Macroeconomic determinants of Islamic banks Profitability in Pakistan: A time series analysis

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Abstract

This study examines the macroeconomic determinants of Islamic banks profitability in Pakistan, using 7 years quarterly time series data from 2006 to 2012. In order to achieve the objectives of the study, Unit root test, Johansen and Juselius Cointegration methodology and Granger causality test were used. The test of the study signify that interest rate and inflation rate has positive and significant effect on Islamic banks profit and on the other side, exchange rate showed positive but statistically insignificant effect on Islamic banks profit. It can be concluded that there should be separate interest rate and exchange rate policy develop by the Central bank of Pakistan for Islamic banks so as to ensure maximum profit.

Key words: Islamic banks profitability, Interest rate, Consumer price index, Exchange rate
1. Introduction

Islamic banks showed a remarkable and considerable performance since the very 1st bank which was established in Egypt in 1963\(^1\). Currently more than 170 Islamic Banks providing their service throughout the world which included Islamic financial services. Islamic Financial institutions still growing with a very fast growing rate\(^2\). Islamic banks in the world gaining market share with very fast pace and its presence in the market eliminating fixed interest transactions which exists in the financial institution\(^3\). Over the past years, Islamic banking network increasing and the profitability growing with the same rate which is the major threat for conventional banking system. Islamic banks profitability can be measure by the network they have and the major portion of the Islamic banks is situated Asia and Middle East zone. Sudan, Malaysia, Middle East, Iran and other Islamic countries converted in to Islamic economic system. But in Middle East, Far East and Africa, Islamic banks providing their services along with the Conventional banking system. They have separate Islamic window but not a complete Islamic financial system. Countries like Bahrain, Malaysia are racing to be established a separate Islamic financial hubs that serve 1.2 billion Muslims around the world\(^4\). Islamic banks profitability also contributing in countries economy. Jordan’s Islamic banking system is a good example of it. It contributed 5% in its country GDP for the year 07/08 as compared to Conventional Islamic banking system which contributed around 40% in GDP\(^5\).

The main source of fund for any bank is their clients. Banks heavily focused on customer relationship management to generate more funds which lead to increase in banks profitability. For

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\(^1\) Haroon & Ahmed, (2000)  
\(^2\) Muhammad, (2000)  
\(^3\) Bashir and Hamid, (2003)  
\(^4\) Khatib and Wafaa, (2007)  
this purpose banks facilitate their customers by offering different types of accounts and banking products. While Islamic banks generally offered three types of accounts; 1: Current account, 2: Saving account and 3: investment deposit account. The current and savings account containing risk factor but as compare to investment account, current and saving account has lesser risk. In Islamic banks guarantee of capital is not sure but banks is liable to take care of investors’ money for the time period they are in an agreement.

In Pakistan, Islamic banking started in 1970s and it came across number of practical’s along with some economic concepts and techniques. It included bill of exchange, Participation mode of financing, ledgers, promissory notes, cheques, loaning facility etc. Profitability of Islamic banks has reached up to 8billion by the end of first quarter 11-12 that showed growth rate of over 58%. According to the Islamic bank bulletin released by central bank of Pakistan, the market share of conventional banks in overall profit of Islamic banks is marginally declining. Islamic banks of Pakistan significantly rising and showing positive trend in the market despite of their return of asset (ROA) and return on equity (ROE), both did not showing much significant change over the quarter that was reviewed under the overall banking industry of Pakistan. The total asset of Islamic banks at the end of September 2011 were standing at Rs 568 billion contained the share of 7.3% of overall banking industry and the deposits of Islamic banks reached up to Rs 463 billion during the same quarter which showed 8% increase its market share from 7.6% to the overall banking industry released by Central bank of Pakistan. The Islamic banks branches network has increased to 841 from 799 as compared to last quarter. These 42 new branches will achieve the planned annual plan of branch expansion for the year 2011. It is to be noted that, deposit side of Islamic

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6 Bessadet and Karema, (2009)
7 State bank of Pakistan annual report, (2011)
banks the fixed deposits of customers witnessed 31.8% to 36.5% and 6.3% to 7.5% rise both annually and quarterly, respectively

2. Theoretical Background

Inflation rate is associated with the decrease unit of currency value. Some currency faces extreme inflation and deflation (hyperflation) which disrupts any business including banks where the profitability depends upon the significance of money. That money is deposited in the banks by its patron in the form of current, term and saving accounts. So increases in inflation rate depress the savings and it reduces aggregate savings. This cut in savings has strong impact on banks profitability. Banks encounter to raise savings by increasing interest rate on saving deposits. Hence if the inflation rate is steep, banks will not be able to make profit on deposits.

Interest rate has an important role for any business to make profit. It influence directly to the bank’s capital. Banks attracts the capital by offering high interest rate to the current, savings and term

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8 State Bank of Pakistan, (2011) Annual and quarterly reports
deposits account. When interest rate increases, savings are more attractive where investments are less. This results bank pays more to their saving accounts. Most of the bank splurge considerable amount of time, shaping up the interest rate on loans and accounts that wallop a balance and maximized profit. High interest rates also discourage borrowings. When borrowings on high interest rate, then high monthly payments incurred. In result, default on loans increases and it directly affect banks profitability. Thus the higher the interest rate, the higher banks profitability through increase in capital and lesser borrowings or vice versa.

Exchange rate as a determinant of Islamic banks profitability has considerably less significant impact on its performance in contrast with conventional banking system. Since the currency market determines the exchange rate, there are some transactions that happens in conventional markets are not suitable for Islamic trading system which includes swaps, futures, options and forward contracts. Islamic banks profit directly do not affected by the exchange rate but the variation in the prices of goods cause and affect the efficiency of business and profits.

3. Empirical Studies

Masood. B and Ashraf. M (2012) empirically investigated the impact of macroeconomic and bank specific variables on Islamic banks profitability. They have used balanced annual panel data of 12 countries on 25 Islamic banks for the time period 2006 to 2010. Study variables include banks internal factors like asset quality, asset size, liquidity, deposits, operating efficiency gearing ratios and on the other side, the macroeconomic variables like real GDP growth rate and annual inflation. Panel data regression model has been applied for data analysis. The results of the study show that efficient management and larger assets size allows banks to generate greater return on
their assets. It is also concluded that efficient management in their operating expenses impacts significantly positive on Islamic banks profitability.

Idris et al. (2011) investigated the profitability of Islamic banks in Malaysia by including some internal factors like liquidity, bank size credit risk, capital adequacy and expenses. They have applied hausman test and pooled regression analysis. The data is collected foreign and local Islamic banks that are operated in Malaysia for the year 2007 to 2009. Results of the study suggested that only bank size is a significant and positive determinant of Islamic banks profitability. They have recommended that more banks and factors should be included in further studies for wider scope.

Abduh et al. (2011) empirically analyzes the macroeconomic variables and crisis management on Islamic banks deposits in Malaysia by using time series monthly data for the period 2000 to 2010. They have used interest rate, total deposits, GDP, Inflation, financial crisis and profit rate fluctuation as study variables. Vector error correction model and co-integration test were used for data analysis. Findings show that GDP, interest rate and change in profit rate have no impact on Islamic banks whereas inflation showed negative relationship with Islamic banks. On the other hand, financial crisis is positively related with Islamic banks.

Kasri and Kassim (2009) investigates that the factors affecting in the savings of Islamic Banks Indonesia by using Vector auto regressive and its associated with Impulse responsive function methodology for all Islamic Banks in Indonesia from 2000 to 2007. Variables real rate of return on Islamic deposits, interest rate on conventional deposit, real income and no. of Islamic Banks branches are considered. Results show that the rates of profit have a strong positive relationship with Islamic Bank’s deposits, while the interest rates have a strong negative relationship with it. It is recommended that return to saving is shown to be the most significant factor to save in the
Islamic Banks in the case of Indonesia since the two other factors under considerations, which is no. of Islamic Bank branches and Real income which are shown to be insignificant in affecting the level of Islamic deposit in long run.

Haron and Ahmed (2005) empirically investigates that interest rate effect and rate of profit which are deposited in Islamic Banks by using Pearson’s correlation and first order auto regressive model methodology. Monthly and quarterly time series data have been used. Variables are investment deposit amount, expected rate of profit, interest rate for fixed deposits, savings deposits in Islamic banks, expected rate of profit in Islamic banks facility, rate of interest in conventional banks. T-test has been used. Results show that the depositors are more concern for return on their deposits for investment also negative relation found for Muslims between interests based banking and P/L sharing banking system. It is suggested that every individual has different mindset while depositing their money in Islamic banks therefore to compete with the interest based return, Islamic banks should show their strength to be more profitable.

Hassan and Bashir (2001) empirically analyzed that the financial environment affects the profitability of Islamic banks in the economy by using panel data method. Four macroeconomic variables and reserve to deposit ratios, bank to GDP ratios, tax ratios are considered. Hausman specification test have been used. Results shows that the profitability does not have strong relationship with reserve requirement and profitability will be increase if macro environment is in favor. If GDP rate is high then good performance measures can be seen. Also size of the bank impacts the profitability. It is recommended that banks should analyze the financial and
Adebola et al., (2011) empirically investigated the Islamic banks financing and macroeconomic variables relationship in Malaysia by using data of 2006 to 2011. They have applied ARDL test for co integration and Granger causality test. Results of the study shows that Islamic bank financing is significantly affected by interest rate in Malaysia. On the other side they have also found one long run relationship between the study variables. It is recommended that Malaysian Islamic banks must provide some products based upon profit and loss sharing to be interest free.

Huapea, A.G. and Kasri, R.A., (2010), investigated the Bank margin by comparing Islamic banks and conventional banks. Data was collected for the 1996 to 2006 of 5 banks and have applied ARDL model to test the co integration among the variables. Findings suggested that long run association exists between bank margin and its determinants of Islamic banks. On the other side, interest rate volatility has negative impact on Islamic banks margin while conventional banks responded positive relationship.

Grassa, R. (2012), examine the relationship between risk and income structure of Islamic banks from GCC countries by using data period from 2002 to 2008 of 42 Islamic banks. They have applied multiple regression analysis. Results suggested that listed and non-listed Islamic banks are associated with higher insolvency risk and greater risk on profit and loss sharing products reliance. They did not find any relationship between risk levels and operating income of nonprofit losses sharing, hence listed banks prefer to invest in nonprofit loss sharing products in contrast with profit and loss sharing products.

Wasiuzzaman, A. and Gunasegavan, U.N. (2013), performed a comparative study on the performance of Conventional and Islamic banks of Malaysia by using panel data of 14 Islamic and non-Islamic banks over the time period of 2005 to 2009. They have used multiple regression
analysis and independent sample t-test. Findings shows that the return on bank size, average assets and board size of non-Islamic banks are greater as compare to Islamic banks. They also found significant comparison among other variables of the study in Islamic and non-Islamic banks except board independence and profitability.

Ali et.al (2011), empirically investigated the relationship between macroeconomic indicators and bank specific variables of profitability in Pakistan commercial banks by using data over the period of 2006 to 2009. They have applied correlation and regression analysis. Results of the study suggested that good economic environment and efficient management in assets side provide significant impact on profitability. On the other hand, lower profitability found in high credit risk and capitalization. It is concluded that higher the operating efficiency higher the profitability.

Bashir, A.H.M (1999), empirically found the profitability and risk measures of Sudanese Islamic banks by using data of two Sudanese banks. Unit root test and linear regression model have been applied. Results suggested that size of the banks and profitability have significant relationship. However, bank size and equity to capital ratio found negative relationship. It can be concluded that Islamic banks can grow their profitability as their bank size increases.

Cevik, S. and Charap, J. (2011), examined the Islamic and conventional banks deposit returns in Turkey and Malaysia by using monthly data from Jan 1997 to Aug 2010. Unit root, co integration, Granger causality test and Vector error correction model were applied. Findings of the study suggested that there exists long run co integration among PLS return rates and conventional banks deposit rate. However, it is also found that conventional banks deposit rates causes return on PLS accounts.
Isa, M.M. and Ahmad, K. (2003) investigated the causal relationship among conventional banks and Islamic banking instruments in Malaysia by using monthly data from Jan 1994 to Dec 2002. Unit root test and co integration test were used. Findings suggested that Conventional banks term deposits causes term deposits of Islamic banks in all categories. It can also be concluded that consideration of interest rate is important for Islamic banks before they adjust their returns on deposits.

Maudos, J. and de Guevara, J.F. (2004), Investigated the determinants of interest margin in European union banking sector by using panel data of Spain Italy, France Germany and the United kingdom banking sector over the period of 1993 to 2000. Hausman test of methodology were used. Results of the study shows that the decrease in banks interest margin in European banking sector leads to reduce in the credit risk, interest rate risk and operating cost.

Ahokpossi, C. (2013), empirically investigated the banks interest margin determinants in Sub Saharan African countries by using the un-balanced panel data of 41 SSA countries with 456 banks over the period of 1995 to 2008. They have applied random effect model. Findings suggested that banks specific factors (bank equity, liquidity risk and credit risk) are the main determinants of interest margin. On the other side, interest margin and inflation are sensitive to each other whereas this sensitivity is not for economic growth and public, foreign ownership.

4. Methodology
Time series data of selected sample period is used to investigate the profitability of Pakistan’s Islamic banks. The selected sample is based upon the aggregate level of all Islamic banks operating in Pakistan. Seven years quarterly data were selected from the period 2006 to 2012 for the purpose of analysis. Islamic banks profitability data is collected on the basis of quarterly frequency obtained from quarterly reports of Islamic banking bulletin. On the other hand, data related to
macro-economic variable that is Exchange rate, Inflation and Interest rate are obtained from economic survey of Pakistan.

Since the data is based upon time series with quarterly frequency, therefore unit root test (ADF & PP methodology), Co-integration (Johansen and Juselius methodology), OLS methodology and Granger causality test is used to check the relationship between the variables. Augmented dickey fuller unit root test is used to check the stationary of the data and co-integration is applied to find out the long run or short relationship whereas OLS regression model will suggest the most impacting factor to the dependent variable also the significance of independent variables with dependent variable. Granger causality test is used to check the causation direction of the variables and finally stability analysis is performed by using CUSUM and CUSUM square.

5. Modeling frame work

After the study of some empirical and theoretical work, the model to examine the Islamic banks profitability is as follows:

\[ IBP = f (IR, EXR, INF) \]  (3.1)

Since the inflation is measured through Consumer price index (CPI), therefore,

\[ IBP_t = \beta_0 + \beta_1 IR_t + \beta_2 EXR_t + \beta_3 INF_t + \varepsilon_t \]  (3.2)

Where \( IBP \) is the Islamic banks profitability, IR is the interest rate, EXR is the exchange rate and INF is the inflation rate. \( \varepsilon_t \) is defined as the error term with time.
6. **Estimations and Results**

Time series data has the ability that it has time trend which causes over estimations in the results called spurious estimations. This time trend problem can be understand by graphically from fig 2 and fig 3.

From the fig (2), it shows that there is an increasing trend exists in EXR but a mix trend can be seen in IR, INF and P. So this time trend can be removed by taking first difference of the given series and then further this series will be tested graphically whether this data is converted into stationary or not.

< Insert fig 2 here >

From the Fig (3) it can be seen that all the data series i.e. P, EXR, INF and IR has been converted into stationary and the problem of time trend in the data has been removed.

< Insert fig 3 here >

7. **Unit root test**

As long as the preliminary analyses concern, a conventional unit root test have been applied to check the data integrating property. Since the data series contain likely structural breaks, the test for stationarity of the data i.e. unit root test is performed by Augmented Dickey Fuller (ADF) test statistic as well as Phillips-Perron (PP) methodology. Both ADF test & PP test were performed but Phillip- Perron test were taken into account. The chances of non stationarity arise from the different source of structural unsteadiness and also from some external shocks under the period in which the country is examined.

Unit root test was applied at both levels i.e. at I(0) and I(1) to the all variables which are used in comprehensive and basic model. Test applied with two different models i.e. with constant (C) along with the assumption that variables do not have trend in the level and the series difference persist zero mean. Whereas the second model i.e. with constant (C) & linear trend (T) have been
used when there is a linear trend is observed in the level of data. Thus the test of Unit root is reported in Table 4.1.

< Insert table 4.1 here >

From the table 4.1 it is clearly seen that on the basis of ADF & PP test, the null hypothesis of unit root (whether or not trend is included) is accepted at level for each variable. And the null hypothesis of unit root test (whether or not trend is included) is rejected at first differencing for each variable. So on the basis of test results, it is concluded that all the variables are stationary at first difference i.e. I(1). It is therefore implies that the given series combination may exhibit a long run association and we further can proceed with co-integration test.

8. **Co-integration Analysis:**

It is more important that when model have more than two variables, then there may be more than one co-integrating vector exists. The methodology was generated by Johansen (1988, 1991) which is further extended by Johansen & Juselius (1990) and considered this approach as superior to Engle-Granger method. This methodology gives multivariate structure and more than one co-integrating vectors are allowed. The two tests were developed by Johansen & Juselius (1990) for test of co-integration commonly known as Maximum Eigen value test and Trace test. These tests values are then reported along with their corresponding critical values in Table 4.2.

< Insert table 4.2 here >

The null hypothesis of the co-integration test showing that the trace statistics is greater than the 5 percent critical value. So the null hypothesis is rejected of no co-integration in courtesy of the alternatives of at least one co-integrating vector. For Max Eigen value test statistics, here also null hypothesis is rejected i.e. no co-integration at 5 percent critical value in favor of alternative i.e.
one co-integrating vector. Hence the result of both test statistics confirms that there is a stable long run equilibrium relationship exists between the Islamic banks profitability and its determinants such as EXR, INF and IR.

9. **Ordinary least square test**

< Insert table 4.3 here >

From the Table 4.3, results show that the inflation has positive and significant impact on profit made by Islamic banks in Pakistan. These results are consistent with past studies Haffernan and Fu (2008), Bashir (2000), Guru *et.al* (2002), Athanasoglou *et al* (2005) and Vong and Hoi (2009) found positive relationship between Islamic banks profit and Inflation rate prevails in the country. This relationship suggested that Islamic banks income increases more than its cost with the inflation rate. However changes in inflation rate, banks forecasting resulted correctly in interest rate adjustment and margin which helps Islamic banks to increase in their profit.

The interest rate has positive and significant impact on Islamic banks profit. This positive relationship is consistent with Hasan and Bashir (2003), Bourke (1989) and Molyneux and Thornton (1992). It is pointed to the fact that interest is used as a benchmarking in fixing their fees to their depositors of using funds and rewards provided to their depositors as well (Nienhaus 1983). This fact was also supported by Homoud (1994) which further revealed that interest rate offered by conventional banks is equal to profit sharing ratio in Islamic banks. Therefore Islamic banks increase their profit while increasing their charges (mark-up) to customers.

Exchange rate on the other side has positive and statistically insignificant impact on Islamic banks profit. Some studies revealed that exchange rate decrease profit Schaeck and Čihak (2008) but in our case exchange rate has positive impact on profit. This result is consistent with Chortareas et al
implies that exchange rate increase profit. The reason is obvious in our case that Islamic banks focused primarily issues regarding foreign exchange currencies and has limited version of exchange rate in their system. It includes Riba (Usury), Uncertainty (Gharar) and Speculation (Qimar). Therefore, exchange rate has lesser impact on profit but as they deal with some Islamic foreign exchange instruments for remittances and some other currency transaction under sharia rules which impacts positive on profit.

10. Causality Analysis

Granger (1969) causality test is used to analyze the direction of causality among the independent and dependent variables. This causality test has been performed on two lags as per Akaike information criterion of our Islamic banks profitability model.

Test for Granger causality is reported in table 4.4. Results shows that there is uni-directional causality have been found running from Inflation to profitability of Islamic banks. On the other hand, exchange rate exerting uni directional causality running from exchange rate to interest rate and interest rate also showed uni directional causality running from interest rate to inflation rate. There is no bi-directional causality is reported in the model.

11. Stability Analysis

The consistency and the stability in a relationship are necessary for the effectiveness of Islamic banks and macro-economic variables policies. Therefore CUSUM and CUSUM of square of recursive residual (Brown, Durbin & Evans, 1975) were applied to test the consistency of the estimates over the considered time period.
Figure (4) shows the test of stability which implies that the CUSUM test results indicates the estimation is within the two standard deviations but CUSUM of square test reflects that there is slightly fluctuation in 2008 quarter but there after it shows the stability over the sample period.

< Insert fig 4 here >

12. Conclusion

Banks performance has a measure feature of profitability in this changing environment. This study has a focus to examine the Islamic banks profitability with key macroeconomic variables. The sample of the data is comprises on seven years quarterly time series data which is collected from Islamic banking bulletin published by Central bank of Pakistan along with key macro-economic variables. Time series data has been used FY 2006 to 2012 on quarterly frequency in this study. Unit root test is applied for data stationary and Johansen co-integration methodology employed for long run association ship. On the other side, OLS method was used to test the long run determinants and Granger causality test suggested the cause and effect or in other words direction among the variables.

On the basis of empirical findings, we found that Inflation has positive and significant impact on Islamic banks profitability. This positive relation reported that Islamic banks in Pakistan are managing their cost well under the increase in inflation increment and obtaining higher profitability.

The Islamic financial banks using interest rate only as a benchmark in Pakistan. So the impact in our findings is statistically significant and this relationship exerting positive impact on profitability. As Islamic banks do not offer cash in terms of loan so when interest rate goes up Islamic financial institutions raise their profit by increasing their bank charges to their customers.
The contribution of exchange rate in our study is positive and insignificant on Islamic banks profitability. Increase in exchange rate depreciates local currency and this change in exchange rate usually gave negative impact on banking side. But we have taken Islamic financial environment where they deal foreign exchange trade according to sharia laws. On the other side, Islamic banks have very small portion of foreign exchange trade along with risk free transactions and sharia scholars are engaged to develop a mode for the arrangement of foreign exchange transactions.

13. Policy recommendations

It is suggested that Central bank of Pakistan should form a friendly policy for interest rate with the investors and develop a separate interest rate plan for Islamic banks to ensure them more profitable. On the other side, Sharia scholars of Islamic banks should plan and suggest to central bank an Islamic exchange rate policy so that Islamic financial institutions can trade in foreign exchange products.
References


Stationarity Analysis

Fig. 2

Fig. 3
Unit root test

Table 4.1: Stationarity Test Results:

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF test</th>
<th>PP test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I(0)</td>
<td>I(1)</td>
</tr>
<tr>
<td>C</td>
<td>-2.326</td>
<td>-2.246</td>
</tr>
<tr>
<td>EXR</td>
<td>-0.078</td>
<td>-2.250</td>
</tr>
<tr>
<td>INF</td>
<td>-2.906</td>
<td>-2.644</td>
</tr>
<tr>
<td>IR</td>
<td>0.133</td>
<td>-2.847</td>
</tr>
</tbody>
</table>

Note: The critical values for ADF and PP tests with constant (C) and with constant and trend (C&T) at 1%, 5% and 10% level of significance are -3.711, -2.981, -2.629 and -4.394, -3.612, -3.243 respectively. Source: Authors’ estimation.

Co-integration test

Table 4.2: Cointegration test results

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Trace Statistics</th>
<th>5% critical values</th>
<th>Prob</th>
<th>Max. Eigen Value Statistics</th>
<th>5% critical values</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>57.156</td>
<td>47.856</td>
<td>0.005</td>
<td>33.345</td>
<td>27.584</td>
<td>0.008</td>
</tr>
<tr>
<td>At most 1</td>
<td>23.810</td>
<td>29.797</td>
<td>0.208</td>
<td>19.949</td>
<td>21.131</td>
<td>0.072</td>
</tr>
<tr>
<td>At most 2</td>
<td>3.861</td>
<td>15.494</td>
<td>0.914</td>
<td>3.655</td>
<td>14.264</td>
<td>0.893</td>
</tr>
</tbody>
</table>

Source: Authors’ estimations.

OLS test

Table 4.3: Long Term Determinants of Islamic Banks Profitability

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-stats</th>
<th>Prob.</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>4.0942</td>
<td>63.4207</td>
<td>0.000</td>
<td>-</td>
</tr>
<tr>
<td>EXR</td>
<td>0.0005</td>
<td>0.4776</td>
<td>0.637</td>
<td>2.343</td>
</tr>
<tr>
<td>INF</td>
<td>0.0033</td>
<td>1.8309</td>
<td>0.079</td>
<td>1.340</td>
</tr>
<tr>
<td>IR</td>
<td>0.0169</td>
<td>2.0722</td>
<td>0.049</td>
<td>2.633</td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td></td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>D.W stats</td>
<td></td>
<td></td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>F-stats (prob)</td>
<td></td>
<td>8.1434 (0.000)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: at 10% level of significance
Source: Author’s estimations
Granger Causality analysis

Table 4.4: Results of Granger Causality Test

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>P</th>
<th>EXR</th>
<th>INF</th>
<th>IR</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
<td>0.700</td>
<td>45.188</td>
<td>1.782</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.695)</td>
<td>(0.004)</td>
<td>(0.344)</td>
</tr>
<tr>
<td>EXR</td>
<td>1.161</td>
<td></td>
<td>1.038</td>
<td>1.344</td>
</tr>
<tr>
<td></td>
<td>(0.500)</td>
<td></td>
<td>(0.544)</td>
<td>(0.444)</td>
</tr>
<tr>
<td>INF</td>
<td>3.155</td>
<td>13.994</td>
<td></td>
<td>6.626</td>
</tr>
<tr>
<td></td>
<td>(0.187)</td>
<td>(0.026)</td>
<td></td>
<td>(0.073)</td>
</tr>
<tr>
<td>IR</td>
<td>0.265</td>
<td>0.527</td>
<td>2.101</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.940)</td>
<td>(0.791)</td>
<td>(0.292)</td>
<td></td>
</tr>
</tbody>
</table>

*Note: as per Akaike Information Criteria (AIC), Lag length in each case is two F-statistics. Critical values can be found in Gujarati (1995), p. 814.
Source: Author’s estimations

Stability analysis

![CUSUM and 5% Significance](image1)

![CUSUM of Squares and 5% Significance](image2)

Fig. 4