Pakistan Economic and Social Review
Volume 57, No. 1 (Summer 2019), pp. 47-68

IS TRADE OPENNESS INFLATIONARY IN DEVELOPING ECONOMIES: AN ASYMMETRIC ANALYSIS FOR PAKISTAN

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Abstract. The present study reexamines inflation and trade openness nexus for the time period from 1972-2016. The study is first of its kind in applying the nonlinear autoregressive distributed lag (NARDL) technique to investigate the nature of relationship between inflation and trade openness for Pakistan. The findings reveal that both variables are symmetrically and positively associated with each other in the long run. However, their relationship appears asymmetric and positive in the short run. Overall, this study invalidates Romer's (1993) proposition that inflation tends to decline as trade openness increases.

Keywords: Trade openness, inflation, Cointegration, NARDL, Pakistan

JEL Classification: C22, F41, O53

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I. INTRODUCTION

Persistently higher inflation has always been an important factor in impeding growth and lowering the welfare levels of lower income groups. Attaining and maintaining price stability by keeping inflation rate under control has been a key goal of macroeconomic management of a large number of developed and developing economies including Pakistan. The policymakers have always focused on keeping inflation rates within reasonable bounds as it leads to uncertainty, which is more likely to adversely impact economic growth process. Therefore, considerable theoretical and empirical research has been devoted to trace the factors which tend to accelerate the inflationary pressures in a country, or help to control it. For instance, dynamic inconsistency problem of inflation presented by Kydland and Prescott (1977), and Barro and Gordon (1983), and the debate of rules versus discretionary monetary policy between Monetarists and Keynesians are the preliminary theoretical discussions carried out to understand the behavior of inflation. Recently, stronger markets and increased global integration have diverted the attention of researchers towards analyzing inflation behavior conditional on various factors such as exchange rate regimes, level of income, and trade openness. Particularly, trade openness, in this regard, has attained significant consideration.

Theoretically, there are two views explaining the link between openness and inflation. The spillover hypothesis, mainly established by the proponents of trade openness, postulates that more trade integration with the world economy leads to lower inflation. In the similar vein, the conventional view supports the spillover hypothesis stating that in open economies the cost of monetary surprise is higher due to depreciation of exchange rate, therefore, the incentive of unanticipated monetary expansion is low (Rogoff ,1985). Moreover, new growth theory portrays that inflation remains lower in small open economies as openness spurs economic growth through promoting competition and optimal allocation of resources. Trade openness fosters competition in domestic markets and diminishes the pricing power of the firms, thus reducing inflation. In addition, monetary policy is expected to be more prudent and less inflationary in the presence of stronger market competition. Furthermore, trade expansion increases country's production possibilities,

consequently, the efficient production level is higher in open economies and accordingly inflation will be low (Binici *et al*., 2012).

Conversely, the cost-push hypothesis proposed by the opponents of trade openness maintains that trade liberalisation increases inflation. This arises because of some degree of monopoly power enjoyed by monetary authorities in the international market due to some degree of inelasticity of demand for domestically produced goods from foreign consumers (Evans, 2007). Moreover, open economies are also expected to import inflation from foreign countries through imports of goods and services (Lotfalipour et al., 2013). Most importantly, it is argued that trade openness reduces monetary policy effectiveness, particularly, in controlling inflation.

Following the theoretical underpinnings, a large body of empirical research is devoted to empirically evaluate the impact of trade openness on inflation. The pioneering empirical assessment established by Romer (1993) explains that unanticipated monetary expansion leads to depreciation in real exchange rate, thus causes more harm in an open economy compared to a closed economy. This reduces the incentive of the monetary authorities to undertake expansionary monetary policies. Through this mechanism, open economies are expected to have lower inflation rate. The negative link between trade openness and inflation is further explored and supported by various studies such as Lane (1997), Sachsida et al., (2003), Kim and Beladi (2005), Gruben and McLeod (2004), Samimi et al., (2012), Wynne and Kersting (2007), Badinger (2009), Lin (2010), Joshi and Acharya (2010), Kim et al., (2012), Haq and Zhu (2016), Bowdler and Malik (2017), Lin, Mei, Wang and Yao (2017), and Jedidia et al. (2019). These studies contend that trade openness influences inflation through various channels such as improved efficiency, reduced cost of production, better allocation of resources, higher domestic and foreign investment and increased output growth.

On the other hand, studies by Evans (2007), Terra (1998), Rajagopal (2007), Cooke (2010), Ghanem (2010), Samimi et al., (2012), Thomas (2012), Neeraj et al., (2014), Watson (2016), Zombe et al. (2017), and Sahu and Sharma (2018) refute Romer's (1993) hypothesis and substantiate positive association between inflation and trade openness. These studies maintain that trade openness leads to higher inflation. More

recently, the studies attempt to scrutinize the existence of asymmetries between trade openness and inflation. For instance, Ajaz, Nain and Kamaiah (2016) assert an asymmetric relationship between openness and inflation in India. Jedidia et al. (2019) state that it is important to identify threshold level of trade openness in order to assess asymmetries between inflation and openness. All this clearly suggests that trade openness does matter for inflation, nonetheless, the impact of the former on the latter is ambiguous.

Pakistan started its journey towards trade liberalization in the 1980s. Over time, a number of trade related reforms such as reduction in tariffs and quantitative restriction on trade along with abandonment of fixed exchange rate regime have been introduced in the economy. This is reflected in a persistent increase in trade to gross domestic product (GDP) ratio for the country, implying an increasing integration with the world economy. Inflation was not a serious problem until the end of 1960s, it remained in single digit and peaked at 9% in 1966-7 after the war with India, due to slow movement of goods across the country. In the early 1970s, however, a host of domestic and external factors including separation of East Pakistan, now Bangladesh in 1971, the sharp reversal of policies by the new government including nationalization of large manufacturing sector as well as small scale agricultural industry, the financial sector as well as the social sectors in 1972 resulted in decline in the growth performance of productive sectors of economy. Hence, the country had to experience a decline in exports and an increase in imports. This coupled with more than 100% devaluation of the currency in 1972 and sharp acceleration of oil prices in the world market particularly in 1974 and 1979 induced sharp rise in general price level. During the 1970s Pakistan adopted four Stand by or one-year non-conditional adjustment programs of the International Monetary Fund (IMF) to reform the external sector, promote growth, and control inflation with no success. In the early 1980s Pakistan devalued the currency again, the slow reversal of the policy of nationalization by the military government and a discouraging response by the private sector continued to adversely impact exports and imports, leading to sharp increase in current account deficit and the fiscal deficit stood at 8.7% of GDP in the fiscal year1987-88. After the complete failure of the Standby programs of the 1970s, Pakistan adopted the Extended Fund Facility (EFF) or the three year highly

conditional Structural Adjustment Program (SAP) of the IMF in 1988. The conditional programs which continued in the 1990s and beyond, introduced massive reforms in the manufacturing, banking, financial and foreign sectors in Pakistan (Zaidi, 2015). During the 1990s Pakistan gradually increased its pace of international integration by adopting various measures such as privatization, and liberalization of economic and financial sectors, movement towards free float exchange rate regime and lifting up controls on short term capital movement.

A journey towards the path of trade liberalization has also experienced fluctuating behaviour of inflation in the country due to a number of factors. For instance, the liberalization process expanded demand of goods and services. Easy and/ or accommodative monetary policy has been adopted to boost exports and various other fiscal measures adopted to promote trade liberalization process contributed in inflationary pressures in post liberalization process. In addition, depreciation in Pak rupee and oil price fluctuations have also major contribution in inflationary pressure in Pakistan. The relationship between inflation and trade openness remains unclear during the study period. For instance, 1970s witnessed a high inflation (10.87%) and low size of trade openness (24.06) while 1980s figures show and decrease in inflation rate (6.98%) while higher degree of trade openness (30.0%) is experienced during this time period. During 1990s, there is an increase in extent of trade openness (33.38%) along with an increase in inflation rate (9.25). The decade of 2000s indicates a very low inflation rate of 4.31% with a slight decline in the degree of (29.90%). Thus, it is not clear whether the relationship between inflation and openness is positive or negative in Pakistan. Moreover, it is also imperative to assess whether this relationship is linear or nonlinear.

The changing trends of inflation have attracted the attention of research scholars to examine the link between trade openness and inflation in Pakistan. For instance, studies by Ashra (2002), Gruben and Mcleod (2004) and Kim and Beladi (2004) based on panel data framework have concluded a negative and symmetric relationship between the two. Similarly, the time series results provided by Hanif and Batool (2006), and Mukhtar (2010) show that openness reduces inflation in Pakistan. In contrast, time series analyses conducted by Munir and Kiani (2011) and Zakaria (2011) document a positive association of

openness with inflation. Though there is considerable amount of research work available on linking the trade openness with inflation, however, all these studies have examined linear association between openness and inflation for Pakistan.

In view of the inconclusive evidence from the existing literature looking at the symmetry in inflation and openness, the present study aims to reassess inflation-trade openness nexus considering asymmetric aspect in this relationship in the context of Pakistan. In other words, the objective of the study is to examine whether the effects of trade openness on inflation are symmetric or whether increase in openness affects inflation differently than the reduction in the level of openness. Since the main focus of this study is on investigating asymmetric relationship between inflation and trade openness in a small open developing economy, it will make a vital addition to the relevant stock of literature on Pakistan.

The rest of the study is structured as follows: section II outlines a model of inflation and trade openness nexus along with data and econometric technique used to estimate the model; analysis of the results are reported in section III; and finally section IV concludes the study.

II. ANALYTICAL FRAMEWORK

THE MODEL

This study seeks to examine the dynamic association between trade openness and inflation for Pakistan's economy allowing for asymmetry in this association. Inflation is a complex phenomenon and it is not possible to identify and incorporate all the determinants of inflation in a single model. The standard practice is to work with a single equation model treating inflation rate as dependent variable while trade openness and some other important variables are taken as explanatory variables. Following Romer (1993), Yiheyis (2013), Jedidia et al. (2019), among others, the model adopted in this study is given by equation (1) as:

$$CPI = f(TROP, GDPGR, M2, EER, REM) \quad (1)$$

where, CPI, $TROP$, $GDPG$, $M2$, EER and REM represent consumer price index, trade openness, growth rate of GDP, the broadly defined

money supply, nominal effective exchange rate and foreign remittances respectively. The econometric specification of equation (1) can be written as:

$$LCPI_t = \beta_0 + \beta_1 TROP_t + \beta_2 GDPGR_t + \beta_3 LM2_t + \beta_4 LEER_t + \beta_5 REM_t + u_t \quad (2)$$

where, all variables are logarithmic except trade openness, growth rate of GDP, and foreign remittances. LCPI is used as a measure of inflation. TROP measures trade openness. As Romer (1993) proposes that open economies experience low inflation as the incentive of monetary surprise is low in open economies thus portraying an important link between the two. GDPGR is measure of economic activity. As explained by Romer (1993), GDP can influence inflation through various channels. For instance, higher GDP leads to higher supply of goods which will reduce the prices. Following Zakaria (2011) and Mukhtar (2010), $M2$ indicates the stance of monetary policy because in the long run monetary policy decisions determine the extent of inflation in a country. An expansionary monetary policy induces inflationary pressures and vice versa. Moreover, Quantity Theory of Money (QTM) by Cambridge Approach and Freidman restatement of QTM explain the direct effect of money supply on prices. The impact of exchange rate on domestic prices is advocated by currency pass through affect. An increase in EER leads to expensive imports which will increase domestic prices, termed as imported inflation (Mukhtar, 2010; Jedidia et al., 2019; Ajaz et al., 2016). The impact of remittances depends on how this source of external finance is utilized. Remittances tend to induces variations in price behavior by affecting the purchasing power of a country, increasing foreign exchange reserves, and also by appreciating the exchange rate (Iqbal et al., 2019).

We expect that:

$\beta_1 < 0$, $\beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0$.

DATA AND ECONOMETRIC METHODOLOGY

The dataset consists of annual time series observations from 1972 to 2016 for Pakistan. Inflation rate has been proxied by CPI. To keep inflation within some specified limit is the principal objective of

monetary policy in Pakistan. In this regard, the State Bank of Pakistan (SBP) announces a target for inflation rate. Since long time series data for various measures of openness is hard to acquire (Ashra, 2002), therefore, trade openness is generally defined as total trade (imports + exports) as percent of GDP which indicates the overall openness of the Pakistan's economy. Data for CPI, imports, exports, money supply, nominal effective exchange rate and GDP are accessed from the IMF's International Financial Statistics (IFS) while GDPGR and foreign remittances (as percent of GDP) data are obtained from World Development Indicators (WDIs) published by the World Bank

For estimation purposes the study has employed the nonlinear autoregressive distributed lag (NARDL) technique developed by Shin et al. (2014) which is basically an asymmetric version of the renowned linear ARDL model of Pesaran et al. (2001). The NARDL technique accommodates short run and long run asymmetries (or nonlinearities) by taking partial sum decomposition of explanatory variable(s). This technique is also equally applicable in a situation when the regressors do not have same order of integration i.e., it can be employed when the underlying regressors are I(0), I(1) or an amalgamation of both. To get an expression for asymmetric association between inflation and trade openness we begin with the linear ARDL model as:

$$\Delta LCPI_t = \alpha_0 + \alpha_1 LCPI_{t-1} + \alpha_2 TROP_{t-1} + \alpha_3 LM2_{t-1} + \alpha_4 GDPGR_{t-1} + \alpha_5 LEER_{t-1} + \alpha_6 REM_{t-1} + \sum_{i=1}^{p-1} \gamma_1 \Delta LCPI_{t-i} + \sum_{i=0}^{q-1} \gamma_2 \Delta TROP_{t-i} + \sum_{i=0}^{q-1} \gamma_3 \Delta LM2_{t-i} + \sum_{i=0}^{q-1} \gamma_4 \Delta GDPGR_{t-i} + \sum_{i=0}^{q-1} \gamma_5 \Delta LEER_{t-i} + \sum_{i=0}^{q-1} \gamma_6 \Delta REM_{t-i} + e_t \quad (3)$$

To convert expression (3) into asymmetric or nonlinear ARDL model first of all trade openness variable is decomposed into its positive and negative partial sums where formal and latter partial sums represent increase and decrease in trade openness, respectively. Ensuing Shin et al., (2014) the asymmetric decomposition of trade openness variable is computed as:

$$TROP_t^+ = \sum_{i=1}^{t} \Delta TROP_i^+ = \sum_{i=1}^{t} \max(\Delta TROP_i, 0); TROP_t^- = \sum_{i=1}^{t} \Delta TROP_i^- = \sum_{i=1}^{t} \min(\Delta TROP_i^-, 0) \quad (4)$$

Now equation (3) can be converted into the asymmetric error correction model (ECM) as follows:

$$\Delta LCPI_t = \alpha_0 + \alpha_1 LCPI_{t-1} + \alpha_2^+ TROP_{t-1}^+ + \alpha_2^- TROP_{t-1}^- + \alpha_3 LM2_{t-1} + \alpha_4 GDPGR_{t-1} + \alpha_5 LEER_{t-1} + \alpha_6 REM_{t-1} + \sum_{i=1}^{p-1} \gamma_1 \Delta LCPI_{t-i} + \sum_{i=0}^{q-1} \left\{ \begin{array}{l} \gamma_2^+ \Delta TROP_{t-1}^+ + \gamma_2^- \Delta TROP_{t-1}^- + \gamma_3 \Delta LM2_{t-i} + \gamma_4 \Delta GDPGR_{t-i} \\ + \gamma_5 \Delta LEER_{t-i} + \gamma_6 \Delta REM_{t-i} \end{array} \right\} + e_t \quad (5)$$

where, Δ indicates the first difference operator, α_0 shows drift component, α_i is long run coefficients, γ_i represents short run coefficients with $i = 1....6$, and e_t is usual white noise random error term. Expression (5) can be more compactly written as:

$$\Delta LCPI_t = \alpha_1 ECT_{t-1} + \sum_{i=1}^{p-1} \gamma_1 \Delta LCPI_{t-i} + \sum_{i=0}^{q-1} \left\{ \begin{array}{l} \gamma_2^+ \Delta TROP_{t-1}^+ + \gamma_2^- \Delta TROP_{t-1}^- + \gamma_3 \Delta LM2_{t-i} + \gamma_4 \Delta GDPGR_{t-i} \\ + \gamma_5 \Delta LEER_{t-i} + \gamma_6 \Delta REM_{t-i} \end{array} \right\} + e_t \quad (6)$$

where, $ECT_t = LCPI_t - \delta_1^+ TROP_t^+ - \delta_1^- TROP_t^- - \delta_2 LM2_t - \delta_3 GDPGR_t - \delta_4 LEER_t - \delta_5 REM_t$

is the nonlinear error correction term and $\delta_1^+ = \frac{\alpha_2^+}{\alpha_1}, \delta_1^- = \frac{\alpha_2^-}{\alpha_1}, \delta_2 = \frac{\alpha_3}{\alpha_1}, \delta_3 = \frac{\alpha_4}{\alpha_1}, \delta_4 = \frac{\alpha_5}{\alpha_1}, \delta_5 = \frac{\alpha_6}{\alpha_1}$ are the associated asymmetric long run parameters. Two important issues are set for asymmetric analysis of inflation and trade openness association using the nonlinear ARDL technique. Firstly, to check for existence or non-existence of cointegration between inflation and all explanatory variables

of model (1), the null hypothesis of no cointegration i.e. $\alpha_1 = \alpha_2^+ = \alpha_2^- = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ is tested by using lower and upper bounds critical values of F-test statistic as provided by Pesaran et al. (2001). Rejection of null hypothesis indicates presence of long run relationship between inflation and trade openness along with other explanatory variables given in model (5). Secondly, the standard Wald test is applied to test symmetric long run and symmetric short run relationships between inflation and trade openness to the null hypotheses $\alpha_2^+ = \alpha_2^-$ and $\gamma_2^+ = \gamma_2^-$ respectively.

III. RESULTS AND DISCUSSION

Before running the asymmetric cointegration test between inflation and trade openness, it is pertinent to test the stationarity properties to ensure that none of the selected variable is integrated of order two i.e., I(2). To this end, we have applied the widely used Augmented Dickey-Fuller (ADF) unit root test and the results are displayed in Table 1. Inflation, money supply, nominal effective exchange rate and foreign remittances are non-stationary (contain a unit root) at level, nonetheless, these become stationary at the first difference. Trade openness and economic growth are found to be stationary at level. As the regressors of the model (2) are a mixture of I(0) and I(1) while none of them is I(2), we can conveniently proceed to test for the asymmetric long run association between inflation and trade openness in Pakistan.

TABLE 1

Estimates of Unit Root Test

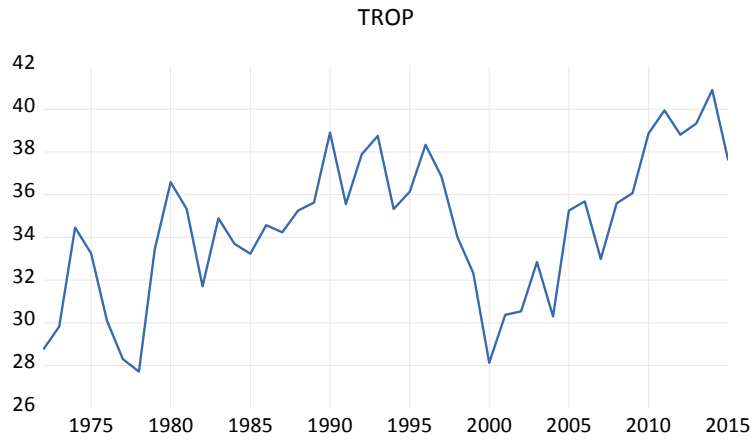
Variable	Level	First Diff	Test Critical Value (at 5% Significance Level)	Decision
LCPI	-0.534	-3.226	-2.933	I(1)
TROP	-2.999	-	-2.933	I(0)
GDPG	-4.971	-	-2.933	I(0)
LM2	-2.019	-4.890	-2.933	I(1)
LEER	-0.431	-7.231	-2.933	I(1)
REM	-1.009	-4.344	-2.933	I(1)

The NARDL technique begins by distinguishing between positive and negative components of trade openness variable. Figure 1 portrays the overall trade openness along with its positive and negative components

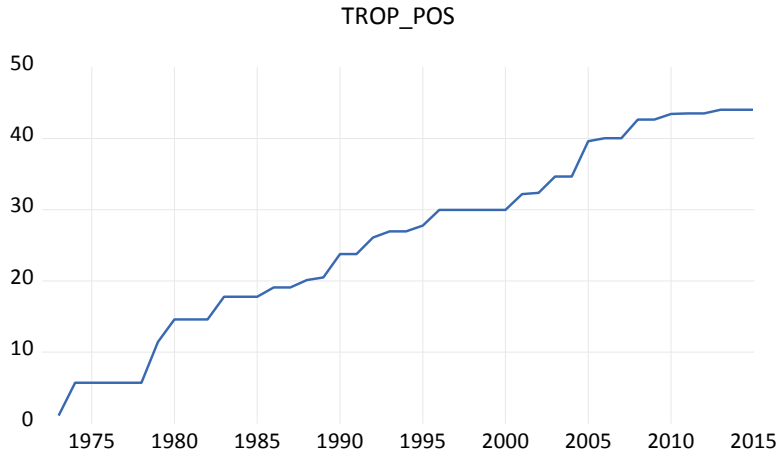
FIGURE 1

Overall Trade Openness (a) its positive (b) and negative (c) components

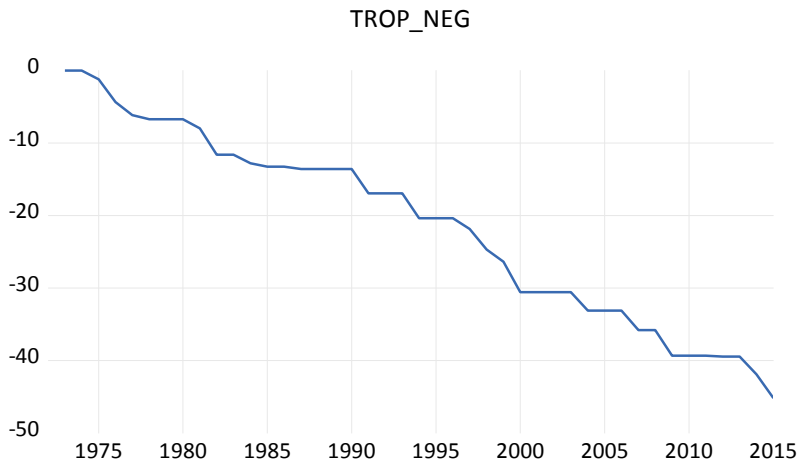
(a)



(b)



(c)



As a first important step pertaining to the determination of the cointegrating relationship between inflation and all the selected explanatory variables including positive and negative components of trade openness variable given in model (5), we have tested the following null hypothesis of no cointegration: $\alpha_1 = \alpha_2^+ = \alpha_2^- = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$

We reject the null hypothesis of no cointegration at 1% level of significance as the F-test statistic for the joint significance of the parameters of the lagged level variables is11.422 which surpasses the upper bound value at 1% level (Table 2).

TABLE 2

Estimates of F Test (Bound Test)

Test Statistic	Value	df
F-stat	11.422 (0.00)	(7, 24)

Next, existence of the long run asymmetric association between inflation and trade openness is determined by the Wald test (Table 3).

TABLE 3

Long Run Asymmetry (Wald Test)

Test Statistic	Value	Df
Chi Square	0.086 (0.769)	1

The results displayed in Table 3 indicate that we fail to reject the null hypothesis of a long run symmetric association between inflation and trade openness in Pakistan. Hence, it can safely be stated that the positive and negative components of trade openness have exerted similar influence on inflation in Pakistan during the selected time period. This finding supports the use of linear ARDL model for analysing cointegration between inflation and trade openness in Pakistan. It also implies that taking into account long run non-linearity lacks any merit while investigating the relationship between inflation and trade openness in the context of Pakistan.

TABLE 4

Long Run Parameter Estimates

Dependent Variable: LCPI		
Variable	Coefficient	t-stat
TROP_POS	0.153***	3.518
TROP_NEG	0.127***	3.214
LM2	0.571***	3.473
GDPGR	-0.009*	-1.946
LEER	0.680***	5.544
LREM	0.124***	6.144
C	6.235***	3.234
@TREND	-0.149***	-3.517

Note: *** and * indicate significant at 1% and 10% levels respectively.

In the long run, both the positive and negative components of trade openness establish a positive relationship with inflation which indicates

that inflation is increasing in trade openness irrespective of the asymmetric nature of the variable (Table 4). The extent of positive impact of both the components of trade openness on inflation are not considerably different as the estimated values of positive and negative components are 0.153 and 0.127, respectively. Hence, a positive shock to trade openness will lead to an increase in inflation while a negative shock to this variable will have a dampening effect. This finding raises serious questions about the price stability objective of the State Bank of Pakistan in the presence of the stated policy of the government of Pakistan towards more outward-orientation of the economy. This outcome can be defended if we consider the importance of oil, machinery and other manufactured goods' imports to Pakistan which have an increasing effect on price level in the country due to their price increasing trend. Overall, the finding of the study corroborates the positive relationship between inflation and trade openness as shown by Evans (2007), Terra (1998), Rajagopal (2007), Cooke (2010), Ghanem (2010), Munir and Kiani (2011), Zakaria (2011), Samimi et.al., (2012), Thomas (2012), and Neeraj et al. (2014). Hence, we fail to find the validity of Romer's proposition regarding inflation and trade openness association in the long run in Pakistan.

With regard to rest of the explanatory variables the results are in accordance with our prior expectations. Money supply, nominal effective exchange rate and foreign remittances are positively related to inflation. Over the course of time, the monetary authorities were unable to check unnecessary increases in money supply in Pakistan as successive governments refused to grant autonomy to the Central Bank. Our findings are similar to Zakaria (2011) and Iqbal et al. (2013) who also document an increase in inflation in consequence to increase in money supply. At the same time, the external sector performance remained poor; current account deficit has become a permanent feature due to declining exports and rising imports passed on to the investors as well as the consumers at highly subsidized rates, along with a persistent decline in the value of domestic currency in terms of all the major currencies of the world. Persistent rise in money supply and effective exchange rate directly contributed in generating inflationary pressures in the country. Mukhtar (2010) and Iqbal et al. (2013) have also reported an increase in domestic price level in response to an increase in real exchange rate. No doubt,

foreign remittance income is regarded as a blessing for a foreign exchange deficit country like Pakistan but excessive consumption oriented use of remittances mainly results in price hike. Same has happened in Pakistan where increase in foreign remittances brought a significant boost in consumption spending rather than in enhancing productive capacity of the economy. Consequently, the inflow of excessive money supply through remittances, unmatched by increase in domestic output leads to a positive relationship between inflation and money supply. Similar findings are reported by Iqbal et al. (2013). They also stress on the importance of channelizing the remittances towards productive investment. Finally, economic growth rate bears a negative relationship with inflation which implies that for price stability it is essential to keep economic growth performance at reasonable levels in accordance with the rise in money supply which helps in checking price hike (Bilquees, 1988; Kemal, 2006; Iqbal et al., 2013).

The short run analysis brings some conflicting outcomes as we reject the null hypothesis of short run symmetry (see middle section of Table 5). It implies an asymmetrical association between inflation and trade openness in the short run. This finding questions the application of linear error correction model for testing the inflation-trade openness nexus in Pakistan. The top section of Table 5 shows that the positive component of trade openness positively affects inflation, while its negative component appears to be an insignificant determinant of inflation in the short run.

Money supply, nominal effective exchange rate and foreign remittances are again appeared as significantly and positively influencing inflation rate in Pakistan. It implies that all these three variables play their role in determining inflation both in the short run and the long run in the country. However, economic growth performance does nothing in shaping inflation behaviour in the short run in Pakistan. Notably, the coefficient of lagged error correction term (ECT) carries a negative sign which signifies stability of long run equilibrium relationship between inflation and all the explanatory variables of model (1). The coefficient value of lagged ECT is -0.556 and it is significant at 1% level. It indicates that if the long run equilibrium between inflation and all the regressors of model (1) is disturbed, in every short run period almost 56% correction towards restoring the long run equilibrium will take place. In other words within two years any deviation from the equilibrium position

will be corrected. At the bottom of Table 5, results of four diagnostic tests are reported which clearly depict that the estimated model does not suffer from serial correction, heteroscedasticity, functional form and normality issues. These outcomes actually increase our confidence on the overall findings of the estimated model. Finally, CUSUM and CUSUM of Squares tests suggest stability of the parameter estimates of the estimated model as their plots stay within 5% level of significance (see Figure 2).

TABLE 5

Short Run Asymmetry and Asymmetric Error Correction Model

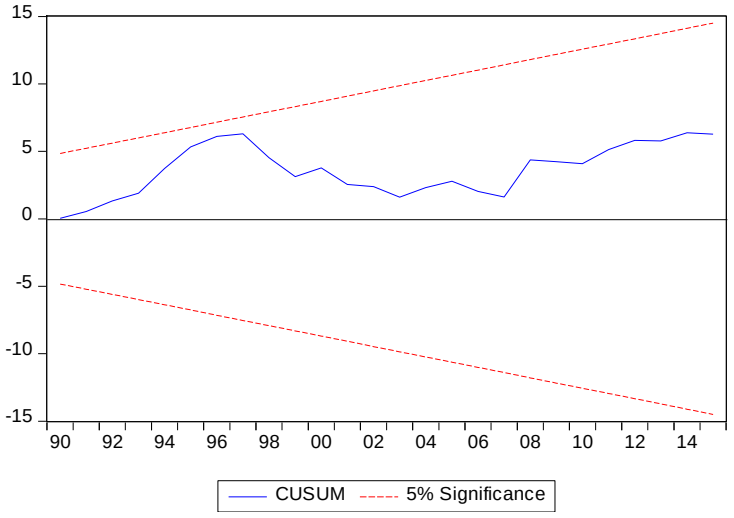
Dependent Variable: LCPI		
Variable	Coefficient	t-stat
D(TROP_POS)	0.066**	2.215
D(TROP_NEG)	-0.002***	-0.593
D(TROP_NEG(-1))	-0.009	-0.448
D(LM2)	0.317***	3.058
D(GDPGR)	-0.003	-1.609
D(LEER)	0.248***	3.015
D(LEER(-1))	0.138	1.580
D(LREM)	0.032***	3.872
D(@TREND())	-0.038***	-5.746
ECT(-1)	-0.559***	-4.714
Short Run Asymmetry (Wald Test)		
Test Statistic	Value	Df
Chi Square	19.786	1
(p value)	(0.000)	
Diagnostic Tests		
χ^2_{SC} = 0.784(0.521)		χ^2_{H} = 0.955(0.387)
χ^2_{FF} = 0.622(0.603)		χ^2_{N} = 3.525(0.183)

Note: *** and ** indicate significant at 1% and 5% levels respectively. χ^2_{SC}, χ^2_{H}, χ^2_{FF} and χ^2_{N} denote LM test for serial correlation, heteroscedasticity, functional form and normality respectively. The associated p values are in parentheses

FIGURE 2

Plots of CUSUM and CUSUMSQ

(a)



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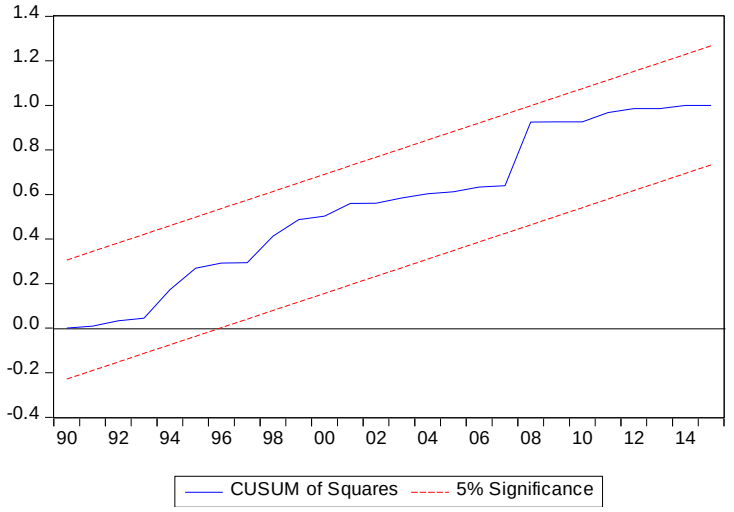

IV. SUMMARY AND CONCLUSIONS

Since Romer's (1993) seminal work the researchers have failed to get a decisive answer about the nature of relationship between inflation

and trade openness. Consequently, this issue continues to attract the attention of researchers to reassess inflation-trade openness nexus for a small open developing economy like Pakistan. One of the basic limitations of the existing body of literature on inflation and trade openness is treating inflation as a linear function of trade openness without any economic or econometric reasoning. The development of nonlinear ARDL technique by Shin et.al. (2014) paved the way for empirically investigating inflation and trade openness association within a nonlinear or asymmetric framework. This technique is capable of simultaneously testing the short run and the long run nonlinearities through positive and negative partial sum decompositions of trade openness variable.

Since in the 1980s, Pakistan's economy started to steadily integrate with the world economy which has increased the possibilities of external shocks to shape price behaviour in the country. The present study has attempted to reinvestigate the inflation-trade openness nexus for the period 1972 to 2016 using the nonlinear ARDL model in Pakistan. The findings of the study indicate that in the long run inflation and trade openness form linear or symmetric relationship while their association is nonlinear or asymmetric in the short run in Pakistan. Furthermore, the link between inflation and trade openness has emerged to be positive both in the short run and the long run which obviously illustrates that increasing integration with the world economy brings inflationary pressure in the country. Hence, Romer's assertion that trade openness tends to restrain inflation has turned out to be inconsistent with Pakistan's data. Money supply, nominal effective exchange rate and foreign remittances are significantly associated with inflation both in the short run and the long run, whereas, economic growth rate adversely impacts inflation only in the long run while it does not influence inflation in the short run. As greater openness to trade is associated with possible soaring of inflation, it reinforces the fear that trade liberalization will increase macroeconomic instability in Pakistan. Therefore, it is imperative to adopt effective and well integrated fiscal, monetary and trade policies in the country so that price stability can be achieved and maintained without compromising the degree of trade liberalization.

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