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ARDL – Analysis of the Relationship among Exports, FDI, Current Account Deficit and Economic Growth in Pakistan

Khalid Mahmood Zafar*[1]

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Abstract

This paper empirically examines the relationship among exports, foreign direct investment, current account deficit, and economic growth in Pakistan during 1975-2016. We adopted the autoregressive distributed lag (ARDL) approach to co-integration together with ECM techniques to trace long-run and short-run relationships. The results demonstrate a positive and significant relationship between exports, foreign direct investment, and economic growth in Pakistan in the long and short-run. In contrast, results depict that the current account deficit is negatively and significantly correlated to economic growth in the long-run and short-run. Furthermore, the Granger causality test reports the unidirectional causality from exports to economic growth.

Keywords: Economic Growth, Exports, ARDL, ECM, Causality, Pakistan.

JEL Classification: F13, E22, F32.

1. Introduction

International trade has played an important role in the development of both developed and underdeveloped countries, as countries are dependent on one another due to uneven distribution of resources. Trade is not only undesirable but also inevitable because countries have to cater to the growing needs of their economies. Export of agricultural and other primary commodities accounts for a major share of developing countries income (Todaro and Smith, 2003).

Trade enables countries to specialize in the production of those commodities in which they have a comparative advantage. With

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1. SDM, Education Department, Dera Ismail Khan, Pakistan (Corresponding Author: kmzafar9@gmail.com).

specialization countries are able to take the advantage of efficiencies of scale and increased output. International trade increases the size of a firm's market, resulting in lower average costs and increased productivity, ultimately leading to increased production. The countries involved in free trade experience rising living standards, increased real income and higher rates of economic growth.

Trade openness brings many economic benefits, including increased technology transfer of skills, increased labor, transfer total factor productivity and economic growth and development. With free trade, it is, much easier for nations to focus on producing the goods for which they have a comparative advantage.

On the other hand, the excess of imports on exports result in the trade deficit. The balance of payments statistics demonstrates that except for few years, Pakistan has been facing persistent Current Account Deficit (CAD) which is a warning and dangerous signal for the overall health of the economy because this implies that the country is importing present consumption and exporting future consumption and the future generations have to bear the burden of the profligacy of the past generation. All the available options to meet CAD are unpleasant. The deficit country is consuming more than it is producing domestically. Foreign aid and remittances have financed major proportion of imports in 1960s – 1980s.Both short-run and long-run foreign capital inflows to meet CAD have political implications culminating in compromising the sovereignty of the country. Accommodating capital inflow makes the deficit country a client state, and the country becomes unable to pursue desirable economic policies independently. Such state of affairs characterizes Pakistan's economy over the decades (Afzal and Ali, 2008).

Current account deficit lowers aggregate demand and decrease the exchange rate. Current account deficit, therefore, contribute to debt and a potential downward spiral of negative basic transfer (loss of foreign exchange and a net outflow of capital), dwindling foreign reserves and stalled development prospects (Holmes, 2006b).

Therefore, the objective of this research is to examine the relationship among exports, foreign direct investment and economic growth in Pakistan. Rest of the research paper is designed as follows: Section 2 will discuss the literature review, in section 3 data and specification of the model is described, section 4 explains the methodology, section 5 provides the estimation and interpretation of empirical results and finally, conclusion and policy implications will end up the paper in section 6.

2. Literature Review

The literature review is consisting of empirical studies on all those variables, which are being used in this paper (equation 1) is discussed as follows.

Afzal (2006) investigated the causality between exports, world income and economic growth in Pakistan and found a stable as well as strong relationship between economic growth and exports. His findings report that there exists bi-directional causality between industrial exports and economic progress for Pakistan economy.

Gudaro et al. (2010) investigated the impact of foreign direct investment on economic growth for Pakistan. The data used in this study over the period 1981-2010.They did the regression analysis by taking the GDP as dependent variable and foreign direct investment and consumer price index as the independent variable. Study concluded the significant and positive impact of FDI on economic growth, and negative impact of consumer price index (CPI) on GDP.

Alam (2011) investigated the efficiency of export-led growth hypothesis In Pakistan. This study used twenty seven years (1971-2007) quarterly time series data from Pakistan. The study applied the co-integration technique and error correction model to investigate the relationship among the export, import and GDP growth. He found a positive relationship among economic growth and imports and exports.

Hye and Siddiqui (2011) investigated the nature of relationship among the exports, terms of trade and economic growth by using the ARDL approach and rolling window regression method for the data over the period 1985-2008.Their empirical findings indicate that long-run relationship exist when real gross domestic product (GDP) and real exports are dependent variables.

Khan and Khan (2011) established an empirical relationship between industry specific foreign direct investment and output under the frame work of Granger causality and panel cointegration for

Pakistan over the period198-2008.The results supports the evidence of panel cointegration between FDI and output. FDI has a positive effect on output in the long-run. The result also supports the evidence of long-run causality running from GDP to FDI, while in the short run the evidence of two-way causality between FDI and GDP is identified. The most striking result obtained is that FDI causes growth in primary and services sectors, while growth causes FDI in the manufacturing sector.

Alavinasab (2013) empirically analyzed the relationship between exports and economic growth in Iran by taking a time – series data for the period of 1976-2010. He applied the ordinary least square (OLS), unit root tests and co-integration method to investigate the relationship among GDP exports, inflation and exchange rate. The result of the study showed that there is a positive and significant effect of exports, inflation and real exchange rate on economic growth in Iran.

Sahin and Mucuk (2014) investigated the effect of current account deficit on economic growth for Turkey over the period 2002-2013. Their empirical findings show that current account deficit affect economic growth negatively for Turkish economy.

Bashir et al. (2015) investigated the exports-led growth hypothesis in Pakistan by applying unit root test, cointegration vector error model and Granger causality tests. They used the time-series data for the period of 1972-2012. Their finding revealed that there is a strong positive long run as well as short run relationship between exports and economic growth in Pakistan.

Tahir et al. (2015) analyzed the relationship between external determinants and economic growth of Pakistan economy. Empirical analysis was carried out with time series econometric techniques using data over the period 1977-2013.According to their findings the foreign remittances and foreign direct investment have a significant positive role in the growth process of Pakistan economy.

Tunian (2015) investigated the impact of current account deficit on economic growth of Armenia. Estimating the econometric VAR models revealed that the negative current account impacts on GDP growth negatively.

Pandya and Sisombat (2017) examined foreign direct investment (FDI) inflows and its impact on economic growth in Australia through multiple regression analysis. The results highlight that FDI inflows contribute to the Australian economy including a growth in GDP, exports performance and employment.

Edeme et al. (2018) analyzed the relationship between exports and economic growth in Nigeria. They employed the Toda-Yamamoto Granger causality framework and found unidirectional causality running from exports to economic growth. They suggested that encouraging exports is necessary in stimulating growth.

3. Data and Specification of the Model

This study uses annual time series data for the period 1975-2016 for Pakistan, which is taken from Pakistan economic survey various issues and State Bank of Pakistan's annual reports. In order to examine the relationship among Exports, Foreign Direct Investment, Current Account Deficit and Economic Growth in Pakistan the following Econometric model is developed.

$$\mathbf{lnGDP_t = \beta_0 + \beta_1 lnX_t + \beta_2 lnFDI_t + \beta_3 lnCAD + \varepsilon_t} \tag{1}$$

Dependent Variable

$lnGDP_t$= Gross Domestic Product (GDP serves as proxy for Economic Growth.)

Explanatory Variables

lnX_t = Exports

$lnFDI_t$ = Foreign Direct Investment

$lnCAD_t$ = Current Account Deficit

ln= Natural Logarithm

β_0 =the constant or the intercept.

$\beta_1 - \beta_3$ = are the parameters/ coefficients of the explanatory variables.

While, the expected signs of the parameters are: $\beta_1>0$, $\beta_2>0$ and $\beta_3<0$

The error term (ε)is assumed to be independently and identically distributed. The subscript (t) indexes time.

4. Methodology

We will apply the Autoregressive Distributed Lag approach to co-integration (ARDL) together with ECM techniques. Equation (1) represents only the long-run equilibrium relationship and may form a co integration set provided all the variables are integrated of order 0 and 1, i.e. I(0) and I(1).

4.1 Unit Root Test

Since macroeconomic time-series data are usually non-stationary and thus conducive to spurious regression (Mukhtar, 2010; Nelson and Plooser, 1982). A time series which have a unit root is said to be non-stationary. Therefore, in order to conduct a meaningful statistical analysis, one should assess the stationary of the involved time series. According to (Brooks, 2014) stationarity can be defined as a time series with a constant mean, constant variance and constant auto-covariance for each given lag i.e. all are constant over time. A non-stationary time series y_t that is stationary in first difference is said to be integrated of order one and is denoted by $y_t \sim I(1)$.In general if a non-stationary series must be differenced d times before becoming stationary the series is said to be integrated of order d and is denoted by I(d).If the series is stationary at level e.g. y_t (non-differenced) it is denoted by $y_t \sim I(0)$ (Brooks, 2014).To test the time series data for stationary a common method is to apply an Augmented Dickey-Fuller test (ADF) (Dickey and Fuller, 1979) to test for a unit root. Keeping in view the error term which is found to be white noise, Dickey and Fuller made some modifications in their test procedure and introduced an augmented version of the test to overcome the problem of autocorrelation in the test equation by including the extra lagged terms of the dependent variable hence, this test is now known as ADF test. We therefore, use the ADF test to test the unit root. The ADF test, tests the null hypothesis that a series $Y_t$is non-stationary by calculating a t-statistic for $\delta = 0$ in the following regression.

$$\Delta Y_t = \alpha + \gamma T + \delta Y_{t-1} + \sum_{i=1}^{p} \beta i \Delta Y_{t-i} + u_t.$$

Where,α and γT arethedeterministic elements,Y_t is a variable at time t, and $u_t$is the disturbance term.

4.2 ARDL Model Specifications

In order to empirically analyze the long-run co-integration and dynamic interactions among the variables under consideration, we employ the most recently introduced, the autoregressive distributed lag (ARDL) approach to cointegration developed by Pesaran et al. (2001). This procedure is adopted for three reasons: first, the bounds test procedure is simple. As opposed to other multivariate cointegration techniques such as Johansen and Juelius (1990), it allows the cointegration relationship to be estimated by OLS once the lag order of the model is identified. Secondly, the bounds testing procedure does not require the pre-testing of the variables included in the model for unit boots unlike other techniques such as the Johansen approach. It is applicable irrespective of whether the underlying regressors in the model are purely I(0), I(1) or fractionally/mutually cointegrated. Thirdly, the test is relatively more efficient in small or finite sample data sizes as is the case in this study. The procedure will however crash in the presence of I(2) series (Fosu and Magnus, 2006 : 2080).

The ARDL bounds testing approach is given as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta Y_{t-j} + \varepsilon_t \qquad (2)$$

Where α_0 is the drift component and ε_t are white noise errors.

On the basis of equation (2), unrestricted error correction version of the ARDL model is given by:

$$\begin{aligned} \Delta \ln GDP_t = {} & \varphi + \lambda_1 \ln GDP_{t-1} + \lambda_2 \ln X_{t-1} + \lambda_3 \ln FDI_{t-1} + \lambda_4 \ln CAD_{t-1} \\ & + \sum_{i=1}^{p} \alpha \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_1} \beta \Delta X_{t-i} + \sum_{i=0}^{q_2} \gamma \Delta \ln FDI_{t-i} \\ & + \sum_{i=0}^{q_3} \delta \Delta \ln CAD_{t-i} + \varepsilon_t \qquad (3) \end{aligned}$$

The long-run dynamics of the model are revealed in the first part. Where, the short-run effects/relationships are shown in the second part with summation sign, while Δ is the first difference operator.

Where λ_i are the long run multipliers, φ is the Drift, andε_t are white noise errors.

4.3 Bounds testing Procedure

According to (Fosu and Magnus, 2006: 2080) The first step in the ARDL bounds testing approach is to estimate equation (3) by ordinary least squares (OLS) in order to test for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables, i.e., $H_{0:}\ \lambda_1 = \lambda_2 = \lambda_3 = \lambda 4 = 0$ (no long-run relationship) against the alternative H_1: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda 4 \neq 0$(long-run relationship exists).We denote the test which normalize on GDP by F_{GDP}(GDP\X,FDI,CAD). Two asymptotic critical values bounds provide a test for co integration when the independent variable are I(d)(where $0 \leq d \geq 1$): a lower value assuming the regressors are I(0), and an upper value assuming purely I(1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the order of integration for the time series. Conversely, if the test statistic falls below the lower critical value the null hypothesis cannot be rejected. Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive. The approximate critical values for the F and t tests were obtained from Pesaran et al. (2001).

In the next step, once cointegration is estimated, the conditional ARDL (p, q_1, q_2, q_3) long run model derives from following equation:

$$\Delta \ln GDP_t = \varphi + \sum_{i=1}^{p} \alpha \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_1} \beta \Delta X_{t-i} + \sum_{i=0}^{q_2} \gamma \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_3} \delta \Delta \ln CAD_{t-i} + \varepsilon_t \qquad (4)$$

where all variables under consideration have already been explained and defined. We use the Akaike information criteria (AIC) to select the orders of the ARDL (p, q_1,q_2,q_3) model in the three variables. In the third and final step, in order to get the short-run dynamic parameters we estimate the error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta lnGDP_t = \varphi + \sum_{i=1}^{p} \alpha \Delta lnGDP_{t-i} + \sum_{i=0}^{q_1} \beta \Delta \mathrm{X}_{t-i} + \sum_{i=0}^{q_2} \gamma \Delta lnFDI_{t-i} + \sum_{\mathrm{i=0}}^{\mathrm{q_3}} \delta \Delta \mathrm{lnCAD_{t-i}} + \eta ECM_{t-i} + \varepsilon_t \quad (5)$$

Here α, β, $\gamma and\ \delta$ are the short –rum dynamic coefficients of the model's convergence to equilibrium and $\boldsymbol{\eta}$ is the speed of adjustment. Where ECM is the error correction term and is defined as:

$$\mathrm{ECM}_t = \Delta \mathrm{lnGDP_t} - \varphi - \sum_{\mathrm{i=1}}^{\mathrm{p}} \alpha \Delta \mathrm{lnGDP_{t-i}} - \sum_{\mathrm{i=0}}^{\mathrm{q_1}} \beta \Delta \mathrm{X_{t-i}} - \sum_{\mathrm{i=0}}^{\mathrm{q_2}} \gamma \Delta \mathrm{lnFDI_{t-i}} - \sum_{\mathrm{i=0}}^{\mathrm{q_3}} \delta \Delta \mathrm{lnCAD_{t-i}} \ldots \quad (6)$$

Note: p describes the lag of dependent variable and q demonstrates the lag of independent variables.

4.4 Granger Causality Test

In order to ascertain the direction of causation between the series, we use the Granger Causality test proposed by Granger (1969, 1988). The Granger Causality equations are specified as follows:

$$\mathbf{GDP_t = \delta_0 + \sum_{i=1}^{k} \delta_i GDP_{t-i} + \sum_{j=1}^{k} \lambda_j X_{t-j} + \varepsilon_1 t} \quad (7)$$

$$\mathbf{X_t = \beta_0 + \sum_{i=1}^{k} \beta_i X_{t-i} + \sum_{j=1}^{k} \gamma_j GDP_{t-j} + \varepsilon_2 t} \quad (8)$$

Where, it is assumed that both $\boldsymbol{\varepsilon_1 t}$ and $\boldsymbol{\varepsilon_2 t}$ are uncorrelated white noise error terms.

$$\mathbf{If \sum_{j=1}^{k} \lambda_j = 0 \ and \sum_{j=1}^{k} \gamma_j = 0},$$

Then Exports (X) does not Granger cause Economic Growth/(GDP) in equation(7). and Economic growth (GDP) does not Granger cause Exports (X) in equation(8). It then follows that Exports (X) and (GDP)/Economic growth are independent, otherwise both series could be interpreted as a cause to each other.

5. Estimation and Interpretation of Empirical Results

In order to conduct cointegration analysis first of all, we have to check the presence of a unit root in variables under study. Therefore, to examine the unit root properties of the time-series data, we first use the ADF test statistics for the purpose. We can see in Table1 the results of the ADF tests for the level as well as for the first-difference of the involved variables. On the bases of these results of ADF test it is stated that all variables are non-stationary at levels. However, they have been become stationary in their first differences. This implies that all the series are integrated of order one i.e. I (1).

5.1 Augmented Dickey-Fuller (ADF) Test for Unit Roots

Table 1: Result of ADF Tests

Variables	Level					
	Constant			Constant & Trend		
	C.V	T.Stat:	Prob:	C.V	T.Stat:	Prob:
DlnGDP						
1% Level	-3.600987	-0.186115	0.9322	-4.198503	-2.942450	0.1605
5% Level	-2.935001			-3.523623		
10% Level	-2.605836			-3.192902		
DlnX						
1% Level	-3.600987	-2.263169	0.1884	-4.198503	-0.904822	0.9457
5% Level	-2.935001			-3.523623		
10% Level	-2.605836			-3.192902		
DlnCAD						
1% Level	-3.600987	-4.001467	0.0034	-4.198503	-4.876138	0.0016
5% Level	-2.935001			-3.523623		
10% Level	-2.605836			-3.192902		
DlnFDI						
1% Level	-3.600987	-1.768131	0.3906	-4.198503	-2.007237	0.5801
5% Level	-2.935001			-3.523623		
10% Level	-2.605836			-3.192902		

Variables	Level					
	Constant			Constant & Trend		
	C.V	T.Stat:	Prob:	C.V	T.Stat:	Prob:
DlnGDP						
1% Level	-3.605593	-6.316443	0.0000	-4.205004	-6.242977	0.0000
5% Level	-2.936942			-3.526609		
10% Level	-2.606857			-3.194611		
DlnX						
1% Level	-3.605593	-3.993804	0.0036	-4.205004	-4.439353	0.0055
5% Level	-2.936942			-3.526609		
10% Level	-2.606857			-3.194611		
DlnFDI						
1% Level	-3.605593	-7.230589	0.0000	-4.205004	-7.327092	0.0000
5% Level	-2.936942			-3.526609		
10% Level	-2.60685			-3.194611		
DlnCAD						
1% Level	-3.605593	-8.945546	0.0000	-4.205004	-8.828306	0.0000
5% Level	-2.936942			-3.526609		
10% Level	-2.606857			-3.194611		

Source: Authors' Calculations (Eviews 9)

Where the ARDL approach allows us to proceed, irrespective of whether the underlying regressors are I(1), I(0) or fractionally integrated, it also impose certain restrictions that the series must not be integrated of order two i.e., I(2).Therefore, in order to confirm that variables are not integrated of order two, we have already been used the Augmented Dickey Fuller test (See Table 1) with maximum lag, and found that all the variables are integrated of order one i.e. 1(1). Then, since neither of our series are 1(2) we can now apply Autoregressive Distributed Lag (ARDL) bounds testing approach to examine the relationship among exports, foreign direct investment, current account deficit and economic growth in Pakistan.

Furthermore, before the adoption of (ARDL) bounds testing approach to co-integration we have been selected the appropriate lag length by using the Akaike information criteria [(AIC = -2(1/T)+2(K/T)].

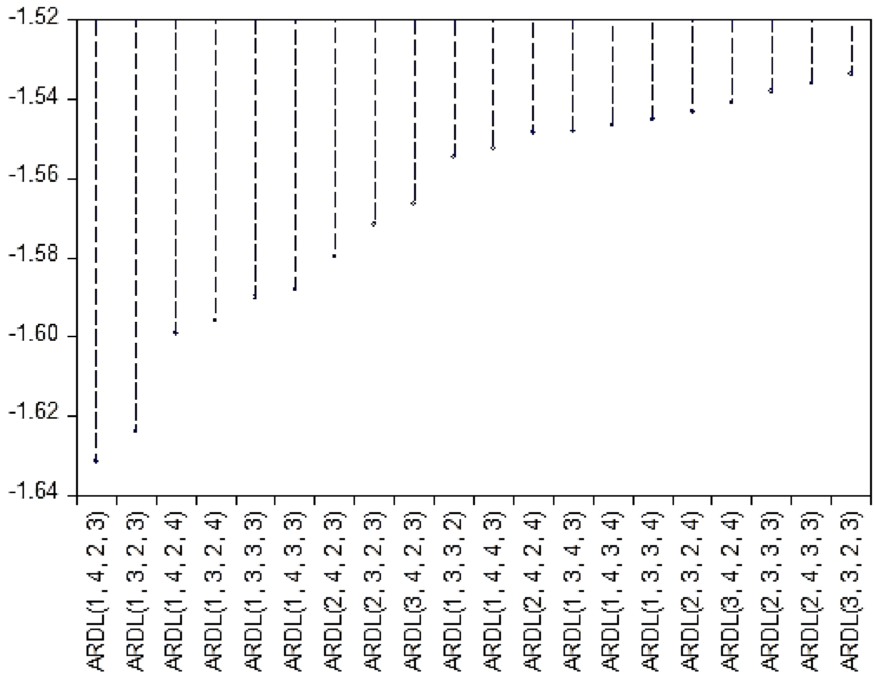

Figure 1: Akaike Information Criteria (Top 20 Models)
Source: Authors' Estimations and Eviews 9 Plotting

The figure 1 depicts that ARDL (1,4,2,3) model is our appropriate model.

According to bounds test shown in table 2 the computed F-statistics (14.28299) is greater than the upper bound of 3.2, 3.67, 4.08 and 4.66 at 10%, 5%, 2.5% and 1% respectively. we therefore, reject the null hypothesis that there exist no long run relationships. Rather we accept the alternative hypothesis that there exists a long run cointegration relation among economic growth (GDP), exports(X), (FDI) and (CAD) in case of Pakistan. Therefore, it has been confirmed that there exist a cointegration among the variables under consideration and study.

Table 2: Autoregressive Distributed Lag Bounds Test, Using: ARDL (1, 4, 2, 3) Model

Null Hypothesis: No Long-Run Relationships Exist		
Test Statistic	**Value**	**K**
F-statistic	**14.28299**	**3**
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Authors' Calculations (Eviews 9)

Table 3 reveals that the estimated long run coefficients of the selected ARDL (1,4,2,3) model are significant at 5% level of significance possessing expected signs. The coefficient of Exports (X) is positive and significant at 5% level of significance, thus supporting the contention that exports carry perceptible influence on the economic growth. The positive coefficient of exports of 1.393104 indicates that in long run a unit increase in exports will leads to 139.31 percent increase in economic growth/GDP, all things being the same. The estimated coefficient of foreign direct investment (FDI) is 0.429540 which is also positive and significant indicating that in the long run a unit increase in FDI will bring an increase of 42.95 percent in the economic growth of Pakistan. Moreover, the coefficient of Current Account Deficit (CAD) is -0.501256 which is negative indicating that in the long run 1% increase in CAD decreases GDP by 50.125 percent. Our results are consistent with those of Atrkar (2007), Siddiqui et al. (2008), Khan and Saqib (1993), Ashfaque Khan and Afia (19995), as they found positive relationship between exports and economic growth.

Table 3: Estimated Long-Run Coefficients Using: ARDL (1, 4, 2, 3) Model

Dependent Variable: lnGDP				
Variable	**Coefficient**	**Std. Error**	***t*-Statistic**	**Prob.**
lnX	1.393104	0.240702	5.787660	0.0000
lnFDI	0.429540	0.162423	2.644573	0.0142
lnCAD	-0.501256	0.174171	-2.877961	0.0083
C	3.929739	2.273042	1.728846	0.0967

Source*:* Authors' Calculations (Eviews 9)

The short run dynamics coefficients from the estimated ARDL (1, 4, 2, 3) model are being shown in table 4. Where, the lag is selected by Akaike information criteria. Table 4 shows that the estimated lagged error correction term ECM (-1)/$EC_{t-1,}$ is -0.419320 which is highly significant at 5% level of significance and negative (ranges between zero and one) as was expected having probability value less than 5%, which is 0.0000. These results support the short-run relationship/co-integration among the variables represented by equation (1). The feedback coefficient is -0.419320 suggests that approximately 41.93% disequilibrium from the previous year's shocks in equation(5) converge back to the long run equilibrium and is corrected in the current year.

Table 4: Error Correction Estimation for Estimated ARDL (1, 4, 2, 3) Model

Dependent Variable: lnGDP
Selected Model: ARDL (1, 4, 2, 3)
Sample: 1975 – 2016
Included observations: 38

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(lnX)	0.026802	0.116220	0.230617	0.8196
D(lnX(-1))	-0.414107	0.167703	-2.469284	0.0210
D(lnX(-2))	-0.944858	0.158963	-5.943894	0.0000
D(lnX(-3))	-0.271374	0.184205	-1.473214	0.1537
D(lnFDI)	0.026624	0.038967	0.683243	0.5010
D(lnFDI(-1))	-0.227315	0.037678	-6.033146	0.0000
D(lnCAD)	-0.012092	0.022104	-0.547056	0.5894
D(lnCAD(-1))	0.149431	0.029275	5.104350	0.0000
D(lnCAD(-2))	0.073841	0.022696	3.253527	0.0034
ECM(-1)	-0.419320	0.045939	-9.127839	0.0000

ECM = lnGDP - (1.3931*lnX + 0.4295*lnFDI -0.5013*lnCAD + 3.9297)

R-squared	0.998159	Akaike info criterion	-1.631458
Adjusted R-squared	0.997162	Schwarz criterion	-1.028136
F-statistic	1001.071	Hannan-Quinn criterion	-1.416801
Prob(F-statistic)	0.000000	Durbin-Watson statistic	1.737742

Source: Authors' Calculations (Eviews 9)

5.2 Stability and Diagnostic Tests of ARDL (1, 4, 3, 2) Model

Table 5, 6, and 7 generally pass the several diagnostic tests for ARDL

(1, 4, 2, 3) model. These tests reveal that the model have achieved desire econometric properties and the model have the best goodness of fit of the ARDL (1, 4, 2, 3) model and valid for reliable interpretation. Breusch – Godfrey (1978) serial correlation LM test which is used to test for the presence of Serial Autocorrelation indicates that the residuals are not serially correlated as we can see in table 5 that the P-Value is greater than 5% level of significance so we cannot reject the null hypothesis (There is no serial correlation) and conclude that the model has no serial correlation. White's test (White, 1980) for Heteroskedasticity (ARCH test, see table 6) shows that the residuals have not heteroskedasticity problem as the P- Value is greater than five percent level of significance, the null hypothesis (There is no ARCH effect) is not rejected and we have been known that this model does not have any ARCH effect. Similarly, the Regression Specification Error Test (RESET. see table 7) (Ramsey, 1969) for functional form also confirm no miss-specification and we cannot reject the null hypothesis (No power in non-linear combinations - No miss-specification) as the p – value is greater than 5% level of significance. According to (Brooks, 2014) non- normality may cause problems regarding statistical inference of the coefficient estimates such as significance tests and for confidence intervals that relies on the normality assumption. We therefore, use the Jarque-Bera test to know that whether there is normality in the residuals or not. Figure 2 shows the Jarque – Bera normality test because, the P–Value is greater than the five percent level of significance we therefore, cannot reject the null hypothesis (that residuals are normally distributed). In the light of all these tests it is, therefore, concluded that in this model there is no serial correlation, no ARCH effect and the residuals are normally distributed.

Table 5: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.275779	Prob. F(2,22)	0.7616
Obs*R-squared	0.929389	Prob. Chi-Square (2)	0.6283

Source: Authors' Calculations (Eviews 9)

Table 6: Heteroskedasticity Test: ARCH

F-statistic	0.182192	Prob. F(2,33)	0.8343
Obs*R-squared	0.393169	Prob. Chi-Square (2)	0.8215

Source: Authors' Calculations (Eviews 9).

Table7: Ramsey RESET Test

	Value	Df	Probability
T-statistic	1.092985	23	0.2857
F-statistic	1.194615	(1, 23)	0.2857

Source: Authors' Calculations (Eviews 9)

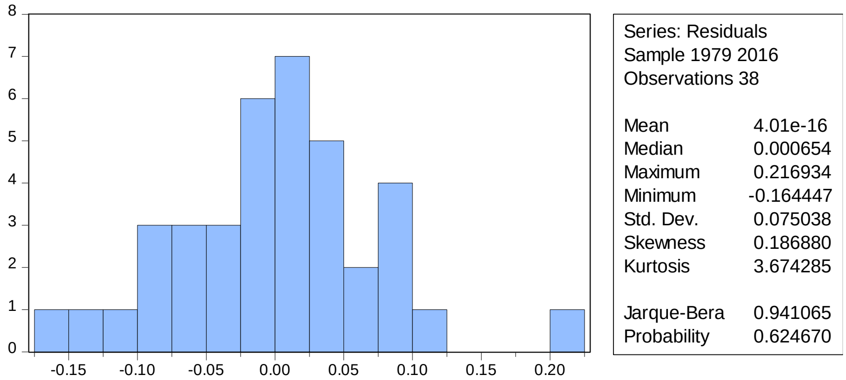

Figure 2
Source: Authors' Calculations (Eviews 9)

5.3 Granger Causality Tests

The Granger Causality test is given in following table 8 which shows that there is unidirectional causality running from Exports (X) to GDP/Economic growth.

Table 8: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests

Sample: 1975-2016.

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
lnX does not Granger cause lnGDP	40	7.17765	0.0024
lnGDP does not Granger cause lnGX		1.56408	0.2236

Source: Authors' Calculations (Eviews 9)

In order to check the stability of our finding from the estimation of both long run and short run parameters from the ARDL (1, 4, 2, 3) model with error correction. Following Pesaran and Pesaran (1997) we apply level of stability tests, also known as the cumulative (CUSUM) and cumulative sum of squares (CUSUMQ) proposed by Brawn et al. (1975).The CUSUM and CUSUMQ statistics are updated recursively and plotted against the break points. If the plotted points for the CUSUM and CUSUMQ statistics stay within the critical bounds of a 5% level of significance, the null hypotheses for all coefficients in the given regression are stable and cannot be rejected. Accordingly, the CUSUM and CUSUMQ plotted points to check the stability of the short-run and long-run coefficients in the ARDL error correction model are given below in the figure 3 and 4 respectively depicts that the both statistics CUSUM and CUSUMQ remains within the critical bound of the five percent significance level. Indicating that all coefficients in the ARDL error correction model are stable. Therefore, the null hypothesis that all the coefficients are stable cannot be rejected.

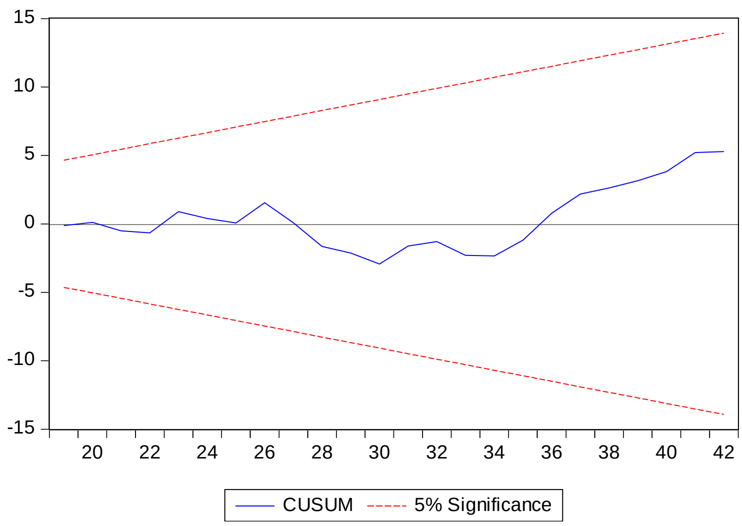

Figure 3: Plot of Cumulative Sum of Recursive Residuals

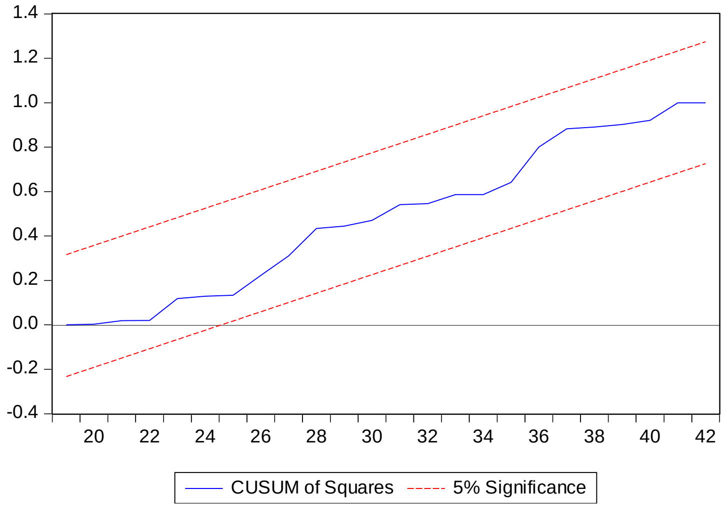

Figure 4: Plot of Cumulative Sum of Squares of Recursive Residuals

6. Conclusion and Policy Implications

The present study has been conducted with the objective to empirically examine the relationship among exports, foreign direct investment and current account deficit in Pakistan during the period of 1975-2016. We adopted the autoregressive distributed lag (ARDL) approach to co-integration together with ECM techniques to trace long-run as well as short-run relationships. Our findings demonstrate the existence of a positive and significant relationship among exports, foreign direct investment and economic growth both in the long-run as well as in short-run in case of Pakistan. While, results show that the current account deficit is negatively and significantly correlated to economic growth in the long-run and short-run. Moreover, the Granger causality test also confirms the unidirectional causality running from exports to economic growth. It is, therefore, concluded that real exports earnings and FDI can substantially contribute for the promotion of economic growth of Pakistan. However, current account deficit is very harmful for the overall health of the economy.

This study has some important policy implications, the government should take some positive steps for the promotion of exports and at the same time we have to ensure and bring the political stability in the country so that the confident of the foreign investors is restored. In order to meet with the problem of current account deficit the expansion of exports and FDI flows in Pakistan are very essential.

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