2021. The features of ARDL is possibility to estimate the long run and short run coefficients jointly. It's applicable when the variables integrated at different order of integration. i.e. Integrated at order of I(0) and I(1). But, not usable at order of I(2) due to invalidate of computed F-statistic (Pesaran et al, 2001). Moreover, irrespective of applying ARDL without considering the order of integration. However, ARDL is useless at order of I(2). Therefore, to avoid variables are I(2) unit root test Augmented Dickey- Fuller (1979) test were applied to check the stationarity of data. Thus, the econometric model explain the relationship between trade openness and inflation as follows :

$$INF = \beta_1 + \beta_2 OP + \beta_3 RGDP + \beta_4 FDI + \mu_t \quad (1)$$

Where : INF stand for inflation which measuring by consumer price index; OP represent trade openness which is sum of exports and imports as percentage of GDP; RGDP is real gross domestic product; FDI is foreign direct investment; μ_t the error term. The data are collected from World Bank data base-World Bank Indicator (WBI). All variables are transformed into logarithm form. But, some of foreign direct investment observation contain negative values, therefore foreign direct investment transformed to logarithm through using procedure suggested by Busse and Hefeker (2007) as follows :

$$Y = ln\left(x + \sqrt{(x^2 - 1)}\right) \quad (2)$$

To test the existence of cointegration relationship and estimate the long run and short run relationship between trade openness and inflation the general autoregressive distributed lag (ARDL) model is formulated in the following form :

$$\Delta lnINF_t = \alpha_0 + \sum_{t=0}^{n} \varphi_1 \Delta \mathrm{Ln}INF_{t-I} + \sum_{t=0}^{n} \varphi_2 \Delta LnOP_{t-i} + \sum_{t=0}^{n} \varphi_3 \Delta LnRGDP_{t-i} + \sum_{t=0}^{n} \varphi_4 \Delta LnFDI_{t-i} + \partial LnINF_{t-1} + \emptyset LnOP_{t-1} + \gamma LnRGDP_{t-1} + \delta LnFDI_{t-1} + \mu_t \quad (3)$$

Where: $\varphi_1 \; to \; \varphi_4$ are the parameters of the short run while ∂, δ, γ, and $\emptyset$ are the long run parameters. The null hypothesis of $H_0: \partial = \emptyset = \gamma = \delta = 0$ have been tested against the alternative hypothesis $H_1: \partial \neq \emptyset \neq \gamma \neq \delta \neq 0$ to test the existence of long run cointegration relationship among the variables by applying ARDL bound test. The lag length determined using Akaike Information Criterion (AIC).

From equation (3) the error correction model (ECM) have been formulated as follows to estimate the short run relationship :

$$\Delta lnINF_t = \alpha_0 + \sum_{t=0}^{n} \varphi_1 \Delta \mathrm{Ln}INF_{t-i} + \sum_{t=0}^{n} \varphi_2 \Delta LnOP_{t-i} + \sum_{t=0}^{n} \varphi_3 \Delta LnRGDP_{t-i} + \sum_{t=0}^{n} \varphi_4 \Delta LnFDI_{t-i} + \theta ECM_{t-1} + \varepsilon_t \quad (4)$$

Where : θ is the coefficient of error correction term (ECM) which is explain the speed of adjustment in the model from the short run to the long run. Following of equation (4) the long run relationship model presented in equation (5) as follows :

$$\Delta lnINF_t = \partial LnINF_{t-1} + \emptyset LnOP_{t-1} + \gamma LnRGDP_{t-1} + \delta LnFDI_{t-1} + \mu_t \quad (5)$$

To accomplish the purpose of this paper, the diagnostic test were conducted to test the parameters stability in long run and short run through apply cumulative sum (CUSUM) of recursive residual and cumulative sum of squares (CUSUMSQ) of recursive residual test.

4. Result and Discussion

To confirm that all variables are not integrated of order I(2), we applied the Augmented Dickey-Fuller unit root test. The results are reported in Table 1 below :

Table 1 : Unit Root test Results (ADF)

	At Level				
		LOG(INF)	LOG(OP)	LOG(RGDP)	LOG(FDI)
With Constant	t-Statistic	-1.4301	-1.2436	-0.7725	-1.3753
	Prob.	0.5548	0.6420	0.8125	0.5813
With Constant & Trend	t-Statistic	-1.5576	-3.3568*	-1.4720	-0.6249
	Prob.	0.7865	0.0813	0.8169	0.9701
Without Constant & Trend	t-Statistic	-0.7371	0.3242	4.4420	-0.4954
	Prob.	0.3890	0.7727	1.0000	0.4933
	At First Difference				
		d(LOG(INF))	d(LOG(OP))	d(LOG(RGDP))	d(LOG(FDI))
With Constant	t-Statistic	-5.3837***	-3.7372***	-5.6850***	-4.6955***
	Prob.	0.0001	0.0087	0.0001	0.0007
With Constant & Trend	t-Statistic	-5.2860***	-8.8314***	-5.6543***	-4.2125**
	Prob.	0.0009	0.0000	0.0004	0.0125
Without Constant & Trend	t-Statistic	-5.4821***	-3.7836***	-2.7090***	-4.7474***
	Prob.	0.0000	0.0005	0.0085	0.0000

Null Hypothesis: the variable has a unit root

Note : (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

The results in Table 1 indicate that, at the level, all the variables exhibit unit roots except for trade openness, suggesting that the variables are not stationary at this level. However, it is evident that all the variables are stationary at first difference. Therefore, since the results of the Augmented Dickey-Fuller test illustrate that all the variables are integrated, it is appropriate to apply the ARDL bound test to determine whether there is a long-run cointegration relationship among the variables. Thus, the results of the ARDL bound test are presented in Table 2 :

Table 2: Bounds Test results

Test Statistic	Value	k
F-statistic	7.644212	3
Bound Test Values		
Significance	I(0)	I(1)
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Null Hypothesis : No long run relationship

The results in Table 2 illustrate a significant long-run cointegration relationship among the variables at the 1% level, as indicated by the calculated F-statistic (7.644212), which exceeds the upper critical value of the bound test. Consequently, the null hypothesis H0: $\partial = \emptyset = \gamma = \delta = 0$ of no long-run cointegration relation has been rejected in favor of the alternative hypothesis H1: $\partial \neq \emptyset \neq \gamma \neq \delta \neq 0$, which confirms the existence of a long-run relationship. With the establishment of the long-run relationship, it becomes imperative to estimate the coefficients of the ARDL model in the long run. Accordingly, the long-run coefficients of the selected ARDL model have been estimated, and the results are presented in Table 3 below :

Table 3 : The result of long run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OP)	3.637218	1.595869	2.279146	0.0389
LOG(RGDP)	-1.715833	0.840957	-2.040334	0.0606
FDI	-1.509370	0.352591	-4.280794	0.0008
C	37.50501	17.09453	2.193977	0.0456
EC = LOG(INF) - (3.6372*LOG(OP) -1.7158*LOG(RGDP) -1.5094*FDI + 37.5050)				
Selected Model : ARDL (2, 3, 4, 1)				

The results in Table (3) display the estimated coefficients of the long-run relationship. This outcome indicates a statistically significant positive relationship between trade openness and inflation at the 5% significance level, as indicated by the t-statistic. This finding contradicts Romer's (1993) hypothesis but is consistent with the findings of previous studies (Samimi et al., 2012; Mahyar, 2014; Zakaria, 2011; Sahu & Sharma, 2018), where a 1% increase in trade openness leads to a 3.64% increase in inflation. Conversely, real gross domestic product (GDP) and foreign direct investment (FDI) exhibit a negative relationship with inflation at the 10% and 1% significance levels, respectively, as indicated by the t-statistics. According to the estimated results, a 1% increase in real GDP and FDI leads to a decrease in inflation by 1.72% and 1.51%, respectively. Thus, the positive relationship between trade openness and inflation can be attributed to a higher dependence on imports than exports. This result explains that GDP and FDI can play a vigorous role in reducing inflation pressures in Indonesia.

Accordingly, the error correction model (ECM) has been estimated to examine the effect of trade openness, real GDP, and FDI on inflation in the short run. The results are presented in the following table 4 :

Table 4: Result of Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(INF(-1))	0.151723	0.110703	1.370538	0.1921
DLOG(OP)	1.737703	0.333273	5.214049	0.0001
DLOG(OP(-1))	-1.108755	0.283519	-3.910689	0.0016
DLOG(OP(-2))	-0.807312	0.314651	-2.565741	0.0224
DLOG(RGDP)	-8.859438	1.721529	-5.146260	0.0001
DLOG(RGDP(-1))	-2.088232	1.656912	-1.260316	0.2282
DLOG(RGDP(-2))	-2.150818	1.455905	-1.477306	0.1617
DLOG(RGDP(-3))	-8.747994	1.757490	-4.977551	0.0002
D(FDI)	-0.452647	0.141640	-3.195752	0.0065
ECM(-1)	-0.518504	0.073965	-7.010090	0.0000
R-squared	0.820087	Mean dependent var		-0.046092
Adjusted R-squared	0.730130	S.D. dependent var		0.466349
S.E. of regression	0.242264	Akaike info criterion		0.274872
Sum squared resid	1.056449	Schwarz criterion		0.750659
Log likelihood	6.151798	Hannan-Quinn criter.		0.420325
Durbin-Watson stat	2.598576			

The short-run estimation results in Table (4) indicate that trade openness has a positively significant relationship with inflation, while real gross domestic product (GDP) and foreign direct investment (FDI) show a negatively significant relation with inflation in the short run. The coefficient of the error correction model (ECM) is statistically significant at the 1% level with the correct sign (negative). This result illustrates that the disequilibrium observed in the model can be corrected in less than two years at a rate of 51% per annum.

To achieve the objectives of this paper, diagnostic tests such as the cumulative sum (CUSUM) of recursive and cumulative sum of squares (CUSUMSQ) were applied to test parameter stability. The results of CUSUM and CUSUMSQ are reported in Figure 1 and Figure 2, respectively.

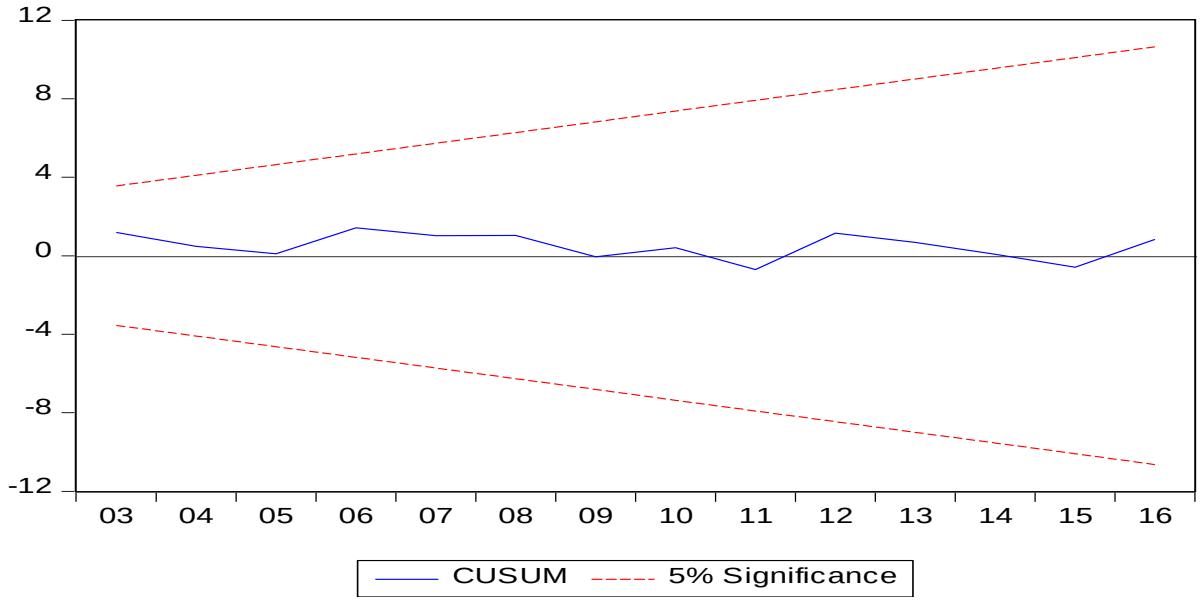

Figure 1 : Plot Cumulative Sum (CUSUM) of Recursive Residual

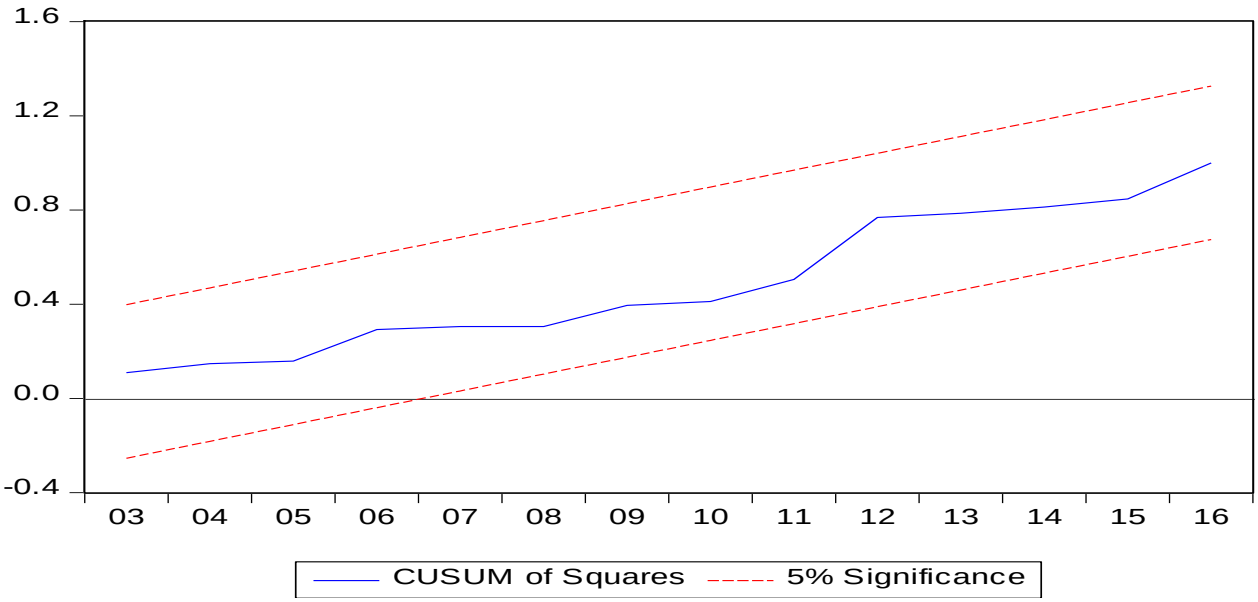

Figure 2 : Cumulative Sum of Squares (CUSUMSQ) of Recursive Residual

The results of the diagnostic tests in Figure 1 and Figure 2 show that the calculated statistics of residuals and squared residuals fall within the straight lines of the critical bound test at the 5% significance level. This result indicates that the estimated parameters are stable both in the long run and the short run throughout the study period.

5. Conclusion

This study tested Romer's hypothesis by examining the relationship between trade openness and inflation in Indonesia in both the long run and short run over the period of 1980-2021. To do so, the autoregressive distributed lag (ARDL) model with a cointegration approach and error correction model (ECM) were applied to estimate the coefficients for the long run and short run. Additionally, variables such as gross domestic product and foreign direct investment were included in the model due to their direct impact on inflation. The data were collected from the World Bank database. The results of the bound test confirmed the existence of a long-run relationship among the variables. The empirical findings revealed a positive association between trade openness and inflation in the long run, attributed to imports increasing more than exports, leading to a deficit in the current account. This result is inconsistent with Romer's hypothesis. However, real gross domestic product and foreign direct investment (FDI) were found to have negative influences on the inflation rate in the long run, suggesting that these variables are important for reducing the inflation rate.

Furthermore, the results of the error correction model (ECM) were statistically significant with the expected negative sign, indicating that the disequilibrium observed in the model can be corrected in less than two years at a rate of 51% per annum. This underscores the importance of improving initial conditions for trade openness in Indonesia through supporting and encouraging the export sector, diversifying export markets internationally, reducing reliance on raw material exports, and developing economic infrastructure. Moreover, stimulating foreign direct investment inflow can support economic conditions and price stability, thereby controlling inflation, through the elimination of all barriers and facilitation of procedures for foreign investors.

REFERENCES

1. Ada, O. E., Oyeronke, A., Odunayo, A. J., Okoruwa, V. O., & Obi-Egbedi, O. (2014). Trade openness and inflation in Nigerian economy: A vector error correction model (VECM) approach. *Research Journal of Finance and Accounting*, *5*(21), 74-85.
2. Afzal, M., Malik, M. E., Butt, A. R., & Fatima, K. (2013). Openness, inflation and growth relationships in Pakistan: An application of ARDL bounds testing approach. *Pakistan Economic and Social Review*, 13-53.
3. Ajaz, T., Nain, M. Z., & Kamaiah, B. (2016). Inflation and openness in India: an asymmetric approach. *Macroeconomics and Finance in Emerging Market Economies*, *9*(2), 190-203.
4. Alla, O. A. Y. A., Abdelmawla, M. A., Mohamed, A. A. A., & Mudawi, S. K. M. (2015). Evaluation of foreign direct investment inflow in Indonesia: An empirical investigation (1990-2013). *Journal of Business Studies Quarterly*, *7*(2), 149-168.
5. Anggara, A. A., & Pramuka, B. A. (2020). What is Behind Green Industry Motive to Maintain Rural Areas?. In *SHS Web of Conferences* (Vol. 86, p. 01012). EDP Sciences.
6. Anggara, A. A., Weihwa, P., Khananda, R. W. V., & Randikaparsa, I. (2024). How Do Indonesia Firms Encounter Covid-19 Pandemic? An Evidence of Transformation of the Roots of Competitive Advantage from EMDE Country. *Quality-Access to Success*, *25*(198).

7. Atabay, R. (2016). The relationship between trade openness and inflation in Turkey. International Journal of Research in Business and Social Science, 5(3), 137-145.

8. Babatunde, M. A. (2017). Trade openness and inflation in Nigeria: A nonlinear ARDL analysis. *Journal of Economics and Sustainable Development*, *8*(24), 129-148.

9. Binici, M., Cheung, Y. W., & Lai, K. S. (2012). Trade openness, market competition, and inflation: Some sectoral evidence from OECD countries. *International Journal of Finance & Economics*, *17*(4), 321-336.

10. Busse, M., & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. European journal of political economy, 23(2), 397-415.

11. Dewandaru, R. O., & Anggara, A. A. (2023). Analysis Effect of Corporate Social Responsibility on the Company Value in LQ45 Index. *Riwayat: Educational Journal of History and Humanities*, *6*(3), 1648-1653.

12. Dickey, D.A., Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association 74(366a) 427-431.

13. Elfaki, K. E. (2018). Determinants of Exchange Rate Stability in Indonesia (1991-2016). *International Journal of Economics and Financial Issues*, *8*(2), 33-39

14. Eltaib, S. A. E., & ELbeely, K. H. (2013). The Impact of Trade Liberalization and Foreign Direct Investment Flows on Economic Growth: Indonesia Experience 1972–2010. University of Bakht Alruda Scientific Journal, 8(1), 181-194.

15. Fischer, S., Sahay, R., & Végh, C. A. (2002). Modern hyper-and high inflations. *Journal of Economic literature*, *40*(3), 837-880.

16. Jedidia, K. B., Dammak, T. B., & Kamel, H. (2019). Trade-threshold Effect on Inflation in Tunisia: New Evidence Resulting from a Nonlinear Approach. *International Economic Journal*, *33*(1), 149-169.

17. Kouton, J. (2018). An Asymmetric Analysis of the Relationship between Openness and Inflation in Côte d'Ivoire. International Journal of Economics and Financial Issues, 8(6), 65-75.

18. Kurihara, Y. (2013). International trade openness and inflation in Asia. Research in World Economy, 4(1), 70-75.

19. Lane, P. R. (1997). Inflation in open economies. *Journal of International Economics*, *42*(3-4), 327-347.

20. Lin, H. Y. (2010). Openness and inflation revisited. International Research Journal of Finance and Economics, 37, 40-45.

21. Lin, F., Mei, D., Wang, H., & Yao, X. (2017). Romer was right on openness and inflation: Evidence from Sub-Saharan Africa. *Journal of applied economics*, *20*(1), 121-140.

22. Mohamed, M. A. A. (2005). The impact of external debts on economic growth: an empirical assessment of the Indonesia: 1978-2001. *Eastern Africa Social Science Research Review*, *21*(2), 53-66.

23. Mahyar, H. A. M. I. (2014). Inflation and Openness: Empirical Evidences from Iran (1965-2010). Studies in Business and Economics, 9(2), 27-32.

24. Moriyama, K. and A. Naseer (2009). Forecasting Inflation in Indonesia. IMF Working Paper WP/09/132.

25. Mukhtar, T. (2012). Does trade openness reduce inflation? Empirical evidence from Pakistan. *Journal of Economic Cooperation and Development*, *33*(2), 33-52.

26. Munir, S., Hasan, H., & Muhammad, M. (2015). The effect of trade openness on inflation: Panel data estimates from selected Asian economies (1976-2010). *Southeast Asian Journal of Economics*, *3*(2), 23-42.

27. Munir, S., & Kiani, A. K. (2011). Relationship between Trade Openness and Inflation: Empirical Evidences from Pakistan (1976—2010). *The Pakistan Development Review*, 853-876.

28. Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed-lag modelling approach to cointegration analysis. Econometric Society Monographs, 31, 371-413.

29. Pesaran , M.H., Shin ,Y., Smith , R.J., (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, vol. 16, 289 – 326.

30. Romer, D. (1993). Openness and inflation: theory and evidence. *Quarterly Journal of Economics*, 108: 869-903.

31. Sahu, P., & Sharma, N. K. (2018). Impact of Trade Openness on Inflation in India: An Autoregressive Distributed Lag (ARDL) Approach. The Empirical Economics Letters, 17(1), 21-32.

32. Salimifar, M., Razmi, M. J., & Taghizadegan, Z. (2015). A survey of the effect of trade openness size on inflation rate in Iran using ARDL. *Theoretical & Applied Economics*, *22*(3), 143-154.

33. Samimi, A. J., Ghaderi, S., Hosseinzadeh, R., & Nademi, Y. (2012). Openness and inflation: New empirical panel data evidence. *Economics Letters*, *117*(3), 573-577.

34. Sepehrivand, A., & Azizi, J. (2016). The effect of trade openness on inflation in D-8 member countries with an emphasis on Romer theory. *Asian Journal of Economic Modelling*, *4*(4), 162-167.

35. Suliman, K. M. (2012). The determinants of inflation in Indonesia. African Economic Research Consortium, Nairobi, Research Paper 243.

36. Tauci, H. M., Esener, S. Ç., & Darici, B. (2009). The effects of openness on inflation: panel data estimates from selected developing countries. Investment Management and Financial Innovations, 6(4), 28-34.

37. Thomas, C. (2012). Trade openness and inflation: Panel data evidence for the Caribbean. The International Business & Economics Research Journal (Online), 11(5), 507-516.

38. Yiheyis, Z. (2013). Trade openness and inflation performance: A panel data analysis in the context of African countries. African Development Review, 25(1), 67-84.

39. Zakaria, M. (2011). Openness and inflation: evidence from time series data. Doğuş Üniversitesi Dergisi, 11(2), 313-322.

40. Zombe, C., Daka, L., Phiri, C., Kaonga, O., Chibwe, F., & Seshamani, V. (2017). Investigating the Causal Relationship between Inflation and Trade Openness using Toda–Yamamoto Approach: Evidence from Zambia. Mediterranean Journal of Social Sciences, 8(6), 171-182.