Sectoral Volatility, Development and Governance: A case study of Pakistan

by
Toseef Azid, Fulbright Fellow, Social and Behavioral Sceices Division, El Camino College, Torrance, California, USA

Naeem Khaliq, Post Graduate Student, Markfield Institute of Higher Education, Loughborough University, UK
And
Muhammad Jamil, Staff Economist Pakistan Institute of Develoment, Economics Islamabad

Abstract

Recent empirical work finds a strong impact of sector volatility on development. Growth stability is an important objective because development requires sustained increases in income, volatility is costly for poor as well deters growth. This study views the nature of volatility of the different economic sectors and trying to find out that to what extant do volatility in growth rate is associated with the volatility of the sectors under analysis. This study finds that in a country like Pakistan no long-run relations exists in between volatility of growth rate and the sectoral volatility. However, a relationship exists for the short-run. This study suggests that may be volatility in growth rate have some relationship with the volatility of the political structure and the governance of the government. So effort should be made for the estimation of this relationship.

Sectoral Volatility, Development and Governance: A case study of Pakistan

1. Introduction

Since the independence the economy of Pakistan has undergone dramatic structural changes and economic growth. Pakistan has tried to change its economic structure as the other underdeveloped countries from an agricultural economy to an industrial export-oriented one, in which the manufacturing sector constitutes today the dominant form of economic activity. This dominance resulted from a development strategy based on a tax exemption scheme, in addition to other incentives, which the Pakistan's government implemented in the past five decades. The main objective of different schemes was to alleviate the historically high level of unemployment and at the same time, promote the economic and social welfare of the population.

During the last five decades the manufacturing sector itself has experienced a series of changes in its internal structure. The structure is based towards the capital intensive techniques instead of labor-intensive one. This however, created the problem of unemployment, balance of payments (most of the intermediate and final inputs are imported). The high technology is also attracted by the government and main industrial groups in Pakistan. One of the main reasons for the attraction has been the necessity to maintain or improve the international competitiveness of Pakistan's manufacturing sector. The imported technology used by these industries and the associated technical changes have also affected the utilization of layout and has contributed towards increase in labour productivity. It has induced changes in the organization and composition of the work force, and affected skill requirements and management of labour. Despite all of this, still agriculture plays a significant role in the development of Pakistan's economy.

The pattern of economic volatility in Pakistan is complex. At the macroeconomic level the very high volatility recorded in real growth rates, price inflation, and private investment per capita, government revenues per capita, terms of trade and real exchange rate. But patterns of volatility vary among sectors. In terms of GDP the most volatile sectors are agricultural, industrial and service; while the least volatile are distribution, transport, and communications. On government expenditure current expenditures (there are three major components of current expenditure, namely, interest payments, defence, and expenditure on civil administration) are highest than the development expenditures while public expenditure as percentage share of GDP has been relatively stable.

Tax and debt funded public spending as the driving force of the Pakistan's economy, fiscal policy and budget management constitute the pivot of macro-economic policy. Major problems include: excessive centralization of resources and powers, to the detriment of sub – national units of government; prevalence of fiscal imbalances both vertically horizontally; and frequent overlapping and non – coordination of expenditure responsibilities among different levels of government. There is need to evaluate and restructure present fiscal set-up, to ensure fiscal discipline at all levels, as well as to secure greater understanding and cooperation across the different tiers of government.

Exchange rate policy is a key factor in economic management. In an elusive search for a real exchange rate to maintain both internal and external balance, Pakistan has experimented with a succession of exchange rate regimes. The latest experiment is based on managed floating rate of exchange.

Since its beginning in 1947 national development planning in Pakistan has suffered from lack of systematic, integrated and target oriented approach, each plan being essentially a laundry list of projects, some rolled over from the over from the previous ones. Lack of clear vision, transparency and functional cooperation at the political levels, marginalisation of civil society in the planning process, and lack of rigour at the bureaucratic level have severely compromised the quality of the planning. At all levels,

of government technical expertise as well as technology and information management systems are very deficient.

The review of policy options considers short-middle term as well as long term prospects. It focuses on monetary policies, prices and exchange rate management, revenue stabilisation, diversification and growth, public expenditure management, and the constitutional and operational problems of fiscal federalism. The main determinant of the stock of money, in Pakistan, has been the consolidated fiscal balance of all levels of government, federal, state and local, which has been in deficit for most of the time since 1947. The money supply growth has contributed to the relative growth of the service sector and the relative decline of the agricultural sector of the economy, contributing to considerable GDP volatility. The federal government and most state governments have embarked on programmes to improve public expenditure management by downsizing, rightsizing and restructuring the public services and privatising public enterprises the stabilisation of public expenditure is constrained by the lack of harmonisation and coordination of expenditure management by the various tiers of government

Public revenue in Pakistan is inadequate and unstable. The major cause of revenue volatility is a combination of two factors: the large and unpredictable fluctuations in agricultural sector because the whole economic activity is based on agriculture and adhoc policies as well as inefficient structure of the central board of revenue. In the short run efforts should be made to raise more revenue through more effective harvesting of existing sources and more imaginative investigation and development of new ones. In the long run steps should be taken to promote and support increased production and productivity in the various sectors of the economy. The low level of social development and social security is a major constraint to sustainable growth. There is need to enlarge the revenue base through social security taxation in order to provide adequately for the necessary investment in social service delivery.

In the economic literature, a number of efforts can be seen discussing the impact of volatility on the economic performance of different countries especially the developing countries, e.g., Koren and Tenreyro (2005) explained that despite the number of steps

have been taken by most of the developing countries towards the stability of their economies, still one can easily observe the volatility in most of their macroeconomic variables. The concern with volatility in most of the developing countries arises day by day. Most of the studies are concerned with this question. Why is GDP growth so much volatile in poor countries than in rich one?

Generally experts identified the four possible reasons:

(i) poor countries specialize in more volatile sectors;

(ii) poor countries specialize in fewer sectors;

(iii) poor countries experience more frequent and more severe aggregate shocks (e.g. from macroeconomic policy); and

(iv) poor countries' macroeconomic fluctuations are more highly correlated with the shocks of the sectors they specialize in.

This is the requirement of the time that how to decompose volatility into these four sources, quantify their contribution to aggregate volatility, and study how they relate to the stage of development.

However, a number of studies can be seen in the literature discussing the phenomenon of volatility and its impact on the performance of the economy, It is well recognized that volatility of different sectors has impact on the performance of the economy. Especially in the literature, it has been observed that volatility of those sectors in which the economy is specialized has a significant effect on the production and trade of the developing as well as the developed economies. For example, macro economic impact of volatility discussed by Mobarak (2005), Koren and Tenreyro (2005), Lucas (1988), Acemoglu and Zilibotti (1997 Obstfeld (1994), Saint-Paul (1992), and Green- wood and Jovanovic (1990) Obstfeld (1994) and Saint-Paul (1992) Acemoglu and Zilibotti (1997) and Green-wood and Jovanovic (1990)) Imbs and Wacziarg (2003), Stockman (1988), Dumas, et al. (2005) Scheinkman and Xiong (2003). Breena and Garcia (1999), Perotti (1996). Atkinson (1996, 1997) and Gottschalk and Smeeding (1997), Bourguignon and Morrissson (1998) and Li, Squire and Zou (1998). Breena and Garcia (1999) Easterly et

al (2002), Ukwu (2003), Gordon (2005) Mobarak (2004) Pritchett (2000) Jalan and Ravallion 1999). (Morduch 1995). Although Lucas (1987) (Pallage and Robe 2003), (Wolfers 2003 (Barlevy 2002). Barro and Sala-I-Martin (1995), :Pritchett (2000) and may others. Whereas determinants of Vvlatility is dicussed by Levine and Renelt (992), Rostow and Reynolds., Acemoglu and Zilibotti (1997). Rodrik (1999 Mubarak (2005). Relationship between dmocracy and vlatility explained by Henisz (2000), Nooruddin (2003). Mobarak (2001) Chandra (1998) and Quinn and Woolley (2001).

This study is organized in the following manner. Section 2 presents the methodology and estimations of impact of sectoral volatility on the performance of Pakistan's economy. Whereas section last section presents the summary and some policy suggestions.

2. Measurement of Volatility

In spite of the crucial importance attributed to growth rate of GDP in Pakistan like other developing countries, no empirical quantitative research has however, been conducted to examine the volatility of that sector in which economy is specializing, and its impact on the volatility of growth rate in Pakistan.

The main objective of this study is to use a time series analysis to analyse the actual cause of the volatility in the growth rate of the Pakistan's economy. The technical characteristics of the volatility of the different sectors will be analysed and then analyse that which sector is more volatile by using the Generalized Auto Regressive Conditional Heteroscadesticity(GARCH). Also an effort will be made to estimate the impact of sectoral volatility on the growth rate of the Pakistan's economy.

This will represent the first attempt to analyse quantitatively the relationship between the volatility and development. Specific questions which will be addressed in the course of study will include: What are the main characteristics of the structure of the Pakistan's economy? What is the nature of volatility of the different economic sectors? Does Sectoral volatility explains relative changes in the growth rate? In other words, is sectoral volatility biased or neutral? How is the volatility in the different sectors of Pakistan's economy is Correlated with each other? To what extent do volatility in growth rate is associated with the Volatility of the sectors under analysis? What are the main implications of the volatility parameters for the Pakistan's policy problem, and for the achievement of stable growth rate?

Despite the sharp structural change experienced by the Pakistan's economy during the last four decades, in which industrial and service sector have exhibited an extra ordinary rate of growth, while the agricultural sector did not show that rate of growth which was experienced during the time of green revolution. The volatility of growth rate has been experienced by the economy from the last four decade. Still no serous attempt has been seen covering the area of development and sectoral volatility. This is the first systematic quantitative study on the measurement of volatility and development. In addition, it is the first attempt to provide a quarterly time series data set covering the period 1971-72 to 2002-2003, which capture the different shocks of the Pakistan's economy and adjustments associated with the different economic and political crises. Most studies on the volatility structure and development have been undertaken for developed and developing countries as will be reviewed in the study. Only a very limited number of studies deal with these issues in less developed countries (LDCs). The analysis of the relationship between the sectoral volatility and growth rates in Pakistan makes it a unique study in views of future policy options.
To the extent that most of the recent volatility in growth rate of GDP can be attributed to the increasing share of the some volatility of the some prominent sectors, the analysis of their volatility can be useful in providing some enlightenment on the factors behind this phenomenon and its implications for the formulation of the policy in the future. This can be considered an important contribution of the present study.

Since the effects of the development on the overall economy in Pakistan are largely dependent upon the characteristics of the different prominent sectors such as agriculture, industry and service, knowledge of the features of this volatility is quite important. In this respect, the examination of the volatility in Pakistan, and its implications for the economy's problem, is also an important contribution. It is for the first time that this issue is being addressed in Pakistan in the context of a systematic quantitative frame work.

One of the major contributions of this study is related to the functional form of the growth rate. Past studies of the growth rate of the Pakistan's economy have applied the more traditional functional forms such as the Leontief, Cobb-Douglas and CES. There are several limitations of these forms. In particular, they did not use the time series analysis for the examination of this behaviour. This study follows the more appropriate functional form, and constitutes the first time this form used to analyse the growth rate in Pakistan. In this respect, it takes advantage of the developments in the

theory of unit root test, Vector Auto Regressive Model (VAR) and estimates a variance based on the generalized Autoregressive Conditional Heteroskedasticity Model (GARCH) and then uses the Implicit Response Function. In particular, this will be very useful in providing more reliable estimates variance of development and its determinants.

The secondary data is used in this study. Major secondary data has been drawn from the publications of Pakistan Institute of Development Economics especially the Quarterisation of Annual GDP of Pakistan.

2.1 Empirical Analysis

This section used the conventional techniques of time series analysis, i.e., a rolling (moving) variance of the series, GARCH as a measure of uncertainty that forecasts movements and measure uncertainty around that forecast. VAR and Co-integration Test, Variance Decomposition and Impulse Response Functions, and the techniques suggested to capture the effects of volatility on economic performance. And then presents the empirical results and its analysis.

List of Variables

Two types of volatility variables are used (4-quarter moving standard deviation and 8-quarter moving standard deviation). Here volatility variable is also calculated using ARCH-GARCH process to differentiate following notations are used

4 quarter moving Standard deviation = Vol
8 quarter moving standard deviation = voll
Volatility based on ARCH-GARCH = Volt

Notations that are used for the variables are as under

Output(GDP) = Y
Value added of agriculture = VAG
Value added of Finance and Insurance = VFIN
Value added of Services = VSER
Value added of Industry = VIN
Value added of Whole sale and retail = VWH

Growth rate of output =GRY
Growth rate of value added of agriculture = GR_VAG
Growth rate of value added of Finance and Insurance = GR_VFIN
Growth rate of value added of Services = GR_VSER
Growth rate of value added of Industry = GR_VIN
Growth rate of value added of Whole sale and retail = GR_VWH

For volatililities of the above variables following notations has been used

<u>Volatility based on 4 quarter moving standard deviation</u>

Volatility of output = VOL_Y
Volatility of value added of agriculture = VOL_VAG
Volatility of value added of Finance and Insurance = VOL_VFIN
Volatility of value added of Services = VOL_VSER
Volatility of value added of Industry = VOL_VIN
Volatility of value added of Whole sale and retail = VOL_VWH

<u>Volatility based on 8 quarter moving standard deviation</u>

Volatility of output = VOLL_Y
Volatility of value added of agriculture = VOLL_VAG
Volatility of value added of Finance and Insurance = VOLL_VFIN
Volatility of value added of Services = VOLL_VSER
Volatility of value added of Industry = VOLL_VIN
Volatility of value added of Whole sale and retail = VOLL_VWH

Volatility based on ARCH-GARCH process

Volatility of Growth rate of output = VOLT_GRY
Volatility of Growth rate of value added of agriculture = VOLT_GR_VAG
Volatility of Growth rate of value added of Finance and Insurance = VOLT_GR_VFIN
Volatility of Growth rate of value added of Services = VOLT_GR_VSER
Volatility of Growth rate of value added of Industry = VOLT_GR_VIN
Volatility of Growth rate of value added of Whole sale and retail = VOLT_GR_VWh

2.1.1 Result and Discussion

Unit Root Test

The data for this study exhibits the regular characteristics associated with most Macroeconomic variables. This conclusion derives from the unit root tests carried out on the variables used. Checking stationary is necessary because during building models for time series, the underlying stochastic process that generated the series must be invariant with respect to time. If the characteristics of the stochastic process change over time, i.e., if the process is nonstationary, it will often be difficult to represent the time series over past and future intervals of time by a simple algebraic model. This leads to misleading result.

Table 1. Unit Root Tests of the Variables

Variables		ADF Test Statistics					
		Intercept		Trend and Intercept		None	
		Level	First Difference	Level	First Difference	Level	First Difference
Y		2.868	-4.7467	-2.447	-1.617	6.3290	-1.6179
VWH		1.465	-5.1124	-2.1241	-5.30796	6.0821	-2.7513
VSER		5.148	-5.5177	-0.8968	-7.4847	9.5974	-1.8768
Vin		2.516	-5.9679	-2.326	-6.5399	7.3812	-2.8258
Vfin		-1.156	-9.9411	-4.5852	-9.9046	0.6380	-9.7911
Vag		0.736	-5.755910	-2.4458	-5.8665	3.7258	-4.47299
Gry		-5.564	-12.33577	-6.0393	-12.2891	-1.9418	-12.3894
Critical Values	1%	-3.483	-3.484	-4.0348	-4.038	-2.582	-2.582
	5%	-2.884	-2.885	-3.446	-3.446	-1.9426	-1.9426
	10%	-2.579	-2.579	-3.1481	-3.148	-1.6171	-1.617

On the other hand, if the stochastic process is fixed in time, i.e., if it is stationary, then one can model the process via an equation with fixed coefficients that can be estimated from past data. We report the results for the ADF test because it has an

Over-riding advantage on the series, as ADF automatically controls for higher order correlations by assuming that the coefficient of the series follows an AR (p) process and automatically adjusts the test methodology. Results of ADF tests shows that all the variables of the model are integrated at I (1), suggesting the need for differencing of the variables. This means that we can precede with the Johansen co integration tests for these variables. Table 1 and table 2 contain the results from the unit root test.

Table 2. Unit Root Tests of the Variables

Variables		**ADF Test Statistics**		
		Intercept	**Trend and Intercept**	**None**
		Level	**Level**	**Level**
GRY		-5.359021	-5.862386	-1.951609
Gr_VWH		-4.739507	-5.080336	-2.575839
Gr_Vser		-6.798848	-7.078382	-2.898288
Gr_Vin		-5.48857	-5.944511	-2.474010
Gr_Vfin		-4.793151	-4.772634	-4.432687
Gr_Vag		-6.215031	-6.188192	-4.570678
Critical Values	1%	-3.4847	-4.0355	-2.5825
	5%	-2.8851	-3.4469	-1.9426
	10%	-2.5792	-3.1482	-1.6171

Variable GRY is integrated of order zero i.e. I (0)

Variable Growth rate of value added of whole sale and retail sales is integrated of order zero i.e. I (0)

Variable Growth rate of value added of Services is integrated of order zero i.e. I(0)

Variable Growth rate of value added of industry is integrated of order zero i.e. I(0)

Variable Growth rate of value added of Finance and insurance is integrated of order zero i.e. I (0)

Variable Growth rate of value added of agriculture is integrated of order zero i.e. I (0)

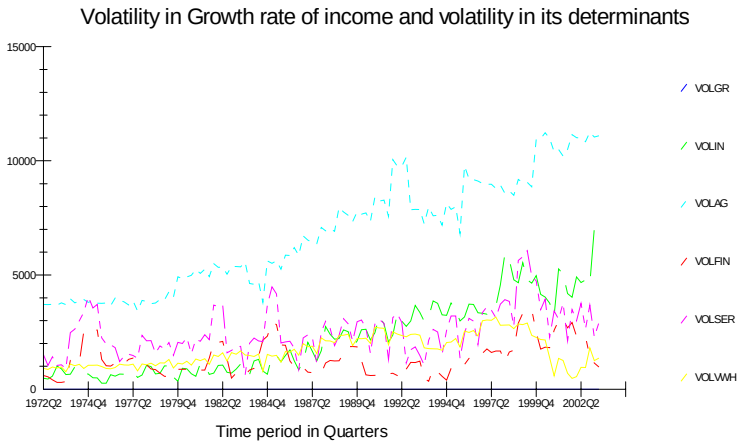
Now we will check the level of integration of the volatility of the growth rate of the variables (see Table 3).

Table 3. Level of Integration of Volatilities of Growth rates of value added of variables

Variables		ADF Test Statistics		
		Intercept	**Trend and Intercept**	**None**
		Level	**Level**	**Level**
VOIT_GRY		-4.203811	-4.233343	-4.170112
VOIT_Gr_VWH		-4.486575	-4.447732	-4.500675
VOIT_Gr_Vser		-5.249385	-5.239287	-5.270846
VOIT_Gr_Vin		-4.465337	-4.884791	-4.484121
VOIT_Gr_Vfin		-4.793151	-4.772634	-4.665427
VOIT_Gr_Vag		-4.8655	-5.269097	-4.883120
Critical Values	1%	-3.4906	-4.0435	-2.5844
	5%	-2.8877	-3.4508	-1.9429
	10%	-2.5805	-3.1505	-1.6172

Here one can check from Table 3 that all the variables are integrated of order zero (that should be because all the growth rate variables are also integrated of order zero so level of integration of volatility variable cannot be greater than the level of integration of growth rate of variables) According to Angel-Granger Approach if any of the variable is integrated of order zero then co-integration do not exist. So there is no co-integration among volatility of growth rate of output and volatility of growth rates of value added by different sectors, all there exist is the short run relationship (see Figure 1).

Figure 1



Regression Results of the variables of Volatility obtained from the ARCH-GARCH Process

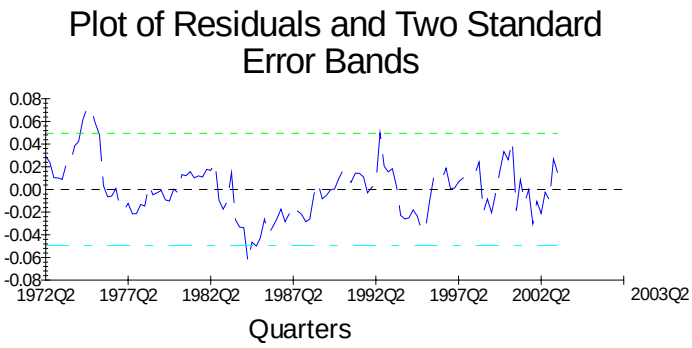
In this case analysis has been performed in two steps in the first step volatility of growth rate of value added of each variable is regressed over the volatility of growth rate of output. In the second step all the variables of volatility of growth rates of value added of different variables used to check the impact on volatility of growth rate of output at once.

From the regression results it has been observed in the short run that volatility of the selected sectors have significant impact on the volatility of growth rate of the income. However, this relationship exists only in the short-run but not prevails in the long-run during the period of study.

Another attempt is made to test the hypothesis based on the volatility derived from moving average. Dependent variable is volatility of the growth rate and independent variables are volatility of the value added of different sectors, such as industries, agriculture, finance and insurance, services and whole sale and trade. Except services every sector shows a negative impact on the volatility of growth rate. However, the impact of financial sector is insignificant.

```
Ordinary Least Squares Estimation
*******************************************************************
 Dependent variable is VOLGR
 125 observations used for estimation from 1972Q2 to 2003Q2
*******************************************************************
 Regressor     Coefficient       Standard Error         T-Ratio[Prob]
 CONS              .22622            .010032            22.5500[.000]
 VOLIN          -.1079E-4           .3147E-5           -3.4274[.001]
 VOLAG          -.6220E-5           .2118E-5           -2.9373[.004]
 VOLFIN         -.3954E-6           .4847E-5          -.081576[.935]
 VOLSER          .1848E-4           .3899E-5            4.7394[.000]
 VOLVWH         -.1308E-4           .4665E-5           -2.8037[.006]
*******************************************************************
 R-Squared           .63135   R-Bar-Squared        .61586
 S.E. of Regression  .024789   F-stat.    F(  5, 119)   40.7593[.000]
 Mean of Dependent Variable .18416 S.D.of Dependent Variable  .039996
 Residual Sum of Squares .073125   Equation Log-likelihood   287.8761
 Akaike Info. Criterion  281.8761 Schwarz Bayesian Criterion 273.3912
 DW-statistic                .40924
*******************************************************************
```

Figure 2



After that unit root test was applied.

```
Unit root tests for residuals
*******************************************************************
 Based on  OLS regression of VOLGR on:
 CONS  VOLIN   VOLAG    VOLFIN          VOLSER        VOLVWH
 125 observations used for estimation from 1972Q2 to 2003Q2
*******************************************************************
Test Statistic          LL      AIC       SBC         HQC
 DF     -3.7014      334.4840 333.4840  332.0903    332.9180
 ADF(1) -2.9292      336.1549 334.1549  331.3675    333.0229
 ADF(2) -3.4838      338.8636 335.8636  331.6824    334.1656
 ADF(3) -3.1369      339.0409 335.0409  329.4659    332.7768
 ADF(4) -3.4008      340.0136 335.0136  328.0449    332.1836
*******************************************************************
 95% critical value for the Dickey-Fuller statistic =  -4.8482
 LL  = Maximized log-likelihood      AIC = Akaike Information
Criterion
```

```
 SBC = Schwarz Bayesian Criterion    HQC = Hannan-Quinn Criterion
```

The calculated value at 95% level is less than the critical value so the series is not stationary. And rejected the null hypothesis that unit root exists. This may stem from a structural break for the years chosen as a sample. So a dummy is added for particular quarters having some political disturbance. Giving the value one to these quarters and otherwise zero. Then again run a regression.

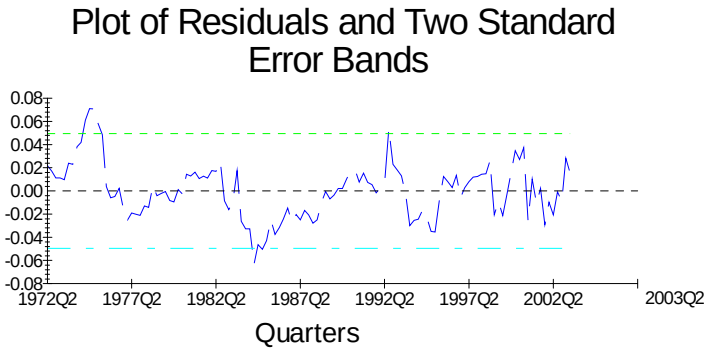
```
Ordinary Least Squares Estimation
*******************************************************************
 Dependent variable is VOLGR
 125 observations used for estimation from 1972Q2 to 2003Q2
*******************************************************************
 Regressor      Coefficient   Standard Error         T-Ratio[Prob]
 CONS            .22561            .010032           22.4882[.000]
 VOLIN         -.1064E-4           .3145E-5            -3.3835[.001]
 VOLAG         -.6467E-5           .2125E-5            -3.0425[.003]
 VOLFIN        -.1083E-5           .4877E-5            -.22206[.825]
 VOLSER         .1968E-4           .4032E-5             4.8821[.000]
 VOLVWH        -.1381E-4           .4702E-5            -2.9370[.004]
 DUMMY          .0080367           .0069780             1.1517[.252]
*******************************************************************
 R-Squared      .63544   R-Bar-Squared  .61691
 S.E. of Regression  .024755   F-stat.    F(  6, 118)   34.2803[.000]
 Mean of Dependent Variable .18416 S.D.of Dependent Variable  .039996
 Residual Sum of Squares .072312   Equation Log-likelihood 288.5748
 Akaike Info. Criterion 281.5748  Schwarz Bayesian Criterion 271.6757
 DW-statistic                .43776
*******************************************************************
```

Again follow the same procedure as computed ADF statistics before. However, same results are found.

```
Unit root tests for residuals
*******************************************************************
 Based on OLS regression of VOLGR on:
 CONS  VOLIN  VOLAG  VOLFIN    VOLSER  VOLVWH          DUMMY
 125 observations used for estimation from 1972Q2 to 2003Q2
-------------------------------------------------------------------


Test Statistic       LL       AIC       SBC            HQC
 DF     -3.8389    331.2672  330.2672 328.8734       329.7012
 ADF(1) -2.9564    333.4115  331.4115 328.6240       330.2795
 ADF(2) -3.5773    336.5912  333.5912 329.4100       331.8932
 ADF(3) -3.1506    336.9097  332.9097 327.3347       330.6456
 ADF(4) -3.3838    337.7384  332.7384  25.7697       329.9083
*******************************************************************
**********
 95% critical value for the Dickey-Fuller statistic =   *NONE*
 Critical value not available for the number of regressors in the
regression!
 LL  = Maximized log-likelihood      AIC = Akaike Information
Criterion
 SBC = Schwarz Bayesian Criterion    HQC = Hannan-Quinn Criterion
```

Figure 3

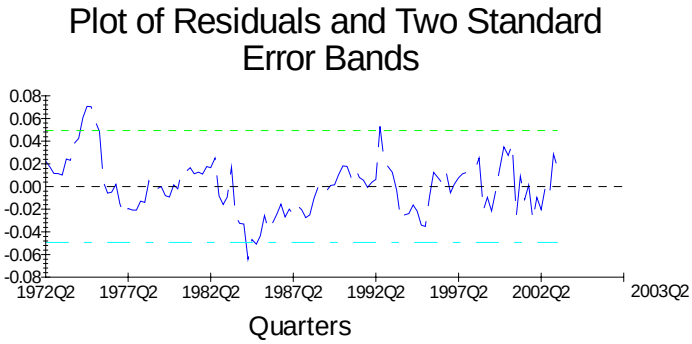


As it is observed that volatility of financial sector has not the significant impact on the dependent variable. So a new regression is estimated without this variable and included the same dummy. However, the similar results are obtained. All these has shown that relationship exists in the short run.

Ordinary Least Squares Estimation

```
*******************************************************************************
 Dependent variable is VOLGR
 125 observations used for estimation from 1972Q2 to 2003Q2
*******************************************************************************
 Regressor    Coefficient   Standard Error         T-Ratio[Prob]
 CONS          .22539           .0099441            22.6654[.000]
 VOLIN        -.1063E-4           .3132E-5           -3.3936[.001]
 VOLAG        -.6524E-5           .2102E-5           -3.1042[.002]
 VOLSER        .1901E-4           .2645E-5            7.1879[.000]
 VOLVWH       -.1330E-4           .4090E-5           -3.2523[.001]
 DUMMY         .0078470           .0068978            1.1376[.258]
*******************************************************************************
 R-Squared       .63529   R-Bar-Squared       .61997
 S.E. of Regression  .024656   F-stat.    F(  5, 119)   41.4577[.000]
 Mean of Dependent Variable .18416 S.D. of Dependent Variable .039996
 Residual Sum of Squares .072343   Equation Log-likelihood 288.5487
 Akaike Info. Criterion  282.5487 Schwarz Bayesian Criterion 274.0637
 DW-statistic                .42459
*******************************************************************************
```

Figure 4




```
Unit root tests for residuals
**************************************************************************
 Based on  OLS regression of VOLGR on:
 CONS    VOLIN    VOLAG     VOLSER          VOLVWH       DUMMY
 125 observations used for estimation from 1972Q2 to 2003Q2
**************************************************************************
Test Statistic     LL            AIC            SBC            HQC
 DF      -3.7720   332.8503       331.8503       330.4566       331.2843
 ADF(1) -2.9365   334.7908       332.7908       330.0033       331.6588
 ADF(2) -3.5615   338.0208       335.0208       330.8396       333.3228
 ADF(3) -3.1656   338.2671       334.2671       328.6921       332.0031
 ADF(4) -3.3508   338.9037       333.9037       326.9350       331.0737
**************************************************************************
 95% critical value for the Dickey-Fuller statistic =  -4.8482
 LL  = Maximized log-likelihood      AIC = Akaike Information
Criterion
 SBC = Schwarz Bayesian Criterion    HQC = Hannan-Quinn Criterion
```

From unit root test it has been observed that critical value is greater than the calculated value.

Error Correction Mechanism (or short-run relationship)

One can also find the short run one by constructing an error correction mechanism (ECM). So took the variables in difference and residual in one period lagged then regressed the equation as appeared in Table . The error correction term is positive and significant at the one percent level and magnitude of the corresponding coefficient shows that almost 99 percent of any disequilibrium in the long-run relationship between the variables are corrected after one year. In other words, growth rate adjusts towards equilibrium level and the error correction provide further evidence that the variables in the equilibrium regressions are not for the long term. From these results it is observed that some other variables have also long-run impact

on the volatility of growth rate like the instability of the political structure of the country.

```
Error correction model

Ordinary Least Squares Estimation
*******************************************************************
 Dependent variable is DVOLGR
 124 observations used for estimation from 1972Q3 to 2003Q2
*******************************************************************
regressor      coefficient       Standard Error       T-Ratio[Prob]
 CONS            .22611            .7442E-4           3038.3[.000]
 DVOLIN         -.1080E-4          .2418E-7          -446.3787[.000]
 DVOLAG         -.6239E-5           1557E-7          -400.6120[.000]
 DVOLSER         .1824E-4          .1900E-7           960.0117[.000]
 DVOLVWH        -.1289E-4          .3061E-7          -420.9851[.000]
 RESID(-1)        .99991           .6764E-3           1478.3[.000]
*******************************************************************
 R-Squared      .99998   R-Bar-Squared                    .99998
 S.E. of Regression .1826E-3   F-stat.    F(  5, 118)   1174120[.000]
 Mean of Dependent Variable.1845 S.D. of Dependent Variable  .039890
 Residual Sum of Squares  .3934E-5 Equation Log-likelihood   894.5528
 Akaike Info.Criterion  888.5528   Schwarz Bayesian Criterion880.0919
 DW-statistic                .95557
*******************************************************************
**********
```

Impulse Response Function (IRF)

The findings of Impulse Response functions are not very much promising. It has been observed from Fig. 5 to Fig.9 that sectoral volatility has not significant impact on the performance of the economy in the long-run. Fig 5 presents the impulse response function of volatility of value added of agricultural sector to one standard deviation shock to volatility of growth rate of income. And the IRFs in Fig 6 indicate that impact is temporary. The volatility of growth rate of income gradually returns to the converging point. Previous literature does not suggest any a priori explanation of this behaviour. Whereas the effects of finance and insurance sector are presented in fig. 6. Same phenomenon has been occurred as we have been observed above. Short run fluctuation cab be seen whereas long run effects are not appeared. Currently it is well known fact that increases in the volatility of finance and insurance sector has the impact in the performance of the economy. The impact of industrial sector, service sector and whole sale and retail are not significantly different from zero.

Impulse Response Functions

Following are the impulse response functions traced using the help of Eviews. The effect has been checked from 1st of 4th lag and then at twelve lag.

Fig. 5. Impulse Response Function Between Volatility of growth rate of output and volatility of growth rate of value added of agriculture

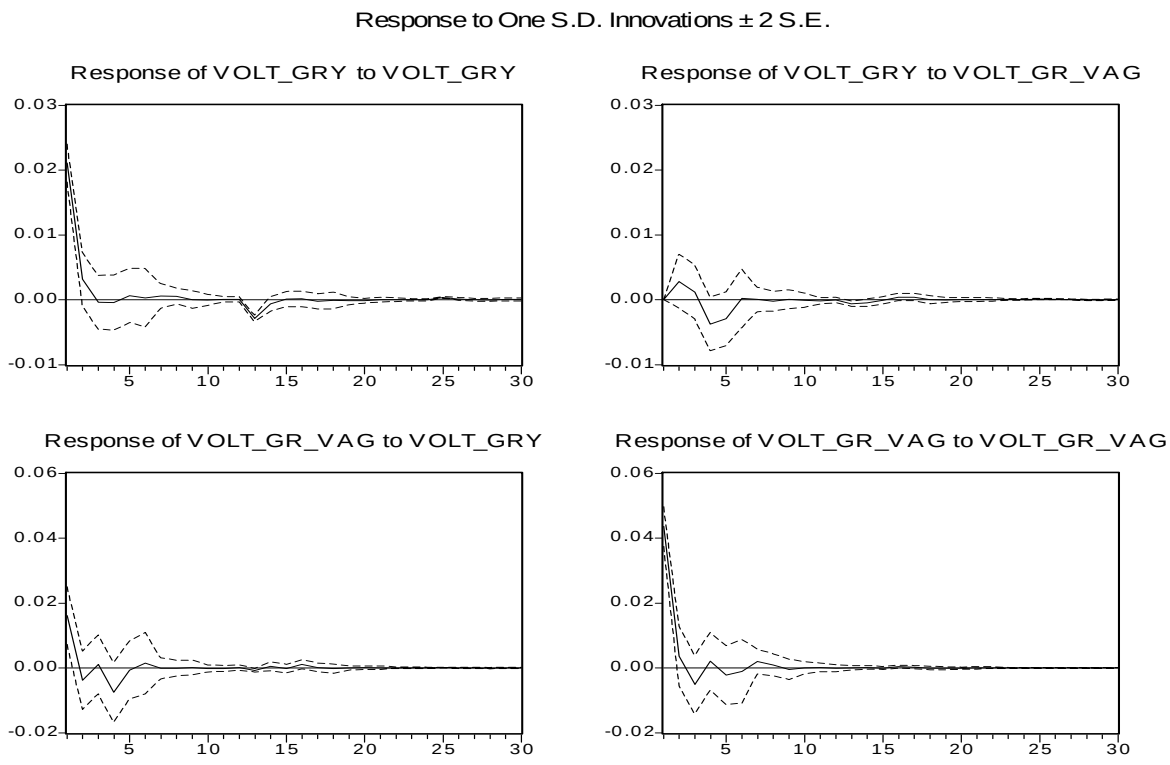


Fig. 6. Impulse Response Function between Volatility of growth rate of output and volatility of growth rate of value added of Finance and Insurance

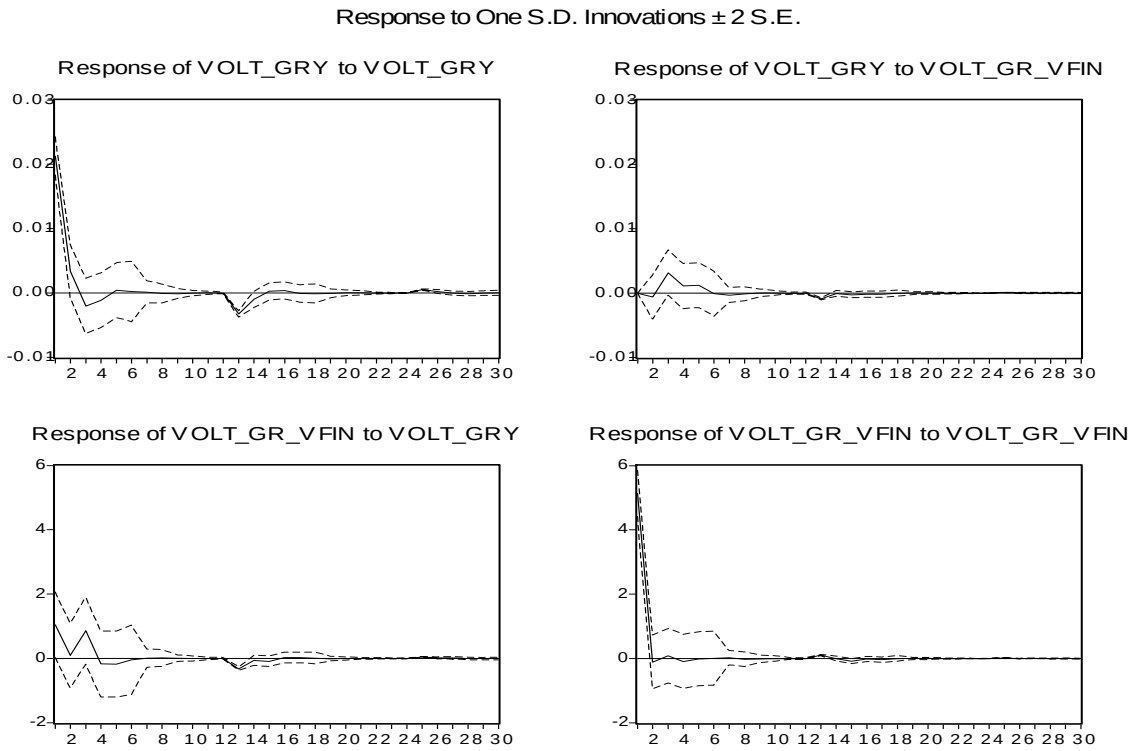


Fig 7. Impulse Response Function between Volatility of growth rate of output and volatility of growth rate of value added of Industry

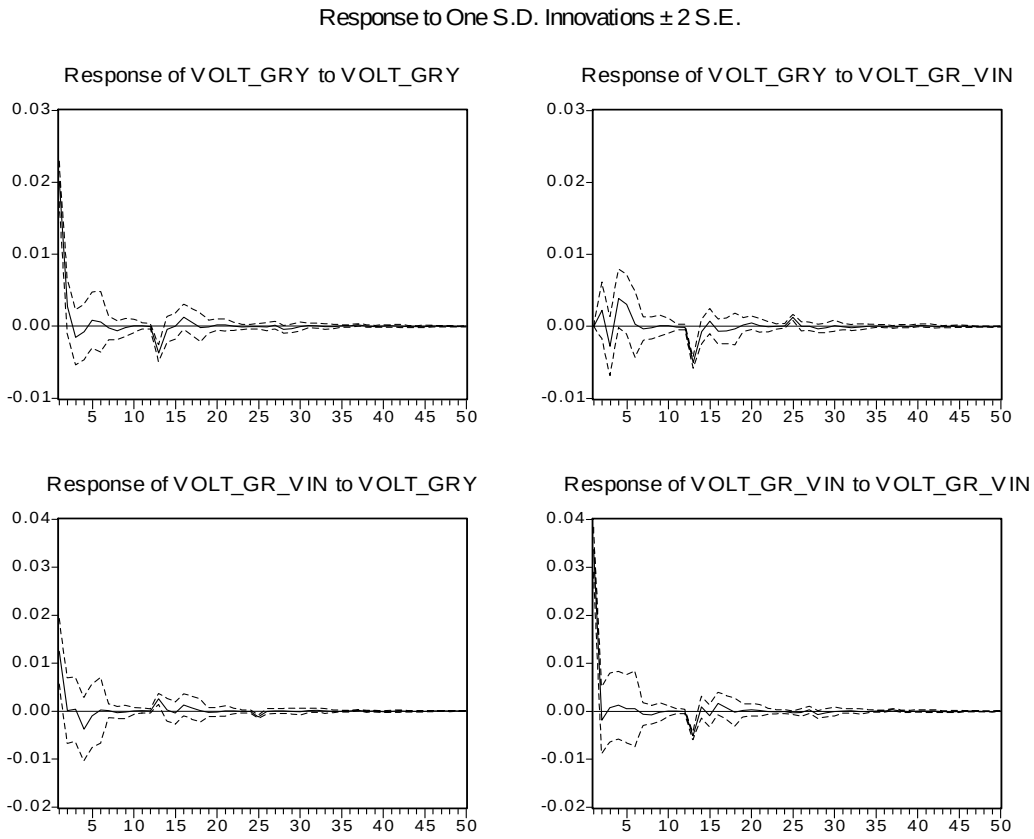


Fig. 8 Impulse Response Function between Volatility of growth rate of output and volatility of growth rate of value added of Services

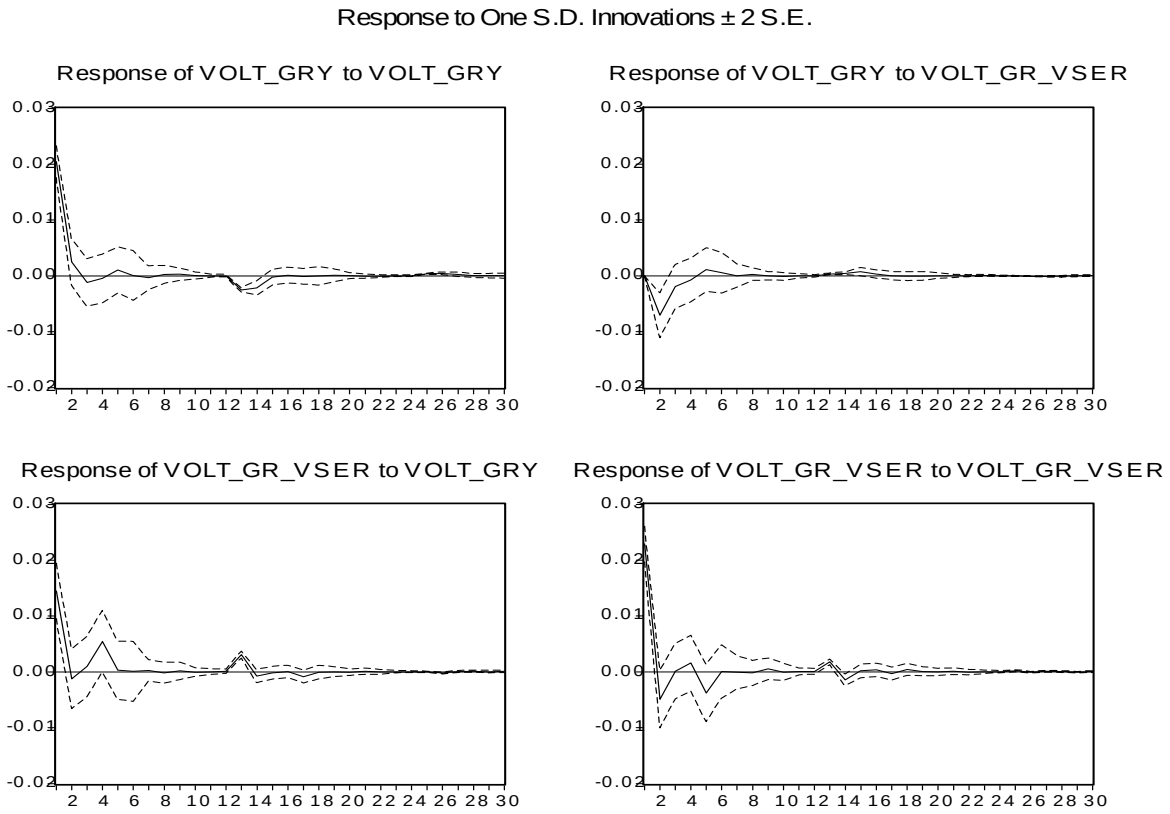
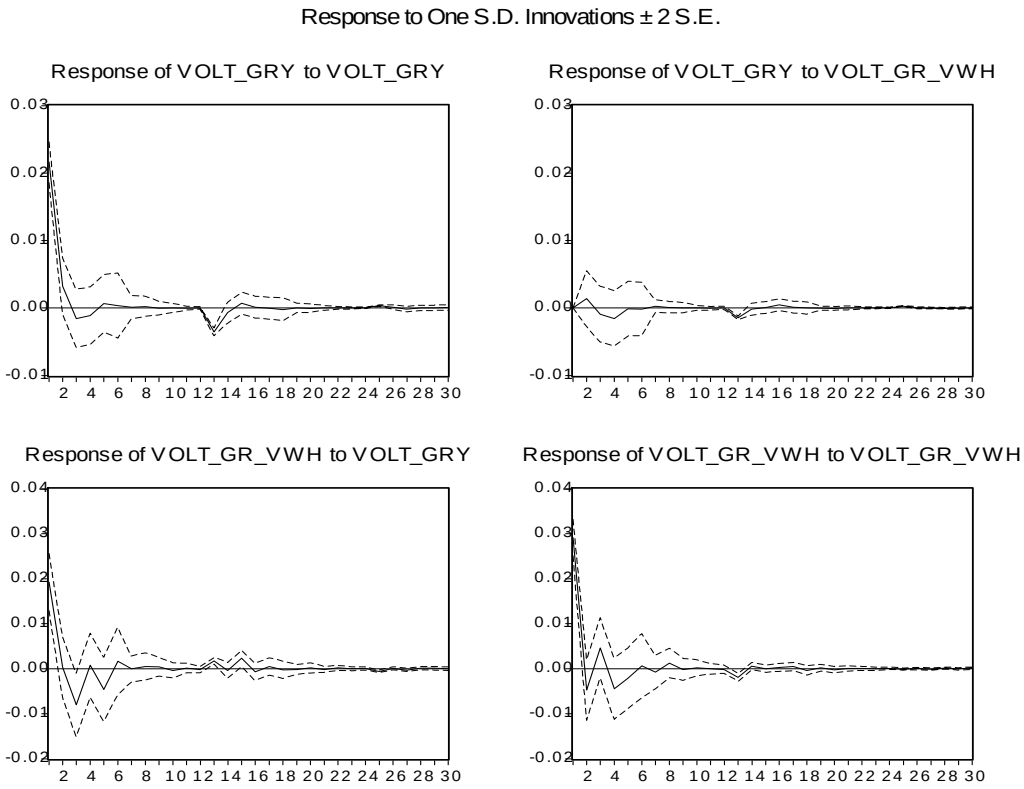


Fig. 9. Impulse Response Function between Volatility of growth rate of output and volatility of growth rate of value added of Whole sale and Retail



Conclusion

From this study it has been observed that in Pakistan every policy is based on short-run whereas it requires the introduction of a long term planning and expenditure framework for Pakistan. This requires an appropriate policy and institutional framework which addresses the long-term goals of the nation as determined through a transparent process involving all the legitimate stakeholders, and should be based on a clear strategy and an integrated programme of action. The National Economic Council has a central role to play in this task.

However, for this study it is also observed that not only the volatility of different sectors have impact on the volatility of growth rates in the short-run but also other variables like dynamic changes in political structure have also impact on the growth rate of the economy. So there is a need to estimate the impact of political instability on the volatility of the growth rate.

The problem of inadequate, untimely and unreliable data has adversely affected development planning and management. Although there are several institutions at the federal level charged with the production of statistical and survey reports, their performance has been uneven and irregular. The system lacks the capacity to harvest and use the information available at the various agencies and centres of action.

There is need to re-think and restructure fiscal federalism in Pakistan. Under prolonged military rule the principles and practice of fiscal federalism were eroded. Efforts are now being made to re-build the system. Such efforts should include the establishment of mechanisms for coordination and cooperation between Federal Government of Pakistan and provincial governments in such a way as to make it possible to agree on economy - wide macroeconomic objectives and targets, and ways of achieving same. The Constitution itself should be drastically reviewed and refashioned in the light of the needs and expressed wishes of the people.

Bibliography.

Acemoglu, Daron and Fabrizio Zilibotti (1997). "Was Prometheus Unbound by Chance? Risk, Diversification, and Growth," *Journal of Political Economy* 105(4): 709-751.

Atkinson, A.B. 1996: "Seeking to Explain the Distribution of Income", in *New Inequalities: The Changing Distribution of Income and Wealth in the United Kingdom.* John Hills, ed. Cambridge: Cambridge University Press: 19-48.

Atkinson, A.B. 1997: "Bringing the Income Distribution in from the Cold", *Economic Journal,* 107(441): 297-321.

Barlevy, Gadi (2002). "The Cost of Business Cycles under Endogenous Growth," mimeo, Northwestern University.

Barro, Robert and Xavier Sala-I-Martin (1995). *Economic Growth*. New York: McGraw-Hill.

Betancourt, Roger (1996). "Growth Capabilities and Development: Implications for Transition Processes in Cuba," *Economic Development and Cultural Change*: 315-331

Bourguignon, F. and Morrisson, C. 1998. "Inequality and development and: the role of dualism", *Journal of Development Economics*, 57 (): 233-57.

Chandra, Siddartha (1998). "Plurality of Institutions and Economic Growth," mimeo, University of Pittsburgh.

Faisal Cheema (2004) Macroeconomic Stability of Pakistan: The Role of the IMF and World Bank (1997–2003), University of Illinois at Urbana-Champaign,Available at http://www.acdis.uiuc.edu/Research/ops/cheema/cover.html Access date 26th march,2006.

Feeney and Alam Report on Pakistan fertility, (2003) PDF Format. Available at http:www.gfeeney.com/pubs/2003-pakistan-fertility, Access date 26th march,2006.

Gottschalk, Peter and Timothy M. Smeeding 1997 'Cross-National Comparisons of Earnings and Income Inequality' *Journal of Economic Literature*, 35: 633-687.

Greenwood, J. and Jovanovic, B. (1990). Financial development, growth, and the distribution of income, *Journal of Political Economy* 98(5): 1076.1107.

Henisz, Witold (2000). "The Institutional Environment for Economic Growth," *Economics and Politics* 12(1): 1-31.

Himala South Asian, Pakistan Edition(july,2002) Available at (http:www.himalmag.com. Access date 26th march,2006.

Imbs, J. and Wacziarg, R. (2003). Stages of diversification, *American Economic Review 93(1): 63.86.*

Jalan, Jyotsna and Martin Ravallion (1999). "Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China," *Journal of Development Economics* 58: 61-81.

Kemal, A R and Arby M F (2004) Quaterisation of Annual GDP of Pakistan (Statistical Paper), Pakistan Institute of Development Economics, Islamabad, Pakistan.

Koren, M. and Tenreyro, S. (2005). Technological diversification, FRB Boston Working Paper 05/1.

Levine, Ross and David Renelt (1992). "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review* 82(4): 942-963.

Li, H., Squire, L. and Zou, H.-F. 1998: "Explaining International and Intertemporal Variations in Income Inequality", *Economic Journal* 108: 26-43.

Lucas, R. E. J. (1988). On the mechanics of economic development, *Journal of Monetary Economics 22(1): 3.42.*

Lucas, Robert (1987). *Models of Business Cycles*. Oxford: Basil Blackwell Publishers.
Ministry of Finance(2005). Government of Pakistan(http://www.finance.gov.pk/) Access date 30th march,2006.

Mobarak, Ahmed Mushfiq (2001). "Why Democracies are More Stable: Models of Policyn Choice and Political Conflict," mimeo, University of Maryland.

Morduch, Jonathon (1995). "Income Smoothing and Consumption Smoothing," *Journal of Economic Perspectives* 9 (3): 103-114.

Nooruddin, Irfan (2003). *Credible Constraints: Political Institutions and Growth Rate*, Doctoral Dissertation, Dept. of Political Science, Univ. of Michigan

Obstfeld, M. (1994). Risk taking, global diversification, and growth, *American Economic Review 84(5): 1310.1329.*

Pakistan ends 15-year ties with IMF; 7 September 2004 Daily Times,) Pakistani NewsPaper Article, 2004 Available at http;//www.dailytimes.com.pk/print.asp Access date 30th march,2006.

Pakistan GDP Reference(nd)Available at http;//www.worldbank.org/data/databytopic/GDP_ppp.pdf).Access date 30th march,2006.

Pallage, Stephane and Michel Robe (2003). "On the Welfare Cost of Economic Fluctuations in Developing Countries," forthcoming, *International Economic Review*.

Perotti, R. 1996: "Growth, Income Distribution and Democracy: What the Data Say", *Journal of Economic Growth*, 1: 149-187.

Pritchett, Lant (2000). "Understanding Patterns of Economic Growth: Searching for Hills among Plateaus, Mountains and Plains," *World Bank Economic Review* 14(2): 221-50.

Quinn, Dennis and John Woolley (2001). "Democracy and National Economic Performance: The Preference for Stability," *American Journal of Political Science* 45(3): 634-657, July.

Ramey, Garey and Valerie Ramey (1995). "Cross-Country Evidence on the Link Between Volatility and Growth," *American Economic Review* 85(5): 1138-1151.

Rodrik, Dani (1999). "Where Did All the Growth Go? External Shocks, Social Conflict, and Growth Collapses," *Journal of Economic Growth* 4(4): 385-412.

Rostow, Walt (1990). *The Stages of Economic Growth: A non-Communist Manifesto*, Third Edition. Cambridge: Cambridge University Press.

Saint-Paul, G. (1992). Technological choice, .nancial markets and economic development, *European Economic Review* 36: 763.781.

Scheinkman, J. A., and W. Xiong, 2003, "Overconfidence and Speculative Bubbles," *Journal of PoliticalEconomy*, 111, 1183–1219.

Stockman, A. C. (1988). Sectoral and national aggregate disturbances to industrial output in seven European countries, *Journal of Monetary Economics* 21: 387.409.

Volatility, Doctoral Dissertation, Dept. of Political Science, Univ. of Michigan.
Wolfers, Justin (2003). "Is Business Cycle Volatility Costly? Evidence from Surveys of Subjective Wellbeing," NBER Working Paper No. 9619.

Appendix

Table.4.13. Impact of volatility of growth rate of value added of agriculture on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:07
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001390	0.002039	-0.681693	0.4968
VOLT_GR_VAG	0.153930	0.043229	3.560818	0.0005

R-squared	0.100887	Mean dependent var	-0.001303
Adjusted R-squared	0.092930	S.D. dependent var	0.022962
S.E. of regression	0.021869	Akaike info criterion	-4.790213
Sum squared resid	0.054045	Schwarz criterion	-4.742475
Log likelihood	277.4372	F-statistic	12.67943
Durbin-Watson stat	1.820916	Prob(F-statistic)	0.000542

Table 4.14.Impact of volatility of growth rate of value added of Finance and Insurance on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:09
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001836	0.002107	-0.871668	0.3852
VOLT_GR_VFIN	0.000802	0.000327	2.456254	0.0156

R-squared	0.050685	Mean dependent var	-0.001303
Adjusted R-squared	0.042284	S.D. dependent var	0.022962
S.E. of regression	0.022472	Akaike info criterion	-4.735881
Sum squared resid	0.057062	Schwarz criterion	-4.688143
Log likelihood	274.3131	F-statistic	6.033186
Durbin-Watson stat	1.789683	Prob(F-statistic)	0.015561

Table 4.15.Impact of volatility of growth rate of value added of Industry on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:10
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001139	0.002054	-0.554405	0.5804
VOLT_GR_VIN	0.181405	0.054727	3.314741	0.0012

R-squared	0.088618	Mean dependent var	-0.001303
Adjusted R-squared	0.080553	S.D. dependent var	0.022962
S.E. of regression	0.022018	Akaike info criterion	-4.776659
Sum squared resid	0.054782	Schwarz criterion	-4.728921
Log likelihood	276.6579	F-statistic	10.98750
Durbin-Watson stat	1.789706	Prob(F-statistic)	0.001233

Table 4.16. Impact of volatility of growth rate of value added of Services on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:12
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001674	0.001911	-0.875703	0.3830
VOLT_GR_VSER	0.299976	0.054527	5.501397	0.0000

R-squared	0.211254	Mean dependent var	-0.001303
Adjusted R-squared	0.204274	S.D. dependent var	0.022962
S.E. of regression	0.020483	Akaike info criterion	-4.921177
Sum squared resid	0.047411	Schwarz criterion	-4.873439
Log likelihood	284.9677	F-statistic	30.26537
Durbin-Watson stat	1.480839	Prob(F-statistic)	0.000000

Table 4.17.Impact of volatility of growth rate of value added of Whole Sale and Retail on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:13
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000971	0.001945	-0.499280	0.6186
VOLT_GR_VWH	0.249295	0.049596	5.026559	0.0000

R-squared	0.182736	Mean dependent var	-0.001303
Adjusted R-squared	0.175504	S.D. dependent var	0.022962
S.E. of regression	0.020850	Akaike info criterion	-4.885660
Sum squared resid	0.049125	Schwarz criterion	-4.837922
Log likelihood	282.9254	F-statistic	25.26629
Durbin-Watson stat	1.801032	Prob(F-statistic)	0.000002

Table 4.18.Impact of volatility of growth rate of value added of agriculture, volatility of value added of services, volatility of value added of industry, volatility of value added of Finance and Insurance, Volatility of growth rate of value added of Whole sale and retail on volatility of growth rate of output

Dependent Variable: VOLT_GRY
Method: Least Squares
Date: 04/09/06 Time: 01:20
Sample(adjusted): 1974:2 2002:4
Included observations: 115 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001932	0.001548	-1.247810	0.2148
VOLT_GR_VAG	0.154153	0.033819	4.558217	0.0000
VOLT_GR_VFIN	0.000679	0.000242	2.803969	0.0060
VOLT_GR_VIN	0.131356	0.046420	2.829745	0.0055
VOLT_GR_VSER	0.298972	0.045496	6.571380	0.0000
VOLT_GR_VWH	0.120188	0.045821	2.622998	0.0100

R-squared	0.506775	Mean dependent var	-0.001303
Adjusted R-squared	0.484150	S.D. dependent var	0.022962
S.E. of regression	0.016492	Akaike info criterion	-5.321091
Sum squared resid	0.029647	Schwarz criterion	-5.177877
Log likelihood	311.9627	F-statistic	22.39892
Durbin-Watson stat	1.398850	Prob(F-statistic)	0.000000