# SAMA Working Paper:

**IMPACT OF RISING INTEREST RATE ON SAUDI ECONOMY**

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# IMPACT OF RISING INTEREST RATE ON SAUDI ECONOMY*

## Abstract

This paper investigates the impact of rising interest rate on Saudi Economy using quarterly data for the period 2005:01 -2013:04. Different Vector Autoregressive (VAR) specifications have been used to capture the impact on most sectors of the Saudi economy. The impact of rising interest rate found to be negative on the GDP , non-GDP and on credits to all economic sectors as well.

**Keywords:** Monetary Policy, Transmission, Interest rate channel, Credit Channel, Vector Autoregressive (VAR)

**JEL Classifications:** E47, E50, E52

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# 1. Introduction

The recent global economic developments have increased the importance of seeking well-managed domestic macroeconomic policies that help in mitigating spillovers from policies being or will be adopted by different economies; particularly, the advanced countries. One of the important developments is the tapering of the US Fed quantitative easing policy and the expectation of rising Fed interest rate. Since the Saudi riyal is pegged to the US dollar, the choice for the Saudi monetary policy makers is limited. Historically, domestic interest rates were changed shortly after the US Fed rate changes (Figure 1). It is worth mentioning that the primary influences on Saudi domestic interest rates; proxied by the Saudi Interbank Offered Rate (SIBOR), are the US Federal Funds rate, domestic demand for credit, and the London Interbank Offered Rate (LIBOR). The first two are considered the most influential on the SIBOR as Saudi banks are not dependent on international interbank markets.

SIBOR is the key interbank rate in Saudi Arabia, and the benchmark for commercial and consumer lending rates. It is worth noting that the SIBOR is influenced by SAMA policy rate which is the Reverse Repo Rate. This policy rate is set with reference to the US Fed target rate. If SAMA's policy rate would not follow closely the US Fed rate, then, potential pressures on the peg would emerge as a result of more likely capital in- or out-flows.

**Figure 1: US Fed Rate vs. Reverse Repo Rate**
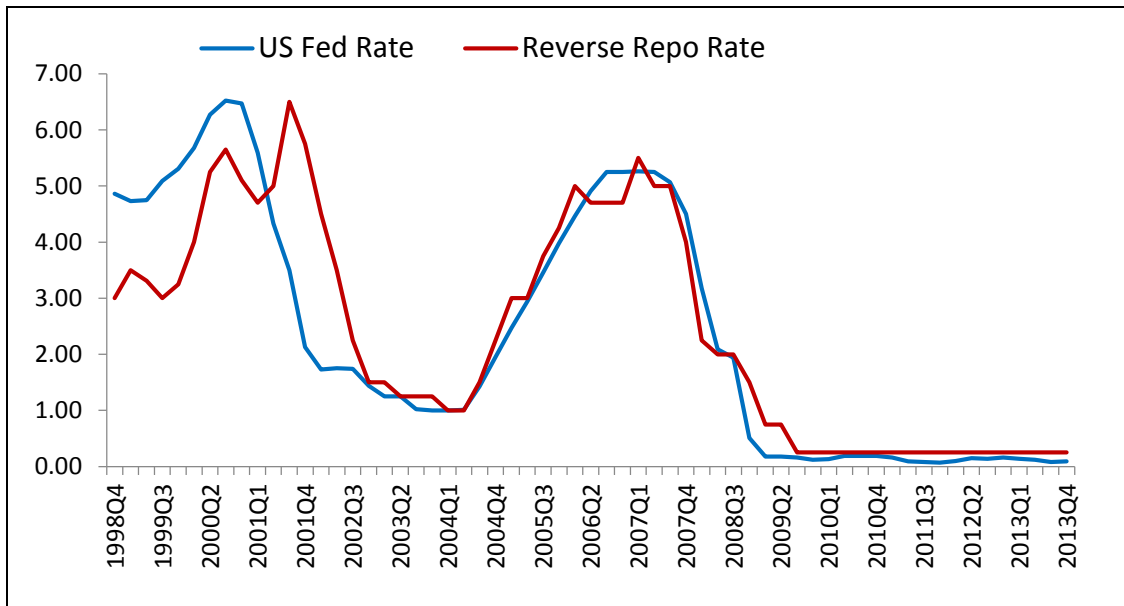


Source: SAMA

The other important factor that might influence the SIBOR movement is the domestic demand for credit whose impact appears mostly on the short run. Figure 2 shows how domestic demand for credit tends to push up rates which is in-line with theory stating that increasing demand for money will raise its price (ceteris paribus)[1].

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[1] Bank Credits, on average, include 30 percent of consumption loans, 6 percent of government loans and 64 percent loans to private sector.

**Figure 2: Loan Growth vs. SIBOR**
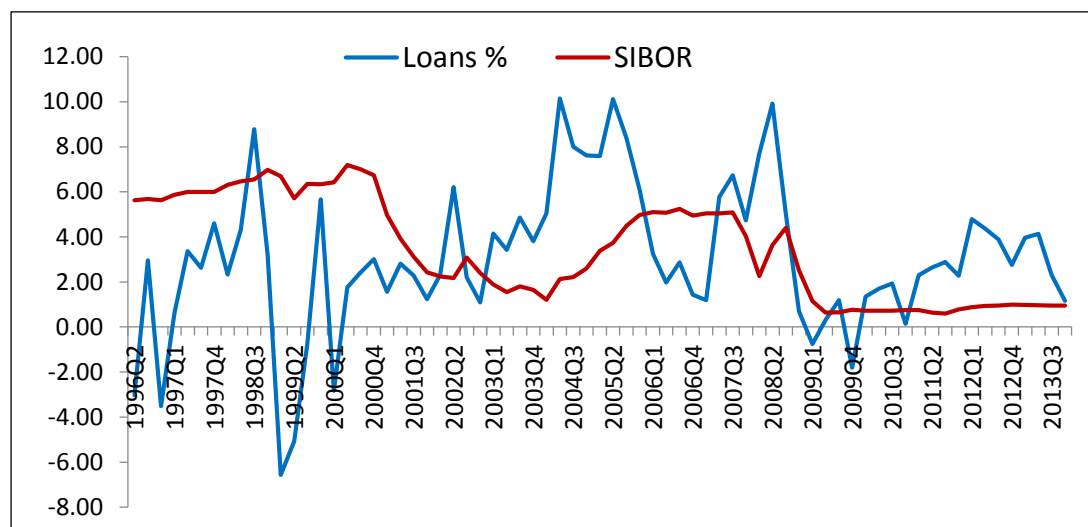


Source: SAMA

The above brief description leads us to think about the impact of expected rise of US interest rates on our economy which should help decision makers manage better any spillovers by developing policy scenarios based on analytical framework. Following the IMF approach in conducting such analysis[2] this paper adopts the Vector Autoregressive (VAR) Model & Impulse-Response Analysis which helps in predicting the impact of changing a policy measure on other factors in the economy such as different sectors, credit, or economic activities.

To answer the question "What are the effects of rising interest rate to different sectors and activities in the Saudi economy?", different VAR model specifications have been applied to analyze rising interest rate impact on Saudi economy through different channels. Data specification, methodology and impulse response functions are documented in annex 1.

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[2] See Espinoza, R. A., & Prasad, A. (2012). Monetary policy transmission in the GCC countries, Bova, E., forthcoming, "Interest Rate Spread in the GCC: the Role of Monetary Policy Intervention," IMF working paper (Washington: International Monetary Fund),and Prasad, Ananthakrishnan and May Khamis, 2011, "Monetary Policy and the Transmission Mechanism in the GCC Countries," in *Gulf Cooperation Council Countries: Enhancing Economic Outcomes in an Uncertain Global Economy* (IMF).

The following discussion will be analyzing the impacts of the interest rate channel and the bank credit channel on different economic sectors/activities and/or agents.

## 2. Results Discussion

As can be seen in table 1, a rise in the Saudi interest rate (the SIBOR) would have negative impacts on the GDP and non-oil GDP. When the interest rate rises, theoretically speaking consumption and investment should decline (i.e., high cost to finance consumption and investment, and then eventually less attractive for households and firms to take loans). Obviously, in countries where the private sector dominates this should lead to a decline in aggregate demand, and then in the output.

**Table 1: Theoretical and Empirical findings of Response of Different Variables to an increase in the SIBOR**

| Variable/Measure | Theoretical | Findings [3] |
|---|---|---|
| GDP | (-) | (-) |
| Non-Oil GDP | (-) | (-) |
| Investment | (-) | (-) |
| Consumption | (-) | (+) |
| Consumer Loans | (-) | (-) |
| Total Bank Credit (BC) | (-) | (-) |
| Bank Credit for Building & Construction (BCB) | (-) | (-) |
| Bank Credit for Transport and communications (BCT) | (-) | (-) |
| Bank Credit for Manufacturing and Processing (BCM) | (-) | (-) |
| Bank Credit for Miscellaneous (BCMIS) | (-) | (-) |

Source: SAMA

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[3] Our findings are based on the used 11 VAR model specifications in the annex 1.

In addition to the interest rate channel, impacts of rising interest rate through bank credit found to be important and mostly consistent with economic theory, negative. This comes in line with economic theory where rising interest rate increases capital cost, which will reduce bank loans ultimately. Particularly, a rise in the SIBOR would result in negative impacts on: Bank Credits for Building & Construction (BCB), Bank Credits for Transport and communications (BCT), Bank Credits for Manufacturing and Processing (BCM) and Bank Credits for Miscellaneous (BCMIS)[4].

## 3. In More Details

Table 2 illustrates by how much a 1 percent (i.e., a hundred basis points)[5] increase in the SIBOR would impact different variables and the time span. The results show that:

- An increase of 1 percent shock of the SIBOR, leads to a decline in the GDP by -0.090 percent in quarter 2 and by 0.095 percent in quarter 3 (the trough), then the shock dies out after $4^{th}$ quarter (Figure 3).

- Similarly, the impulse response of non-oil GDP has been found to be negative for the first five quarters, and then dies out after the $5^{th}$ quarter.

- For investment, a shock of 1 percent increase in the SIBOR, investment declines by 0.017 percent in the $2^{nd}$ quarter then dies out after the $3^{rd}$ quarter.

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[4] On average, bank credits for miscellaneous comprise 70 percent of consumer loans.
[5] It is important to note that one-standard deviation as impulse response has been scaled to 1 percent.

- In addition, impulse response of consumption , at odd, found to be positive as of 0.01 percent in the 4$^{th}$ quarter, then dies out after the 5$^{th}$ quarter[6].

- For consumer loans, as expected, a shock of 1 percent increase in the SIBOR will lead to a decline in the 4$^{th}$ quarter by 0.026 percent then it dies out after the 5$^{th}$ quarter.

- In the same vein, the impulse response of the inflation (i.e., $\Delta$(CPI)) to the SIBOR was very low and statistically insignificant for all periods[7] (Figure 4).

- For the GDP, the result is consistent with the economic theory. Also, rising of the interest rate leads to a reduction in the money supply.

- For the bank credit channel, the impulse response of the total bank credit (BC) to a 1 percent rise in the SIBOR found to be negative with 0.02 percent as a trough in the fourth quarter.

- Similarly, the impulse response of Bank Credit for Building & Construction (BCB) was negative as of 0.07 percent as a trough in the sixth quarter.

- In addition, the impact on Bank Credit for Transport and communications (BCT) has been negative with a 0.233 percent as a trough in the second quarter; and, the bank credit for Manufacturing and Production (BCM) declined significantly for almost the first six quarters with a trough in the fifth quarter by 0.075 percent. This decline is expected when Manufacturing and construction firms found borrowing cost rising.

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[6] It is important to mention that government spending accounts for almost 40 percent of total consumption.

[7] For inflation, we used interpolated consumer price index.

- Finally, as expected, the impulse response of the Bank Credit for Miscellaneous (BCMIS) to a 1 percent increase in the SIBOR found to be negative with 0.029 percent in the second quarter.

**Table 2: Empirical Results of Different Variables to a 1 percent Shock (Increase) in the SIBOR**

| Variable/Measure | | Findings [8] |
|---|---|---|
| GDP | -0.090% to -0.095% | 2nd & 3rd Quarters |
| Non-oil GDP | -0.023% | 3rd Quarter |
| Investment | -0.017% | 2nd Quarter |
| Consumption | 0.01% | 4th Quarter |
| Consumer Loans | -0.026% | 4th Quarter |
| Inflation | statistically insignificant | |
| Total Bank Credit (BC) | 0.02% | 4th Quarter |
| Bank Credit for Building & Construction (BCB) | -0.07% | 6th Quarter |
| Bank Credit for Transport and communications (BCT) | -0.233% | 2nd Quarter |
| Bank Credit for Manufacturing and Processing (BCM) | -0.075% | 5th Quarter |
| Bank Credit for Miscellaneous (BCMIS) | -0.029% | 2nd Quarter |

Source: SAMA

## 4. Further Possible Analysis

Some data were not available while conducting this research, which would have benefited the analysis and provided more accurate results with better economic perspectives. These data include the borrowing rate, SIBID and lending rate, in general, and on each sector. Having such data (as well as the suggested ones in Table 3 & 4 in the Annex) should help in

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[8] Our findings are based on the impulse responses of the 11 VAR model specifications in the annex 1

investigating the pass-through effect and the response of market interest rates to policy rates changes.

In addition to aforementioned data, size of bank loans relative to borrowers balance sheet (Debt/Asset), size of SMEs Lending and sectors they belong to, and types of lending to SMEs (long term vs. Short term, if any) will be useful for analyzing the impact of rising interest rate on these variables. This can deepen the practical discussion of the impact of interest rate changes on the Saudi market.

**Further Needed Data**

**Table 3: Some Unavailable Data**

| Data | frequency |
|------|-----------|
| SIBID | monthly/quarterly |
| Sukuks and other interbank sukuks(bonds) | monthly/quarterly |
| REPO rate (longer series) | monthly/quarterly |
| Reverse REPO rate  (longer series) | monthly/quarterly |
| FX swaps ( and examples of when they were used) | monthly/quarterly |

**Table 4: Some Unavailable Data**

| Data | frequency |
|------|-----------|
| Maturity of Credit by sector (Short term vs. Long term) | monthly/quarterly |
| Lending Rate & Lending rate for each sector | monthly/quarterly |
| Percentage of large borrowers within each sector | monthly/quarterly |
| Size of bank loans relative to borrowers balance sheet (Debt/Asset) | monthly/quarterly |
| Size of SMEs Lending and sectors they belong to | monthly/quarterly |
| Type of lending to SMEs (long term vs. Short term, if any) | monthly/quarterly |
| Deposit  rate | monthly/quarterly |

## Annex 1.

This annex explains the data specification, methodology, followed by unit root test tables with impulse response functions of the 11 VAR specifications.

## Methodology

Various model specifications have been applied to analyze the impact of rising interest rate on the Saudi economy through different channels. The VAR model can be formulated as follows:

$$Y_t = \Gamma_0 + \Gamma_1 Y_{t-1} + \cdots + \Gamma_p Y_{t-p} + t + d08 + u_t$$

where $Y_t \equiv (GDP\_1_t, WP\_1_t, SIBOR_t)'$ is the 3-dimensional vector of the 3 endogenous variables, , the $\Gamma$ are 3×3 coefficient matrices, $u_t \equiv (u_{gdp,t}, u_{WP,t}, u_{sibor,t})'$ is the 3-dimensional vector of residuals with variance-covariance matrix $\Sigma\mathbf{u}$ , t is the time index, p is the lag order[9] and d08 is the dummy variable accounting for the 2008 financial crisis.

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[9] In our analysis, the lag order usually is found to be 2 or 3 in all specifications.

## Data Descriptions

Quarterly data were obtained for the period 2005:01-2013:04 from SAMA's 49th Annual Report with some collected data. We use the gross domestic product (GDP), the non-oil GDP (NOGDP), total consumption (CONSU), total consumer loans(LLON), total investment (INV), Saudi Interbank Offered Rate, the SIBOR (SBR) , whole sale price index (WP), total bank credit (BC), and bank credits to various economic activity[10]. All data have been converted into real terms using the whole price index  and transformed into logarithms except the WP and the SIBOR. All series, also, are seasonally adjusted using the X12-ARIMA method.

## Stationary Properties

To avoid spurious results when applying Vector Autoregressive (VAR) specifications , all included series should be stationary. In our study, we apply the Augmented-Dickey-Fuller (ADF) test. Null hypothesis of this test states that series is non-stationary ( i.e., there is a unit root ), where the alternative hypothesis is that series is stationary. From the first glance at our time series in figure 10, it is obvious that they are not stationary at levels. As can be seen in Table 1, the GDP ,INV, WP, BCB,BCT, BCM and BCMIS are stationary after first-difference have been taken and statistically significant at 1 percent . The BC (Total Bank Credit) variable is found to be stationary after 2nd  difference. In addition to the ADF test, we apply the Zivot-Andrews Unit Root Test on the SIBOR  since they have breaks in their series. The SIBOR is stationary at level ( See Table 4).

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[10] Bank credit for Building and Construction (BCB), Bank Credit for Transport and communications (BCT) , bank credit for Manufacturing and Processing (BCM), and bank credit for Miscellaneous (BCMIS).
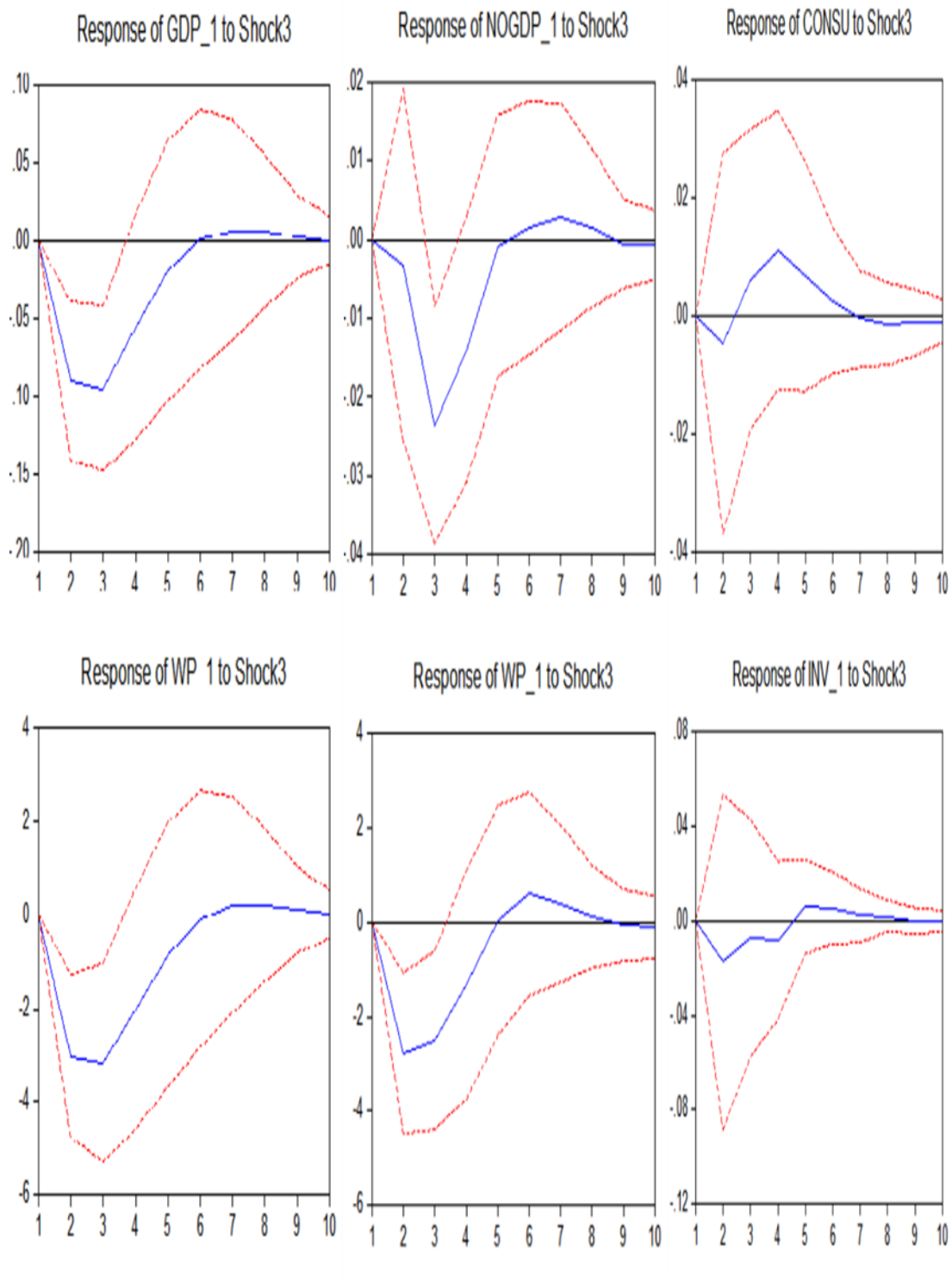
# Figure 3: Specifications ( 1-3)
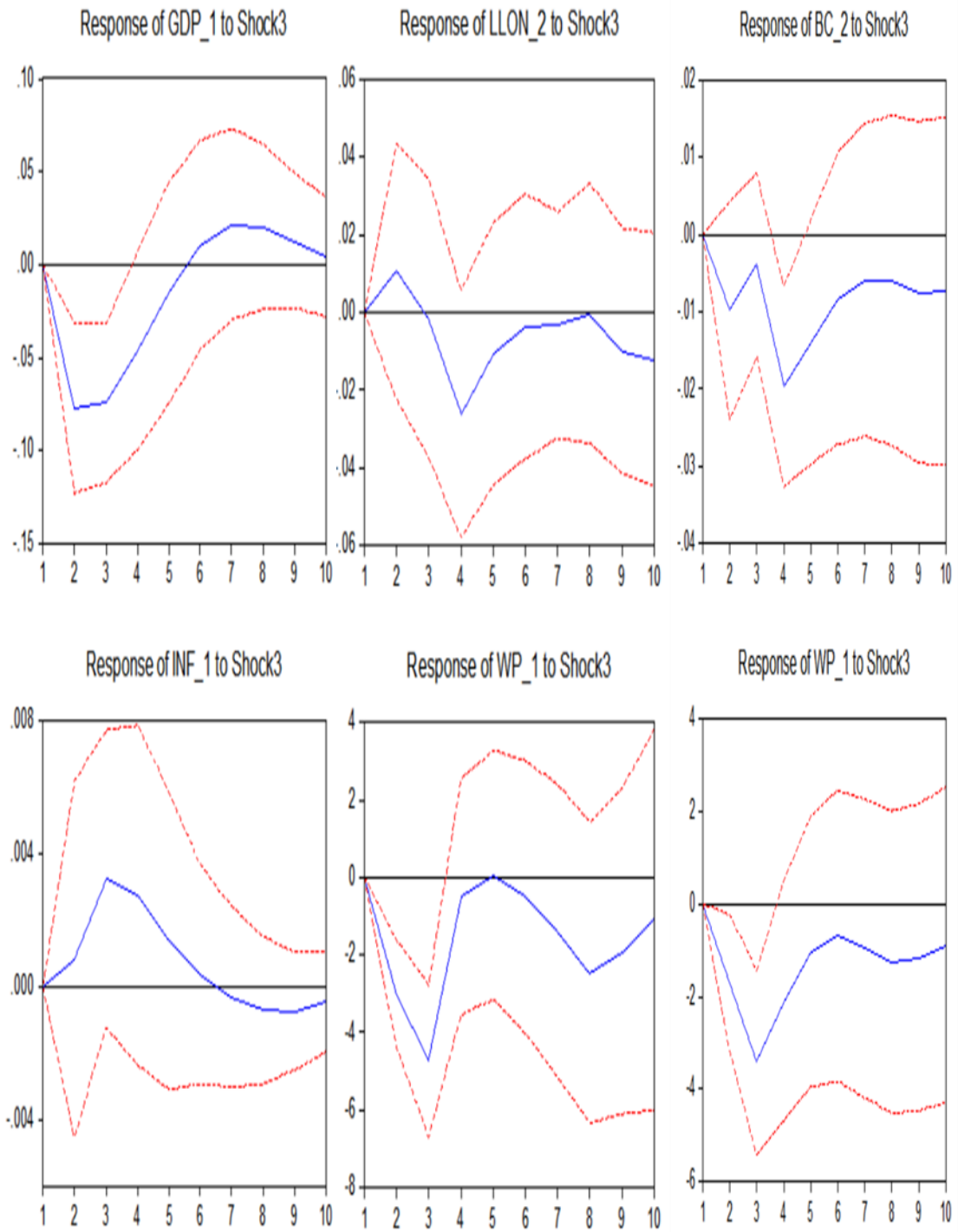
# Figure 4: Specifications ( 4-6)



Response of GDP_1 to Shock3

Response of LLON_2 to Shock3

Response of BC_2 to Shock3

Response of INF_1 to Shock3

Response of WP_1 to Shock3

Response of WP_1 to Shock3
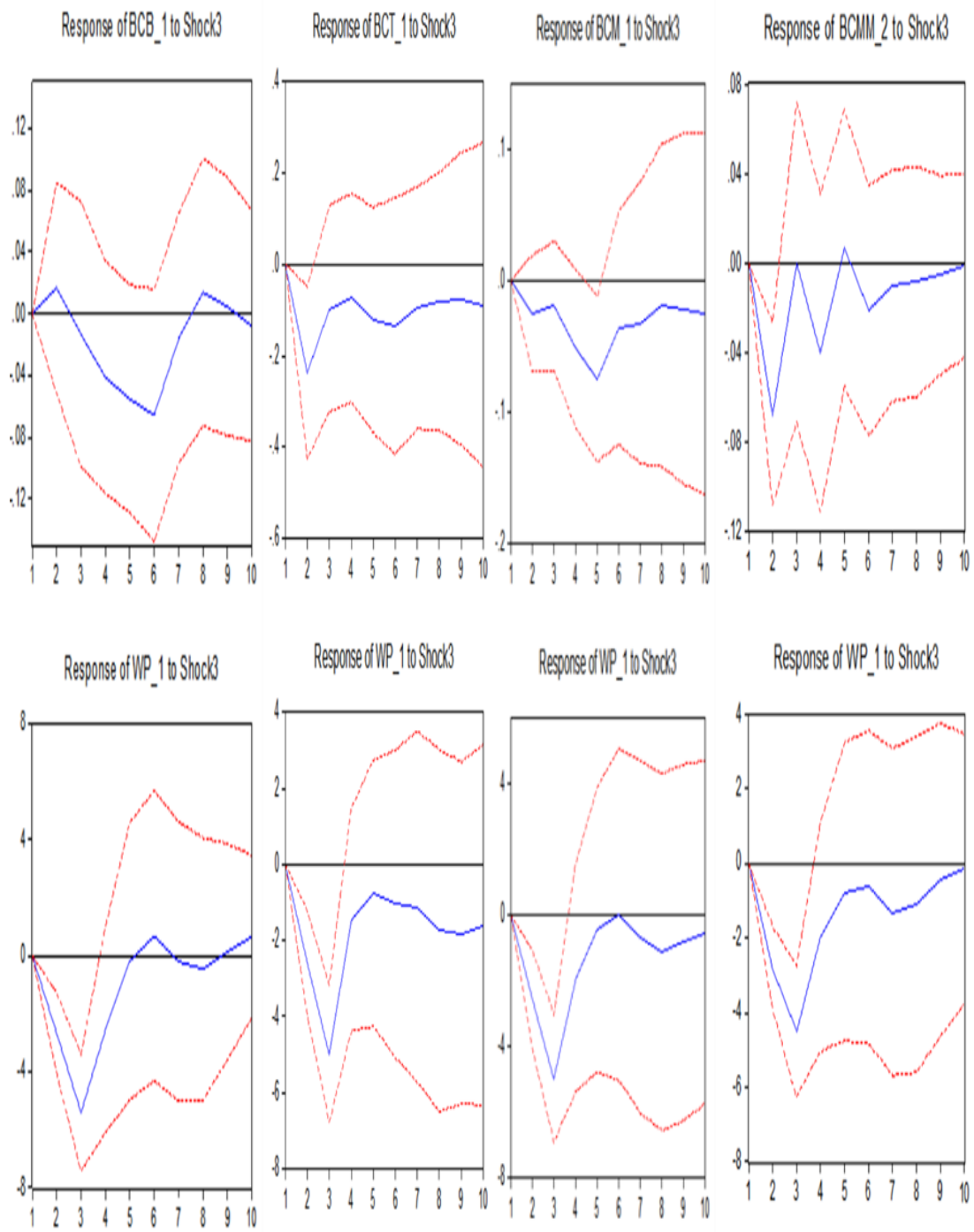
# Figure 5: Specifications ( 7-11)

# Figure 6: Trends of used time-series
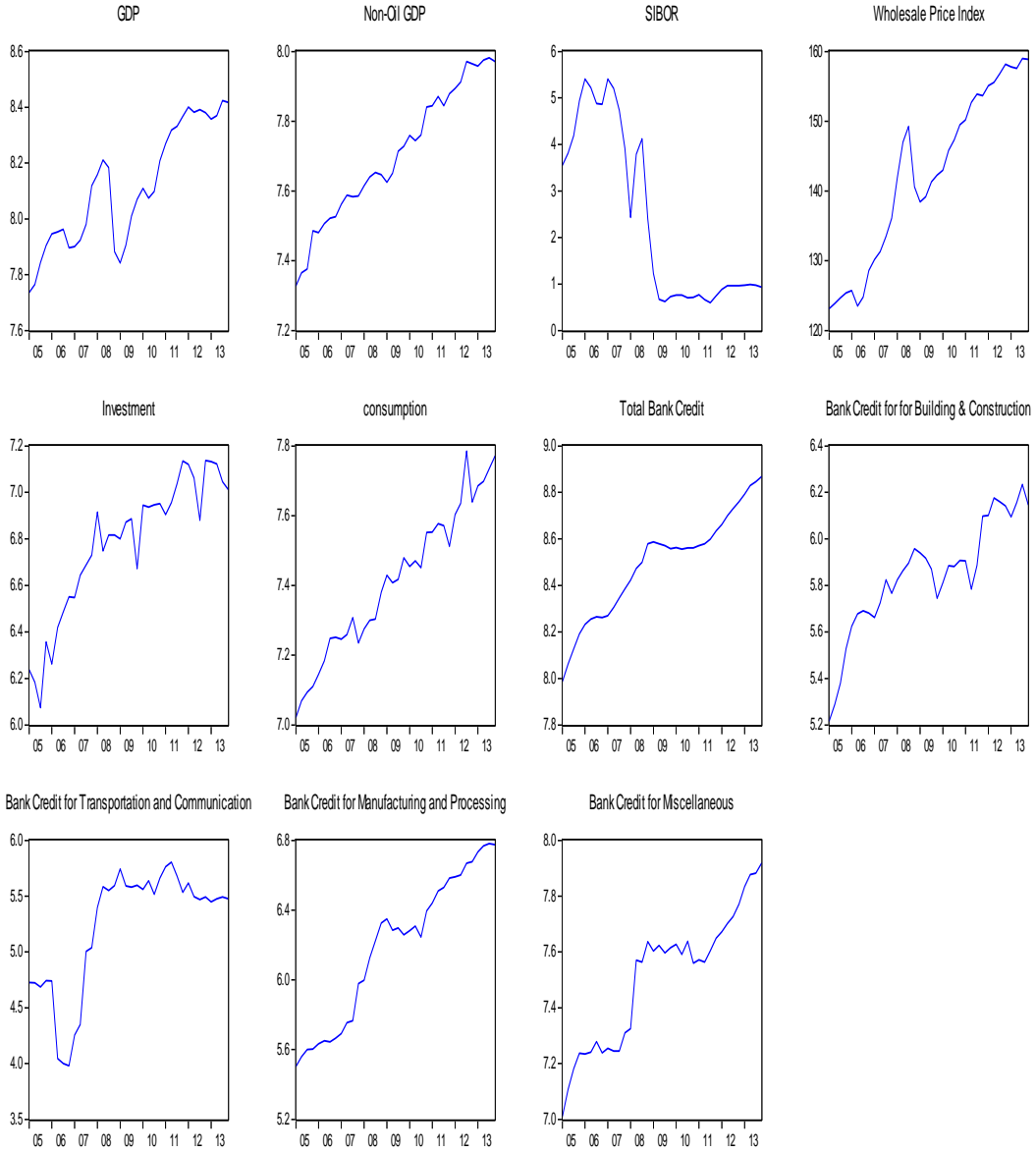
**Table 5: Augmented Dickey-Fuller (ADF) Unit Root Tests**

| Variables | ADF in levels | ADF in First Differences |
|-----------|---------------|--------------------------|
| GDP | -3.687983 | -3.548490** |
| CPI | -2.786630 | -4.262735 * |
| INV | -2.641672 | -4.252879 * |
| CONSU | -4.243644 * | |
| BCB | -2.901434 | -4.252879 * |
| BCT | -3.004225 | -4.252879 * |
| BCM | -1.650778 | -4.252879 * |
| BCMIS | -2.507411 | -4.252879 * |

Asterisks *,** refer to the significance level of 1%, 5%, respectively.

**Table 6: Zivot-Andrews Unit Root Test**

| Zivot-Andrews Unit Root Test | | |
|---|---|---|
| Date: 04/09/14   Time: 20:04 | | |
| Sample: 2005Q1 2013Q4 | | |
| Included observations: 36 | | |
| Null Hypothesis: SBR has a unit root with a structural break in the intercept | | |
| Chosen lag length: 2 (maximum lags: 4) | | |
| Chosen break point: 2008Q4 | | |
| | t-Statistic | Prob. * |
| Zivot-Andrews test statistic | -4.932471 | 0.000470 |
| 1% critical value: | -5.34 | |
| 5% critical value: | -4.93 | |
| 10% critical value: | -4.58 | |
| * Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process | | |

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