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MONETARY POLICY TOWARDS INCLUSIVE GROWTH: THE CASE OF KOREA

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Abstract

This paper investigates the impact of interest rate policy on employment using Korean data (1982.1/4~2012.4/4). Based on the analyses of impulse response functions, it was found that interest rate policy has a bigger impact on the cyclical component of employment than on total employment. The shrinking effect of employment by a hike in interest rate is estimated to be larger in contrast to the expanding effect of employment as a result of declining interest rate. Interestingly, most of the effect of interest rate on employment is realized through wage workers and manufacturing sector employment rather than non-wage workers or service sector employment. In this regard, in order to expand total employment and keep it at a desire level, to enable inclusive growth, it is essential to reduce the volatility of the policy rate and maintain interest rate at a long-term neutral level for a prolonged period and to reduce exchange rate volatility created by changes in interest rate. In particular, it is necessary to ensure that exchange rate does not appreciate too much, so as to avoid over-shooting of the exchange rate in order to reduce the volatility of manufacturing sector employment when interest rates are on the rise.

Key Words: Interest Rate Policy, Employment, Policy Rate, Transmission Mechanism, VAR Model, Impulse Response Function

JEL Classification: C32, E24, E43

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MONETARY POLICY TOWARDS INCLUSIVE GROWTH: THE CASE OF KOREA

1. Introduction

Financial inclusion has become an increasingly important agenda in various development dialogues and is now becoming a common objective of many policymakers and regulators, including in Asian emerging economies (CGAP and The World Bank Group, 2010). All over the continents, several initiatives have been undertaken to ensure widespread financial access. Easing access to financial assistance for the underprivileged is now viewed as an essential step in battling poverty. Financial inclusion, therefore, is important because it is a necessary condition for sustaining equitable growth. It can also contribute to job creation both directly and indirectly by allocating more credit to consumers and firms that have limited access to financial services.

After half a decade into the global financial crisis (GFC), while economic growth in many economies, both advanced and emerging, is picking up, labor market conditions continue to be staggered. Some SEACEN economies such as Korea, Philippines, Singapore, and Chinese Taipei, have shown that growth has no significant effect on employment both before (2001-2007) and after the GFC (2008-2011) (Hanusch, 2012). On the other hand, in Malaysia and Thailand, economic growth has a significant impact on employment only post-GFC. In this sense, jobless growth[3] seems prevalent in the SEACEN region despite strong economic growth. Furthermore, many economies in Asia and the Pacific region have experienced rising inequality as reflected by the Gini coefficient of per capita expenditure during the last two decades (Zhuang et al., 2014). Therefore authorities in the Asia-Pacific region are finding ways to achieve higher employment level or lower unemployment rate. In particular, central banks are trying to implement monetary policy consistent with achieving higher employment in order to address rising inequality and to attain inclusive growth. In this regard, this paper explores the case of Korea, specifically on: (i) how interest rate policy of central banks can contribute to inclusive growth by expanding and stabilizing employment; and (ii) whether the relationship between interest rate and employment is symmetric between the periods of interest rate on the rise and decline. While only the Korean case is considered, the methodology employed in this paper can be applied to other economies.

2. Interest Rate and Employment

2.1 Transmission Channels of Policy Rate: Theoretical Debates

Changes in policy rate by central banks affect aggregate demand, growth and inflation through various transmission channels and induce changes in employment as a result. Transmission lags of monetary policy of changing interest rate by central banks are not only long but also vary. In general, it is well known that monetary policy can affect the real economy through five main transmission channels, namely interest rates, asset prices, exchange rates, credit and expectations.

[3] A jobless growth or jobless recovery is a phenomenon in which the economy experiences growth while maintaining or decreasing its level of employment.

2.1.1 Interest Rates Channel

When central banks raise the policy rate, both short-term interest rates such as the interbank rate and long-term interest rates rise, resulting in the increase of both deposit and loan rates of banks. Ceteris paribus, this prompts households to increase their savings and at the same time cut down on consumption expenditure. Likewise, firms reduce investment as investment costs rise. In most economies, as consumption and investment form a large part of aggregate demand, production is likely to decline leading to less demand for labor.

2.1.2 Asset Prices Channel

Changes in the policy rate can influence the real economy through changes of asset prices of stocks, bonds and real estate. This influence in general can be explained by Tobin's *q* theory and wealth effect. When interest rate rises, stock price (market value of firms) declines and Tobin's *q* (market value of firms/replacement cost of physical asset of firms) drops as well following which, investment will decrease causing the aggregate demand to also decrease. In addition, the increase in interest rate causes the present value of future returns on stocks, bonds and real estate to decrease. Subsequently, the decline in asset prices (wealth) reduces household consumption and aggregate demand and thus, employment.

2.1.3 Exchange Rate Channel

When interest rates increase, the yield rate of domestic financial assets denominated in domestic currency becomes comparatively higher than those of foreign assets. This results in rational investors selling foreign currency while buying domestic currency, leading to an appreciation of the domestic currency. Appreciation of the domestic currency would simultaneously increase the export prices while reducing import prices. Henceforth, imports will increase on one hand while exports and aggregate demand will decline on the other.

2.1.4 Credit Channel

When central banks raise the policy rate, credit availability of banks shrinks and loans extended to firms and households decline. Investment and consumption will weaken accordingly. This credit channel can be further divided into the balance sheet channel and the bank lending channel. When interest rates rise, future profits of firms decrease and the real value of debt increases, worsening the balance sheet of firms.[4] The increased risk premium implies that firms will face difficulties in financing their investment by means of external funds. Via the bank lending channel, when interest rates rise, banks may have doubts about the ability of borrowers to repay loans due to asymmetric information.[5] Accordingly, loan screening becomes tighter. All these developments imply a reduction of banking loans, investment and consumption.

[4] The balance sheet channel implies that the effect of monetary policy on investment and consumption would be far bigger than expectations of traditional effect of interest rates and thus, this channel is also called the process of financial accelerator.

[5] Banks would normally reduce loans to small and medium enterprises (SMEs) first because of the more serious asymmetric information problem and lower transparency of SMEs than large enterprises, which in turn can cause SMEs to decrease investment and production. This implies that monetary policy impacts the real economy mostly through SMEs that rely more on bank loans than large enterprises.

2.1.5 Expectations Channel[6]

Monetary policy of central banks can change the economic outlook and inflation expectations of economic agents, thus affecting consumption, investment and inflation accordingly. For instance, increase in the policy rate would lower inflation expectations which in turn lower wage rate. This leads individuals and firms to consume and invest less respectively.

2.2 Issues in Empirical Test in a VAR Model

The variables used in the empirical analysis to study the effect of interest rate policy on employment are growth (aggregate demand), exchange rate and price besides interest rate and employment. These macro variables have a typical characteristic of bi-directional causality to each other. In this regard, a VAR model is estimated and the impulse response functions are used to analyze the effect of policy rate on employment. In using the VAR model, the particular ordering of variables in the model and stationarity of variables must be taken into account.

The ordering of variables are related to the identification of the model and in our particular VAR model, the issue is the sequencing of the variables, namely interest rate, employment and other macro variables including output, price and exchange rate. When interest rate as a policy variable is put before employment and other variables, it implies that a change in policy interest rate has an instantaneous effect on employment while the response of interest rate (monetary policy) to changes of the economic environment (namely other variables in the model) is not contemporaneous but rather with lags. In contrast, in case of putting the interest rate variable after employment or other variables, the model implies that interest rate (monetary policy) respond to changes in economic environment without a lag while it takes time for interest rate to affect the other variables of interest (e.g., employment).

It is noted that monetary policy normally affect the real economy through numerous transmission channels with long and variable lags. In Korea, for example, it takes about one year for monetary policy to impact aggregate demand (The Bank of Korea, 2005). In this regard, in our VAR model, employment and other variables are put before the interest rate policy variable. The endogeneity of the policy rate in Korea is confirmed as the existence of a strong bidirectional causality between output and interest rate (see Table 1). Also, The Bank of Korea tends to raise interest rate incrementally and in measured pace, while during a crisis period, it tends to cut down interest rate significantly and frequently, to respond to the crisis in a swift manner. Therefore, putting policy rate after employment and other variables (output, exchange rate and price) would be appropriate.

As the VAR model is a reduced model, when the error term of each variable in the VAR model is correlated, the pure impulse of each variable cannot be identified. Therefore, interpretation of impulse responses created by one unit of innovations of the residuals becomes unclear. To solve this problem, this paper uses the Cholesky decomposition so that all the error terms are orthogonalized and the impulse responses are then derived from the orthogonalized error terms. Cholesky decomposition is a way of identifying error terms by constraining a variable that first variable is “more” exogenous, with a lower triangular matrix. This type of reduced VAR model is termed as a semi-structural VAR model. In this way, the impulse response function can be interpreted as a pure and uncorrelated innovation of each error term.

[6] When expectations channel works effectively, transmission lags of monetary policy shorten and policy effectiveness becomes bigger. In this regard, expectations channel has become increasingly important.

The next issue considered is stationarity. In modelling, when variables have unit roots, implying that they are non-stationary series, differencing of series is needed to make them stationary before estimation as the relationship would be spurious otherwise. Differencing, however, results in the loss of information. However, although variables are non-stationary, the relationship among variables can be cointegrated, that is, the linear combination of non-stationary variables can be stationary. This cointegrating relationship can precisely recover the loss of information by differencing. From the cointegration relationship, the error correction model can be computed (Engle and Granger, 1987 and Johansen, 1988).

Table 1
Causality Tests between Policy Rate and Output

	Null Hypothesis	p-value							
		Lag=1	2	3	4	5	6	7	8
1982.1/4~ 2012.4/4	Policy rate ↛ GDP	.01	.00	.01	.01	.06	.13	.10	.19
	GDP ↛ Policy rate	.21	.01	.00	.00	.00	.13	.01	.00
1999.1/4~ 2012.4/4	Policy rate ↛ GDP	.01	.01	.01	.06	.22	.42	.17	.57
	GDP ↛ Policy rate	.92	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 2012.4/4	Change in policy rate ↛ Cyclical comp of GDP	.13	.36	.46	.32	.41	.40	.76	.71
	Cyclical comp of GDP ↛ Change in policy rate	.00	.00	.00	.00	.00	.00	.00	.00
1999.1/4~ 2012.4/4	Change in policy rate ↛ Cyclical comp of GDP	.42	.56	.62	.74	.58	.38	.59	.63
	Cyclical comp of GDP ↛ Change in policy rate	.46	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 2012.4/4	Change in policy rate ↛ Change in GDP	.03	.01	.01	.03	.09	.11	.10	.21
	Change in GDP ↛ Change in policy rate	.00	.00	.00	.01	.02	.04	.04	.01
1999.1/4~ 2012.4/4	Change in policy rate ↛ Change in GDP	.00	.01	.06	.22	.42	.07	.23	.34
	Change in GDP ↛ Change in policy rate	.00	.00	.00	.00	.00	.00	.00	.00

Shaded area implies p-value is lower than 5%.

2.3 Estimating the Relationship between Interest Rates and Employment: Initial Investigation

Before carrying out the analysis using the VAR model, we explore the following potential issues: (i) the interaction between interest rate changes and cyclical component of employment; (ii) the relationship among business cycle, interest rate and employment; and (iii) the asymmetric effect of interest rate policy on cyclical employment.

2.3.1 The Interaction between Interest Rate Changes and Cyclical Employment

Employment, like most economic variables can be divided into a structural component[7] and a cyclical component. Theoretically, policy rate changes by central banks are more likely to affect the cyclical component of employment rather than the structural employment or total employment. In this paper, employment is divided into a trend and a cyclical component using the H-P filter. Comparing the effect of the policy rate on the change of total employment and on the cyclical employment, the Granger causality tests[8] indicated that the policy rate influences manufacturing industry workers only in case of total employment while it affects both workers in manufacturing and service industries in case of cyclical employment. In addition, after the Asian currency crisis period of 1999.1/4~2012.4/4, the policy rate affects wage workers only in case of total employment while it influences both wage and non-wage workers in case of cyclical employment.[9] These results support the hypothesis that interest rate policy has a greater impact on cyclical employment than on total employment.

[7] Structural changes of employment are usually determined by changes in industrial structures, improvement of labor productivity, rigidity of labor market, capacity of labor supply, etc.

[8] Granger causality tests between policy rate and total employment including cyclical component of employment is not presented.

[9] Wage workers comprise of regular workers, temporary workers and daily workers. Non-wage workers comprise of the self-employed and family workers without payment.

Table 2

Granger Causality Tests between Policy Rate and Cyclical Component of Employment

Period	Null Hypothesis	p-value							
		Lag =1	2	3	4	5	6	7	8
<policy rate (difference)>									
1982.1/4~ 2012.4/4	Rate ↛ total empl	.96	.95	.66	.70	.85	.90	.95	.95
	Total empl ↛ rate	.00	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 1997.4/4	Rate ↛ total empl	.23	.16	.29	.57	.68	.78	.83	.21
	Total empl ↛ rate	.52	.19	.19	.37	.60	.62	.75	.76
1999.1/4~ 2012.4/4	Rate ↛ total empl	.00	.01	.05	.10	.14	.37	.19	.28
	Total empl ↛ rate	.75	.51	.54	.88	.88	.96	1.0	1.0
1982.1/4~ 2012.4/4	Rate ↛ wage empl	.42	.81	.61	.42	.10	.15	.29	.18
	Wage empl ↛ rate	.00	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 1997.4/4	Rate ↛ wage empl	.10	.39	.29	.45	.32	.46	.63	.71
	Wage empl ↛ rate	.37	.36	.43	.76	.85	.90	.87	.94
1999.1/4~ 2012.4/4	Rate ↛ wage empl	.00	.00	.01	.03	.04	.35	.49	.61
	Wage empl ↛ rate	.90	.33	.49	.56	.61	.76	.91	.95
1982.1/4~ 2012.4/4	Rate ↛ non-wage empl	.38	.31	.32	.57	.51	.55	.91	.45
	Non-wage empl ↛ rate	.86	.09	.17	.12	.03	.06	.13	.10
1982.1/4~ 1997.4/4	Rate ↛ non-wage empl	.91	.30	.31	.63	.67	.73	.93	.31
	Non-wage empl ↛ rate	.98	.05	.03	.03	.07	.09	.16	.11
1999.1/4~ 2012.4/4	Rate ↛ non-wage empl	.04	.20	.31	.40	.54	.69	.45	.58
	Non-wage empl ↛ rate	.21	.50	.45	.88	.86	.95	.98	.99
1982.1/4~ 2012.4/4	Rate ↛ manu empl	.05	.23	.02	.03	.02	.04	.06	.03
	Manu empl ↛ rate	.00	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 1997.4/4	Rate ↛ manu empl	.63	.82	.34	.38	.35	.47	.58	.36
	Manu empl ↛ rate	.26	.34	.40	.68	.63	.67	.76	.76
1999.1/4~ 2012.4/4	Rate ↛ manu empl	.01	.16	.07	.09	.10	.19	.22	.19
	Manu empl ↛ rate	.38	.85	.28	.52	.58	.70	.81	.88
1982.1/4~ 2012.4/4	Rate ↛ service empl	.30	.39	.55	.48	.55	.67	.41	.45
	Service empl ↛ rate	.65	.81	.94	.95	.95	.98	.99	.71
1982.1/4~ 1997.4/4	Rate ↛ service empl	.33	.56	.67	.91	.95	.76	.86	.78
	Service empl ↛ rate	.14	.32	.22	.39	.56	.56	.71	.71
1999.1/4~ 2012.4/4	Rate ↛ service empl	.73	.25	.11	.12	.20	.15	.02	.00
	Service empl ↛ rate	.65	.66	.92	.95	.88	.95	.92	.98

Shaded area implies p-value is lower than 5%.

2.3.2 Relationship among Business Cycle, Interest Rate and Employment

It is viewed that business fluctuations can allocate scarce investment funds to more productive sectors and contribute to growth and employment expansion ultimately by way of Schumpeterian creative destruction as marginal enterprises exit during recession periods. On the other hand, it is also viewed that business fluctuations may be harmful to growth and employment expansion since it generates sunken cost in investment during contraction periods. As long as interest rate policy by central banks is to stabilize the economy by minimizing business fluctuations, it can also contribute to employment stability. If we examine the mandates of the U.S. Federal Reserve System, monetary policy is to maintain maximum employment, stable prices, and moderate long-term interest rates. This implies that by maintaining price stability, long-term interest rate can be maintained as low as possible thus achieving maximum employment. After all, central banks can expand employment by maintaining long-term interest rate at a low and stable level through maintaining price stability for long time.

To investigate the effect of interest rate policy on employment, the relationship among the cyclical component of business coincidence index, policy rate and cyclical component of employment using monthly data spanning 1982.7~2012.12 is tested. Firstly, the cross correlation coefficient between the policy rate and business coincidence index is the largest at 0.25 when the business coincidence index is leading the policy rate by 6 to 7 months. This means that the response of the central bank using policy rate was roughly 2 quarters after the business fluctuations. On the other hand, after the Asian currency crisis, the largest cross correlation coefficient is 0.51, twice as large as for the whole period, when the business coincidence index is leading policy rate by 2~4 months. This implies that The Bank of Korea responded to the business cycle much more swiftly and aggressively using interest rate policy after the Asian currency crisis. The positive cross correlation coefficient between the business cycle and interest rate implies that the central bank raised policy rate to cool down inflation pressure during the expansionary phase of the business cycle. In most cases, policy rates were lowered during the contractionary phase, implying The Bank of Korea conducted monetary policy appropriately to react to economic contraction.

Table 3

Cross-correlation Coefficients

Policy Rate and Cyclical Component of Business Coincidence Index							
Lags	Rate, Cyclical Com(*-i*)	Lags	Rate, Cyclical Com(*i*)	Lags	Rate, Cyclical Com(*-i*)	Lags	Rate, Cyclical Com(*i*)
Total Period (1982.7～2012.12)				After Crisis (1999.1～2012.12)			
0	.0835	0	.0835	0	.4213	0	.4213
-1	.1339	+1	.0315	-1	.4814	+1	.3750
-2	.1738	+2	-.0164	-2	.5111	+2	.3105
-3	.2036	+3	-.0550	-3	.5157	+3	.2380
-4	.2257	+4	-.0824	-4	.5056	+4	.1679
-5	.2394	+5	-.1038	-5	.4885	+5	.1098
-6	.2470	+6	-.1178	-6	.4644	+6	.0649
-7	.2466	+7	-.1244	-7	.4315	+7	.0275
-8	.2395	+8	-.1233	-8	.3886	+8	.0003
-9	.2300	+9	-.1163	-9	.3399	+9	-.0225
Cyclical Components of Employment and Business Coincidence Index							
Lags	Employment, Cyclical Com(-*i*)	Lags	Employment, Cyclical Com(*i*)	Lags	Employment, Cyclical Com(*-i*)	Lags	Employment, Cyclical Com(*i*)
Total Period (1982.7～2012.12)				After Crisis (1999.1～2012.12)			
0	.6238	0	.6238	0	.5548	0	.5548
-1	.6157	+1	.6108	-1	.5038	+1	.5074
-2	.5951	+2	.5739	-2	.4242	+2	.4422
-3	.5599	+3	.5139	-3	.3373	+3	.3640
Policy Rate and Cyclical Component of Employment							
Lags	Rate, Empl (*-i*)	Lags	Rate, Empl (*i*)	Lags	Rate, Empl (*-i*)	Lags	Rate, Empl (*i*)
Total Period (1982.7～2012.12)				After Crisis (1999.1～2012.12)			
0	.0634	0	.0634	0	.0959	0	.0959
-1	.0179	+1	.1083	-1	.1066	+1	.1590
-2	-.0188	+2	.1393	-2	.1307	+2	.1955
-3	-.0593	+3	.1678	-3	.1391	+3	.2119
-4	-.0912	+4	.2019	-4	.1396	+4	.2177
-5	-.1153	+5	.2282	-5	.1381	+5	.2159
-6	-.1373	+6	.2460	-6	.1315	+6	.2062
-7	-.1606	+7	.2518	-7	.1387	+7	.1969
-8	-.1761	+8	.2536	-8	.1508	+8	.1800
-9	-.2003	+9	.2508	-9	.1500	+9	.1560
-10	-.2163	+10	.2450	-10	.1487	+10	.1285
-11	-.2229	+11	.2412	-11	.1361	+11	.0985
-12	-.2145	+12	.2298	-12	.1252	+12	.0676
-13	-.2123	+13	.2109	-13	.1098	+13	.0357

Shaded area implies p-value is lower than 5%.

Secondly, it turns out that the cyclical component of the business coincidence index and cyclical component of employment move together without time lags[10] with the cross correlation coefficient being 0.62 for the whole period and 0.55 for the period after the Asian currency crisis. In most cases, employment increased during the expansion period, while it contracted during the recession period of business cycle.

Thirdly, in case of the relationship between interest rate and the cyclical component of employment, interest rate leads employment by 7~9 months with the cross correlation coefficient of 0.25 during the whole period, while interest rate leads 3~5 months with the cross correlation coefficient of 0.22 after the currency crisis. This result can be interpreted as follows: when the economy starts to expand, employment begins to increase and central bank reacts by raising the policy rate after 1~2 quarters. Subsequently, expansion of employment decelerates after 2~3 quarters following the rise in interest rates. As a result, the cross correlations coefficient between employment and interest rates is positive, albeit magnitude is small.[11]

Finally, as central bank's interest rate policy is implemented in such a way to achieve the price target, the study also analyses the relationship between the cyclical component of the business coincidence index and inflation rate (CPI, year-over-year). We find that the business cycle leads the inflation rate by 9~10 months for the whole period and by 6~8 months for the period after the currency crisis. The magnitude of cross-correlation is 0.31 and 0.53 respectively, implying that the relationship between the business cycle and the inflation rate became stronger after the currency crisis. The sequence can be analyzed as follows: when the business cycle moves in the expansionary stage, employment expands, price then rises after 2~3 quarters after the expansion in employment prompting the central bank to preemptively raise the policy rate approximately 1 quarter before price increases. Thus, employment expansion is affected 1~2 quarters after the implementation of a higher policy rate. This finding shows that interest rate policy by the central bank to stabilize the business cycle has a significant impact on employment.

[10] Business coincidence composite index includes non-farm employment.
[11] Caution is needed to interpret the relationship between policy rate and cyclical component of employment as the cross correlation coefficient is small for both periods of total and after the Asian currency crisis.

Table 4
Cross-correlation Coefficients between CPI Rate and Business Coincidence Index

CPI Rate and Cyclical Component of Business Coincidence Index							
Lags l	Price, Cyclical Com(-l)	Lags l	Price, Cyclical Com(l)	Lags l	Price, Cyclical Com(-l)	Lags l	Price, Cyclical Com(l)
Total Period (1982.7～2012.12)				After Crisis (1999.1～2012.12)			
0	-.0492	0	-.0492	0	.0719	0	.0719
-1	.0027	+1	.-0964	-1	.1663	+1	-.0413
-2	.0546	+2	-.1339	-2	.2515	+2	-.1417
-3	.1048	+3	-.1632	-3	.3337	+3	-.2325
-4	.1543	+4	-.1849	-4	.4130	+4	-.3213
-5	.2000	+5	-.2001	-5	.4822	+5	-.4033
-6	.2389	+6	-.2031	-6	.5230	+6	-.4621
-7	.2670	+7	-.1944	-7	.5260	+7	-.4883
-8	.2880	+8	-.1780	-8	.5201	+8	-.4791
-9	.3009	+9	-.1585	-9	.4989	+9	-.4496
-10	.3055	+10	.-1378	-10	.4756	+10	-.4098
-11	.2972	+11	-.1194	-11	.4399	+11	-.3578

Shaded area implies p-value is lower than 5%.

2.3.3 Asymmetric Effect of Interest Rate Policy on Cyclical Employment

Monetary policy is generally considered to be effective in cooling an over-heated economy but its potency is limited for boosting a depressed economy.[12] In other words, the effect of monetary policy appears asymmetric between contractionary policy and expansionary policy and this asymmetry can be amplified when the financial market is unstable in particular. For example, when central banks conduct contractionary monetary policy under the circumstance of unstable financial market due to, for example, a financial crisis, credit availability of banks shrinks significantly (credit crunch) and borrowing cost of households and firms increases markedly. The contractionary effect, therefore, is accelerated. On the other hand, under a similar circumstance, when central banks try to supply liquidity to the financial market through expansionary monetary policy, banks are reluctant to extend loans to households and firms because of heightened credit risk. The transmission mechanism of expansionary monetary policy thus breaks down.

In this paper, in order to analyze the asymmetric effect of monetary policy on employment, monetary policy is divided into expansionary and contractionary periods. Using Korean data spanning 1982.1/4~2012.4/4[13], causality tests reveal that policy rate affects cyclical employment during the contraction period more than the expansion period. It is also found that cyclical employment affects the policy rate to a large degree for both contraction and expansion periods. This implies that there exists a feedback channel between interest rate and employment (cyclical component) and it can therefore be said that The Bank of Korea takes into consideration employment in conducting monetary policy.

[12] Karras (1996) found the effect of contractive monetary policy is stronger than that of expansionary monetary policy.

[13] To look into the effect of interest rate policy during the financial instability period, i.e., after the Asian currency crisis, the period includes 1998.1/4~1998.4/4.

Table 5

Comparisons between Expansion and Contraction Periods

Period	Null Hypothesis	p-value							
		Lag =1	2	3	4	5	6	7	8
Policy Rate (Differenced; Expansion Period)									
1982.1/4~ 2012.4/4	Rate ↛ Employment	.00	.09	.30	.52	.83	.83	.92	.85
	Employment ↛ rate	.41	.00	.00	.00	.00	.00	.00	.00
1982.1/4~ 1997.4/4	Rate ↛ Employment	.52	.65	.81	.93	.97	.99	1.00	.35
	Employment ↛ rate	.73	.73	.90	.96	.85	.85	.81	.67
1998.1/4~ 2012.4/4	Rate ↛ Employment	.00	.01	.00	.00	.00	.00	.00	.00
	Employment ↛ rate	.05	.19	.02	.06	.03	.01	.06	.01
Policy Rate (Differenced; Contraction Period)									
1982.1/4~ 2012.4/4	Rate ↛ Employment	.01	.07	.11	.12	.24	.36	.50	.15
	Employment ↛ rate	.02	.02	.05	.06	.04	.02	.05	.05
1982.1/4~ 1997.4/4	Rate ↛ Employment	.18	.10	.22	.45	.53	.55	.37	.05
	Employment ↛ rate	.25	.08	.08	.14	.58	.63	.60	.70
1998.1/4~ 2012.4/4	Rate ↛ Employment	.00	.01	.05	.07	.02	.01	.00	.01
	Employment ↛ rate	.66	.00	.00	.00	.00	.00	.00	.00

Shaded area implies p-value is lower than 5%.

3. Empirical Model and Result

3.1 VAR Model

The VAR Model utilizes the policy rate and employment (total workers, wage and non-wage workers, manufacturing and services industry workers). To control other channels that influence employment besides the interest rate channel, aggregate demand (GDP) which affects employment most is included. The exchange rate (real effective exchange rate, BIS) and oil price (Dubai, IMF) are also included in the model to reflect the high degree of openness of the Korean economy as well as external supply shocks. To cater for external shock, oil price is included as an exogenous variable. Furthermore, price (CPI) is added to the model as an endogenous variable since when employment expands, aggregate demand is also expected to increase. This will also lead to an increase in price that may eventually force the central banks to react by raising policy rate. But if price rises by a relatively large margin, an increase in economic uncertainty is expected, leading to the possibility of a contraction in economic growth and employment. In this regard, there exists a close relationship among price, interest rate and employment.[14]

[14] Granger causality tests between price and employment reveal that changes in employment affect changes in price for the whole period while changes in price influence changes in employment for the period of the aftermath of the Asian currency crisis only (results are not presented).

With the above factors in mind, the final VAR model consists of variables, with the respective sequencing, of the exchange rate, aggregate demand, price, employment, policy rate. Oil price is included as an exogenous variable.[15] The reason the price variable is inserted after the aggregate demand variable is that the time lag of price (3~8 quarters) is usually longer than the time lag for aggregate demand (2~6 quarters) in the transmission effect of monetary policy (The Bank of Korea, 2005). Every variable except interest rate variable is deseasonalized and logged. The data set comprises 1982.1/4~2012.4/4 for the whole period and 1998.1/4~2012.4/4 for the aftermath of Asian currency crisis period.

Before estimating VAR model, unit root tests and cointegration tests are conducted. The tests show that all the variables have unit roots but the 1st differenced variables appear to be stationary. In addition, there does not exist any cointegrating relation among endogenous variables. Therefore, all endogenous and exogenous variables included in the VAR model are 1st differenced. The optimal lag of the model is 2 (two), based on the Akaike Information Criterion (AIC) and Schwartz Information Criterion (SIC) with the exogenous variable, oil price, at 2 (two) as well.

Table 6
Result of Unit Root Tests

Variables	Level		Difference	
	t-statistic	p-value	t-statistic	p-value
Exchange rate (ex)	-3.13	0.11	-8.82	.00
Aggregate demand (y)	-1.72	0.73	-10.81	.00
Price (p)	-0.36	0.99	-7.13	.00
Total employment (e^t)	-1.68	0.76	-9.04	.00
Wage workers (e^w)	-2.18	0.50	-7.05	.00
Non-wage workers (e^{nw})	-0.98	0.94	-9.51	.00
Manufacturing sector employment (e^m)	-2.75	0.22	-5.55	.00
Service sector employment (e^s)	-0.38	0.99	-5.02	.00
Interest rate (r)	-2.65	0.26	-9.14	.00
Oil price (oil)	-1.73	0.73	-7.58	.00

[15] Data sourced from “GDP and Policy Interest Rate,” The Bank of Korea and “CPI and Employment,” Statistics Korea.

3.2 Result of Impulse Response

Firstly, the analyses of impulse response functions indicated that total employment declined approximately 0.2%[16] after 2 quarters by one standard deviation positive shock[17] and then recovered slowly to the previous level after 2 years in case of the whole period (1982.1/4~2012.4/4) (see Figures 1~6 in the Appendix). For the period after the Asian currency crisis (1998.1/4~2012.4/4), total employment dropped more than 0.4%, twice as much as the case for the whole period. During the period of interest rate increase, total employment declined 0.2% and 0.4% for the whole and after the crisis period, respectively, while during the period of interest rate decline, total employment increased more than 0.2% for the period after crisis but it was insignificant for the whole period.[18] The impact of interest rate shock on total employment, therefore, appeared bigger in the period after crisis than the whole period. This is consistent with the fact that the influence of interest rate has become stronger since it has been used as a primary policy tool after the adoption of inflation targeting by The Bank of Korea in early 1998. In particular, the effect of the rise in interest rate during economic contraction is twice as much as the effect of reduction in interest rate during economic expansion, which supports the hypothesis that the effect of interest rate is indeed asymmetric. The implication is that in order to utilize interest rate policy to support employment, it is desirable to manage interest rate in a stable manner near the long-term neutral level.[19]

Secondly, when total employment is divided into wage and non-wage workers, the function showed that wage workers shrank by 0.4% after 2 quarters with a one standard deviation shock for the whole period, and recovered quickly until 4 quarters. It then recovered slowly the previous level after 10 quarters (see Figure 7~18 in the Appendix). On the other hand, it turned out insignificant for non-wage workers. For the case after the crisis period, wage workers dropped 0.8%, or twice as much as for the whole period, while non-wage workers appeared insignificant for the whole period. Meanwhile, when interest rate rises, wage workers declined by 0.4% and 0.6% for the whole period and after the crisis period, respectively, while in the case of a decrease in interest rate, wage workers increased by 0.25% and 0.5%, respectively. However, for non-wage workers, all results were insignificant. Thus, we can conclude that the impact of the policy rate was realized entirely through wage workers and appeared bigger in the period after the crisis than during the whole period. In addition, the effect of interest rate increase during economic contraction was estimated to be larger than that of a decrease in interest rate during expansion for both periods. This observation is consistent with the case of total employment.

[16] According to Modeste and Mustafa (2002), a 1% rise in the federal fund rate increased unemployment by 0.3% in the US.
[17] Standard deviation of policy rate is 1.7% for total period, 2.0% for the period after Asian currency crisis.
[18] As impulse response for the period of interest decline is also the result of positive shock of policy rate, it can be interpreted as expansion of employment considering symmetric effect.
[19] Neutral rate means interest rate level of maintaining potential growth rate without inflationary or deflationary pressures.

Thirdly, when total employment is divided into manufacturing sector and service sector, analyses of the impulse response functions showed that employment in the manufacturing sector shrank by 0.6% after 2 quarters with a one standard deviation shock for the whole period. It then recovered quickly for 5 quarters before slowly reaching the level prior to interest shock, after 3 years. In the case of employment in service sector, it was insignificant[20] (see Figure 19~30 in Appendix). For the crisis period, employment of the manufacturing sector declined 0.8%, larger than for the whole period, while that of the service sector was insignificant. During the period of interest rate rise, employment of the manufacturing sector declined by 0.6~0.7% both for the period of the whole and after the crisis. On the other hand, employment of the service sector appeared to be insignificant for both periods. For a decrease in interest rate, employment in the manufacturing sector increased 0.4% and 0.6% for the whole and after crisis periods, respectively, while for the service sector, the effect was insignificant. This implies that the effect of interest rate shock was realized entirely through employment in the manufacturing sector and the effect was estimated to be bigger after the crisis period than the whole period. Furthermore, the effect of interest rate increase during economic contraction appeared larger than that of the decrease in interest rate during economic expansion for both periods.

The reason that wage workers and employment in manufacturing sector responded significantly in contrast to non-wage workers and employment in the service sector is that there are more wage workers employed in the manufacturing sector than in the service sector. In addition, when exports contract during exchange rate appreciation as a result of interest rate increase, the effect of reduced employment is primarily realized through the manufacturing sector that produces tradable goods. In this regard, one may need to ensure that the exchange rate does not appreciate too much in case of a policy rate hike for employment stability.

Fourthly, using the cyclical component of employment, it was estimated the effect of policy rate with a one standard deviation positive shock was insignificant for the whole period, while the cyclical employment declined significantly by 0.4% after crisis period (see Figure 31~36 in the Appendix).[21] During the period of interest rate rise, cyclical employment dropped 0.4% and 0.6% for the whole and after crisis periods, respectively. On the other hand, the effect of a decrease in interest rate for both the whole and after crisis periods was insignificant.[22] This implies that the effect of interest rate shock on cyclical employment, like the case of total employment and manufacturing sector employment, appeared to be larger during the period after crisis than the whole period. We can also conclude that the impact of contractionary interest rate policy on cyclical employment was larger than that of expansionary policy for both periods. The summary of the results can be found in Table 7.

[20] In the US, interest rate influenced unemployment of durables manufacturing sector 3 times more than unemployment of services sector (Williams, 2004).
[21] The optimal lag is 3 for the case of the cyclical component of employment.
[22] The result of the impulse response is different from that for the Granger causality tests (see Table 5).

Table 7

Summary Result of Impulse Response

	Interest Rate*	Total Period (1982.1/4~2012.4/4)	After Asian Currency Crisis (1998.1/4~2012.4/4)
Total Employment	0	-0.2% (after 2 quarters)	-0.4% (after 2 quarters)
	+	-0.2% (after 2 quarters)	-0.4% (after 2 quarters)
	–	Insignificant	+0.2% (after 2 quarters)
Wage workers	0	-0.4% (after 2 quarters)	-0.8% (after 2 quarters)
	+	-0.4% (after 2 quarters)	-0.6% (after 2 quarters)
	–	+0.25% (after 3 quarters)	+0.5% (after 2 quarters)
Non-wage workers	0	Insignificant	Insignificant
	+	Insignificant	Insignificant
	–	Insignificant	Insignificant
Manufacturing sector employment	0	-0.6% (after 2 quarters)	-0.8% (after 2 quarters)
	+	-0.6 (after 2 quarters)	-0.7% (after 2 quarters)
	–	+0.4% (after 3 quarters)	+0.6% (after 2 quarters)
Service sector employment	0	Insignificant	Insignificant
	+	Insignificant	Insignificant
	–	Insignificant	Insignificant
Cyclical component of employment	0	Insignificant	-0.4% (after 2 quarters)
	+	-0.4% (after 4 quarters)	-0.6% (after 3 quarters)
	–	Insignificant	Insignificant

*0 refers to positive shocks of interest rate; + refers to positive shocks of interest rate on the rise (during the contraction periods); and – refers to positive shocks of interest rate on the decline (during the expansion periods).

4. Summary and Policy Implications

Based on the analytical results of the impulse response functions, we can conclude that the interest rate policy of The Bank of Korea is effective for stabilizing and expanding employment, directly contributing to inclusive growth. In particular, this effect became larger and quicker after the Asian currency crisis. Interest rate policy is estimated to have a bigger impact on the cyclical component of employment than on total employment particularly during the contraction period, which supports the view that monetary policy is most effective for fine-tuning the economy compared to changing the trend of economic growth and employment. Our results show that most of the interest rate impact on employment is realized through wage workers and manufacturing sector employment. We also note that the shrinking effect of employment as a

result of increasing interest rate is estimated to be bigger than the expanding effect of employment by the lowering of interest rate.

Based on the above, we can draw a few major policy implications. The asymmetric effect of interest rates on employment implies that it is essential to reduce the volatility of the policy rate and maintain interest rate at a long-term neutral level for a prolonged period in order to stabilize and expand employment. In fact, with references to the Fed mandates on price stability and maintaining long-term interest rate at appropriate level, it is necessary to manage long-term nominal interest rate at low and neutral levels. In this regard, the Fed mandates support our policy implications. In any case, price stability is a prerequisite for employment stability, higher employment and inclusive growth.

In particular, it is necessary to ensure that the exchange rate does not appreciate too much, to avoid its over-shooting when interest rates are on the rise in order to reduce the volatility of manufacturing sector employment. This is because a rise in interest rates will result in exchange rate appreciation and both variables would subsequently reinforce one other to adversely impact manufacturing sector employment.

Although these policy implications are drawn from the case of the Korean economy, they can most likely be also applicable for most SEACEN economies as these economies are exported-oriented and where the asymmetric effect of monetary policy is a well-known fact.

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Appendix

Figure 1
Response of DLTOTALEMPLOY_SA to DCALLRATE Innovation
(Total Period)

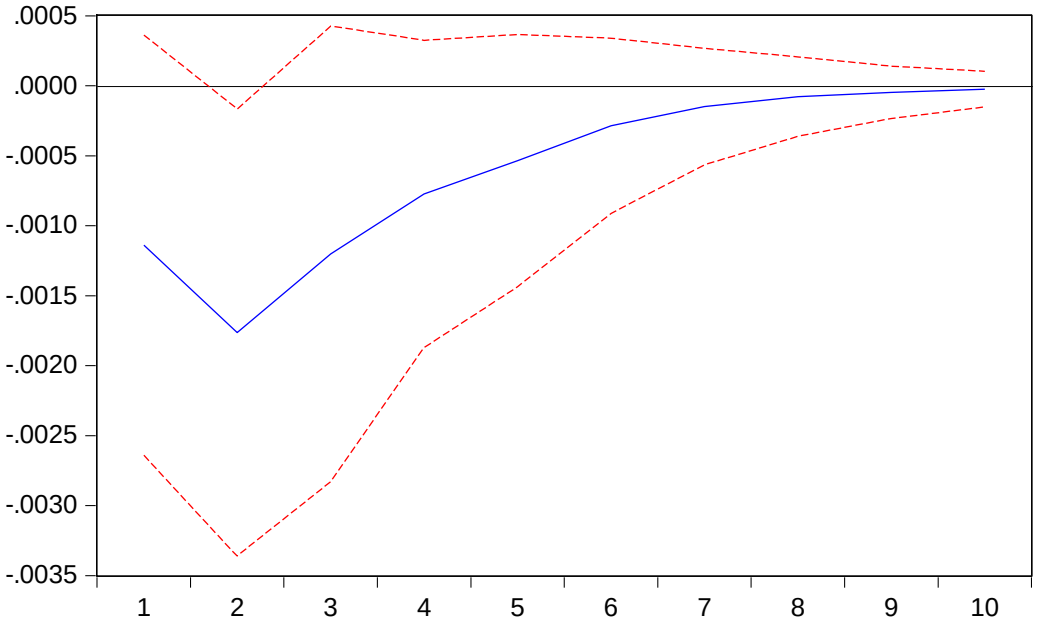

Figure 2
Response of DLTOTALEMPLOY_SA to DCALLRATE Innovation
(After Crisis)

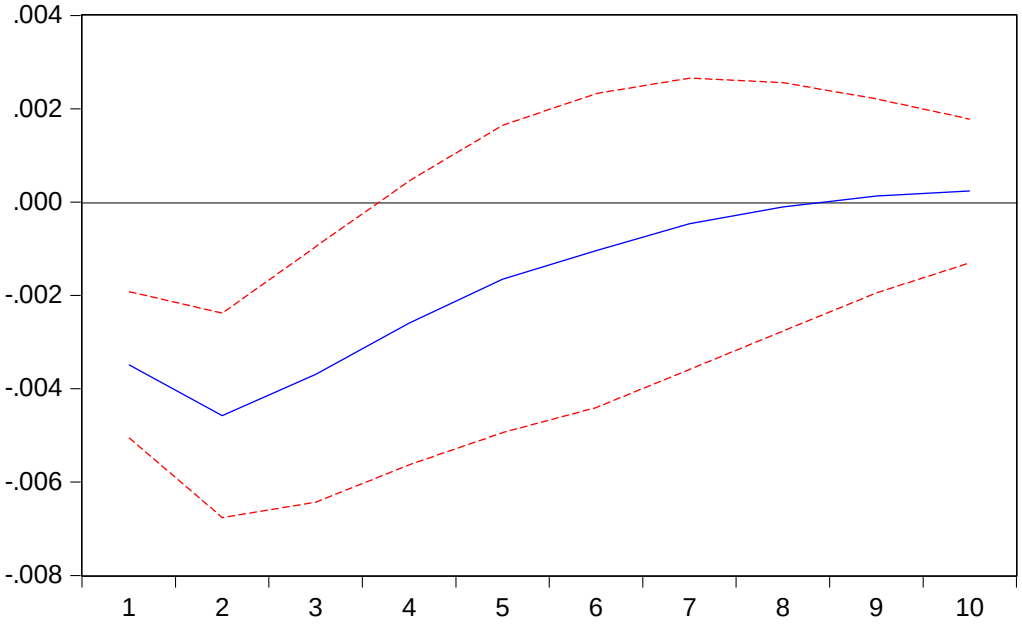

Figure 3
Response of DLTOTALEMPLOY_SA to DCALLRATEPLUS Innovation
(Total Period)

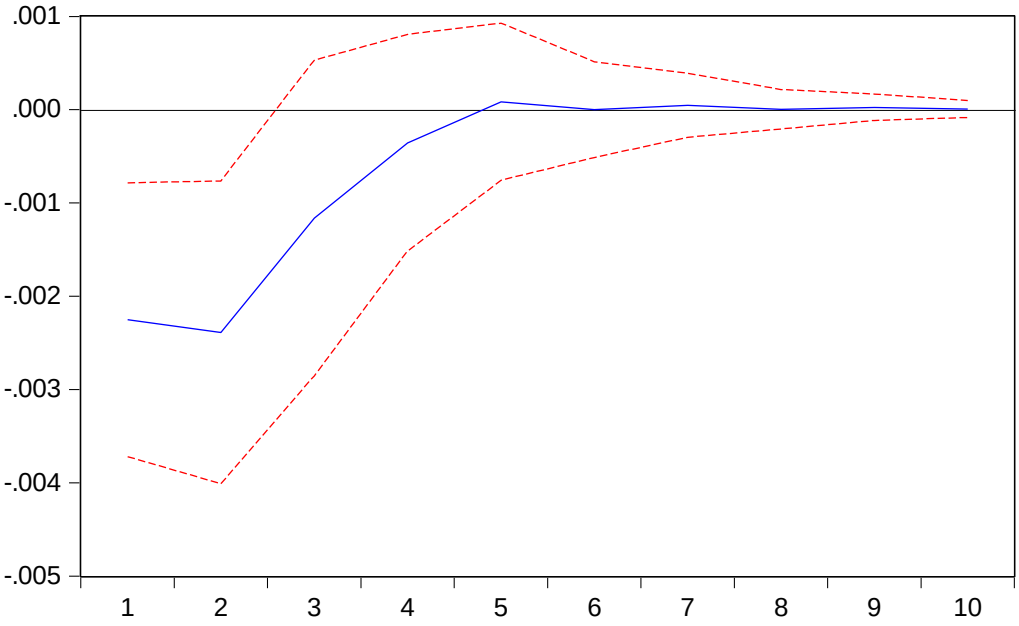

Figure 4
Response of DLTOTALEMPLOY_SA to DCALLRATEPLUS Innovation
(After Crisis)

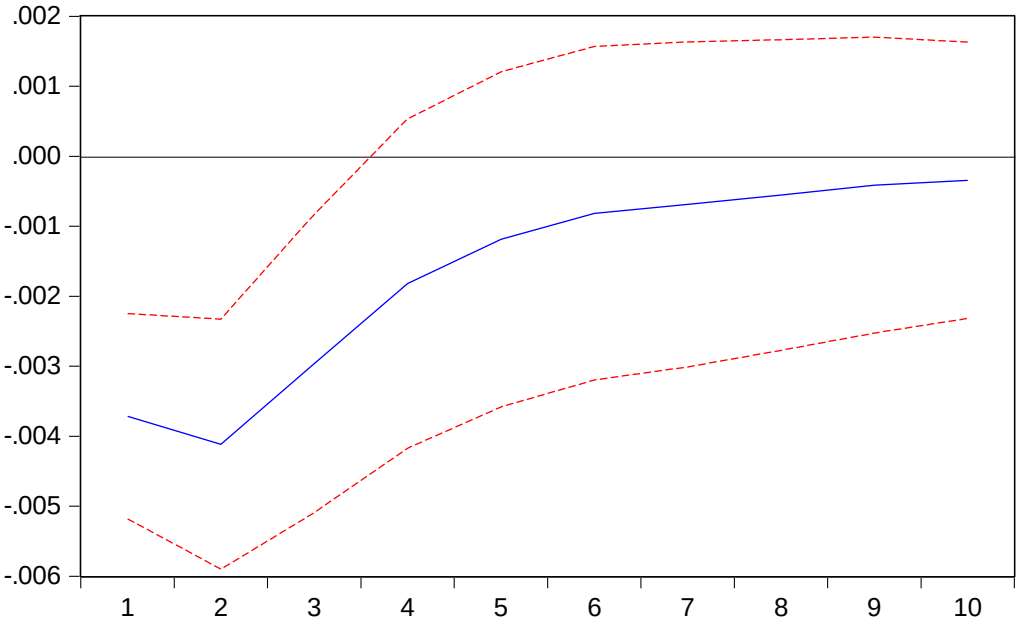

Figure 5
Response of DLTOTALEMPLOY_SA to DCALLRATEMINUS Innovation
(Total Period)

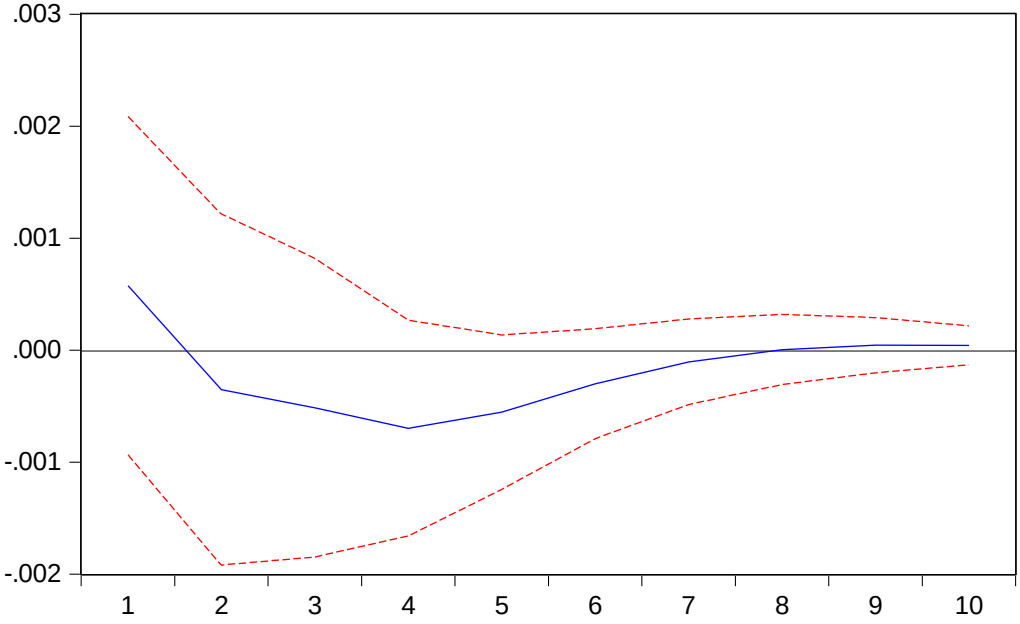

Figure 6
Response of DLTOTALEMPLOY_SA to DCALLRATEMINUS Innovation
(After Crisis)

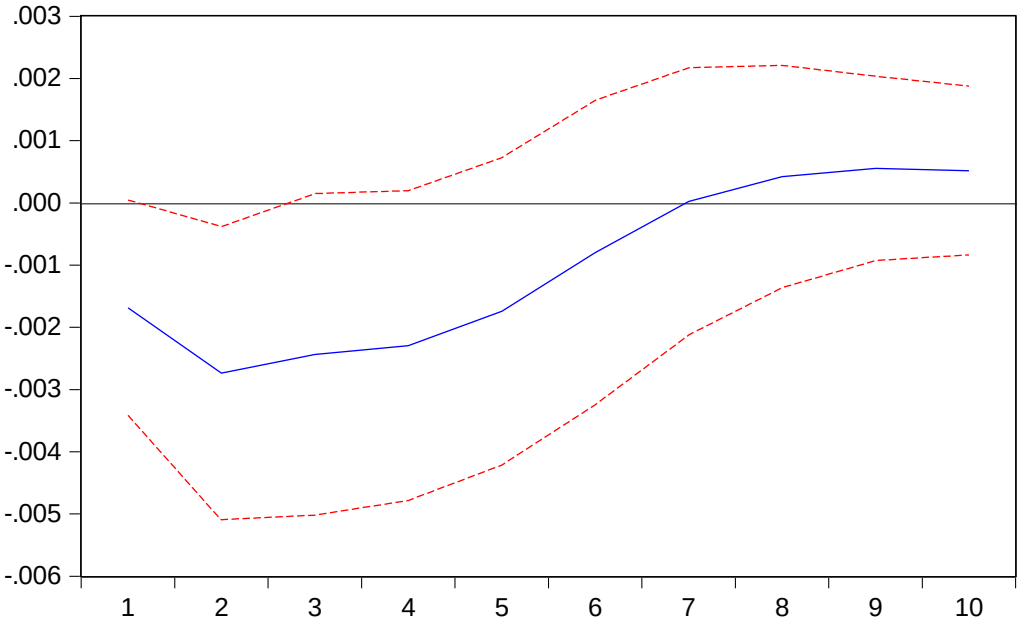

Figure 7
Response of DLWAGEEMPLOY_SA to DCALLRATE Innovation
(Total Period)

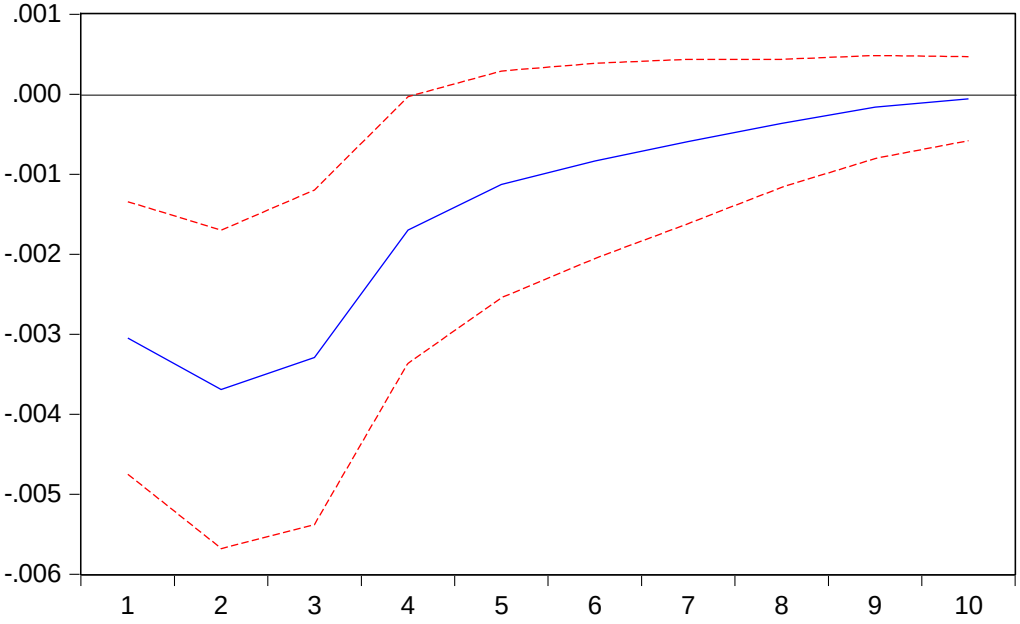

Figure 8
Response of DLNONWAGEEMPLOY_SA to DCALLRATE Innovation
(Total Period)

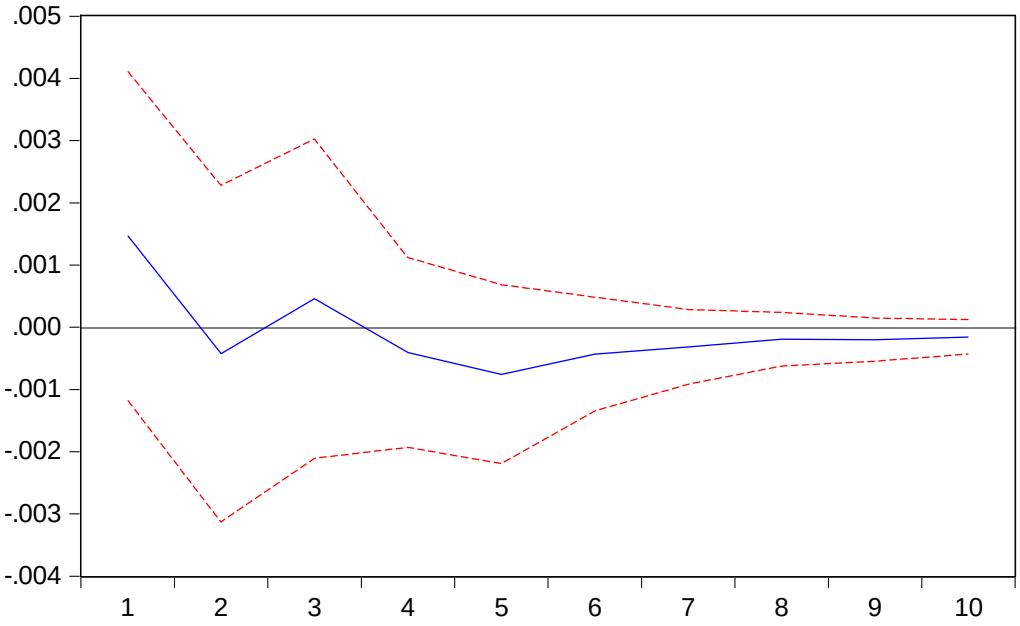

Figure 9
Response of DLWAGEEMPLOY_SA to DCALLRATE Innovation
(After Crisis)

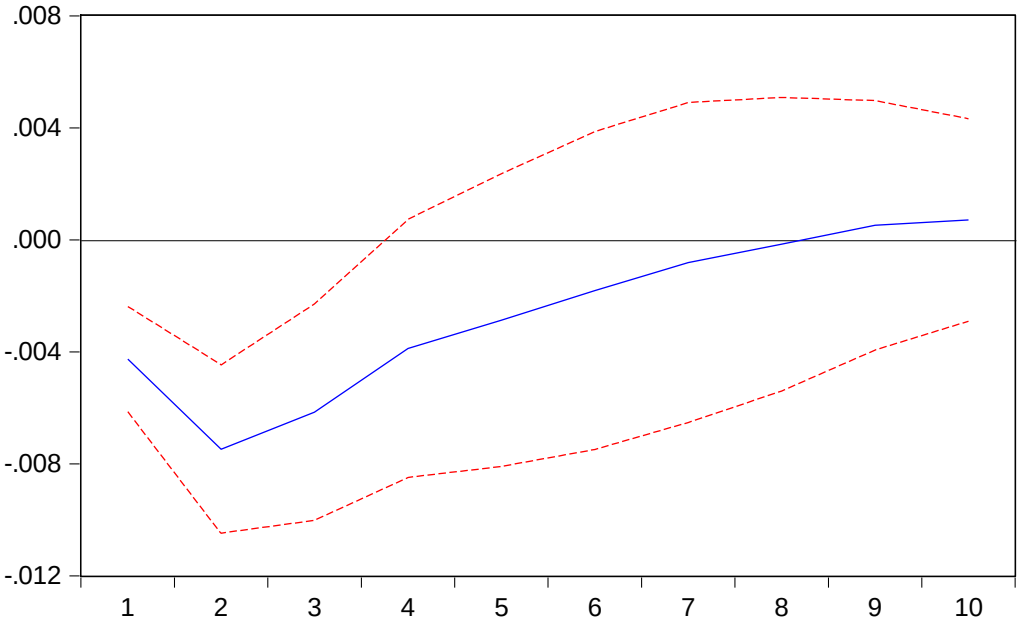

Figure 10
Response of DLNONWAGEEMPLOY_SA to DCALLRATE Innovation
(After Crisis)

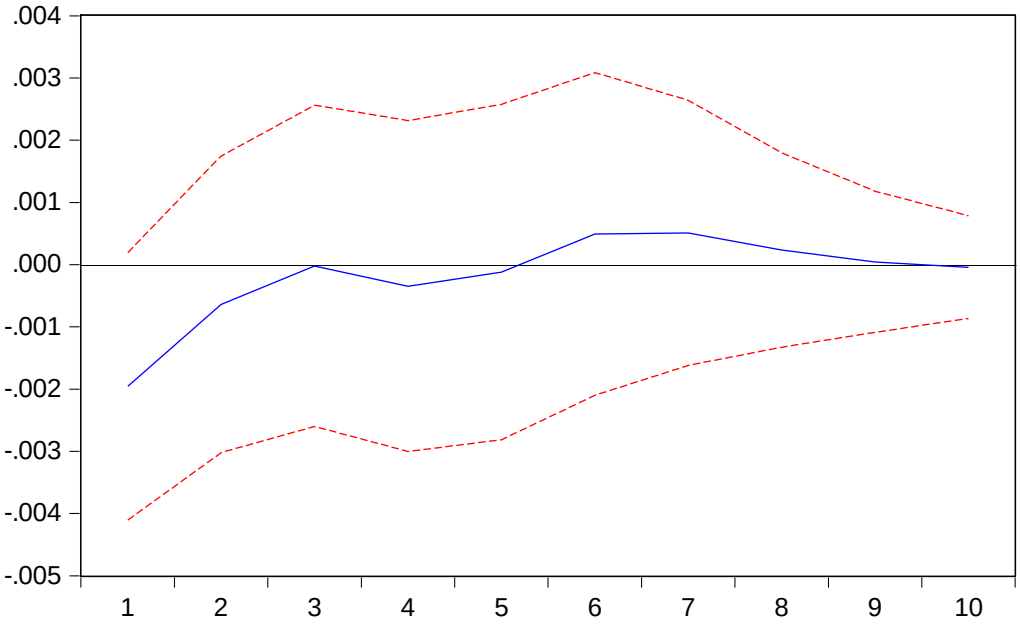

Figure 11
Response of DLWAGEEMPLOY_SA to DCALLRATEPLUS Innovation
(Total Period)

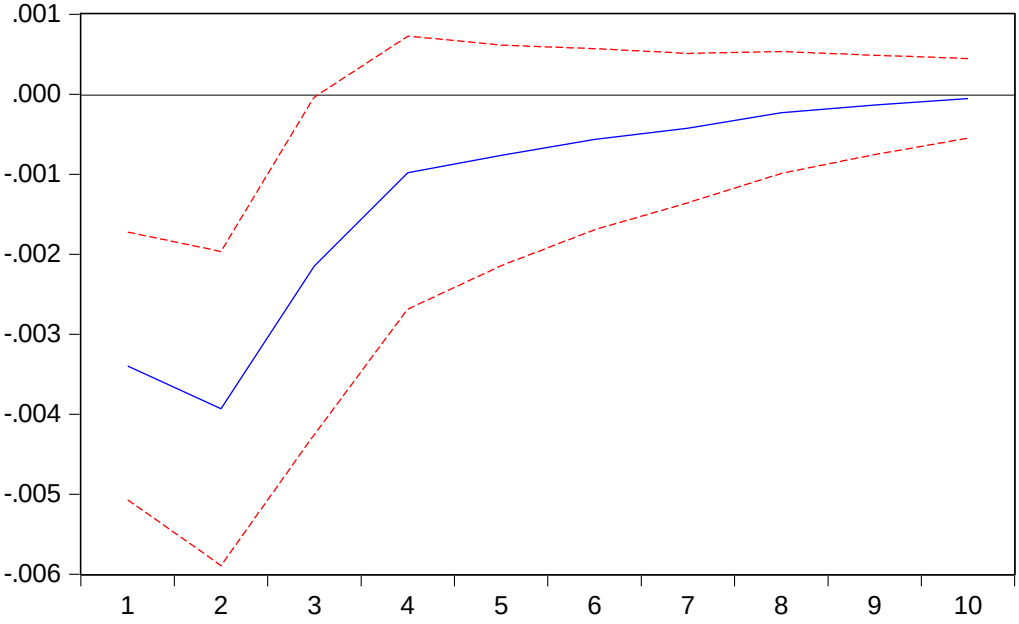

Figure 12
Response of DLWAGEEMPLOY_SA to DCALLRATEPLUS Innovation
(After Crisis)

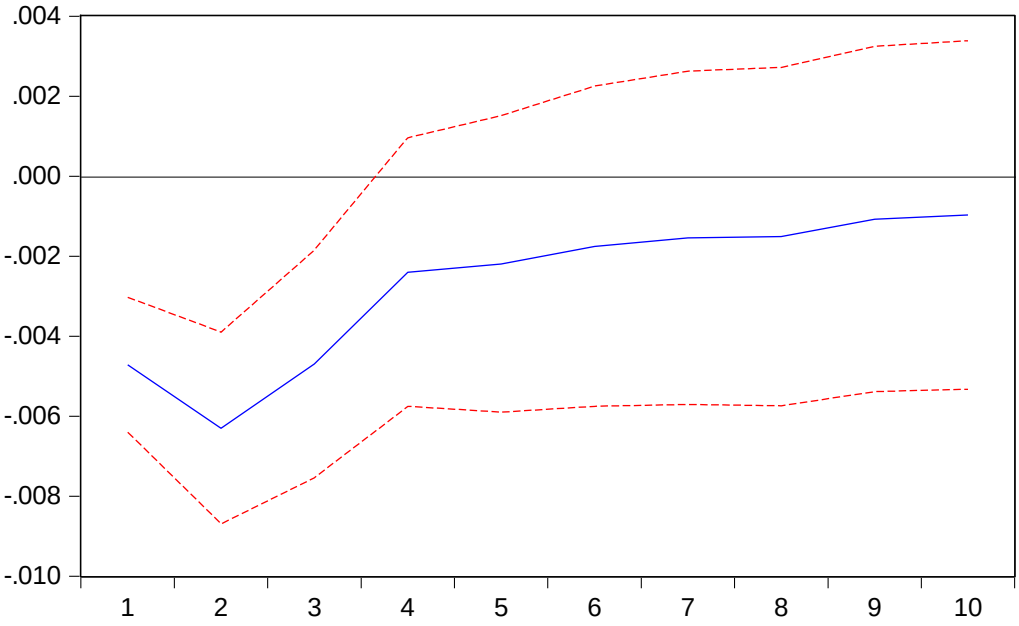

Figure 13
Response of DLWAGEEMPLOY_SA to DCALLRATEMINUS Innovation
(Total Period)

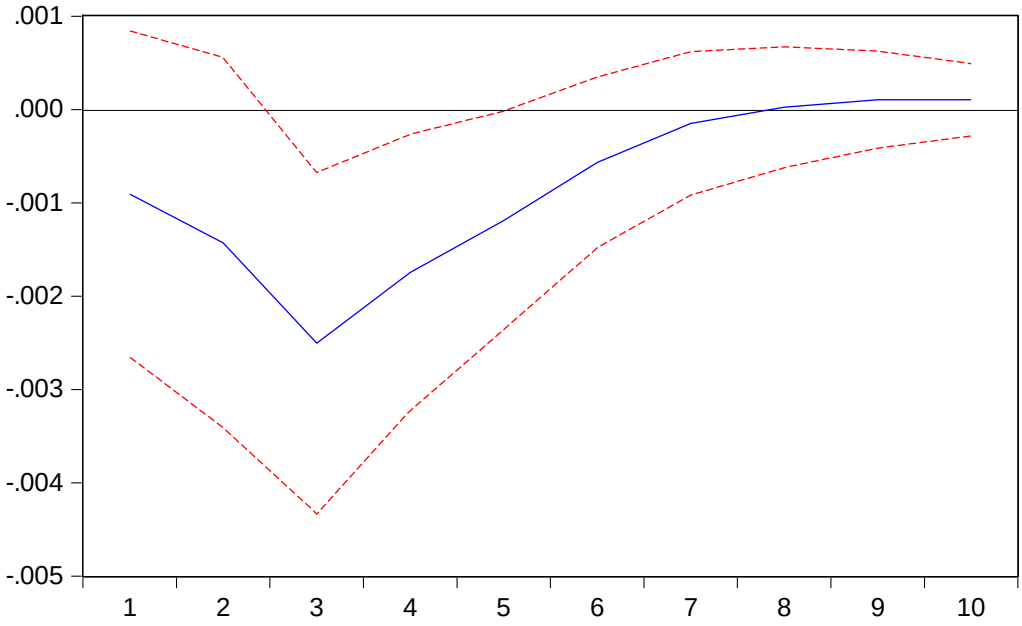

Figure 14
Response of DLWAGEEMPLOY_SA to DCALLRATEMINUS Innovation
(After Crisis)

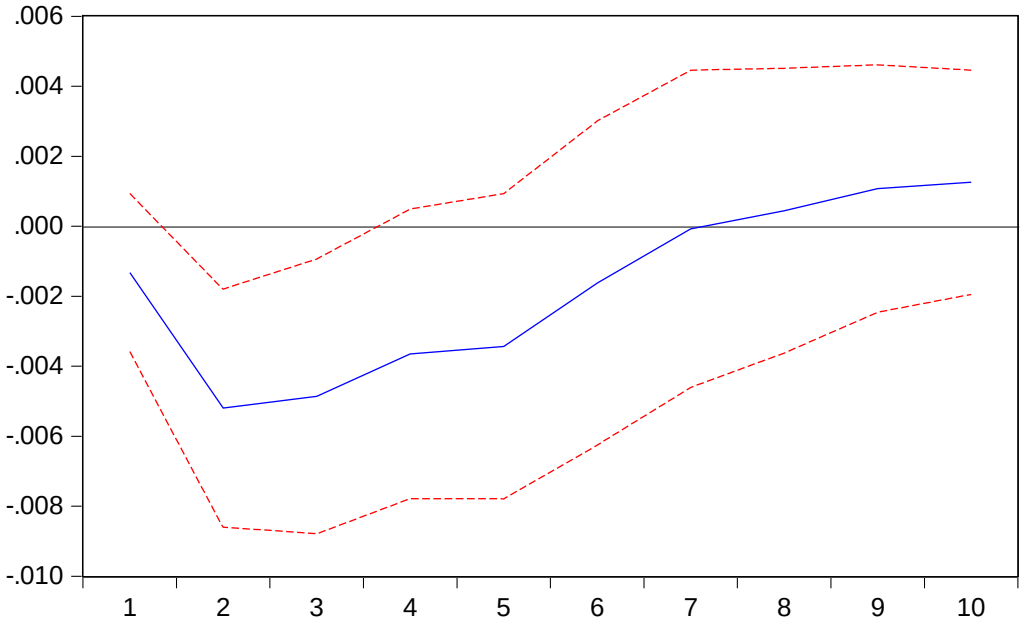

Figure 15
Response of DLNONWAGEEMPLOY_SA to DCALLRATEPLUS Innovation
(Total Period)

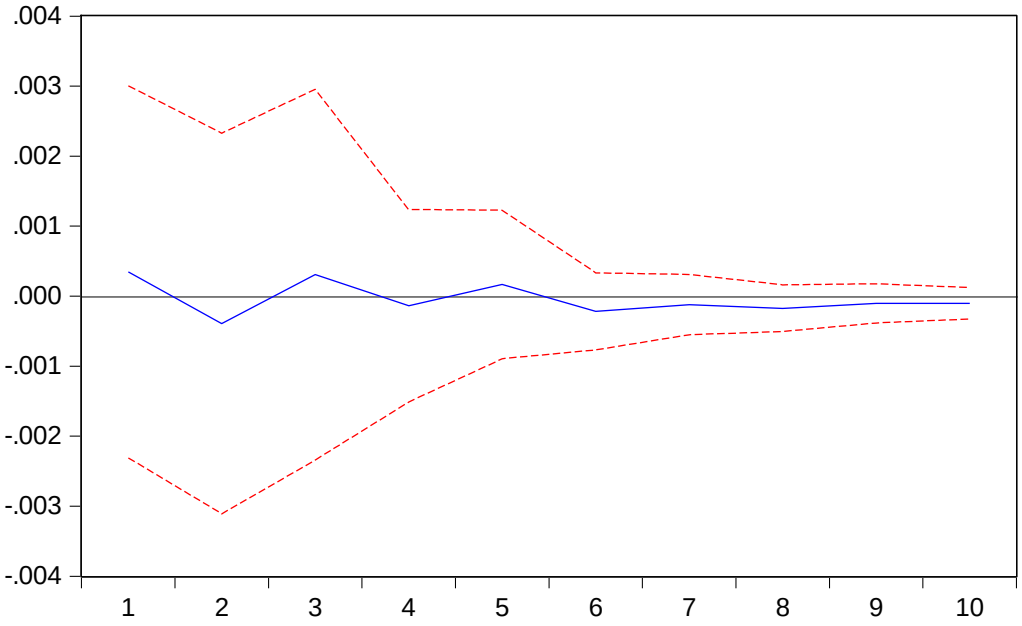

Figure 16
Response of DLNONWAGEEMPLOY_SA to DCALLRATEPLUS Innovation
(After Crisis)

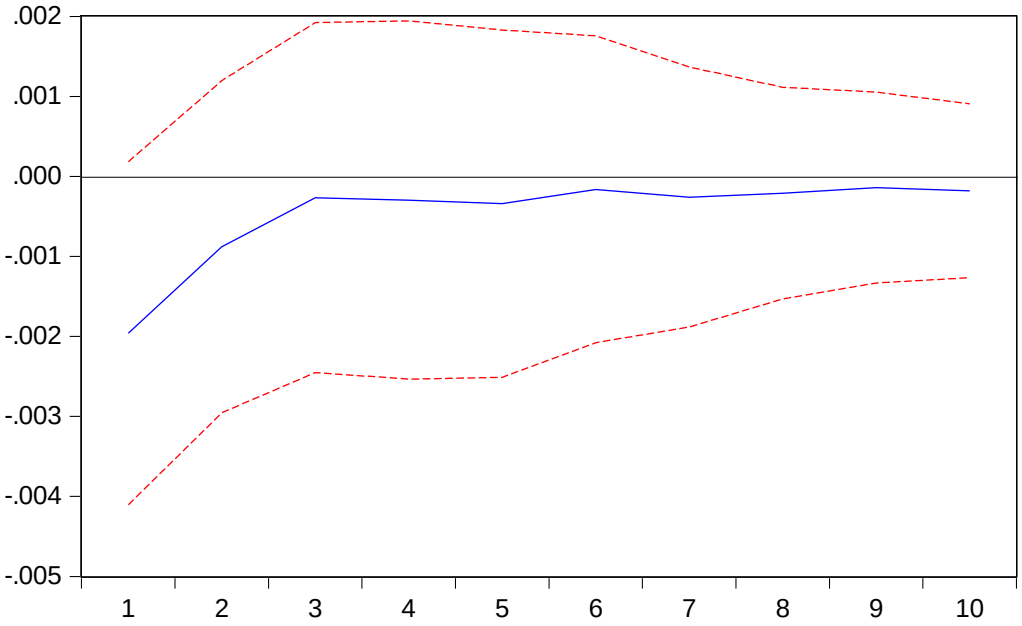

Figure 17
Response of DLNONWAGEEMPLOY_SA to DCALLRATEMINUS Innovation
(Total Period)

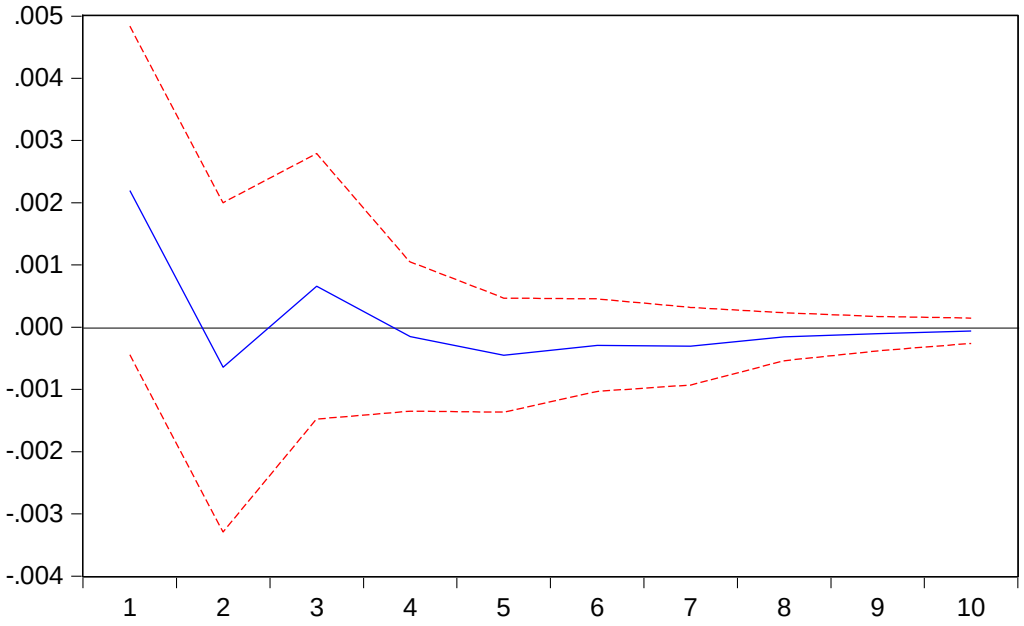

Figure 18
Response of DLNONWAGEEMPLOY_SA to DCALLRATEMINUS Innovation
(After Crisis)

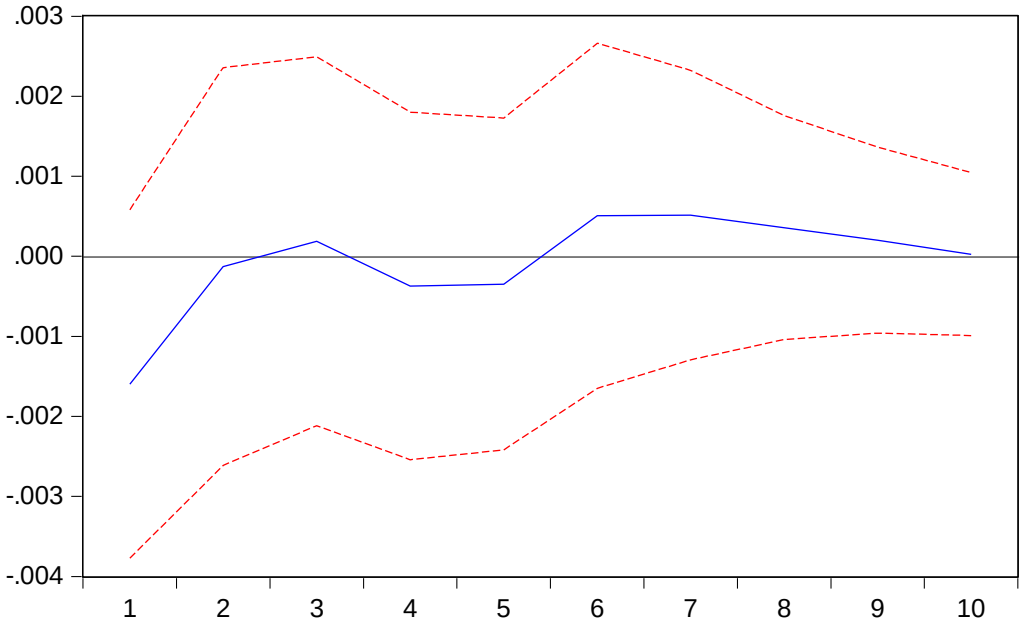

Figure 19
Response of DLMANUFAC_SA to DCALLRATE Innovation
(Total Period)

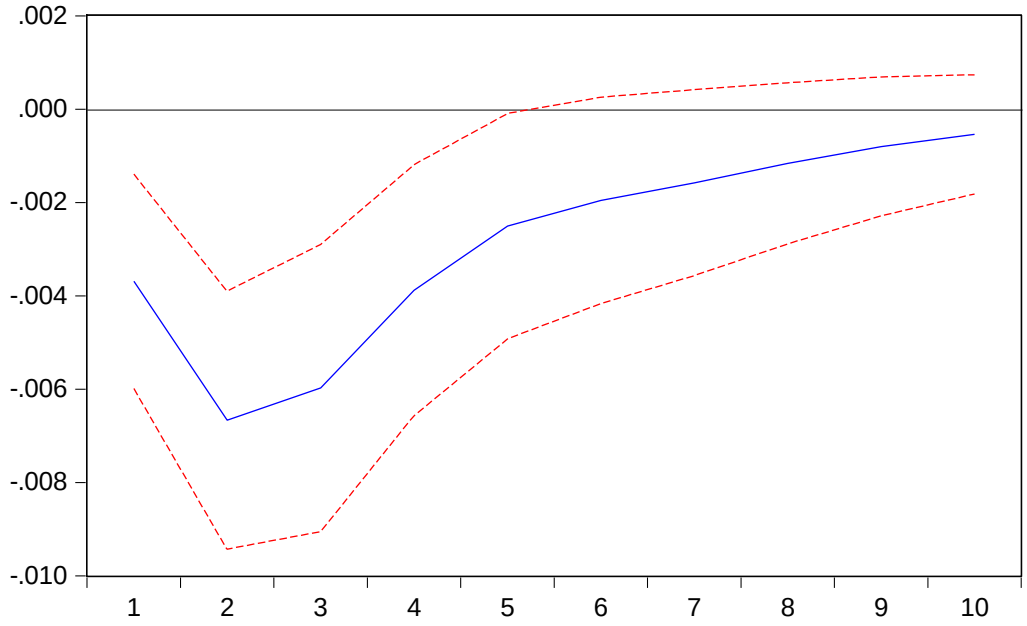

Figure 20
Response of DLSERVICES_SA to DCALLRATE Innovation
(Total Period)

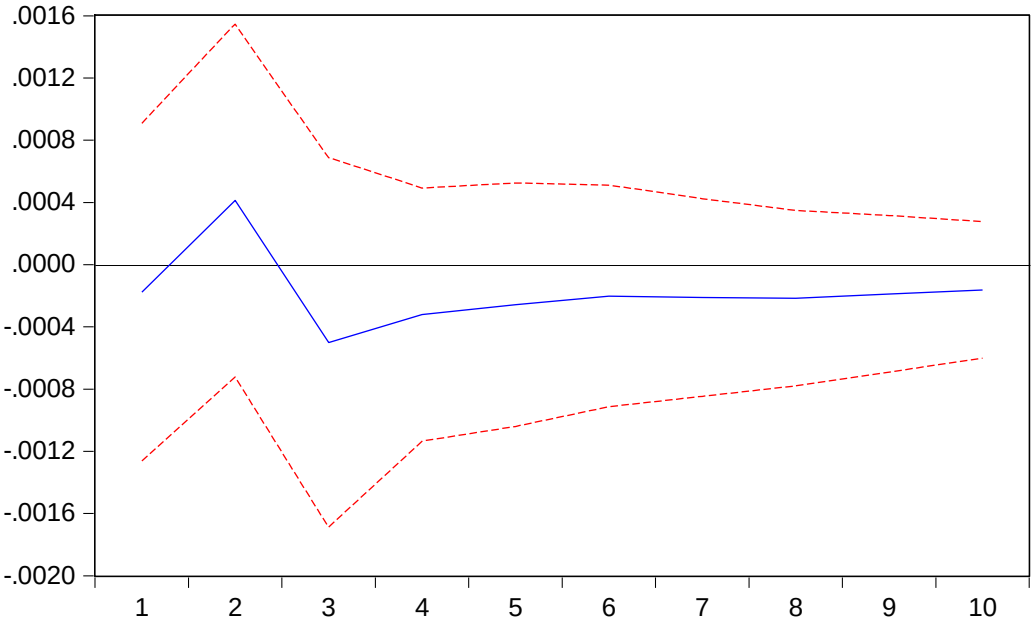

Figure 21
Response of DLMANUFAC_SA to DCALLRATE Innovation
(After Crisis)

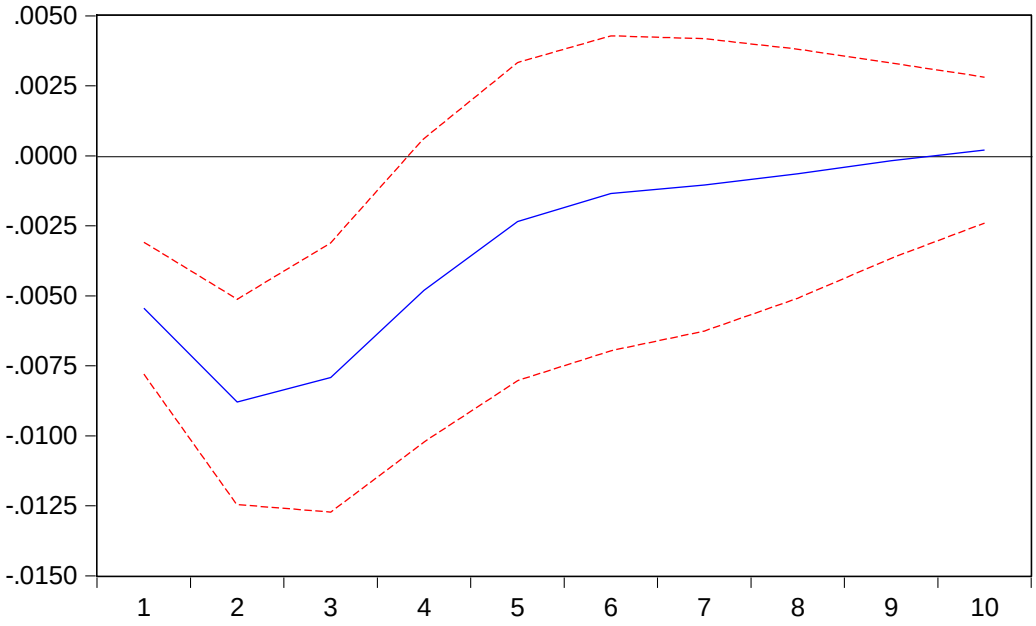

Figure 22
Response of DLSERVICES_SA to DCALLRATE Innovation
(After Crisis)

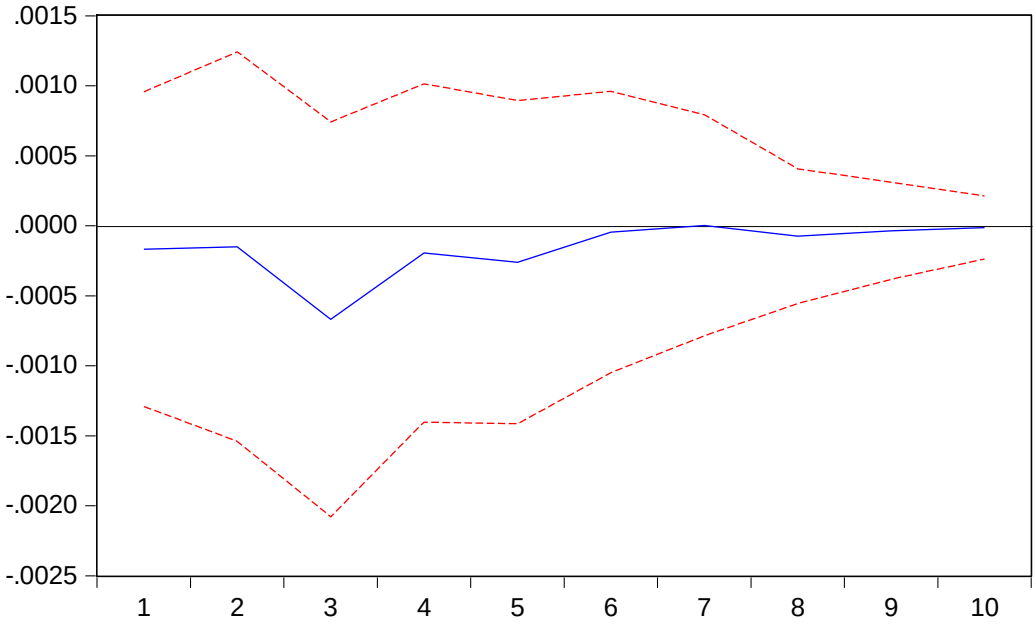

Figure 23
Response of DLMANUFAC_SA to DCALLRATEPLUS Innovation
(Total Period)

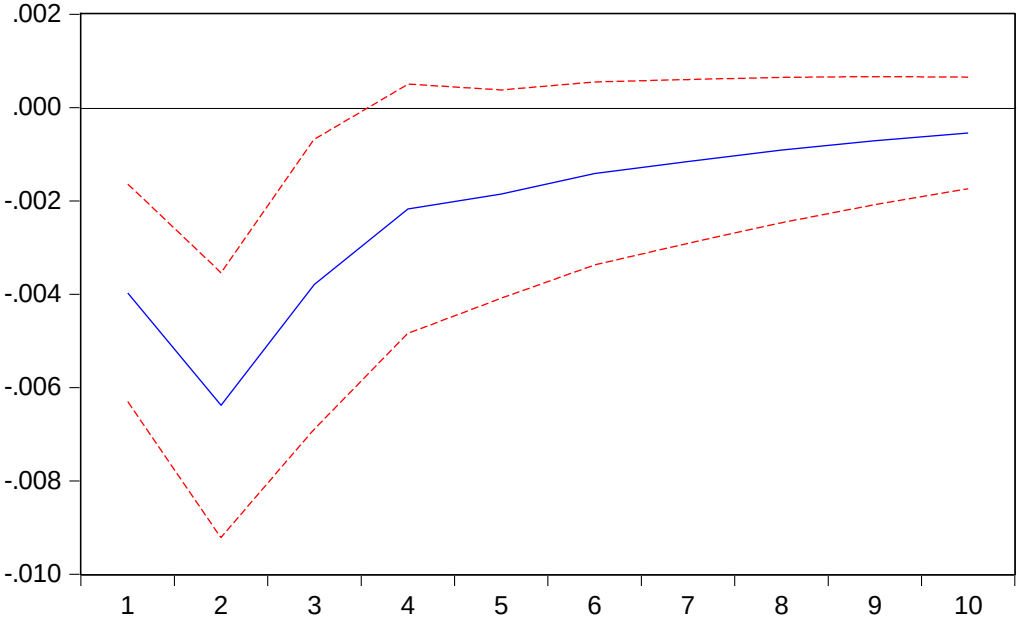

Figure 24
Response of DLMANUFAC_SA to DCALLRATEPLUS Innovation
(After Crisis)

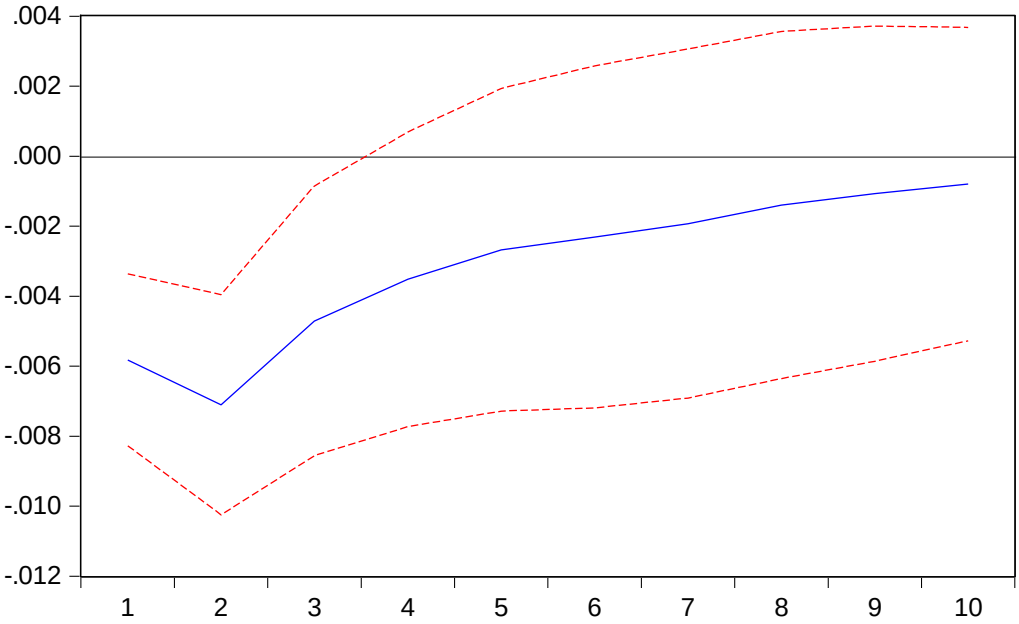

Figure 25
Response of DLSERVICES_SA to DCALLRATEPLUS Innovation
(Total Period)

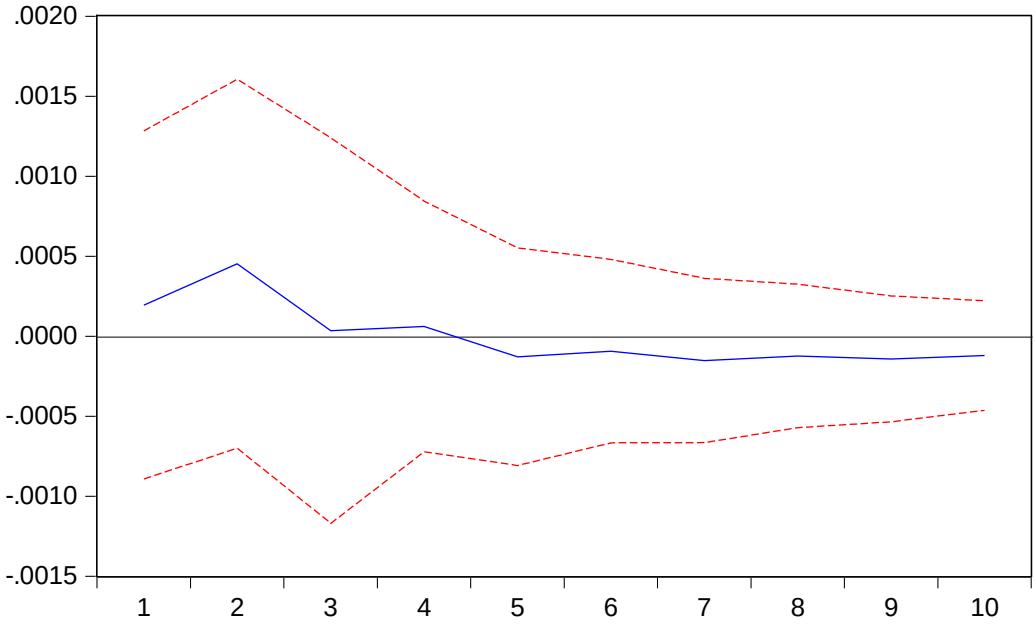

Figure 26
Response of DLSERVICES_SA to DCALLRATEPLUS Innovation
(After Crisis)

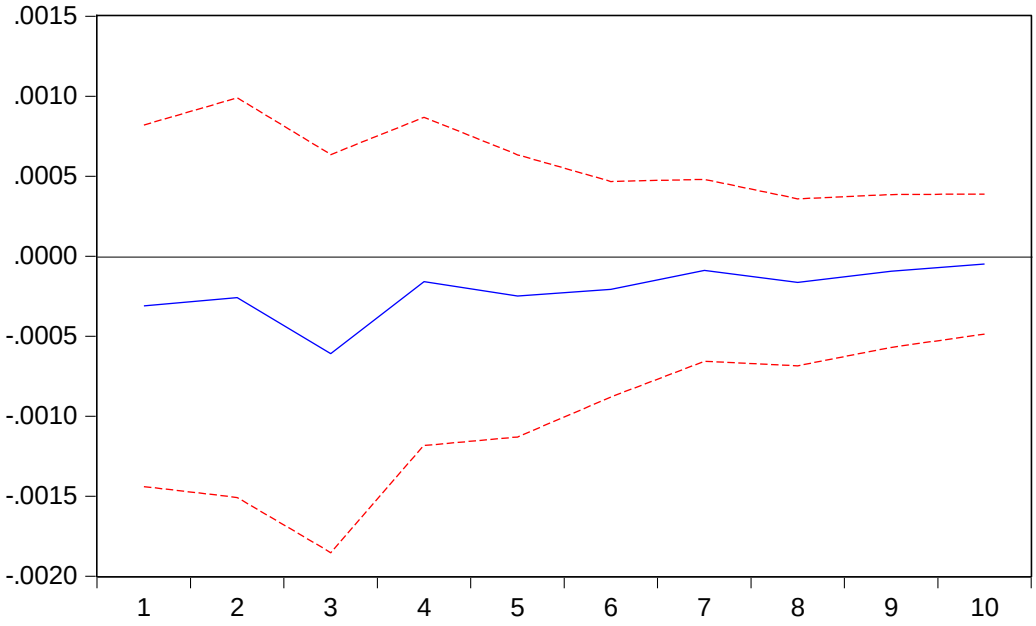

Figure 27
Response of DLMANUFAC_SA to DCALLRATEMINUS Innovation
(Total Period)

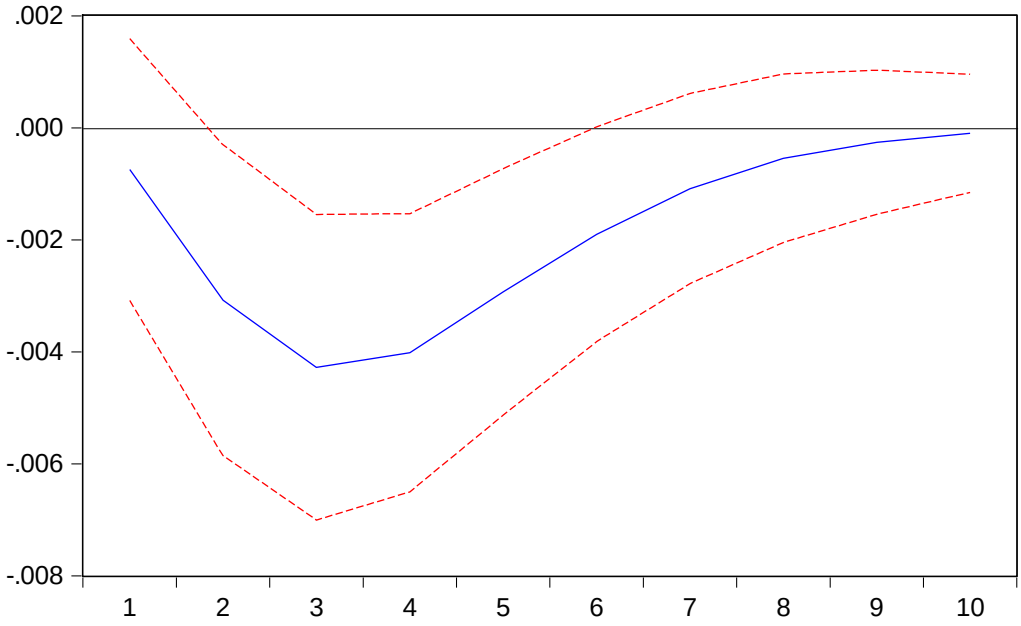

Figure 28
Response of DLMANUFAC_SA to DCALLRATEMINUS Innovation
(After Crisis)

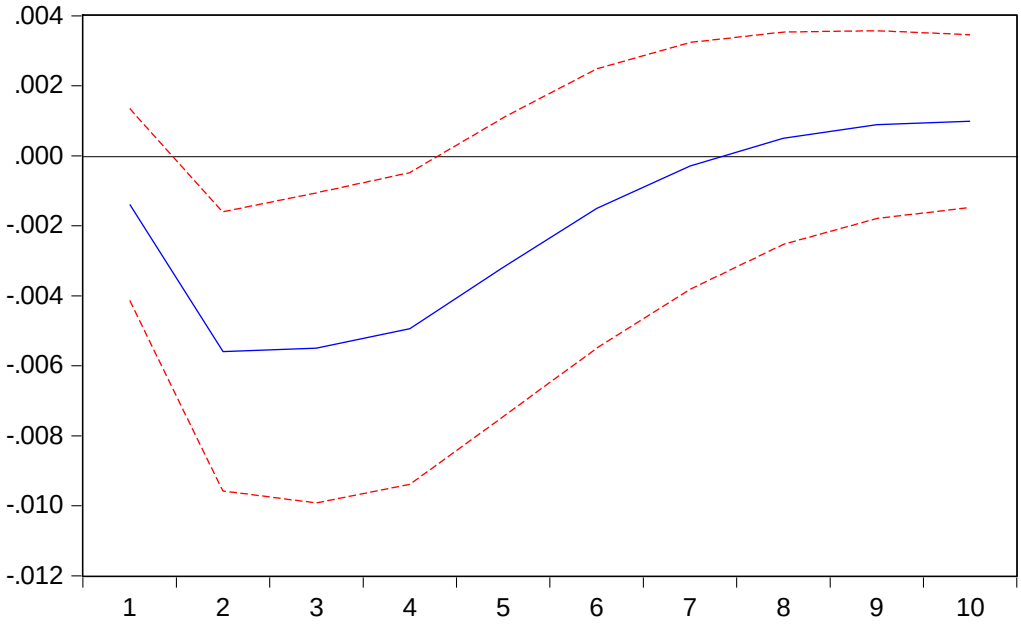

Figure 29
Response of DLSERVICES_SA to DCALLRATEMINUS Innovation
(Total Period)

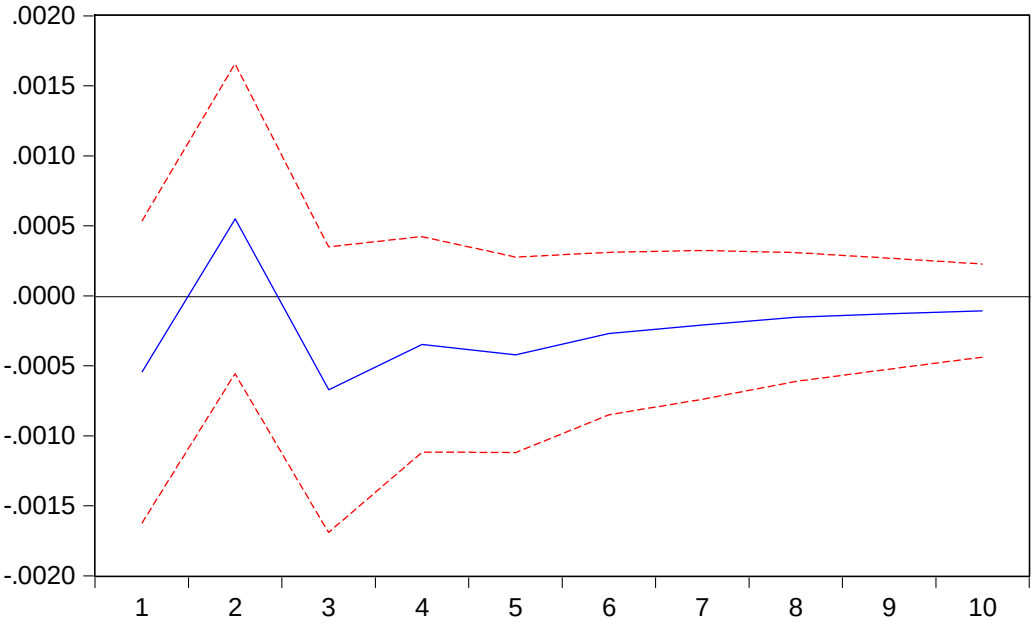

Figure 30
Response of DLSERVICES_SA to DCALLRATEMINUS Innovation
(After Crisis)

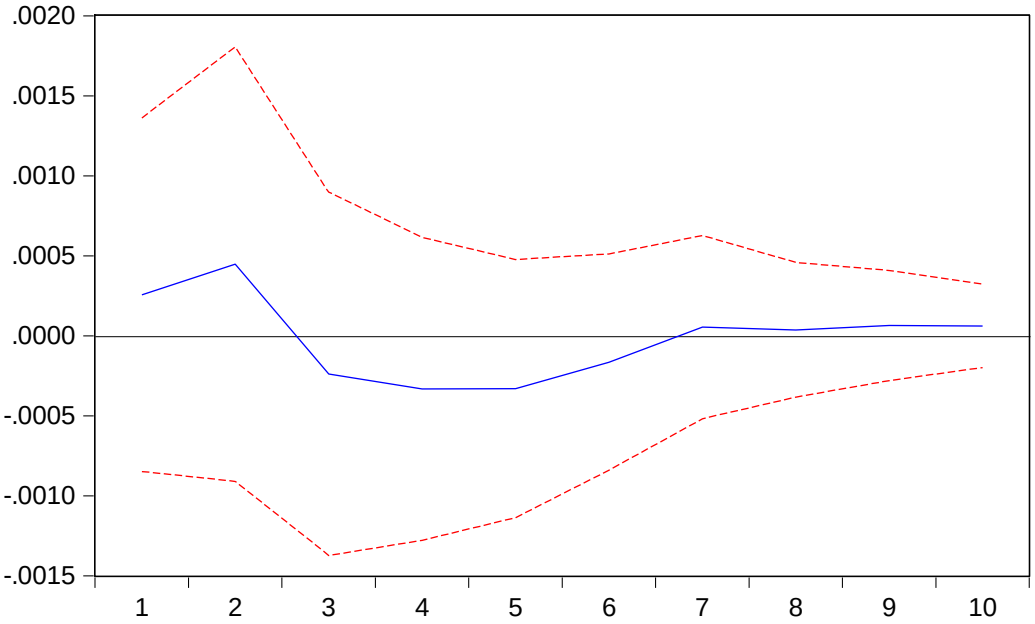

Figure 31
Response of LTOEMPCYCLE to DCALLRATE Innovation
(Total Period)

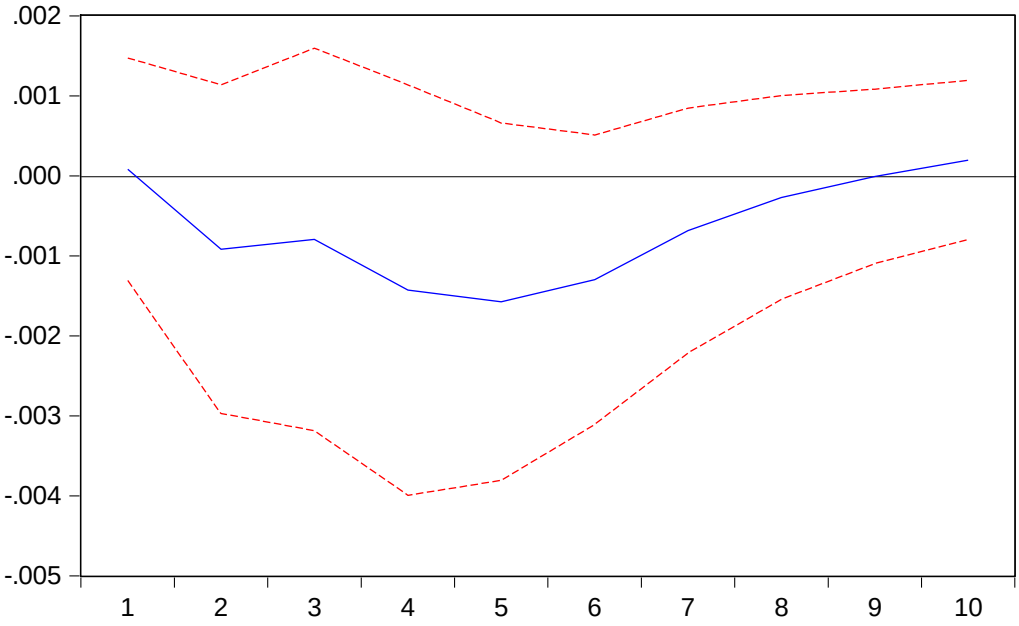

Figure 32
Response of LTOEMPCYCLE to DCALLRATE Innovation
(After Crisis)

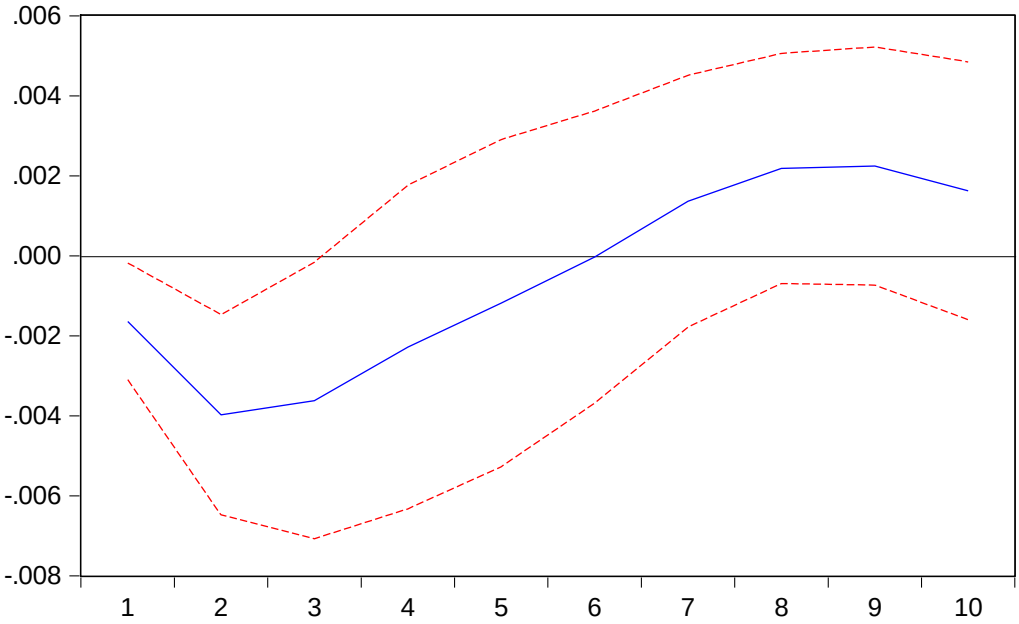

Figure 33
Response of LTOEMPCYCLE to DCALLRATEPLUS Innovation
(Total Period)

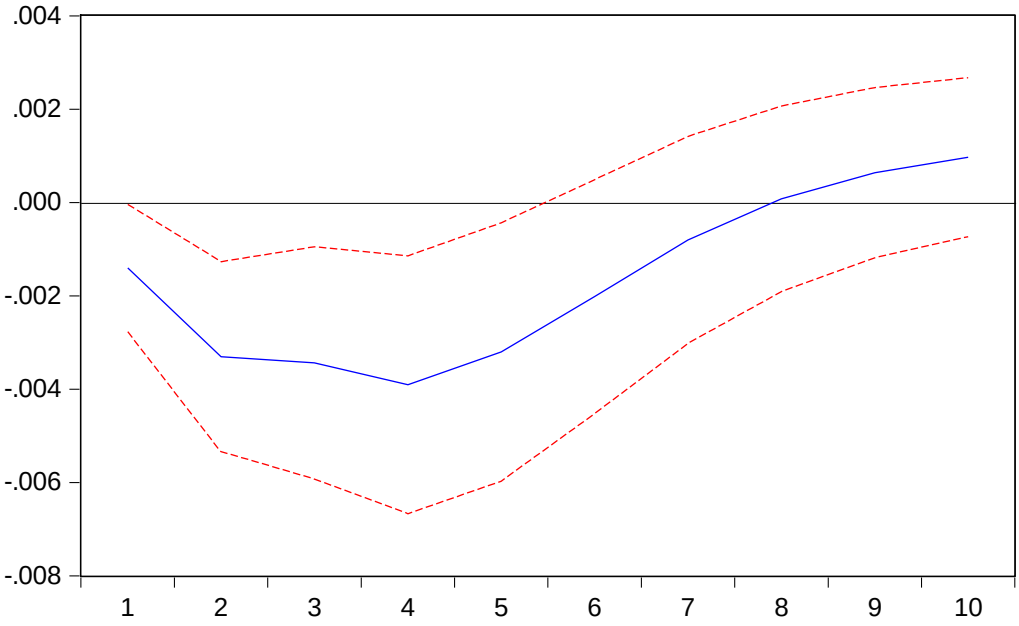

Figure 34
Response of LTOEMPCYCLE to DCALLRATEPLUS Innovation
(After Crisis)

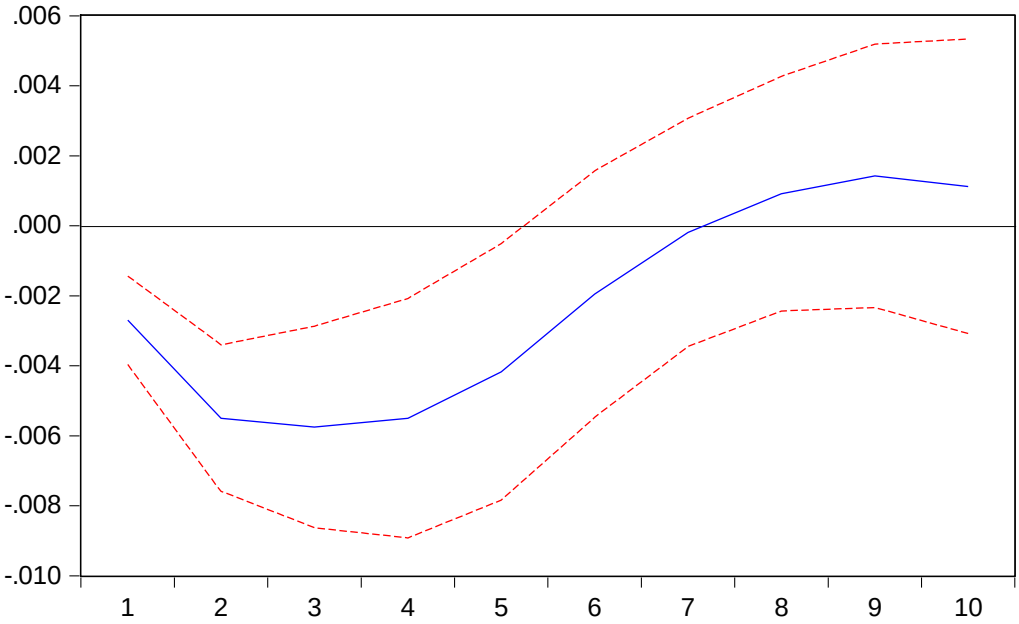

Figure 35
Response of LTOEMPCYCLE to DCALLRATEMINUS Innovation
(Total Period)

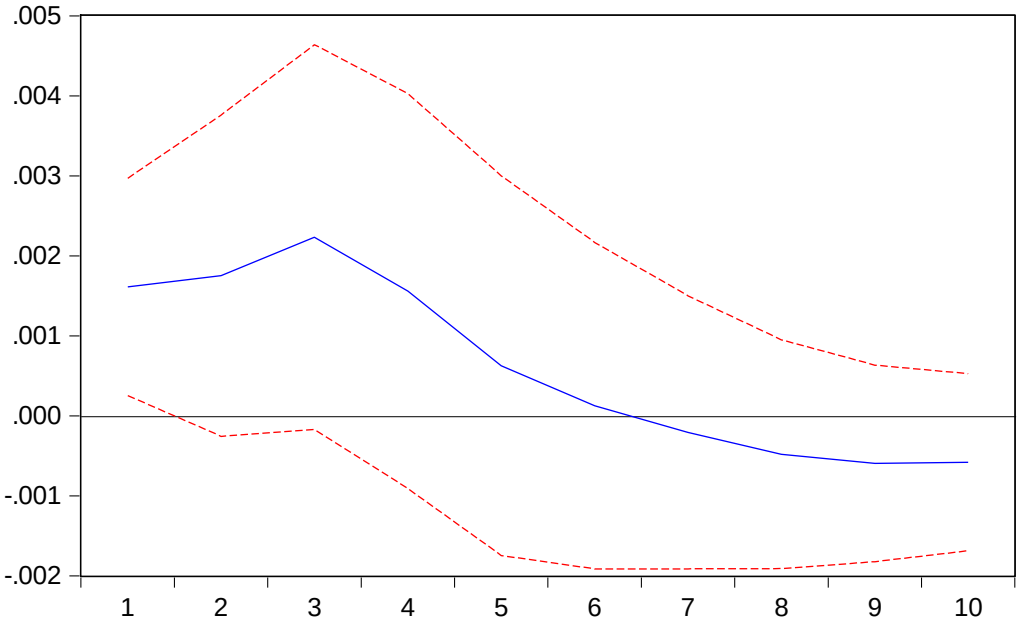

Figure 36
Response of LTOEMPCYCLE to DCALLRATEMINUS Innovation
(After Crisis)