10. FISCAL THEORY OF PRICE LEVEL: A PANEL DATA ANALYSIS FOR SELECTED SAARC COUNTRIES

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Abstract

This paper examines the validity of fiscal theory of price level in the five selected SAARC countries, namely Bhutan, India, Nepal, Pakistan and Sri Lanka by using panel data analysis for the period 1990-2009. Specification tests, i.e. F-test and Hausman test indicate that the fixed effect model can be considered as the best model to examine the relationship between budget deficit and price level. Empirical findings also show that budget deficit is significant and negatively related with the price level in pooled least square, while fixed and random effect model explain that the budget deficit has no role in explaining the given scenario. The GDP per capita is positively and highly significant in all of the models, while openness is explaining its role in reducing the price level in the specified set of countries. The additional robustness tests are also performed to test the validity of results of the model. After removing the variable, i.e. GDP_{PC} from the fixed effect model, the budget deficit (BD) significantly impacts on the SAARC price level. Our findings substantiate that fiscal theory of price level is not valid in the selected SAARC countries. This study opens new dimensions for policy planners, government agencies, NGO's and other donor agencies working in the SAARC region.

Keywords: budget deficit, price level, trade openness, gross domestic product per capita, panel data, SAARC countries

JEL Classification: E31, E62, H62

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1. Introduction

Emerging economies are growing unhurriedly and in the position of below the trend growth rates. Most of the South Asian countries are facing high inflation due to demand pull factors which induces to balance of payments pressure, fiscal imbalances and reduction in Forex reserves. Except Bangladesh and Nepal, all the South Asian economies were in the trouble of double digit inflation in 2008; especially this quandary was rigorous in Afghanistan, and Sri Lanka (ADB, 2008). Currently, the economy of Pakistan is also in the stage of stagflation (unemployment with inflation). All these countries faced the sudden shock in their growth rate that was 7.1% in 2008, down from 8.6% and 9% in 2007 and 2005, respectively (SHRDC, 2008).

The worse condition of fiscal deficit as a share of gross domestic product (GDP) in the region was estimated to be around 8.0 percent in 2008, from 5.2 percent in 2007, mainly due to the massive bill of subsidies. Food exports have been controlled and India has prohibited the export of wheat since September 2007 along with the imposition of export tax on basmati rice (World Economic Outlook, 2008). Bangladesh also stopped its food exports in May 2008. Central banks of different countries have called to contractionary monetary policy where Indian, Pakistan and Sri Lanka raised up their policy rates and yield on government securities, respectively, but currency pegs countries, namely Bhutan, Maldives, and Nepal could not adjust their monetary policy to handle the inflationary pressure (SHRDC, 2008).

The mentioned study develops the linkages between budget deficit (excess of government outlays over revenue) and price level. The expansionary fiscal policy that arises from increase in government expenditure causes increase in aggregate demand and pulls the inflation up. Both the classical and Keynesian schools of thought agree on this framework. But the controversy arises in case of cut in taxes. The classical school is consistent with Ricardian equivalence, where budget deficit that arises due to cut in taxes neither affect aggregate demand nor lead to inflation, while Keynesian is in favor of non-Ricardian regime, where tax cut increases the aggregate demand and results in inflation.

The budget deficit either from cut in taxes or increase in expenditure leads to temporary burst of inflation, but not a prolonged increase in inflation. However, the persistent increase in aggregate demand leads to continuous rise in money supply and prices. If the government is unable to finance its deficit through taxes or borrowing from public, it finances its budget through printing of money that may directly call to inflation.

2. Literature Review

There is an abundant literature on both theoretical and empirical sides of the fiscal theory of price level. Firstly, Sargent and Wallace (1981) contribute by explaining the behavior of government inter-temporal budget constraint that may affect monetary policy conditions and, especially, the price dynamics. After this study, a large corpus of literature exists based on that issue. Chhibber *et al.,* 1989) conclude that attempts to control inflation completely may create unwarranted recession in the economy.

They also suggest that the government should adopt such policy measure that minimizes the disinflationary effects of the policy. Bencivenga and Smith (1992) evaluate that with optimal reserve requirement, reductions in government spending lead to the liberalization of banking system. Chaudhary and Anjum (1996) put in by analyzing the sustainability of fiscal policy based on different domestic and foreign debt strategies and reveal that fiscal deficit is not sustainable in case of Pakistan and its negative impact leads to higher inflation, low economic growth and destabilize other important macroeconomic variable.

Vieira (2000) uses different econometric approaches, such as VECM, VAR causality analysis and ordinary least square (OLS) regression method and finds out that fiscal deficits do not contribute to inflation in six major European countries. Catao and Terrones (2001) advocate for 23 emerging market countries that 1 percentage point reduction in the ratio of fiscal deficit to gross domestic product (GDP) typically lowers long run inflation by 1.5 to 6 percentage points, depending on the size of the inflation tax base. Akay *et al.,* 2001) initiate for time series data that public sector borrowing requirements have long run effect on inflation whereas consolidated budget deficits do not have permanent effect.

Solomon and Wet (2004) estimate VAR model and reveal that there is stable long-run relationship between the budget deficit, gross domestic product and inflation in Tanzanian economy. Rother (2004) empirically examine by using Generalized Least Square (GLS) method 15 OECD countries. The author finds that one standard deviation increase in discretionary fiscal policy increases inflation volatility by 10%. Favero and Giavazzi (2004) theoretically analyze that in case of Brazil the presence of default risk premium reinforces the possibility of vicious circle that make fiscal constraint more rigorous.

Kim (2004) develops a theoretical endowment economy model and show that under the presence of money demand shocks and endowment shocks there is inverse relation between inflation volatility and steady state real value of (nominal) government debt that contradict the conventional result. While, positive aggregate demand shock increase the current inflation rate and endowment shock alters both the goods market and money market equilibrium. Alavirad and Athawale (2005) empirically scrutinize the case of Islamic Republic of Iran by using autoregressive distributive lag (ARDL) and error-correction model (ECM) and confirm that government budget deficit has a positive effect on prices in long run but this effect is less severe in short run.

Agha and Khan (2006) analyze the Pakistan economy and show that 1 billion rupees increase in total bank borrowing by government results in increase in prices by 0.0048 percentage points and an expansion of one billion Rupees in fiscal deficit increases prices by 0.0215 percentage points. Piergallini (2006) predicts based on theoretical model that fiscal variables crucially affect price dynamics and the price stability cannot be achieved without appropriate fiscal policy. Giannitsarou and Scott (2006) suggest that widely anticipated increase in fiscal deficits, due to demographic factors are not necessarily predictors of higher inflation. Haider and Khan (2007) use the monthly data for Pakistan and empirically suggest that there is a strong correlation between the volatility in government borrowing and domestic inflation in short run while its

significance does not change in long-run. Their findings also illustrate that change in government borrowing tends to increase in domestic inflation by 8.5 percent.

Duate and Woman (2007) provide an exhaustive theoretical study and suggest that in flexible price system, fiscal authority decrease the labour tax income and minimize the inflation differential while the role of productivity shocks and expenditure shocks don't contradict with the given results. Ersel and Ozatay (2007) indicate that coordination of fiscal and monetary policies is essential for obtaining inflation targeting and desired results. Bassetto (2008) suggest that fiscal policy and government debt determine the price level while monetary policy play at bests an indirect role.

Kerun and Ozmen (2008) empirically evaluate that there is a shift of government debt financing from central bank monetization to commercial bank that does not support to the hypothesis of fiscal theory of price level. Fan and Minford (2009) investigate empirically the fiscal theory of price level for UK inflation in 1970 and their results indicate that active fiscal policy and passive monetary policy with non-Ricardian regime suggest a period of inflation in both the model. Javid *et al*., 2009) empirically evaluate the phenomena for the regime of 1970-2007. Their findings for Pakistan confirm that level of debt and nominal income fall in case of the surplus in nominal GDP and it is contrary to the non-Ricardian regime. Lucotte (2009) empirically concludes for a large set of developing countries that fiscal deficit and inflation remain stable at low level due to the improvement in the degree of central bank's independence.

Abdullah *et al.,* 2007) investigate the long-run relationship between fiscal policy and economic growth in Asia between 1982 and 2001 through the application of Pedroni's cointegration approach. The result shows that there is a positive and statistically significant impact of health and education expenditure, aggregate of government expenditure, and aggregate of other fiscal variables on real per capita GDP. It was also found that the defense expenditure, distorting taxation, and budget balance are significantly and negatively related to real per capita GDP. Asghar *et al.,* 2011) examine the link between inflation and inflation uncertainty in SAARC region countries (Pakistan, India and Sri Lanka) over the period 1980Q1-2009Q4. The results demonstrate that positive shocks to inflation create more uncertainty in Pakistan, India and Sri Lanka. The results of Granger- causality test proved the existence of bi-directional causality between inflation and inflation uncertainty in SAARC region countries.

Khan (2011) examines cyclicality in fiscal and monetary policies including capital flows in 28 Asian countries and explains the cyclicality of fiscal policy by considering the effects of corruption and democracy. The result shows that fiscal policy and capital flows are mostly pro-cyclical in lower income countries and a-cyclical in higher income countries. Second, monetary policy is mostly a-cyclical (or slightly pro-cyclical) in lower income countries and counter-cyclical in higher income countries. Third, emerging East Asian countries show more pro-cyclical fiscal policy than South Asian and Middle Eastern countries. Fourth, there is a positive correlation between corruption and pro-cyclicality of fiscal policy. Forhad (2012) examines the feasibility to form a common currency area in the South Asian Association for Regional Cooperation (SAARC) countries with the aid of Structural Vector Autoregressive

(SVAR) model to test the symmetry of five types of shocks i.e., external global and regional; domestic supply, interest rate and exchange rate shocks over a period of 1980-2010. The results show asymmetric correlations among domestic shocks. Further, lower factor mobility, lower degree of intraregional trade, and lack of political integration suggest that the SAARC countries are not yet ready to introduce a common currency.

The above mentioned discussion suggests inconclusive results about the fiscal theory of price level in the specific context of countries or region that requires conducting further research for the specified region. This paper bridges the gap in the literature by using the panel data technique for SAARC region.

The objective of this paper is to find out that existence of fiscal theory of price level in the selected SAARC countries by using panel data analysis under the period from 1990 to 2009. The more specific objectives are to estimate whether budget deficit and price level is apparently influenced by country specific effects / shocks, time specific shocks or both?

The paper is organized as follows: the analytical framework and methodology along with data source is explained in Section 3, the estimation and interpretation of results is mentioned in Section 4, while section 5 concludes.

3. Analytical Framework, Methodology and Data Description

This section analyzes the theoretical framework and analytical model for empirical investigation along with data description. We employ and theoretically incorporate the work of Kim (2004) and empirically investigate the fiscal theory of price level for selected SAARC region. The representative individual maximizes his utility from real money balances and consumption with exogenous income subject to inter-temporal budget constraint. Income consists of endowments (Y_t) and gross interest income receipts from one-period nominal government bond holdings $(R_{t-1}\ B_{t-1}/P_t$, where one-period nominal government bond holding is B_{t-1}, P_t and R_{t-1} are the price level and gross interest rate of the bonds, respectively). He allocates his income to consumption (C_t), changes in money holdings $[(M_t - M_{t-1})/P_t]$ and nominal government bond holdings after paying a net lump-sum tax to the government (τ_t). Each individual chooses $C_t, M_t,$ and B_t with given $P_t, Y_t, V_t, \tau_t, K_t$ and R_t.

$$\max_{\{C_t, M_t\ B_t\}} E_o \left[\sum_{t=o}^{\infty} \beta^t\ K_t \left(\log C_t\ +\ V_t\ \log \frac{M_t}{P_t} \right) \right]\ s.t.$$

$$C_t + \frac{M_t - M_{t-1}}{P_t} + \frac{B_t - R_{t-1} B_{t-1}}{P_t} + \tau_t = Y_t \qquad (1)$$

where: $M_t \geq 0,\ B_t \geq 0,$ and $Y_t, V_t,$ and K_t are independent identical distribution processes.

First-order conditions of the consumer optimization problem are:

$$\frac{V_t\ C_t\ P_t}{M_t} = 1 - R_t^{-1} \tag{2}$$

$$R_t^{-1} = \beta\ E_t\left[\frac{C_t\ P_t\ K_{t+1}}{C_{t+1}\ P_{t+1}\ K_t}\right]. \tag{3}$$

Equations (2, 3) are the money demand relation and an inter-temporal version of the aggregate demand relation, respectively. Therefore, we can interpret V_t as money demand shocks and K_t as an aggregate demand shock. The positive shock in aggregate demand K_t increases the demand for current consumption in the economy.

The government should satisfy the budget constraint.

$$\frac{M_t - M_{t-1}}{P_t} + \frac{B_t - R_{t-1}\ B_{t-1}}{P_t} + \tau_t = 0 \tag{4}$$

It issues debt (or bonds) and collects lump-sum taxes. The social resource constraint that follows the government budget and household budget constraint pattern is $Y_t = C_t$.

Suppose that monetary and fiscal policy rules satisfy and the fiscal theory of the price level is valid. The monetary authority fixes the interest rate:

$$R_t = \rho \tag{5}$$

The fiscal authority also fixes the net tax level:

$$\tau_t = \gamma_0 \tag{6}$$

Now, we describe the system in terms of real variables (classical framework) such as inflation rate $\pi_t = P_t / P_{t-1}$, real balances $m_t = M_t / P_t$, and real value of the government bonds $b_t = B_t / P_t$, instead of (following Keynesian pattern) in nominal term. Log-linear version of the model around the steady state with zero output growth and the reduced form of the system of equations is,

$$E_t\,\hat{\pi}_{t+1} = \hat{Y}_t - \hat{K}_{t-1} \tag{7}$$

$$\hat{b}_t + \left(\frac{1}{\beta} + \frac{m}{b\,\pi}\right)\hat{\pi}_t = \frac{1}{\beta}\,\hat{b}_{t-1} - \frac{m}{b}\left(\hat{Y}_t + \hat{V}_t\right) + \frac{m}{b\,\pi}\left(\hat{Y}_{t-1} + \hat{V}_{t-1}\right) \tag{8}$$

where: each variable without subscript is the steady state value and each variable with hat and subscript is the percentage deviation from the steady state value.

By following Sims (1995) to solve the equation, the solution for inflation is:

$$\hat{\pi}_t = -\left(\frac{m\,(\pi - \beta)}{m + b\,R}\right)\hat{V}_t - \left(\beta + \frac{m\,(\pi - \beta)}{m + b\,R}\right)\hat{Y}_t + \hat{Y}_{t-1} + \beta\,\hat{K}_t - \hat{K}_{t-1}. \tag{9}$$

Positive money demand shock $\hat{V}_t$, that follows the monetary authority rules of

[equation (5)] increases the money holdings and seignorage in the economy. The monetary authority also chases the rules of fiscal authority [equation (6)] and satisfies the government budget constraint. It also offsets the increase in seignorage by negative inflation tax. Therefore, the current inflation rate decreases.

The size of the inflation rate decrease to a unit shock $\left[\frac{m(\pi-\beta)}{m+bR}\right]$ depends on the steady-state real balance (m) and the steady state real value of total nominal government liabilities [money and gross interest payment of bonds, $(m+bR)$]. It determines the steady-state real money balances of initial increase in seignorage but the steady state real value of total government nominal liabilities determines the amount of inflation tax that it collects by the decrease in inflation.

The presence of money demand shock shows that inflation volatility is negatively related with the steady-state real value of government debt (b). While, the steady state value of government debt is positively related with the inflation tax base.

A positive aggregate demand shock $(\hat{K}_t)$ increases the current inflation rate. The monetary authority offset it by negative inflation tax. Therefore, there is a deflation in next period as $(\hat{K}_{t-1})$ is negatively related with the inflation rate $(\hat{\pi}_t)$. Endowment shock $(\hat{Y}_t)$ as the equilibrium in goods market and money market depend on the effects of a negative aggregate demand and a positive money demand shocks. Therefore, in the presence of endowment shocks, the inflation volatility is also lower when the steady-state real value of government debt is smaller.

3.1. Model Specification

By specifying the model presented in Kim (2004), theoretical contribution is to incorporate and rationalize different variables in it. In addition to that, different variables are specified in order to support both the model formulation as represented by equation (9) and theoretical link of the model with the econometric analysis mentioned by equation (15). The expansionary shock from government side such as increase in government expenditure or cut in taxes may stimulate the budget deficit $(G-T)$ in the economy. The excess of outlays over revenues may compel the government to borrow from the public or central bank. The government issues bonds to the public for money and finances its budget deficit. The increase in bond holdings by the public increases the parameter (b) from the denominator of equation (9). The monetary authority rule satisfies [equation (5)] the fix interest rate (R) that increase the nominal amount from the denominator due to increase in (bR) but the overall amount (the right hand term) such as $\left[\frac{m(\pi-\beta)}{m+bR}\right]$ decreases in the economy by the mathematical rule. Hence, that term is negatively related with the inflation rate $(\hat{\pi}_t)$ (where, hat denotes the percentage deviation from the steady state value) in the presence of negative sign in current period.

We also utilize and extend the work of Abel & Bernanke (2002). The relation between government debt and budget deficit is as

$$\Delta B = \text{Nominal government budget deficit} \quad (10)$$

where: ΔB is the change in nominal value of government bond.

It is assumed that equation (10) satisfies and government issues debt (stock variable different from budget deficit) to borrow from the public. It may decrease the inflation in the economy. But the money holding by the public is offset by the increase in money holding by the government (not by central bank) that may use it to finance its budget deficit. The public may again attain the government benefit (such as increase in government expenditure or social security allowances) that generate the expansionary shock in the economy i.e. aggregate demand shock $(\hat{K}_t)$ (where hat denotes, percentage deviation from the steady state value) from equation (9) that is positively related with the inflation $\hat{\pi}_t$ in the current period. This expansionary effect of inflation may dominate the contractionary effect of inflation that is from public side. So, the economy enjoy with the high debt and high inflation. The result is also consistent with the theoretical literature.

The increase in primary deficit (outlays over revenue that exclude the interest payment) may increase the debt in the economy. If the government is unable to finance its deficit by issuing bonds to the public or directly borrowing from the public, it may depend on central bank and force it to buy the government bonds and print the money for the same amount. It works in two ways; first, government increases the bond issue that also increases the debt in the economy. Second, central bank increases the amount of new currency (seignorage) in the economy that is reflected by this equation:

$$deficit = \Delta B = \Delta B^{P} + \Delta B^{Cb} \quad (11)$$

where: change in bond holding by central bank (ΔB^{Cb}) equal to the change in monetary base $(\Delta Base)$ and assume that government does not issue bonds to the public $\left[\Delta B^{P} = 0\right]$.

Thus, the equation (11) becomes,

$$deficit = \Delta B = \Delta Base \quad (12)$$

And change in monetary base $(\Delta Base)$ equal to change in money supply (ΔM) in the economy, so $\Delta Base = \Delta M$. Now, the equation (12) is,

$$deficit = \Delta B = \Delta M \quad (13)$$

where high level of deficit is consistent with the growth in money supply (ΔM) and its increment may increase the money demand in the economy (M^{d}) in LM framework due to the fix interest rate from equation (5).

The positive money demand shock $\hat{V}_t$ in the economy may increase the seignorage. But monetary authority also works when the net tax level is constant according to the fiscal authority rule [equation (6)] that offset this positive shock with negative inflation tax. Hence, inflation decreases in the economy. The result also supports to the theoretical literature.

The increase in money supply by the central bank is the same as positive aggregate demand shock $\hat{K}_t$ in the economy. Equation (9) satisfies that positive aggregate demand shock and inflation increases in the economy at current period but decreases in the next period due to negative inflation tax today. That is why, $\hat{K}_{t-1}$ is negatively related with the inflation in next period.

Endowment shock $(\hat{Y}_t)$ is the sum of money demand shock and aggregate demand shock. It is also identical independent distribution process and captures both the shocks in the economy. Theoretically, the growth rate in nominal gross domestic product (GDP) at a given period (When the price level is constant or base year) is equal to the growth rate of real gross domestic product (GDP). As

$$\frac{\Delta Q}{Q} = -\frac{\Delta (PY)}{PY} = -\frac{\Delta Y}{Y} \tag{14}$$

where: $\frac{\Delta Q}{Q}$ is the growth rate of government debt, $\frac{\Delta (PY)}{PY}$ is the growth rate of nominal GDP and $\frac{\Delta Y}{Y}$ is the growth rate of real GDP.

The equation shows that increase in growth rate of real gross domestic product is the same as decrease in growth in government debt. Its reduction may decrease the budget deficit (ΔB) in equation (10) and government decreases the outstanding bond issues that decrease the denominator term $(m + bR)$ in 2nd term of equation (9) while, its overall amount increases that decrease the inflation in the economy. This process also satisfies to the endowment shock $(\hat{Y}_t)$ that decrease the inflation in the economy from equation (9). But in the next period it may increase the inflation as $(\hat{Y}_{t-1})$ is positively related with the inflation $(\hat{\pi}_t)$.

The negative aggregate demand shock $(-\hat{K}_t)$ due to decrease in government debt or decrease in bond issue to central bank (reduction in money supply) decrease the inflation (due to increase in money supply with the fixed interest rate rule of equation (5) in the economy but negative money demand shock $(-\hat{V}_t)$ increases the inflation in investment saving- liquidity money (IS-LM) framework. Now, the endowment shock $(\hat{Y}_t)$ that is the sum of negative aggregate demand shock $(-\hat{K}_t)$ {decrease in inflation $\hat{\pi}_t$} and positive money demand shock $(\hat{V}_t)$ {negative inflation $(-\pi_t)$}

decrease the inflation in current period but this positive shock is negatively related with the $(\hat{\pi}_t)$ in the future period $(\hat{Y}_{t-1})$. As, the current shock in the economy is consistent with the higher growth in inflation $(\hat{\pi}_t)$ in future period.

We also employ another important economic variable, "Trade Openness" (ratio of import plus export to gross domestic product) in our study for empirical investigation. Its increment may improve the trade balance in the economy. Such positive shocks in export or negative shocks in import may pull the inflation up. This positive shock in trade balance pilot to the positive aggregate demand shock $(\hat{K}_t)$. Hence, inflation $(\hat{\pi}_t)$ increases in the economy as shown in equation (9). The current period is consistent with inflation but in the next period this shock is offset by the decrease in export or increase in import through the international policies or government intervention. Hence, aggregate demand shock $(\hat{K}_{t-1})$ is negatively related with the inflation $(\hat{\pi}_t)$ in future period.

The improvement in trade openness cause to increase in the income level of the economy but the monetary authority also work and decrease the money demand in the economy in IS-LM framework in order to follow its rule of equation (5). The economy enjoys the positive money demand shock $(\hat{V}_t)$ that decrease the inflation $(\hat{\pi}_t)$ in the economy. The given framework also satisfies to the equation (9) and simple theoretical IS-LM framework. The positive aggregate demand shock $(\hat{K}_t)$ due to the well off international market causes to improve the income level of the country. The positive aggregate demand shock $(\hat{K}_t)$ emerges in the economy. Hence, the endowment shock $(\hat{Y}_t)$ that capture both positive aggregate demand shock $(\hat{K}_t)$ (consistent with the inflation in current period $(\hat{\pi}_t)$) and positive money demand shock $(\hat{V}_t)$ (consistent negative inflation $(-\hat{\pi}_t)$ in current period) due to monetary authority rule of fixed interest rate in Eq. 5 decreases the inflationary expectation in current period. Hence, $(\hat{Y}_t)$ is negatively related with inflation $(\hat{\pi}_t)$ in the current period.

3.2. Data Source and Variable Description

The data set for selected SAARC countries during 1990 to 2009 is collected from International Financial Statistics (IFS, 2009), World Bank (WB, 2009), SAARC Human Resource Development Centre (SHRDC, 2008) and Asian Development Bank (ADB, 2009). A panel least square (LS) technique is used for empirical analysis. The fixed effect model (FEM) and random effect model (REM) are also used to find out the country specific and time specific effects, respectively.

There is need to explain the concise description of different variables used in underline study. Our dependant variable, Consumer Price Index (CPI) is measured as the current cost of the basket of consumer items divided by the cost of the same basket of items in the (some) base year. Budget deficit is our main explanatory

variable and measured as the difference between government expenditure and tax revenues. The excess of government outlays over tax revenue leads to budget deficit.

Gross domestic product per capita is obtained as gross domestic product (GDP) divided by midyear population. Where, GDP is measured by the value of output domestically produced. Another economic variable is trade openness; it takes actual trade flows and captures trade policy indirectly. It is defined as the percentage point in the openness indicator where openness is measured by the ratio of export plus import to GDP.

3.3. Econometric Methodology

3.3.1. Panel Econometric Model

In empirical and theoretical sides, there are several studies that explain the relationship between budget deficit and price level in the context of SAARC region. In this paper, we minimize that gap and employ following three separate methods: Pooled Least Squares (Common Constant Method), Fixed Effect [(i.e., the Least Squares Dummy Variables (LSDV)] and Random Effect Model are used to test the validity of fiscal theory of price level in selected SAARC countries during 1990-2009.

The common constant method (Pooled LS method) of estimation present results under the principal statement that there is no difference among the data matrices of the cross-sectional dimension (N). In other words, the hypothesis is useful that the data set is a priori homogenous. However, this case is quite restrictive; that's why, we include the fixed and random effects in the method of estimation (see, Asteriou and Stephen, 2007).

The theoretical inclusion of all variables that are defined above may help out to make the general econometric representation of the equation is as follows:

$$\ln(CPI)_{it} = \beta_0 + \beta_{1t}\ln(G-T)_{it} + \beta_{2t}\ln(GDP_{PC})_{it} + \beta_{3t}\ln(OPEN)_{it} + \varepsilon_{it} \qquad (15)$$

where:

CPI = Consumer price index (2005 = 100); G = Government Expenditure in current local currency unit (LCU); T = Tax Revenues in current local currency unit (LCU); GDP_{PC} = Gross Domestic Product Per-capita in current local currency unit (LCU); $OPEN$ = Trade Openness $\left(X+M/GDP\right)$ in current local currency unit (LCU), β_0 = intercept; β_1 = coefficient of budget deficit; β_2 = coefficient of per capita growth, β_3 = coefficient of trade openness; t = 1, 2….20 periods; i = 1, 2….5 countries; ε_{it} = error term.

In the fixed effects method the constant is treated as group specific. This means that the model allows for different constants for each group. The fixed effects estimator is also known as the least-squares dummy variables (LSDV) estimator because in order to allow for different constants for each group, it includes a dummy variable for each group.

To incorporate country specific effects, a fixed effects model could take a form:

$$\ln(CPI)_{it} = \alpha_{it} + \beta_1\ln(G-T)_{it} + \beta_2\ln(GDP_{PC})_{it} + \beta_3\ln(OPEN) + u_{it} \qquad (17)$$

where: α_i is a country effects that also depends on time.

An alternative method of estimation is the random effects model. The difference between the fixed effects and the random effects method is that the latter handles the constants for each section not as fixed but as random parameters. Hence, the variability of the constant for each section comes from the fact that:

$$a_i = a + v_i \tag{18}$$

where: v_i is standard random variable with a zero mean and constant variance.

The random effects model therefore takes the following form:

$$Y_{it} = (a + v_i) + \beta_1 X_{1it} + \beta_2 X_{2it} + ... + \beta_k X_{kit} + u_{it}$$

$$Y_{it} = a + \beta_1 X_{it} + \beta_2 X_{2it} + ... + \beta_k X_{kit} + (v_i + u_{it}) \tag{19}$$

The random effects model has two advantages: it has fewer parameters to estimate compared to the fixed effects method and allows for additional explanatory variables that have equal value for all observations within a group (i.e., it allows using dummies).

To incorporate both countries and time effects, random effect model take the form:

$$\ln(CPI)_{it} = \alpha_0 + \alpha_i + \theta_t + \beta_1 \ln(G-T)_{it} + \beta_2 \ln(GDP_{PC})_{it} + \beta_3 \ln(OPEN)_{it} + u_{it} \tag{20}$$

The random effect model with only countries effects can also be written as:

$$\ln(CPI)_{it} = \alpha + n_i + \beta_1 \ln(G-T)_{it} + \beta_2 \ln(GDP_{PC})_{it} + \beta_3 \ln(OPEN)_{it} + u_{it} \tag{21}$$

where: n_i is a group specific random element.

3.3.2. F-Test for Model Specification (Pooled LS vs. Fixed Effects)

Before assessing the validity of the fixed effects method, we need to apply tests to check whether fixed effects i.e., different constants for each group, should indeed be included against the simple common constant least square (LS) method. The null hypothesis is that all the constants are the same (homogenous) and therefore the common constant method is applicable:

$$H_0 : a_1 = a_2 = ...a_N \tag{22}$$

Rejection or acceptance of the null hypothesis depend on the value of F-statistic i.e. if F-statistical is bigger than the F-critical then we reject the null hypothesis.

F-test for Pooled least square (LS) vs. Random Effects Model (REM) and for Fixed Effects Model (REM) vs. Random Effects Model (REM) is explained in Appendix.

3.3.4 Hausman Test for Model Specification (Fixed Effects vs. Random Effects)

The Hausman test is formulated to assist the choice between the fixed effects and random effects approaches. Hausman (1978) adapted a test based on the idea that under the hypothesis of no correlation, both ordinary least square (OLS) and generalized least square (GLS) are consistent but OLS is inefficient, while under the alternative OLS is consistent but GLS is not. More specifically, Hausman assume that there are two estimators $\hat{\beta}_0$ and $\hat{\beta}_1$ of the parameter vector β and he adds two hypothesis-testing procedures. Under null hypothesis, both estimators are consistent

but $\hat{\beta}_0$ is inefficient, and under alternative hypothesis, $\hat{\beta}_0$ is consistent and efficient, but $\hat{\beta}_1$ is inconsistent.

For the panel data, the appropriate choice between the fixed effects and the random effects methods examine whether the regressors correlate with the individual effect. The advantage of the use of the fixed effects estimator is that it is consistent even when the estimators are correlated with the individual effects. The Hausman test uses the following test statistic:

$$H = (\hat{\beta}^{FE} - \hat{\beta}^{RE})'[Var(\hat{\beta}^{FE}) - Var(\hat{\beta}^{RE})]^{-1}(\hat{\beta}^{FE} - \hat{\beta}^{RE}).....x^{2(k)} \quad (23)$$

If the value of the statistic is small and the difference between the estimates is insignificant. So, we reject the null hypothesis that the random effects model is consistent and we use the fixed effects estimators. In contrast, large value of the Hausman statistics implies that the random effects are more appropriate.

4. Empirical Results and Discussion

The results are shown in Table 1; appear to be very good in terms of the usual diagnostic statistics. The value of adjusted R-square for pooled least square (LS) indicates that 55.0% variation in dependent variable has been explained by variations in independent variables. F-stat value is higher than its critical value suggesting an overall good significance of the estimated model. Therefore, fitness of the model is acceptable empirically. Fixed effects model captures all effects which are specific to particular individual countries and do not vary over time. Adjusted R-square has quite high value showing strong relationship between the variables. Incorporating for country effects causes R-square to increase to 98.4%. Random effect model captures both country and time effects. Incorporating for both country effects and time effects leads to R-square up to 87.8%.

Table 1

Pooled Least Square, Fixed Effect and Random Effect of Selected SAARC Countries:

Dependent Variable:	$ln(CPI)_{it}$		
Variables	Pooled OLS	Fixed Effect	Random Effect
C	0.020 (0.045)	-0.627 (-0.908)	-2.200* (-6.162)
$ln(BD)_{it}$	-0.073* (-2.824)	-0.005 (-0.261)	0.0005 (0.025)
$ln(GDP_{PC})_{it}$	0.553* (9.206)	0.483* (6.298)	0.619* (18.533)
$ln(OPEN)_{it}$	-0.601* (-4.639)	-0.157* (-4.404)	-0.202* (-2.975)
Diagnostic Tests			
R-squared	0.564	0.984	0.878
Adjusted R-squared	0.550	0.979	0.874

Dependent Variable:	$ln(CPI)_{it}$		
F-statistic	41.396*	182.895*	231.810*
Prob.(F-statistic)	0.000	0.000	0.000

*Note: Parenthesis show t-values, * shows 0.01 level of significance.*

The regression results of our estimated equation (15) for Pooled least square (LS) are shown in Table 1. The equation which incorporates all explanatory variables explain that all variables are statistically significant and have expected signs except our main explanatory variable i.e., budget deficit does not bear a sign according to the theoretical expectations. It is due to the size of a country or power of central bank in running its monetary system. Since, the relation of budget deficit with price level is positive in Random effect model (REF) but it is insignificance for the selected SAARC countries. Gross domestic product per capita is main source to explain the high price level in the specified set of countries. More income to each individual may compel them to increase their purchasing power with the given supply that leads to the high demand and high prices. Trade openness is another source to reduce the price level in the selected SAARC countries. This may be due to the high demand for imported goods and low demand for exported goods that reduce the prices in the selected region. The overall fitness of the model as shown by F-statistics is empirically accepted.

The result of fixed effect model by estimating the equation (17) is also shown in above table. The estimated coefficient value for the budget deficit is contrary to the theoretical literature and it has insignificant effect on the said period. On the other hand, trade openness is significant and has negative effect on price level that shows globalization is consistent with the reduction of price level in the given set of countries. GDP per capita is significant with the expected sign that shows the growth of the selected countries leads to the higher price level.

The results of random effect model illustrated that the budget deficit bears a sign according to the expectations; however, it is insignificant in the given set of countries. It is due to that the role of other socio-economic factors may have more explanatory power in determining the price level. GDP per capita is significant and positive related with the price level while openness is negatively linked with a price level which shows positive shocks in the globalization reduce the price level in the given system. The diagnostic tests are acceptable at the desirable level.

Since, we take log of both dependant and explanatory variables and interpretation of our result require in elasticities form not in unit form. In pooled least square (LS), the estimated coefficient of budget deficit is -0.07 that indicates 1% increase in budget deficit reduce the price level by 7% in the selected SAARC region. There also exists an ambiguity in the co efficient sign of others models such as FEM and REM, along with insignificant role. The coefficient of gross domestic product (GDP) per capita is 0.61 in REM. It requires that 1% increase in GDP per capita increase the price level by 61%. However, this effect becomes weaker in both of the other models. The coefficient value of trade openness is -0.15 in fixed effect model (FEM) that shows 1% increase in trade openness cause to decrease in prices by 15%, while this effect becomes stronger in random effect model (REM) and polled least square (LS), respectively.

To compare the pooled least square (LS) model with the fixed effect and random effect model, the results are presented in Table 2, and indicate that the fixed effect (FE) analysis is better than the pooled least square (LS) model and random effect (RE) analysis is better than the pooled least square (LS) model. However, the null hypothesis of fixed effect model (FEM) is accepted against the betterment of random effect model (REM), i.e. Random effect model is not suitable than the fixed effect model; therefore, we can conclude that the inflation in the five selected SAARC countries is apparently influenced by country effects only.

Table 2

F-Test for Model Specification

Pooled LS Vs. Fixed Effects	Pooled LS Vs. Random Effects	Fixed Effects Vs. Random Effects
104.498*	10.292*	3.469

*Note: * indicates the rejection of null-hypothesis at 1% level of significance.*

Table 3

Hausman Test for Model Specification (Random vs. Fixed)

Statistic	P-value
χ^2 =-1.36	0.928

Note: P-value and χ^2 are the probability value and Chi-square, respectively.

Comparing the fixed effects model with the random effects model, the Hausman Test indicates that the fixed effect model is a better choice for the analysis, as shown the value of H = -1.36 which designates insignificance level.

The conclusions are supported by the analysis; however the budget deficit coefficient is not significant in two of the three models, while the present study finds the impact of the fiscal policy on the price level. Moreover, the best model is found in this study to be the Fixed Effect model in which the budget deficit variable is not significant. Therefore, this study further performed robustness test i.e., incremental regression in fixed effect model. The incremental regression is performed by removing individual independent variables from the model and by checking the effect on the value of R-squared. This test would enable us to find whether at any stage if we remove one independent variable except budget deficit, then what will happen on the size and magnitude of the budget deficit in fixed effect model. Table 4 shows the results of fixed effect incremental regression.

Result shows that among all the variables removed, GDP_{PC} has altered the value of R-squared to a highest degree (25.9% decreases in the portion of the dependent variable explained by independent variables) as the value for the R-squared changes from 98.4% to 72.5%. This substantial decrease in the value of the R-squared shows the importance of GDP_{PC} in the fixed effect model.

This importance is also highlighted in the fixed effect regression result as the value of coefficient of the variable (0.483) is highest among all the variables. Another significance of GDP_{PC} is that, after removing it, budget deficit (BD) variable is significant at one percent level. However, in column 2, after removing trade openness

variable (OPEN), budget deficit remains insignificant impact on price level in selected SAARC countries.

Table 4

Results of Fixed Effect Incremental Regression of Selected SAARC Countries:

Dependent Variable:	$ln(CPI)_{it}$	
Variables	Fixed Effect OLS (1)	Fixed Effect OLS (2)
C	1.829 (0.185)	-1.085 (-0.758)
$ln(BD)_{it}$	-0.112* (-3.983)	-0.014 (-0.527)
$ln(GDP_{PC})_{it}$	----------	0.178** (2.108)
$ln(OPEN)_{it}$	-0.785* (-4.189)	---------
R-squared	0.725	0.882
Adjusted R-squared	0.698	0.857
F-statistic	121.852*	212.851*
Prob.(F-statistic)	0.000	0.000

*Note: Parenthesis show t-values, * and * shows 0.01 and 0.05 level of significance.*

5. Conclusion

The objective of the study is to analyze the impact of budget deficit on inflation in case of selected SAARC countries. In order to examine this relationship, we choose different economics variables on the basis of theoretical and empirical literature. The results reveal that budget deficit has a significant and negative impact on price level in pooled least square method while there has not been found such relationship in fixed and random effect model. However, after removing GDP_{PC} variable in the fixed effect model, budget deficit (BD) variable shows significant negative impact on the price level. This result indicates the demand-side shock which perhaps the result of an increase in government spending (a fiscal expansion), as prices increase, purchasing power falls and the ability to spend decreases. The net result of this shock is an increase in the price level with no change in output or real spending. The overall finding depicts that fiscal theory of price level is not valid in the selected SAARC countries.

Gross domestic product per capita has important implication in increasing the price level in SAARC region. This effect is significant in all of the models but its coefficient value is highest in random effect model (REM). Trade openness is significantly negative related with the price level in the selected SAARC countries. Globalization or interaction with the world is important source in reducing the price level for the given countries.

Different tests, i.e F-test and Hausman-test are used for model specification. F-test indicates that fixed effect model (FEM) is preferred over both of the pooled least

square (LS) and random effect model (REM) while for the comparison between fixed effect model (FEM) and random effect model (REM), Hausman-test specify that fixed effect model is preferred over random effect model (FEM). Hence, both of the tests indicate that FEM is better model and there exist country specific effects in selected SAARC region.

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Appendix

F-Test (Pooled LS vs. Random Effects)
The F-statistics is:

$$F = \frac{R_{RE}^2 - R_{CC}^2 /(N-1)}{(1-R_{RE}^2)/(NT-N-K)} \qquad (A)$$

where: R_{FE}^2 coefficient of determination of the fixed effects is model and R_{CC}^2 is the coefficient of determination of the common effect method. If F-statistical is bigger than the F-critical then we reject the null hypothesis.

F-Test (Fixed Effects vs. Random Effects)
The F-statistics is:

$$F = \frac{R_{RE}^2 - R_{FE}^2 /(N-1)}{(1-R_{RE}^2)/(NT-N-K)} \qquad (B)$$

where: R_{FE}^2 coefficient of determination of the fixed effects is model and R_{RE}^2 is the coefficient of determination of the random effect method. If F-statistical is bigger than the F-critical then we reject the null hypothesis.