The Impact of Trade Openness on Inflation in Pakistan

Javed Hussain
javedhussainsst@gmail.com
. M.Phil. Scholar, Department of Economics and Development Studies, University of Swat, KP, Pakistan

Naveed Ali
naveedali@uswat.edu.pk
Department of Economics and Development Studies, University of Swat, KP, Pakistan.

Aqil Khan
aqilkhan47uop@gmail.com
Directorate of Commerce Education and Management Science, Higher Education Archives and Libraries, KP, Pakistan
Corresponding Author: * Naveed Ali naveedali@uswat.edu.pk

ABSTRACT

This empirical study investigates the impact of trade openness on inflation in Pakistan during the periods of 1991-2023. In addition to trade openness, several control variables—unemployment, remittances, population growth, oil prices, and government expenditure—are incorporated to examine their influence on inflation. While employing, Augmented Dickey-Fuller (ADF) test, it is concluded that except inflation variable, the variables namely: trade openness, unemployment, remittances, population, oil price, and government expenditure are non-stationary at level. The ARDL bound test reveals a co-integration relationship between the variables, suggesting the existence of a long-run equilibrium. Moreover, the results also indicate that unemployment, population growth, oil prices and government expenditure have a positive effect on inflation, however, trade openness and remittances have a negative effect. The findings have significant policy implications, suggesting that managing factors such as unemployment, population growth, oil prices, and government expenditure is crucial for controlling inflation in Pakistan.

Keywords: Inflation, International Trade, Unemployment and ARDL

INTRODUCTION

Inflation and international trade are two fundamental macroeconomic variables that have significantly shaped a country's economic performance and policy landscape especially in the developed countries. The interaction between trade dynamics and domestic price levels has gained renewed attention in both theoretical and empirical economic literature, particularly in the context of global market integration, exchange-rate volatility, and supply-chain disruptions. Understanding the inflation–trade nexus is essential for assessing how economies adjust to external shocks, maintain price stability, and pursue trade-led growth strategies (Smith and Jones, 2022; Baldwin, 2016). Since 1990s, Pakistan has liberalized its trade practices, reduced tariffs, and integrated more nearly into the global frugality. These ways were taken to stimulate profitable growth, ameliorate competitiveness, and give Pakistani consumers access to a broader range of goods and services. Still, the goods of trade openness on inflation have been complex and multidimensional, with mixed results across colorful sectors and time ages. Some studies like Ahmad and Khan (2014) suggested that increased openness might reduce inflation by enhancing request competition and perfecting product effectiveness. Still, it also raised the concern of imported inflation due to Pakistan's reliance on significances for essential goods like oil painting, ministry, and agrarian products. For illustration, Ahmad and Khan (2014) set up that while trade openness helped reduce inflation in certain sectors, it made Pakistan

susceptible to" imported inflation" in others, especially due to reliance on imported energy and food particulars. Studies by Baldwin (2016) suggested that increased interconnectedness can lead to both lower costs and lesser perceptivity to value shocks. For case, dislocations in global force as those observed during the COVID- 19 pandemic redounded in significant inflationary pressures in numerous husbandries, as stressed by Dornbusch and Fisher (2019). In current times, scholars have also concentrated on the post-pandemic geography, probing how reanimated trade pressures and force chain issues impact inflation. Jiang et al. (2021) set up that rising protectionism could complicate inflation in open countries by reducing access to cheaper significances. Also, Smith and Jones (2022) refocused to the part of digital trade in reshaping price dynamics.

Theoretically, several economic frameworks explain how international trade influences inflationary processes. Classical and neoclassical theories suggest that increased trade openness enhances market efficiency, reduces mark-ups, and increases competitive pressures, thereby exerting a downward influence on domestic prices. Under the Heckscher–Ohlin and New Trade Theories, trade integration allows countries to specialize in goods with comparative advantage, improving resource allocation and potentially stabilizing long-term price levels. Conversely, structuralist and cost-push inflation perspectives argue that import dependence—particularly on food, energy, and intermediate inputs—can transmit global price shocks into the domestic economy, leading to imported inflation. Exchange-rate pass-through theory further explains how currency depreciation raises the local-currency cost of imports, amplifying inflationary pressures in open economies. Thus, theory presents both inflation-dampening and inflation-amplifying pathways through which trade affects price levels. In theory, the purchasing power equality (PPP) proposition suggests that increased openness can lead to a confluence of domestic prices with global prices, making original countries more sensitive to transnational inflation trends. Likewise, the Mundell-Fleming model in open frugality macroeconomics explores how trade openness influences inflation through exchange rate mechanisms and capital overflows.

Advanced fiscal development and veritably low affectation are the pretensions of macroeconomic policymakers in their separate countries. Due to its dynamic relationship with both trade openness and fiscal development, affectation may impact the relationship between trade openness and fiscal development. One of moment's" mystifications" in transnational macroeconomics is the affectation- openness link, which varies by country (Temple, 2002). Research in advanced countries has frequently suggested that trade openness helps to check inflation by adding competition, lowering product costs, and enhancing effectiveness. In discrepancy, researchers observed that rear relationship, specially whether a high degree of trade openness fosters fiscal development or not (Ashraf, 2018; Baltagi, Demetriades, & Law, 2009; Do & Levchenko, 2007; Kim, et al, 2010b). There are also a number of scientific papers studying the direct relationship between the variables of interest of this paper, they rather explored the triangle trade openness (TO), fiscal development (FD), and profitable growth relationship. In line with the antedating debate, realistic substantiation on the relationship between trade openness and fiscal development incross-country studies is still inconclusive (Caporale, Sova, & Sova, 2021; Suzan & HUSKIC, 2019). The empirical exploration relating trade openness to fiscal development did n't slightly suggest a favorable relationship between trade openness and fiscal development. While some experimenters have set up an adverse relationship, others have set up an inconsequential relationship. (Ayadi, Arbak, Naceur, & De Groen, 2015; David, Mlachila, & Moheeput, 2014; D.- H. Kim, Lin, & Suen, 2010a; Zhang, Zhu, & Lu, 2015). Hence the relationship between trade and inflation is still inconclusive. Some studies find that trade openness leads to advanced inflation due to currency volatility and imported inflation, while others suggest that it can reduce inflation if it promotes productivity and lowers costs. In Pakistan, studies examining this relationship are limited and have frequently concentrated on short- term goods or narrow timeframes. Given Pakistan's reliance on significances and its exposure to external shocks, it's pivotal to further probe how trade openness influences inflation in both the short and long term, considering the structural characteristics of

Pakistan's frugality. This study aims to fill this exploration gap by assaying the impact of trade openness on inflation in Pakistan, drawing on both literal data and contemporary trends. In addition, it also incorporate the impact of unemployment, remittances, population and government expenditure as control variable on the inflation.

LITERATURE REVIEW

Global Studies

Empirical studies have explored the link between trade openness and inflation, with varying conclusions depending on the country-specific context and methodological approaches. Romer (1993) found a negative relationship between trade openness and inflation, arguing that more open economies experience lower inflation rates due to heightened competition and better resource allocation. He suggested that trade openness forces domestic producers to adopt more efficient production methods, reducing costs and, ultimately, prices for consumers. Similarly, Kim and Beladi (2005) supported this view by showing that countries with greater trade openness, particularly those with diversified exports, tend to experience lower inflation. However, other studies have painted a more complex picture. Fischer (2003) anatomized data from developing countries, concluding that trade openness generally correlates with lower inflation, primarily due to the importation of goods at lower prices. Still, other studies, similar as that by Cote (2004), set up that while trade openness could lower inflation in stable countries, it might lead to imported inflation in cases of currency depreciation or global force chain dislocations. Choudhry and Hakura (2006) farther demonstrated that countries with flexible exchange rates could witness heightened inflationary volatility due to external shocks, emphasizing the need for robust financial fabrics in open countries. The rise of global force chains in the 2010s added another subcaste to the analysis. Terra (1998) found that trade openness can have inflationary effects, especially in countries with volatile exchange rates. In such economies, trade openness often increases exposure to global commodity price fluctuations, which can result in higher import prices and contribute to inflationary pressures. This finding is particularly relevant for countries with high import dependency, such as Pakistan. Moreover, countries with less flexible exchange rate regimes may find that trade liberalization exacerbates inflationary tendencies when external shocks, such as oil price hikes, occur.

Studies on Pakistan

In Pakistan, several studies have examined how trade openness influences inflation, revealing both positive and negative outcomes. Historical studies, such as those by Ahmed and Ali (1999), suggest that trade openness in Pakistan has contributed to inflationary pressures due to the country's heavy reliance on imports of energy and food. As global commodity prices rise, the cost of these imports increases, pushing up the general price level. Additionally, the lack of export diversification in Pakistan means that the country is more vulnerable to external price shocks, which exacerbates inflation. Khan and Qayyum (2007) found that while trade openness might have a short-term deflationary effect by increasing competition and lowering the prices of imported goods, the long-term effects are often inflationary. This is particularly true in Pakistan, where currency depreciation and rising import costs have outweighed the benefits of cheaper imports. The study emphasized that exchange rate volatility, a common feature of Pakistan's economy, plays a significant role in determining the relationship between trade openness and inflation. More recent studies, such as those by Zaidi and Saeed (2016) and Hassan and Rafique (2020), have highlighted that the inflationary effects of trade openness are mediated by several factors, including exchange rate volatility, global commodity price fluctuations, and the structural weaknesses of the economy. For instance, the reliance on energy imports and food commodities makes Pakistan highly vulnerable to inflationary pressures from external price shocks.

Hussain et al. (2017) and Haider and Qayyum (2018) examined how Pakistan's inflationary responses to trade openness evolved over time, finding that while initial impacts were inflationary due to exposure to global price shocks, these pressures tended to stabilize in the long term as the economy adjusted. They also highlighted the role of monetary policy in mediating these effects, noting that proactive measures by the State Bank of Pakistan could mitigate some of the inflationary pressures associated with trade openness. In recent years, world economic trade series affected by COVID, the Masco-Ukraine war, and rising energy costs have intensified the discussion around trade openness and inflation. Bhutto and Malik (2022) and Raza and Ahmed (2023) demonstrated that Pakistan's inflation has become increasingly sensitive to external shocks, suggesting that trade openness without strategic protections can leave the country vulnerable to global volatility. These studies emphasize that for Pakistan, managing inflation in an open economy requires not only monetary and fiscal policies but also targeted strategies for stabilizing imports and bolstering domestic production. Crucial studies from this period include Razing and Louganis (2005), who set up that trade openness generally moderated inflation in developed countries but had a lower harmonious effect in arising requests, especially those largely reliant on imported goods. Research in this period also frequently emphasized the Mundell- Fleming model, exploring how exchange rate volatility affected inflation in open countries. For illustration, Ahmad and Khan (2014) specifically examined the impact of trade openness on inflation in Pakistan, noting that Pakistan's reliance on energy significances made the country vulnerable to external price shocks and exchange rate volatility. They stressed that while openness did ameliorate access to a wider variety of goods, it also led to advanced inflation during ages of global price hikes, especially in energy and food sectors. Sectoral studies like this underlined the significance of Pakistan's reliance on imported rudiments, suggesting that trade openness without sufficient exchange rate stability or domestic product capacity could complicate inflationary pressures. 2015- 2020 Advanced Econometric Approaches and Policy Counteraccusations During this period, advancements in econometric styles allowed for further sophisticated analyses of trade openness and inflation, with numerous studies using autoregressive distributed pause (ARDL) models to capture short- and long- term goods. These styles allowed experimenters to see how trade openness impacted inflation over time, furnishing policymakers with perceptivity into implicit inflationary pressures during profitable liberalization phases. Hussain et al. (2017) applied ARDL models to examine the relationship between trade openness and inflation in South Asian countries, including Pakistan, chancing those inflationary goods were frequently more pronounced in the short term but tended to moderate over longer ages as countries acclimated to transnational competition. Also, Haider and Qayyum (2018) stressed that financial policy played a pivotal part in interceding the inflationary goods of trade openness, suggesting that Pakistan's central bank demanded to borrow a visionary approach to manage inflation prospects in a more open trade terrain. These studies emphasized that effective inflation control in the face of trade openness needed coordinated financial and financial programs, especially in countries with high import reliance. 2020- 2023 Recent Studies and the Impact of Global Price Shocks The period from 2020 to 2023 introduced new complications to the trade openness- inflation discussion.

The COVID- 19 epidemic and posterior force chain dislocations, coupled with geopolitical pressures and inflationary pressures from energy price shocks, brought renewed attention to the vulnerability of open countries to global inflation. These global developments underlined that trade openness could heighten exposure to external shocks, leading to inflation in developing countries that calculate on significances for rudiments. Bhutta and Malik (2022) explored how Pakistan's inflationary pressures increased sprucely as a result of force chain dislocations and currency deprecation. They noted that while trade openness is salutary for growth, it can introduce inflationary pitfalls in times of global insecurity, which may bear further flexible exchange rate administrations and diversified import sources to manage. Likewise, exploration by Raza and Ahmed (2023) delved the relationship between trade openness and imported inflation, pressing the case of Pakistan where substantial energy and food significances produce a direct channel for global inflation to impact domestic prices. Their findings suggest that for countries like

Pakistan, trade openness without sufficient inflation control mechanisms can lead to heightened price volatility, especially in light of recent exchange rate oscillations. These recent studies recommend that policymakers in open countries like Pakistan consider trade strategies that can alleviate inflation, similar as bolstering domestic product capacities and establishing strategic trade hookups to secure stable import channels. For Pakistan and other arising countries, the inflationary pitfalls of openness tend to be more pronounced due to reliance on significances and perceptivity to global price changes. Part of Sectoral Dependences exploration has underlined those inflationary goods of trade openness are frequently sector-specific. In Pakistan, sectors like energy and food, which are heavily dependent on significances, are particularly vulnerable to global price shifts, emphasizing the need for targeted policy measures in these areas to stabilize inflation. Significance of Exchange Rate Stability a recreating theme in the literature is the significance of exchange rate stability in managing the inflationary goods of trade openness. Pakistan's exchange rate volatility has been stressed as a major factor impacting inflation, as currency deprecation directly impacts the cost of significances, especially essential goods. Advanced Econometric Techniques Studies from 2015 onward decreasingly espoused advanced econometric ways, similar as ARDL models, which allowed for a further nuanced understanding of the short- and long- term inflationary goods of trade openness. These findings have corroborated that while inflationary pressures may be acute originally, they can stabilize as domestic requests acclimate. Global Shocks and Policy Recommendations, the COVID-19 epidemic and recent geopolitical pressures have renewed focus on the vulnerability of open countries to external shocks. Recent studies recommend that Pakistan and analogous countries borrow diversified trade strategies, strategic import hookups, and programs that promote domestic product to alleviate these inflationary pressures. From 2002 to 2023, the exploration on trade openness and inflation has evolved to encompass a further comprehensive and environment-sensitive understanding of how openness impacts price stability. Early studies concentrated on general trends, while latterly exploration, especiallypost-2015, offered more specific perceptivity into the short- and long- term goods and policy counteraccusations. The events of recent times, particularly global force chain dislocations and energy price volatility, have emphasized the significance of adaptable trade programs and robust financial strategies to stabilize inflation in a decreasingly connected global frugality. For policymakers in Pakistan, these perceptivities are critical to shaping an open yet flexible frugality that can harness the benefits of trade openness while guarding against inflationary pitfalls.

Gaps in the Literature

While the literature provides valuable insights, several gaps remain in the understanding of the relationship between trade openness and inflation in Pakistan. Most studies tend to focus on short-term effects or use outdated data, with limited analysis on the impact of recent global shocks, such as the COVID-19 pandemic. Additionally, the structural issues facing Pakistan, such as energy dependency and limited export diversification, have not been sufficiently explored in relation to the trade openness-inflation dynamic. There is also a lack of in-depth analysis on the role of domestic policies, such as fiscal and monetary policies, in mediating the effects of trade liberalization on inflation.

RESEARCH METHODOLOGY

Model specification

The main objective of this empirical study to examines the impact of trade openness on inflation in Pakistan from 1991 to 2023. The model used in this study emerged from the previous literature:

$$INF_t = \beta_0 + \beta_1 TO_t + \beta_2 UNE_t + \beta_3 REM_t + \beta_4 POP_t + \beta_5 OP_t + \beta_6 GE_t + u_t \quad (1)$$

Where in equation (1) the *INF, TO, UNE, REM, POP, OP* and *GE* represent the Inflation, Trade openness, unemployment, remittances, population, Oil price and Government expenditure respectively. *INF* is the dependent variable, while *TO, UNE, REM, POP, OP* and *GE a*re the independent variables. The subscript t and u_t represents the time periods from 1991 to 2023 and residual term respectively. To avoid data sharpness and Heteroscedasticity we convert *TO, REM, POP, OP* and *GE* into natural logarithms, except *INF* and *UNE* which are already in the percentage form.

Unit Root Testing

To avoid spurious retrogression, the first step of any econometrics fashion to test the unit root test, thus we used the Augmented Dickey Fuller test (ADF). which is grounded on the t-rate of the parameter in the following retrogression.

$$\Delta Z_t = \propto + \emptyset t + \partial_i Z_{t-i} + \sum_{i=1}^{n} \omega_i \Delta Z_{t-i} + e_t \quad (2)$$

Where equation 2, Z_t, $Z_t \Delta Z_{t-i}$ represent the the dependent variable, lag of dependent variable and change lag of dependent variable of the ith lag. The term $\propto$, $\emptyset$, ∂_i, ω_i and e_t represent the intercept, slope of trend series, slop of dependent variable lag, slope of ΔZ dependent variable lag and error respectively. If the $\partial_i = o$ we conclude that series is non stationary.

ARDL Methods

The autoregressive distributed pause (ARDL) system was developed by Psarian et al. (1995). This style has applicable in the incase of mixed order of data stationarity similar as I (0) and I (1). Alternate, unlike the Johansen system, which requires large quantities of data to be valid, ARDL can be applied with small sample sizes. Third, the ARDL system may be able of accommodating variables with varying optimal pause lengths. Fourth, unlike other co-integration processes that bear system equation specification, ARDL employs a single reduced- form equation.

$$\Delta INF_t = \beta_0 + \beta_1 INF_{t-1} + \beta_2 TO_{t-1} + \beta_3 UNE_{t-1} + \beta_4 REM_{t-1} + \beta_5 POP_{t-1} + \beta_6 OP_{t-1} + \beta_7 GE_{t-1}$$
$$+ \sum_{i=1}^{p} \emptyset_1 \Delta INF_{t-p} + \sum_{i=1}^{p} \emptyset_2 \Delta TO_{t-p} + \sum_{i=1}^{p} \emptyset_3 \Delta UNE_{t-p} + \sum_{i=1}^{p} \emptyset_4 \Delta REM_{t-p}$$
$$+ \sum_{i=1}^{p} \emptyset_5 \Delta POP_{t-p} + \sum_{i=1}^{p} \emptyset_6 \Delta OP_{t-p} + \sum_{i=1}^{p} \emptyset_7 \Delta GE_{t-p} + U_t \quad (3)$$

For the short run relationship, we developed the ECM in the following:

$$\Delta INF_t = \beta_0 + \sum_{i=1}^{p} \emptyset_1 \Delta INF_{t-p} + \sum_{i=1}^{p} \emptyset_2 \Delta TO_{t-p} + \sum_{i=1}^{p} \emptyset_3 \Delta UNE_{t-p} + \sum_{i=1}^{p} \emptyset_4 \Delta REM_{t-p} + \sum_{i=1}^{p} \emptyset_5 \Delta POP_{t-p}$$
$$+ \sum_{i=1}^{p} \emptyset_6 \Delta OP_{t-p} + \sum_{i=1}^{p} \emptyset_7 \Delta GE_{t-p} + \omega ECM_{t-1} + U_t \quad (4)$$

Data

In this study we used seven variables, which are INF, TO, UNE, REM, POP, OP and GE. All variables have been taken from world development indicator (WDI), while oil price has been taken from Macro trend data. The data span from 1991 to 2023 based on data variability. Table 1 provides an overview of the data, including its description, source, and measurement details.

Table 1: Data description, source and measurement

Symbol	Variable	Unit of measurements	Source
INF	Inflation	Annual %	WDI
TO	Trade openness	$$TO = \frac{Exports + Imports}{GDP}$$	WDI
UNE	unemployment	Unemployment, total (% of total labor force) (modeled ILO estimate)	WDI
REM	Remittances	Personal remittances, received (current US$)	WDI
POP	Population	Population, total	WDI
OP	Oil price	Crude Oil Prices, average closing price	Macro trends
GE	Government expenditure	General government final consumption expenditure (current US$)	WDI

RESULTS AND DISCUSSION

Descriptive statistics

In table 2, represent the descriptive statistics of the variables, the mean value of INF, TO, UNE, REM, POP, OP, and GE are 9.488, 17.792, 1.886, 22.487, 18.990, 3.759 and 23.502 respectively. The Median value of INF, TO, UNE, REM, POP, OP, and GE are 9.496, 17.825, 0.597, 22.515, 19.019, 3.885 and 23.676 respectively. The maximum value of the INF, TO, UNE, REM, POP, OP, and GE are 30.768, 18.171, 6.338, 24.167, 19.298, 4.602 and 24.395 respectively. The minimum value of INF, TO, UNE, REM, POP, OP, and GE are 2.529, 17.316, 0.398, 20.719, 18.596, 2.669 and 22.560 respectively. The standard deviation of the INF, TO, UNE, REM, POP, OP, and GE are 5.799, 0.197, 1.959, 1.187, 0.211, 0.627 and 0.676 respectively. The Jarque-Bera statistics confirms that except INF, all other variables are statistically insignificance favoring to accept the null hypothesis of data normality.

Table 2: Descriptive statistics

Variables	INF	TO	UNE	REM	POP	OP	GE
Mean	9.488	17.792	1.886	22.487	18.990	3.759	23.502
Median	9.496	17.825	0.597	22.515	19.019	3.885	23.676
Maximum	30.768	18.171	6.338	24.167	19.298	4.602	24.395
Minimum	2.529	17.316	0.398	20.719	18.596	2.669	22.560
Std. Dev.	5.799	0.197	1.959	1.187	0.211	0.627	0.676
Skewness	1.677	-0.523	1.124	-0.082	-0.343	-0.189	-0.129
Kurtosis	6.904	2.677	2.759	1.483	1.901	1.597	1.430
Jonquière	36.436	1.650	7.027	3.199	2.305	2.903	3.480
Probability	0.000	0.438	0.030	0.202	0.316	0.234	0.175
Sum	313.120	587.125	62.227	742.060	626.672	124.053	775.555
Sum Sq. Dev.	1075.993	1.240	122.757	45.058	1.428	12.585	14.643
Observations	33	33	33	33	33	33	33

Table 3: ADF test

At Level								
		INF	TO	UNE	REM	POP	OP	GE
With Constant	t-Statistic	-4.461*	-1.586	-0.420	-0.526	-2.311	-1.270	-0.764
	Prob.	0.000	0.478	0.894	0.873	0.176	0.631	0.816
With Constant & Trend	t-Statistic	-3.524*	-2.294	-2.101	-2.430	-2.173	-1.949	-1.981
	Prob.	0.000	0.425	0.526	0.358	0.485	0.606	0.589
Without Constant & Trend	t-Statistic	0.498	0.745	0.461	2.368	1.158	0.625	2.963
	Prob.	0.818	0.870	0.809	0.995	0.933	0.846	0.999
At First Difference								
		d(INF)	d(TO)	d(UNE)	d(REM)	d(POP)	d(OP)	d(GE)
With Constant	t-Statistic	-4.499	-5.834	-6.828	-4.479	-4.336	-5.528	-6.959
	Prob.	0.001*	0.000*	0.000*	0.001*	0.000*	0.000*	0.000*
With Constant & Trend	t-Statistic	-4.843*	-5.742*	-6.983*	-4.382*	-2.154*	-5.456*	-6.870*
	Prob.	0.003	0.000	0.000	0.008	0.054	0.001	0.000

Note: represent the 1% level of significance

Results of Unit Root Test

In table 3, shows the results of ADF test at level With Constant, and With Constant & Trend, TO, UNE, REM, POP, OP, and GE are statistically insignificance accept the non-stationary, while INF is statistical significance and accept the alternative hypothesis of data stationarity. All variables achieve stationarity after applying the first difference transformation. We observed that some variables are stationary at level and some are non-stationary at level but becomes stationary after first difference, so there is mixed order of data stationarity, so we will use the ARDL methods (Azam et al., 2023).

Results of ARDL Bound Test

The results of ARDL bound test shows in table 4, the F-Bounds Test is greater than 3.881 > [(I (0) 2.62 and I (1) 3.77]. We reject the null hypothesis of No Cointegration, and Accept the alternative hypothesis of Cointegration. So, we will use the ARDL test further.

Table 4: ARDL Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signify.		I (0)	I (1)
				Asymptotic: n=1000	
F-statistic	3.881*	10%		1.85	2.85
K	8	5%		2.11	3.15
Actual Sample Size	32	2.50%		2.33	3.42
		1%		2.62	3.77

Note: *Represent the 1% level of significance

ARDL Long Run and Short Run Results

The estimates of ARDL Long run and Short Run are shows in table 5. In long run the TO and REM have negative effect on inflation, while UNE, POP, OP and GE have positive effect on inflation. The coefficient of TO is -12.081, indicating that 1% increase in trade openness leads to reduce inflation by 12.081%. The reason of the negative sign,

The finding consistent with the finding of Mukhtar (2012) and Nasrat (2020). Mukhtar (2012) analyzed the connection between trade openness and inflation in Pakistan from 1960 to 2007 and found that trade openness reduced the inflation. Nasrat (2020) examined the Trade Openness on Inflation, Evidence from Six South Asian Countries from 1980 to 2016. They found that trade openness reduces the inflation in South Asian Countries. Our finding contradicts with the finding of Sepehrivand and Azizi (2016). Sepehrivand and Azizi (2016) examined the impact of trade openness on inflation in D- 8 countries and they found that TO raise the inflation. The results of Yaya Keho (2017), about trade openness and underpayment shows that trade openness and inflation have positive impacts on economic growth in short and long run. Similarly, Ikechukwu et al (2015) proved that commodity price also exerts a positive effect on unemployment rates. Nwosa et al (2020) reported that trade openness had and negative significant effect on unemployment rate in Nigeria. The findings of Rehman et all (2017) about the same subject reveal that population and trade openness have positive effect on economic growth in three developing countries. The same works done by Mohsin et al (2015) shows that population has the biggest effect on trade openness and inflation as well as GDP. Akobi e al (2021) in their findings reported that trade openness and inflation and government expenditure proved positive effect. Mahadra et al (2020) worked on the same subject and revealed that trade openness, inflation and government expenditure has negative effect. The UNE measure, measured at 0.829, suggests that a 1 increase in severance could affect in a 0.829 rise in affectation. This positive relationship reflects the profitable mechanisms that contribute to inflationary trends in similar scripts.

Table 5: ARDL Long run and Short Run estimates

Long run				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TO	-12.081[*]	5.448	-2.218	0.044
UNE	0.829[**]	0.321	2.579	0.021
REM	-9.379[*]	2.559	-3.665	0.003
POP	0.964	25.952	0.037	0.971
OP	1.487[***]	0.724	2.055	0.052
GE	0.983[*]	0.072	13.724	0.000
C	-62.725	79.873	-0.785	0.462

Short Run				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TO)	-16.134[*]	4.322	-3.733	0.002
D(UNE)	0.443	0.523	0.847	0.411
D(REM)	-4.974[**]	1.968	-2.528	0.024
D(POP)	11.243[*]	2.120	5.302	0.000
D(OP)	2.426[**]	1.062	2.284	0.021
D(GE)	0.644[*]	0.113	5.683	0.000
ECM (-1)	-1.412[*]	0.177	-7.985	0.000

The coefficient of REM is -9.379, indicating that 1% increase in remittances leads to reduce inflation by 9.379%. the reason of the negative sign the coefficient of POP is 0.964, indicating that 1% increase in population leads to raise inflation by 0.964%. the reason of the positive sign, the coefficient of OP is 1.487, indicating that 1% increase in oil price leads to raise inflation by 1.487%. the reason of the positive sign the coefficient of GE is 0.983, indicating that 1% increase in government expenditure leads to raise inflation by 0.983%.

Note:*, and ***** Represent the 1%, 5% & 10% level of significance. Selected Model: ARDL (1, 1, 1, 1, 1, 1, 1).

ARDL Diagnostics Test

Following the execution of the ARDL short- and long-term projections We tested the ARDL diagnostic test such as Breusch-Godfrey test for Serial Correlation, Heteroskedasticity Test: Breusch-Pagan-Godfrey, Heteroskedasticity Test: ARCH and Jarque Bera test for normality. All tests have insignificance value therefore we confirm that our ARDL estimates is free from Serial correlation, free from Heteroskedasticity and normally distributed. Figure 1 and figure 2 shows the CUSUM test and CUSUM test forecourt, it shows for the ARDL model stability. Both figure in favor of our ADRL model is stable.

Table 6: ARDL Diagnostics

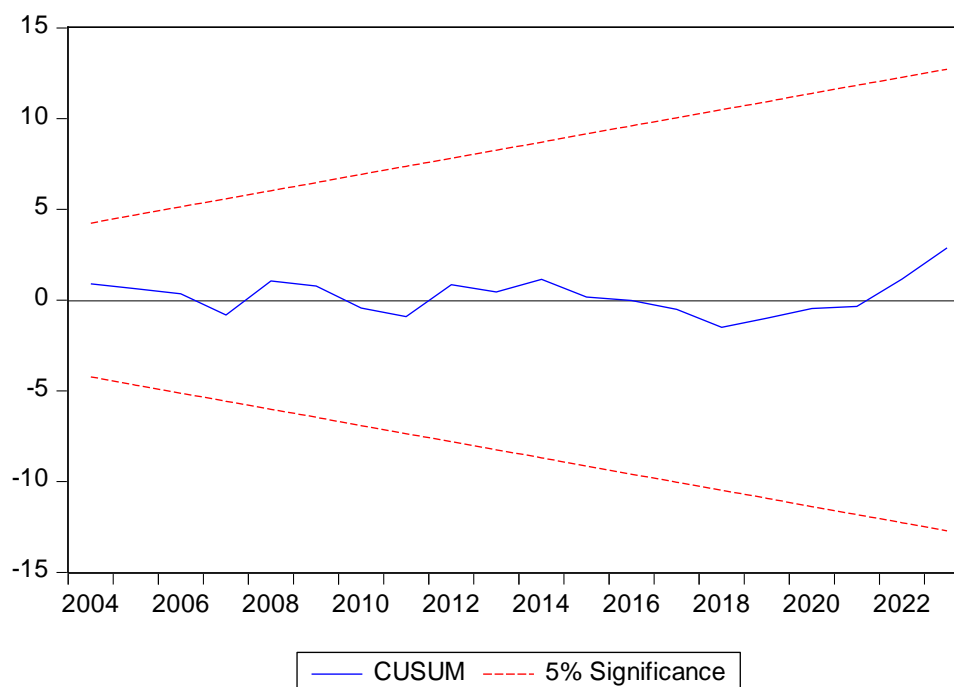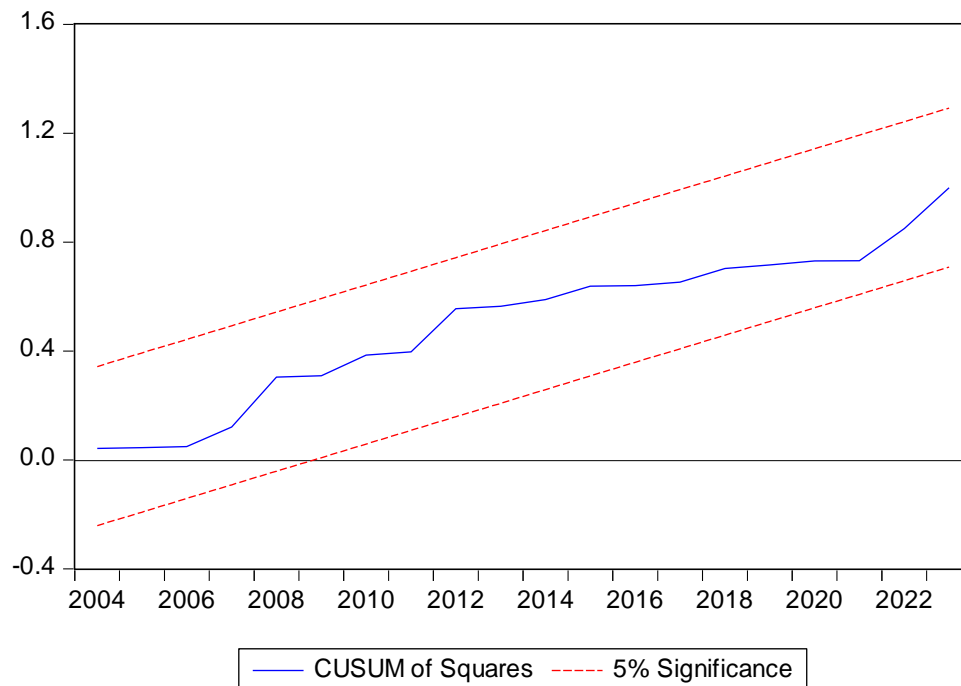| Test	F – statistics	P. value
Breusch-Godfrey test for Serial Correlation	0.317	0.732
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.680	0.757
Heteroskedasticity Test: ARCH	0.579	0.452
Jarque Bera	0.604	0.439

Figure 1: CUSUM Test

Figure 2: CUSUM Square Test

CONCLUSION AND RECOMMENDATIONS

The primary objective of this empirical study was to examine the impact of trade openness on inflation in Pakistan between 1991 and 2023, with a focus on the role of control variables such as unemployment, remittances, population growth, oil prices, and government expenditure. This study employed a combination of econometric methods, including the Augmented Dickey-Fuller (ADF) test, the ARDL bound test, and the ARDL model, to analyze the data and draw conclusions. The ADF test results indicated that, at the level with constant and with constant & trend, the variables trade openness (TO), unemployment (UNE), remittances (REM), population (POP), oil price (OP), and government expenditure (GE) were statistically insignificant, and the data was non-stationary. However, inflation (INF) was found to be statistically significant, which led to the acceptance of the alternative hypothesis that INF is stationary. This result underscored the necessity of transforming the data for accurate modeling. The ARDL bound test revealed the presence of a co-integration relationship between the variables, which suggests a long-run equilibrium relationship. The diagnostic tests for the ARDL model confirmed that the model was free from serial correlation and heteroscedasticity, and the residuals were normally distributed, which reinforces the reliability of the estimated results. The long-run and short-run estimates derived from the ARDL model showed distinct effects on inflation. Unemployment, population growth, oil prices, and government expenditure were found to have a positive impact on inflation, whereas trade openness and remittances exerted a negative influence. These results highlight the complex dynamics between trade openness, remittances, and inflation in Pakistan, with trade openness and remittances serving as stabilizing factors.

Based on the empirical findings of this study, it is crucial for policymakers to address factors contributing to inflation in Pakistan as follows: 1) Unemployment was found to have a positive effect on inflation. To address this issue, the government should focus on employment generation through public-private

partnerships, especially in sectors like infrastructure development, manufacturing, and services. 2): Population growth was also positively correlated with inflation. To manage this, it is essential to implement policies that control population growth, including enhancing family planning services and promoting awareness campaigns. 3): As oil prices are highly volatile and subject to global market conditions, Pakistan should implement strategies to buffer against oil price fluctuations. This can include building strategic oil reserves to reduce dependency on global oil markets and promoting the development of renewable energy sources. 4): The government must prioritize fiscal discipline by ensuring that public spending is efficient and focused on growth-enhancing sectors. Reducing wasteful expenditures and improving the targeting of social welfare programs can help prevent inflationary pressures stemming from excessive public spending. By adopting these policy measures, Pakistan can establish a more balanced approach to managing inflation, while fostering long-term economic stability. Effective management of trade openness and remittances, alongside controlling domestic inflation drivers, will enable Pakistan to maintain macroeconomic stability and support sustainable development in the coming decades.

REFERENCE

Ahmed, S., & Amanullah, M. (2016). Trade liberalization and inflation in developing countries: Evidence from South Asia. Journal of Asian Economics, 45, 36-49.

Arby, M. F., & Hanif, N. (2010). Inflation and trade openness in Pakistan: An empirical analysis. SBP Research Bulletin, 6(2), 1-19.

Asian Development Bank. (2021). Economic Indicators for Pakistan. ADB Publications.

Balassa, B. (1989). Comparative Advantage, Trade Policy, and Economic Development. Harvester Wheatsheaf.

Barro, R. J. (1996). Inflation and growth. Review of Economics and Statistics, 78(1), 166-175.

Bhagwati, J. N. (2004). In Defense of Globalization. Oxford University Press.

Dollar, D., & Kraay, A. (2003). Institutions, trade, and growth. Journal of Monetary Economics, 50(1), 133-162.

Dornbusch, R. (1987). Exchange rates and prices. American Economic Review, 77(1), 93-106.

Edwards, S. (1998). Openness, productivity, and growth: What do we really know? The Economic Journal, 108(447), 383-398.

Enders, W. (2014). Applied Econometric Time Series (4th ed.). Wiley.

Fischer, S. (1993). The role of macroeconomic factors in growth. Journal of Monetary Economics, 32(3), 485-512.

Frankel, J. A., & Rose, A. K. (2002). Is trade good or bad for the environment? Journal of Economic Perspectives, 16(1), 147-169.

Gruben, W. C., & McLeod, D. (2004). The openness-inflation puzzle revisited. Applied Economics Letters, 11(8), 465-468.

Gujarati, D. N., & Porter, D. C. (2009). Basic Econometrics (5th ed.). McGraw-Hill Education.

Ha, J., Stocker, M., & Yilmazkuday, H. (2020). Inflation and openness revisited. Journal of International Money and Finance, 102, 102-120.

Helpman, E., & Krugman, P. R. (1985). Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy. MIT Press.

Husain, I. (2005). Pakistan's economy in the globalized world. Pakistan Development Review, 44(4), 781-807.

Hyder, Z., & Shah, S. M. (2005). Exchange rate pass-through to domestic prices in Pakistan. SBP Research Bulletin, 1(1), 35-58.

IMF. (2022). Regional Economic Outlook: Middle East and South Asia. Washington, DC: International Monetary Fund.

Khan, A. H., & Qayyum, A. (2007). Trade liberalization, financial sector reforms, and growth in Pakistan. Pakistan Development Review, 46(4), 479-503.

Kim, J., & Lin, S. (2010). Trade openness and inflation: Testing for causality. Economics Letters, 107(2), 177-180.

Krugman, P. R., & Obstfeld, M. (2012). International Economics: Theory and Policy (9th ed.). Pearson.

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

Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3-42.

Malik, S. (2007). Inflation in Pakistan: Evidence from ARDL bounds testing approach. Pakistan Economic and Social Review, 45(2), 123-136.

Ministry of Commerce, Pakistan. (2021). Trade Policy Framework 2021-2025. Islamabad: Government of Pakistan.

Obstfeld, M., & Rogoff, K. (1996). Foundations of International Macroeconomics. MIT Press.

Pakistan Bureau of Statistics. (2022). Statistical Yearbook of Pakistan 2022. Islamabad: PBS.

Rogoff, K. (1985). The optimal degree of commitment to an intermediate monetary target. The Quarterly Journal of Economics, 100(4), 1169-1189.

Romer, D. (1993). Openness and inflation: Theory and evidence. The Quarterly Journal of Economics, 108(4), 869-903.

Sachs, J. D. (2003). Institutions matter, but not for everything. Finance & Development, 40(2), 38-41.

Sachs, J. D., & Warner, A. (1995). Economic reform and the process of global integration. Brookings Papers on Economic Activity, 1995(1), 1-118.

Siddiqui, R., & Iqbal, Z. (2005). Impact of trade openness on economic growth in Pakistan. Pakistan Journal of Applied Economics, 21(1-2), 33-54.

State Bank of Pakistan. (2023). Annual Report on the State of the Economy. Karachi: SBP.

Talukdar, M. (2012). Inflation dynamics and monetary policy in South Asia. Asian Economic Journal, 26(3), 273-299.

Taylor, J. B. (1999). Staggered price and wage setting in macroeconomics. Handbook of Macroeconomics, 1, 1009-1050.

Terra, C. T. (1998). Openness and inflation: A new assessment. The Quarterly Journal of Economics, 113(2), 641-648.

Wooldridge, J. M. (2015). Introductory Econometrics: A Modern Approach (6th ed.). South-Western Cengage Learning.

World Bank. (2020). Pakistan Trade Diagnostic Study. Washington, DC: World Bank Publications.

Zaidi, S. A. (2015). Issues in Pakistan's Economy: A Political Economy Perspective (3rd ed.). Oxford University Press.