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AN EMPIRICAL ANALYSIS OF ECONOMIC GROWTH-FDI NEXUS: THE ROLE OF FDI VOLATILITY IN PAKISTAN

Muhammad Tariq Majeed and Saba Ashiq[1]

Abstract

Attracting FDI has continued to be a vital concern for many countries to complement their insufficient investment and to boost economic performance. However, the empirical studies on growth impact of FDI have produced mixed results. This study explains growth-FDI nexus in the context of Pakistan by focusing on volatility of FDI in shaping the growth-FDI nexus from 1976 to 2016. The exponential generalized autoregressive conditional heteroscedastic (EGARCH) statistical method is used to measure volatility of FDI. The long run relationships of variables are tested employing "autoregressive distributed lag (ARDL)" method of estimation. Moreover, this study incorporates endogenous structural breaks into the empirical analysis. "Zivot and Andrews" and "Lumsdaine and Papell" tests are applied. The results show that FDI inflows increase growth whereas FDI volatility adversely affects growth.

Keywords: Volatility, FDI, ARDL, growth, structural breaks, Pakistan

JEL Classification: F21, O40, O50

1. INTRODUCTION

FDI inflows create job opportunities, increase innovations and positive spillover effects, offer access to international markets for exports, promote competition by improving the imperfectly organized firms, modernize human capital by providing trainings to managers and workers. Hence, FDI broadens the learning of the host economy and stimulates economic performance (De Mello, 1997).

Ozturk (2007) reviews many empirical studies on growth-FDI nexus and concludes FDI causes diverse effects on growth of an economy. Whereas, many quantitative evidence has been provided to explore the connection of FDI with growth, an equally important issue namely the impact of FDI volatility on growth is relatively ignored. Accordingly, perhaps, FDI-growth nexus remains inconclusive. The literature ignores the issue of FDI volatility. In effect, stable FDI inflows tend to increase economic growth, whereas volatile FDI causes opposite effect on the growth because of following reasons.

First, innovations and technological adoption in the host economies are discouraged in the presence of volatile FDI inflows. Second, FDI volatility is an indicator of host county specific risks such as political or policy uncertainties in the host economies. Foreign investors postpone FDI or withdraw FDI in the presence of country specific uncertainties. Consequently, growth of the economy is negatively affected (see, for

[1] Authors are respectively Associate Professor in school of Economics, Quaid-i-Azam University, Islamabad and MPhil Research Scholar in University of Sargodha, Pakistan. (Email of corresponding author: tariq@qau.edu.pk)

details, Lensink and Morrissey 2006). Moreover, unpredictability of capital inflows causes negative effect on growth by destabilizing investment and discouraging innovation and technology [Dixit & Pindyek (1994), Lensink & Morrissey (2006), Guillaumont and Chauvet (1999), Xiaming (2005) and Majeed & Ahmad (2006)].

In the case of Pakistan, various studies simply concentrate on the contribution of FDI to growth and exhibit inconclusive outcomes. Few research investigations suggested positive contribution of FDI to growth [Aurangzeb et al. (2012), Ahmad et al. (2012), Iqbal et al. (2010), Zeb et al. (2014), Younus et al. (2014) Abdullah et al. (2015) and Malik (2015)]. Contrary, some studies have shown adverse growth effect of FDI [Saqib et al. (2013) and Falki (2009)]. These studies ignore FDI volatility in determining FDI-growth nexus. This paper extends the literature by modeling FDI volatility for growth-FDI nexus in the context of Pakistan between 1976 and 2016.

Remaining study is arranged in following sections: next part gives description of the FDI trends. Part 3provides "review of the literature". Part4 outlines "the data, variables and empirical methodology". "Empirical results" are explored in Part 5. Part 6 concludes the research.

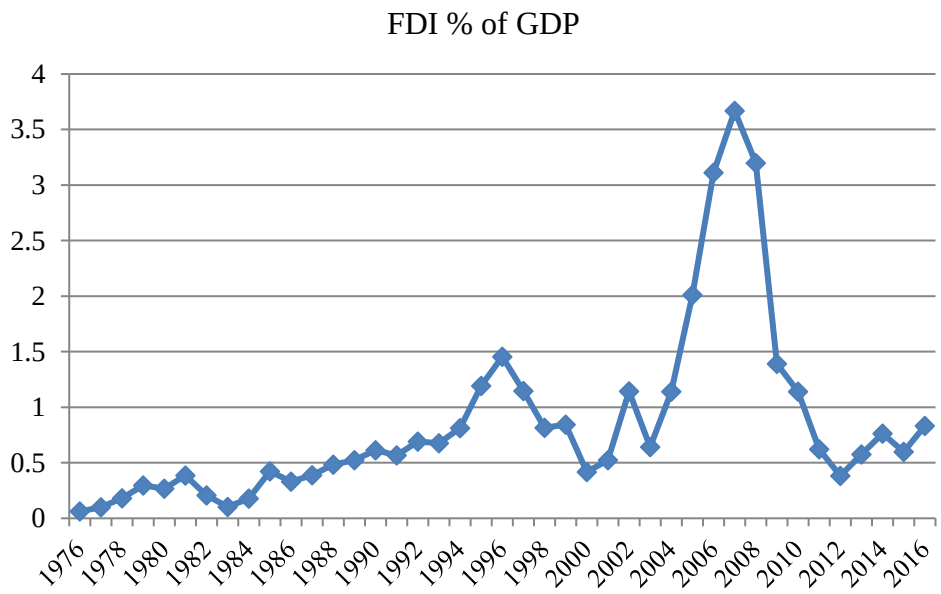
2. TREND OF FDI IN PAKISTAN

FDI inflows boost production, improve technology and make domestic firms more creative and therefore, developing nations encourage FDI. Pakistan has an incredible potential to attract FDI because of plentiful resources, substantial market and better geological location in respect to different countries. However, Pakistan failed to attract sustainable inflows of FDI because of number of interior and exterior issues such as weak and ineffective institutions, weak regulatory systems, corruption, political instability, poor "law and order" conditions, and inefficient labor production (Khan and Khan, 2011; Pakistan Economic Survey, 2016).However, in 1990s, Pakistan offered certain financial advantages, tax relaxations and also decreased tariff related to FDI [Khan (1997) and Aqeel & Nishat (2004)]. Therefore, 100% equity offered to foreign investors on industrial projects without earlier endorsement. Further, in 1994, the government reduced restrictions on some capital exchanges and relaxed certain foreign investment (Khan, 2008).

Moreover, during 2000s, Pakistan received a remarkable amount of FDI. As indicated by Board of Investment (BOI), in 2001–2002, FDI is measured around $485 million and quickly expanded for the subsequent six years. The ascent of FDI in 2006 was due to privatization process and primarily credited to green field investment. The green field investment brings new jobs, influx of innovations and learning and upgraded the human capital in Pakistan. In spite of the remarkable increase in FDI, it stayed deficient as compared to other emerging nations. In 2007, the capital inflows in developing countries were around 7.5% whereas they were 4 % in Pakistan (Zeb et al., 2014).

However, during 2007 to 2008, inward FDI was expanded in different services sectors, exclusively in telecom sector. Still, in some areas, FDI inflows were diminished because of political instability, deficient institutional framework, and terrorism in Pakistan (Khan and Khan, 2011) and FDI estimated around $5409 million. Afterward, in 2011–2012, the level of FDI further diminished and came to $732 million because of Global Financial Crisis. In 2013, FDI again showed upward growth and reached to $140863 million (Malik, 2015). During the last few years, government has impelled comprehensive policy to make favorable investment conditions to attract FDI. Therefore, during 2015 FDI displayed an improvement of "10.2 percent and came to $2,057.3 million against $1,866.3 million" during 2014. It shows that investors are re-establishing their confidence which has set back because of past bad investment conditions (Pakistan Economic Survey, 2015).

Figure 1: Trend of FDI



3. LITERATURE REVIEW

This part gives the description of literature on FDI, growth and FDI volatility. The sub-sections are organized as follows: First, a review of the theoretical studies has been provided. Second, empirical literature has been discussed. Third, the relationship of FDI volatility and growth is discussed. Fourth, literature with respect to Pakistan has been discussed.

3.1. Theoretical Literature

There are distinctive beliefs about the relationship of FDI with growth. As Solow growth model considered foreign capital as exogenous and showed that, capital

accumulation only influences short run growth while long run growth becomes possible when the state of technology increases constantly (Solow, 1957). Afterward, Romer (1986) & Lucas (1988) built up "endogenous growth" model, which is widely acknowledged in the literature. In endogenous growth model, following channels are important. First, FDI boosts accumulation of the capital in a developing economy through bringing new input sources and technology (Dunning, 1992; Majeed & Ahmad, 2008). Second, FDI promotes the existing state of information and abilities in the host economies by training the labor and supervisor ("De Mello, 1997, 1999"). Third, FDI also triggers competition between local and foreign firms (Majeed & Ahmad, 2009).

3.2. Empirical Studies

Empirical studies can be classified into three strands of the literature. First, FDI inflows are positively related with growth of the host economies. Second, FDI inflows exert negative influence on growth. Third, the domestic conditions of FDI receiving countries mediate the contribution of FDI to growth. FDI causes positive influence on growth only in those economies where domestic conditions namely development of financial sector, strength of human capital, and institutions is high. One of the earlier investigations, Findlay (1978), and Borensztein et al. (1998) proposed that FDI would improve growth by technological development. Similarly, numerous authors have discovered that FDI upgraded the skills of labor, lessening the gaps between saving and investment, and relaxed the restriction on foreign exchange [Aitken et al. (997), Adeniyi et al. (2012) and Majeed (2017)]. It is generally believed that in the short run FDI boosts growth by extending economic activities. Notwithstanding, in long run FDI causes negative effect on growth rate because of reliance, especially de-capitalization and mutilation of resources [Bornschier (1980) and Mazenda (2014)].

Though, another view stated that few unfriendly conditions shrink FDI and obstruct economic growth. For example, FDI tends to deteriorate current accounts and increment external obligation (Mencinger, 2003). Furthermore, the studies of Omran and Bolbol (2003), Chase-Dunn (1975) and Esso (2010) point out that FDI inflow can negatively affect growth of host economies for the following reasons. Foreign firms have the advantage of superior technology and technical know-how and they can exploit because of having better access to larger financial resources and by promoting competition crowd out the domestic investment. Whereas, Dimelis (2005) and (Kolstad and Wiig, 2013) point out that when domestic firms obtained an aggressive position (imitative position) against external firms, economies of scale don't provide positive spillovers to local markets and FDI also expand income disparity.

Some other studies, such as Ekanayake and Ledgerwood (2010), show that FDI boosts growth only "when a sufficient level of absorptive capacity for advance technologies exists in the host economies". According to, Cuadros et al. (2004), and Busse and Groizard (2008) the effect of FDI on economic growth depends on trade strategy, institutional quality, and sociopolitical conditions of host economies. Moreover, contribution of FDI to growth also mediates through "quality of

governance, the security of property rights, tax structure, the openness of accepting nation, and the quality of infrastructure" (De Mello 1997; Borensztein et al. 1998; Hsiao and Shen 2003; Majeed, 2016). On the bases of abovementioned arguments, questions arise as to how should we constitute FDI policy? How FDI contributes to growth? To find the answers of these question we investigate the role of FDI volatility.

3.3. FDI Volatility and Economic Growth

The theoretical studies highlight that volatility of FDI streams may negatively affect real GDP growth because the volatility of FDI streams tends to build instability [Lensink & Morissey (2006), Choong & Liew (2009), Van Staveren (2011) and Edwards et al. (2016)]. In times of higher instability, investors postpone investment because of "lower expected returns" and create hurdles in the way of innovation by increasing expenditure on research and development [Aizenman & Marion (1996), Serven (2002), Lensink & Morrissey (2006) and van Staveren (2011)].

However, the vast majority of the studies have shown that long-run capital flows are more stable as compared to short-run capital flows since short term FDI streams are exceptionally touchy to temporary moves in domestic and worldwide macroeconomic conditions and impacted by speculative powers and financing cost differentials [Sarno & Taylor (1999), Gabriele et al. (2000) and Felices et al. (2008)]. But some studies don't affirm this conclusion [Abel (1983) and Claessens et al. (1995)].

3.4. FDI and Economic Growth in Pakistan

An empirical study by Atique et al. (2004) presumed that the effect of FDI is more noteworthy during "export promotion trade regime" than "import substitution trade regime". They conducted an empirical analysis for Pakistan from 1970 to 2001. The results of their study confirmed favorable role of FDI for growth. However, this favorable role varies depending upon the trade regime. Their analysis shows that that FDI contributes to growth more under an "export promotion trade regime" than "import substitution trade regime".

However, using data from 1973 to 2014, Yousaf et al. (2008) contended FDI exerts permanent positive influence on imports. Whereas, FDI adversely influences exports in the short-term yet this effect is reversed in the long-term. Khan et al. (2011) argue that the contribution of FDI to growth varies depending upon the type of FDI receiving sectors. They found out that FDI encourages growth in "primary and services sectors" whereas FDI contributed little in manufacturing divisions over the period 1981-2008.

In relation to economic growth, Iqbal et al. (2010), Zeb et al. (2014), Younus et al. (2014), Abdullah et al. (2015) and Malik (2015), Aurangzeb et al. (2012) and Ahmad et al. (2012) provided evidence of positive role of FDI for economic growth. On the opposite side, some studies found out negative growth effect of FDI in Pakistan [Saqib et al. (2013) and Falki (2009)].

Saqib et al. (2013) explored the growth effect of FDI in the context of Pakistan from 1981 to 2011. They argued that FDI competition has destroyed local natural resources and developed monopolies dominated by industrial sector. Their analysis confirms negative role of FDI for economic performance. Yet, economic development is profited from local investment execution. Similarly, Falki (2009) explored the influence of FDI on growth of Pakistan from 1980 to 2006.Shealso found negative role of FDI for economic performance. However, the negative effect is statistically insignificant.

As we noticed from the above discussion that neither theoretical and nor empirical studies trace out a precise and conclusive association between FDI and economic growth. In some years Pakistan got high volume of FDI flows and in some years we are failed to get sufficient FDI and there is no study, which considers the impact of FDI volatility on economic growth of Pakistan, as far concern to our knowledge. Therefore, this study investigates the effect of FDI volatility on economic growth in Pakistan by utilizing the "ARDL bound testing approach". The essential point of this study is to add into the rare empirical literature on FDI volatility and economic growth by showing time series evidence for Pakistan.

4. RESEARCH METHODOLOGY, DATA DESCRIPTION AND MODEL SPECIFICATION

The data is extracted from Pakistan Economic Survey (2015) and "World Development Indicators" (WDI, 2016). The time period of study was selected based on the data availability at the time of research. The starting period is 1976 because in the start of 1970 Pakistan and Bangladesh were united. Moreover, the fourth five year plan (1970-1975) of Pakistan includes Bangladesh as part of Pakistan. Furthermore, the amount of FDI as a ratio of GDP was negligible, less than 0.1%, during 1970-75. Economic growth of united Pakistan in 1970 was 11.35%while it drastically fell to 0.47 and 0.81 in the years of 1971 and 1972, respectively. This is why the starting period is considered 1976 to assess the FDI inflows specific to Pakistan. This study follows endogenous growth model because it does not consider foreign capital as 'fixed' like neoclassical growth model. According to neoclassical theory, "FDI is considered to only have a short-run effect on the growth of output because of diminishing returns of capital in the long run. Neo-classical growth models postulate that long-run economic growth arises from both technological progress and labour force growth, which are both exogenously determined. However, the recent endogenous growth theory has promoted research into channels through which FDI can be expected to encourage economic growth both in the short run and long-run" and treated endogenously in the model (see, for details, Ngugi, 2014).

$$LrGDP_t = \alpha_0 + \alpha_1 FDIV_t + \alpha_2 FDI_t + \alpha_3 INV_t + \alpha_4 LF_t + \alpha_5 Trade_t + \alpha_6 CPI_t + \varepsilon_t \quad (1)$$

In equation (1), log of real GDP is used as dependent variable.[2] Whereas, explanatory variables are FDI inflows (FDI), total domestic investment by public and private

[2] In order to create real GDP series, the nominal GDP series is deflated by the GDP deflator.

sector (INV), Trade is the "sum of exports and imports as a % of GDP". Labour force is measured by population (15-60) % of total population and inflation (CPI) is used as a proxy of macroeconomic uncertainty.

4.1 Structural Break Unit Root Tests

To check structural breaks in the data, we employed Zivot & Andrews (1992) unit root test for one break and Lumsdaine & Papell (1997) for two breaks. According to Perron (1989), it is important to incorporate structural breaks while applying unit root tests. However, the Zivot and Andrews (1992) test is widely used than Perron (1989) test as it examines the structural break in the series endogenously rather than exogenously. The null hypothesis of Zivot and Andrews testis that "the series showing unit root including drift reject any structural break in the series". The present study applied 3rd model of Zivot and Andrews test as it allows for structural break in both intercept and trend and it is widely accepted model in the empirical literature. Sen (2003) indicated that it will cause a substantial loss in power if model with intercept used while break is occurred in trend. Contrary to this, it will create a minor loss in power if model with trend used whereas the break is arisen in intercept. Therefore, we employ model with intercept and trend. The following equation is estimated:

$$\Delta Y_t = \beta_t + \beta_2 T + \phi DU_t + \gamma DT_t + \delta Y_{t-1} + \sum_{i=1}^{k} \rho_i \Delta Y_{t-i} + \varepsilon_t \qquad (2)$$

Where DUt is a dummy variable which shows structural variation in the intercept at time TB (the break date); the dummy variable DUt is equal to =1if t >TB and zero if t <TB. The dummy variable DTt denotes "an adjustment in the slope of the trend function; DT_t = t-TB if t > TB and zero otherwise" (Glynn et al., 2007).

We have also applied "Lumsdaine and Papell" (1997) unit root test. Itis a flexible test as it allows more than one structural breaks in the series. It is an extension of the 3rd model (intercept and trend) of Zivot and Andrews.

$$\Delta Y_t = \beta_t + \beta_2 T + \phi DU1_t + \gamma DT1_t + \omega DU2_t + \psi DT2_t + \delta Y_{t-1} + \sum_{i=1}^{k} \rho_i \Delta Y_{t-i} + \varepsilon_t \qquad (3)$$

In equation (3) DU1t and DU2t and DT1t and DT2t are dummy variables which show structural breaks in the intercept and in the trend at time TB1 and TB2, respectively. "DU1t=1 if t>TB1 and zero otherwise; DU2t=1 if t>TB2 and zero otherwise; DT1t= t-TB1 if t>TB1 and zero otherwise; and finally DT2t=t-TB2 if t>TB2 and zero otherwise" (Valadkhani et al., 2005). However, the null hypothesis under the both test is same.

4.2. Model Specification

We applied Nelson's (1991) EGARCH methodology to measure the volatility of FDI and Autoregressive Distributed Lag (ARDL) Method to confirm co-integration among variables.

a. EGARCH Model

Nelson used the logarithm of conditional variance in EGARCH model which is defined as

$$Logh_t = \alpha + \sum_{i=1}^{p} \beta_t \left(\frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} \right) + \sum_{j=1}^{q} \lambda_j \log h_{t-j} + \sum_{k=1}^{r} \omega_k \left(\frac{\varepsilon_{t-k}}{h_{t-l}^{0.5}} \right) \quad (4)$$

Where variance of FDI is presented by $\log h_t$, the lagged conditional variance of the FDI error term is denoted by h_{t-j}. While α, β, λ and ω are estimated parameters of constant, ARCH, GARCH and EGARCH (leverage effect) models correspondingly. Lag structure are shown with p, r, and q. The term ε_t represents error term. We use Gaussian normal as error distribution and utilize EGARCH (1, 1) model.

b. Autoregressive Distributed Lag (ARDL) Method

We applied ARDL method to deal with co-integration (bound testing technique) among variables formatted by Pesaran et al. (2003). The "ARDL bound approach" is based on two stages. In the first stage, an unrestricted error correction model (UECM) is assessed as follow.

$$\begin{aligned} \Delta LrGDP_t = {} & \gamma_0 + \sum_{i=1}^{p_1} \alpha_1 \Delta LrGDP_{t-i} + \sum_{i=0}^{p_2} \alpha_2 \Delta FDIV_{t-i} + \sum_{i=0}^{p_3} \alpha_3 \Delta FDI_{t-i} + \sum_{i=0}^{p_4} \alpha_4 \Delta INV_{t-i} + \\ & \sum_{i=0}^{p_5} \alpha_5 \Delta LF_{t-i} + \sum_{i=0}^{p_6} \alpha_6 \Delta Trade_{t-i} + \sum_{i=0}^{p_7} \alpha_7 \Delta CPI_{t-i} + \beta_1 GDPP_{t-i} + \beta_2 FDIV_{t-1} + \beta_3 FDI_{t-1} + \beta_4 INV_{t-1} + \beta_5 LF_{t-1} \\ & + \beta_6 Trade_{t-1} + \beta_7 CPI_{t-1} + \omega_t \end{aligned} \quad (5)$$

The description of variables in the equation 4 is above-mentioned. Where Δ is demonstrating 1st difference operator and γ_0 indicates constant term. The estimated short run coefficients represented by α_i and long run coefficients of ARDL model with one year lagged terms are symbolized by β_i, and optimal lag length is displayed by p_i. The long run association among variables including one year lagged terms is assessed by applying bound test. The null hypothesis of bound testing indicates that, variables involved in the model don't have long run association and all the long-term parameters have zero explanatory power. Whereas, alternative hypothesis ratifies that all examined variables have long run relationship. Afterward, the second stage of "ARDL approach" incorporates the short-term "dynamic error-correction model".

$$\begin{aligned} \Delta LrGDP_t = {} & \lambda_0 + \gamma_0 (ECM_{t-1}) + \sum_{i=1}^{a} \alpha_1 \Delta LrGDP_{t-i} + \sum_{i=0}^{b} \alpha_2 \Delta FDIV_{t-i} + \sum_{i=0}^{c} \alpha_3 \Delta FDI_{t-i} + \\ & \sum_{i=0}^{d} \alpha_4 \Delta INV_{t-i} + \sum_{i=0}^{e} \alpha_5 \Delta LF_{t-i} + \sum_{i=0}^{f} \alpha_6 \Delta Trade_{t-i} + \sum_{i=0}^{g} \alpha_7 \Delta Trade_{t-i} + \varepsilon_t \end{aligned} \quad (6)$$

In equations (6) λ, γ and α are coefficients to be assessed, ε_t are serially uncorrelated error terms, and ECM_{t-1} is valued from the co-integrating equation.

5. Results and Discussion

This section displays the consequences of our observational investigation. Table 1 reports descriptive statistics.

Table 1: Descriptive Statistics

Variables	Mean	Median	Max	Min	Std.Dev	Skewness	Kurtosis	J-B	CV
LrGDP	21.173	21.215	21.616	20.756	0.280	-0.103	1.555	3.4622 [0.1771]	0.013
FDI	0.858	0.613	3.668	0.061	0.838	2.030	6.675	48.7457 [0.0000]	0.977
INV	17.483	17.565	21.104	13.995	1.609	-0.221	3.095	0.3328 [0.8467]	0.092
LF	55.121	53.508	60.320	52.934	2.583	0.885	2.135	6.3122 [0.0426]	0.046
CPI	8.501	7.921	20.286	2.914	3.610	0.757	4.156	5.9035 [0.0522]	0.424
Trade	33.728	33.696	38.909	27.719	2.831	-0.240	2.589	0.6504 [0.7224]	0.084

Note: LrGDP = log of real GDP, INV = Investment, LF = Labour Force, CPI = Inflation, Trade = Trade Openness

The descriptive analysis empowers us to decide that the data is normally distributed or not. In this examination, mean and median of all variables are practically same and their skewedness is close to zero. Furthermore, kurtosis of FDI and inflation is greater than 3 meaning that the data of these variables is not normally distributed. The Jarque-Bera (JB) statistics test is used to check the normality of data. High values of J-B test for the FDI and inflation indicate the rejection of null hypothesis of normality. The "coefficient of variation" (CV) is measured to assess the relative scattering of the variables. The higher the CV, the higher instability and thus permitting the immediate examination of the relative volatility of variables. In our examination, the most volatile variable is FDI. Other exogenous variables do not vary as much as FDI, except inflation as it displayed greater instability given relatively higher CV.

Table 2: Correlation Coefficients

variables	LrGDP	FDIV	FDI	INV	LF	Trade	CPI
LrGDP	1.0000						
FDIV	-0.5674 0.0002	1.0000 -----					
FDI	-0.3578 0.0253	0.7524 0.0000	1.0000 -----				
INV	0.4950 0.0014	0.1269 0.4414	0.4356 0.0056	1.0000 -----			
LF	-0.7909 0.0000	0.5504 0.0003	0.49951 0.0012	-0.3656 0.0221	1.0000 -----		
Trade	0.3492 0.0310	-0.0828 0.6163	0.2082 0.2034	0.4378 0.0053	-0.2380 0.1445	1.0000 -----	
CPI	0.0300 0.8559	0.3252 0.0434	0.3563 0.0260	0.1780 0.2782	0.2164 0.1859	0.4057 0.0104	1.0000 -----

Table 2 reports the correlation coefficients of log of real GDP, FDI volatility, FDI, investment, labor force, trade and CPI. Here, we focus on the correlation of volatility of FDI with all other variables. The estimates of correlation show that volatility of FDI has negative and significant correlation with log of real GDP and have positive correlation with all other variables aside from trade. Trade has positive and significant correlation with significant correlation with log of real GDP implying that growth of Pakistan economy can significantly benefit from trade. Investment also has positive and significant correlation with significant correlation with log of real GDP.

Estimation of FDI volatility

In this study, we employ EGARCH model to measure volatility of FDI for Pakistan. EGARCH (1, 1) model is specified using AR (1) process. The results of EGARCH model are shown in Table 3.

Table 3: The Conditional Variance Estimation for FDI

FDI		**Coefficient**			
Mean Equation					
C		0.7120 (0.0000)			
AR(1)		0.8676 (0.0000)			
Variance Equation					
Constant (α)		0.4577 (0.0635)			
ARCH (β)		-0.7804 (0.0187)			
EGARCH (λ)		0.6105 (0.0000)			
GARCH (ω)		0.9491 (0.0000)			
Diagnostic statistic					
ARCH (1)		0.8280 (0.3628)			
ARCH (16)		12.0748 (0.7388)			
Q-statistic (16)	1.3584 (0.244)	1.3594 (0.507	2.0156 (0.569)	4.6550 (0.325)	4.6959 (0.454)
Q-statistic Squared (16)	0.8606 (0.354)	1.0236 (0.599)	1.6707 (0.643)	2.7060 (0.608)	4.3309 (0.503)

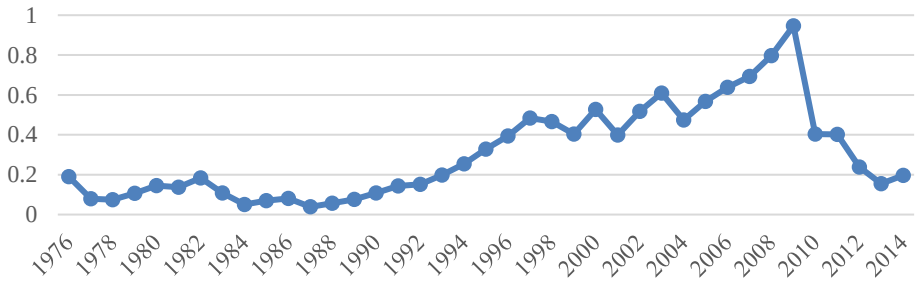
Note: probability values are given in parentheses.

The ARCH parameter expresses symmetric impact of the model. The persistence symmetric impact of FDI volatility is 78%. The EGARCH parameter measures the leverage impact which demonstrates the reaction of FDI volatility to both positive and negative shocks. The evaluated coefficients are positive and statistically not different from zero, showing the presence of leverage impact.

This result proposes that when FDI streams increase unexpectedly, volatility expands more than to unanticipated decline in FDI inflows. The GARCH parameter examines the persistence in conditional volatility. The persistent impact of FDI volatility is 94.9% which implies that after a shock in the economy, FDI volatility takes a long

time to disappear. To check the problem of heteroskedasticity and auto-correlation we applied ARCH (1) and ARCH (16) test and Q statistic and Q squared statistic with 16 lags respectively. However, the results of diagnostic tests indicated that there is no problem of heteroskedasticity and serial-correlation in standardized residuals.

Figure 2: Volatility of FDI



Note: Authors own calculations

Unit Root Tests

Initially, we applied Augmented Dickey-Fuller (ADF) test to confirm the order of integration of the variables. The results demonstrate that LrGDP the FDI series are stationary at level but level of significance is 10 %. Whereas, all other variables like volatility of FDI, investment, labour force, trade and CPI are stationary at 1st difference. To check the strength of the ADF test results, KPSS test is employed. it is presumed that all series in this analysis are stationary at first difference aside from KPSS test, since findings of KPSS test demonstrated that all variables stationery at level, so the findings of KPSS test are not likely the ADF test. These two unit-root tests are utilized to make assure that estimated relationship between FDI volatility and economic growth would is not spurious. Findings of both tests are displayed in Table 4.

Table 4: Result of Unit Root Tests

	ADF		KPSS	
	Intercept and trend		Intercept and trend	
Variables	**Level**	**1st difference**	**Level**	**1st difference**
LRGDP	-3.2030***	-3.8878**	0.0936*	0.1062*
FDIV	-1.9320	-6.0541*	0.0938*	0.1027
FDI	-3.4198***	-3.9886*	0.0579*	0.0473*
INV	-2.5114	-6.7308*	0.0762*	0.0432*
PO	-1.9138	-4.4463*	0.1980***	0.1002*
Trade	-2.9763	-7.6035*	0.1373**	0.0825*
CPI	-3.0152	-7.4717*	0.0559*	0.0457*

*"Note: ADF critical values at 1 percent, 5 percent and 10 percent level of significance are -4.2268, -3.5366 and -3.2003, respectively. KPSS critical values at 1 percent, 5 percent and 10 percent level of significance are 0.2160, 0.1460 and 0.1190, respectively. The *, **, and *** indicates 10 %, 5 % and 1 % levels of significance, respectively."*

Unit Root Tests with Structural Breaks

We apply "Zivot and Andrews" and "Lumsdaine and Papell" tests to test structural breaks. The results of both tests are presented in Table 5. Similarly to ADF test, the t-statistic of all variables aside from FDI is less than the critical values; so, the null hypothesis of unit root tests with structural breaks couldn't be rejected. Consequently, the inference can be drawn that no evidence is found in support of structural breaks in all series except FDI.

Table 5: Unit Root Tests with One and Two Structural Breaks

Variables	Zivot and Andrews Test			LP Unit Root Test		
	intercept and trend			intercept and trend		
	lags	Break Date	t-statistic	Lags	Breaks	t-statistic
LrGDP	1	1996	-4.0698	1	1990 2002	-4.6684
FDI	1	2006	-5.9070*	1	2002 2008	-7.4344*
FDIV	0	2008	-4.1309	0	1986 2007	-5.6779
CPI	0	2008	-4.6466	0	1997 2007	-5.9682
INV	0	2005	-4.48012	0	1995 2004	-5.4860
PO	1	1986	-4.7405	1	1990 2008	-5.1620
Trade	0	1998	-4.6922	0	1994 2002	-5.2438

"Note: Zivot-Andrews (ZA) critical values at 1 percent (*), 5 percent (**)and 10 percent (***) level of significance are -5.5700, -5.0800 and -4.8200 respectively. Lumsdaine-Papell (LP) critical values at 1 percent (*), 5 percent (**) and 10 percent(***) level of significance are -7.1900, -6.7500 and -6.4800. The SBC criterion is used to determine optimal lag length."

The "Zivot and Andrews" test is failed to discover the evidence of stationarity including one structural break besides FDI. The likely reason could be that this test allows only more significant structural break in the data (Aslan, 2010). For this reason, we use "Lumsdaine and Papell" (1997) unit root test. This test allows two structural breaks. The findings of the "Lumsdaine and Papell" test uncover that the t-statistic of all variables are not above the critical valuesexcept FDI; and subsequently, we neglect to reject the null hypothesis of a unit root test besides FDI that being referred to stationary at the 1% level of significance and provide solid evidence for the structural breaks in the data of FDI.

ARDL Bound Testing Approach

We compared F test statistic (conducted from UECM model) with the bounds given by the critical values of Narayan (2005). Table 6 shows that the computed F-statistic is significant and larger than the upper bound. The results of ARDL bound testing approach confirmed a long-run link between economic growth and volatility of FDI for Pakistan. The optimal lag length is selected using SBC criteria.

Table 6: Bound Testing Results

Model	Lags	F Calculated Value	Level of Significance	F-tabulated values	Lags
F(LrGDP/FDIV,FDI,INV,LF,Trade,CPI)				Lower bound	Upper bound
	2	6.9535*	1 %	2.5	3.6
			5 %	2.9	4.0
			10 %	3.6	4.9

*Note: * indicates 1% level of significance*

Long Run Results of ARDL Model

Table 7 shows that the long-term estimates of ARDL model are consistent with theoretical and empirical studies which indicate that FDI volatility causes negative and significant effect on growth [Lensink & Morrissey (2006), Choong et al. (2011), Ngugi (2014) and Ngeny & Mutuku (2014)]. Other independent variables in the model have expected relationship with economic growth such as investment, labor force and trade have positive relation [Majeed & Ayub (2018) and Majeed (2019)] whereas, CPI has a negative though insignificant association with economic growth.

The impact of FDI is not significant. This finding can be explained with the view stated that few unfriendly conditions shrink FDI and obstruct economic growth. For example, FDI tends to deteriorate current accounts and increment external obligation (Mencinger, 2003). Furthermore, the studies of Omran and Bolbol (2003), Chase-Dunn (1975) and Esso (2010) point out that FDI inflow can negatively affect growth of host economies for the following reasons. Foreign firms have the advantage of superior technology and technical know-how and they can exploit because of having better access to larger financial resources and by promoting competition crowd out the domestic investment. Whereas, Dimelis (2005) and (Kolstad and Wiig, 2013) point out that when domestic firms obtained an aggressive position (imitative position) against external firms, economies of scale don't provide positive spillovers to local markets and FDI also expand income disparity.

Table 7: Results of Long Run ARDL Model

ARDL (2,0,0,1,0,1,0) SBC LRGDP				
Variables	**Coefficients**	**Std. Error**	**t-statistics**	**P-values**
FDI volatility	-0.3143*	0.1069	-2.9403	0.0070
FDI	0.0369	0.0388	0.9525	0.3500
Investment	0.0389**	0.0183	2.1256	0.0436
Labour Force	0.0361*	0.0106	3.3972	0.0023
Trade	0.0238*	0.0086	2.7681	0.0105
CPI	-0.0001	0.0051	-0.0136	0.9893

Note: ", ** and*** indicate 1 %, 5% and 10% levels of significance, respectively."*

Short Run Results of ARDL

The short-term result of ARDL model exhibits volatility of FDI has negative and significant effect on growth. The coefficient of ECM has an expected negative and significant impact, demonstrating fast speed of adjustment, almost 60 percent

disequilibrium due to last year shock is converted towards long-term equilibrium in the current year.

Table 8: Short Run Results of ARDL Model

ARDL (2,0,0,1,0,1,0) SBC DLRGDP				
Variables	**Coefficients**	**Std. Error**	**t-statistics**	**P-values**
DLrGDP(-1)	0.3308 **	0.1298	2.5484	0.0173
DFDIV	-0.1872*	0.0572	-3.2748	0.0031
DFDI	0.0220	0.0221	0.9979	0.3279
DINV	0.0035	0.0088	0.3975	0.6944
DLF	0.0215*	0.0070	3.0817	0.0050
DTrade	0.0067	0.0047	1.4333	0.1642
DCPI	-0.00004	0.0030	-0.0136	0.9893
ECM(-1)	-0.5956*	0.1037	-5.7423	0.0000
R-Squared	0.9849	**D-Watson Stat**	2.1762	
Adj R-squared	0.9782	**F-statistic**	147.8444*	0.0000

Note: ", ** and*** indicate 1 %, 5% and 10% levels of significance, respectively."*

Diagnostic Tests

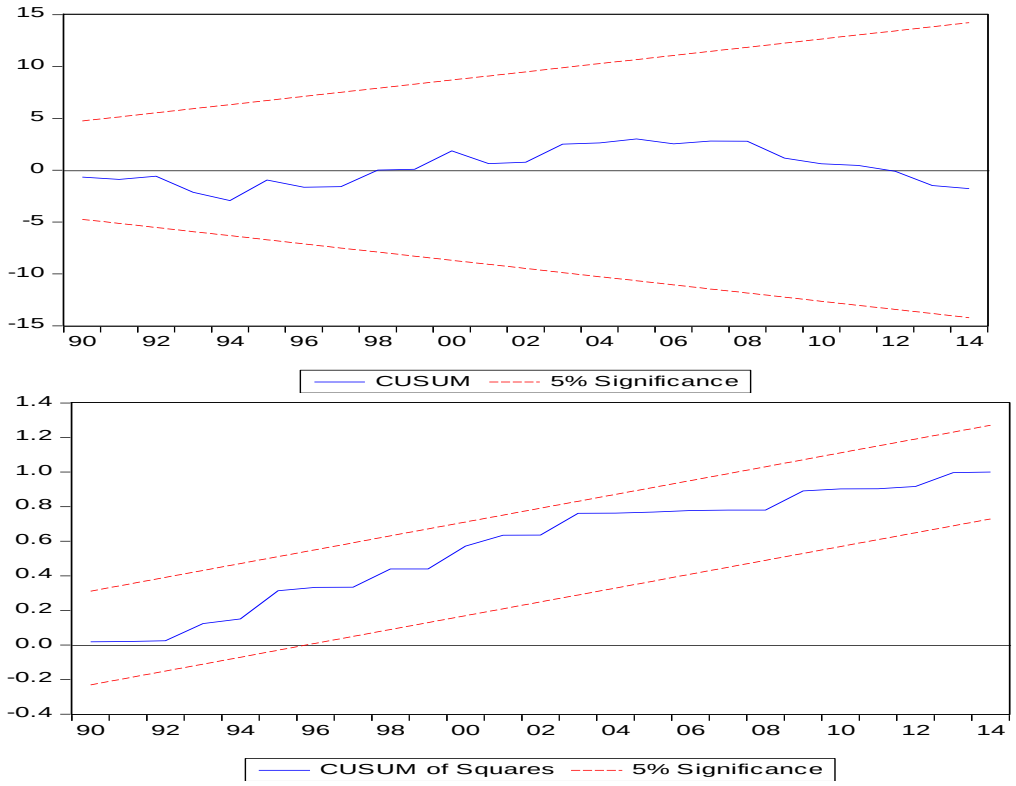
Table 9 reports the results of different diagnostic tests. Highly insignificant F-statistic of all tests indicates that the ARDL model is passed against these all diagnostic tests. The results of this study are not biased because of auto-correlation and heteroskedasticiy. Moreover, Ramsey RESET and Jarque-Bera tests suggest that the model is correctly specified and data is normally distributed, respectively.

Table 9: Results of Diagnostic Tests

Tests		**F-value**	**p values**
Serial-correlation	Breusch-Godfrey	1.1100	0.2921
Heteroskedasticity	ARCH(1)	0.0964	0.7562
Functional Form	Ramsey RESET	1.2820	0.2687
Normality	Jarque-Bera	0.9765	0.6137

Stability Tests

The plots of CUSUM and CUSUMQ are represented below which show that our empirical model is stable over the study period.



6. CONCLUSION

The study examines the relationship of FDI with economic growth through incorporating the role of volatility of FDI inflows in Pakistan over the period 1976-2016.The results are estimated using EGARCH and ARDL approach to cointegration. The EGARCH model is applied to measure volatility and ARDL model is used to confirm long run relationship between variables. The empirical results suggest that FDI significantly increases economic growth whereas its volatility adversely affects growth of Pakistan over the study period.

Since empirical evidence has exhibited that volatility of FDI inflows negatively influences growth, it is recommended that government needs to ensure stable macroeconomic system to ensure sustainable inflows of FDI. Furthermore, government needs to introduce more appealing investment package to attract capital inflows. FDI policy needs to be devised in a way that it compliments to the performance of domestic investment.

This study has certain limitations. The volatility of FDI is incorporated in the empirical analysis while the volatility of economic growth is not estimated. The role of regional FDI is not incorporated in this analysis. The times series analysis for economic growth contains limited causes of growth. The time series data is based on

annual observations whereas quarterly observations give more degree of freedom in empirical analysis. This study focuses on overall FDI inflows whereas the types of FDI are not considered in this study. Moreover, sectoral analysis of FDI inflows is important to better understand growth-FDI nexus. What constitute FDI volatility itself is not consider in this study. Political instability, quality of institutions, and energy shortage are the important factors which can explain FDI volatility in the case of Pakistan.

This study recommends following suggestions for future research. The future studies can address the question: Does FDI volatility varies depending upon the types of FDI inflows? Policy instability is an important indicator which determines sustained inflows of FDI, an index for policy instability can be used to better understand the growth-FDI nexus. The role of political environment and economic freedom is also important to understand growth-FDI nexus. It can be estimated that what type of political regime causes lower volatility of FDI. The role of financial institutions and energy shortage is also important to understand FDI volatility in the case of Pakistan. Future research can use simulations equations to estimate the effect of FDI volatility as independent and as dependent variable simultaneously. Future research can focus on trade volatility to explain FDI volatility.

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