GOMAL UNIVERSITY
JOURNAL OF RESEARCH

Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan
ISSN:1019- 8180 (Print) ISSN: 2708- 1737 (Online)

Website	www.gujr.com.pk	HEC Recognized	Social Sciences	CrossRef	DOI:10.51380

REVISITING THE ROMER'S HYPOTHESIS AND OPENNESS AND INFLATION RELATIONSHIP FOR PAKISTAN

Madiha Munir[1], Saira Tufail[2] & Rahat Munir Ahmed[3]

[1]Department of Economics, National University of Science and Technology, Islamabad, Pakistan
[2]Assistant Professor, Department of Economics, Fatima Jinnah Women University, Rawalpindi
[3]Lecturer, Department of Social Sciences, Foundation University, Rawalpindi, Pakistan

KEYWORDS

Inflation Trade Openness Pakistan Romer's Hypothesis Small Open Economy

Article History

Date of Submission: 14-01-2023
Date of Acceptance: 26-03-2023
Date of Publication: 31-03-2023

ABSTRACT

The substantial economic integration coupled with the increased inflation becomes serious dilemma for developing economies. Inflation has recently emerged as the major economic issue, making it necessary to investigate the additional causes of this issue. This study revisited the age-old subject of how openness affects inflation, utilizing time-series data from 1990 to 2021 for Pakistan. Primary goal of study is to investigate Romer hypothesis and relationship between openness as well as inflation in Pakistan using Co-integration analysis. Other explanatory variables are the growth of real agriculture value added, an average annual growth rate of money, and quasi-money and openness of economy. Though openness and inflation have a positive long-run relationship, there is no evidence of a short-run relationship, refuting Romer's argument for Pakistan. Present study offered signifncant information through results and support from previous studies in reaching the conclusion about inflation and its main reasons behand. Additionally, it offers renewed perspectives on how inflation is affected by global economic integration and how it thus undesarbaly influenced the financial growth from different dimensions that further hinders sustainable development. .

Corresponding Author: Madiha Munir: madiha.munir@s3h.nust.edu.pk

DOI: https://doi.org/10.51380/gujr-39-01-09

INTRODUCTION

For decision-makers, inflation has emerged as one of the most important factors contributing to economic instability that may harm economic growth. However, in developing nations, the purpose of macroeconomic policies is to preserve stability and non-inflationary economic growth (Jafari, Ghaderi, Hosseinzadeh & Nademi, 2012). For many developing economies like Pakistan, achieving price stability via controlling inflation has been a major objective of macroeconomic management (Amjad & Asghar, 2021). Since, uncertainty is more likely to harm process of the

economic growth, authorities have long focused upon keeping inflation rates within reasonable ranges (Mukhtar, Jehan & Bilquees, 2019). Thus, no developing economy may be able to isolate itself from the international world. The literature contains in-depth assessments of benefits of open economic policies that contribute to maximizing advantages of international commerce and capital flows. Economic liberalization, globalization and openness became necessary as the result of the 1990s' changing global environment. In this connection, gradual shift in opinion has been observed in favor of greater global economic integration. Thus, the tendency of closed economies in developing countries shifts to open economies in diverse situations so that the international community is unaffected (Ashra, 2002). Contentious discussion on how openness affects inflation was sparked by the significant rise in global economic integration over recent decades.

Understanding this influence is vital for best design and implementation of monetary policy, thus policymakers and academics, have shown great deal of interest in the subject (Bernanke, 2007; Trichet, 2008). Regarding the effects of inflation and openness, there are two theories. According to new growth theory, openness causes the decline in inflation, as openness boosts economic growth through efficient allocation of resources and competition in the markets. The openness of an economy to international trade fosters competition in domestic market, and reduces monopoly power of firms, leading to reduce inflation. While, other schools of thought proposed that inflation is driven up by the cost-push effect of the increased openness. There is inelastic demand for domestically produced commodities from foreign customers, monetary authorities have some degree of the monopoly power on the global market. Another reason for increased inflation is the result of import of goods and services from foreign countries. Other earlier studies observed focused on association between inflation and openness (Afzal, Malik, Butt & Fatima, 2013). Extensive corpus of research is devoted to empirically evaluating effect of trade openness on inflation in light of theoretical foundations provided by Romer (1993) whose groundbreaking empirical analysis reveals that unexpected monetary expansion results in a decline in real exchange rate and, as result, thus hurts open economy more than a closed economy.

This lessens the monetary authorities' incentive to implement expansionary monetary policy. Moving on this phenomenon, open economies are expected to have lower inflation and several studies support the negative relationship between trade openness and inflation like Haq and Zhu (2016), Lin et al. (2017), Bowdler and Malik (2017), Jedidia et al. (2019), Bosnjak et al. (2022) and Hassan (2022). All of the above studies focus that trade openness being likely to negatively influence inflation through increased competition, reducing the cost of production over imported innovation, more exports, increase in FDI, and efficient allocation of resources. However, the other school of thought based on a positive relationship between trade openness and inflation has been found by several studies Zombe et al. (2017), Sahu and Sharma (2018), Jededia et al. (2019) and kamal et al. (2022). All these studies concluded that trade openness increased inflation in small open economies. Pakistan had commercial policies that fortified import substitution beginning in early 1970s, which produced a highly protected environment for the industry. However, as it dramatically cut its export levies, quantitative trade barriers, and import tariffs, and followed a prudent exchange rate policy, Pakistan gradually shifted to an outward-looking policy in late 1980s. The country's trade liberalization process began in late 1980s. Bias against exports has lessened, and trade's contribution to Pakistan's GDP has grown.

The main factor impeding Pakistan's efforts to increase trade openness is government's heavy reliance on tariffs as a source of revenue (Sulehri & Khan, 2020). As Pakistan moved towards free trade regime, it experienced fluctuations in inflation behavior. Due to number of factors like easy monetary policy to increase exports, higher demand for imported goods and services, and other fiscal measures put pressure on inflation after adopting trade liberalization policies. But even after adopting trade liberalization, trade openness and inflation relation were unclear for Pakistan. For example in the 1970s and 1980s, there was high inflation with a reduced level of trade openness. Whereas, in 1990s, economy of Pakistan experienced increased inflation with an increase in trade openness. Inflation rate showed signs of stability from 2000 to 2003 – reducing from over 10% in 1990-2000 to around 3 percent in 2001 with a slight decrease in trade openness. From 2003 onwards, it began to rise again, reaching as high as 20 percent in 2008 and staying around 14 percent in 2009, and 2010. An improvement in consumer and investors' confidence was recorded and growth that initially increased to 4.3 percent in 2014-15 further improved to 5.3 percent in 2017. Inflation came down to a single digit. In 2021, the inflation reaches 9.5% with trade openness at 29.92%. In 2022, inflation reaches its peak at 24.5%.

Therefore, it is unclear if there is positive/negative correlation between inflation and openness in Pakistan. Additionally, determines whether this relationship is in short run or the long run. Secondly, there is a need to see the causality between trade openness and inflation in Pakistan. The fluctuating behavior of inflation has piqued interest of policymakers to evaluate the likely relationship between inflation and trade openness. There are sum of recent studies like Tahir et al. (2019), Sulehri and khan (2020), and Shah et al. (2022) worked on the time series data to get the association between inflation and trade openness. The openness of an economy to international trade fosters competition in domestic market, and reduces the monopoly power of firms, leading to reduce inflation. The tendency of closed economies in developing countries shifts to open economies so that international community is unaffected (Ashra, 2002). None of studies considered long-run and short-run relationship between inflation and trade openness in Pakistan using time-series data. In light of above background, study filled gap by exploring inflation-openness nexus (Romer hypothesis) for Pakistan in long-run & short run. Secondly, it investigates causal relationship between inflation and trade openness. 1990–2021 research period was chosen because it encompasses all economic situations and changes in the Pakistan economy.

LITERATURE REVIEW

The influence of trade openness on inflation has drawn the lot of attention in macroeconomic research since Romer's (1993) key work. The findings of this study are not yet definitive. In terms of the development of empirical methodologies and the expansion of knowledge within academic community, literature review in this study strives to offer discoveries from around the world. Following are the recent studies providing the empirical evidence regarding Romer's hypothesis Lotfalipour et al. (2013) examined the relationship between trade openness and inflation for the regional countries using an imbalanced static panel data method of estimate for years 1990 through 2010. The findings demonstrated that the two-way fixed effects model offered a negative and statistically significant correlation among the variables, in contrast to Romer's (1993) study, which discovered a negative link between variables in the cross-country analysis. In this linking, this argues that the monetary authorities in these nations, which are predominantly oil-producing ones, should improve their understanding of factors that effect

the general level of prices. The study by Salimifar et al. (2015) attempted to investigate a study of the relationship between Iran's inflation rate and the extent of trade openness. Therefore, ARDL approach and panel data were used in the 1973–2010 timeframe when technique was used.

The findings indicated that output gap hurt inflation, and growth of liquidity had a significant and favorable impact on inflation both for short-run as well as for long-run estimation models. Munir et al. (2015) study, attempted to determine how trade openness affected inflation in a few Asian economies. Panel data for the years 1976 to 2010 were employed, and the Author applied a general-to-specific model for this purpose. The outcome demonstrated that the fixed effects and random effects estimation of the model's nominal exchange rate carried a positive sign, real agricultural value added carried the significant positive sign, and interest rates had a negative influence on inflation. Openness inflation nexus in South Caucasus economies was examined by Aliyev and Gasimov (2014). All of above studies focus that trade openness being likely to negatively influence inflation over increased competition, reducing cost of production over imported innovation, more exports, increase in FDI, and efficient allocation of resources. From 1996 to 2012, time series were used. Findings showed that, in Georgia and Armenia, the discovered that, as imports/GDP ratio rises, inflationary pressure unquestionably falls. None of coefficients were statistically weighty when holds influence of other components constant. Evans (2012) looked at whether openness causes inflation. commitment to policy & imperfect competitiveness.

Theoretically, this channel was based on the well-known beggar thy neighbor incentive and its effects on a monetary authority's capacity to commit to a policy, as well as asymmetric effects of the underlying frictions in the model between local and foreign households. Autoregressive Distributed Lag (ARDL) was used by Chhabra and Alam (2020) to control effects of the fiscal deficit, exchange rate, and income terms of trade of central government. Romer's hypothesis for India was disproved by the empirical findings. In a panel data sample covering the regional countries like Nepal, Pakistan, Sri Lanka, Bhutan, and Bangladesh from 1980 to 2016, Nasrat (2020) examined the relationship between openness and inflation and discovered a positive impact of trade openness on inflation. Later, Saygl (2020) established that the nature of trade is an important factor for Romer's hypothesis to be true. Saygl (2020) added that both internal and foreign forces can function as the inflationary pressures in a nation. Bosnjak et al. (2022) examined the uni-directional relationship between the openness and inflation. To empirically assess the relationship between trade openness and inflation in six European countries, this study uses the dynamic panel data methodology with generalized technique of moments as the estimator.

The study concludes that trade openness eventually causes inflation rates to rise as reported by Romer hypothesis. The trade openness has no direct correlation with inflation rates. However, empirical findings made it abundantly evident that trade openness had an impact on inflation rates, with unemployment rates serving as a mediating factor. Hassan et al. (2022) investigate role of trade openness and inflation in increasing foreign direct investment in GCC countries using panel data analysis from 1995-2018. They came to conclusion using panel analysis, trade openness fosters FDI influx into the GCC economies over long run. Panel causality analysis reveals that trade openness and inflation have a unidirectional causal link that leads to FDI, although no causal relationship could be established for the other variables. Above literature

takes unidirectional relationship between inflation and openness. Some of studies positively respond to Romer's hypothesis. While some of studies pointed out that there is no direct link between inflation and openness. None of studies finds causality between trade openness and inflation nor do they find long-run and short-run relationship separately. This study fills this literature gap.

Analytical Model

Finding single empirical model that accurately labels economic circumstances of developing nation like Pakistan is challenging due to the complexity of inflation forecasting. The process of inflation in Pakistan's economy can, however, be affected by several important factors that can be identified. Impact of openness on inflation in Pakistan is being investigated using the following estimated model (Ashra, 2002).

$$\boldsymbol{Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon}$$

$\boldsymbol{Y}$ denotes rate of inflation (consumer price index). $\boldsymbol{X_1}$ denotes real growth rate for agriculture value added (Rs.). The annual growth rate for money is given by $\boldsymbol{X_2}$ (Rs.) The economy's trade openness is represented by $\boldsymbol{X_3}$. According to Romer (1993), open economies have low inflation because there is less motivation for monetary surprises, illustrating a fundamental connection between the two. In this linking, one of the explanatory variables is the real growth rate for agriculture value added, which is also a proxy of GDP growth. As Inflation is influenced by GDP in the several ways. For instance, increased GDP results in an increased supply of goods, which lowers prices. In line with the Mukhtar et al. (2019), Money growth (M2) denotes the direction of monetary policy because, over time, the monetary policy choices affect how much inflation a nation experiences. In this regard, the inflationary pressures are brought on by expansionary monetary policy and vice versa. Also, direct impact of money supply on prices is explained by Quantity Theory of Money (QTM) OF Freidman. Expected hypothesis for growth rate of Agriculture value added is $\boldsymbol{\beta_1 > 0}$, $\boldsymbol{\beta_2 > 0}$ and co-efficient of interest of trade openness $\boldsymbol{\beta_3 < 0}$.

RESEARCH METHODOLOGY

The study analyzed available data, secondary yearly inflation statistics, and other explanatory variables from 1990 to 2021 to examine the effect of openness on inflation in Pakistan. The main goal of monetary policy in Pakistan is to keep inflation within a given range. The State Bank of Pakistan (SBP) declares targeted inflation in this regard. It is difficult to obtain long time series data for different metrics of the openness, trade openness is typically defined as imports of economy plus exports as a percentage of GDP, which shows how open the Pakistani economy is. The data for CPI, Imports and exports, M2 (Quasi-money,) and Agriculture value added were gathered from a variety of sources, including the Pakistan Economic Survey (latest issues), the website of the Federal Bureau of Statistics, IFS latest data and State bank latest annual reports. To study association between inflation and openness for Pakistan's economy. Study employs co-integration regression. Engle-Granger co-integration method is applied for long-run relationships. The short-run impact of openness on inflation was examined using the ECM. In this connection, typically, every linear combination of the time series $I(1)$ variables is spurious. However, in the long-run relationships, errors tend to dissipate and return to zero, i.e $I(0)$. In case, two non-stationary series are integrated of level $I(1)$ and their residuals came out as stationary, then these variables are referred to as co-integrating (Engle & Granger, 1987).

$$Y_t = \beta_o + \beta_t X_t + \mu_t$$

Steps for AEG (Augmented Enger Granger Co integration) Testing: First, calculate the Natural log of each variable. Second, run the co-integration regression.

$$c_t = b_o + b_1 Y_t + \vartheta_t$$

Keep the residuals, ut. and use these estimated residuals for the auxiliary regression model.

$$\Delta \vartheta_t = \theta \vartheta_{t-1} + e_t$$

The Null and alternate hypothesis are:

$$H_o: \vartheta = 0 \Rightarrow \text{There is no cointegration}$$

$$H_1: \vartheta < 0 \Rightarrow \text{cointegration}$$

To avoid serial correlation, use lag-differentiated terms.

$$\Delta \vartheta_t = \theta \vartheta_{t-1} + \theta_1 \vartheta_{t-2} + \theta_2 \vartheta_{t-3} + \theta_3 \vartheta_{t-4} + \theta_4 \vartheta_{t-5} + \varepsilon_t$$

Minimized the SIC (Schwarz Information Criteria) and use F-test values for the reduced-form model.vError Correction Mechanism: Error-Correction model (ECM) can be used to describe the association between two variables if they are co-integrated. The error-correction term can be obtained by taking the lag of the error term of regression results. The co-integration in this instance offers proof of a long-run relationship between the variables, whereas the ECM offers proof of a short-run association. Thus, the following would be a simple ECM model: The ECM theory suggests that required error correction term coefficient ρ should be negative (Gujarati, 2019).

$$\Delta y_t = \mathrm{X}_0 + \mathrm{X}_1 \Delta x_t - \rho(\vartheta_{t-1}) + \varphi_t$$

RESULTS & DISCUSSION

This study's main objectives were to determine how openness affected the inflation in Pakistan and explore the association between inflation and openness.

Stationarity of Dataset

When the mean, variance, and autocovariance (measured at different lag-length) of time-series data stay constant regardless of measurement point, these are said to be stationary & measured to be time-invariant. A stationary time series does not alter throughout time. An upward or downward trend can be seen in non-stationary series (unit root). Data from time series should be constant. The current time period is taken under consideration, in case, the dataset taken is non-stationary. The data in each time series would consequently be for certain time periods. A dataset with the non-stationarity properties in forecasting could not have much practical value (Dickey, 1984). The majority of economic variables, average yearly increase of quasi-money (M2), openness, agriculture value-added, inflation, show non-stationarity pattern. Stationarity of data set has been examined using augmented Dickey-Fuller unit root test (Dickey & Fuller, 1979). A unit root test was conducted on each variable to establish the order of integration of time series. Outcomes of ADF unit root test are displayed in Table 1 below. With intercept and trend, stationarity of model's variables was examined. Time series became stationary in first difference which is evidenced that unit root in dataset. To put it another way, these variables are included in order 1 and I (1) variables have become stationary. All of studies like Mukhtar et al. (2019), Sulehri and Khan (2020), and Shah et al. (2022) evidenced existence of unit-root for time-series data for inflation, trade openness, agriculture value-added, and quasi-money in Pakistan.

Cointegration & ECM Results

When is long-run or equilibrium relationship exists between two variables, they are said to be co-integrated. The two non-stationary variables I (1) series are referred to as co-integrating if

their residuals are stationary as a result of regression. To determine the long-term relationship between the inflation and openness, the co-integration analysis was performed. However other variables like value added to agriculture and quasi-money (M2) were taken as exogenous. The co-integration test was conducted using the Engle-Granger test. If the time series contains a non-stationarity component, the series will likely be stationary after taking the first difference of the dataset. For correction of the spurious regression, the Engle-Granger test can be used. When time series have high R2 but also frequently show large auto-correlated residuals, as evidenced by very low Durbin-Watson statistics, spurious regressions problem predominates in regression analysis. The typical regression co-efficient significance test is quite deceptive in such a case (Phillips, 1986). The natural log of each variable was calculated since the variables were non-stationary. The model underwent OLS estimation by including the intercept term. The results of the OLS estimate method are shown in Table 2. There was possibility of spurious regression because variables weren't stationary. After the estimation resultant equation is as follows:

$$\boldsymbol{Inflation} = 3.21 + 0.24\,\boldsymbol{OPENNESS_t} - 0.07\,\boldsymbol{AGRI_t} + 0.45\,\boldsymbol{M2_t}$$

The equation's residuals were kept after estimation. This procedure refers to error correction. ADF test was performed to determine whether the error term is stationary or not. The results of the ADF test performed on the residuals are displayed in Table 3. The p-value indicated that residuals were stable at levels. The residuals in regression of inflation on openness were $I(0)$, confirming stationarity. The variables were the non-stationary even though they were analyzed separately. As, from regression results, when variables were integrated at $I(1)$, the error term was stationary, indicating that the regression was not spurious. Co-integration of the variables showed long-run relationships between the variables. The calculated equation interprets the long-run function as a function of long-run parameters. Since openness and inflation have a positive long-run relationship, the coefficient of openness of 0.24 illustrates this relationship. It indicates that a 1 unit improvement in the openness will result in a 0.24 unit decrease in inflation. Pakistan's inflation is significantly and positively impacted by openness in the long run.

Empirical Results of ECM

Constructing an Error Correction model is the second step in the Engle-Granger co-integration method. The co-integrating system has two variables that represent the long-term correlation between inflation and openness. However, the Error Correction Mechanism (ECM) contends that there is no association between the inflation and openness in the short run. Inflation and openness have a long-run association, but there is no short-run relationship, according to the coefficient of the lagged values of these two variables. In ECM, the estimated residuals are used to calculate the rate of adjustment. How quickly the equilibrium is restored to its actual position in the short run is determined by the speed of adjustment (Ibrahim & Florkowski, 2005). According to the estimates, the ECM for inflation from 1990 and 2021 is shown below equation:

$$\Delta\,\text{Inflation} = 0.0637 - 0.043891\,\Delta\,\text{Openness} + 0.0348\,\Delta\,\text{M2} + 0.153\Delta\,\text{Agri} + 0.0437\,\text{Error Term}$$

The ECM results are displayed in Table 4. The variables of interest are integrated at level $I(1)$. The stationarity of the variables in the time series has a problem. Results for all variables except intercept in Table 4 are not significant. Additionally, the value of R2 is relatively small, and the result of the f-stat shows that all variables of model are not significant. The estimated

value for lag of the error term has a positive value, showing that it also affects inflation. The study concludes that openness and inflation do not interact in the short run as they do in long run.

Despite the variable's unequal nature, long-run link between the inflation rate and both the positive and negative aspects of trade openness shows that inflation is rising. Increase in trade openness will cause inflation to rise, whereas a decrease in variable will likely reduce inflation. These results call into severe doubt State Bank of Pakistan's goal of maintaining price stability in light of government of Pakistan's declared preference for a more globalized economy. The results of study can be justified if in case we considered that most of imports of Pakistan are manufactured products like oil, machinery, and final products and their increased price trends are likely to increase inflation in Pakistan. Positive relationship between inflation and openness is in line with recent studies like Zakaria (2011), Neeraj et al. (2014), Mukhtar et al. (2019), Sulehri and Khan (2020) and Shah et al. (2022). So, from the above results, we are not able to validate Romer's hypothesis for Pakistan economy of association between inflation and trade openness.

The results for other choice variables are following our expectations. One of the main reasons for inflation is increase in the money supply. As there is a problem of state bank autonomy in Pakistan, there is difficult for the government to curb unnecessary growth of money supply. Similar results are found by Zakaria (2011) and Iqbal et al. (2013). Similarly, there is the poor performance of external sector in Pakistan. Current account deficit is now a routine feature of Pakistan's economy due to rising imports of finished goods as compared to exports of middle goods as also similarly reported by Mukhtar et al. (2019) and Sulehri and khan (2020). Last but not least, the growth of agriculture value added is negatively related to inflation due to an increase in the money supply. Thus, the short-run analysis produces some contradictory and insignificant results. There is no interaction between inflation and trade openness in the short run as evident from the results and as witnessed from the existing research on issues in this context.

Table 1
Stationarity Test (ADF)

Variables	ADF test value	P	Lags
Inflation	-6.06	0.00	1
Openness	-4.14	0.00	1
Agriculture Value Added	-3.63	0.00	1
M2 (Quasi Money)	-3.27	0.00	1

Table 2
Regression Results using OLS Estimation

Variables	β	S.E	T	P
Intercept	3.21	1.28	10.34	0.00
M2(Quasi-Money)	0.45	0.053	8.52	0.00
Agriculture value added	-0.07	0.062	-1.20	0.24
Openness	-0.24	0.098	-2.70	0.01

Table 3
Regression Outcomes

R2.	0.98
Adj. R2	0.98
D.W	0.65

Table 4
Test for Residual Stationarity (ADF)

Variable	***β***	t	S.E	P
Res (-1)	0.57	3.67	0.15	0.00
D((-1))	0.54	3.04	0.18	0.00
R2.		0.37		
Adj. R2		0.30		
D.W		2.30		

Table 5
ECM Estimation Results For First Differences

Variables	***β***	S.E	***t***	***p***
Intercept	0.064	0.0099	6.41	0.00
ΔOpen	-0.044	0.0568	-2.77	0.00
ΔM2(Quasi-money)	0.035	0.0404	0.86	0.40
ΔAgriculture value added	0.153	0.1462	3.05	0.00
Error Termt-1	0.044	0.0776	0.57	0.58

Table 6
Regression Outcomes

R2.	0.07
Adj. R2	-0.02
D.W	1.18
F	0.784(0.513)

Durbin- Watson test for Cointegrating Regression (CRDW).
To test co-integration between openness and inflation Sargan and Bhargava (1983) suggested Durbin-Watson test for co-integration regression. The effectiveness of Durbin-Watson in time series analysis is supported by test. This test assumed to take null hypothesis as d=0 leaving alternate hypothesis as d=2. The estimated ρ will be close to 1, which indicates that *d* will be close to zero if there is unit root. Resulting d value for this investigation was 0.65 as reported. As estimated *d* value is above critical value for *d*, signifying co-integration relation between inflation and openness, rejecting the null hypothesis of co-integration at 1%, 5%, and 10% level of significance.

Two-way Granger test for Causality
According to f-test, the ECM results after taking first differences of the explanatory variables were statistically insignificant. However, in case of the inflation equation, the test results after taking first difference were all statistically significant, based on t-test statistics. F-test result

does not show any statistical significance for any of the explanatory variable coefficients. ECM had little impact on the outcomes. It is not necessary to establish causation or the influence's direction only because the two variables are related. The Pairwise Granger Causality test was applied to demonstrate how openness influences inflation. In the second regression, openness does not Granger-cause inflation, and vice versa, which is the null hypothesis in the Granger causality test. The F-test identifies the causes and effects of each variable. Table 5 presents the test findings. The results of the paired Granger causality test are shown in Table 5, and the p-value indicates that the null hypothesis, according to which inflation does not affect openness, is accepted. It implies that openness is unaffected by inflation. It disproves the null hypothesis inflation is unaffected by openness. It implies that Pakistan's inflation is likely to be impacted by openness.

Table 7
Two-way Granger Causality Test for Inflation and Openness (lags=2)

H_o	F	p
Openness does not Granger cause Inflation	1.452	0.253
Inflation does not Granger cause Openness	7.094	0.004

Trade opening will probably have impact on inflation. In general, open economies experience lower inflation. The goal of study was to examine how Pakistan's economy's openness affected inflation and to determine whether there was correlation amid trade openness and inflation. The study has taken time series data from 1990 to 2021. The data from a time series were not stationary. Non-stationary time series might not have much use in forecasting. Data from time series should be constant. The individual series are initially examined for a common sequence of integration as part of this examination of time series data stationarity. Co-integration would be implied if the time series were integrated and in the same order. Second, the stationarity of series was examined using the Augmented Dickey-Fuller (ADF) test. For long-run association between inflation and openness, the Engle-Granger co-integration test was used. However, for short-run association, Error Correction Mechanism (ECM) was used. All variables had same order of integration. Though there was no evidence of short-run association between openness and inflation, it was discovered that there is a long-run relationship between two. In terms of ramifications for policy, it was a significant effort. It will be useful when deciding whether to allow for trade.

CONCLUSIONS

After the pioneering work of Romer (1993) on the nature of relationship between inflation and trade openness in small open economies, researchers revisit this relationship with the small economy like Pakistan. The current study aimed to reinvestigate the inflation-trade openness association in Pakistan from 1990 to 2021 using the co-integration approach. According to the study's findings, inflation and trade openness have a positive linear relationship in long run, but is no significant relationship was found in short run for Pakistan. The two-way causality test also confirms linear relationship and found that trade openness is likely to affect inflation in Pakistan. A positive relationship found that more integration is likely to have an inflationary impact on Pakistan economy. Similar to other emerging nations, major goal of macroeconomic policy is to maintain low inflation without impeding economic growth. In Pakistan, that is also true. Due to fact, impact of economic integration on level of domestic prices was considered in this study. Inflation is major economic issue in Pakistan. An outward-looking trade policy may

not be the best choice if high inflation discourages domestic capital growth and more capital accumulation is required for development. The government should concentrate its efforts on trade from a policy standpoint, especially those required to enhance imports of raw materials and technology to boost productivity. To improve exports even further, export policies also need to be reviewed. The future challenge for Pakistan is to reduce inflation by boosting the factors that have negative correlation with it. Stable economic growth cannot be achieved without lowering inflation. Government must implement effective and well-integrated fiscal, monetary, and trade policies to attain and sustain price stability without jeopardizing the trade openness reforms.

REFERENCES

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.

Amjad, M. A., & Asghar, N. (2021). Historical Aspect of Inflation in Pre and Post-Covid-19 Pandemic in Pakistan. *Perennial Journal of History*, 2(2), 383-401.

Ashra, S. (2002). Inflation and Openness: A study of selected developing countries. Indian Council for Research on International Economic Relations. *Working Paper*, 84.

Bernanke, B. S. (2007). Globalization and monetary policy. Board of Governors of the Federal Reserve System (US). *Working Paper*, 262.

Bleaney, M. (1999). The disappearing openness-inflation relationship: a cross-country analysis of inflation rates. *IMF working paper* 99/161.

Bosnjak, M., Novak, I., & Basic, M. (2022). Openness And Inflation Nexus: The Case Of European Post-Transition Countries. Proceedings of FEB Zagreb 13th International Odyssey Conference on Economics and Business.

Bowdler, C., & Malik, A. (2017). Openness and inflation volatility: Panel data evidence. *The North American Journal of Economics and Finance*, 41(2016), 57-69.

Chhabra, M., Giri, K., & Kumar, A. (2022). Do Trade Openness, Output Gap Affect Inflation? Empirical Evidence from BRICS Nations. *Millennial Asia*, 09763996221116586.

Dickey, D. A. (1984). Stationarity issues in Time Series Models. *Proceedings of Business and Economic Statistics Section, American Statistical Association*, 123-30.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of American Statistical Association* 74, 427-433.

Engle, R. F. & G.W.J. Granger. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. Econometrica, 55, 251-276.

Evans, R. (2012). Openness, Inflation, and Imperfect Competition: Theory and Evidence., Globalization and Monetary Policy Institute. The Federal Reserve Bank of Dallas. GMPI Working Paper, 5.

Fuller, W. A. (1976). Introduction to Statistical Time Series, 5th ed., John Wiley and Sons. New York.

Gasimov, I. & Aliyev, K. (2014). The Openness-inflation nexus in the South Caucasus economies. Aliyev, K., & Gasimov, I.(2014). *Openness-Inflation Nexus in South Caucasus Economies*, (62761).

Government of Pakistan.Economic Survey. (2020-21). Economic Advisor's Wing. Ministry of Finance, Islamabad. Gujarati, D. N. (2004). *Basic Econometrics*, 7th ed., McGraw-Hill Co, New York. Gujarati, D. N. (2019). *Basic Econometrics*, 6th ed., McGraw-Hill Co, New York.

Haq, I and Zhu, S. (2016). Does Proxy of Openness or Methodology Matter to Hold Romer's Hypothesis? *International Journal of Economics, Commerce, and Management*, 4(1): 1-12.

Hassan, H. M. (2022). The importance of trade openness and inflation for attracting Foreign Direct Investment in GCC Countries. *Available at SSRN* 4315836.

Ibrahim, M., & W.J. Florkoeski. (2005). Testing for seasonal Co-integration and error-correction: the US Pecan-Price Inventory Relationship. Selected Papers Presented at the Southern Agricultural Economics Association Meeting, Little Rock, Arkansas.

Iqbal, J., Nosheen, M., & Javed, A. (2013). The Nexus between Foreign Remittances and Inflation: Evidence from Pakistan. *Pakistan Journal of Social Sciences* (PJSS), 33(2):331-342.

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

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.

Kamal, T. A., Naaz, S., Bhandari, R. S., Shukl, H., & Khan, R. (2022). Impact of trade openness and inflation on FDI in India: ARDL Approach. *Journal of Statistics and Management Systems*, 25(5), 1103-1113.

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.

Lotfalipour, M. R., Montazeri, S., & Sedighi, S. (2013). Trade Openness and Inflation. Evidence from MENA Region Countries. *Petroleum-Gas University of Ploiesti Bulletin, Technical Series*, 65(2).

Mukhtar, T., Jehan, Z., & Bilquees, F. (2019). Is trade openness inflationary in developing economies: An asymmetric analysis for Pakistan. *Pakistan Economic and Social Review*, 57(1), 47.

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*, 23-42.

Nasrat, M. N. (2020). The Impact of Trade Openness on Inflation: Evidence from Six South Asian Countries from 1980 to 2016. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 7(4), 165-178.

Neeraj, K., Kapoor, V., & Poddar, S. (2014). Openness and Inflation: Empirical Evidence from India. *Journal of Business Management and Social Sciences Research*, 3(9): 49–53.

Phillips, P. C. B. (1986). Understanding Spurious Regressions in Econometrics. *Journal of Econometrics*, 33(2):311-340.

Romer, D. (1993). Openness and Inflation: Theory and Evidence. *Quarterly Journal of Economics*, 108(4):869-903.

Romer, D. (1998). A New Assessment of Openness and Inflation: Reply. *Quarterly Journal of Economics*, 113(2): 649-52.

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):1-12.

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).

Saygılı, H. (2020). The nature of trade, global production fragmentation, and inflationary dynamics: Cross-country evidence. *The World Economy*, 43(7), 2007-2031.

Shah, M., Khan, M. M. S., & Kamal, A. (2022). The Impact of Trade Openness and Public Debt Level on Fiscal Spending in Pakistan. *International Journal of Business and Management Sciences*, 3(2), 1-18.

State Bank of Pakistan. (2019). Monetary Policy Statement. Karachi: State Bank of Pakistan. Sulehri, F. A. and Khan, J. (2020). The effect of trade openness on inflation in Pakistan. *Bulletin of Business and Economics*, 9(3), 135-140.

Terra, C. (1998). Openness and Inflation: New Assessment. *Quarterly Journal of Economics*, 113 (2): 641-648.

Trichet, J. C. (2008). Globalization, inflation, and the ECB monetary policy. Speech held at the Barcelona Graduate School of Economics, *Barcelona*, 14.

Zakaria, M. (2010). Openness and inflation: evidence from time series data. Doğuş Üniversitesi Dergisi, 11(2), 313-322.

Zombe, C., Daka, L., Phiri, C., Kaonga, O., Chibwe, F., and 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.

Appendix I

Estimation of the Stationarity of Inflation at First Difference

Variable	β	S.E	t	p
Intercept	-0.214	0.610	-0.351	0.73
D(CPI(-1))	-1.720	0.284	-6.060	0.00
D(CPI(-1),2)	0.243	0.159	1.527	0.14

D (CPI (-1)) = 1st Difference for Inflation

D (CPI (-1), 2) = 2nd Difference for Inflation

R2.	0.70
Adj. R2	0.68
F	31.91(0.00)
D.W	1.80

Appendix II

Estimation of the Stationarity of Openness at First Difference

Variable	β	S.E	t	P
Intercept	-0.368	0.227	-1.616	0.12
D(OPEN(-1))	-0.723	0.175	-4.141	0.00
D(OPEN(-1),2)	0.392	0.167	2.348	0.03

D (OPEN (-1)) = 1st Difference for Openness

D (OPEN (-1), 2) = 2nd Difference for Openness

R2	0.39
Adj. R2	0.35
F	8.67(0.001)
D.W	2.25

Appendix III

Estimation of the Stationarity of Agriculture Value Added at First Difference

Variable	β	S.E	t	p
Intercept	279	871	3.212	0.00
D(AGRI(-1))	-1.08	0.297	-3.632	0.00
D(AGRI (-1),2)	-0.011	0.202	-0.056	0.96

D (AGRI (-1)) = 1st Difference for Agriculture Value Added

D (AGRI (-1), 2) = 2nd Difference for Agriculture Value Added

R2.	0.54
Adj. R2	0.51
F	16.09(0.0034)
D.W	1.99

Appendix IV

Estimation of the Stationarity of Quasi-Money (m2) at First Difference

Variable	β	S.E	t	p
C	383	154	2.49	0.02
D(M2(-1))	-1.04	0.314	-3.33	0.00
D(M2 (-1),2)	0.006	0.213	0.029	0.98

D (M2 (-1)) = 1st Difference for Quasi-money

D (M2 (-1), 2) = 2nd Difference for Quasi-money

R2.	0.47
Adj. R2	0.43
F	12.08(0.000)
D.W	1.84