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Original Paper

Relationship between Volatility of Economics Variables and Economics Growth

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Abstract

Economic growth of an economy is defined as the steady state path through which the productivity of an economy is improved and increases the levels of national output and income. The government consumption expenditures and investment play a key role in the process of investigating the macroeconomic performance of an economy and determinants of economic growth. The countries which grow quickly, invest a substantial fraction of their GDP for consumption expenditures as well for the sources which encourage private investment. The objective of this study to calculate the volatility in economics growth in Pakistan. The annual time series data are used from 1975 to 2014 from WDI, Economics survey of Pakistan and Hand Book of Statistics. GARCH model has been used to measure volatility of all variables. The empirical results of the study confirmed that the volatility of the different variables (volatility of inflation, volatility of interest rate, volatility of political instability, volatility of GDP, and volatility of foreign direct investment) significant affect the government consumption expenditures and private investment in the economy of Pakistan. The study analyzed data by using the autoregressive distributive lag model which is mainly used in time series data Econometrics to estimate the non-stationary models with mix order of integration. The estimated results of the study evaluated that volatility of the inflation lead to uncertainty which is also suggested by the Able (1980) and negatively affect the economy consumption expenditures as well as private investment in the economy of Pakistan. Because uncertainty directly affects the cost of capital as well as reduce private investor confidence.

Keywords

volatility, economics growth, economics variables

1. Introduction

Economic growth of an economy is defined as the steady state path through which the productivity of an economy is improved and increases the levels of national output and income. The government consumption expenditures and investment play a key role in the process of investigating the macroeconomic performance of an economy and determinants of economic growth. The countries which grow quickly, invest a substantial fraction of their GDP for consumption expenditures as well for the sources which encourage private investment. While slowly developing countries are those which fail to invest. It makes clear that investment and government consumption expenditures are the key components of economic growth of an economy. The changes in the share of government consumption and investment expenditures can affect the economic growth of the economy due to the uncertainty (Bloom et al., 2007).

Traditional Solow Swan (1956) growth model shows that an increase in the government consumption expenditures shifts the economy toward a new steady state equilibrium which is also increasing the saving and investment that only have transitory effects on the rate of growth, so economy move toward the new higher steady-state equilibrium. Following figure shows that any change in the investment will change the output of the economy and consumption expenditures of the economy while on the other side government fulfill their expenditures by increase the taxation. The following diagram shows that equilibrium takes place at point E1, due to the increase in the government consumption expenditures steady state equilibrium shift upward at point E2.

2. Method

2.1 Subhead

The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model is one of the popular models for estimating stochastic volatility of the macroeconomics series. GARCH model assumed that the randomness of the variance process varies with the variance of the series, as opposed to the square root of the variance as in the Heston model.

In empirical work with ARCH models, high q is often required, a more parsimonious representation is the Generalized ARCH model.

$$= \omega + \alpha(L)\varepsilon^2 + \beta(L)\sigma^2$$

$$define \quad \upsilon_t \equiv \varepsilon^2{}_t - \sigma^2{}_t$$

$$\varepsilon^2{}_t = \omega + (\alpha(L) + \beta(L))\varepsilon^2 + \beta(L)\upsilon \ + \upsilon_t$$

This is an ARMA (max (p, q), p) model for the squared innovations.

The standard GARCH (1, 1) model has the following form for the variance differential:

$$d\nu_t = \theta(\omega - \nu_t)\,dt + \xi\nu_t\,dB_t$$

The GARCH model has been extended via numerous variants, including the NGARCH, TGARCH, IGARCH, LGARCH, EGARCH, GJR-GARCH, etc. Strictly, however, the conditional volatilities from GARCH models are not stochastic since at time *t* the volatility is completely pre-determined (deterministic) given previous values.

2.1.1 Subhead

Unit Root Test:

The unit root test has been highly popular to test for stationary. To explain this test we start with the following equation.

Yt = PYt-1 + U1……. (3.3)

In this equation, we regress Yt its lagged value Yt-1 and find out if the estimated is statically equal to I, stationary.

Now subtract Y_{t-1} from both sides of the equation and obtain

$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + U_t$

$\Delta Y_{t} = (\rho\text{-}1) Y_{t-1} + \mu_t$

$\Delta Y_t = \delta Y_{t-1+} \mu t$…… (3.4)

Now we estimate the above equation and test the null hypothesis $\delta = 0$. If $\delta=0$ then $\rho = 1$ which means that the time series under consideration is non-stationary and for stationary, ρ should be less than 1. Then examine the significance of the empirical results, which test we should use if the estimated coefficient of Y_{t-1} in equation (3.4) is zero or not. Firstly, we may tend to use usual t test, but unfortunately, under the null hypothesis that $\delta = 0$ ($\rho = 1$), the t value of the estimated coefficient of Y_{t-1} does not follow the t distribution even in the large sample. Alternatively, Dickey and Fuller considered that under the null hypothesis that $\delta = 0$, the estimated t value of the coefficient of Y_{t-1} follows the τ (tau) statistics. Dickey and Fuller computed the critical values of the tau statistics on the basis of Monte Carlo Simulation. Generally, tau statistics is known by the name of Dickey and Fuller statistics.

The Dickey and Fuller estimated co-efficient of Y_{t-1} in three different specifications like

$\Delta Y_t = \delta Y_{t-1} + \mu_t Y_t$ is Random Walk.

$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu_t Y_t$ is the Random Walk with drift.

$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \mu_t$…… (3.5) Y_t is the Random Walk with drift around a stochastic trend.

The procedure of actual estimation is that first, estimates these equations by OLS, divide he estimated coefficient of Y_{t-1} by its standard error to calculated tau statistics and move toward Dickey and Fuller table. Now if the computed absolute value of the tau statistics exceeds the Dickey and Fuller critical

value, we reject H_0, that is, $\delta = 0$, in such case, the time series will be stationary. On the other hand, if the computed absolute value of the tau statistics is less than the Dickey and Fuller critical value, we don't reject the null hypothesis $\delta = 0$, in such case, the time series is non-stationary.

There are two types of unit root test:

1) Augment Dickey and Fuller test
2) Phillips-Peron test

3. Result

Empirical results of the macroeconomic volatility, which is closely linked with the macroeconomic uncertainty by using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. The dynamics of consumption expenditure, private investment and its related volatile variables, according to given hypothesis, after estimating the data during 1975 to 2014. The interpretations of results are divided into two sections. Hence (Section-I) organized with detail of the results and interpretation of descriptive results, which is based on the measure of central tendency as well as correlation matrix, precisely explain the empirical relationship between consumption expenditure, private investment and dynamic of some other macroeconomics variables (volatility of interest rate, volatility of consumer price index, volatility of gross domestic product, volatility of political instability). Section 1 also explains the short run and long run relationship of consumption expenditures and other macroeconomic variables (volatility of interest rate, volatility of consumer price index, volatility of gross domestic product, and volatility of political instability).While Section 1 also explains the short run and long run relationship of private investment and other macroeconomic variables (volatility of interest rate, volatility of consumer price index, volatility of gross domestic product, volatility of political instability). However, the complete empirical interpretation of both sections is given as follows.

The volatility of macroeconomics variables and government consumption expenditures and private investment:

In the economic data exhibit volatility clustering, where time series show periods of high volatility means high deviation form mean value of the data and periods of low volatility (low deviation form mean value of the data). The volatility of the government consumption expenditures and investment with some other macroeconomics variables calculated by GARCH variances series, the realized volatility can be measured by monthly data. But monthly data are not available for most macroeconomic variables especially in case of Pakistan. So in this study we calculated GARCH variances series by using annul frequency data from 1975 to 2014 of the different macroeconomics variables. GARCH variances series is based on conditional variance plots the one-step ahead variance for each observation in the given sample. The volatility graphs of the all macroeconomics series are available below. Following diagram shows the volatility of the Consumer Price index which is used as

a proxy of the inflation. According to the diagram the volatility of the Consumer Price index increases after 1990s.

Table 1. Estimated Long Run Coefficients Using the ARDL Approach

Dependent Variable: (CE)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-235590823	684508274.7	-0.34418	0.7396
CPIV	-1959378781	877223161.5	-2.23362	0.056
GDPV	0.0012	0.00034	3.529433	0.0082
IV	890142369.7	147683301.3	6.027373	0.0003
PIV	-115817128.1	94762122.23	-1.22219	0.2564
FDIV	708.773134	278.987067	2.540523	0.0347
R-squared	0.82	F-statistic		319
Adjusted R-squared	0.76	Prob (F-statistic)		0.00
Durbin-Watson stat	2.22			

Table 2. Estimated Short Run Coefficients Using the ARDL Approach Dependent Variable: (CE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔCE_{t-1}	-1.322	0.372	-3.558	0.007
ΔCE_{t-2}	0.101	0.570	0.177	0.864
ΔCE_{t-3}	-1.127	0.338	-3.331	0.010
ΔCPIV	271632979.633	378068969.078	0.000	0.000
ΔCPIVt-1	1480376351.145	936711561.455	0.000	0.000
ΔCPIVt-2	-2060127785.186	915091091.964	0.000	0.000
ΔGDPV	0.013	0.083	-0.252	0.807
$\Delta GDPV_{t-1}$	0.005	0.051	3.533	0.008
$\Delta GDPV_{t-2}$	0.002	0.039	-1.065	0.318
$\Delta GDPV_{t-3}$	0.001	0.021	2.742	0.025
ΔIV	-544837979.254	292938162.676	0.000	0.000
ΔIV (-1))	-1387152427.082	249081891.417	0.000	0.000
ΔIV (-2))	768702533.430	498023488.227	0.000	0.000
ΔIV (-3))	390080637.822	459444489.729	0.000	0.000
ΔPIV)	-31587888.248	52249278.192	0.000	0.000
ΔPIV (-1))	156172783.851	52538360.156	0.000	0.000
ΔPIV (-2))	-29946037.544	30296409.313	0.000	0.000
ΔFDIV)	-70.455	178.876	-0.394	0.704
ΔFDIV (-1))	-219.578	278.706	-0.788	0.454

ΔFDIV (-2))	407.867	183.338	2.225	0.057
ECM_{t-1}	1.0023	0.336	3.046	0.016
R-squared	0.81	F-statistic		319
Adjusted R-squared	0.76	Prob (F-statistic)		0.00
Durbin-Watson stat	2.20			

Table 3. Estimated Short Run Coefficients Using the ARDL Approach Dependent Variable: (Pri)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔPRIVt-1	2.18351	0.18606	11.73554	0
ΔPRIVt-2	1.4659	0.139715	10.49209	0
ΔPRIVt-3	1.007461	0.157998	6.376413	0.0004
ΔCPIV	3.74115E+19	1.33149E+21	7.00327	0
ΔCPIVt-1	-1.50146E+19	9.64875E+20	-5.037101	0
ΔCPIVt-2	-2.73712E+21	1.13376E+21	-18.060192	0
ΔCPIVt-3	-1.17625E+21	8.24316E+20	-6.958379	0
ΔGDPV	1842.664332	724.842527	2.542158	0.0385
ΔGDPVt-1	1348.906805	781.675237	1.725661	0.1281
ΔGDPVt-2	-3865.535433	986.579783	-3.91812	0.0058
ΔGDPVt-3	-1390.732822	1258.070808	-1.10545	0.3055
ΔIV	-4.18861E+20	1.16872E+20	-7.06474	0
ΔIVt-1	-1.15528E+21	1.85201E+20	-11.95868	0
ΔIVt-2	6.85746E+20	4.52843E+20	9.86673	0

ΔIVt-3	1.65776E+21	4.70827E+20	5.85573	0
ΔPIV	1.29724E+19	3.25323E+19	6.83563	0
ΔPIVt-1	9.19126E+19	4.38153E+19	19.47768	0
ΔFDIV	1.38935E+15	9.30963E+13	11.6267	0
ΔFDIVt-1	6.5693E+13	7.71522E+14	9.58378	0
ΔFDIVt-2	4.99758E+14	3.71837E+14	7.83662	0
ΔFDIVt-3	7.53684E+14	5.87292E+14	7.36576	0
ECM_{t-1}	-0.220278	0.346613	-12.1758	0
R-squared	0.88	F-statistic		193
Adjusted R-squared	0.80	Prob (F-statistic)		0.00
Durbin-Watson stat	2.08			

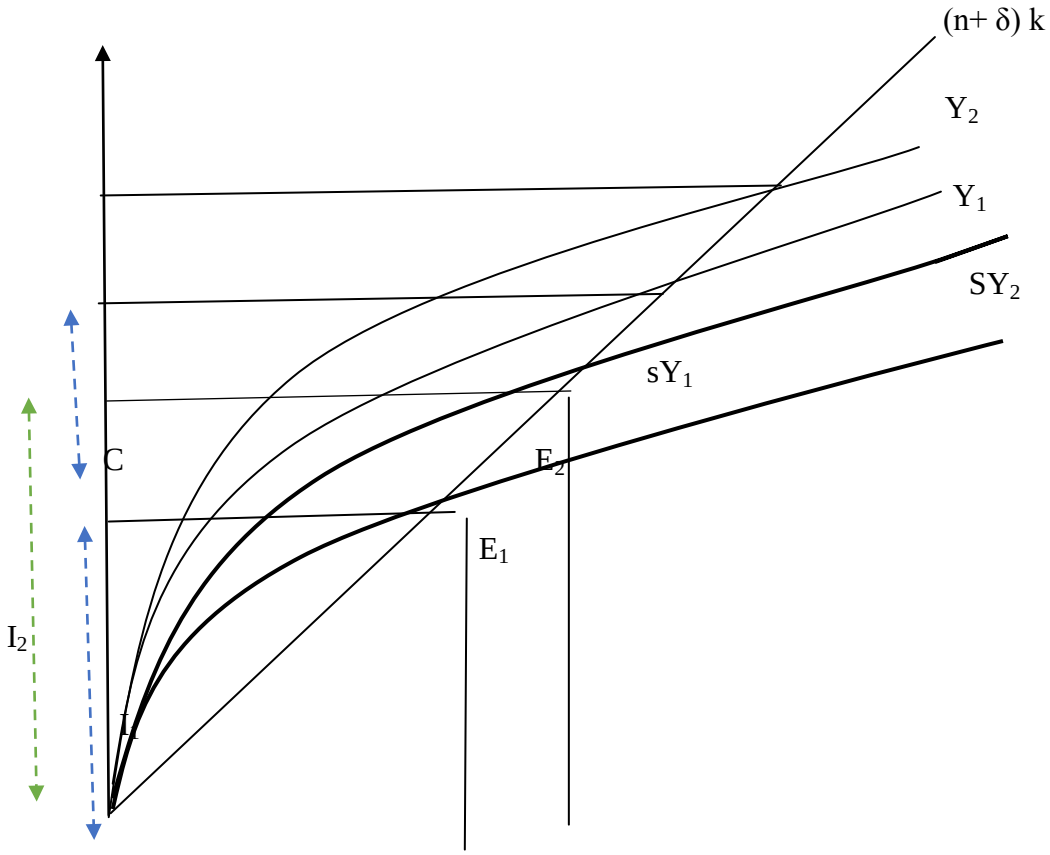

Figure 1. Consumption and Investment in Steady State

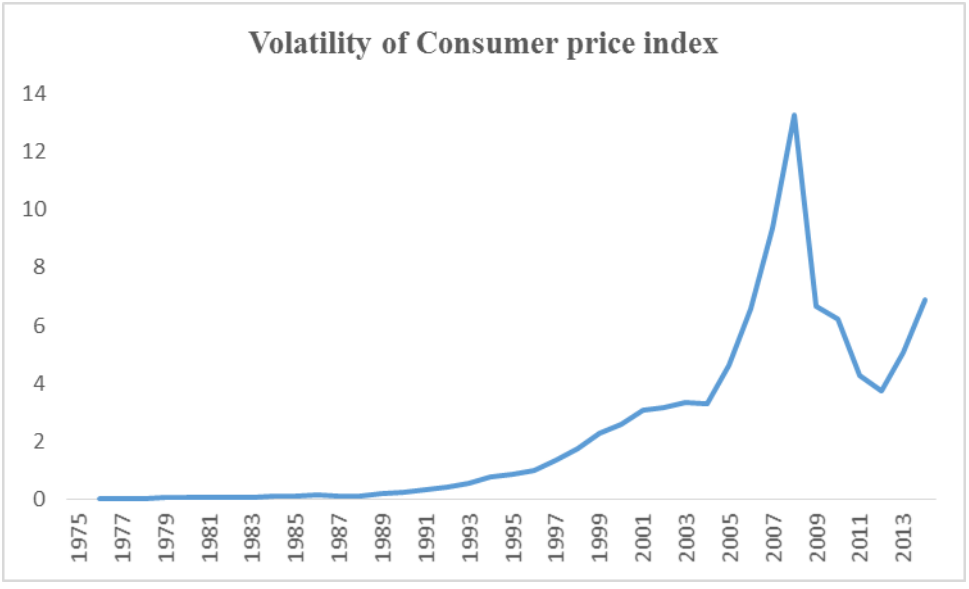

Figure 2. Consumption and Investment in Steady State

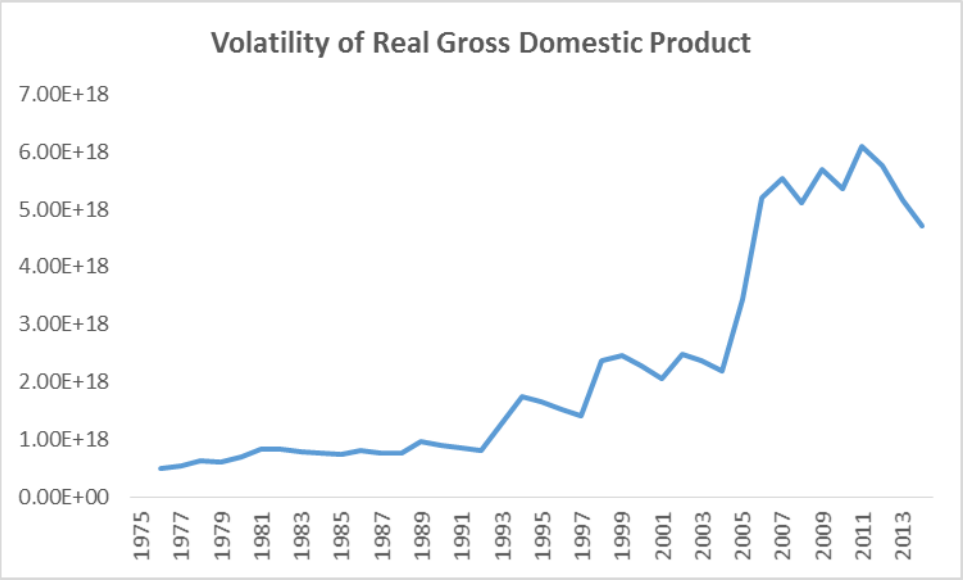

Figure 3. Shows the Volatility of the Gross Domestic Output Increases

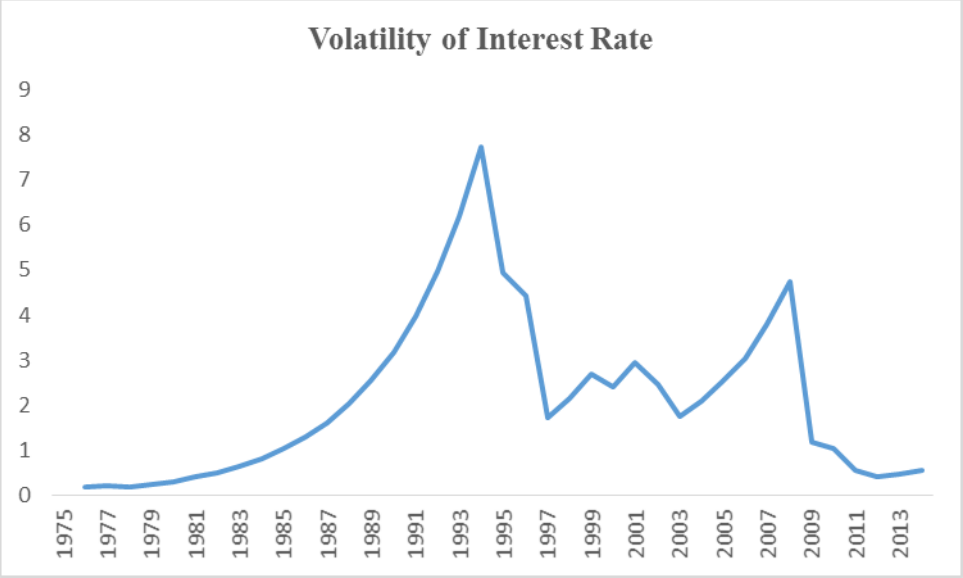

Figure 4. Shows the Volatility of the Interest Rate

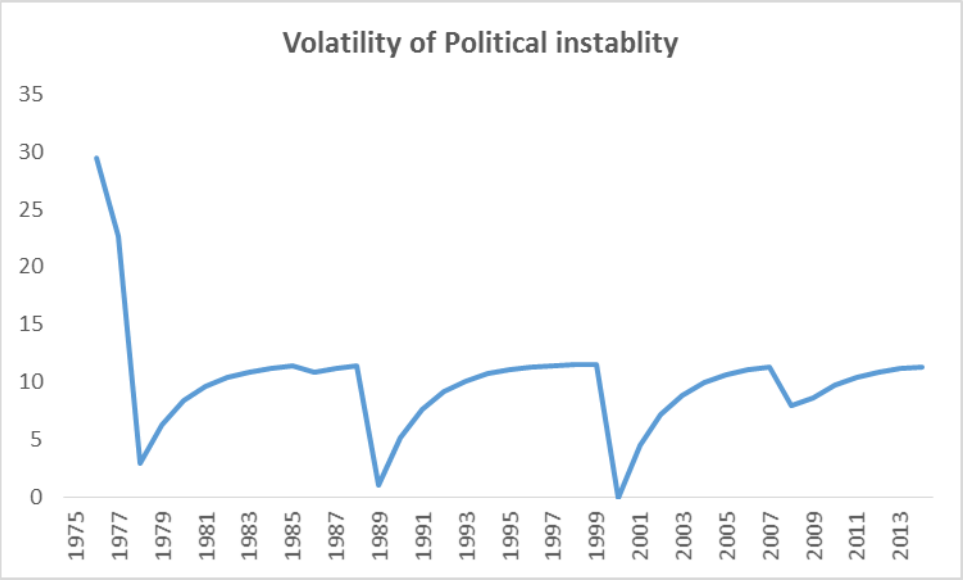

Figure 5. Shows the Volatility of the Political Instability

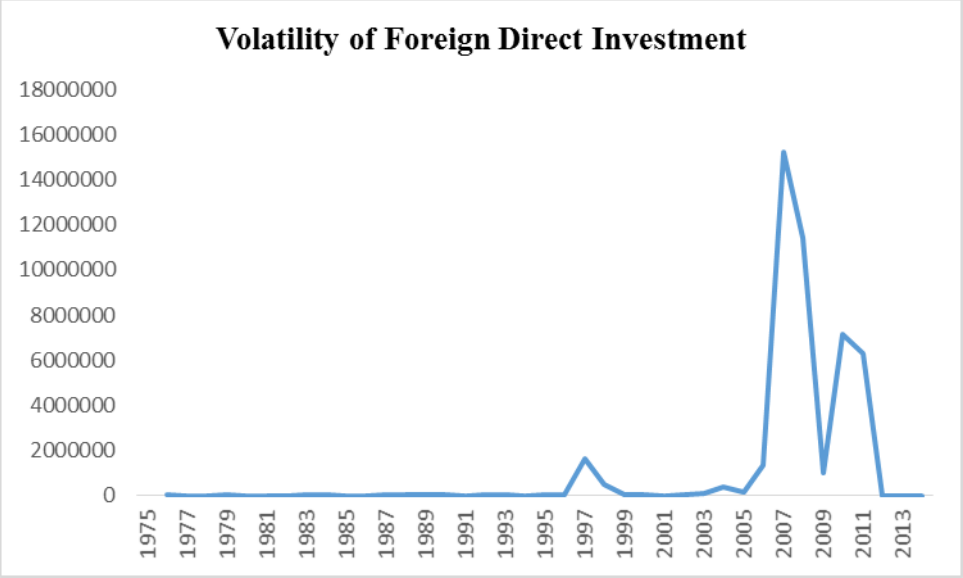

Figure 6. Shows the Volatility of the Foreign Direct Investment

4. Discussion

The fundamental objective of the study was to evaluate the Macroeconomic Uncertainty, Consumption Expenditure and Fixed Private Investment in case of Pakistan with other control variables such as volatility of inflation, volatility of interest rate, volatility of political instability, volatility of GDP, and

volatility of foreign direct investment. For this purpose secondary data on these macroeconomics variables collected from different published sources like the World Bank and systematic peace web site for the period 1975 to 2014. The empirical results of the study confirmed that the volatility of the different variables (volatility of inflation, volatility of interest rate, volatility of political instability, volatility of GDP, and volatility of foreign direct investment) significant affect the government consumption expenditures and private investment in the economy of Pakistan. The study analyzed data by using the autoregressive distributive lag model which is mainly used in time series data Econometrics to estimate the non-stationary models with mix order of integration.

The estimated results of the study evaluated that volatility of the inflation lead to uncertainty which is also suggested by the Able (1980) and negatively affect the economy consumption expenditures as well as private investment in the economy of Pakistan. Because uncertainty directly affects the cost of capital as well as reduce private investor confidence.

Political thinkers and policy makers believe that the volatility of the macroeconomic and political variables may lead to uncertainty in the developing economy which has significant impact on government consumption expenditures and private investment.

The foreign capital inflow plays a key role in the development of an economy in the form of resource flows between the industrial and developing economies in the form of infrastructure development and technological advancement which lead to improve productivity growth of the economy. Foreign direct investment is the one of the form of capital inflow from the host countries. The estimated results of the study confirm the statistically significant adverse effect of the volatility of the foreign direct investment on the government consumption expenditure and private investment in the economy. Because the domestic political and security situation affects foreign direct investment with negative trend throughout the world. So there is a need for a policy which reduces the volatility of foreign direct investment.

The overall findings of our study concluded that macroeconomic uncertainty due to the volatility of the macroeconomic variables significantly matters for the determination of government consumption expenditures as well as private investment in the developing countries like Pakistan. We observed in our study that Pakistan experiences more volatility in macroeconomics variables caused more fluctuation in government consumption expenditures and private investment.

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References

Abaidoo, R. (2012). Macroeconomic Uncertainty, Consumer Sentiments, Consumption Expenditures And US Fixed Private Investment Growth. *The Journal of Applied Business Research—January/February 2012*, *28*(1). https://doi.org/10.19030/jabr.v28i1.6690

Able, S. L. (1980). *Inflation Uncertainty, Investment Spending and Fiscal Policy, Economic Review*. February, Federal Reserve Bank of Kansas City.

Ahmad, I., & Qayyum, A. (2008). *Dynamic Modeling of Private Investment in Agricultural Sector of Pakistan*. https://doi.org/10.30541/v47i4IIpp.517-530

Ahmad, I., & Qayyum, A. (2008). Effect of Government Spending and Macroeconomic Uncertainty on Private Investment in Services Sector: Evidence from Pakistan. *European Journal of Economics, Finance and Administrative Sciences*, *2008*(11). Retrieved from http://mpra.ub.uni-muenchen.de/11673/ MPRA Paper No. 11673, posted 21. November 2008 16:47 UTC

Barro, R. (1996). Democracy and growth. *Journal of Economic Growth*, *1*, 1-27. https://doi.org/10.1007/BF00163340

Caggiano, G., Castelnuovo, E., & Groshenny, N. (2014). Uncertainty Shocks and Unemployment Dynamics in U.S recessions. *Journal of Monetru Economics, 2014*(67), 78-92. https://doi.org/10.1016/j.jmoneco.2014.07.006

Caporale, G. M., Onorante, L., & Paesani, P. (2010). *Inflation and Inflation Uncertainty in the Euro Area European Central Bank Working Paper Series 1229*. https://doi.org/10.2139/ssrn.1493154

Demir, F. (2008). Financial Liberalization, Private Investment Portfolio choice; fInancialization of real sectors in emerging market. *Journal of Development Economics, 2009*(88), 314-324. https://doi.org/10.1016/j.jdeveco.2008.04.002

Demir, F. (2009). Macroeconomic Uncertainty and Private Investment in Argentina, Mexico and Turkey. *Applied Economics Letters*, *16*(6), 567-571. Hester Hall, 729 Elm Avenue, Norman, Oklahoma, USA 73019. https://doi.org/10.1080/13504850701206528

Dornbush, R., Fisher, S., & Startz R. (1999). *Macroeconomics* (7th ed.). New York: Mc Graw-Hill International Editions.

Foye, V. O. (2014). The Imact of Public Capital Spending on Private Investment in Nigeria. *Journal of International Academic Research for Multidisciolinary*, *2*(2).

Ganti, S., & Bharat R. K. (1979). Wagner's Law of Public Expenditures: Some Efficient Results for the United States. *Public Finance/Finances Publiques*, *34*, 225-233.

Georgakopoulos, T. A., & Loizides, J. (1994). The Growth of the Public Sector: Tests of Alternative Hypotheses with Data from Greece. *The Cyprus Journal of Economics*, *7*, 12-29.

Khandelwal, P., & Roitman, A. (2013). *The Economics of Political Transitions: Implications for the Arab Spring*. IMF WP/13/69. https://doi.org/10.5089/9781475569643.001

Koetse, M., de Groot, H., & Florax, R. J. (2006). *The Impact of Uncertainty on Investment: A Meta-Analysis*. Tinbergen Institute, Amsterdam and Rotterdam, 06-060/3. https://doi.org/10.2139/ssrn.917095

Kottaridi, C., & Escaleras, M. (2000). *MACROECONOMIC UNCERTAINTY, SOCIOPOLITICAL INSTABILITY AND PUBLIC PROVISION: EFFECTS ON PRIVATE INVESTMENT*. Florida Atlantic University, Department of Economics, USA.

Lensink, R. (2000). Is the Uncertainty-Investment Link Non-linear? Empirical Evidence for Developed Economies. *Weltwirtschaftliches*, *138*. https://doi.org/10.1007/BF02707327

Litzenberger, R. H., & Rabinowitz, N. (1995). Backwardation in oil futures markets: Theory and empirical evidence. *The Journal of Finance*, *50*(5), 1517-1545. https://doi.org/10.1111/j.1540-6261.1995.tb05187.x

Madni, G. R. (2012). Role of fiscal policy for private investment in Pakistan. *International Journal of Economic Sciences and Applied Research*, *7*(2), 139-152.

Mahmood, B., Sohail, M. M., Mushtaq, S. K., & Rizvi, S. A. (2014). *Social Factors Hindering Political Participation in Pakistan: A Review Article*. https://doi.org/10.5901/mjss.2014.v5n23p1933