Causal Relationship between Interest Rate and Inflation Rate: A study of SAARC Economies

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Abstract

This article focuses on the evaluation of the causal relationship between interest rate and inflation rate in SAARC economies by using panel data ranging from the year 2006 to 2013. The need for this type of research from both dimension are very important. From one side according to macroeconomic issues, the increase in interest rate will lead to increase in the production costs and consequently the level of prices and inflation rate increases. On other hand theoretically it is expected that with increase in level of prices the interest rate will also increase. For the assessment of the causal relationship between interest rate and inflation rate, two scenarios have been identified; in the first scenario the causal relationship between lending interest rate and changes in inflation rate has been tested empirically and in second scenario causal relationship between real interest rate and inflation rate is considered. The obtained results in first scenario show that there is no relationship from changes in inflation rate to the changes in lending rate but in second scenario, the results are dual in nature showing the cause and effect relationship between real interest rate and inflation rate.

Key Words: Causal Relationship, Interest Rate, Inflation Rate, Panel Data, SAARC.

JEL Classification: J10, O09, G20

1. Introduction

As inflation rate has significant impact on decision making of economic agents, it is considered and discussed by many economists as a variable in macroeconomic policy and thus attracted a huge attention from the economists. One of the fundamental macroeconomic variables which relates with inflation rate is the interest rate (Mehrghan et al, 2005). The interest rate is one of the important variables of macroeconomic which is known as the cost of capital from investor perspective and opportunity cost from the depositors point of views. The nature of interest rate depends on nature of money and based on preference of economic units to keep saving in terms of justifiable liquidity. But currently the world's advanced economies are heavily influenced by interest rate and quickly react with the changes. In fact, the interest rate index operates as powerful tool to manage and lead the market. Interest rate in advanced economies with regards to the market situation determines by the interaction of supply and demand, and so there is a rate of normal or competitive rate. But in many developing countries the lack of efficient structures like advances financial markets, interest rate without market conditions, determined for syntax and taking into account all the economic indicators , including inflation and by support of economic sectors (Mehri et al, 2011).

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According to the economic literature, if the price level increases, the first variable which will be affected from the increase of prices level is the balance of real money. In other word, the increase in prices level will decrease the supply of real money. In the framework of the Keynesian analysis, decrease supply of real money (excess demand for money) will cause disorders in the economy. According to Walrasian equilibrium, to institute balance in economy, the incidence of excess demand in the money market caused excess supply of money in the bond market, which reduced the prices of the bonds and interest rate. Therefore, theoretically it is expected that the increase in prices level will lead to increase on interest rate. Then based on theory there is positive causal relationship between inflation to nominal interest rate. But the impact of inflation rate on interest rate could be explained in different ways. One of the effect of interest rate on inflation is using of the cost of capital. As interest rate increase, the uses of the cost of capital increases which leads to increase in the production costs. The increased cost of production by shifting to the left side of aggregate supply curve leads to the higher inflation rate. Also the changes of interest rates could affect the money supply. Thus, in models of endogenous money, that the supply of money is a function of interest rates, increase in interest rate will increase the money supply.

Thus the concern is with these two variables that is interest rate (lending interest rate and real interest rate) and inflation rate. To carry on the study, we assume a hypothesis stating that there is one way causal relationship between interest rate (lending interest rate and real interest rate) to the inflation rate.

2. Objectives

1. To analyse the causal relationship between interest rate and inflation rate.
2. To suggest some policy suggestions based on the results.

3. Relevance of Study

Interest rate is known as the opportunity cost of investment or cost of credit needed in the production cost. It plays an important role in the price of finished goods. In other hand, inflation rate is one of the fundamental macroeconomic variables which is considered by most of the economic agents and attracted their attentions. It has close relationship between two variables. This study studies the impact of interest rate (lending rate, real interest rate) on inflation rate and vice versa.

4. Problem Statement

As the changes in interest rate have a considerable effect on decision making of economic agents, it has been one of the main policy variables in macroeconomics, and it has been attracted the attention of economic agents and participants to itself. One of the basic macroeconomic variables related with interest rate is inflation rate. Some policy makers describe that increase in interest rate could increase the production cost and consequently increase the level of prices and inflation. Therefore, increase in interest rates, will increase the cost of capital, which leads in the increase of the production cost. Increase in production cost will shift the curve in left side of aggregate supply of economy, which causes to increase the level of inflation. Therefore, based on theoretical

issues and empirical studies of experts, there is a bidirectional causality relationship between interest rate and inflation rate. Asgharpur et al. (2007) reported that some studies have been rejected a strong bidirectional relationship between two mentioned variables. The economic theories indicate that increased inflation rate gives rise to higher interest rate.

5. Literature Review

Kasman et al, 2005 examined the validity of Fisher hypothesis by using 33 developed countries and they used the monthly data from IMF. For measurement of inflation rate of each country, first log of each CPI difference is considered as well as for interest rate. They investigated two tests first one was conventional co integration test which didn't provide strong evidence on the relationship between nominal interest rate and inflation rate. Therefore, used from fractional Co-integration analysis to test the long-run relationship between two variables. The results indicate that the long-run relationship between nominal interest rates and inflation do not exist for most countries in the sample. However, fractional co integration between the variables is found for a large majority of countries, implying the validity of the Fisher hypothesis. Asadpour and Alidadi (1981-2012) investigated the relationship between interest rate and inflation in Iran (one year deposits and loan interest rates and market rate) during 1981 to 2012 by using the autoregressive vector model with distributed lags and vector error correction model via granger causality test. Consequently, in this article it showed that there is a long term relationship between bank interest rates and inflation in order to this he found that through managing the trend of loan interest rate could control inflation index. Ghazali and Ramlee (2003) examined the interest rate of G-7 countries in long term by using ARIMA model and emphasized on that by using the co integration hypothesis, relationship between interest rate and inflation rate in long period time is not available or there is no strong relationship between these two variables. Through the Fisher effect concludes that the relationship in these countries is not real. Kandel et al (1996) analysed real interest rate and inflation rate in an anticipated analysis by using Fisher price index hypothesis which have been tested that the real interest rate is independent from expected inflation rate. It was found that there is a negative correlation between real interest and expected inflation rate, although the study contradicts with Fisher hypothesis and consistent with Tobin and Mandel theory. Mehrgan, et al. (2006) investigated the causal relationship between interest rate and inflation rate by using panel data in 24 countries. Based on economic theory, increase in inflation rate will cause increase in interest rate. The results confirmed the existence of relationship between interest rate and inflation rate, but they believe that based on the statistical data increase of interest rate will lead to increase in inflation rate, so the interest rate causes the inflation and the increase of inflation significantly couldn't cause increase in interest rate in the selected countries. Shadmeri, et al. (2011) in an article studied Hsiao causality test between interest rates and inflation rate for MENA countries and assessed the causal relationship between changes of interest rate and inflation rate in MENA countries. The objectives of this study was to answer that would the control of interest rate manages the inflation rate? Based on this they used from the seasonal data which related to inflation rate and interest rate in 16 countries in the period of 1997 to 2008 to analyze it (Jordan, Algeria, Iran, Bahrain, Tunisia, Djibouti, Syria, Saudi Arabia, Oman, Qatar, Kuwait, Lebanon, Libya, Morocco, Egypt and Yemen). They used for reliability of time series data from Dickey-Fuller test and structural breaks of Philips.

And also for determining of the causal relationship between interest rate and inflation rate used form Granger causality test and Hsiao test. The obtained result from the Granger causality and Hsiao test shows that the hypothesis only applies in Djibouti and Qatar. In other words in these countries the causal relationship will have the changes of interest rate to changes in inflation rate but in other countries the changes of interest rate is not the cause to inflation rate. According to the results they found that the policy of reducing interest rate to control the inflation would not help us they reached to our goal.

According to the arguments came to know that there is the causal relationship between inflation rate and interest rate and in fact can say that based on the obtained results there is positive significance causal relationship between inflation rate and nominal interest rate.

6. Data Analysis

a) Panel Data Unit Roots Test

In combined models same as the time series data model in case of non-statics of dummy variables regression issues will be applicable and the observation of higher R^2 is due to the existence of time variables which will not have the real relationship between the variables. Therefore, the application of unit roots test from the combined data will be essential to ensure the accuracy and reliability of the result.

$$X_{it} = \rho i X_{it-1} + Z_{it\,\gamma i} + \varepsilon_{it} \quad (1)$$

Where *i* related to the cross-sections and *t* is related to the period of time. X_{it} Represents the endogenous variables of the model and ρi the statement of coefficient of

Autoregressive statements. If $|\rho i| < 1 X_i$ ، $|\rho i| = 1$is statics and if the X_i ، will have unit roots test. One the test which is used in this study is the Im, Pesaran and Shin test. Based on that the Dickey Fuller test is generalized where in the beginning done for each of the dummy cross sectional data (for each variables separately) and then computed the generalized mean of statistic of Dickey Fuller. For each of variable which had shown below

$$X_{it} = \rho i X_{it-1} + \sum_{j=1}^{\rho 1} \varphi ij \Delta X_{i,t-j} + Z_{it\,\gamma i} + \varepsilon_{it} \quad (2)$$

Z_{it} is the component of deterministic and can be zero, one, fixed effect, or could be the fixed effect and trend of time. Assume that ε_{it} independent and uniformly distributed and for all the *i*, $\rho_i = \rho$ in this case:

$$H_0: \rho = 1 H_1: \rho < 1$$

In this data t for ρ combination model, will be counted as below:

$$\bar{t} = \frac{1}{N} \sum_{t=1}^{N} t\ \rho i \quad (3)$$

Then will be assumed as:

$$\frac{\sqrt{N}(\frac{1}{N}\sum_{i=1}^{N} t - E[t])}{\sqrt{var[t]}} \rightarrow N(0,1) \quad (4)$$

Now, the generalized test of Dickey-Fuller for each cross-sectional data and the mean will be calculated. If the statistical implies to reject the zero the particular variable will not have unit roots and will be statics (Turab, 2012).

b) Co integration test through Panel Data

In the co integration analysis, the existence of long run relationship of economic will be assessed. The main idea in the analysis of co-integration is that the most of the economic time series data are non-viable (containing random trends), but in the long run it is possible that the linear combination of these variables are viable (without the random trend). The co-integration analysis will help us to assess the long run relationship of equilibrium. If the economic theory is correct, the special collection of variables that have been identified by the theory which are associated with each other in long run. In addition to this, economic theory just stipulates the static (long run) relation and does not provide information on the dynamics in short term variables. In case theory of the validity, we have expected that despite non-stationary of variables, a static linear combination of these variables have stationary random trends. Otherwise, the validity of the theory will be questioned. Because of that used the economic theory and parameter estimation in long-term. The evaluation of the existence on co-integration variables in the combine data is very important. For the test of co-integration of combined data, Kao (1999) and Pedroni (1999) after estimation of long run relationship between variables, like the time series and the cross-sectional data have done, from the following statistic could use for the test:

$$DF_\gamma = \frac{\sqrt{NT}(\hat{\gamma}-1)+3\sqrt{N}}{\sqrt{10.2}} \quad (5)$$

$$DF_t = \sqrt{1.25t_\gamma} + \sqrt{1.875N} \quad (6)$$

In the above formula γ shows the regression of coefficient of error in long run, and this (e_{it}) shows the interruption of model estimation error by panel data in the following formula:

$$\hat{e}_{it} = \gamma\, \hat{e}_{it-1} + u_t \quad (7)$$

In the statistical of DF_γ andDF_t, N shows the number of cross-sectionals and t_γ the quantity and t is the standard coefficient in the above relation (7). The statistics derived both the normal distribution with means of zero and variance. The hypothesis testing of co-integration of combined data is written in the following:

Statistics derived both, are normally distributed with zero mean and variance. Hypothesis testing, data integration combined as follows

$$H_0 : \gamma = 1 H_1 : \gamma < 1 \quad (8)$$

The first hypothesis shows the existence of co-integration between the variables in the all cross sectionals and the second hypothesis shows the lack of co-integration between the variables.

Koa (1999) the generalized test of Dickey Fuller with the assumption of common vector integration for each point is equal to the following equation:

$$\hat{e}_{it} = \gamma\, \hat{e}_{it-1} + \sum_{j=1}^{p} J_j\, \Delta\hat{e}_{i,t-j} + v_{i,tp} \quad (9)$$

In the equation (3-15) $\hat{e}_{it}$ represent the estimated error in the long run with method of combined data and P is the number of breaks in the test of ADF which depends on the correlation between the components of the error. Also Jj shows the coefficient of the variable difference of breaks of test and $v_{i,tp}$ is the error of the above estimated equation. In other word, in this test like the test of DF_γ and after the DF_t estimation of long run, they estimated error and which has done from the above test of ADF. The hypothesis of this test is like other hypothesis test of DF_γ andDF_t, the statistical test have t distribution standard. (Padroni, 1999) in other hand, calculates the equation (9) which contains table in the of coefficient of t standard distribution γ test.

c) The Hsiao Causality Test

In the 1980s most of the studies like Thornton and Baten (1985) used from the method of corrected Granger Causality (Hsiao test) achieved strong and credible results for the selection of the optimal orders. The method of corrected Granger causality test (Hsiao test) has two steps. In the first steps, the variable regression model estimated as the dependent and shows that first the dependent variable regressed on variables with lag. Then the regression by using the two lags fits on dependent variable and in this manner it will continue and in other regression one lag will be added.

The causality test based on these regressions (17-3) and 18-3) have two technical forms which are as followed:

a. There is the possibility of non-stationary of data in the analysis of regressions (could solve the problem taking a difference from each one of it).

b. The selection of number of regression lags and the impact of F statistics from the structural breaks, the selection of corresponding test will be voluntary. In the above formula, T is the number of observations, $FPE_y(J,I)$ represents the final error prediction Y for the lag J from Y and the lags of I from X and $\Sigma(y_{it}-\bar{y}_{it})^2$ shows the sum of the squares.

The acceptance of null hypothesis (b)

$$FPE_x(J^{**},0) < FPE_x(J^{**},I^{**})$$

The rejection of null hypothesis (b)

$$FPE_x(J^{**},0) > FPE_x(J^{**},I^{**})$$

It should be noted that in causality test of Hsiao need to be stationary and in case of non-stationary of the variables should take a difference of each variables and after that could use for the test. (Shahdmehri et al, 2008).

d) The Static (stationary) Test

First and foremost in the estimation of combined data models such as the time series models it is important to examine the static variables and in case of necessities could use from the random data. By

considering to the mentioned statistics the result of static variables has given in the below table:

Table 1: The result of static variables of Lending interest rate, Real interest rate

Variables	Inflation rate		Real interest rate		Lending interest rate	
Level differencing	Level	1st difference	Level	1st difference	Level	1st difference
Levin, Lin & Chu t	-6.38	-6.54	-11.87	-17.14	-2.85	-4.18
P – Value	0.00	0.00	0.00	0.00	0.00	0.00
Im, Pesaran and Shin W-stat	-2.84	-2.11	-4.56	-7.18	0.04	-0.66
P – Value	0.00	0.01	0.00	0.00	0.51	0.25
ADF - Fisher Chi-square	34.06	30.18	49.16	64.74	10.10	17.67
P – Value	0.00	0.00	0.00	0.00	0.60	0.22
PP - Fisher Chi-square	34.39	47.61	46.44	86.57	10.26	17.62
P – Value	0.00	0.00	0.00	0.00	0.59	0.12

Source: Data Output from E-Views

According to the above table the variable's coefficient of the inflation rate and real interest rate for the Unit Root test conducted in surface (the surface means, the original time series without taking the difference) is 5 percent significant but the lending interest rate variables in the tests of the Luwin, Lin and Chaw in the surface with one difference with the possibility of 5 percent become significant and in all other test it is not significant. As a result the null hypothesis based on the existence of the unit root test for the variables of inflation rate and real interest by taking one difference for the lending interest rate could be reject it. Therefore, the result indicates that the pooled times series variables of inflation rate and real interest rate are significant on the surface and from types of I(0) and the lending interest by taking one difference becomes significance and will be from types of I(1).

e) Co integration Test Result

In the co integration analysis, estimates and test the long term economic relationship. The main idea in the analysis of the co integration is that, though most of the economic time series are non-stationary (containing random effect), but it is possible in the long run might have a linear combination of the variables which are static (without random effect). After the static test and the knowledge of the unit root test done. In this study, it is used from the co –integration of within and between groups of Pedroni co integration test.

Table 2: The result of Pedroni co integration- the variables of Inflation rate, Real Interest Rate and Lending Interest Rate

	Test within the group	Test between the group	
Panel ν-Statistic	0.10	Group ρ-Statistic	1.92
p-value	0.45	*p-value*	0.97
Panel ρ-Statistic	0.64	Group pp-Statistic	-5.46
p-value	0.73	*p-value*	0.00

Panel PP-Statistic	-4.81	Group ADF-Statistic	-3.14
p-value	0.00	*p-value*	0.00
Panel ADF-Statistic	-3.40	Panel ADF-Statistic	-3.40
p-value	0.00	*p-value*	0.00

Source: Data output from E-Views

As it seems, based on the presented results from the above table, the co – integration or the existence the equilibrium long run relationship between variable's model by static's of PP and ADF which are endogenous static and the static's of PP and ADF between the statics are accepted as a intergroup. This result shows the existence of long run relationship between lending interest rate, inflation rate and real interest rate. Finally, by creating the appropriate policies could make sustainable balance by considering the effective variables on long run equilibrium.

e) The Estimation of Research Data

In this section the estimation of research data would introduced in two separate scenarios. In the first scenario the causal relationship between lending interest rate and the inflation changes will be tested empirically. In this scenario the determination of the optimal lag of variables of the inflation rate changes and the changes of lending rate used from the criteria of Akaiake and FPE. After selecting the optimal lag by using the

Hsiao causality test where can achieve it from comparing $FPE_y(J^*,0)$ and $FPE_y(J^*,I^*)$ and on the above mentioned relation in the (based (J^{**},I^{**}) and $(J^{**},0)$ explanation of the test) could understand the causality relationship between lending interest rate and the changes of inflation rate. In the second scenario the causal relationship between lending interest rate and inflation will be subjected as an empirical testing. In this scenario used from the Akaiak Information Criteria(AIC) and FPE to determine the optimal length between inflation rate and real interest rate. After selecting the optimal lags by using the Hsiao causality to compare could achieve $FPE_y(J^*,0)$ and $FPE_y(J^*,I^*)$ and $FPE_y(J^*,I^*)$and $(J^{**},0)$ and(J^{**},I^{**}) (according to the mentioned relationship that is indicated in this test) where could realized the causal relationship between real interest rate and inflation rate. After determination of the causal relationship of the inflation rate and interest rates variables the necessary estimation done for the purpose of combined data through using the particular data.

f) First Scenario

The basic model of lending as a function of inflation rate or vice versa, according to equations is given below:

$$X_{it} = \alpha_0' + \sum_{j=1}^{J} \alpha_j' X_{it-j} + \sum_{i=1}^{I} \beta_i' Y_{iit-i} + v_{it}$$

where in the equation Y1 lending interest rate and X shows the inflation rate. The corrected method of Granger causality (Hsiao) is the method which determines the optimal method based on the least standard predicted error and estimated the regression equation. The Akaiake Information Criteria with 'AIC' shows the length of lags with J and I and least square error with the Final Prediction Error (FPE). In the table, the obtained results from the estimation show the length of optimal lags through the Hsiao causality test between

changes of lending rate and changes of inflation rate. In the table 3 from the causal test, based on the Standard Prediction Error of Hsiao (based on the mentioned relationship in the indication of this test) which shows the existence of relationship between changes of inflation rate and lending interest rate.

Table 3: The result of Hsiao Causal relationship between changes of Lending Rate and Inflation

(J , 0)	AIC	FPE	(J,1)	AIC	FPE
1	3.83	2.71	1	3.56*	2.09*
2	3.52	1.98	2	3.57	2.10
3	3.48*	1.90*	3	3.63	2.26

Source: Data Output from E-Views

The above Table shows the obtained results of the causal test, based on the Vector Autoregressive (VAR) model by using the equation and the standard Prediction Error of Hsiao and the Akiake Information Criteria to determine the existence of Hsiao Causal Relationship between changes of lending interest rate and inflation rate. In the first step the changes of lending interest rate with one lag on itself entered into the VAR model and later on it examined the optimized of the lags from the AIC and FPE test through that achieved the number of 3.83 AIC and 2.71 FPE. As the Hsiao causality test would try to have minimum number of Akaike and the Final Prediction Error. Therefore, continued until three lags where the result shows that after taking three differences, the numbers became the least AIC and FPE and the third lags shows the optimal result. In next step the changes of lending rate considered by taking three difference and the changes of inflation rate variable estimated until three differences where the result shows that in the first step the changes in inflation become optimal. Finally compared the third difference with previous differences and the result shows the relationship $FPE_y(J^*,0) < FPE_y(J^*,I^*)$ which means that the acceptance of null hypothesis (a) and which represent those changes of inflation will not cause on lending rate. That means there is no relationship between inflation rate and lending rate.

Table 4: The result Hsiao Causality test between inflation rate changes and lending rate changes

(J , 0)	AIC	FPE	(J, 1)	AIC	FPE
1	7.03	66.31	1	5.29*	11.74*
2	6.43	36.63	2	5.36	12.66
3	5.16*	10.31*	3	5.42	13.47

Source: Data Output from E -Views

Table 4 also represent the result of causal test which is based on the Vector Autoregressive(VAR) model by using equation and Final Prediction Error and Akaiake Information Error to determine the causal relationship of Hsiao between changes of lending rate and inflation rate. In first step examined that by taking one difference from the changes inflation rate by using the AIC and FPE test where the result shows that the number of AIC is 7.03 and FPE is 66.31. As the Hsiao Causality test would continue with having the least number of AIC and FPE. Therefore, would continue the lags until three where the third lags shows that there is minimum AIC and FPE, and now the third lag is known as optimal value. Next step the changes of inflation rate considered

by three lags and the changes lending rate variables would enter into the model until third lags so the result indicates the first difference is the optimal value of lending rate changes. In third step would compare it with the previous optimal where the result of the test with hypothesis indicates which means this is accepted null hypothesis of (b) and $FPE_x(J^{**},0) < FPE_x(J^{**},I^{**})$ the final result shows that the lending interest rate would not cause inflation rate. Finally the acceptance of both the null hypothesis (a, b) indicates that the changes of lending rate and inflation rate in the research countries don't have causal relationship.

g) Second Scenario

The base model of real interest rate is the function of inflation or vice versa by considering to the equation (3-17) and (3-18) as follows:

$$Y_{rit} = \alpha_0 + \sum_{j=1}^{J} \alpha_j Y_{rit-j} + \sum_{i=1}^{I} \beta_i X_{it-i} + U_{it}$$

$$X_{it} = \alpha_0' + \sum_{j=1}^{J} \alpha_j' X_{it-j} + \sum_{i=1}^{I} \beta_i' Y_{rit-i} + v_{it}$$

The above equations indicate the real interest rate and X is the inflation rate. The Granger causality corrected method (Hsiao) is the method to determine the optimal lags based on a final prediction error and estimates the regression equations. The result of Hsiao Causality test in table 5 and 6. The Akaike Information Criteria (AIC) length of lags with J and I and the final prediction error is shown by FPE. In table 5 the obtained result from the estimation determines the optimal length to test the Hsiao causality test shows the causal relationship between real interest rate and inflation rate. Also in table 6 the result of causal test is based on the predicted standard error of Hsiao (according to mentioned relationship which explained in the test) which has represents the existence of relationship between inflation and real interest rate.

Table 5: The result Hsiao causal relationship between real interest rate and inflation rate

(J , 0)	AIC	FPE	(J, 1)	AIC	FPE
1	5.69	17.44	1	*5.18	*10.47
2	5.67	17.15	2	5.23	11.02

Source: Data output from E-Views

The above table causal test's result is based on Vector Autoregressive (VAR) model by using equation table 4 and Predicted Standard Error and Akiake Information Error shows to determine the existence of causal relationship of Hsiao between real interest rate and inflation rate. In the first step the real interest rate by taking one difference on itself used from the VAR model where shows that the optimal lags examined through the AIC and FPE test and the achieved result from the Akaike 5.69 and from FPE is 17.44. As the Hsiao causal test trying to make the least number of Akaike and final prediction error. Therefore, the number of lags would continue until three lags which show that the third lags has the least Akaiake and Final prediction error, which would be the optimal value. In second step the real interest rate considered by three lags and inflation rate variable continued until third lags into the model and the result shows the first lags of inflation rate is the

optimal value. Finally the third lags of optimal value earned from comparing of two previous relations where the result shows $FPE_y(J^*,0) > FPE_y(J^*,I^*)$ this relation shows the lack of acceptance null hypothesis (a), this represent that the inflation rate would cause the real interest rate.

Table 6: The result of Hsiao Causal test between inflation rate and real interest rate

(J , 0)	AIC	FPE	(J, 1)	AIC	FPE
1	6.34	33.37	1	4.77	6.96
2	6.46	37.79	2	4.83	7.38
3	5.79	19.19	3	4.88	7.78

Source: Data Output from E-Views

The above table represents the result of causality test, according to model of Vector Autoregressive by using from the equation and Prediction Standard Error of Hsiao and Akaiake Information Criteria to determine the existence of the causal relationship of Hsiao between real interest rate and inflation rate. Firstly inflation rate entered with one lags into the VAR model and then the optimal value of the lags are examined by the AIC and FPE where the result represents that the number of Akaike and FPE 33.37. As the Hsiao Causality test would follow the least number of Akaike and final prediction error. Therefore, the number of lags would continue until the third lags which shows that the third lags has the least quantity of Akaiake and final prediction error which is the optimal value. In next step inflation rate considered by four lags and the variable of real interest would enter into the model until third lags which shows the first lag of real interest rate is the optimal value. Finally the optimal lags achieved would compare it with previous one where comparing of the test with the research shows the relation of $FPE_x(J^{**},0) > FPE_x(J^{**},I^{**})$ that indicates the lack of acceptance of the null hypothesis (b), based on that relation would say that the real interest rate could cause on inflation rate. Finally the rejection of both null hypothesis (a) and (b) shows the inflation rate would cause on the real interest rate or vice versa, in other words there is two ways relationship between real interest rate and inflation rate which represent this hypothesis has not been proved in the research.

7. Conclusion

The objective this research was to test the hypothesis that there is a one way causal relationship from the interest rate (lending rate and real interest rate) to the inflation rate and tested the validity of this argument where to the changes of interest rate will cause to the changes of inflation rate. In this study from the period of 2006 to 2013 examined the causal relationship between interest rate (lending rate and real interest rate) and inflation rate based using the panel data in two separate data. The obtained from the first scenario shows that in this selected countries there is no causal relationship between interest rate and inflation rate. Also the data achieved from the second scenario in first step it shows that there is two way relationships between interest rate and inflation rate.

b) Suggestions

By considering all the results from the first and second scenario in this research and meanwhile by mentioning

to the previous discussions the following are suggested:

1. As in there are two way relationships between inflation rate and real interest rate. This result shows that as the real interest rate effects on investment and saving the inflation too have the same effects.

2. As there is two way causality between real interest rate and inflation rate, this result shows that the inflation rate is not neutral, in other word the real and monetary variables have impact on each other, based on this research the monetary policies in the given countries are effective and by having an appropriate policies of investment, production, unemployment, and all the real variables would keep in optimal limits.

3. As in these countries the causality relationship between lending rate and inflation rate doesn't exist, therefore in these countries by having of nominal interest rate cannot control the inflation rate.

4. As in this research identified that between the changes on lending rate and inflation rate doesn't exist any relationship, so for other researcher would suggest that to find the factors which are impacting on the inflation rate.

5. In second scenario of research considered on the causal relationship between inflation rate and real interest rate, according this would suggest to the researcher.

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