Key Factors Affecting GDP in Pakistan Over the period 1975-2011

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Abstract

The main objective of this study was to investigate the impact of key factors like agriculture, industrial, the services sectors output, exchange rate and the trade openness on the economic growth in Pakistan. To fulfill the objective of the study, time series data spreading over the last 37 years (1975-2011) were collected from World Development Indicator (WDI). The empirical analysis started by analyzing the time series property of the data which was followed by checking the stationarity of all dependent and independent variables. The Johansen VAR-based Co-integration approach was applied to examine the sensitivity of real economic growth to changes in the explanatory variables in the long-run. The estimated coefficients of agriculture, services, industrial output, trade openness and the exchange rate positively and significantly affected the real GDP by 0.05, 0.42, 0.35, 0.025, and 0.062 percent respectively. The most significant factor identified, having impact upon the real GDP was the industrial output. It was contributing 0.42 % toward the real GDP.

Key words: Johansen Co-integration, GDP, agriculture, industrial, the services sectors, trade openness

1. Introduction

The gross domestic product (GDP) or gross domestic income (GDI) is one of the measures of national income and output for a given country's economy. GDP can be defined in three ways, all of which are conceptually identical. First, it is equal to the total expenditures for all final goods and services produced within the country in a stipulated period of time (usually a 365-day year). Second, it is equal to the sum of the value added at every stage of production (the intermediate stages) by all the industries within a country, plus taxes less subsidies on products, in the period. Third, it is equal to the sum of the income generated by production in the country in the period—that is, compensation of employees, taxes on production and imports less subsidies, and gross operating surplus (or profits).

The Gross Domestic Product (GDP) in Pakistan was worth 211.09 billion US dollars in 2011, according to a report published by the World Bank. The GDP value of Pakistan is roughly equivalent to 0.34 percent of the world economy. GDP in Pakistan is reported by the World Bank Group. Historically, from 1960 until 2011, Pakistan GDP averaged 48.8 USD Billion reaching an all time high of 211.1 USD Billion in December of 2011 and a record low of 3.7 USD Billion in December of 1960. The gross domestic product (GDP) measures of national income and output for a given country's economy. The gross domestic product (GDP) is equal to the total expenditures for all final goods and services produced within the country in a stipulated period of time.

The agricultural sector was considered as the largest pillar of the economy that accounted for more than 21% of GDP and absorbed 45% of the aggregate labor force of the country. The major components of agricultural sector are major and minor crops, forestry, fisheries and livestock. The agriculture growth significantly declined to 3.2% during 2000s as compare to 5.4% in 1980s, and 4.4% in 1990s due to energy crisis, shortage of the irrigation water, and deficiency of mechanization.

Another important pillar of Pakistan's economy is the industrial sector. There are three key sub-sectors of the industrial sector of the economy like manufacturing sector, mining, quarrying, and energy sectors. The Industrial Sector displayed on average greater growth of 9.7% since 2002-03. The growth performance in 2007-08 declined and the deceleration process of growth that started after 2004 still continued due to internal and worldwide factors like political instability, and poor law and order condition etc.

The services sector has been considered an economic power house for Pakistan. This sector comprises of following sub-sectors; transport, communication, storage, insurance, finance, defense, public administration, possession of dwelling, wholesale and the retail trade, the social, community and private services. Over the previous many years, it grew on average 5.5% in 2000s that was lesser than the average growth of 6.6% in the 1980s. The continuous buoyant tendency of services producing sector (SPS) sustained the commodity producing sector (CPS) and particularly the economy of Pakistan.

Trade openness was considered as an imperative factor of the economic growth. In the beginning, the developing countries followed tight trade policies. By the passage of the time and as a result of globalization integration, all developing countries felt that they should liberalize their economies for the trade. Exchange rate was also counted as a key factor that affected economic growth through influencing the trade balance.

This study was designed to examine empirically the link between GDP and its key determinants like agricultural, industrial, the services, trade openness and exchange rate during 1975-2010. Generally, the real gross domestic product was considered the most comprehensive indicator to measure the economic growth of the country. The economy lost considerable growth momentum during 2007-2010 due to domestic and external hurdles like negative impacts of war on terrorism, international financial crisis, devastating floods, energy crisis and unsatisfied security condition resulting from war on terrorism. In 2004-05, the real GDP of Pakistan grew with 8.4%. Consequently, Pakistan came on the second position in the world growing economies after China.

The paper is organized in five sections. Section 1 presents the introduction of key variables. Section 2 discusses reviews of literature. Section 3 explains the methodology and econometric modeling framework. Section 4 illustrates conclusions and discussions.
Finally, in section 5 appropriate policy interventions to sustain and foster economic growth in Pakistan is suggested.

1.1 Objectives of the study
The principle objectives of the study were as follow:
1. To check the stationarity of all dependent and independent variables given in the model
2. To explore the impact of agriculture, services and the industrial sectors output, trade openness, and exchange rate on the real GDP in the long-run over the period 1975-2011
3. To suggest policy measures to obtain higher and sustainable economic growth.

2. Review of Literature

Williams and Daniel (1991) undertook a regression analysis of the factors affecting economic growth in Barbados over the 1972-1986 periods. They found that gross fixed capital formation, exports and government debt as a proportion of GDP had positive effects on economic growth, while government size (the ratio of government expenditure to GDP) and special interest group activity (i.e., the ratio of government employment to total employment had a negative impact on growth.

Bautista (2003) applied co-integration technique to check the long term association between industrial output and the economic performance of the economy of Mexico. Behuria and Khullar (1994) and Gordon and Gupta (2003) also pointed out that intermediate services by providing supporting services such as transport, communication, insurance and export financing, had facilitated trade activities which enhanced economic growth in this economy. Katircloglu (2002) and Aryeetey (2005) empirically explored a positive association between economic growth and agriculture, services and industry sectors in case of Turkish Republic of Northern Cyprus.

Nasrudin (2004) investigate financial development topics related to economic growth with regional approach and adopting full Levine's model, replace the measured of sample unit from 71 country in the world with provinces in Indonesia. Empirical results show that financial indicator has a positive relationship with economic growth are assets and the total of bank branch office. Credit and third party fund suppose as power of bank intermediation show a negative sign.

Mahmood and Linden (2007) highlighted that shares of the key sectors (industry, service, and agricultural) of the economy had been positively related to economic growth in the long run in case of fifteen Schengen countries. Hussain and Khan (2008) and Jatuporn *et al* (2010) also empirically found the positive long run relationship between GDP growth rate and agriculture growth rate in Pakistan and Thailand respectively by using Johansen Co-integration test. Javed and Farooq (2009) suggested that exchange rate, and exports had positively influenced economic growth in case of Pakistan.

Chebbi (2010) wanted to evaluate the role of agriculture in economic growth with the dealings with other sectors. Johansen's multivariate approach has been used to study the co integration with the other sectors in its country economy and He deeply analyzed how to overcome the problems of spurious regression. He paid the extraordinary attention to investigate non-causality between agriculture and the other economic sector. Result showed that it's all country economic sectors co integrate and have a tendency to move together. Lee (2010) also counted imports and exports as key factors which positively participated into economic growth in case of Pakistan.

3. Data and Econometric Modeling Framework

This section briefly outlines the empirical setup by illustrating data and econometric estimation approaches used in this dissertation.

3.1 Data

Annual time series secondary data from 1975 to 2010 were collected for the variables like gross domestic product agricultural production, industrial production, services, exchange rate, exports, and imports from WDI in constant 2000 U.S. dollars. The exchange rate is an annual average exchange rate based on the monthly averages (rupee relative to the U.S. dollar).

3.2 Functional Form

Following Katircloglu (2002) and Linden (2007), The Log linear regression model was applied to measure the link between the real GDP and agriculture, services, the industrial sectors output, trade openness, and exchange rate and to avoid from the unit measurement problem.

The functional form of the model can be written as follow:

GDP = f (Agriculture, industrial, services, trade openness, and exchange rate)

3.3 Estimation Procedure

VAR based Johansen Co-integration approach can be carried out through following steps:

Step 1;   Application of Unit Root Test

In time series analysis, the unit root test has its own importance to avoid from the unit root problem which results in spurious relationship between dependent and independent variables. The general form of the unit root test is given as follow:

$$\Delta Y_t = \delta Y_{t-1} + \mu_t \tag{1}$$

Where $\delta = \rho - 1$. It is also necessary to select an appropriate estimation technique for estimating the econometric models. For this purpose, the Augmented Dickey Fuller (ADF) unit root test was used. If all the variables of interest found stationary at level, then OLS can also be used. On the contrary, if all variables are non-stationary at level and become stationary at the first difference, then VAR based Johansen Co-integration approach can be applied.

The general form of ADF test with trend and intercept can be written as:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha i \Delta Y_{t-1} + \mu_t \tag{2}$$

A time series is said to be integrated of order zero denoted by I(0) if it is stationary   without differencing it and if it is stationary after taking its first difference, it will be integrated of order one shown by I (1) (Gujrati, 4th edition).

Step 2;   Finding Optimal Lag Length

To achieve appropriate empirical results, the selection of the optimal lag length is an important work. The Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) have been utilized to choose the optimal lag length on the basis of minimum values of these both criterions.

Step 3;   Johansen co-integration test

3.4 Johansson Co-integration

This study utilizes the VAR based Johanson co-integration estimation technique finally developed by Juselius and Johansen (1990), to measure the empirical long term relationship between key factors of the economy like agricultural output, industrial output, services, ER, trade openness, and economic growth in case of Pakistan.

Suppose that X_t is a (n*X_t) vector of variables along with a sample of t. It is assumed that Xt follow I(1) process which highlights the number of the co-integrating vectors. This practice interprets the estimation of the VEC (vector error correction) representation that is given below:

$$\Delta X_t = A_o + \Pi X_{t-1} + \sum_{i=1}^{p-1} Ai\Delta X_{t-i} + \varepsilon_t \qquad (3)$$

In the above equation (3), it is confirmed that the vector ΔX_t and ΔX_{t-1} are the variables which are integrated at

I(1) order. As a result, the long run link among X_t is achieved with the rank of Π such that $\qquad \Pi = \alpha\beta'$

Where, α, β mostly measure the strength of the co-integration association and $\beta' X_t$ is I (0), although Xt are I

(I). In such circumstances, $(A_0, A_1,....., A_{p-1,} \Pi)$ is measured by ML (maximum likelihood) methods, such that 'Π' can be put as in equation (3) (Hjalmarsson and Österholm, 2007). In Johansen co-integration approach, two statistical tests are used for the co-integration among the variables, named by the Maximum Eigen value (λ max) test and the Trace (T_r) test which are shown as follow:

$$T_r = -T \sum_{i=r+1}^{n} \ln(1-\hat{\lambda}) \qquad (4) \qquad\qquad \lambda_{max} = -T \sum_{i=r+1}^{n} \ln(1-\lambda_{r+1}) \quad (5)$$

3.5 Error Correction Model

If the long run relationship among the variables exists, it means that the variables under discussion move together over time and if any instability is occurred, it is corrected from the long run trend. So this study estimated mentioned below error correction model.

$$\Delta GDP_t = \beta_1 + \sum_{I=1}^{n} \beta_2 \Delta GDP_{t-1} + \sum_{I=1}^{n} \beta_3 \Delta AGRI_{t-1} + \sum_{I=1}^{n} \beta_4 \Delta IND_{t-1} + \sum_{I=1}^{n} \beta_5 \Delta SER_{t-1}$$

$$+ \sum_{I=1}^{n} \beta_6 \Delta TOP_{t-1} + \sum_{I=1}^{n} \beta_7 \Delta ER_{t-1} + \alpha ECM_{t-1} + \mu_t \qquad (6)$$

4. Results and Discussions

This part of the study will elaborate empirical links between economic growth and explanatory variables like agriculture, services, the industrial sector, trade openness, and exchange rate during 1975-2010 on the basis of Johnson Co-integration approach. E.View 6.1 was used to conduct the procedure of empirical analysis.

4.1 Results of the Unit Root Test

Firstly, all independent and dependent variables were examined for the unit root over the period 1975-2010 as given below:

Table 4.1 ADF Unit Root Test Results

variables	ADF at Level	Results	ADF at First difference	Results
LnGDP	-1.63	Non-stationary	-4.73*	stationary
LnAGRI	-2.97	Non-stationary	-7.37*	stationary
LnIND	-1.44	Non-stationary	-4.28*	stationary
LnSER	-2.08	Non-stationary	-4.33*	stationary
LnTOP	-2.09	Non-stationary	-6.05*	stationary
LnER	-2.55	Non-stationary	-3.89*	stationary

*identified the significance level at 1 %

ADF unit root test results indicate that all variables are non-stationary at the level, but they are stationary at the first difference. In such situation, we can employ Johanson Co-integration technique.

Table 4.2 Co- integrating Relations

Hypothesized No. of CE(s)	Max-Eigen Statistic	Critical Value [Eigen] at 5%	Trace Statistic	Critical Value [Trace] at 1%
None *	65.23366	40.07757	161.8761	95.75366
At most 1 *	43.56883	33.87687	96.64245	69.81889

* denotes rejection of the null hypothesis at the 0.05 level

Finally, findings of the both maximum eigen value and trace tests highlighted two co-integrating vectors at 5% level of significance.

4.2 Empirical Long Run Relationship between Economic Growth and Explanatory Variables

The results regarding long term relationship between dependent and independent variables were presented as follow:

Table 4.3 Estimated Co-Integrated Vector in Johansen Estimation

Variables	Coefficients	T-statistics
LnAGRI	0.05	1.71
LnIND	0.42	5.35
LnSER	0.35	4.22
LnTOP	0.025	1.72
LnER	0.062	3.21

$$L\hat{n}GDP_t = 2.90 + 0.05 LnAGRI_t + 0.42 LnIND_t + 0.35 LnSER_t$$
$$+ 0.025 LnTOP_t + 0.062 LnER_t$$

Table 4.3 explored the empirical results of Johansen co-integration. It is concluded that there had been co-integration between the explanatory variables i.e. agricultural output, services sector, industrial output, trade openness, and exchange rate and economic growth over the period 1975-2010.

Statistically, the estimated significant coefficient of agricultural output exhibited that on average 0.05 percent rise in economic growth had been resulted from 1% increase in agriculture production due to favorable weather for the crops, availability of the best quality seeds and pesticides, and improvement in the irrigation system. This outcome was also favored by Linden (2007), Jatuporn *et al* (2010), and Katircloglu (2002).

The estimated coefficient of the industrial output was 0.42 which exerted that one percent increase of the industrial output led to the 0.42 % rise in the real GDP as a result of powerful domestic demand, worldwide economic expansion, and increasing FDI in the mining sector. Bautista (2003) also agreed with these findings.

The estimated coefficient of the services sector displayed that 1% rise in the services led to the 0.35 % increase in the real GDP because of growing security needs, expansion of agriculture and industrial sectors and financial development in the country. The same result was derived by Gordon and Gupta (2003) and Behuria and Khullar (1994).

The empirical findings also revealed that 0.025% upturn in the real GDP had been due to 1% increase in the trade openness because of growing export volume resulting from competiveness in the world market and higher tariff

and non-tariff barriers on imports. This outcome was also favored by Atif *at al* (2010) and Lee (2010) but it was opposed by Siddique *at al* (2005).

The estimated coefficient of exchange rate disclosed that one percent increase in the annual average exchange rate brought about 0.062 % rise in the real GDP in the long run because currency depreciation caused a positive contribution of the net exports into real GDP. This outcome was also supported by Javed and Farooq (2009).

The stochastic error correction term expressed the speed of the adjustment towards the long period equilibrium. Its value was 1.01. Its negative sign described the convergence towards the long period equilibrium and explained that 101% adjustment would take place in each period to the long period equilibrium. Moreover, the error correction term was observed significant at 1% significance level.

5. Conclusions and Suggestions

Keeping in view the significance of the key factors of economic growth of Pakistan, this study analyzed the impact of these factors on the economic growth over the period 1975-2010 by employing Johanson Co-integration approach.

Among the all independent variables, the estimated coefficients of agricultural output, and trade openness were observed positive, but small. Consequently, it was stated that they witnessed a small contribution into the economic growth as compare to other three key factors because of energy crisis, shortage of the irrigation water, deficiency of mechanization, and because of being less competiveness in the world market.

Although, the persistent energy crisis in the economy deteriorated utilization capacity of textile industry, the industrial sector displayed a positive and satisfactory contribution into the real GDP. The share of the tertiary sector into the real GDP was also remained reasonable.

5.1 Suggestions

Government should ensure the supply of key inputs like seeds, fertilizers, tractors and latest machines at lower prices and improve them with the latest technologies to increase agricultural share into GDP.

In the industrial department, it is imperative to overcome the energy crisis, dissatisfied security situation and the political instability to promote industrial sector's output.

It is also essential to develop the insurance, finance, communication, transportation private and social services and to reduce uncertainty, to raise business activities, and to improve the well-being of the people.

The government should eradicate tariff and non-tariff trade barriers to enhance the economic growth by improving the efficiency and the indigenous technology.

The government should adopt such suitable exchange rate policy for adjusting real exchange rate that is more useful to accelerate output capacity and the economic growth

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