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Aid recipient developing countries have remained stagnant and they are becoming more aid dependent after receiving large amount of aid from developed countries. This reality provokes vigorous debate on the effectiveness of aid. This study analyzes the effectiveness of aid in the education sector of Pakistan during the period 1973-2008. This study focuses on the second Millennium Development goal, which attributes to achieve universal primary education. We estimate econometric model to test the short run and long run relationship between foreign aid and gross primary enrollment in the education sector of Pakistan. For this purpose, Augmented Dickey Fuller test, Johansen Likelihood Ratio test and Vector Error Correction Methods are used. The results show that foreign aid has significantly increased primary school enrollment in Pakistan. The results proved the short run as well as long run relationship between foreign aid and primary school enrollment.

Key Words: Universal Primary Education, Millennium Development Goal, Foreign Aid

JEL Classification: F35, I21, O12, O19

I. INTRODUCTION

Most of the developing countries are dependent on foreign aid to expand the productive capacity of their economies due to the lack of internal resources. The international community has put a lot of effort and financial support into upgrading the social sectors of developing countries during the last few decades. World Bank is the major external financier of education sector in developing countries with accumulative spending of 3.4 billion dollars in fiscal year 2009¹. Moreover, with the adoption of the Millennium Development Goals (MDGs)², one must expect the priority accorded to the social sectors to be upheld.

This paper used Official Development Assistance (ODA) that is a subcategory of foreign aid and account for all official aid in different sectors. According to the World Bank, ODA comprises flows that meet the Development Assistance Committee's (DAC) definition of ODA and are made to countries on the DAC list of aid recipients. Usually, this aid is specified to promote the economic growth or to combat natural disasters. This study focuses on the effectiveness of foreign aid in the education sector of Pakistan.

The provision and financing of education, especially at primary level around the world is the responsibility of the public sector because of the difference between social and private returns. According to the article 37(b) of the constitution of Pakistan, "The state shall remove illiteracy and provide free and compulsory secondary education within minimum possible period". Despite such commitments, Pakistan spends less on education than developed countries. Even Government spending on education in Pakistan has declined from 2.5 percent of GNP in 1996 to 1.4 percent of GNP in 2008³. Pakistan is among the signatories of the Millennium Development Goals as well as the Dakar Framework of Action (2000). In this context, policies like National Plans of Action for "Education For All" (EFA) has been initiated to achieve these goals. There are eight bilateral donors providing aid to the education sector of Pakistan. Among these, World Bank is the largest donor followed by United States Agency for International Development and Asian Development Bank. The World Bank assists the education sector in four different phases. In the first phase, during the 1970's, they helped to promote the vocational and higher education projects. In the second phase, during the late 70's, they shifted their concentration towards different projects of primary education because of high social rate of return in this sector. In 1985, during the third phase, emphasis was increased on provincial based projects especially in the province of the Punjab. Moving towards the fourth phase in 1990's, the World Bank shifted their support to province based sector programs.

The gross primary enrollment in Pakistan in 2007 was 84 percent of the relevant age group while during the same year; this ratio was 108 in South Asia and 105 in the World on average. The above data shows that the condition of the education sector in Pakistan is very poor as compared to the World and other countries in the region. While examining the effectiveness of foreign aid in the education sector of Pakistan, the question arises; Does foreign aid effect primary school enrollment in Pakistan?

The education sector is selected for this study because it is generally believed that this sector influences the human development. It is commonly held that an educated population is a prerequisite for a well-functioning economy. Through foreign aid the Government may be able to increase spending in this sector and may influence the human development. Consequently, an educated labor force contributes to overcome the economic problems like poverty; hunger etc and can play an effective role in economic development.

This paper comprises five parts. Section II reviews the literature. Section III elaborates the specification of the model and econometric methodology. The results about the long run and short run relationship among variables are discussed in section IV. Section V concludes the findings of the study and policy implications emerging from the study.

II. REVIEW OF LITERATURE

Most of the studies on foreign aid concentrate on its effectiveness on economic growth. These studies focus on international cross sectional analysis rather than individual country. This study emphasizes on aid data disaggregated by sector. Aid for social sector, like education, affects economic growth through many ways such as increase in productivity and diffusion of knowledge. (Nelson and Phelps 1966; Lucas 1988; Romer 1990; Mankiw, Fomer and Weil 1992; Appiah and McMahon 2002). Importance of aid in this sector may be justified because it provides resources for building schools, free textbooks and training of the teaching staff etc. It can be helpful to improve the quality of services in this sector.

Asiedu and Nandwa (2007) analyzed the effect of foreign aid on education. They found a significant effect of foreign aid on growth. They took in to account both heterogeneous nature of aid and heterogeneity of aid recipient country. They disaggregated the data in different segment of education and run separate regressions for each country with respect to the level of incomes. They found that the effect of aid varies by level of income and level of aid.

Wolf (2007) examined the effectiveness of aid on education, health and water & sanitation. The study also included some social sectors like freedom of press and decentralization. This study concluded that aid for health and education sectors had a significant positive impact on the outcomes but the effect of total aid was found negatively associated.

Thiele et al (2006) discussed the aid portfolio of various donors. They argued that donors were different in terms of their generosity and their aid allocated to achieve different goals of MDG's. They concluded that targeting of aid have to improve to increase the effectiveness of aid in aid recipient countries. So they ultimately blamed the insufficient targeting of aid.

Pettersson (2006) used sectoral data and proved a significant relation between government spending and DAC aid for education sector. He considered aid for education as exogenous variable because this study examined the real effect of fungibility of aid.

Michaelowa and Weber (2006) revealed a positive relation between aid for education and primary school enrollment. According to this study, the political and institutional background of the aid recipient country also matters. The study concluded that if bad governance was observed, the aid would be no more effective and even in case of some countries, the impact of aid turned to be negative.

Dreher et al. (2006) examined the effectiveness of aid on education. This study analyzed the relationship between aid for education and educational attainment. They analyzed that educational attainment is a function of multiple factors like educational expenditure of aid recipient country, quality of institutions etc. they concluded that there is a positive and significant relation between aid and primary school enrollment.

Filmer and Pritchett (1999) analyzed cross-country patterns in school enrollment and educational attainment by household wealth in 35 developing countries. They concluded that in most countries the deficit of universal primary education comes from the poor, however, the achievement of higher level of enrollment for this group is due to social inclusion, reaching out and bringing the poorest in to what is already the norm for the rich and for those in the middle with respect to wealth status.

It seems that multiple factors are responsible for primary school enrollment. As no comprehensive study is available which shows the long run as well as short run relationship between foreign aid and MDG in the education sector of Pakistan so this study will contribute in an important way that it will observe the short run and the long run behaviour of foreign aid in this sector.

III. THE EMPIRICAL MODEL AND DATA

The main factors that are identified for education sector are foreign aid for education, population ages 0-14 and public spending on education etc. For the purpose of selection of variables, this study followed Dreher et al. (2006), Michaelowa & Weber (2006), Pettersson (2006) and Wolf (2007). However, in addition to that, some other variables like number of primary schools and number of teachers in primary schools are also included in this study by assuming that these variables have significant role in this sector.

The study covers the period from 1973 to 2008. The choice of the period is based on availability of data. Data for social indicators has been taken from various issues of Pakistan Economic Survey and World Development Indicators and the data on foreign aid for health and education sectors are taken form OECD's Creditor Reporting System (CRS) that contains information on the sectoral allocation of aid ⁴. This study used the amount of aid commitments at current prices in million US Dollar. Although the data based on disbursement should be preferred but information on disbursement by sector is available only from 1990 onward so due to unavailability of data, aid commitment is used in this study.

The Model

In regression equation, we have employed Gross Primary Enrollment (GPE) as a dependent variable. It is because, according to the MDG, it is one of the indicators used to assess progress towards achieving Universal Primary Education. The functional form of the model is written as follows:

$$\text{GPE} = f(\text{FAE}, \text{POP}, \text{PS}, \text{PSE}, \text{TPS})$$

Or

$$Y_t = f(X_{1t}, X_{2t}, X_{3t}, X_{4t}, X_{5t})$$

And the econometric model is written as:

$$Y_t = \alpha_0 + \alpha_1 X_{1t} + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X_{4t} + \alpha_5 X_{5t} + e_{1t}$$

Where:

$Y_t \Rightarrow$ GPE = Gross Primary Enrollment

$X_{1t} \Rightarrow$ FAE = Foreign Aid for Education

$X_{2t} \Rightarrow$ POP = Population ages 0-14

$X_{3t} \Rightarrow$ PS = Number of Primary Schools

$X_{4t} \Rightarrow$ PSE = Public Spending on Education

$X_{5t} \Rightarrow$ TPS = Number of Teachers in Primary Schools

$e_{1t} \Rightarrow$ Error Term

$t \Rightarrow 1, 2, 3, \dots$

Econometric Methodology

For the estimation purposes, three steps methodology has been employed i.e. checking the stationarity of the data, estimating the long run function and estimating the parsimonious error correction model along with the stability and other diagnostic tests. First, we have applied Augmented Dickey Fuller (1979, 1981) tests to each of the variables and determine the stationarity property in their level as well as in their differences and all the variables found to be integrated of the same order. In order to find the long run relationship among variables, Maximum Eigenvalue test and Trace Statistic are used. Finally, parsimonious Vector Error Correction Model (VECM) is used to determine the short run relationship between these variables.

IV. EMPIRICAL RESULTS

The model is estimated by using annual time series data for the period 1973 to 2008. It provides a framework to clarify mainly the role of foreign aid in the determination of primary school enrollment in Pakistan that is the objective of the study. The estimated function asserts the long run as well as short run relationship between these variables.

Testing of Unit Root

To test for stationarity in these variables, we used Augmented Dickey Fuller (ADF) test. In ADF Test, lagged differences are included to remove possible serial correlation in the error terms. This test confirms the order of integration of the individual series. ADF test statistics corresponds to the t-value of parameter ρ for the individual series.

The results presented in table 1 show that null hypothesis of unit root ($\rho=0$) cannot be rejected for any variable in the level form. However, the null hypothesis of unit root is rejected for all variables in the first differenced form at 5% level. Thus our test results show that all variables are I(1). The results obtained in this part provide basis to move to the co-integration technique.

The Long-run Function: A Co-integration Analysis

One of the objectives of the study is to analyze the long run relationship between Gross Primary Enrollment and foreign aid in Pakistan. Here the existence of cointegrating relationship amongst Gross Primary Enrollment and its determinants are estimated. Before we run cointegration test we need to specify the lag structure. For this purpose, we employed Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), as suggested by Enders (1995) and Davidson (1998) to investigate the optimal lag length. It is important because an appropriate lag structure may over parameterize and it can reduce the power of cointegration test. The appropriate lag length of the VAR is two. To find the long run relationship, Johansen cointegration procedure is used. The results from the Johansen cointegrated test (both Trace test and Max Eigen value test) are presented in tables 2 and 3. All the variables included for the test have the same order of integration.

The empirical results in tables 2 & 3 show that there exists a long run relationship between Gross Primary Enrollment and its determinants. Significance of the variables confirms their validity in the model. The results of estimated function are presented in the following equation.

$$Y_t = -10574.57 + 6.62 * X_{1t} + 390.69 * X_{2t} + 84.81 * X_{3t} + 3978.66 * X_{4t} + 7.34 * X_{5t}$$

[T-Value] [4.927] [3.163] [5.512] [11.734] [1.561]

The estimated coefficients have expected signs and are significant except TPS (X_{5t}). The estimated equation indicates that the FAE, POP, PS and PSE determine GPE. Although the impact of Teachers in Primary School is not significant, however, t-value is greater than one; therefore, this variable is not redundant. The cointegration analysis indicates that the estimated coefficient of foreign aid for education (X_{1t}) is 6.624 (t = 4.927) that is positive and significant, implying that in the long run it has positive and significant effect on Gross Primary Enrollment. It shows that with the one million dollar increase in foreign aid, the gross primary enrollment will increase by 6624 units. The analysis indicates that there is positive long run relationship between GPE and Population ages 0-14. The estimated coefficient of POP (X_{2t}) is 390.697 (t = 3.163), which is positive and significant. It implies the importance of population ages 0-14 in determining the GPE in Pakistan. The analysis also shows that there is positive and significant long run relationship between GPE and number of primary schools in Pakistan. The estimated coefficient of PS (X_{3t}) is 84.818 (t = 5.512), which is positive and significant. It indicates that it also plays an important role in determining the Gross Primary Enrollment in Pakistan. The analysis also indicates that there is positive long run relationship between GPE and Public Spending on Education. The estimated coefficient of PSE (X_{4t}) is 3978.660 (t = 11.734), which is positive and significant. It implies the importance of Public Spending on Education in determining the GPE in Pakistan. The estimated co-efficient of number of TPS (X_{5t}) is 7.345 (t = 1.561) that is positive. The t-value shows that this variable is significant at about 8 percent (not 5 percent) level of significance.

The Short-Run Dynamic Model: The Error Correction Approach

To determine the short run relationship between variables, we used VECM followed by Hendry's approach known as "general to specific." we include different lags of explanatory variables from top to low and first lag of Error Correction Term (ECT). The following Error Correction Model (ECM) is established using the two lags structure as suggested by AIC and SBC.

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta Y_{t-2} + \alpha_3 \Delta X_{1t} + \alpha_4 \Delta X_{1t-1} + \alpha_5 \Delta X_{1t-2} + \alpha_6 \Delta X_{2t} + \alpha_7 \Delta X_{2t-1} + \alpha_8 \Delta X_{2t-2} + \alpha_9 \Delta X_{3t} + \alpha_{10} \Delta X_{3t-1} + \alpha_{11} \Delta X_{3t-2} + \alpha_{12} \Delta X_{4t} + \alpha_{13} \Delta X_{4t-1} + \alpha_{14} \Delta X_{4t-2} + \alpha_{15} \Delta X_{5t} + \alpha_{16} \Delta X_{5t-1} + \alpha_{17} \Delta X_{5t-2} + \lambda_1 ECT_{t-1} + e_{1t}$$

After estimating the above model, we gradually eliminate the insignificant variables using the general to specific approach in order to get a parsimonious model. The results of the preferred model are presented in table 4.

The error correction coefficient is estimated as -0.50 with t = -2.89 enters into the short run dynamic equation at highly significant. The estimated coefficient of ECT indicates that approximately 50 percent of the dis-equilibrium in the determination of Gross Primary Enrollment is corrected within the one year which shows a high speed of convergence to equilibrium if there appears a dis-equilibrating shock.

In the above estimated model, the coefficients of lagged changes in foreign aid for education are positive and significant which shows that the changes in previous period of foreign aid for education has positively affected the short-term changes in gross primary enrollment. The results of the analysis suggested that the impact of changes of foreign aid for education on the determination of the gross primary enrollment works through transmission lags. This finding may reflect the situation that primary school enrollment may increase due to increase in foreign aid for education.

Diagnostic Tests

The validity of the estimated model is tested using the standard diagnostic tests. The high probability values of all the diagnostic tests show that the model specification is appropriate and parameters of the model are stable. Moreover, the high probability value of different tests for heteroskedasticity and serial correlation prove that these problems do not exist in the model. Similarly, CUSUM and CUSUM of square tests show that there is no instability in the model.⁵

V. CONCLUSION AND POLICY IMPLICATIONS

This study has been analyzed the effectiveness of foreign aid on the education sector of Pakistan. In this regard, one of the MDG; enhancing gross primary enrollment is analyzed. For this purpose, the study covers an extensive review of literature on the subject. Considering the theoretical developments and empirical evidence, an econometric model was developed containing the wide range of determinants in these sectors. In the end, the dynamic function was specified to analyze the short run and the long run behaviour of the determinants in the education sectors in Pakistan. After confirming the order of integration of each variable by using ADF test, Johansen cointegration and ECM tests are used to determine a long run and short run relationship among variables. These econometric models were estimated over the period 1973-2008 using annual data. The cointegration analysis in the education sector indicates that the estimated relationship of foreign aid with gross primary enrollment is positive and significant, implying that in the long run there is an increase in gross primary enrollment due to increase in foreign aid. So, we can say that there is a positive relationship between them. In error correction model, short run relationship has been proved and the error correction coefficient is highly significant with theoretically correct sign, which show that the economy will converge to its equilibrium within one year if there appears a dis-equilibrating situation.

In view of commitments to the achievement of MDG, the Government of Pakistan has developed a National Plan of Action on "Education For All" for the period 2001-2015. The gap in financial resources required to implement this plan is enormous and will have to be met from external assistance. As the results of this study indicate that with one million dollar increase in foreign aid, the gross primary enrollment will increase by 6624 students. As foreign aid has a significant role in the education sector thus it is recommended that efforts should be made to obtain the required assistance through grants and loans and its effective use. The data shows that public spending in this sector is very low and it is further decreasing with the passage of time. It is, therefore, suggested that all efforts should be made to enhance the budgetary allocation in these sectors otherwise it would not be possible to achieve the MDGs by 2015.

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Table 1: Augmented Dickey-Fuller Test Results for Unit Root

Variables At Level	With Trend	Variables At First Difference	With Trend	Results
	ADF-Statistics		ADF-Statistics	
GPE	-2.748	Δ GPE	-4.958*	I(1)
FAE	-2.660	Δ FAE	-9.939*	I(1)
POP	0.682	Δ POP	-5.052*	I(1)
PS	-0.890	Δ PS	-5.322*	I(1)
PSE	0.336	Δ PSE	-4.370*	I(1)
TPS	-1.006	Δ TPS	-4.521*	I(1)

- Note:
1. * Denote significant at 5 percent
 2. I(1) indicates stationarity of the data after first differencing

Table 2: Johansen Cointegration Test (Trace Test)

Null Hypothesis	Alternative Hypothesis	Trace Statistic	5% critical values
$r = 0$	$R \geq 1$	206.3739*	95.75366
$r \leq 1$	$R \geq 2$	132.1868*	69.81889
$r \leq 2$	$R \geq 3$	75.10228*	47.85613
$r \leq 3$	$r \geq 4$	39.80338*	29.79707
$r \leq 4$	$r \geq 5$	15.44589	15.49471
$r \leq 5$	$r \geq 6$	3.327057	3.841466

- Note: 1. * Indicates significant at the 5 percent level.
2. Author's calculations

Table 3: Johansen Cointegration Test (Maximum Eigen Value Test)

Null Hypothesis	Alternative Hypothesis	Max-Eigen Statistic	5% critical values
$r = 0$	$R = 1$	74.18710*	40.07757
$r \leq 1$	$R = 2$	57.08456*	33.87687
$r \leq 2$	$R = 3$	35.29891*	27.58434
$r \leq 3$	$R = 4$	24.35748*	21.13162
$r \leq 4$	$R = 5$	12.11884	14.26460
$r \leq 5$	$R = 6$	3.327057	3.841466

- Note: 1. * Indicates significant at the 5 percent level.
2. Author's calculations

Table 4: Results of Short Run Dynamic Model for Education

Dependent Variable ΔY_t			
Variable	Coefficient	t-Statistic	Prob.
C	-133.4952	-0.940778	0.3566
ΔX_{1t-1} ***	3.547107	2.738292	0.0117
ΔX_{1t-2} ***	4.807205	3.287175	0.0032
ΔX_{2t}	6023.557	1.566573	0.1309
ΔX_{2t-1} **	16008.91	2.237870	0.0352
ΔX_{2t-2} ***	9828.704	2.694920	0.0129
ΔX_{3t}	15.92774	1.183818	0.2486
ΔX_{5t}	6.923816	1.323121	0.1988
ΔX_{5t-1} ***	19.88502	3.307439	0.0031
ECT _{t-1} ***	-0.501922	-2.894569	0.0082
R ²	0.73		
Adjusted R ²	0.62		
F-statistics	6.74		
Prob (F-Statistics)	0.000105		

Note: ** and *** shows rejection of the Null Hypothesis of insignificance at .05 and .01 level respectively.

List of Variables and data sources

Variable	Source
Gross Primary Enrollment (total, in thousand)	Pakistan Economic Survey 97-98, 08-09
Foreign Aid for Education (at current prices, million US\$)	OECD, CRS, online
Population ages 0-14 (% of total)	WDI, 2008
Total number of Primary Schools (total, in thousand)	Pakistan Economic Survey 97-98, 08-09
Public Spending on Education (% of GNP)	Pakistan Economic Survey (various issues)
Teachers in Primary School (total, in thousand)	Pakistan Economic Survey 97-98, 08-09

Millennium Development Goals and Targets

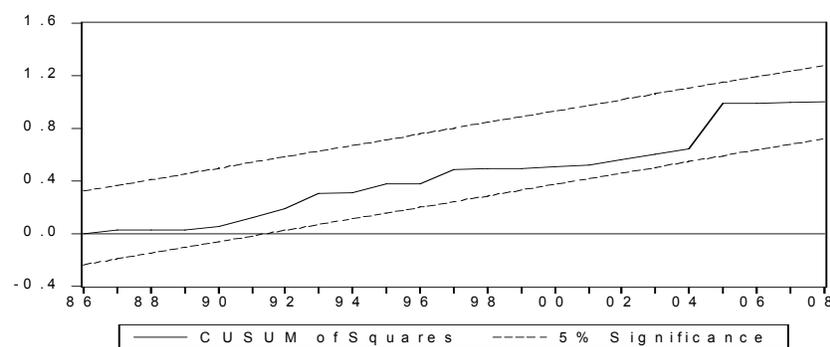
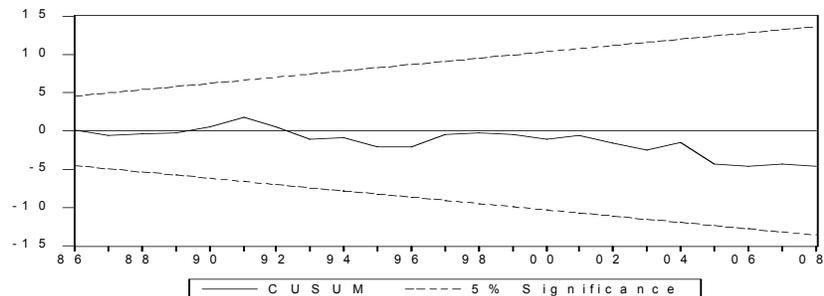
Goal 1: Eradicate extreme poverty and hunger Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day. Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger.
Goal 2: Achieve universal primary education Target 3: Ensure that by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.
Goal 3: Promote gender equality and empower women Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2015, and in all levels of education not later than 2015.
Goal 4: Reduce child mortality Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.
Goal 5: Improve maternal health Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio.
Goal 6: Combat HIV/AIDS, malaria and other diseases Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.
Goal 7: Ensure environmental sustainability Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.
Goal 8: Develop a global partnership for development Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. Target 13: Address the special needs of the least developed countries. Target 14: Address the special needs of land locked developing countries and small Island developing states. Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term. Target 16: In cooperation with developing countries, develop and implement strategies for decent and productive work for youth. Target 17: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries. Target 18: In cooperation with the private sector, make available the benefits of new techniques, especially information and communications.

Diagnostic Tests for Education Sector

			Probability
Model Specification Test (Ramsey RESET Test)		F-Statistics 0.062	0.804
		Log likelihood Ratio 0.093	0.759
Normality Test (Jarque-Bera Statistics)		Jarque-Bera Statistics 0.5005	0.778
Heteroskedasticity Test (The White Test)		F-Statistics 1.465	0.236
		χ^2 -Statistics 21.556	0.252
ARCH Test (Autoregressive Conditional Heteroskedasticity Test)	First Order	F-Statistics 0.206	0.652
		χ^2 -Statistics 0.218	0.640
	Second Order	F-Statistics 0.102	0.902
		χ^2 -Statistics 0.225	0.893
	Third Order	F-Statistics 0.126	0.943
		χ^2 -Statistics 0.432	0.933
	Fourth Order	F-Statistics 0.310	0.868
		χ^2 -Statistics 1.4246	0.839
Serial Correlation (Breusch-Godfrey LM Test)	First Order	F-Statistics 0.871	0.360
		χ^2 -Statistics 1.257	0.262
	Second Order	F-Statistics 1.084	0.356
		χ^2 -Statistics 3.088	0.213
	Third Order	F-Statistics 0.724	0.549
		χ^2 -Statistics 3.233	0.357
	Fourth Order	F-Statistics 0.864	0.503
		χ^2 -Statistics 5.079	0.279

Source: Author's Calculation

CUSUM and CUSUM of Squares Test of Stability



¹ World Bank, World Development Report, 2009

² For detail, See Appendix-II

³ Pakistan Economic Survey 1997-98 & 2008-09

⁴ See Annex-I

⁵ For detail, see appendix-III