Causality between Economic Development and Unemployment: Using ARDL Model

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Abstract

The meditation of this study is to realizeunemploymentin Pakistan with the perspective of macroeconomic factors, including FDI,private investment,exports and government expenditure.Annual dataused in this study from 1985 to 2019was obtained from different issues of economic surveys and official website of the Pakistan's Central Bank. The prerequisite required to exploretime series model is to check the stationarity, we apply ADF and PP tests to identify stationary series among our macroeconomic series. All variables are used log transformation in order to smooth the series. The results reveal that at level only unemployment is stationary while remaining series are stationary at first difference. Therefore,the appropriate time series model for different stationary series is Autoregressive Distributed Lag (ARDL) model. We apply four different ARDL models to detectthe long-run connection between unemployment and other macroeconomic series employed in this paper. Out of four, three models confirm that the relationship amoung variables is characterized long-run between unemployment and government expenditures.The empirical results reveal that FDI and exports(model (1)) help to reduce unemployment while government expenditure(model (2)) has no impact. Moreover, private investment (model (3)) has aninverse relationship with unemployment. The results also show a long run connection of foreign direct investment, exports, government expenditures and private investment with unemployment if all variables are in one model (4). More focus must be paid towards increasing the FDI which opens the door of employment opportunities. Exports increases production in the exising settings and help reduce unemplolyment.

Keywords: Unemployment, Export; FDI, Private Investment; Government Expenditure. JEL: C12, C22, O11

Introduction

The Great Recession of December 2007 has led developing and developed countries to think of the phenomenon of unemployment on a serious note. Literature on this topic suggests various theories to explain the unemployment problem. Some blame the economic system while others blame external sources, labour market and lack of innovation.Employment opportunities for people,especiallythe young generation, becomes a challenge for developing countries. (Elsby, Ryan, and David, 2015; Blanchard, 2007; Black, 1986).

Obayori (2014) investigated that unemployment elimination for any developing country is a challenging mission. Pakistan also faces the same unemployment problem and has become one of the major issues where mostof the population is less than 20 years old. On average, 3 millionof the country's population is unemployed, which is nearly 6% according to government data. Pakistan is one of the countries which the financial crises have victimized. Somewhat, it is dependent on economic environment of South-Asia as a whole andsluggish growth in exports,whilethere is also political crisis which have issues for the growthofthis country (Qazi, Raza, & Sharif; 2017).

The rising trend of unemployment has been witnessed. In the 1990s, on average, the unemployment in Pakistanwas 5.7% which increased to 6.80%in the 2000s.If the government fails to control unemployment, its worst consequences will hamper economic growth in future. Unemployment casues crime, terrorism and economic syndrome, which eventuallymakes the economic growth weaken. This is why quickpreemptive measures are required to overwhelmed the unemployment phenomenon. These carryfirmness in economic activitiesin almost all sectors of an economy (Raza, Mohiuddin, Zaidi, & Osama, 2018).Unemployment has always been one of the center and dynamic issue of Pakistan. Earlier, somestudies have been contributed on the topic by employing various factors to determine why augmenting unemployment year after year (Daly et.al., 2017; Christiano et.al., 2016; Jesús, 2008, Bovenbergand van, 1996).

Literature Review

While exloring the literature, the research conclude that there is a massive amount of studies available which are establishing the linkage between macroeconomic variables withunemployment. Every study picked a different perspective to explain the given phenomenon

since the topic is exciting and an issue to many developing countries—the question of which factor affects reducing the unemployment rate in a country still exists.

Chutto (2020) examined the link of economic growth with reference to unemployment in Mauritius through testing validity of Okun's law. The study employed ARDL and ARDL-ECM model to analyze the linkage among variables. In short as well as long run, the result concluded cointergration among the variables. Soylu, Ismail and Fatih (2018) investigated the economic growth with its relationship to unemployment on the footsteps of Okun's Law. Their study confirmed the Law and illustrated a negative relationship between the variables. With 1% increase in GDP decreases unemployment by 0.08%. The study employed the Pooled OLS and Johansen Co-integration test.

Sahnoun and Abdennadher (2019) relationship of the variables of unemployment rate with inflation and economic growth with a sample period of 42 years on North African countries. The researchers have applied vector error correction model to explore the casualty among the variables. To test the Granger causality, the statistical techniques applied on the time series data were unit root test and co-integration. Algeria, Egypt, Morocco and Tunisia were the sampled countries. The results suggest that the studied variable are cointegrated. Unidirectional causality was observed from inflation to economic growth in the time span of short run while in the time span of long run, these two variables were mutually causal which is providing evidence to the feedback between these variable. By the term feedback means, that these two variables can reinforce each other which is a valuable implication for the policymakers and hence the policymakers must adopt control policy to deal with the inflation and keeping in line its linkage with the economic growth. As far as the relationship of the other two variables are concern, the unidirectional relationship is moving from the economic growth to unemployment rate in both time spans, which is suggesting to the policy makers that there is no feedback among the two variables. Therefore, the conclusion suggest that unemployment may reduce the economic growth but economic growth is not sufficient for mitigation or reduction of unemployment. Therefore, the governments and economic policymakers must understand to apply active policies to mitigate the unemployment and stimulate the dysfunctional labor market in the right direction. The study guide to the policymakers that when even formulating strategies for economic growth, consideration for controlling of unemployment is essential. The linkage established through the study between inflation and unemployment was also unidirectional in both the time spans, which is emphasizing on the

governments as well as economic policy makers to perform actively to creation of job opportunities to reduce unemployment prevailing in the country. Therefore, study was concluding with the challenge to policymakers to reduce unemployment rate without accelerating the inflation rate.

Misini et al. (2017) has explored the macro economic growth and its linkage with the unemployment on the sample collected from Kosovo. The proxy for the growth in this study increment in nominal GDP. The finding to the study suggest that enhancing nominal GDP has very mere impact on employment which leads to poverty reduction in Kosovo. The logical argument in the study is that poor people are unemployed and economic growth has not changed their standard of living. Alhdiy et al. (2015) also explored the growth and unemployment to reach in Egypt. The sample period of eight years from 2006-2013 was selected with and applied the standard tests on the data. The conclusion of the research suggest there is no statistically acceptable relationship between the two variables of unemployment and gross domestic product (GDP) neither cointegration exist among the variables, which is reflective of no long term relationship between the studied variables. While observing the two variables in the shorter span of time, it is observed that causality flows from unemployment to economic growth. Therefore, the study was concluded with the remarks that there was no substantial reason to confirm the relationship between the studied variables.

Dogan and Taylan **(**2012) studied the impact on unemployment due to macroeconomic variables. The paper collected quarterly data from 2001 through 2010 from the central bank of Turkey to test the hypothesis that the real GDP, exchange rate, export growth, inflation, growth in money supply and interbank interest rate influence on unemployment. Empirical results conclude an ample negative affect of the explanatory studied variables on unemployment. These results were consistent with Philip's curve and Okun's law.

Akinyemi, Ogundana and Ekure (2018) considered unemployment in Nigeria and its causal linkage with entrepreneurship. Their study period was thirty one years from 1981 to 2011. Their results show a positive relationship between entrepreneurial activities represented by the industrial productivity component of GDP and unemployment. The study proposes that unemployment is not linked with the labor force but with labor productivity.

Stamatiou (2014) presented his paper at a research conference, examining the connections among the macroeconomic variables like unemployment rate, FDI along with unemployment in Greece from 1970 to 2012. The ARDL and ECM-ARDL models suggest the long-run relationship among these constructs, while VECM Granger Causality confirmed the short and long-run relationship. Al-Habeel (2012) explored the causal connections of economic growth along with unemployment in Jordan and other neighboring middle eastern countries. Counteract linkage were established among the two studied variables and suggested that there should be separate economic policies for every region in the Arab to implement them.

Shahid (2014) investigated the impact on economic growth led by inflation and unemployment by using yearly data of Pakistan from 1980 to 2010. Long run connection among the variables was established with the help of the ARDL model. Arsalan and Zaman (2014) probed the unemployment along with its determinants in Pakistan. Twelve years of data from 1999 to 2010 was gathered. The explanatory variables include GDP, FDI, population growth (PG) and inflation rate (INR). Empirical evidence shows that the variables of the study have a significant impact on unemployment. More specifically, there is an inverse impact on unemployment of inflation, FDI and GDP, while population growth is positively related to unemployment. Khrais (2016) scrutinized the GDP and its linkage with unemployment along MENA region from 1990 to 2016. The results revealed that GDP does not impact unemployment in any country in the MENA region. Zughalu and Ogwumike (2013) studied unemployment in Nigeria, which becomes alarming year after year. The paper employed economic growth, export, and FDI as explanatory variables to examine if these economic variables have a role in eliminating Nigeria's unemployment. The data was collected from Central Bank of Nigeria. Twenty-seven years of data was gathered starting from 1984 to 2010, empirical results suggest that unit root exists and data has time series property. Johansen co-integration provides support to prolonged association among the studied factors. However, Granger causality shows that FDI, GDP and unemployment do not cause unemployment.

Babatunde et.al.(2012) assessed the impact on unemployment due to export trade in Nigeria. The paper attempts to create a link among export, unemployment and poverty. The paper concluded that oil exports do not create jobs and have no relationship to reduce poverty, while agriculture products exports create jobs in Nigeria and poverty alleviates. Mehmet and Demirsel (2013) explored linkage among the variables of unemployment and FDI with the context of developing

countries. Total number of studied countries were seven. The study employed the panel data from 1981 to 2009.The researchers applied a variety of statistical techniques deemed necessary for time series data to reach to the conclusion. The research concludes with the establishment of a link among the variables like unemployment rate and Foreign Direct Investment (FDI). They show that FDI increases unemployment in Argentina and Turkey. However, decreases unemployment in Thailand.

Research Methods

Hypotheses Development

Different relevant statistical tests are employed to determine the impact on unemployment of some exogenous variables, stating if they cause unemployment along with their long or short-run relationship with unemployment. FDI plays a pivotal role in creating economic activities which lead to the expansion in the job market on one side and on the other side innovation through transfer of technology. The ultimate impact of FDI injection is acceleration in the economic growth with the positive externalities further accelerating economic activities. The GDP goes up while the factors of production increase in land, capital and labor. As mentioned earlier technological transfer require training of labor while mixing the two advanced technology and skilled labor the overall productive efficiency increase which creates positive externalities. FDI is ownership by foreign stock holders which include valuable assets, mines and production units (Paramati, Ummalla and Apergis 2016; Borensztein, Gregorio & Lee, 1998). It is assumed that FDI and export(x) positively impact some economic constructs: inflation, poverty, the balance of payment, and productivity Maqbool etal. (2013). Another aspect of FDI is its utilization to the expansion of export in the resident country, as it has the exposure of the international market along with has considerable size. As a result, the acceptance of locally produced goods and services increase in the international market which is also helpful to the resident country's economic growth. Therefore, it is logically evident that inflow of FDI is significant as it supports the balance of payment, exports and discourages import. This eventually reduces unemployment (Fujita &Moscarini; 2017).

$$lune_t = \alpha + \beta_1 lfdi_t + \beta_2 lx_t + e_t \quad \text{..... (1)}$$

Where, lune: is the log of Unemployment

lfdi is the log of Foreign Direct Investment

lx is the log of Exports

Hypotheses

1. The FDI inflows pressurize the unemployment rate to reduce a large number of exports opens the door of employment and reduces unemployment

Government expenditures pertain to the goods and services consumed / invested by a government. It can be divided into two different parts, the consumption of government and the investment by the government. In this study, the spending by government means the total government capital expenditure. DB & Furceri (2016) suggest that government spending reduces unemployment in both the short as well as long run time periods. Bidemi (2016) also concluded the same results in Nigeria. Keynes (1934) considered that depression and unemployment is faced by aggregate demand function. Therefore, the objective of increasing employment in a country may be achieved by expending the overall utilization of goods and services and therefore expending the consumption and investment. Since utilization of goods and services depends on taste and habit, which remain stable for a long time therefore increasing consumption is not easy, only investment-Government Expenditure can help increase employment in a country.

$$lune_t = \alpha - \beta_3 lge_t + v_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

lge is the log of Government Expenditures

Hypothesis

2. Larger government expenditures lead to a lower unemployment rate

Pakistan faced an increase in Private investment (PI) year after year but still is on its way to achieve the target level. Pakistan is a country with capital deficiency and due to resource starvation, income is low. However, lower level of saving is the effect of low-income levels, resulting in lower investment. Thus, the main goal of a government, like Pakistan is to shrink poverty and upsurge employment. To meet the goal, government encourages private investments (Agrawal & Matsa, 2013)

$$lune_t = \alpha + \beta_3 lpi_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where,

lpi is the log of Private Investment

Hypothesis

3. Private investment forces the unemployment rate to reduce

This study also determines a long-run relationship of unemployment with FDI, private investment, export, government expenditure. The study determines what level of FDI, export, private investment and government expenditure should be maintained to eliminate unemployment.

$$lune_t = \alpha + \beta_1 lfdi_t + \beta_2 lx_t + \beta_3 lpi_t + \beta_4 lge_t + €_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Hypotheses

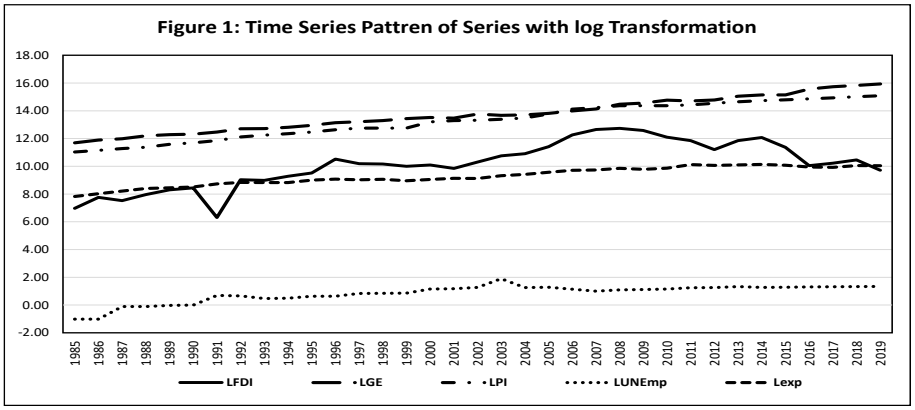
4. There is a long-run link among private investment, FDI, export and government expenditure with unemployment.

The objective of this paper is three folds. Firstly, it examines four macroeconomic factors which impact unemployment (une). These factors are Foreign Direct Investment (fdi), export (x), Government Expenditure (ge) and Private Investment (pi). Secondly, it attempts to discover the long-run relationship among these exogenous constructs. Arsalan and Zaman (2014) consider that FDI, GDP, growth in population and inflation have an impact on unemployment. Since urban areas of Pakistan have industrialized zones/ areas which are not available in the rural areas, therefore rural areas have much larger ratio of unemployment as compare to urban centers of Pakistan. All series used in this study are in log form.

Data Collection

We collected annual data through official website of State Bank of Pakistan and economic surveys reports of different issues. The sample consists of fifty years, starting from 1985 to 2019. Since it is time-series data, a graphical presentation gives an idea of the data movement. Figure 1 shows the pattern of all of these variables. Apparently, the variables are not moving in the same directions, and their mean values are not the same.

Figure 1



Philips-Perron and Augmented Dickey-Fuller models: It is essential to the way forward for any higher and sophisticated econometric modeling to run the necessary statistical techniques to conclude the stationarity in the sampled data series. To fulfill our purpose, variety of approaches can be utilized to evaluate unit root but we prefer Augmented Dickey-Fuller (1979, 1981) which is considered as the most appropriate and famous technique. The statistical form of this test can be illustrated as equation 5:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{n} \alpha \Delta y_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where: in Eq. (1), 'y' is a data series in time 't', while, 'n' known as the optimum number of lags, 'α_o' is referred to a constant value, whereas the white noise error is regarded as 'e' in Eq. (5).

Philips-Perron (1988) have suggested another robust test, which has additionally been recommended a strategy for the application of a unit root test that provided a supplementary state:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

In Eq. (6), 'y' is called the data series in time 't', whereas 'α_o' is regarded as a constant value, and the white noise error is known as 'e' in Eq. (6).

Results and Analysis

Table 1

Descriptive Statistics

	LFDI	**LGE**	**LPI**	**LUNE**	**LX**
Mean	.0.15	.3.74	.3.28	).83	).28
Maximum	.2.73	.5.94	.5.08	..89	.0.13
Minimum	).31	.1.69	.1.03	1.02	'.83
Std. Dev.	..67	..21	..28	).66	).66
Skewness	0.39	).16	0.22	1.37	0.36
Kurtosis	².49	..99	..74	).53	².10
Jarque-Bera	..2621	..6319	².6234	.4.3756	..9313
Probability	**).5320**	**).4422**	**).2694**	).0008	**).3807**

Table 1 reflects the basic descriptive analysis of all the factors involved in the results**.** On an average log of general expenditure (LGE) is highest and log of unemployment is the lowest.

Whereas LFDI have highest range (the difference between maximum and minimum) and lowest in LUNE among all variables, which can also be seen in the standard deviation i.e. standard deviation is also high in LFDI and lowest in both LUNE and LX. All variable except LGE have negative skewness and high kurtosis (non normal). The normality test explains that only for LUNE the Ho of normality is rejected as p-value <0.05 (at 95% confidence), whereas for all remaining variables p-value >0.05 (at 95% confidence) reflects the acceptance of Ho of normality.

Table 2

Stationarity tests result

Variables	**Augmented Dickey-Fuller (ADF)**						
	lags	**Level**	**Prob.**	**lags**	**1st Diff**	**Prob.**	
L fdi	0	-2.0915	0.2491	0	-7.2755	**0.0000**	*
lge	0	0.1795	0.9672	0	-7.2847	**0.0000**	*
L pi	0	-1.6082	0.4676	0	-4.8213	**0.0005**	*
lune	0	-3.1290	**0.0337**	0			**
lx	0	-2.7855	0.0709	0	-4.9417	**0.0003**	*
Philips-Perron (PP)							
	lags	**Level**	**Prob.**	**lags**	**1st Diff**	**Prob.**	
L fdi	1	-2.0587	0.2618	1	-7.2861	**0.0000**	*
lge	2	0.4038	0.9802	2	-7.3347	**0.0000**	*
lpi	14	-2.7292	0.0796	7	-4.7389	**0.0006**	*
lune	5	-3.9999	**0.0040**				*
Lx	2	-2.8128	0.0670	3	-4.9237	**0.0003**	*
Note: * significant at 1% significance level ** significant at 5% significance level							
MacKinnon (1991) critical value (-3.461 at 0.01), and rejected the unit root hypothesis.							

Table2 reveals unit root by, i.e. ADF and PP, the result reveals that out of five variables (lfdi, lge, lpi and lx), first four variables capture stationarity on first difference, which means these variables are I (1). In contrast, fifth variable, lune is stationary at levels, i.e. I (0). The lag selection criteria for ADF is SCI and for PP is Newey-West Bandwidth. The result of stationary is the same for both methods. Since the integrating orders of all variables are different, we cannot apply the conventional short-run model VAR for the causal relationship Granger causality test and the long-run relationship Johnson co-integration model. The appropriate model for a different order of

stationary variables is ARDL-model, by using ARDL model, we can find both spans of the time either short or long relationship between the five variables.

In general, ARDL(p,q_1,q_2 …….q_k) model specification is given in equation 7:

$$\emptyset(L) = \varphi + \theta_1(L)x_{1t} + \theta_2(L)x_{2t} \dots\dots\dots\dots + \theta_k(L)x_{kt} + \mu_t \dots\dots\dots\dots\dots\dots (7)$$

Where L stands for a lag operator for each component of the vector, $L^k y = y_{t-k}$ is convenient to define the lag polynomial $\emptyset(L,p)$ and the vector polynomial $\beta(L,q)$. Provided, it may be presumed that the error term u_t is white noise process, or more generally, is stationary and independent of x_t, x_{t-1} ……. and y_t, y_{t-1} …..,the results of ARDL models may be inferred consistently by OLS.

The ARDL framework for equation (8) to (11) are as follows:

$$\Delta lune_t = \alpha_o + \sum_{i=1}^{p} \beta_i lfdi_{t-i} + \sum_{i=1}^{p} \gamma_i lx_{t-i} + \delta_1 lfdi_{t-1} + \delta_2 lx_{t-1} + \varepsilon_{1t}$$
……..……..(8)

$$\Delta lune_t = \alpha_1 + \sum_{i=1}^{p} \pi_i lge_{t-i} + \epsilon_1 lge_{t-1} + +\varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots\dots$$
…… ….....(9)

$$\Delta lune_t = \alpha_2 + \sum_{i=1}^{p} \tau_i lpi_{t-i} + \omega_1 lpi_{t-1} + +\varepsilon_{3t} \dots\dots\dots\dots\dots\dots\dots\dots$$
……....(10)

$$\Delta lune_t = \alpha_3 + \sum_{i=1}^{p} \rho_i lfdi_{t-i} + \sum_{i=1}^{p} \emptyset_i lx_{t-i} + \sum_{i=1}^{p} \theta_i lgei_{t-i} + \sum_{i=1}^{p} \vartheta_i lpi_{t-i}$$
$$\mu_1 lfdi_{t-1} + \mu_2 lx_{t-1} + \mu_3 lge_{t-1} + \mu_4 lpi_{t-1} + +\varepsilon_{4t}$$
…… ……(11)

As summation sign show in the above equations, the error correction dynamics whereas the second term part [terms with δs in equation (8), ϵ_1 in equation (9), ω_1 in equation (10) and μ_s in equation (11)] correspond to the long-run relationship. The null hypothesis in the above four equations are as follows:

Ho (1'): $\delta_1 = \delta_2 = 0$, Ho (2'):$\epsilon_1 = 0$, Ho (3'):$\omega_1 = 0$and Ho (4'):$\mu_1 = \mu_2 = \mu_3 = \mu_4 = 0$ respectively, which the non-existence of the long-run relationship.

We also apply bond test to capture the long-run linkages in all above four equations. **Table 2** depicts findings of bond test revealed, out of 4 equations, only equation (2') resulted in no long-run connections among unemployment and government expenditures, whereas the remaining three equations [equation (1'), (3') & (4')] shows the long-run relationship among unemployment and all other independent variables.

For model (1'), value of F-statistics is 5.96, which is significantly above threshold values of Bond test, therefore long-run relationship is established in model (1'), value of F-statistics is 2.37, is smaller as compare to critical values of Bond test, concluding no long run connections established in model (2'), value of F-statistics as 5.06 which is above benchmark values against 5% & 10% significance level of Bond test, therefore confirming long-run connection in model (3'). Similarly, value of F-statistics reflects as 8.64, which is significantly higher to critical values of Bond test; therefore, long-run relationship is established in the model (4').

Table 3

ARDL Bounds Test Results for Model 1 to Model 4

Model 1

Sample: 1987 2019

Included observations: 33

Test Statistic	**Value**	**k**
"F-statistic"	5.96	3

"Critical Value Bounds"

Significance (%)	**I0 Bound**	**I1 Bound**
10	3.17	4.14
5	3.79	4.85
2.5	4.41	5.52
1	5.15	6.36

"There is a long-run relationship between variables"

Model 2

Sample: 1989 2019

Included observations: 31

Test Statistic	**Value**	**k**
"F-statistic"	2.37	1

"Critical Value Bounds"

Significance (%)	**I0 Bound**	**I1 Bound**
10	4.04	4.78
5	4.94	5.73
2.5	5.77	6.68
1	6.84	7.84

"There is no long-run relationship between variables"

Model 3

Sample: 1990 2019

Included observations: 30

Test Statistic	Value	K
"F-statistic"	5.06	1

"Critical Value Bounds"

Significance (%)	I0 Bound	I1 Bound
10	4.04	4.78
5	4.94	5.73
2.50	5.77	6.68
1	6.84	7.84

'There is a long-run relationship between variables"

Model 4

Sample: 1990 2019

Included observations: 30

Test Statistic	Value	K
"F-statistic"	8.64	4

"Critical Value Bounds"

Significance (%)	I0 Bound	I1 Bound
10	2.45	3.52
5	2.86	4.01
2.50	3.25	4.49
1	3.74	5.06

'There is a long-run relationship between variables"

Table 4 explains the ARDL model 1; hundred regression estimates have been made while applying ARDL in equation (1'). The model selected by AIC is (1,0,1), based on lower prediction error, therefore, AIC based model is preferred here. The estimated ARDL cointegration and long-run model is:

Table 4

ARDL Model 1; (1,0,2)

Dependent Variable: LUNE

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LUNE(-1)	0.6261	0.1097	5.7057	0.0000
LFDI	-0.0283	0.0384	-0.7361	0.4680
LX	0.8588	0.3933	2.1836	0.0379
LX(-1)	-1.3881	0.5430	-2.5562	0.0165
LX(-2)	0.7339	0.3675	1.9971	0.0560
C	-1.2167	0.9232	-1.3179	0.1986
"R-squared"	0.8609	"Mean dependent var"		0.9423
"Adjusted R-squared"	0.8351	"S.D. dependent var"		0.4820
"S.E. of regression"	0.1957	"Akaike info criterion"		-0.2612
"Sum squared resid"	1.0344	"Schwarz criterion"		0.0109
"Log likelihood"	10.31	"Hannan-Quinn criter"		-0.1696
"F-statistic"	33.41	"Durbin-Watson stat"		1.9783
Prob(F-statistic)"	).0000			

'Note: p-values and any consequent tests do not account for model selection.

ARDL Cointegrating And Long Run Form

"Dependent Variable": LUNE

"Selected Model": ARDL(1, 0, 2)
"Sample": 1985 2019
"Observations": 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI)	-0.4358	0.0384	-11.3490	0.0000
D(LX)	0.2984	0.3933	0.7587	0.4546
D(LX(-1))	-0.9145	0.3675	-2.4886	0.0193
CointEq(-1)	**-0.4056**	**0.1097**	**-3.6961**	**0.0010**

Cointeq = LUNE - (-1.0744*LFDI + 1.4010*LX -2.9630)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	-1.0744	0.3309	-3.2471	0.0031
LX	1.4010	0.3346	4.1874	0.0003
C	-2.9630	1.8552	-1.5971	0.1219

$lune_t = -2.9630 – 1.0744*lfdi_t + 1.4010*lx_t$

The estimated result of Model 3 is given in **Table 5**. Thirty regression estimates have made while applying ARDL method in equation (3'). The model selected by AIC is (1,4) since AIC based model is selected here as it has the lower prediction error. The estimated ARDL cointegration and long-run model is:

Table 5

ARDL Model 3 (1,0)

Dependent Variable: LUNE

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LUNE(-1)	0.6766	0.1111	6.0926	0.0000
LPI	0.0846	0.0591	1.4313	0.1623
C	0.7969	0.7158	1.1133	0.2741

R-squared"	0.8583	"Mean dependent var"	0.8846
Adjusted R-squared"	0.8492	"S.D. dependent var"	0.5820
S.E. of regression"	0.2260	"Akaike info criterion"	0.0522
Sum squared resid"	1.5838	"Schwarz criterion"	0.0825
Log likelihood"	3.89	"Hannan-Quinn criter"	0.0062
F-statistic"	93.89	"Durbin-Watson stat"	2.4345
Prob(F-statistic)"	0.0000		

"Note: p-values and any subsequent tests do not account for model selection.

ARDL Cointegrating And Long Run Form

"Dependent Variable": LUNE

"Selected Model": ARDL(1, 0)

"Sample": 1985 2019

"Observations": 34

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPI)	0.4774	0.0591	8.0729	0.0000
CointEq(-1)	**-5.5766**	**0.1111**	**-50.2157**	**0.0000**

Cointeq = LUNE - (0.0856*LPI + 0.0220)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPI	0.0856	0.0092	9.2949	0.0000
C	0.0220	0.1287	0.1706	0.8656

$lune_t = 0.0220+0.0856*lpi_t$

The result of ARDL Model 4 is reported in **Table 6**. A sum of 2500 regression estimates has been applied following ARDL methods in equation (3') is 2500. The model selected by AIC is (4, 1, 3, 4, 4) since AIC based model is selected here as it has the lower prediction error. The estimated ARDL cointegration and long-run model is:

Table 6

ARDL Model 4 (2,4,4,4,4)

Dependent Variable: LUNE

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LUNE(-1)	0.5496	0.2298	2.3920	0.0437
LUNE(-2)	0.2392	0.2832	0.8448	0.4227
LFDI	-0.1530	0.0580	-2.6394	0.0297
LFDI(-1)	0.1255	0.0789	1.5911	0.1502
LFDI(-2)	0.1306	0.0971	1.3449	0.2155
LFDI(-3)	0.0274	0.0705	0.3893	0.7072
LFDI(-4)	0.1001	0.0591	1.6952	0.1285
LGE	0.0823	0.5891	0.1397	0.8923
LGE(-1)	0.1079	0.5578	0.1934	0.8515
LGE(-2)	-0.4488	0.5389	-0.8327	0.4292
LGE(-3)	0.4671	0.4239	1.1020	0.3025
LGE(-4)	0.9329	0.4308	2.1653	0.0623
LX	1.1815	0.5381	2.1955	0.0594
LX(-1)	-1.1406	0.4720	-2.4168	0.0421
LX(-2)	0.3735	0.5164	0.7232	0.4901

LX(-3)	-1.1141	0.5738	-1.9415	0.0881
LX(-4)	0.7366	0.3920	1.8790	0.0971
LPI	-0.3225	0.4782	-0.6744	0.5191
LPI(-1)	0.2746	0.5374	0.5110	0.6231
LPI(-2)	-0.1754	0.7097	-0.2471	0.8111
LPI(-3)	0.6995	0.6600	1.0599	0.3202
LPI(-4)	-1.7496	0.6551	-2.6709	0.0283
C	-1.2335	1.6338	-0.7550	0.4719

‘R-squared”	0.9721	“Mean dependent var”	1.010
“Adjusted R-squared”	0.8954	“S.D. dependent var”	0.412
“S.E. of regression”	0.1333	“Akaike info criterion”	-1.063
“Sum squared resid”	0.1422	“Schwarz criterion”	0.001
“Log likelihood”	39.4695	“Hannan-Quinn criter”	-0.716
“F-statistic”	12.6691	“Durbin-Watson stat”	2.633
“Prob(F-statistic)”	0.0005		

Note: p-values and any subsequent tests do not account for model selection.

ARDL Cointegrating And Long Run Form

“Dependent Variable”: LUNE

“Selected Model”: ARDL(2, 4, 4, 4, 4)

“Sample”: 1985 2019

“Observations”: 31

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LUNE(-1))	0.4358	0.2832	1.5389	0.1624
D(LFDI)	0.2984	0.0580	5.1489	0.0009
D(LFDI(-1))	-0.9145	0.0971	-9.4189	0.0000
D(LFDI(-2))	1.2018	0.0705	17.0545	0.0000
D(LFDI(-3))	0.2118	0.0591	3.5861	0.0071
D(LGE)	-0.2118	0.5891	-0.3595	0.7285
D(LGE(-1))	0.2118	0.5389	0.3929	0.7046
D(LGE(-2))	0.2118	0.4239	0.4996	0.6308
D(LGE(-3))	0.2118	0.4308	0.4915	0.6362
D(LX)	-0.2118	0.5381	-0.3935	0.7042
D(LX(-1))	0.2118	0.5164	0.4101	0.6925
D(LX(-2))	0.2118	0.5738	0.3691	0.7217
D(LX(-3))	0.2118	0.3920	0.5402	0.6037
D(LPI)	-0.2118	0.4782	-0.4428	0.6696
D(LPI(-1))	0.2118	0.7097	0.2984	0.7730
D(LPI(-2))	0.2118	0.6600	0.3209	0.7565
D(LPI(-3))	0.2118	0.6551	0.3233	0.7548
CointEq(-1)	**-0.8414**	**0.2992**	**-2.8125**	**0.0228**

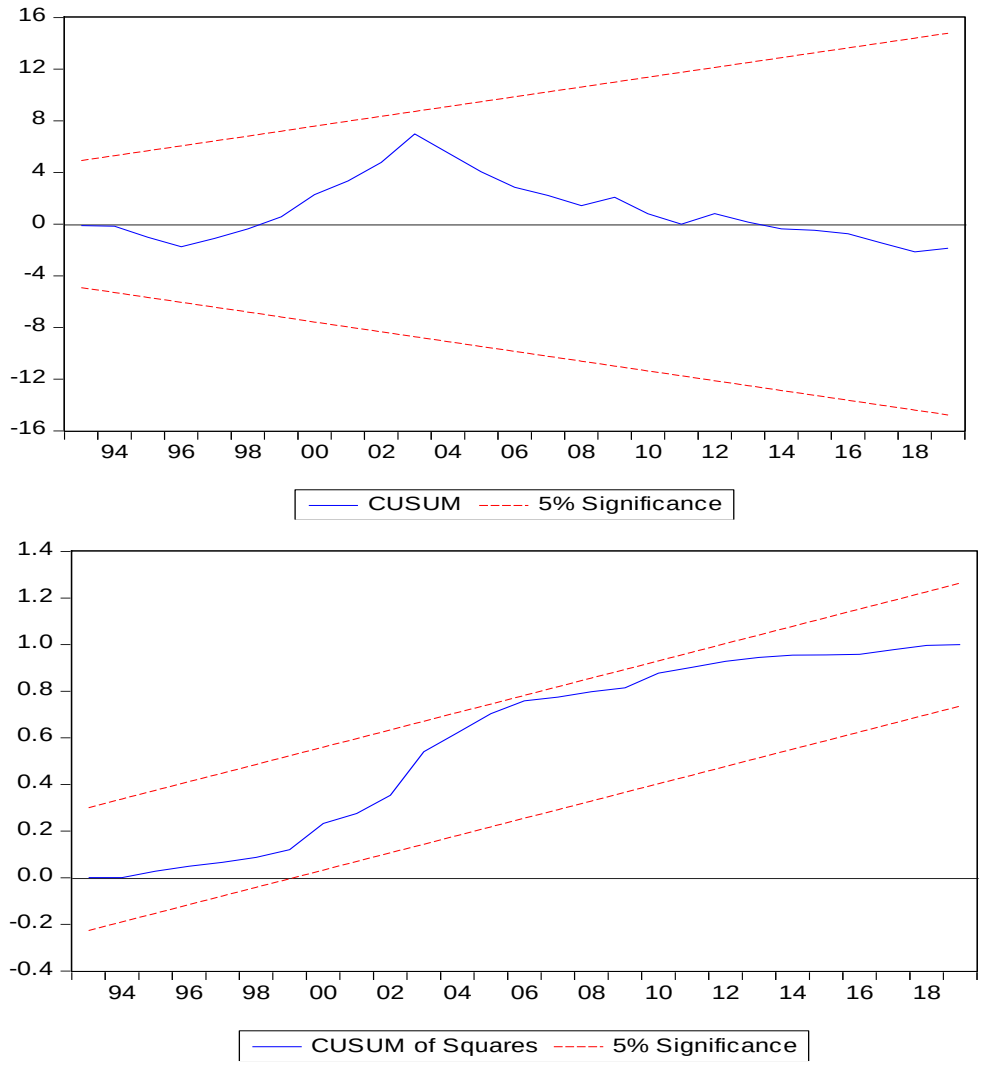
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	-1.0047	0.2680	-3.7484	0.0056
LGE	-1.2585	0.7856	-1.6020	0.1478
LX	-1.2585	0.4498	-2.7981	0.0233
LPI	-1.2585	1.7370	-0.7245	0.4894
C	-0.2517	1.9748	-0.1275	0.9017

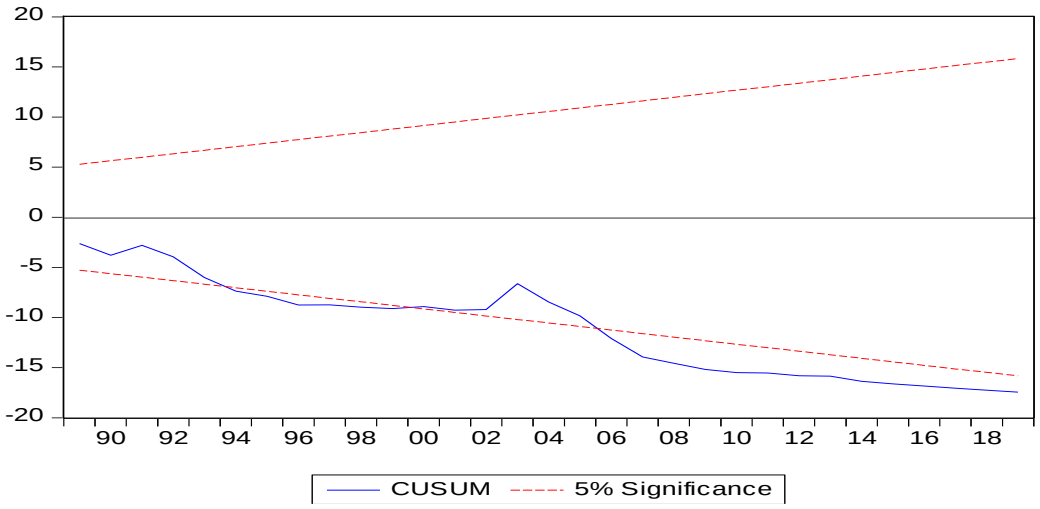
$lune_t = -0.2517 – 1.0047*lfdi_t – 1.2585*lge_t - 1.2585*lx_t – 1.2585*lpi_t$

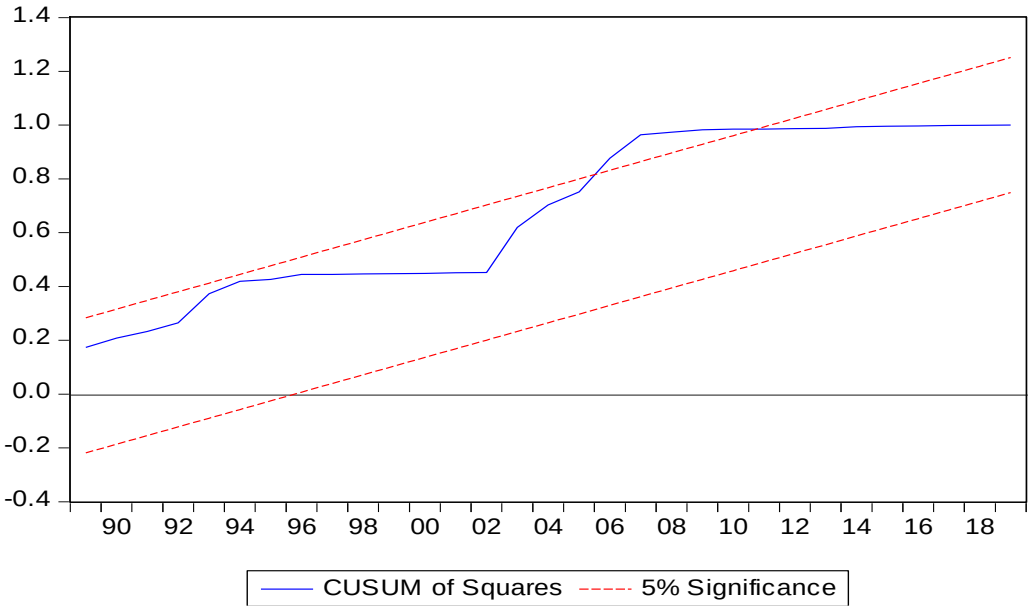
The diagnostics for all three ARDL models (1, 3, 4) is done by using cusum & cusum squared test. Below are the graphs of both test, which shows for both tests that the models 1 & 4 are stable at 95% significance for the whole period, whereas model 3 is not stable in between the period.

Model 1: ARDL (1,0,2)

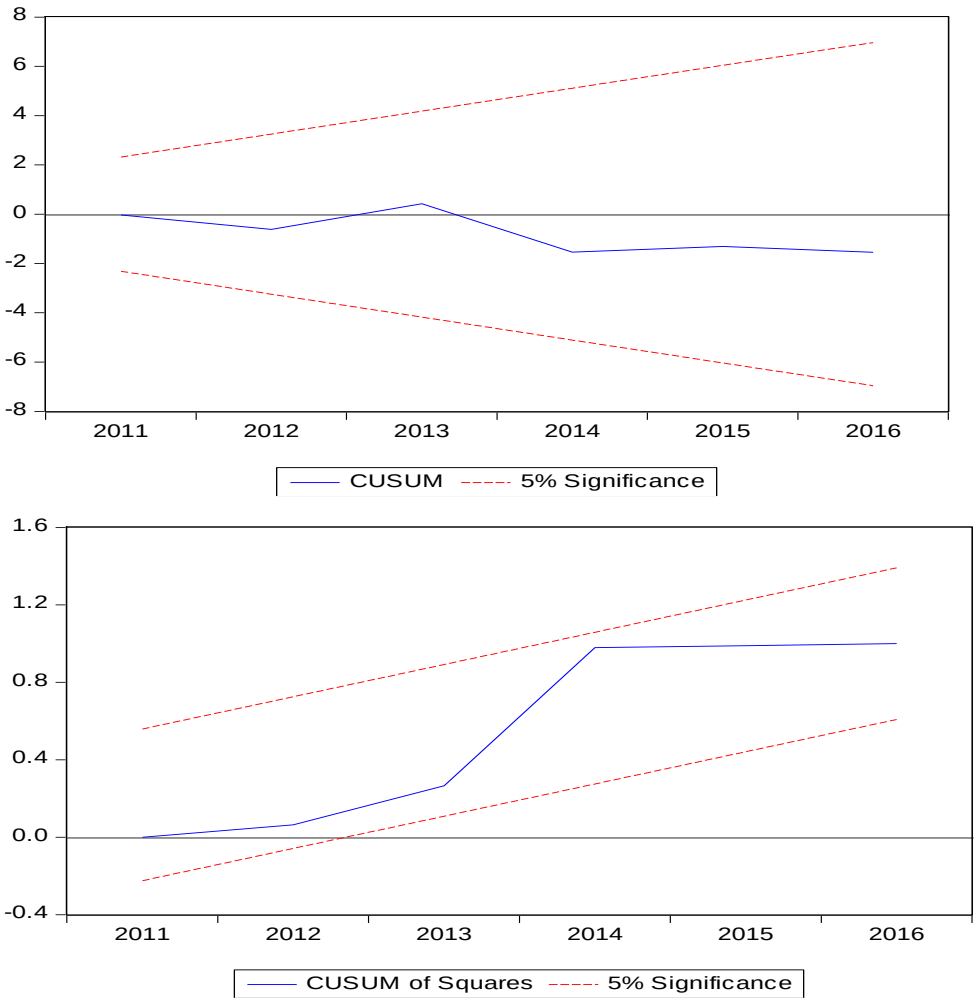


Model 3: ARDL (1,0)





Model 4: ARDL (2,4,4,4,4)



Conclusion

Pakistan has been victimized by the unemployment and facing the worst situation of crime and poverty. Various studies have been conducted in Pakistan to overwhelmed the problem. Besides, various international studies have also examined the problem throughout various countries in the world to eradicate or at least reduce the unemployment in the various countries (Aqil, Qureshi, Ahmed & Qadeer,2014).

The present study focused on the impact on unemployment due to FDI, private investment, export and government expenditure. The results reveal that lower levels of FDI and fewer government

expenditures have a significant role in creating new jobs, and reduce unemployment. Similar result was also found in (Young&Pedregal2000; Arsalan& Zaman, 2014; Mehmet & Demirsel, 2013). Export does not contribute to create job therefore the impact of export is insignificant on unemployment. Similar results were also obtained by (Ozughalu & Ogwumike, 2013). Private investment shows an impact on unemployment with inverse relationship with unemployment, showing, inconsistency with theoretical framework. This same result was also got in other researches (Aktar&Ozturk, 2008).

All the independent variable examined in the study confirm existence of a long run relationship with unemployment except government expenditures. This particular study provides excellent support to economists and regulatory authorities to comprehend variables of the study in creating jobs**.** Government must focus on FDI, private investment and exports to reduce unemployment. The negative relationship between unemployment and private investment should encourage to bring the private investment up to that level that may curtail unemployment since research concludes that when private investment decreases, there is an increase in the unemployment, confirming theoretical framework. Since the economic activities decrease with the decrease in the private investment, therefore more workers get unemployed at that time.

For future studies, the researchers, interested to examine the issue of unemployment are encouraged to study various macro-economic and social variables which are not a part of this study but may impact on the unemployment.

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