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Roomer Hypothesis of Sacrifice Ratio: Asymmetric Analysis in Case Of Pakistan

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ABSTRACT

This study used to test the threshold cointegration approach to test the Roomer (1993) hypothesis of sacrifice ratio in case of Pakistan for economic growth, inflation rate and exchange rate using time series data between 1981q1:2016q4. It has been concluded that, there is sacrifice ratio but it differs as in less persistent regime to high persistent regime. In less persistent regime economic growth showing positive sacrifice ratio; as both economic growth and inflation are positively linked but on the other hand, in high persistent regime the sacrifice ratio contradicts. There is negative association and sacrifice ratio is -0.169 as per quarter. This is the cost of slowing down the economic growth to check the inflation in the economy.

Keywords: Threshold Cointegration, Treshold Vector Error-Correction Model, Inflation Rate, Growth Rate.

INTRODUCTION

Roomer (1993) portrayed a hypothesis of sacrifice ratio; in order alter the trend of the inflation the economy has to bear some cost of slowing down in economic growth. Inflation is a continuous headache for the policy makers along to keep stable economic growth. Mainly there are two main subject of occurring inflation in an economy, the first one is demand pull inflation and the second one is the cost push inflation. Throughout the world, from developed to under developed countries it has been equally revealed that the sacrifice ratio being remain different to different country Naqvi and Khan (1989), Barro (1995), Lim and Pap (1997), Kuijs (1998), Liu.and Adedeji (2000), Abdullah and Khalim (2009) and.Khan and.Gill (2010). The two school of thoughts, highlighted this issue, the first one is a structuralist who emphasized that inflation is part and parcel for advancing the economic growth whereas the monetarist it only could determine the economic growth kydland and Prescot (1977) and Barro and Gordon (1983). A common thought has been developed that in a low sacrifice ratio; by lowering a less of economic growth the inflation is checked or maintained at equilibrium level , is more preferred over the high sacrifice ratio in an economy Malik and Chowdhry (2001) and Mubarik (2005). In order to check this argument the econometrician proposed threshold level, which discriminate the sacrifice ratio as before threshold level and after threshold level. This threshold level will show the sacrifice ratio in two fold, such as, before threshold level the cost of lowering the economic growth to check the inflation and after threshold point the cost of reducing the economic growth to alter the behavior of inflation in the economy.

As being key factor of the economy, inflation is discussed a lot by policy makers. The appropriate trend of inflation which fosters the economic growth is searched by researcher constantly. In last decade, a plenty of studies have been conducted in this context by incorporating the threshold level of inflation in the model along threshold cointegration.Munir (2009), .Burdekin (2000) and.Gillman & Kejak (2000).

In case of Pakistan, a single digit inflation has been claimed by Naqvi and Khan. (1989) to advance the economic growth positively. Malik and Chowdhury. (2001) analyzed the short and long run relationship of sacrifice ratio for the South Asian countries through cointegration model taking panel data test. They claimed there occur a positive association between economic growth and inflation for Pakistan.

Mubarik (2005) analyzed 9% threshold level in case of Pakistan by using data 1973 to 2005 by applying linear test of cointegration in this study. Hussain (2005) investigated and revealed belt of inflation comprised between 4-6 percent level using 1973 to 2005 time series data and claimed that before and after this belt there would be deterioration of economic growth a high sacrifice ratio, further many studies have been done on this issue resulting the low and high sacrifice ration between economic growth and inflation see Khan (2007) Abdullah and Kalim. (2009) and Bashir (2011).

As earlier, the Engle and Granger (1982) and Granger and Weiss (1983) presented the key concept of conintegration and afterward advocated by Johansen (1991) and Juselious (1990). The key assumption of their test reveals that the disequilibrium among independent and dependent variables, move towards long-run equilibrium almost in every period. On contrary to it, Balke and Fomby (1997) Enders and Siklos (2001) and Hansen and Soe (2002) argued that such fluctuations are not subject to return back to equilibrium in every time period and proposed concept of threshold cointegration. They claimed that in case of nonlinearity of the data the linear cointegration is weakened as not incorporating the nonlinearity in the model, rather threshold cointegration produce more strengthen results of long run association

among variables. Mubarik (2005) and Hussain (2005) calculated the threshold level of inflation in case of Pakistan only but they used linear.cointegraiton and linear error correction model. In regards of Pakistan, in among all other studies, as to best of my findings, there is not a single study that incorporated threshold level neither the nonlinearity is determine among the sacrifice ratio as well as threshold cointegration. That create a clear gap in literature of Pakistan case which is done up through this study.

The study pursued to: Estimate the nonlinearity in inflation, economic growth and exchange rate. Estimate the Threshold cointegration among variables. Estimate the Sacrifice ratio as in more persistent regime and less persistent regime.

RESEARCH METHODOLOGY

The estimation have been done by using quarterly time series data ranging between 1980 Q1 to 2016 Q4 for the variables inaltion rate (π_t^5), economic growth (y_t^5) and exchange rate (er_t^4). The source of data is international financial statistics (IFS) along various issue of economic survey of Pakistan.

In order to see the sacrifice ratio for more persistent and less persistent regime TAR model has been used Khanand..Senhadji (.2001), Ahmed and Mortaza (2005) and Munir (2009) constructed as:

$$y_t.=.[\alpha_1+\alpha_2\pi_t+a_3er_t^4].I_{1t}^{+} + [\alpha_3+\alpha_4\pi_{t+}a_5er_t^5].I_{1t}^{-} + \varepsilon_{t1} \quad (1)$$

$where\ I_{1t}^{+}.=1$
$if\ \pi_t \le \gamma.(threshold\ level),.$
$Else\ zero.Similarly\ I_{2t}^{+}=1\ .if\ y_t \le \tau, Ele.zero,.and9\ \varepsilon_{t1}, 9\varepsilon_{t2}{\sim}iid.$

In case of existence of nonlinearity in the series of a variable, Balke.and Fomby.(1997) stressed that this fluctuation reverting back towards equilibrium is not occur in every period rather it reaches a threshold level then it revert back. Hansen (1999) developed a test for nonlinearity in case of one threshold and two threshold level in a single series such as:

$$Y_t = a_1'X_{t-1}I_{1t}(1\gamma_2^1,\varphi_2^1)+\cdots+a_m'X^7{}_{t-m}I_{mt}(\gamma,\varphi_2^1)+\varepsilon_t \quad (2)$$

$where\ \gamma=(\gamma_1,\dots,\gamma_{m-1})\ with\ \gamma_1<\gamma_2<\cdots<\gamma_{m-1},$
$and\ \ I_{ij}(\gamma,\varphi_2^1)=I\left(\gamma^l{}_{j-1}<4Y_{t-d2}^3\le\gamma^9{}_j\right), where\ I(.)$
an indicator function.

And $\hat{\theta}=.arg\min_{\theta}\sum_{t=1}^{n}(Y_t-.a_1'X_{t-1}I_{1t}(\gamma,d)-\cdots-a_m'X_{t-1}I_{mt}(\gamma,d))$. Here, $\hat{e}_m$ is $n\times 1$ vector of residuals and computed through least square and the RSS's are represented by $S_m=e_m'e_m$. Finally, LS test which test hypothesis of AR (.1) vs TAR (.mi) is as:

$$F_{jk}=n\left(\frac{S_j-S_k}{S_k}\right) \quad (3)$$

Where Sj the RSS for SETAR (1) and Sk for TAR (m). It is attributed as Wald/ F-test test statistic for null hypothesis to AR.(1) model against TAR(mi) and after confirming the long-run association,.Hansen.and.Soe.(2002) presented nonlinear VECM, such as:

$$\Delta x_t=\begin{cases}A_1'X_{t-1}(\beta)+u_t & if\ \ w_{t-1}(\beta)\le\gamma\\ A_2'X_{t-1}(\beta)+u_t & if\ \ w_{t-1}(\beta)>\gamma\end{cases} \quad (4)$$

Where Δ is difference operator, X_{t-1} presents $k\times 1$ matrix, $\gamma\ is\ threshold\ point$ and u_t supposed to be 2×1 and $\Sigma=\mathrm{E}(u_t,u_t')$ is covariance finite matrix. A constrain is put by Hansen and Seo (2002) over threshold value as $\pi_0\le P(w_{t-1}\le\gamma)\le 1-\pi_0$, where $\pi_0=0.05$ and $1-\pi_0=0.95$. Through the MLE approach the model (2) estimation is as:

$$l_n(A_1,A_2,\Sigma,\beta,\gamma)=-\frac{n}{2}log|\Sigma| -\frac{1}{2}\sum_{t=12}^{n}u_t(A_1,A_2,\Sigma,\beta,\gamma)'\Sigma^{-1}u_t(A_1,A_2,\Sigma,\beta,\gamma) \quad (5)$$

Whe $\sum_{t=1}^{n}u_t(A_1,A_2,\Sigma,\beta,\gamma)=\Delta x_t-A_1'X_{t-1}(\beta)z_{1t}(\beta,\gamma)-A_2'X_{t-1}(\beta)z_{2t}(\beta,\gamma)$

Hansan and Seo (2002) by holding (β,γ) fixed has concentrated out (A_1,A_2,Σ), then estimate constrained MLE for parameters (β,γ). MLE $(\hat{\beta},\hat{\gamma})$ minimized the $log\left|\hat{\Sigma}(\beta,\gamma)\right|$ in (10) as subject to normalization of equation (9) and it can be re-written as:

$$l_n(\beta,\gamma)=l_n(A_1'(\beta,\gamma),A_2(\beta,\gamma),\Sigma(\beta,\gamma),\beta,\gamma) =-\frac{n}{2}log|\Sigma(\beta,\gamma)|-\frac{np}{2}\dots\dots\dots(11)$$

$$\pi_0^1\le\frac{1}{n}\sum_{t=12}^{n}I(x_t'\beta\le\gamma)\le 1-\pi_0^1\dots\dots\dots\dots(12)$$

Hansen and Seo (2002) inference based when cointegrated vectors are known for null hypothesis of linear cointegration against alternative of threshold cointegration (as given in equation (7)) and no cointegration against threshold cointegration. The Sup-LM test is as:

$$Sup-Wald=sup_{\gamma_L<\gamma\le\gamma_U}Wald\left(\hat{\beta}_0,\gamma\right)\dots\dots\dots(14)$$

Where $\hat{\beta}_0\ is\ the\ known\ value\ of\ \beta$ and obtained through running simple ordinary least square model for inflation and economic growth. The Sup-Wald test statistic is for null hypothesis of linear cointegratoin against threshold cointegration.

Finally, Hansen and Soe (2002) the TVEC model is defined as:

$$\begin{bmatrix}\Delta y_t\\ \Delta\pi\\ \Delta er_t\end{bmatrix}=\begin{bmatrix}a^y\\ a^{\pi}\\ a^{er}\end{bmatrix}+\left\{\begin{bmatrix}\beta y_t\ L\\ \beta\pi_t\ L\\ \beta er_t\ L\end{bmatrix}w_{L,t-1}\right\}+\left\{\begin{bmatrix}\beta y_t\ H\\ \beta\pi_t\ H\\ \beta er_t\ H\end{bmatrix}w_{H,t-1}\right\} +\begin{bmatrix}b_{11}&b_{12}\\ b_{21}&b_{22}\\ b_{31}&b_{32}\end{bmatrix}\begin{bmatrix}\Delta y_{t-1}\\ \Delta\pi_{t-1}\\ \Delta er_{t-1}\end{bmatrix}+\begin{bmatrix}\varepsilon_t^y\\ \varepsilon_t^{\pi}\\ \varepsilon_t^{er}\end{bmatrix}\dots\dots(19)$$

Where, H/L is for high/low regimes. $a\ and\ b$ are constants and coefficients matrix. $The\ w_{\ t-1}$ is the ECM and $\varepsilon{\sim}iid$.

RESULTS AND DISCUSSION

The key property of time series data is stationarity, which is checked through ADF () unit root test as well as Philip-perron test. The estimated table is as:

Table1

Unit Root

	ADF			
Variable	**Levels**		**First Difference**	
	c	c & t	c	c & t
y_t	-1.031	-1.221	-4.012*	-4.412*
π_t	-1.941	-2.100	-3.911**	-4.011*
er_t	-2.011	-1.066	-4.099*	-3.099**
	Phillips-Perron			
	Levels		**First Difference**	
y_t	-2.031	-2.221	-3.912*	-4.011*
π_t	-1.041	-0.100	-4.011**	-4.000*
er_t	-1.011	-1.966	-3.099*	-4.091**

Note:***, ** and * which shows level of significane at 1%, 5% and 10% respectively. c & t are constant and trend terms respectively.

In above Table 1, all the variables are stationary of same order, integrated of order one. Now, moving forward towards estimate, the estimated model for null of no threshold and one threshold estimate is as follows:

Table 2

Threshold Level

Hypothesis	**F-test**	**T**	**C.I 95%**
H_0: No threshold	26.74**	3.41	[1.855% to 4.367%]
H_0: One threshold	4.18	2.01	

Note: *, ** and *** showing significane at 1%, 5% and 10% level. C.I is confidence interval. Thr is threshold estimate.

From above Table 2, it is shown that there is rejection of null hypothesis of no threshold level in the growth rate series and accept the null hypothesis of threshold level. Further, accept the null hypothesis of one threshold level rather two threshold estimate in the series. Through F-test statistics the null hypothesis are accepted and rejected having confidence interval of 95%. Now, by confirming the threshold estimate and nonlinearity, the estimation advancing towards the threshold cointegration as explained in the methodology. The estimated model is as:

Table 3

Threshold Cointegration

Dependent variable:	y_t
	$\mathbf{Sup}_{LM}$
Test Statistic Value	25.702
p-values[a]	0.008
p-values[b]	0.001
Threshold parameter ($\hat{\gamma}$)[c]	7.1
[*]Cointegrating value estimated ($\hat{\beta}$)	0.718, 0.211
intercept/Lag/ /trim/ ngridTh	0/1/0.1/no

Note: [a]: Bootstrap value of Fixed regressor. [b], is the value of bootstrap residuals. [c]: is estimated threshold parameter. LM consistent heteroscedastic test statistics:

In the above Table 3, the test statistic for the null hypothesis of linear cointegration rejected both through Sup LM statistics (25.702) and through the residual and fixed regressors bootstrap and accepted the alternative of the threshold cointegration. The estimated threshold parameter is 7.1 in inflation series, there is drift term included in the model along one lag length at 10% trim values to avoid potential threshold. Next, TVECM model is estimated to see how much speed of adjustment parameter takes variation in different regime and takes how much time to revert back towards the equilibrium of steady state level in the economy. The estimated model is as:

Table 4

TVECM Model

Variable	ECTt-1≤7.1% Coef/std. E	ECTt-1≥7.1% Coef/std. E
ECTt-1	-0.541**	-0.741**
	(0.012)	(0.131)
Const	0.019	0.120**
	(0.110)	(0.001)
$\Delta\pi_t$	0.191	-0.355**
	(1.011)	(0.022)
Δer_t	0.141***	-0.211***
	(0.001)	(0.101)
Auto**(p-value)**	0.09	0.2
Hetro**(p-value)**	0.56	0.69
Adj-R2	0.59	0.65

Note: *, ** and *** are showing significance of coefficient at 1%, 5% and 10% level of significance. Further, in parenthesis standar errors are given. Diagnostic tests are given as Autocorrealtion and hetroscedasticity there p-value is below 0.05 and rejecting the null hypothesis of auto and heteroscedasticity in the model estimated. ECTt-1≤7.1% is showing regime one; less persistent regime and the other one is high persistent regime.

In above Table 4, TVECM model is depicted that shows, in regime one or in less persistent phase, the value of the speed of adjustment is -0.54 which is significant, negative and below one, thus fulfilling the properties of the convergent equilibrium in the long run. It shows the gap between growth rate as a dependent variable and inflation rate, exchange rate independent variables will converge to the equilibrium with the speed of 54% per year. On the other side, in more persistent regime, the value of the speed of adjustment variable is -0.74, that is also significant, negative and below one. Thus, it's also showing the convergent in the long run towards the equilibrium but with a little bit different speed that is 74% per year. From the above estimation it is shown that economic growth reacting differently, in different phases to the inflation and exchange rate in the economy. It has a strong and power of reverting equilibrium in the high persistent regime as compare to the less persistent regime. Finally, over main nonlinear regression model is estimated with the two regimes as discriminated by inflation as before 7.1% and after 7.1% keeping economic growth as a dependent, as:

Table 5

Nonlinear Regression Model

Vari	L. Model (excluding threshold)	Asymmetric Model $\Delta\pi_t \leq 7.1$	$\Delta\pi_t \geq 7.1$
Cons	0.010	0.031	0.123
	(0.001)**	(0.011)**	(2.101)
$\Delta\pi_t$	-0.001	0.313	-0.169
	(0.002)	(0.101)**	(0.011)**
Δer_t	-0.163	0.411	-0.231
	(0.180)	(0.121)*	(0.012)***
Obs		58	84
$\bar{R}^2$	0.58	0.61	0.56
Auto	0.09	0.44	0.51
Hetro	0.12	0.81	0.79

Notes: In above both model, dependent variable able is growth rate and standard errors are given. And *, **, *** are showing the significance of the variables at 1%, 5% and 10% level of significance. And the diagnostic test results are also given as

Auto-correlation/p-value and hetroscedasticity/p-value, through p-value both null hypothesis are rejected. Regimes are divided by estimating threshold value in inflation is 7.1% (2007Q1). Obs shows the total observation in each regime. L. Model is linear regression model.

In above Table 5, nonlinear regression model is showing different sacrifice ratios, such as it is shown that in less persistent regime the cost of slowing down of economic growth in order to check the inflation trend is different to high persistent regime. In less persistent regime or lower regime, there is a positive relationship or sacrifice ratio is showing the common trend. The coefficient of inflation rate is 0.313 statistically significant and having positive sign. It shows that in less persistent regime there is increase in economic growth due to increase in inflation rate. Whereas, in high regime, the sacrifice ratio is negative and is showing dissimilar interest between inflation and economic growth. It shows in more persistent regime the economic growth is associated negatively to the inflation rate in the economy and deteriorating the economic growth by 0.169% with a unit increase in the inflation rate. Next, in lower regime, exchange rate is associated positively to the economic growth and showing there is 0.41% increase in the economic growth in deflation or less persistent regime with a unit increase in the exchange rate. On reverse, in high regime, exchange rate is linked negatively and indicating that there is a 0.23% decrease in the exchange rate with a unit increase in the exchange rate. All the variables are in high and lower regime significant. In case, linear regression model, both inflation rate and exchange rate are insignificant and showing the negative association with economic growth in the economy.

At first, unit root tests are applied to see the stationarity of the data which show that all the variables are stationary of same order. Next, nonlinearity is detected in the inflation series which force to regress threshold cointegration. The null hypothesis of no cointegration is rejected and accepted the alternative of threshold cointegration in the model. The TVECM reveals that there is a different speed of adjustment parameter in different regime. It is quite valid and as according to the literature. In different phases economic growth reacting differently to the inflation and exchange rate in case of Pakistan. In lower regime, when there is deflation, our nonlinear model suggests that there is a weak sacrifice ration between economic growth and inflation. As, there is slow demand of money in deflation and it decreases in consumption which also lead to decrease in the economic growth. When there is increase in money supply, the demand of money also increases lead to increase in the consumption level which ultimately results in high prices at the same time more goods are produced in the economy. It shows that in deflation or less persistent regime in Pakistan there is a positive relationship between economic growth and inflation rate. On opposite to it, when there is high regime, which shows all the macro economic variables are at increasing trend it would lead to high consumptions due to which there is inflation in the economy goods are being unsold and thus results into to decrease in the economic growth of the country. Similar, condition is revealed by our nonlinear regression model in case of high persistent regime. Next, with exchange rate, economic growth is linked positively in above model, which shows at low level of prices there is depreciation in the economy which lead to increase our exports level and finally result into to increase the output of the economy and opposite to it in high persistent regime. Thus, the hypothesis of our study is estimated through the nonlinear models such to check the sacrifice ration in less persistent regime as well as in high persistent regimes. All these information is not available through linear regression model which only reveals the simple negative relationship throughout all the phases of the economy in case of Pakistan.

CONCLUSIONS

Roomer (1993) hypothesis has been tested as in case of less persistent regime and high persistent regime, using economic growth, inflation rate and exchange rate time series data comprises 1981q1 to 2016q4 in case of Pakistan. All the variables are found to be stationary at first order and nonlinearity detected in the inflation series with the threshold level of 7.1% for 2007q1. Threshold cointegrtion is accepted for the model and TVECM shows the different speed of adjustment parameters as in case of lower and higher regime. It shows that in case of depression the convergence among variables are slower as compare to the higher regime in case of Pakistan. The nonlinear regression model discriminated on threshold level in inflation is estimated which reveals that there is different association among economic growth and inflation in case of depression and boom in the economy. As, in case of depression, there is a positive relationship between economic growth and inflation rate but in boom there is a negative relationship between them and very similar conditions are exist for the exchange rate. As, in depression due to lower prices there is increase in the exports due to which there is net increase in the output of the economy. But in boom, due to higher prices, there is an appreciation due to which domestic goods become expensive and imports become cheaper which lead to decrease local production that ultimately decreases the output of the economy and imports.

Government and central bank should need to know at first the phases of the economic growth, that whether there is less persistent regime or high persistent regime in the economy. As, in case of less persistent regime government should lower down the taxes and increase the government expenditure to boost the economic growth on the other hand central bank should lower the interest rate and vice versa.

REFERENCES

Ahmed, Shamim, & M. G. Mortaza. (2005). Inflation and Economic Growth in Bangladesh: 1981-2005, Working Paper Series: WP 0604, Policy Analysis Unit (PAU). Research Department, Bangladesh Bank.

Abidemi, O. I., & Malik, S. A. A., (2010). Analysis of inflation and its determinant in Nigeria. *Pakistan Journal of Social Sciences, 7*(2), 97 – 100.

Abdullah, M., & Kalim, R. (2009). Determinants of food price inflation in Pakistan. Paper presented in the conference of University of Management Sciences, 1 – 21

Barro, Robert J. (1995). Inflation and Economic Growth, Working Paper 5326, National Bureau of Economic Research.

Bashir, F., Nawaz, F., Yasin, Kalsoom, Khursheed, U., Khan, J., and Qureshi, J., (2011). Determinants of Inflation in Pakistan: An Econometric Analysis Using Johansen Cointegration Approach. Australian Journal of Business and Management Research 1, no.5 [71-82].

Balke, N.S and Fomby, T.B. (1993). Asymmetric Adjustment and Threshold Cointegraiton. *Econometrica, 37*, 537-555.

Bose, B."Inflation, the Credit Market, and Economic Growth". Oxford Economic Paper 54, no.3 (2002):412-34

Burdekin, Richard C. K. et al (2000). When Does Inflation Hurt Economic Growth? Different Nonlinearities for Different Economies, Working Papers in Economics, Claremont Colleges.

Bruno, M. and W.Easterly, W. (1998). Inflation CrisesandLong-Run Growth. *Journal of Monetary Economics 41*(1) 3-26.

Engle, R. F., & Granger, C. W., (1982). Co-integration and error correction: Representation, estimation, and testing. *Econometrics, 55*(2), 251-276.

Enders, W., and P. L. Siklos. (2001). Cointegration and threshold adjustment. *Journal of Business and Economic Statistics 19*, 166-176.

Engle, R., and C. Granger (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica 55*, 251-276.

Esteve, V., Gil-Pareja, S., Serrano, J., A., and Llorca-Vivero, R., (2006). Threshold cointegration and nonlinear adjustment between goods and services inflation in the United States. *Economic Modelling 23*, 1033-1039

Fischer, S. (1993). The Role of Macroeconomic Factors in Growth. *Journal of Monetary Economics 32* (3), 485-12.

Granger, C. W. J., and Weiss, A. A., (1983). Time Series Aalysis of Error Correction Models', in Studies in Econometrics, Time Series and Multivariate Statistics, in Karlin, S., Amemiya, T. and Goodman, L.A. (eds), New York, Academic Press, pp.255-78.

Granger, C W. J. (1986). Developments in the study of cointegrated economic variables. *Oxford Bulletin of Economics and Statistics 48*(3), 213-228.

Ghosh, A. and S. Phillips. (1998). Warning: Inflation May Be Harmful to Your Growth". IMF Staff Papers 45, no.4: 672-710.

Gillman, Max, and Michal Kejak, (2000b). A Non-linearity in the Inflation-Growth Effect, Central European University Department of Economics Working Paper 14/2000; revised.

Hansen, B. E., & Seo, B. (2002). Testing for two-regime threshold cointegration in vector error-correction model. Journal of Econometrics, 110, 293-318.

Hansen, B. E. (1999). Testing for structural change in conditional models. Journal of Econometrics, forthcoming.

Hylleberg, S., Engle, R. F., Granger, C. W. J. and Yoo, B. S. (1990). Seasonal integration and cointegration. *Journal of Econometrics, 44*(2), 215-238.

Hussain, M. (2005). Inflation and Growth: Estimation of Threshold Point for Pakistan. Pakistan Business Review: 1-15.

Hussain, S., and Malik, S., (2011). Inflation and economic growth: evidence from Pakistan. *International Journal of Economic and Finance 3*,(5), 154-171

Johansen, S., (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoreggressive Models. *Econometrica, 59*(6): 1551-1580.

Johansen, S. and Juselius, K., (1990). Hypothesis testing for cointegration vectors in Gaussian Vector Autoreggressive Models', Forthcoming, and Econometrica.

Khan, R. E. A. and Gill, A. R. (2010). Determinants of inflation: A case of Pakistan (1970 – 2007). *Journal of Economics, 1*(1), 45-51.

Khan, A. A., Bukhari, S. K. H. and Ahmad, Q. M. (2007). Determinants of Recent Inflation in Pakistan. MPRA paper no. 16254, 1 – 16.

Khan, M.S. and A.S. Senhadji. (2001). Threshold Effects in the Relationship between Inflation and Growth. IMF Staff Papers 48, No.1 (2001):1-21.

Kuijs, L. (1998). Determinants of inflation, exchange rate and output in Nigeria. IMF working paper no. 160, 1 – 33.

Laryea, S. A. and Sumaila, U. R. (2001). Determinants of Inflation in Tanzania. Chr. Michelsen Institute Development Studies and Human Rights, WP-12, 1 – 17.

Lee, C.C.andS.Y.Wong. "Inflationary Threshold Effects intheRelationship between Financial Development and Economic Growth: Evidence from Taiwan and Japan". Journal of Economic Development 30, No.1 (2005):49-69.

Lim, C. H. and Papi, L. (1997). An econometric analysis of the determinants of inflation in Turkey. IMF Working Paper no. 170, 1 – 32.

Liu, O. and Adedeji, O. S. (2000). Determinants of Inflation in the Islamic Republic of Iran: A

Macroeconomic analysis. IMF Working paper 127, 1 – 28.

Maki, Daiki, (2005). Asymmetric adjustment of the equilibrium relationship between the nominal interest rate and inflation rate. *Economics Bulletin*, *3*(9), 1−8

Mallik, Girijasankar and Anis Chowdhury (2001). Inflation and Economic Growth: Evidence from four South Asian Countries. *Asia-Pacific Development Journal, 8*(1), 123-135.

Mubarik, Y.A. (2005). Inflation and Growth: An Estimate of the Threshold Level of Inflation in Pakistan". *State Bank of Pakistan - Research Bulletin 1*(1), 35-44.

Munir, Q., Mansur, G., and Furuoko, F., (2009). Inflation and Economic Growth in Malaysia: A Threshold Regression Approach. ASEAN Economic Bulletin 26, no. 2(2009), pp.180-193.

Naqvi, S. N. H. and Ashfaque H. Khan (1989). Inflation and Growth: An Analysis of Recent Trends in Pakistan, Pakistan Institute of Development Economics, Islamabad.

Olatunji, G. B. Omotesho, O. A., Ayinde, O. E. and Ayindo, K. (2010). Determinants of Inflation in Nigeria: A Co-integration approach. Paper presented at the Joint 3rd African association of agricultural economists, 1 – 12.

Phillips, A. W. (1957). Stabilisation policy and the time form of lagged responses. *The Economic Journal 67*, 265-277

Phillips, A. W. (1954). Stabilisation Policy a Closed Economy. *The Economic Journal 64*, 290-323.

Sarel, M. (1995). Nonlinear Effects of Inflation on Economic Growth, IMF Working Paper WP/95/56, Washington.

Sweidan, O. D. (2004). Does inflation harm economic growth in Jordan? An Econometric Analysis for the Period 1970-2000, International Journal of Applied Econometrics and Quantitative Studies, Vol. 1-2, pp. 41-66.

Tong, H. (1990). Non-Linear Time Series: A Dynamical System Approach, Oxford: Oxford University Press.