Impact of Foreign Aid Volatility on Economic Growth in Pakistan

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Abstract
Most of the developing countries have inadequate level of savings/investment and foreign aid can increase domestic savings for their investment and further to boost economic growth. In this regard, the focus of current study is to analyze the impact of foreign aid and volatility of foreign on economic growth of Pakistan for the time period of 1972-2010. Foreign aid volatility is measured by GARCH family modeling and found that GARCH (1,1) is appropriate model for measuring foreign aid volatility. After data compilation, stationarity of all the variables is checked and found that all the variables are integrated of I(1) and then apply cointegration technique and found that there is long run relationship between variables on the basis of Trace and Eigen statistics. Empirics' shows that foreign aid and economic growth are positive associated while foreign aid volatility is negatively associated with economic growth. On the basis of study findings, it is recommended that foreign aid should make sustainable for economic growth of Pakistan.

Introduction

Early literature on the determination of the aid-growth link was based on growth model of the Harrod-Domar. Before Harrod-Domar explanations, there were some other models those were developed by Chenery and Strout (1966). It was assumed in these models that there is an excessive labor supply, and growth is only reserved by the accessibility and productivity of capital. Three gaps were identified as constraints to economic growth, which are needed to be filled by foreign aid to facilitate investment. The three gaps are savings gap, trade gap and fiscal gap.

Generally, it was assumed that most of the developing countries have inadequate levels of savings/investment and foreign aid can complement domestic savings, which could be concentrating toward investment. In this study, we assume that all foreign aid will be allocated for investment and further economic growth purposes. Poor countries also face the problem of insufficient export earnings required to import capital goods for investment. So it is assumed that the foreign aid will assist poor countries like Pakistan to fill all three gaps. The Fiscal gap was first openly demonstrated by Taylor and Bacha (1990). Most of the developing and under developed countries do not have the potential capacity to generate revenue to cover the minimum substantial level of public investment. In this regard, the foreign aid is seen as essential tool to fill this gap in developing countries.

There is vast literature available on aid-growth linkages but there is no study available on aid volatility and economic growth in Pakistan. As the trend of aid and volatility of aid in Pakistan is concerned, under the various circumstances that are put forwarded by the donors, most of the South Asian countries depend upon developed countries for aid receiving for long-term, short-term and humanitarian development programs. Aid flow into the South Asian countries is highly volatile and also shows no stability in its trend over the long time period. Same situation is seen in the case of Pakistan, as Figure 1 show that how the aid disbursement fluctuate in Pakistan during the study period.

AID
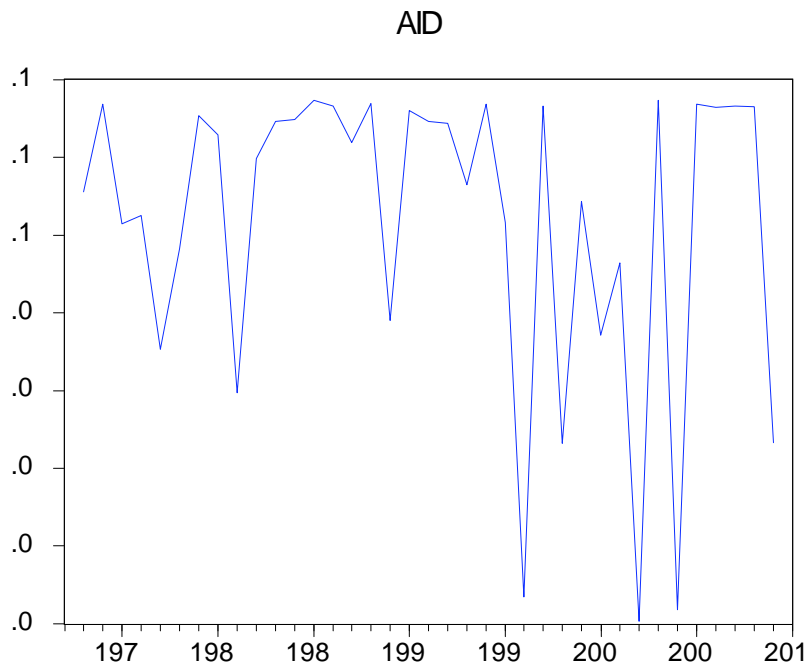
In addition, the South Asian region is vulnerable because of facing civil conflict and guerrilla war, natural disasters and political instability over the last few decades, which sanction foreign aid to be heterogeneous. Since studies on growth effect of aid and its volatility haven't so far been done taking individual country effects into account in South Asia, this study, therefore, with our strong intention, fulfills this gap mainly focusing on effect of aid and its volatility on economic growth.

In this regard, present study focused only on Pakistan by using time series data. The aim of this study, however, is to draw attention to a previously neglected factor in the aid-growth literature, namely, the volatility of foreign aid flows. In terms of its contribution to economic growth, such volatility may influence the effectiveness of aid. Studies such as Bulir and Hamann (2003, 2005) and Chauvet and Guillaumont (2008) have looked at the volatility of foreign aid flows, but there are limited studies those investigated the link between economic growth and volatile aid. So this study analyzed impact of foreign aid and its volatility on economic growth of Pakistan.

Literature Review

Foreign aid plays an essential role in fulfilling saving gap, accumulating physical and human capital stock, developing infrastructure in the host countries (McGillivrary, 2009), and thus

promote economic growth in recipient countries. Studies on growth effect of foreign aid in the developing countries, in 70s, found zero correlation between growth and aid, but came under criticism that during 1970s and 80s the concept of aid, its implementation process, and evaluation methods were new (Doucouliagos and Paladam, 2009). However, according to McGillivray et al. (2006) some researchers in 60s and 70s have also found that aid was associated either with higher savings or growth, while some others found the opposite. Later on, some findings came to various conclusions on the effect of aid on growth. In such a way, authors Doucouliagos and Paladam (2009) in their Meta study, which analyses previous studies and theories related to growth impact of foreign aid, concluded that the aid-growth effect is stronger in Asian countries.

Existing literature show that foreign aid and economic growth are positively associated in which some are explained here. Papanek (1973), found a positive and significant relationship between foreign aid and economic growth. He separated aid from other types of foreign capital and empirically examined the relationship between foreign aid, saving and foreign private investment. He maintained that foreign aid should be directed at countries suffering from a balance of payments constraint.

Levy (1988) examined the relationship between aid and growth in sub-Saharan Africa and found a significant positive correlation between aid and investment as well as between aid and economic growth in Africa. Similarly, Singh (1985), Hadjimichael et al. (1995) and Dowling and Hiemenz (1983) all find a positive and significant impact of foreign aid on growth. Clemens et al. (2004) distinguish between short-impact aid and long-impact aid and find a strong and positive effect of aid on growth.

There are several other studies available which explain reasons as to why foreign aid may be unfavorable to economic growth. One line of argument attributes the negative impact of foreign aid on growth to government actions. Since foreign aid expands a government's resource envelope, it often relaxes its tax raising efforts and thus results in reduced tax revenues. The country's tax raising mechanisms may subsequently deteriorate triggering the need for additional aid while dissipating the short-term beneficial effects of aid and creating a culture of dependency (Adam and O'Connell, 1999). Moreover, many critics of foreign aid refer to the tendency of large capital inflows to reduce government fiscal discipline (Levy, 1988). A larger resource

envelope may have a corrupting influence on governments since it relaxes its need to explain its actions to citizens.

A further important negative effect of foreign aid on growth involves a phenomenon termed the 'Dutch Disease'. The mechanism is as follows. When a part of the large windfalls of resources (in this case foreign aid) is spent on non-traded goods and services in the domestic country, an excessive demand for this type of goods and services arises. As imports cannot satisfy this excess demand and due to domestic supply constraints, the price of non-tradable goods and services will consequently increase relative to the price of tradable goods. The subsequent appreciation of the real domestic exchange rate results in the loss of external competitiveness which, in turn, could lead to lower economic growth in the long-run (Van Wijnbergen 1984).

Moreover volatility in foreign aid flows result in variability of expenditure and thus in a proliferation of half-complete projects, thus lowering their rate of return. Volatile aid inflows especially in the form of technical assistance and consultancy result in high staff turnover in developing countries, discontinuity of relationships within the aid donor-recipient community, and as a consequence of the resulting low levels of social capital. Hudson and Mosely (2008b) observed that unstable expenditure distribution resulting from volatile inflows creates an capricious policy environment. Bulir and Hamann (2008) discussed the relative volatility of aid flows in the developing countries and their domestic revenues, concluded that volatility makes the macro economy hard to manage in very poor or aid dependent countries, whereas Neanidis and Varvarigos (2009) analyzed the growth effect, considering two types of aid such as directly productive and pure aid, found that aid can hurt the recipient's growth rate emerge only in case where foreign aid is volatile. But Hudson and Mosely (2008a) argued that the poor countries have the highest volatility appears not to be correct, concluding that impact of aid on growth is depends on the types of aid, and further suggested that measures which increase trust between donor and recipient, and reductions in the degree of donor oligopoly reduce aid volatility without obliviously reducing its effectiveness.

Data and Methodology

In this study I have collected annual data for Pakistan for below mentioned variables ranging from 1972-2010 from various sources like UNDP, International Financial Statistics of IMF and World Development Indicators.

Following model has been estimated to investigate impact of foreign aid and its volatility on economic growth in Pakistan.

$GDP_t = f(FAID_t, AIDVOLT_t, FDI_t)$

Where

GDP= Gross Domestic Product

FAID= Foreign Aid

AIDVOLT= Foreign Aid Volatility

FDI= Foreign Direct Investment

Data on GDP, FAID, AIDVOLT and FDI is collected from world development indicators while AIDVOLT is measured by GARCH (1, 1) variance because this model is best fit to detect volatility of FAID on the basis of shwartz criteria. The data on GDP, FDI and FAID is in millions at current US$. To minimize the inflationary effect, all independent variables, except AIDVOLT are converted in real form by dividing the observations on GDP deflator, GDP deflator is obtained from IFS CD on the base of 2000. After making all series in real then take log of all variables.

After collection of above mentioned variables, I have checked the characteristics/description of variables. In first step I have checked description of all variables with the values of mean, standard deviation, kurtosis, skewness, J-B statistics, etc. These all are applied for the normality of the selected series (Annex-I).

In second step I have estimated correlation matrix for correlation between all variables. This matrix also explains the existence of multicollinearity between independent variables, if any. These estimations show that there is no multicolinearity in independent variables because no value is close to one (Annex-II).

Stationarity Process

Given a simple AR (1) process

$$y_t = \rho y_{t-1} + x_t^{'}\delta + e_t \tag{1}$$

where y_t is a time series, x_t represents optional exogenous regressors, ρ and δ are the parameters to be estimated and e_t is the white noise error component. The standard DF test is implemented through the ordinary least square (OLS) estimation of the model (1) after subtracting the term y_{t-1} from both sides of the equation: $\tag{2}$

$$\Delta y_t = \alpha y_{t-1} + x_t^{'}\delta + e_t$$

Where Δ is the first difference operator, $\alpha = \rho - 1$, and e_t is the error term with zero mean and constant variance. The insignificance of the hypothesis $H_0 : \alpha = 0 (\rho = 1)$ presents that y_t is nonstationary series and its variance increases with time. This also suggests that the differences are required to achieve stationarity. The assumption of white noise is violated if the series is correlated at higher order lags, and in such circumstances, the possible solution of the problem is the ADF. It permits to correct for higher order correlation employed lagged differences of the series y_t among the regressors. In other words, the ADF test "augments" the traditional DF test assuming that the y series is a $AR(p)$ process, and therefore, adding p lagged difference terms of the dependent variables to the right hand side of regression of (2)

$$\Delta y_t = \alpha y_{t-1} + x_t^{'}\delta + \sum_{i=1}^{p} \phi_i \Delta y_{t-i} + \upsilon_t \tag{3}$$

One of the objectives in time series is to investigate the long run dynamics relationship among the variables. Engle and Granger (1987) stated that a linear combination of two or more non-stationary series may be stationary and if such a stationary linear combination exists then the non-stationary time series are said to be *cointegrated*. The stationary linear combination is called the *cointegrating equation* and may be interpreted as a long-run equilibrium relationship among the variables.

Cointegration Analysis

The central concept of cointegration test is the specification of models, which includes the long run movements of one variable relative to others. In other words, it clarifies the existence of long run equilibrium relationship between the two variables. If the time series variables are non-stationary in their levels, they can be integrated with integration of order one, when their first

differences are stationary. These variables can be cointegrated as well, if there are one or more linear combinations among the variables that are stationary. If these variables are being cointegrated, then there is a constant long-run linear relationship among them.

The cointegration test was first introduced by Engel and Granger (1987) and then developed and modified by Stock and Watson (1988); Johansen (1988, 1991, 1995) and Johansen and Juselius (1990). The test is very useful in examining the long run equilibrium relationships between the variables. In the present context, we used Johansen maximum likelihood (ML) approach to test the cointegration. This is because the technique is currently most reliable one and is better for small sample properties. Another advantage of this method is that several cointegration relationships can be estimated simultaneously. The method usually uses two statistics for testing the cointegration: The trace (Tr) test and the maximum eigenvalue (λmax) test.

Causality Analysis

To check the causal relationship between time series, Granger causality test, developed by Granger (1969) was used. According to Granger, a variable x_t is said to be Granger cause another variable y_t if the past and present values of x_t helps to predict y_t. The causality relationship can be evaluated by estimating the following regressions:

$$y_t = \sum_{j=1}^{p} \alpha_{1j} y_{t-j} + \sum_{j=1}^{p} \beta_{1j} x_{t-j} \phi_1 \varepsilon_{1t-1} + \mu_{1t} \tag{5}$$

$$x_t = \sum_{j=1}^{p} \alpha_{2j} y_{t-j} + \sum_{j=1}^{p} \beta_{2j} x_{t-j} + \mu_{2t} \tag{6}$$

The null hypotheses to be tested are:

$H_0 : \beta_{1j} = 0, j = 1, 2, \cdots p$, which means that x_t do not Granger cause y_t; and $H_0 : \alpha_{2j} = 0, j = 1, 2, \cdots p$, which means that y_t do not Granger cause x_t. If none of the hypothesis is rejected, it means there is no causal relationship between the variables. In other words, two variables are independent to each others. The rejection of one hypothesis indicates that there is one-directional causality between the variables. And if both the hypothesis are rejected then it is the indication of bidirectional causality.

Results and Discussions

In Table 1 shows the stationarity of the variables. As literature suggest that most of the economic variables are non-stationary at their level. This situation exists in this table because all the variables are non-stationary in their levels because p>0.05.and stationary in their first differences because p<0.05. It shows that the variables are I(1). This phenomenon can also be checked by comparing the value of test statistics and the critical value at 5% level of significance.

Table 1: Unit Root Test

	Levels		First Difference	
	Test Statistics	**p-values**	**Test Statistics**	**p-value**
Log(GDP)	-0.8315	0.7975	-9.5445	0.0000
Log(AID)	-1.6767	0.4344	-8.3091	0.0000
Log(AIDVOLT)	-2.9047	0.0549	-14.3035	0.0000
Log(FDI)	-1.9067	0.3257	-7.0438	0.0000

Note: ADF test is used for stationarity and all the variables are stationary at their first differences and 5% level of significance is used.

As table 1 shows that all variables are stationary of I(1), so the next step is to find the cointegrating equations which will tell whether there exists long run relationship between the variables or not. Two methods are usually employed to check the number of cointegrating equations; first one is Trace test statistics and second one is max-eigen statistic values. Trace test statistic is used to determine the number of cointegrating equations. Table 2 shows that the value of Trace test statistic is greater than that of critical value and also shows that there exists one cointegrating equations. In this study optimum lag one is used because on the basis of shwartz criteria, which is mostly preffered by researchers, is used here (Annex-III).

Table 2: Cointegrating Trace Statistic Values

Null	**r=0**	**r≤1**	**r≤2**	**r≤3**
Alternative	**r≥1**	**r≥2**	**r≥3**	**r≥4**
Trace Statistics	54.4667	24.9188	7.4965	0.0101
Eigen Value	0.5807	0.4009	0.1976	0.0003
Critical Value(0.05)	47.8561	29.7971	15.4947	3.8415
Probability	0.0106	0.1644	0.5207	0.9195

The next step is to find the cointegrating equation which explains the nature and direction of relationship between variables. As mentioned above, it is clear that there exist long run relationship between variables on the basis of trace statistics value. Trace test statistic is used to determine the number of cointegrating equations. Table 2 shows that the value of Trace test statistic is greater than that of critical value up to the one cointegrating equations. The p-value also indicate that one cointegrating equation exist (p<0.05). Cointegration equation given below shows the exact direction of relationship with their significance.

LGDP = 4.4989 + 0.6122 LFAID - 0.0607 LAIDVOLT + 0.1996 LFDI

$$(0.0606) \qquad (0.0393) \qquad (0.0374)$$

$$[-10.1091] \qquad [1.5470] \qquad [-5.3427]$$

The cointegrating equation is presented above shows coefficients of all variables, standard error in ( ) and t-statistics in [ ]. The result of above mentioned equation shows that increase in foreign aid leads to economic growth significantly and these results are already confirmed in many other studies conducted in developing countries by Levy (1988), Clemens et al. (2004), Singh (1985), Hadjimichael et al. (1995) and Dowling and Hiemenz (1983). While, impact of foreign aid volatility is negative on economic growth of Pakistan and results are same as found by Hudson and Mosely (2008), Bulir and Hamann (2008), Neanidis and Varvarigos (2009), all these studies shows that aid volatility in negatively impacting on economic growth of developing countries. This is because; aid delivered in an unreliable manner can apparently diminish its potential benefits. These results also show that due to every one unit change in foreign aid leads to 0.61 unit increase in GDP, while foreign aid volatility is negatively contributing in GDP of Pakistan. I have added another intermediate variable of foreign direct investment which is again positively and significantly contributing in GDP.

Table 4: Vector Error Correction (VEC) Model

	DLGDP	DLFAID	DLAIDVOLT	DLFDI
Constant	-0.0058 (0.0090)	-0.0856	-0.0273 (0.2237)	0.1645
	[-0.6440]	(0.0500)	[-0.1218]	(0.0924)

		[-1.6797]		[1.7804]
ECM(-1)	-0.1459	1.2721	-1.0070	0.7264
	(0.0561)	(0.3179)	(1.3960)	(0.5765)
	[-2.5972]	[-4.0016]	[-0.7214]	[1.2510]
R^2	0.4559	0.5074	0.5784	0.2490
S.E. of Eq	0.0509	0.2877	1.2635	0.5218
F-Statistics	4.6928	5.7681	7.6821	1.8567

Note: Values in parentheses show standard error while values in [ ] shows t-values.

Table 4 shows vector error correction model, this shows short run speed of adjustment within the model. This model explains that two variables GDP and aid volatility are convergent toward equilibrium while remaining two FDI and FAID are divergent from equilibrium. This speed of adjustment depends on sign of coefficient, negative sign shows convergent and positive sign shows divergent condition of variable.

Table 5: Causality Analysis

Null Hypothesis:	F-Statistic	Prob.
LFAID does not Granger Cause LGDP	13.3184	7.E-05
LGDP does not Granger Cause LFAID	0.08165	0.9218
LAIDV does not Granger Cause LGDP	0.10923	0.8969
LGDP does not Granger Cause LAIDV	2.82036	0.0760
LFDI does not Granger Cause LGDP	4.17503	0.0251
LGDP does not Granger Cause LFDI	3.49353	0.0433
LAIDV does not Granger Cause LFAID	2.37790	0.1100
LFAID does not Granger Cause LAIDV	1.44083	0.2526
LFDI does not Granger Cause LFAID	3.19030	0.0550
LFAID does not Granger Cause LFDI	1.44340	0.2516
LFDI does not Granger Cause LAIDV	0.05649	0.9452
LAIDV does not Granger Cause LFDI	0.39722	0.6757

Above table shows causality analysis which explains cause and effect of all the variables of the model. But I am going to explain causality analysis of all variables with GDP. Results of causality show that there exist uni-directional causality and FAID granger causes GDP but GDP doesn't granger cause FAID. There exists bi-directional causality between GDP and FDI. Its also shown in above table that GDP cause aid volatility in Pakistan during study period. There also

exists uni-directional causality between FDI and FAID is which FDI cause FAID but FAID doesn't cause FDI.

Conclusion

Foreign aid and its effectiveness is highly debated issue in current scenario of Pakistan. Most of the developing countries have inadequate level of savings and foreign aid can supplement domestic savings for their investment and further to enhance economic growth. In this regard, the focus of current study is to analyze the impact of foreign aid and volatility of foreign on economic growth of Pakistan for the time period of 1972-2010.

In this study, foreign aid volatility is measured by GARCH family modeling, after applying different models for detecting volatility and found that GARCH (1,1) is appropriate model for measuring foreign aid volatility. After data compilation on all the variables, stationarity of all the variables is checked by applying ADF test and found that all the variables having unit root at their levels but are stationary at first difference or integrated of I(1). When all the study variables are stationary of I(1), then apply cointegration technique and found that there is long run relationship between variables on the basis of Trace and Eigen statistics. Empirics' shows that foreign aid and economic growth are positively and significantly associated, foreign aid volatility is negatively and significantly associated with economic growth while FDI is positively and significantly contributing in economic growth of Pakistan.

On the basis of study findings, it is recommended that foreign aid should make sustainable for economic growth of Pakistan. When there is volatility in foreign inflows that create uncertainty and discontinuity in our socio-economic and other projects those leads toward economic growth.

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Annex-I: Descriptive Statistics

	LGDP	LFAID	LAIDV	LFDI
Mean	6.958710	3.229352	-2.520116	1.618707
Median	7.008786	3.449023	-2.081222	1.820776
Maximum	7.331739	4.453487	-2.004146	3.564079
Minimum	6.484926	1.946424	-7.633546	-0.763140
Std. Dev.	0.239501	0.684708	1.166958	1.016380

Skewness	-0.362912	-0.270320	-3.219975	-0.430869
Kurtosis	2.001415	1.919933	12.93000	3.195029
Jarque-Bera	2.285986	2.188253	210.1168	1.170945
Probability	0.318863	0.334832	0.000000	0.556843
Sum	250.5136	116.2567	-90.72418	58.27345
Sum Sq. Dev.	2.007628	16.40887	47.66269	36.15596
Observations	36	36	36	36

Annex-II: Correlation Matrix

	LGDP	LFAID	LAIDV	LFDI
LGDP	1	0.7439	0.3932	-0.2404
LFAID	0.7439	1	0.2113	-0.6064
LAIDV	0.3932	0.2113	1	-0.1366
LFDI	-0.2404	-0.6064	-0.1366	1

Annex-III: VAR Lag Order Selection Criteria
Endogenous variables: LGDP LFAID LAIDV LFDI
Sample: 1972 2010

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-99.36158	NA	0.006176	6.264338	6.445733	6.325372
1	-19.51470	135.4977	0.000130	2.394830	**3.301805***	2.700000*
2	-1.392855	26.35905*	0.000120*	2.266234*	3.898787	2.815538
3	12.97659	17.41751	0.000150	2.365055	4.723188	3.158495

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion