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Module title: Economic Data Analysis

Project title: Testing the Crowding Out Effect

Word count: 1513

Data analysis methods used in the project: VAR (Vector Autoregression)

INTRODUCTION

Crowding-out effect is the phenomenon where an increase in government spending causes a decrease in private-sector investments due to high-interest rates. The dynamic competition between public and private organizations for access to limited financial resources in an economy is exemplified by the crowding-out effect. The application of the crowding-out effect is crucial in several economic frameworks. This helps policymakers understand interest dynamics rising out of a crowding effect when implementing monetary policies. Understanding the nuances of the effect can help policymakers with effective debt management. Businesses and investors can understand this effect to create a more balanced portfolio. Overall, understanding and applying the crowding-out effect is fundamental for sound policy-making and creating economic stability. The goal of the paper is to check if this effect translates into real world by testing it with real time data of United States.

This paper first goes over a basic description of the data and any relevant transformation required. The transformed data is then fitted into a VAR (Vector Autoregression Model) whose optimal lag is chosen through a series of tests. The Granger Causality test is run on the VAR model with an optimal lag to see the causal nature of the variables. Next, a one-step forecast is created to understand the model's ability to predict short-term trends which is followed by a 12-step forecast to understand long-term predictability. The model then undergoes orthogonalization to eliminate ambiguity about the contemporaneous relationships between the variables and interpet response of variables to shocks in the model. Finally, the model undergoes a forecast error variance decomposition to understand the contribution of each variable to the overall forecast uncertainty. The paper concludes by drawing insights from the model, pointing out possible drawbacks and suggestions to improve the model.

LITERATURE REVIEW

The crowding-out effect establishes the negative effect of government expenditure on private-sector investment due to higher interest rates.

According to Traditional Keynesian Economics, government expenditure stimulates economic activity. Increased government spending increases demand leading to higher economic output (Keynes, 1936). According to this perspective, increased demand causes higher inflation expectations which are met by higher interest rates. Conversely, a decrease in government spending may have contractionay effect on the economy, reducing demand. A reduction in government spending could make deflationary worries worse if the economy is close to reaching its maximum potential and prices are under pressure to decline. In case of deflationary pressure or lower infaltion, the central bank responds by lowering interest rates. Low interest rates stir the economy as the cost of capital is reduced which encourages private borrowing. Conversely, a higher interest rate would discourage borrowing. If borrowing level is high, then so is the investment level in the private sector.

An increase in public borrowing to finance the budget deficit indicates a rise in demand for loanable funds. Consequently, an increase in savings is observed due to an increase in interest rates in the economy. As a result, there is lesser residual savings to satisfy the demands of the private sector for loanable funds. The utilization of savings by the government to finance its deficit will crowd out the utilization of savings for private investment. (Buchanan & Wagner, 1977).

DATA DESCRIPTION

The data analysis involves 3 US-based time series:

a) Government total expenditures, Hundred Billion Dollars (GE)
b) 1-Year Real Interest Rate, Percent, Quarterly (RIR)
c) Gross Private Domestic Investment, Hundred Billion Dollars, Quarterly (PI)

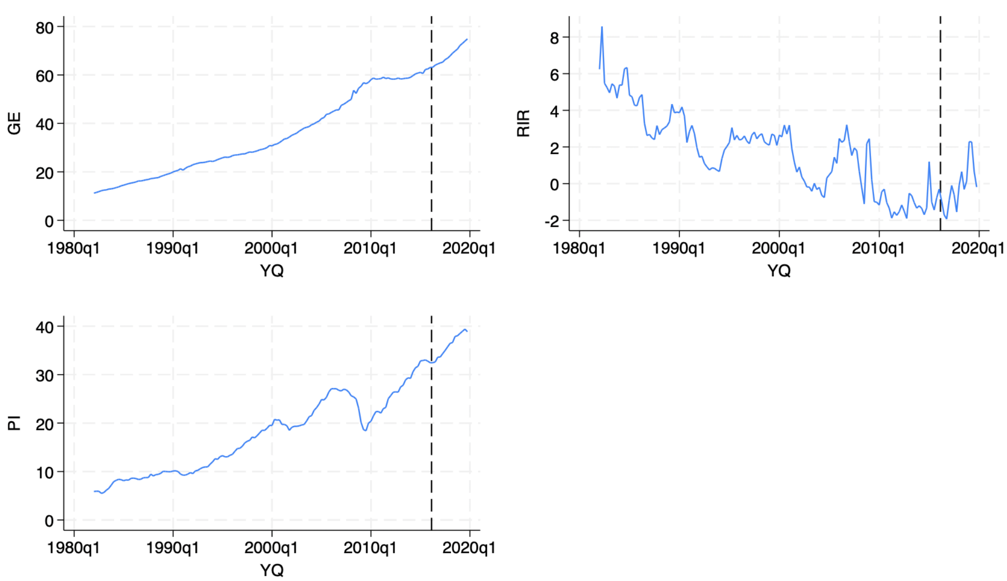
The data has been downloaded from the Economic Research Federal Reserve Bank of St. Louis website.

Here is a quick summary of the data:

Variable	Obs	Mean	Std. dev.	Min	Max
YQ	152	163.5	44.02272	88	239
GE	152	37.61104	18.5991	11.22585	74.88634
RIR	152	1.583199	2.145428	-1.929006	8.572594
PI	152	19.22129	9.295056	5.49242	39.39338

The dataset is a collection of time series which are calculated quarterly from 1982 to 2019. Quarters ranging from 1982 to 2015 make up for the in-sample data whereas quarters ranging from 2016 to 2019 are excluded from the in-sample for forecast testing.

Plotting the three time series we get:



An initial Augmented Dickey-Fuller test and Phillips–Perron test show that these variables are

non-stationary as the p-value is greater than 0.05 hence failing to reject the null hypothesis of non-stationary at a 5% significance level.
(Appendix: *1. Augmented Dickey-Fuller test and Phillips–Perron test on data without*)

Given the nature of the variables, all of them have been differenced to the first level to achieve stationarity. The stationarity can be confirmed by Augmented Dickey-Fuller tests and Phillips–Perron test which show that the p-value is less than 0.05 for each variable.
(Appendix: *2. Augmented Dickey-Fuller test and Phillips–Perron test on first differenced variables*)

VAR MODEL

Information criteria are indicative of the optimal lag length for a VAR which in this case ranges from 1 to 6. Results of varsoc -

Lag-order selection criteria

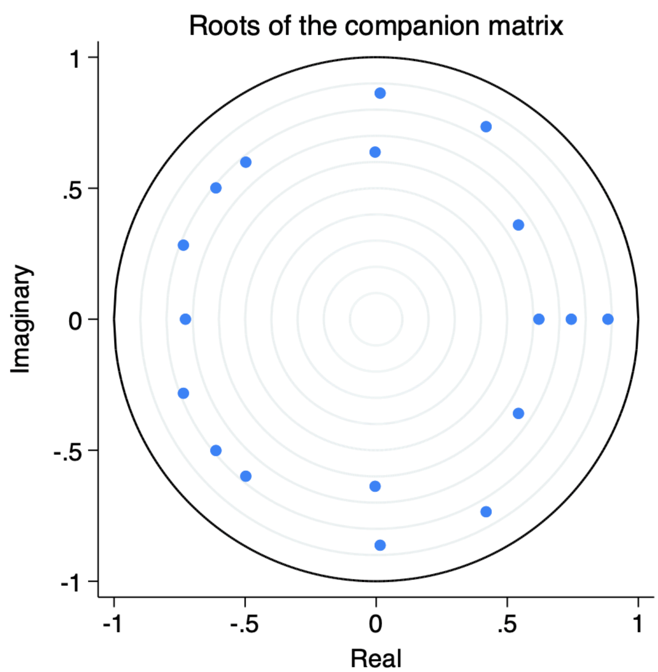
Sample: 1984q2 thru 2015q4 Number of obs = 127

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-346.485				.049295	5.5037	5.53099	5.57088
1	-315.861	61.246	9	0.000	.03507	5.16317	5.27236	5.43191*
2	-296.726	38.272	9	0.000	.029905	5.00355	5.19463	5.47385
3	-281.91	29.631	9	0.001	.027305	4.91197	5.18493*	5.58382
4	-274	15.819	9	0.071	.027811	4.92914	5.284	5.80255
5	-264.51	18.981	9	0.025	.027649	4.92142	5.35816	5.99638
6	-253.275	22.47*	9	0.008	.026766*	4.88622*	5.40486	6.16275
7	-250.819	4.9117	9	0.842	.029785	4.98928	5.58981	6.46736
8	-248.623	4.3927	9	0.884	.03332	5.09642	5.77884	6.77606

* optimal lag
Endogenous: dGE dRIR dPI
Exogenous: _cons

The models are then tested for stability and serial correlation starting with the parsimonious model of lag order 1. After a few tests we find a VAR(6) satisfies the stability test as all the eigenvalues lie inside the unit circle and the null hypothesis of the lagrange multiplier test cannot be rejected at a significance level of 5% indicating no autocorrelation at lag order.
(Appendix: *4. Var(6) Model, 5. Var Stability, 6. Lagrange Multiplier Test*)

Graph of Var Stability Test :



Although Var with ranges 4 and 5 pass all the above tests, Akaike Information Criterion is used to choose the best model which in this case is the one with 6 lags.

GRANGER CAUSALITY

Granger causality helps evaluate whether one-time series may be used to predict another.

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dGE	dRIR	9.0957	6	0.168
dGE	dPI	14.162	6	0.028
dGE	ALL	23.387	12	0.025
dRIR	dGE	29.075	6	0.000
dRIR	dPI	30.042	6	0.000
dRIR	ALL	56.73	12	0.000
dPI	dGE	25.663	6	0.000
dPI	dRIR	2.3509	6	0.885
dPI	ALL	35.704	12	0.000

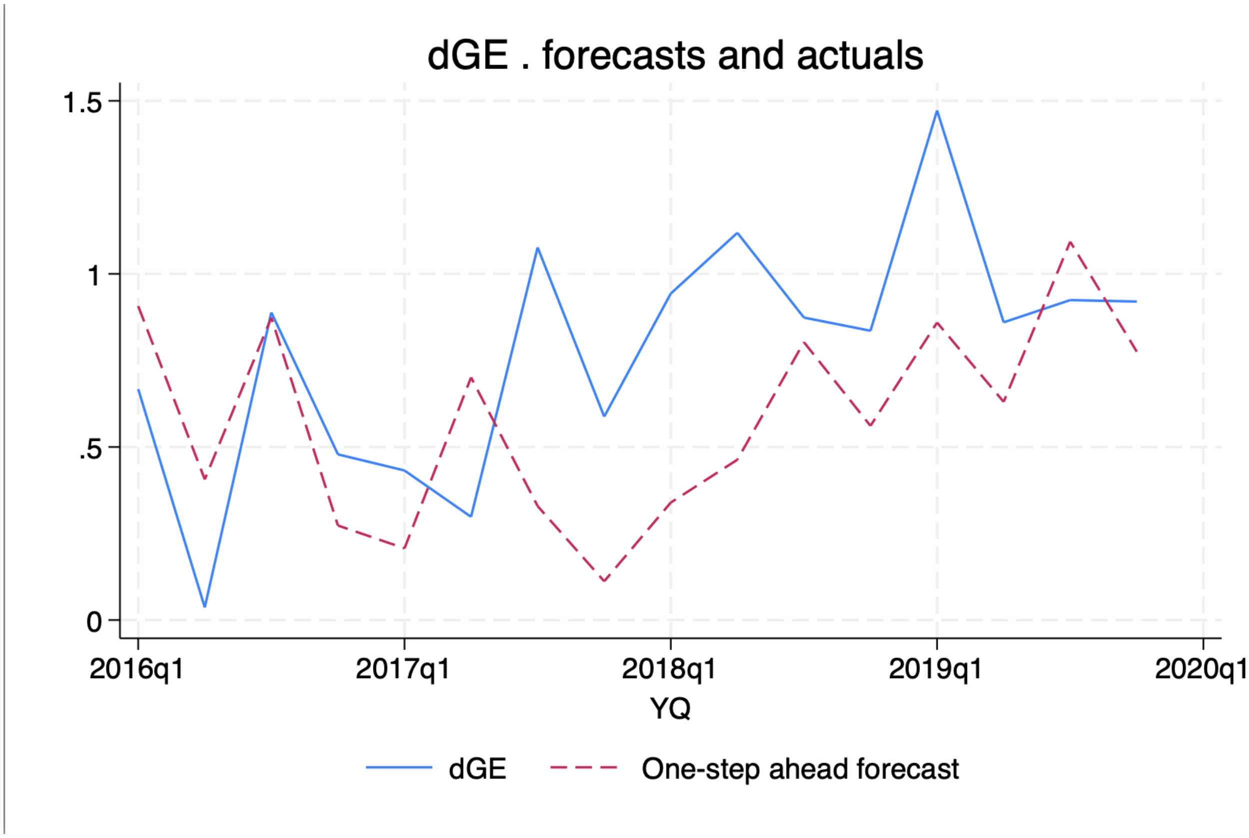
As seen from the table, dPI does granger cause dGE and dRIR at a 5% level. Similarly, dGE does granger cause dRIR as well as dPI at a 1% significance level. dRIR as a single variable does not exhibit Granger causality with either of the other variables.

Most interestingly, a combination of any of the variables does Granger cause the third variable at a 5% significance level, for instance, a combination of dGE and dRIR does granger cause dPI.

FORECAST

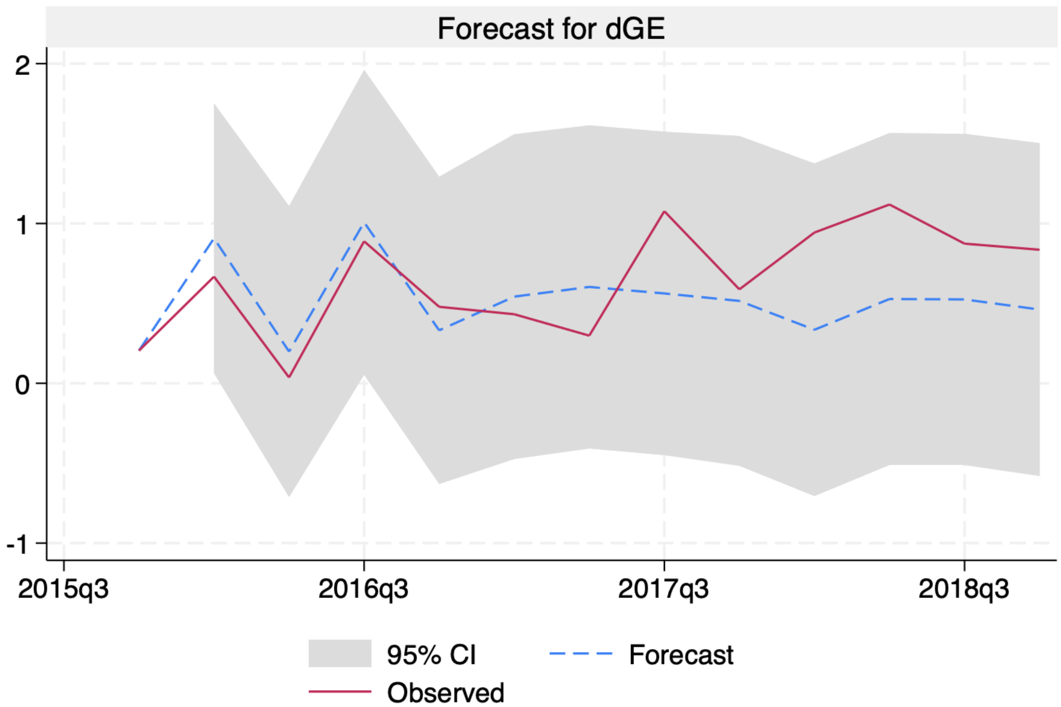
The model provides satisfactory forecasts for a one-step forecast for GE but provides unsatisfactory forecast for dRIR and dPI (Appendix: 7. One-step ahead Forecast of dRIR and dPI) on the same timeline implying that model is able to capture the short-term dynamics of dGE effectively.

One-step forecast of dGE:



The model creates a nearly satisfactory 12-step forecast with a 95% confidence interval for RIR and PI (Appendix: *8. One-step ahead Forecast of dRIR and dPI*) but creates an excellent forecast for dGE on the same timeframe and same confidence interval.

12-step ahead forecast of dGE:



An obvious limitation of the forecast is to withhold the predictions under unexpected events such as the pandemic or sudden changes in fiscal policy.

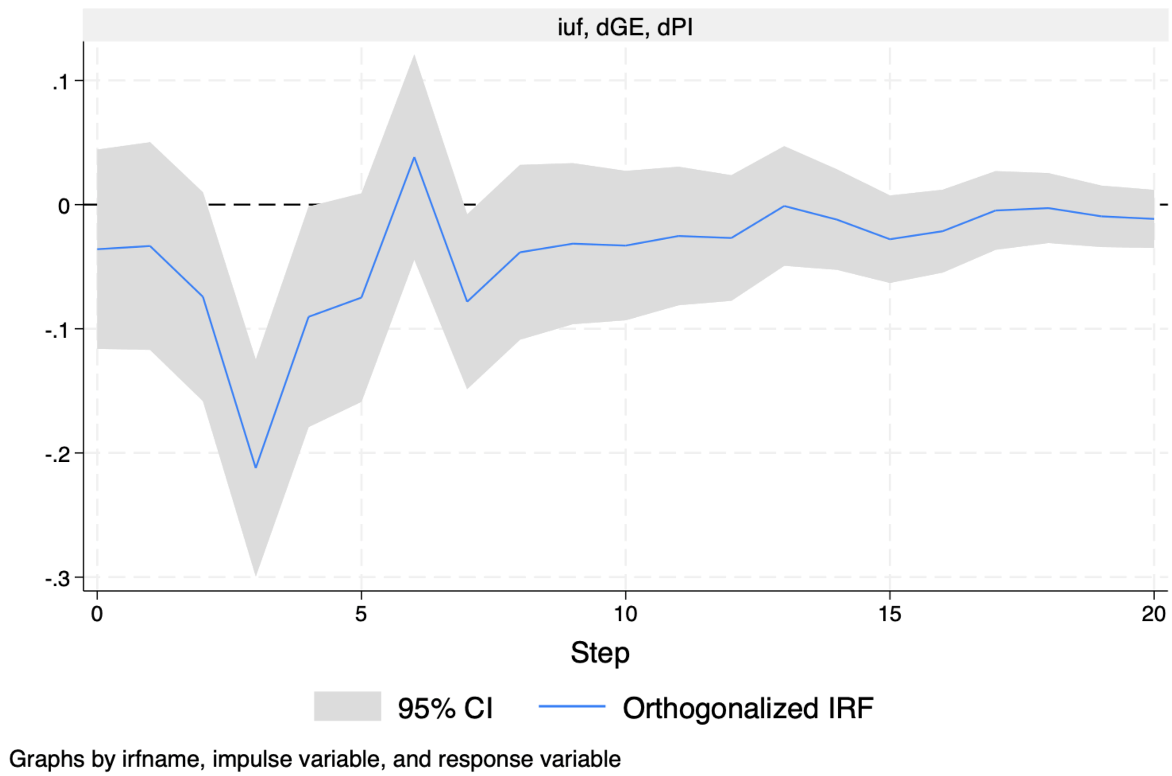
IMPULSE RESPONSE

The causal ordering is chosen as dGE -> dRIR -> dPI as per the crowding out effect. Orthogonalized Impulse Response Functions help us understand the effect of shocks on a model. Orthogonalization solves the problem of possible contemporaneous correlations among the shocks.

From the impulse response function tables (Appendix: *9.Othrogonalized Impulse Respone Function Tables*) we highlight the following relationships -

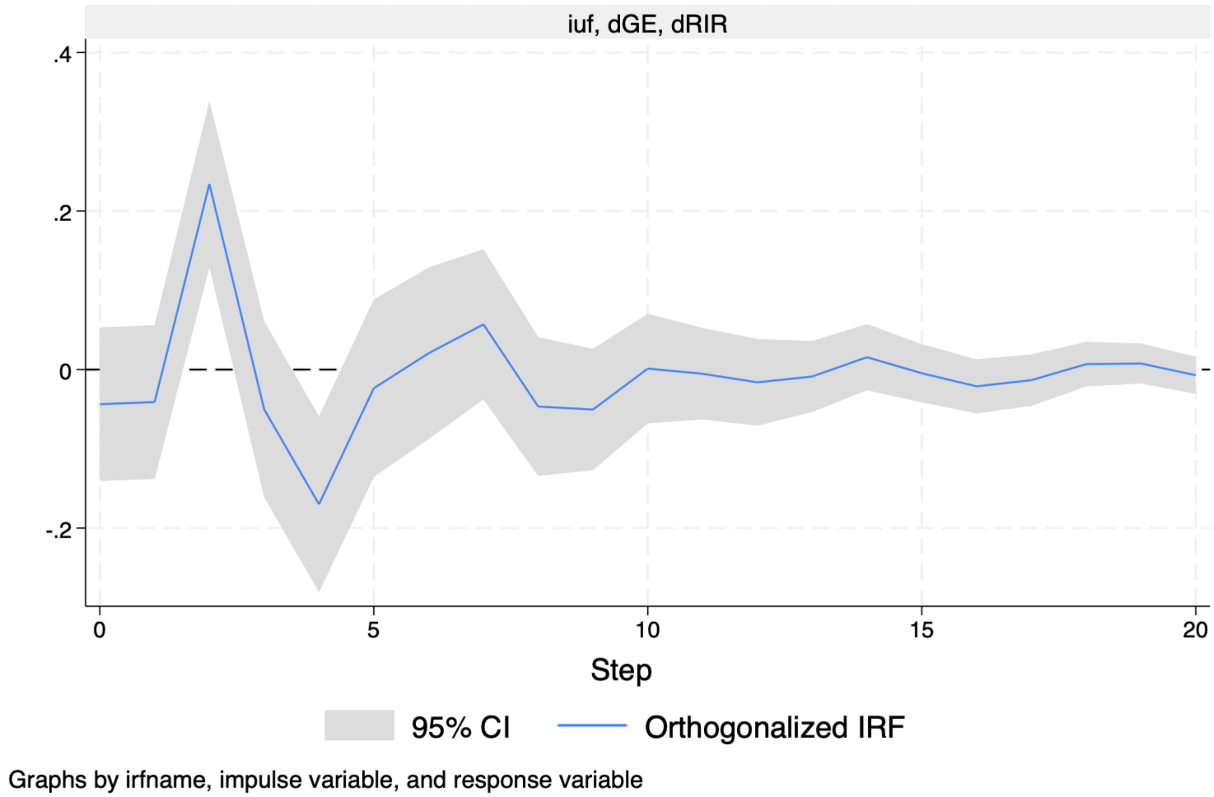
A shock in dGE causes a negative peak of magnitude 0.2 in dPI which takes around six quarters to stabilize.

Response of dPI to dGE shock:



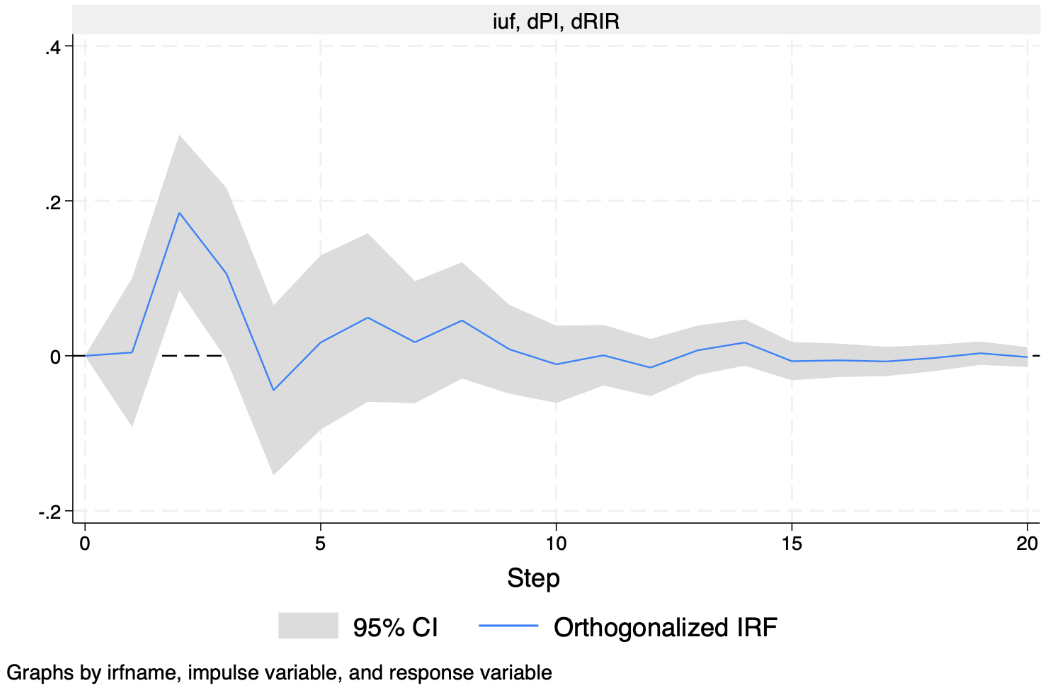
A shock in dGE causes a steep positive rise in dRIR which peaks around the second quarter followed by a negative peak which stabilizes around the fifth quarter. Both peaks have a magnitude of around 0.2.

Response of dRIR to dGE shock:



Furthermore, a shock in dPI causes a positive shock in dRIR offset by a quarter with a magnitude of 0.2 which again stabilizes in the fifth quarter.

Response of dRIR to dPI shock:



CONCLUSION

The Real Interest Rate, Government total expenditures, and Private Sector Investment undergo a stationary transformation to make sure our statistical inferences and valid. A VAR model is constructed to simultaneously analyze the relationship between these three variable over different lag periods. The granger causality test helps us infer the bidirectional causality between the variables suggesting an interdynamic relationship between the three. The forecasting findings show that while the model is good at capturing longer-term trends, it is not perfect at making short-term forecasts. According to the impulse function, an increase in government spending tends to increase real interest rates and may have a delayed negative effect on private sector investment. This pattern is line with our crowding out effect which establishes the negative effect of government expenditure on private-sector investment. A drawback of the model is the lack of impact of impulse shock of real interest when the response function is private sector investment. This can be attributed to the fact that a 1-year real interest rate might not give investors enough time to judge and rebalance their portfolios. Overall, the VAR model plays out in the favour of crowding out effect. Additionally to improve the model, we can introduce another variable called expectation of interest rate. The expectations play an important role in investment behavior which can solidify the current model and provide stronger results. The model can also be tested using data for various countries to further test the validity of the crowding out effect.

CITATIONS

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APPENDIX

1. Augmented Dickey-Fuller test and Phillips–Perron test on data without transformation

. dfuller GE

Dickey–Fuller test for unit root Number of obs = 151

Variable: GE Number of lags = 0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	2.900	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 1.0000.

. pperron GE

Phillips–Perron test for unit root   Number of obs   = 151
Variable: GE   Newey–West lags =   4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	0.965	-19.970	-13.802	-11.068
Z(t)	2.588	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.9991.

.

. dfuller RIR

Dickey–Fuller test for unit root   Number of obs = 151

Variable: RIR Number of lags = 0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	-2.782	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0608.

. pperron RIR

Phillips–Perron test for unit root Number of obs = 151
Variable: RIR Newey–West lags = 4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	-8.733	-19.970	-13.802	-11.068
Z(t)	-2.461	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.1253.

.

. dfuller PI

Dickey–Fuller test for unit root   Number of obs = 151
Variable: PI   Number of lags =   0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	1.223	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.9961.

. pperron PI

Phillips–Perron test for unit root   Number of obs   = 151
Variable: PI   Newey–West lags =   4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	0.627	-19.970	-13.802	-11.068
Z(t)	0.559	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.9866.

2. Augmented Dickey-Fuller test and Phillips–Perron test on first differenced variables

. dfuller dGE

Dickey–Fuller test for unit root Number of obs = 150
Variable: dGE Number of lags = 0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	-13.980	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0000.

. pperron dGE

Phillips–Perron test for unit root Number of obs = 150
Variable: dGE Newey–West lags = 4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	-233.333	-19.967	-13.800	-11.067
Z(t)	-14.072	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0000.

.

. dfuller dRIR

Dickey–Fuller test for unit root Number of obs = 150

Variable: dRIR Number of lags = 0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	-13.761	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0000.

. pperron dRIR

Phillips–Perron test for unit root Number of obs = 150

Variable: dRIR Newey–West lags = 4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	-142.913	-19.967	-13.800	-11.067
Z(t)	-14.335	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.0000.

```
.
. dfuller dPI

Dickey–Fuller test for unit root          Number of obs  = 150
Variable: dPI                             Number of lags =   0

H0: Random walk without drift, d = 0

                               Dickey–Fuller
              Test      -------- critical value ---------
           statistic         1%          5%         10%
-------------------------------------------------------------
 Z(t)         -7.760       -3.493       -2.887       -2.577
-------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

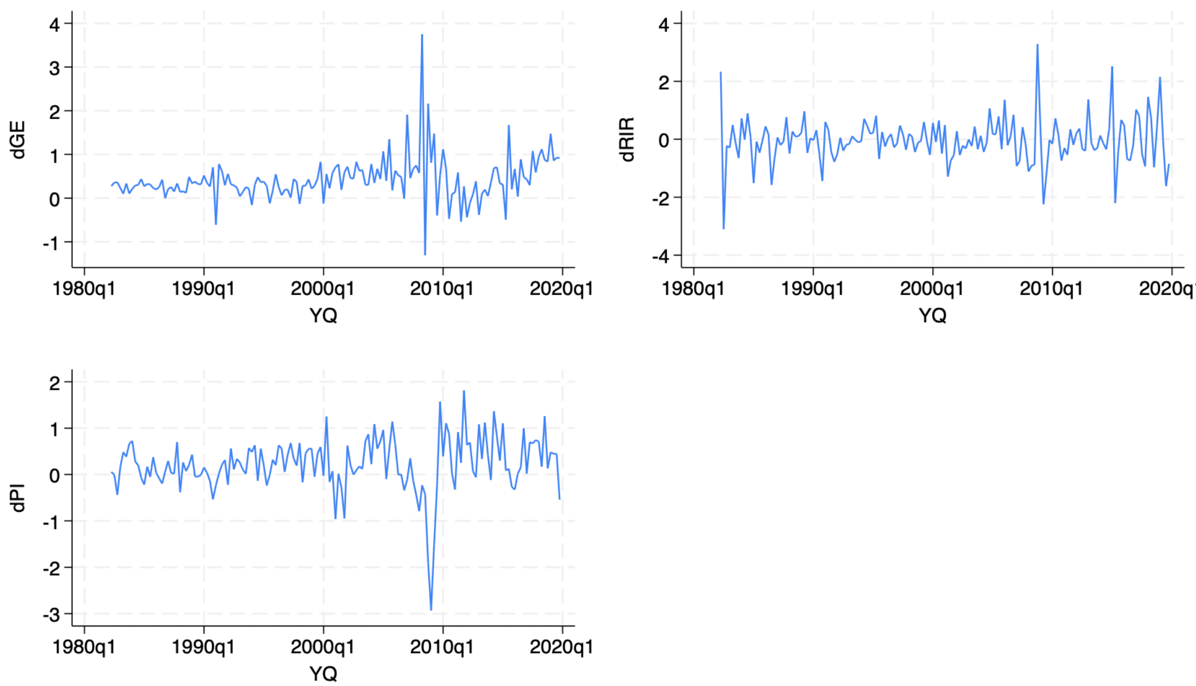
. pperron dPI

Phillips–Perron test for unit root        Number of obs   = 150
Variable: dPI                             Newey–West lags =   4

H0: Random walk without drift, d = 0

                               Dickey–Fuller
              Test      -------- critical value ---------
           statistic         1%          5%         10%
-------------------------------------------------------------
 Z(rho)       -91.802      -19.967      -13.800      -11.067
 Z(t)          -7.876       -3.493       -2.887       -2.577
-------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```

3. Plotting First Differenced Variables



4. VAR(6) model

Vector autoregression

Sample: 1983q4 thru 2015q4 Number of obs = 129

Log likelihood = -257.2687 AIC = 4.872383

FPE = .0263899 HQIC = 5.385825

Det(Sigma_ml) = .010835 SBIC = 6.136021

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dGE	19	.435077	0.4164	92.02667	0.0000
dRIR	19	.607451	0.3689	75.39748	0.0000
dPI	19	.50391	0.3882	81.85102	0.0000

	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]	
dGE						
dGE						
L1.	-.359289	.08641	-4.16	0.000	-.5286496	-.1899284
L2.	.184754	.088516	2.09	0.037	.0112659	.3582422
L3.	.2220809	.096116	2.31	0.021	.033697	.4104648
L4.	.3391097	.1003063	3.38	0.001	.142513	.5357064
L5.	.3440262	.1045054	3.29	0.001	.1391995	.548853
L6.	-.0217544	.0998719	-0.22	0.828	-.2174997	.1739909
dRIR						
L1.	-.0328982	.0627543	-0.52	0.600	-.1558944	.0900981
L2.	-.0133454	.0629464	-0.21	0.832	-.1367181	.1100273
L3.	-.1086481	.067149	-1.62	0.106	-.2402577	.0229615
L4.	.0293991	.0697218	0.42	0.673	-.107253	.1660513
L5.	.0275166	.0613978	0.45	0.654	-.092821	.1478542
L6.	.12433	.0555884	2.24	0.025	.0153788	.2332812
dPI						
L1.	-.2323952	.0755945	-3.07	0.002	-.3805578	-.0842327
L2.	.1454216	.0816337	1.78	0.075	-.0145774	.3054206
L3.	.0237736	.0843477	0.28	0.778	-.1415448	.189092
L4.	.038238	.0838212	0.46	0.648	-.1260486	.2025245
L5.	.0538368	.0833336	0.65	0.518	-.109494	.2171675
L6.	.0813246	.0805802	1.01	0.313	-.0766097	.2392589
_cons	.1029324	.0999638	1.03	0.303	-.092993	.2988577

```
dRIR         |
        dGE |
        L1. |  -.1232595   .1206449    -1.02   0.307    -.3597191    .1132001
        L2. |   .5278301   .1235851     4.27   0.000     .2856077    .7700526
        L3. |   .2346131   .1341962     1.75   0.080    -.0284067    .4976328
        L4. |  -.3225132   .1400467    -2.30   0.021    -.5969996   -.0480268
        L5. |  -.0393149   .1459094    -0.27   0.788    -.3252921    .2466622
        L6. |   .0803145   .1394402     0.58   0.565    -.1929832    .3536122
            |
       dRIR |
        L1. |  -.2030123    .087617    -2.32   0.021    -.3747385   -.0312861
        L2. |  -.2401618   .0878851    -2.73   0.006    -.4124135   -.0679101
        L3. |  -.1019701   .0937528    -1.09   0.277    -.2857222     .081782
        L4. |  -.0514045   .0973448    -0.53   0.597    -.2421968    .1393879
        L5. |   .1189827   .0857231     1.39   0.165    -.0490314    .2869969
        L6. |   .0251832   .0776119     0.32   0.746    -.1269335    .1772998
            |
        dPI |
        L1. |   .0092982   .1055444     0.09   0.930    -.1975649    .2161613
        L2. |   .3688934   .1139761     3.24   0.001     .1455044    .5922825
        L3. |   .3245641   .1177654     2.76   0.006     .0937481    .5553801
        L4. |  -.2020755   .1170303    -1.73   0.084    -.4314508    .0272998
        L5. |  -.0147898   .1163495    -0.13   0.899    -.2428306    .2132511
        L6. |   .2005623   .1125053     1.78   0.075    -.0199441    .4210686
            |
      _cons |  -.3391295   .1395684    -2.43   0.015    -.6126786   -.0655804
-------------+----------------------------------------------------------------
dPI          |
        dGE |
        L1. |  -.0583289   .1000807    -0.58   0.560    -.2544835    .1378256
        L2. |  -.1706808   .1025198    -1.66   0.096    -.3716159    .0302544
```

```
         L3. |  -.4567059   .1113222    -4.10   0.000    -.6748934   -.2385184
         L4. |  -.1146114   .1161754    -0.99   0.324    -.3423111    .1130882
         L5. |   .0553866   .1210388     0.46   0.647    -.1818452    .2926184
         L6. |   .2725425   .1156723     2.36   0.018     .045829    .4992561
             |
        dRIR |
         L1. |  -.0537652   .0726825    -0.74   0.459    -.1962203    .0886899
         L2. |  -.0187083   .0729049    -0.26   0.797    -.1615994    .1241828
         L3. |   .0469345   .0777724     0.60   0.546    -.1054966    .1993657
         L4. |   .0816811   .0807522     1.01   0.312    -.0765903    .2399525
         L5. |   .0206425   .0711114     0.29   0.772    -.1187333    .1600183
         L6. |   .0264804   .0643828     0.41   0.681    -.0997076    .1526684
             |
         dPI |
         L1. |   .3418553   .0875541     3.90   0.000     .1702524    .5134582
         L2. |   .1418766   .0945487     1.50   0.133    -.0434354    .3271885
         L3. |   .0073611   .0976921     0.08   0.940    -.1841118    .198834
         L4. |  -.2231137   .0970823    -2.30   0.022    -.4133915   -.0328359
         L5. |   .0913344   .0965175     0.95   0.344    -.0978364    .2805052
         L6. |   .0097885   .0933286     0.10   0.916    -.1731321    .1927091
             |
       _cons |   .3097085   .1157787     2.68   0.007     .0827864    .5366306
------------------------------------------------------------------------------
```

5. VAR Stability

```
 Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue        |   Modulus   |
  |--------------------------+-------------|
  |   .9074341               |   .907434   |
  |  -.7831736 +  .2859461i  |   .833742   |
```

-.7831736 - .2859461i	.833742
-.00297859 + .807075i	.807081
-.00297859 - .807075i	.807081
.2950413 + .7116823i	.770416
.2950413 - .7116823i	.770416
-.4803607 + .5314495i	.716369
-.4803607 - .5314495i	.716369
.6616274	.661627
-.5103609 + .3883444i	.641311
-.5103609 - .3883444i	.641311
.4069139 + .423451i	.587273
.4069139 - .423451i	.587273
.3943819	.394382

All the eigenvalues lie inside the unit circle.

VAR satisfies stability condition.

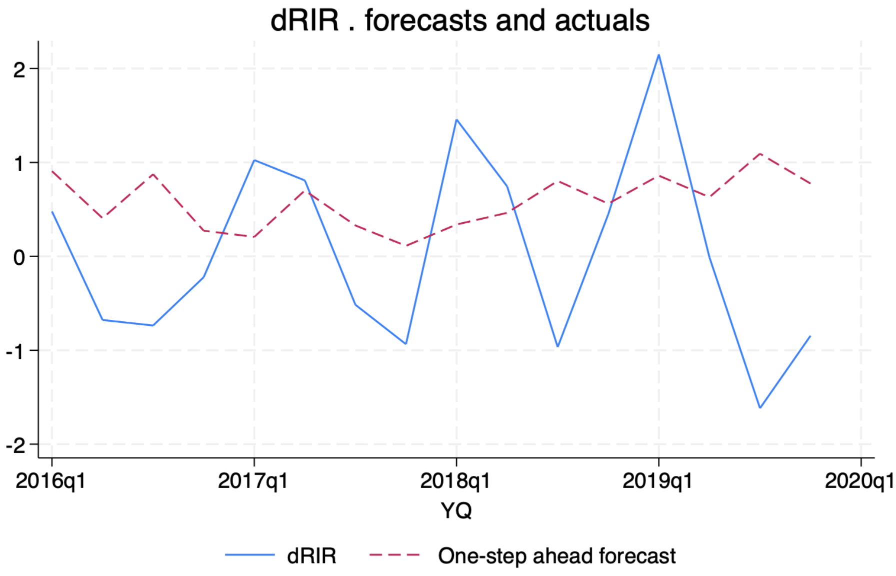
6. Lagrange Multiplier Test

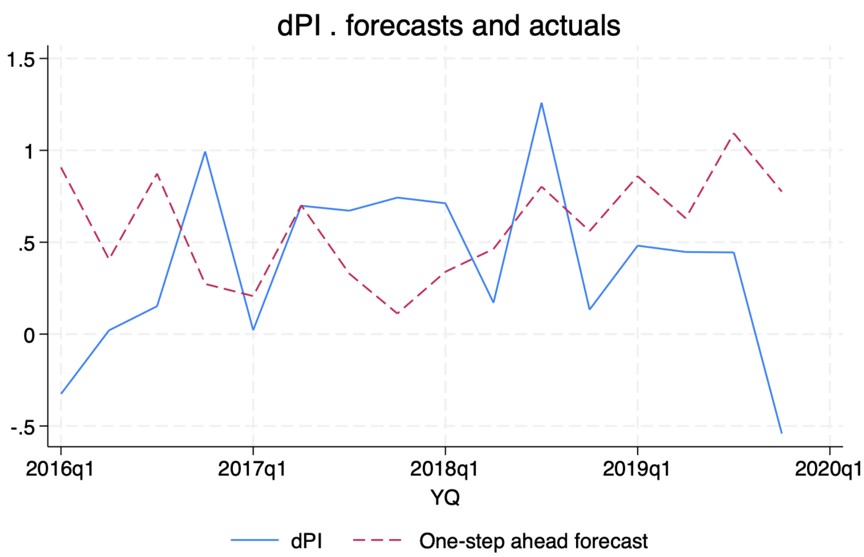
Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	13.1585	9	0.15556
2	8.2054	9	0.51359
3	8.8081	9	0.45517
4	3.3767	9	0.94747

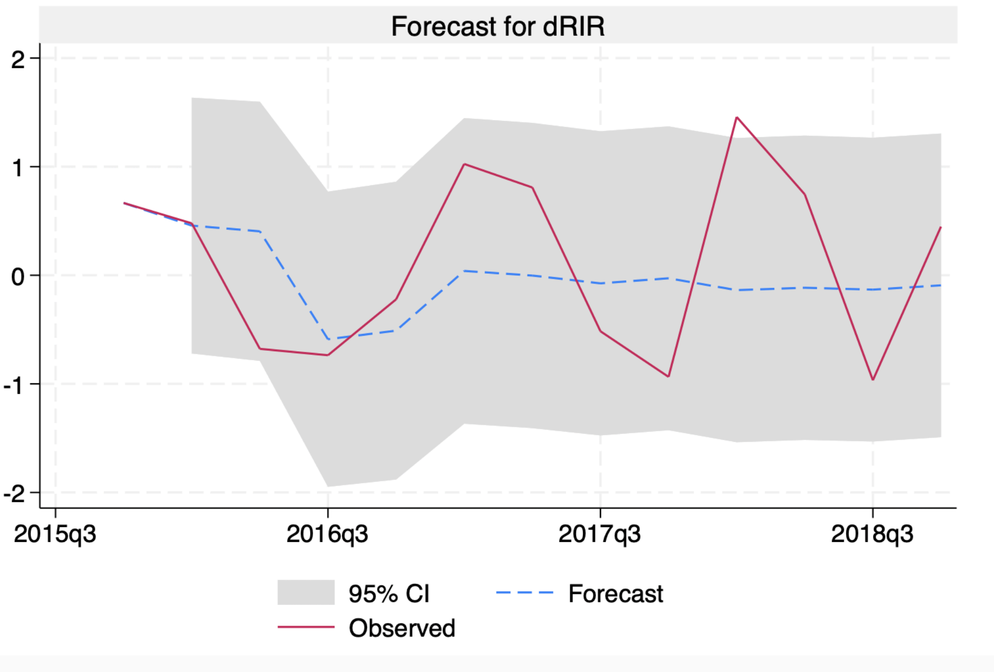
H0: no autocorrelation at lag order

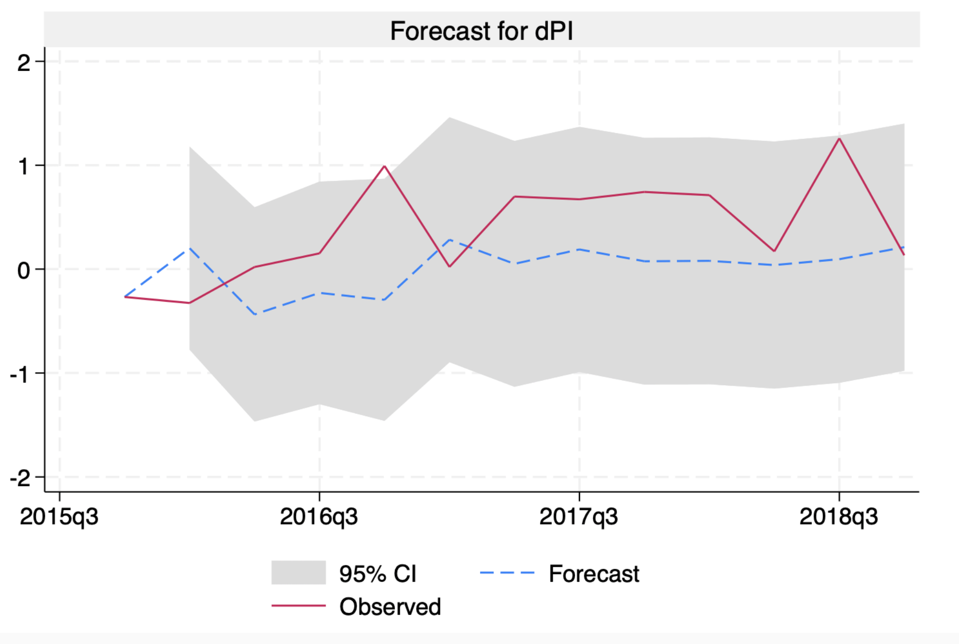
7. One-step ahead Forecast of dRIR and dPI





8. 12-step ahead Forecast of dRIR and dPI





9. Othrogonalized Impulse Respone Function Tables

IRF of dPI

Step	(1) oirf	(2) oirf	(3) oirf
0	-.035887	-.024382	.463296
1	-.033352	-.038402	.15838
2	-.074195	-.020191	.125922
3	-.212151	.024052	.073259
4	-.090355	.06331	-.028185
5	-.074869	.034613	.005471
6	.038276	.039479	.013191
7	-.078214	-.014958	-.021194
8	-.038396	-.015802	.021666
9	-.031451	-.032516	-.024825
10	-.032991	.01582	-.023958
11	-.025275	.009656	-.017447
12	-.026883	.011006	-.013851
13	-.00109	-.01888	.000215
14	-.012103	-.011905	-.009699
15	-.027877	.000227	-.016366
16	-.021368	-.000555	-.014522
17	-.004708	.002611	-.01135
18	-.002789	-.002542	-.007002
19	-.009434	-.001757	-.006942
20	-.011508	-.004341	-.006133

(1) irfname = iuf, impulse = dGE, and response = dPI.

(2) irfname = iuf, impulse = dRIR, and response = dPI.

(3) irfname = iuf, impulse = dPI, and response = dPI.

IRF of dRIR

Step	(1) oirf	(2) oirf	(3) oirf
0	-.043726	.559228	0
1	-.040978	-.113757	.004308
2	.23392	-.118993	.184776
3	-.05026	-.035303	.10607
4	-.169988	.011706	-.044535
5	-.023624	.069693	.017216
6	.020548	.032866	.049343
7	.057004	-.007296	.017512
8	-.046696	.011385	.045654
9	-.050385	-.023413	.008508
10	.001214	-.022358	-.010985
11	-.005284	.02956	.000685
12	-.016092	.022414	-.015248
13	-.008788	.003296	.007097
14	.015637	-.018772	.017175
15	-.004659	-.013291	-.006984
16	-.021179	.007664	-.005842
17	-.013369	.006271	-.007287
18	.006828	.001667	-.002907
19	.007655	-.001899	.003337
20	-.007176	-.000594	-.001677

(1) irfname = iuf, impulse = dGE, and response = dRIR.

(2) irfname = iuf, impulse = dRIR, and response = dRIR.

(3) irfname = iuf, impulse = dPI, and response = dRIR.

IRF of dGE

Step	(1) oirf	(2) oirf	(3) oirf
0	.401761	0	0
1	-.13457	-.012731	-.107668
2	.12704	.006232	.069109
3	.027859	-.06139	-.046076
4	.157864	.041559	.021756
5	.032839	-.018625	-.006196
6	.012083	.059669	.023853
7	.074087	-.061712	.036854
8	.067433	.01082	.02137
9	.017384	.010537	.013032
10	-.000515	.016606	.013453
11	.04711	.003143	.025277
12	.041076	-.007406	.023604
13	.018259	.011495	.014122
14	-.000583	.004502	.015994
15	.019805	-.000249	.014773
16	.027032	.000699	.013606
17	.007897	.008873	.010654
18	.005808	.00473	.010267
19	.010599	-.00137	.011984
20	.015687	-.000602	.009898

(1) irfname = iuf, impulse = dGE, and response = dGE.

(2) irfname = iuf, impulse = dRIR, and response = dGE.

(3) irfname = iuf, impulse = dPI, and response = dGE.

LOG

```
--------------------------------------------------------------------------------------------------------------------
------------------------------------
      name:  <unnamed>
       log:  /Users/saarth2712/Downloads/EDA_COE1.smcl
  log type:  smcl
 opened on:  20 Jan 2024, 17:46:44

.
. import excel "/Users/saarth2712/Downloads/CrowdingOut (1).xlsx", firstrow sheet("Sheet1")
cellrange(B1:D153)
(3 vars, 152 obs)

.
.
. gen YQ = tq(1982q1) + _n-1

. format YQ %tq

. order YQ GE RIR PI

. tsset YQ

. sum

Time variable: YQ, 1982q1 to 2019q4
        Delta: 1 quarter
```

```
.
. local x = tq(2016q1) + 0.5

. tsline GE, xline(`x') name(GE, replace)

. tsline RIR, xline(`x') name(RIR, replace)

. tsline PI, xline(`x') name(PI, replace)

. graph combine GE RIR PI

.
. dfuller GE

Dickey–Fuller test for unit root          Number of obs  = 151
Variable: GE                              Number of lags =   0

H0: Random walk without drift, d = 0

                              Dickey–Fuller
                 Test     -------- critical value ---------
            statistic         1%          5%          10%
--------------------------------------------------------------
 Z(t)           2.900      -3.493      -2.887      -2.577
--------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 1.0000.

. pperron GE

Phillips–Perron test for unit root        Number of obs   = 151
```

```
Variable: GE                          Newey–West lags =   4

H0: Random walk without drift, d = 0

                              Dickey–Fuller
              Test      -------- critical value ---------
           statistic         1%          5%         10%
-------------------------------------------------------------
 Z(rho)          0.965      -19.970      -13.802      -11.068
 Z(t)            2.588       -3.493       -2.887       -2.577
-------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9991.

.
. dfuller RIR

Dickey–Fuller test for unit root          Number of obs  = 151
Variable: RIR                             Number of lags =   0

H0: Random walk without drift, d = 0

                              Dickey–Fuller
              Test      -------- critical value ---------
           statistic         1%          5%         10%
-------------------------------------------------------------
 Z(t)           -2.782       -3.493       -2.887       -2.577
-------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0608.

. pperron RIR
```

Phillips–Perron test for unit root Number of obs = 151
Variable: RIR Newey–West lags = 4

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(rho)	-8.733	-19.970	-13.802	-11.068
Z(t)	-2.461	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.1253.

.

. dfuller PI

Dickey–Fuller test for unit root Number of obs = 151
Variable: PI Number of lags = 0

H0: Random walk without drift, d = 0

	Test statistic	Dickey–Fuller critical value 1%	5%	10%
Z(t)	1.223	-3.493	-2.887	-2.577

MacKinnon approximate p-value for Z(t) = 0.9961.

. pperron PI

```
Phillips–Perron test for unit root       Number of obs   = 151
Variable: PI                             Newey–West lags =   4

H0: Random walk without drift, d = 0

                               Dickey–Fuller
               Test      -------- critical value ---------
            statistic        1%          5%          10%
--------------------------------------------------------------
 Z(rho)        0.627      -19.970     -13.802      -11.068
 Z(t)          0.559       -3.493      -2.887       -2.577
--------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9866.

.
. gen dGE = d.GE
(1 missing value generated)

. gen dRIR = d.RIR
(1 missing value generated)

. gen dPI = d.PI
(1 missing value generated)

.
. tsline dGE, name(dGE, replace)

. tsline dRIR, name(dRIR, replace)

. tsline dPI, name(dPI, replace)
```

```
. graph combine dGE dRIR dPI

.
. dfuller dGE

Dickey–Fuller test for unit root          Number of obs  = 150
Variable: dGE                             Number of lags =   0

H0: Random walk without drift, d = 0

                                 Dickey–Fuller
                Test      -------- critical value ---------
             statistic         1%          5%          10%
------------------------------------------------------------
 Z(t)         -13.980      -3.493      -2.887      -2.577
------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

. pperron dGE

Phillips–Perron test for unit root        Number of obs   = 150
Variable: dGE                             Newey–West lags =   4

H0: Random walk without drift, d = 0

                                 Dickey–Fuller
                Test      -------- critical value ---------
             statistic         1%          5%          10%
------------------------------------------------------------
 Z(rho)      -233.333     -19.967     -13.800     -11.067
```

```
 Z(t)          -14.072       -3.493       -2.887       -2.577
------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

.
. dfuller dRIR

Dickey–Fuller test for unit root          Number of obs  = 150
Variable: dRIR                            Number of lags =   0

H0: Random walk without drift, d = 0

                                  Dickey–Fuller
                  Test      -------- critical value ---------
               statistic          1%           5%          10%
------------------------------------------------------------
 Z(t)          -13.761       -3.493       -2.887       -2.577
------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

. pperron dRIR

Phillips–Perron test for unit root       Number of obs   = 150
Variable: dRIR                           Newey–West lags =   4

H0: Random walk without drift, d = 0

                                  Dickey–Fuller
                  Test      -------- critical value ---------
               statistic          1%           5%          10%
------------------------------------------------------------
```

```
 Z(rho)      -142.913     -19.967     -13.800     -11.067
 Z(t)         -14.335      -3.493      -2.887      -2.577
------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

.
. dfuller dPI

Dickey–Fuller test for unit root          Number of obs  = 150
Variable: dPI                             Number of lags =   0

H0: Random walk without drift, d = 0

                              Dickey–Fuller
               Test      -------- critical value ---------
            statistic          1%          5%         10%
------------------------------------------------------------
 Z(t)          -7.760      -3.493      -2.887      -2.577
------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

. pperron dPI

Phillips–Perron test for unit root        Number of obs   = 150
Variable: dPI                             Newey–West lags =   4

H0: Random walk without drift, d = 0

                              Dickey–Fuller
               Test      -------- critical value ---------
            statistic          1%          5%         10%
```

```
-------------------------------------------------------------
 Z(rho)      -91.802     -19.967     -13.800     -11.067
 Z(t)         -7.876      -3.493      -2.887      -2.577
-------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

.
. varsoc dGE dRIR dPI if YQ < tq(2016q1), maxlag(8)

Lag-order selection criteria

   Sample: 1984q2 thru 2015q4                     Number of obs = 127
  +---------------------------------------------------------------------------+
  | Lag |    LL      LR      df    p     FPE       AIC      HQIC      SBIC    |
  |-----+---------------------------------------------------------------------|
  |   0 | -346.485                      .049295   5.5037   5.53099   5.57088  |
  |   1 | -315.861  61.246    9  0.000  .03507    5.16317   5.27236   5.43191* |
  |   2 | -296.726  38.272    9  0.000 .029905    5.00355   5.19463   5.47385  |
  |   3 |  -281.91  29.631    9  0.001 .027305    4.91197   5.18493*  5.58382  |
  |   4 |     -274  15.819    9  0.071 .027811    4.92914     5.284   5.80255  |
  |   5 |  -264.51  18.981    9  0.025 .027649    4.92142   5.35816   5.99638  |
  |   6 | -253.275   22.47*   9  0.008 .026766*  4.88622*  5.40486   6.16275  |
  |   7 | -250.819  4.9117    9  0.842 .029785    4.98928   5.58981   6.46736  |
  |   8 | -248.623  4.3927    9  0.884  .03332    5.09642   5.77884   6.77606  |
  +---------------------------------------------------------------------------+
   * optimal lag
   Endogenous: dGE dRIR dPI
    Exogenous: _cons

.
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1)
```

Vector autoregression

Sample: 1982q3 thru 2015q4 Number of obs = 134
Log likelihood = -334.4066 AIC = 5.170248
FPE = .0353192 HQIC = 5.275704
Det(Sigma_ml) = .0295259 SBIC = 5.429757

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dGE	4	.480923	0.1597	25.46665	0.0000
dRIR	4	.71404	0.1036	15.47937	0.0014
dPI	4	.529534	0.2113	35.90439	0.0000

	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]	
dGE						
dGE L1.	-.2926354	.0810819	-3.61	0.000	-.4515531	-.1337177
dRIR L1.	.0126326	.0535866	0.24	0.814	-.0923952	.1176604
dPI L1.	-.3026859	.0719129	-4.21	0.000	-.4436326	-.1617392
_cons	.5539068	.0552861	10.02	0.000	.4455481	.6622656
dRIR						

```
        dGE |
        L1. |  -.2086772   .1203847    -1.73   0.083    -.4446269    .0272724
            |
       dRIR |
        L1. |  -.1687955   .0795615    -2.12   0.034    -.3247332   -.0128577
            |
        dPI |
        L1. |    .275065   .1067712     2.58   0.010     .0657973    .4843326
            |
      _cons |  -.0556578   .0820849    -0.68   0.498    -.2165412    .1052255
-------------+----------------------------------------------------------------
dPI          |
        dGE |
        L1. |  -.1207438   .0892777    -1.35   0.176    -.2957249    .0542373
            |
       dRIR |
        L1. |  -.0846775   .0590031    -1.44   0.151    -.2003215    .0309664
            |
        dPI |
        L1. |   .4240697   .0791819     5.36   0.000     .2688761    .5792634
            |
      _cons |   .1554508   .0608744     2.55   0.011     .0361391    .2747625
------------------------------------------------------------------------------

. varstable

   Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue         |   Modulus  |
  |--------------------------+-------------|
  |    .422142                |   .422142  |
```

```
 | -.3551031           |  .355103  |
 | -.1044001           |    .1044  |
 +-------------------------------------+
  All the eigenvalues lie inside the unit circle.
  VAR satisfies stability condition.

. varlmar, mlag(4)

  Lagrange-multiplier test
 +--------------------------------------+
 | lag |      chi2    df   Prob > chi2 |
 |------+------------------------------|
 |  1 |  31.9882     9     0.00020   |
 |  2 |  39.6156     9     0.00001   |
 |  3 |  24.5375     9     0.00353   |
 |  4 |  20.7875     9     0.01363   |
 +-------------------------------------+
  H0: no autocorrelation at lag order


.
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1/2)

Vector autoregression


Sample: 1982q4 thru 2015q4                    Number of obs     =        133
Log likelihood =  -306.3422                  AIC               =   4.922439
FPE            =   .0275735                  HQIC              =    5.10789
Det(Sigma_ml)  =   .0201011                  SBIC              =    5.37881

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
```

```
dGE                7     .470961   0.2189   37.27984   0.0000
dRIR               7     .626497   0.2357   41.00647   0.0000
dPI                7     .527918   0.2395   41.89379   0.0000
------------------------------------------------------------------

------------------------------------------------------------------------------
             | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
dGE          |
         dGE |
         L1. |   -.205516   .0845384    -2.43   0.015    -.3712083   -.0398237
         L2. |   .2571829   .0861781     2.98   0.003      .088277    .4260888
             |
        dRIR |
         L1. |   .0440705   .0567508     0.78   0.437     -.067159    .1553001
         L2. |   .0448458   .0531664     0.84   0.399    -.0593585    .1490501
             |
         dPI |
         L1. |  -.2829607   .0768275    -3.68   0.000    -.4335398   -.1323815
         L2. |   .0840685   .0812852     1.03   0.301    -.0752476    .2433846
             |
       _cons |   .4098571   .0734199     5.58   0.000     .2659567    .5537576
-------------+----------------------------------------------------------------
dRIR         |
         dGE |
         L1. |  -.0710256   .1124573    -0.63   0.528    -.2914379    .1493867
         L2. |   .3165557   .1146385     2.76   0.006     .0918684    .5412429
             |
        dRIR |
         L1. |  -.1296755   .0754928    -1.72   0.086    -.2776387    .0182877
         L2. |  -.2514714   .0707247    -3.56   0.000    -.3900893   -.1128535
```

```
             |
         dPI |
         L1. |   .1602162   .1021999     1.57   0.117    -.0400919    .3605243
         L2. |   .3565874   .1081298     3.30   0.001      .144657    .5685178
             |
       _cons |  -.2659323   .0976669    -2.72   0.006     -.457356   -.0745086
-------------+----------------------------------------------------------------
dPI          |
         dGE |
         L1. |  -.1060786   .0947622    -1.12   0.263    -.2918091    .0796519
         L2. |  -.0638404   .0966001    -0.66   0.509    -.2531732    .1254923
             |
        dRIR |
         L1. |  -.1296022   .0636141    -2.04   0.042    -.2542834   -.0049209
         L2. |  -.0865412   .0595962    -1.45   0.146    -.2033477    .0302652
             |
         dPI |
         L1. |   .3496624   .0861188     4.06   0.000     .1808727    .5184521
         L2. |   .1529435   .0911156     1.68   0.093    -.0256397    .3315268
             |
       _cons |   .1491913   .0822991     1.81   0.070     -.012112    .3104945
------------------------------------------------------------------------------

. varstable

   Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue        |   Modulus   |
  |--------------------------+-------------|
  |  -.6305793               |   .630579   |
  |   .4889405 + .03977539i  |   .490556   |
```

```
  |   .4889405 - .03977539i  |   .490556   |
  | -.03364286 +  .4661009i  |   .467314   |
  | -.03364286 -  .4661009i  |   .467314   |
  |  -.2655452               |   .265545   |
  +----------------------------------------+
   All the eigenvalues lie inside the unit circle.
   VAR satisfies stability condition.

. varlmar, mlag(4)

   Lagrange-multiplier test
  +--------------------------------------+
  | lag |      chi2    df   Prob > chi2 |
  |------+-------------------------------|
  |   1 |   23.0044     9     0.00619   |
  |   2 |   22.5785     9     0.00722   |
  |   3 |   24.9968     9     0.00297   |
  |   4 |   16.8015     9     0.05192   |
  +--------------------------------------+
   H0: no autocorrelation at lag order

.
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1/3)

Vector autoregression

Sample: 1983q1 thru 2015q4                   Number of obs     =        132
Log likelihood =  -288.5139                  AIC               =   4.825969
FPE            =   .0250523                  HQIC              =   5.092205
Det(Sigma_ml)  =   .0158877                  SBIC              =   5.481151
```

```
Equation          Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
dGE                10     .464718   0.2636   47.26047   0.0000
dRIR               10     .609685   0.2987    56.2344   0.0000
dPI                10     .504067   0.3227   62.88444   0.0000
----------------------------------------------------------------


------------------------------------------------------------------------------
             | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
dGE          |
         dGE |
         L1. |  -.2406787   .0855979    -2.81   0.005    -.4084475   -.0729098
         L2. |   .2846264   .0868259     3.28   0.001     .1144508     .454802
         L3. |   .1998902   .0901585     2.22   0.027     .0231827    .3765976
             |
        dRIR |
         L1. |  -.0077391   .0639562    -0.12   0.904    -.1330909    .1176128
         L2. |   .0531882   .0574085     0.93   0.354    -.0593304    .1657068
         L3. |  -.0866237   .0566142    -1.53   0.126    -.1975854     .024338
             |
         dPI |
         L1. |  -.2879234   .0766499    -3.76   0.000    -.4381545   -.1376923
         L2. |   .1167544   .0827957     1.41   0.158    -.0455222     .279031
         L3. |   .0079745   .0841551     0.09   0.925    -.1569665    .1729155
             |
       _cons |   .3250024   .0824652     3.94   0.000     .1633735    .4866312
-------------+----------------------------------------------------------------
dRIR         |
         dGE |
         L1. |  -.1388605   .1122999    -1.24   0.216    -.3589643    .0812433
```

```
        L2. |    .403818   .1139109     3.55   0.000     .1805567    .6270793
        L3. |   .2818199   .1182832     2.38   0.017     .0499892    .5136507
            |
       dRIR |
        L1. |  -.2352057   .0839071    -2.80   0.005    -.3996606   -.0707508
        L2. |   -.294924   .0753169    -3.92   0.000    -.4425424   -.1473056
        L3. |  -.1399585   .0742748    -1.88   0.060    -.2855344    .0056174
            |
        dPI |
        L1. |    .110526   .1005606     1.10   0.272    -.0865691    .3076212
        L2. |   .3232281   .1086235     2.98   0.003     .1103299    .5361263
        L3. |   .2853646    .110407     2.58   0.010     .0689708    .5017583
            |
      _cons |  -.4352522   .1081899    -4.02   0.000    -.6473006   -.2232038
-------------+----------------------------------------------------------------
dPI         |
        dGE |
        L1. |  -.0204328   .0928458    -0.22   0.826    -.2024073    .1615417
        L2. |  -.1400464   .0941778    -1.49   0.137    -.3246314    .0445387
        L3. |  -.3740643   .0977926    -3.83   0.000    -.5657343   -.1823943
            |
       dRIR |
        L1. |   -.102641   .0693716    -1.48   0.139    -.2386069    .0333249
        L2. |  -.0998328   .0622695    -1.60   0.109    -.2218789    .0222132
        L3. |   .0079443   .0614079     0.13   0.897     -.112413    .1283016
            |
        dPI |
        L1. |   .3437174   .0831402     4.13   0.000     .1807656    .5066691
        L2. |   .1236856   .0898063     1.38   0.168    -.0523316    .2997028
        L3. |  -.0664366   .0912809    -0.73   0.467    -.2453438    .1124706
            |
```

```
       _cons |   .3132112   .0894479     3.50   0.000     .1378967    .4885258
------------------------------------------------------------------------------

. varstable

   Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue        |   Modulus   |
  |--------------------------+-------------|
  |   .7626759               |   .762676   |
  |  -.6153137 + .04766592i  |   .617157   |
  |  -.6153137 - .04766592i  |   .617157   |
  |  .00038366 +  .6018552i  |   .601855   |
  |  .00038366 -  .6018552i  |   .601855   |
  |   .4255516 +  .3676824i  |   .562392   |
  |   .4255516 -  .3676824i  |   .562392   |
  |  -.2580431 +  .4390225i  |   .509242   |
  |  -.2580431 -  .4390225i  |   .509242   |
  +----------------------------------------+
   All the eigenvalues lie inside the unit circle.
   VAR satisfies stability condition.

. varlmar, mlag(4)

   Lagrange-multiplier test
  +--------------------------------------+
  | lag  |      chi2    df   Prob > chi2 |
  |------+-------------------------------|
  |   1  |   15.7130     9     0.07312   |
  |   2  |   22.4438     9     0.00757   |
  |   3  |   11.2431     9     0.25941   |
```

```
  |   4  |   18.1913     9     0.03302   |
  +--------------------------------------+
   H0: no autocorrelation at lag order

.
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1/4)

Vector autoregression

Sample: 1983q2 thru 2015q4                      Number of obs     =        131
Log likelihood =   -278.719                     AIC               =   4.850671
FPE            =    .025707                     HQIC              =   5.198492
Det(Sigma_ml)  =   .0141452                     SBIC              =   5.706646

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
dGE                  13     .459991   0.3018   56.61832   0.0000
dRIR                 13     .606324   0.3286   64.10902   0.0000
dPI                  13     .501293   0.3520   71.17481   0.0000
----------------------------------------------------------------

------------------------------------------------------------------------------
             | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
dGE          |
         dGE |
         L1. |  -.2938202   .0866795    -3.39   0.001    -.4637089   -.1239315
         L2. |   .2151666   .0894548     2.41   0.016     .0398385    .3904947
         L3. |   .2713969   .0947397     2.86   0.004     .0857105    .4570834
         L4. |   .2469868   .0978038     2.53   0.012     .0552949    .4386787
             |
```

dRIR |						
L1. |	-.0425441	.065583	-0.65	0.517	-.1710845	.0859962
L2. |	.0270226	.064973	0.42	0.677	-.1003222	.1543674
L3. |	-.0546888	.0618954	-0.88	0.377	-.1760016	.0666239
L4. |	-.0391473	.0584271	-0.67	0.503	-.1536623	.0753678
|						
dPI |						
L1. |	-.2218027	.0795199	-2.79	0.005	-.3776588	-.0659466
L2. |	.0916439	.0829872	1.10	0.269	-.071008	.2542958
L3. |	.0470984	.0851185	0.55	0.580	-.1197307	.2139276
L4. |	-.003154	.084797	-0.04	0.970	-.1693531	.1630451
|						
_cons |	.2303933	.0930591	2.48	0.013	.0480008	.4127857

-------------+--

dRIR |						
dGE |						
L1. |	-.1103654	.1142543	-0.97	0.334	-.3342996	.1135688
L2. |	.4720633	.1179124	4.00	0.000	.2409593	.7031673
L3. |	.1841586	.1248786	1.47	0.140	-.0605989	.4289162
L4. |	-.2494571	.1289174	-1.94	0.053	-.5021305	.0032163
|						
dRIR |						
L1. |	-.1920815	.0864465	-2.22	0.026	-.3615135	-.0226494
L2. |	-.2828086	.0856425	-3.30	0.001	-.4506647	-.1149524
L3. |	-.1283496	.0815857	-1.57	0.116	-.2882548	.0315555
L4. |	.001625	.0770141	0.02	0.983	-.1493199	.1525699
|						
dPI |						
L1. |	.0343983	.104817	0.33	0.743	-.1710392	.2398358
L2. |	.3592272	.1093873	3.28	0.001	.144832	.5736225
L3. |	.2883909	.1121966	2.57	0.010	.0684895	.5082922

```
         L4. |  -.1345528   .1117729    -1.20   0.229    -.3536236    .0845181
             |
       _cons |  -.2973412   .1226633    -2.42   0.015    -.5377569   -.0569255
-------------+----------------------------------------------------------------
dPI          |
         dGE |
         L1. |   .0044884   .0944625     0.05   0.962    -.1806547    .1896315
         L2. |  -.1144276   .0974869    -1.17   0.240    -.3054984    .0766433
         L3. |   -.441179   .1032464    -4.27   0.000    -.6435383   -.2388197
         L4. |  -.0699904   .1065856    -0.66   0.511    -.2788943    .1389136
             |
        dRIR |
         L1. |  -.0577578   .0714718    -0.81   0.419    -.1978398    .0823243
         L2. |  -.0460842    .070807    -0.65   0.515    -.1848634    .0926949
         L3. |    .063532    .067453     0.94   0.346    -.0686734    .1957375
         L4. |   .1151424   .0636733     1.81   0.071    -.0096549    .2399398
             |
         dPI |
         L1. |   .3259187     .08666     3.76   0.000     .1560682    .4957692
         L2. |   .1699297   .0904387     1.88   0.060    -.0073268    .3471862
         L3. |  -.0467192   .0927613    -0.50   0.615     -.228528    .1350897
         L4. |  -.1832545    .092411    -1.98   0.047    -.3643767   -.0021323
             |
       _cons |   .3884986   .1014149     3.83   0.000      .189729    .5872681
------------------------------------------------------------------------------

. varstable

   Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue        |  Modulus    |
```

|-------------------------+-------------|
.8531413	.853141
-.7404095	.74041
-.1050776 + .7111887i	.718909
-.1050776 - .7111887i	.718909
-.3198797 + .5549439i	.640536
-.3198797 - .5549439i	.640536
.3801213 + .4752979i	.608605
.3801213 - .4752979i	.608605
-.5473021 + .200676i	.582933
-.5473021 - .200676i	.582933
.4557807 + .323271i	.558785
.4557807 - .323271i	.558785
+---------------------------------------+

All the eigenvalues lie inside the unit circle.

VAR satisfies stability condition.

. varlmar, mlag(4)

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	14.1859	9	0.11586
2	12.2421	9	0.20000
3	7.9500	9	0.53920
4	9.2581	9	0.41379

H0: no autocorrelation at lag order

.

```
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1/5)

Vector autoregression

Sample: 1983q3 thru 2015q4                    Number of obs     =       130
Log likelihood =  -267.3346                   AIC               =   4.851302
FPE            =   .0257694                   HQIC              =    5.28152
Det(Sigma_ml)  =   .0122676                   SBIC              =   5.910084

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
dGE                  16     .440362   0.3804   79.81226   0.0000
dRIR                 16     .605964   0.3492    69.7556   0.0000
dPI                  16      .50778   0.3566   72.06035   0.0000
----------------------------------------------------------------


------------------------------------------------------------------------------
             | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
dGE          |
         dGE |
         L1. |  -.3420873   .0835845    -4.09   0.000    -.5059099   -.1782647
         L2. |   .1727904   .0878105     1.97   0.049     .0006849    .3448958
         L3. |   .1506457   .0943143     1.60   0.110    -.0342069    .3354983
         L4. |   .3358084   .0998746     3.36   0.001     .1400578     .531559
         L5. |   .3751625   .0969269     3.87   0.000     .1851893    .5651357
             |
        dRIR |
         L1. |  -.0010749   .0632667    -0.02   0.986    -.1250753    .1229254
         L2. |  -.0154923   .0635452    -0.24   0.807    -.1400386    .1090539
         L3. |  -.1172393   .0669032    -1.75   0.080    -.2483671    .0138885
```

L4.	.0215757	.0626203	0.34	0.730	-.1011577	.1443092
L5.	.0271711	.0561836	0.48	0.629	-.0829467	.1372889
dPI						
L1.	-.2262927	.0771258	-2.93	0.003	-.3774564	-.0751289
L2.	.1557702	.0809935	1.92	0.054	-.0029742	.3145146
L3.	.0118556	.083265	0.14	0.887	-.1513408	.175052
L4.	.016451	.0831359	0.20	0.843	-.1464924	.1793944
L5.	.1025748	.0818346	1.25	0.210	-.057818	.2629676
_cons	.1119882	.096595	1.16	0.246	-.0773345	.3013108
dRIR						
dGE						
L1.	-.0835561	.1150173	-0.73	0.468	-.3089858	.1418736
L2.	.5333208	.1208325	4.41	0.000	.2964934	.7701482
L3.	.2024893	.1297821	1.56	0.119	-.0518789	.4568575
L4.	-.2936916	.1374334	-2.14	0.033	-.5630562	-.0243271
L5.	-.0848261	.1333772	-0.64	0.525	-.3462406	.1765883
dRIR						
L1.	-.1876795	.0870587	-2.16	0.031	-.3583114	-.0170475
L2.	-.25363	.087442	-2.90	0.004	-.4250132	-.0822469
L3.	-.0795327	.0920628	-0.86	0.388	-.2599724	.100907
L4.	-.0057301	.0861692	-0.07	0.947	-.1746186	.1631585
L5.	.1396886	.0773119	1.81	0.071	-.01184	.2912172
dPI						
L1.	.0211202	.1061297	0.20	0.842	-.1868902	.2291306
L2.	.3543398	.1114519	3.18	0.001	.135898	.5727816
L3.	.3123695	.1145776	2.73	0.006	.0878014	.5369375

```
         L4. |  -.1796995      .1144    -1.57   0.116    -.4039194    .0445204
         L5. |   .0332846   .1126093     0.30   0.768    -.1874255    .2539947
             |
       _cons |  -.2781866   .1329204    -2.09   0.036    -.5387059   -.0176673
-------------+----------------------------------------------------------------
dPI          |
         dGE |
         L1. |   .0119553   .0963812     0.12   0.901    -.1769483    .2008589
         L2. |  -.1079112   .1012542    -1.07   0.287    -.3063657    .0905433
         L3. |  -.4306649   .1087537    -3.96   0.000    -.6438182   -.2175117
         L4. |  -.0530912   .1151652    -0.46   0.645    -.2788109    .1726285
         L5. |  -.0327085   .1117662    -0.29   0.770    -.2517663    .1863493
             |
        dRIR |
         L1. |  -.0544634   .0729527    -0.75   0.455     -.197448    .0885213
         L2. |  -.0488074   .0732739    -0.67   0.505    -.1924215    .0948067
         L3. |   .0713931   .0771459     0.93   0.355    -.0798102    .2225964
         L4. |   .0803032   .0722073     1.11   0.266    -.0612206    .2218269
         L5. |  -.0184403   .0647852    -0.28   0.776    -.1454169    .1085363
             |
         dPI |
         L1. |    .343373   .0889336     3.86   0.000     .1690662    .5176797
         L2. |   .1629167   .0933935     1.74   0.081    -.0201312    .3459646
         L3. |  -.0611332   .0960128    -0.64   0.524    -.2493147    .1270483
         L4. |  -.2061534   .0958639    -2.15   0.032    -.3940432   -.0182636
         L5. |   .0694996   .0943633     0.74   0.461    -.1154491    .2544483
             |
       _cons |   .3715214   .1113835     3.34   0.001     .1532137     .589829
------------------------------------------------------------------------------

. varstable
```

```
  Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue         |  Modulus   |
  |--------------------------+-------------|
  |   .9074341                |   .907434  |
  |  -.7831736 +  .2859461i  |   .833742  |
  |  -.7831736 -  .2859461i  |   .833742  |
  | -.00297859 +   .807075i  |   .807081  |
  | -.00297859 -   .807075i  |   .807081  |
  |   .2950413 +  .7116823i  |   .770416  |
  |   .2950413 -  .7116823i  |   .770416  |
  |  -.4803607 +  .5314495i  |   .716369  |
  |  -.4803607 -  .5314495i  |   .716369  |
  |   .6616274                |   .661627  |
  |  -.5103609 +  .3883444i  |   .641311  |
  |  -.5103609 -  .3883444i  |   .641311  |
  |   .4069139 +   .423451i  |   .587273  |
  |   .4069139 -   .423451i  |   .587273  |
  |   .3943819                |   .394382  |
  +----------------------------------------+
   All the eigenvalues lie inside the unit circle.
   VAR satisfies stability condition.

. varlmar, mlag(4)

  Lagrange-multiplier test
  +--------------------------------------+
  | lag  |      chi2    df   Prob > chi2 |
  |------+-------------------------------|
  |   1  |   13.1585     9     0.15556   |
```

```
 |  2 |    8.2054     9     0.51359   |
 |  3 |    8.8081     9     0.45517   |
 |  4 |    3.3767     9     0.94747   |
 +-------------------------------------+
  H0: no autocorrelation at lag order

.
. var dGE dRIR dPI if YQ < tq(2016q1), lags(1/6)

Vector autoregression

Sample: 1983q4 thru 2015q4                    Number of obs     =       129
Log likelihood =  -257.2687                   AIC               =   4.872383
FPE            =  .0263899                    HQIC              =   5.385825
Det(Sigma_ml)  =   .010835                    SBIC              =   6.136021

Equation          Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
dGE                 19     .435077   0.4164   92.02667   0.0000
dRIR                19     .607451   0.3689   75.39748   0.0000
dPI                 19      .50391   0.3882   81.85102   0.0000
----------------------------------------------------------------


------------------------------------------------------------------------------
             | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
dGE          |
         dGE |
         L1. |   -.359289     .08641    -4.16   0.000    -.5286496   -.1899284
         L2. |    .184754    .088516     2.09   0.037     .0112659    .3582422
         L3. |   .2220809    .096116     2.31   0.021      .033697    .4104648
```

L4.	.3391097	.1003063	3.38	0.001	.142513	.5357064
L5.	.3440262	.1045054	3.29	0.001	.1391995	.548853
L6.	-.0217544	.0998719	-0.22	0.828	-.2174997	.1739909
dRIR						
L1.	-.0328982	.0627543	-0.52	0.600	-.1558944	.0900981
L2.	-.0133454	.0629464	-0.21	0.832	-.1367181	.1100273
L3.	-.1086481	.067149	-1.62	0.106	-.2402577	.0229615
L4.	.0293991	.0697218	0.42	0.673	-.107253	.1660513
L5.	.0275166	.0613978	0.45	0.654	-.092821	.1478542
L6.	.12433	.0555884	2.24	0.025	.0153788	.2332812
dPI						
L1.	-.2323952	.0755945	-3.07	0.002	-.3805578	-.0842327
L2.	.1454216	.0816337	1.78	0.075	-.0145774	.3054206
L3.	.0237736	.0843477	0.28	0.778	-.1415448	.189092
L4.	.038238	.0838212	0.46	0.648	-.1260486	.2025245
L5.	.0538368	.0833336	0.65	0.518	-.109494	.2171675
L6.	.0813246	.0805802	1.01	0.313	-.0766097	.2392589
_cons	.1029324	.0999638	1.03	0.303	-.092993	.2988577
dRIR						
dGE						
L1.	-.1232595	.1206449	-1.02	0.307	-.3597191	.1132001
L2.	.5278301	.1235851	4.27	0.000	.2856077	.7700526
L3.	.2346131	.1341962	1.75	0.080	-.0284067	.4976328
L4.	-.3225132	.1400467	-2.30	0.021	-.5969996	-.0480268
L5.	-.0393149	.1459094	-0.27	0.788	-.3252921	.2466622
L6.	.0803145	.1394402	0.58	0.565	-.1929832	.3536122

```
        dRIR |
         L1. |  -.2030123    .087617    -2.32   0.021    -.3747385   -.0312861
         L2. |  -.2401618   .0878851    -2.73   0.006    -.4124135   -.0679101
         L3. |  -.1019701   .0937528    -1.09   0.277    -.2857222     .081782
         L4. |  -.0514045   .0973448    -0.53   0.597    -.2421968    .1393879
         L5. |   .1189827   .0857231     1.39   0.165    -.0490314    .2869969
         L6. |   .0251832   .0776119     0.32   0.746    -.1269335    .1772998
             |
         dPI |
         L1. |   .0092982   .1055444     0.09   0.930    -.1975649    .2161613
         L2. |   .3688934   .1139761     3.24   0.001     .1455044    .5922825
         L3. |   .3245641   .1177654     2.76   0.006     .0937481    .5553801
         L4. |  -.2020755   .1170303    -1.73   0.084    -.4314508    .0272998
         L5. |  -.0147898   .1163495    -0.13   0.899    -.2428306    .2132511
         L6. |   .2005623   .1125053     1.78   0.075    -.0199441    .4210686
             |
       _cons |  -.3391295   .1395684    -2.43   0.015    -.6126786   -.0655804
-------------+----------------------------------------------------------------
dPI          |
         dGE |
         L1. |  -.0583289   .1000807    -0.58   0.560    -.2544835    .1378256
         L2. |  -.1706808   .1025198    -1.66   0.096    -.3716159    .0302544
         L3. |  -.4567059   .1113222    -4.10   0.000    -.6748934   -.2385184
         L4. |  -.1146114   .1161754    -0.99   0.324    -.3423111    .1130882
         L5. |   .0553866   .1210388     0.46   0.647    -.1818452    .2926184
         L6. |   .2725425   .1156723     2.36   0.018      .045829    .4992561
             |
        dRIR |
         L1. |  -.0537652   .0726825    -0.74   0.459    -.1962203    .0886899
         L2. |  -.0187083   .0729049    -0.26   0.797    -.1615994    .1241828
         L3. |   .0469345   .0777724     0.60   0.546    -.1054966    .1993657
```

```
        L4. |   .0816811   .0807522     1.01   0.312    -.0765903    .2399525
        L5. |   .0206425   .0711114     0.29   0.772    -.1187333    .1600183
        L6. |   .0264804   .0643828     0.41   0.681    -.0997076    .1526684
            |
        dPI |
        L1. |   .3418553   .0875541     3.90   0.000     .1702524    .5134582
        L2. |   .1418766   .0945487     1.50   0.133    -.0434354    .3271885
        L3. |   .0073611   .0976921     0.08   0.940    -.1841118     .198834
        L4. |  -.2231137   .0970823    -2.30   0.022    -.4133915   -.0328359
        L5. |   .0913344   .0965175     0.95   0.344    -.0978364    .2805052
        L6. |   .0097885   .0933286     0.10   0.916    -.1731321    .1927091
            |
      _cons |   .3097085   .1157787     2.68   0.007     .0827864    .5366306
------------------------------------------------------------------------------

. varstable, graph saving(var_eigen.gph, replace)

   Eigenvalue stability condition
  +----------------------------------------+
  |        Eigenvalue        |  Modulus    |
  |--------------------------+-------------|
  |    .884096               |  .884096    |
  |  .01513879 +  .8626955i  |   .862828   |
  |  .01513879 -  .8626955i  |   .862828   |
  |   .4193134 +   .734831i  |    .84605   |
  |   .4193134 -   .734831i  |    .84605   |
  |  -.6113226 +  .5011531i  |   .790487   |
  |  -.6113226 -  .5011531i  |   .790487   |
  |   -.735338 +  .2826439i  |   .787788   |
  |   -.735338 -  .2826439i  |   .787788   |
  |  -.4973493 +  .5992291i  |   .778737   |
```

```
  | -.4973493 -  .5992291i |  .778737   |
  |  .7443092              |  .744309   |
  | -.7276333              |  .727633   |
  |  .5428022 +  .3596592i |  .651144   |
  |  .5428022 -  .3596592i |  .651144   |
  | -.00417165 +   .637788i |  .637802   |
  | -.00417165 -   .637788i |  .637802   |
  |  .6206365              |  .620636   |
  +----------------------------------------+
   All the eigenvalues lie inside the unit circle.
   VAR satisfies stability condition.
file var_eigen.gph saved

. varlmar, mlag(4)

   Lagrange-multiplier test
  +--------------------------------------+
  | lag  |      chi2    df   Prob > chi2 |
  |------+-------------------------------|
  |   1  |    2.9163     9     0.96752   |
  |   2  |    2.9961     9     0.96445   |
  |   3  |    8.0383     9     0.53029   |
  |   4  |    2.7573     9     0.97314   |
  +--------------------------------------+
   H0: no autocorrelation at lag order

.
. vargranger

   Granger causality Wald tests
  +------------------------------------------------------------------+
```

```
  |        Equation           Excluded |   chi2     df Prob > chi2 |
  |--------------------------------------+---------------------------|
  |            dGE              dRIR |  9.0957     6    0.168    |
  |            dGE               dPI |  14.162     6    0.028    |
  |            dGE               ALL |  23.387    12    0.025    |
  |--------------------------------------+---------------------------|
  |           dRIR               dGE |  29.075     6    0.000    |
  |           dRIR               dPI |  30.042     6    0.000    |
  |           dRIR               ALL |   56.73    12    0.000    |
  |--------------------------------------+---------------------------|
  |            dPI               dGE |  25.663     6    0.000    |
  |            dPI              dRIR |  2.3509     6    0.885    |
  |            dPI               ALL |  35.704    12    0.000    |
  +------------------------------------------------------------------+
```

```
.
. quietly var dGE dRIR dPI if YQ < tq(2016q1), lags(1/6)


.
. predict f_dPI
(option xb assumed; fitted values)
(7 missing values generated)

. label variable f_dPI " One-step ahead forecast"

. tsline dPI f_dPI if YQ >= tq(2016q1), lpattern(solid dash) saving(dPI_1.gph, replace) ,title("
dPI . forecasts and actuals")
file dPI_1.gph saved

.
. predict f_dRIR
```

(option xb assumed; fitted values)
(7 missing values generated)

. label variable f_dRIR " One-step ahead forecast"

. tsline dRIR f_dRIR if YQ >= tq(2016q1), lpattern(solid dash) saving(dRIR_1.gph, replace) ,title(" dRIR . forecasts and actuals")
file dRIR_1.gph saved

.
. predict f_dGE
(option xb assumed; fitted values)
(7 missing values generated)

. label variable f_dGE " One-step ahead forecast"

. tsline dGE f_dGE if YQ >= tq(2016q1), lpattern(solid dash) saving(dGE_1.gph, replace) ,title(" dGE . forecasts and actuals")
file dGE_1.gph saved

.
. predict r_dPI
(option xb assumed; fitted values)
(7 missing values generated)

. label variable r_dPI " Residuals "

. tsline dPI r_dPI if YQ >= tq(2016q1), lpattern(solid dash) saving(dPI_1.gph, replace) ,title(" dPI . forecasts and actuals")
file dPI_1.gph saved

.

. predict r_dRIR

(option xb assumed; fitted values)

(7 missing values generated)

. label variable r_dRIR " Residuals "

. tsline dRIR r_dRIR if YQ >= tq(2016q1), lpattern(solid dash) saving(dRIR_1.gph, replace) ,title(" dRIR . forecasts and actuals")

file dRIR_1.gph saved

.

. predict r_dGE

(option xb assumed; fitted values)

(7 missing values generated)

. label variable r_dGE " Residuals "

. tsline dGE r_dGE if YQ >= tq(2016q1), lpattern(solid dash) saving(dPI_1.gph, replace) ,title(" dGE . forecasts and actuals")

file dPI_1.gph saved

. quietly var dGE dRIR dPI if YQ < tq(2016q1), lags(1/6)

. fcast compute F_, step(12) replace

.

. label variable F_dGE " 12-step ahead forecast"

. fcast graph F_dGE , observed lpattern(dash)

```
.
. label variable F_dRIR " 12-step ahead forecast"

. fcast graph F_dRIR , observed lpattern(dash)

.
. label variable F_dPI " 12-step ahead forecast"

. fcast graph F_dPI , observed lpattern(dash)


.
. capture erase macrovar.irf

. quietly var dGE dRIR dPI if YQ < tq(2016q1), lags(1/6)

. irf create iuf, set(macrovar) step(20) order(dGE dRIR dPI)
(file macrovar.irf created)
(file macrovar.irf now active)
(file macrovar.irf updated)

.
. irf table oirf, noci response(dPI) title(IRF of dPI)

IRF of dPI

--------------------------------------------
         |      (1)         (2)         (3)
    Step |     oirf        oirf        oirf
---------+----------------------------------
       0 | -.035887    -.024382     .463296
```

1	-.033352	-.038402	.15838
2	-.074195	-.020191	.125922
3	-.212151	.024052	.073259
4	-.090355	.06331	-.028185
5	-.074869	.034613	.005471
6	.038276	.039479	.013191
7	-.078214	-.014958	-.021194
8	-.038396	-.015802	.021666
9	-.031451	-.032516	-.024825
10	-.032991	.01582	-.023958
11	-.025275	.009656	-.017447
12	-.026883	.011006	-.013851
13	-.00109	-.01888	.000215
14	-.012103	-.011905	-.009699
15	-.027877	.000227	-.016366
16	-.021368	-.000555	-.014522
17	-.004708	.002611	-.01135
18	-.002789	-.002542	-.007002
19	-.009434	-.001757	-.006942
20	-.011508	-.004341	-.006133

----

(1) irfname = iuf, impulse = dGE, and response = dPI.

(2) irfname = iuf, impulse = dRIR, and response = dPI.

(3) irfname = iuf, impulse = dPI, and response = dPI.

. irf table oirf, noci response(dRIR) title(IRF of dRIR)

IRF of dRIR

----

	(1)	(2)	(3)

Step	oirf	oirf	oirf
0	-.043726	.559228	0
1	-.040978	-.113757	.004308
2	.23392	-.118993	.184776
3	-.05026	-.035303	.10607
4	-.169988	.011706	-.044535
5	-.023624	.069693	.017216
6	.020548	.032866	.049343
7	.057004	-.007296	.017512
8	-.046696	.011385	.045654
9	-.050385	-.023413	.008508
10	.001214	-.022358	-.010985
11	-.005284	.02956	.000685
12	-.016092	.022414	-.015248
13	-.008788	.003296	.007097
14	.015637	-.018772	.017175
15	-.004659	-.013291	-.006984
16	-.021179	.007664	-.005842
17	-.013369	.006271	-.007287
18	.006828	.001667	-.002907
19	.007655	-.001899	.003337
20	-.007176	-.000594	-.001677

(1) irfname = iuf, impulse = dGE, and response = dRIR.

(2) irfname = iuf, impulse = dRIR, and response = dRIR.

(3) irfname = iuf, impulse = dPI, and response = dRIR.

. irf table oirf, noci response(dGE) title(IRF of dGE)

IRF of dGE

Step	(1) oirf	(2) oirf	(3) oirf
0	.401761	0	0
1	-.13457	-.012731	-.107668
2	.12704	.006232	.069109
3	.027859	-.06139	-.046076
4	.157864	.041559	.021756
5	.032839	-.018625	-.006196
6	.012083	.059669	.023853
7	.074087	-.061712	.036854
8	.067433	.01082	.02137
9	.017384	.010537	.013032
10	-.000515	.016606	.013453
11	.04711	.003143	.025277
12	.041076	-.007406	.023604
13	.018259	.011495	.014122
14	-.000583	.004502	.015994
15	.019805	-.000249	.014773
16	.027032	.000699	.013606
17	.007897	.008873	.010654
18	.005808	.00473	.010267
19	.010599	-.00137	.011984
20	.015687	-.000602	.009898

(1) irfname = iuf, impulse = dGE, and response = dGE.

(2) irfname = iuf, impulse = dRIR, and response = dGE.

(3) irfname = iuf, impulse = dPI, and response = dGE.

.

. irf graph oirf, yline(0) response(dPI) impulse(dRIR)

. irf graph oirf, yline(0) response(dRIR) impulse(dGE)

.

. irf graph oirf, yline(0) response(dPI) impulse(dGE)

. irf graph oirf, yline(0) response(dRIR) impulse(dGE)

. irf graph oirf, yline(0) response(dRIR) impulse(dPI)

.

. irf table fevd, response(dPI) title(FEVD of dPI)

FEVD of dPI

	(1)	(1)	(1)	(2)	(2)	(2)
Step	fevd	Lower	Upper	fevd	Lower	Upper
0	0	0	0	0	0	0
1	.005948	-.020511	.032407	.002745	-.015235	.020726
2	.009829	-.027751	.047409	.008473	-.026435	.043382
3	.029722	-.03736	.096805	.009313	-.029655	.04828
4	.166961	.037744	.296178	.009641	-.021344	.040625
5	.185146	.044642	.325651	.021412	-.025722	.068546
6	.198036	.051911	.344161	.024536	-.030426	.079497
7	.200483	.058048	.342918	.02889	-.035125	.092905
8	.214201	.066827	.361576	.028969	-.033148	.091086
9	.21708	.066794	.367366	.029503	-.032099	.091105

10	.21825	.066711	.369788	.032287	-.028237	.092811
11	.220148	.067255	.373041	.03282	-.02811	.09375
12	.221306	.067058	.375554	.032987	-.028435	.09441
13	.222694	.067498	.37789	.033232	-.028468	.094932
14	.222473	.067464	.377482	.0342	-.027681	.096081
15	.222646	.067453	.377839	.034561	-.027445	.096568
16	.22417	.068169	.38017	.03446	-.027344	.096265
17	.225027	.068409	.381644	.034397	-.027273	.096067
18	.22499	.068399	.38158	.034401	-.027336	.096138
19	.224971	.068407	.381536	.034413	-.027296	.096122
20	.225132	.068481	.381782	.034408	-.027299	.096115

	(3)	(3)	(3)
Step	fevd	Lower	Upper
0	0	0	0
1	.991307	.959407	1.02321
2	.981698	.930952	1.03244
3	.960965	.885057	1.03687
4	.823398	.693287	.953509
5	.793442	.648018	.938865
6	.777428	.624084	.930773
7	.770627	.618426	.922828
8	.756829	.601397	.912262
9	.753417	.595402	.911432
10	.749463	.589815	.909112
11	.747032	.585846	.908218
12	.745707	.583317	.908096
13	.744074	.580755	.907393

14	.743326	.579805	.906848
15	.742793	.578761	.906825
16	.74137	.576431	.906309
17	.740576	.575048	.906105
18	.74061	.575106	.906114
19	.740616	.575134	.906097
20	.74046	.574893	.906027

95% lower and upper bounds reported.

(1) irfname = iuf, impulse = dGE, and response = dPI.

(2) irfname = iuf, impulse = dRIR, and response = dPI.

(3) irfname = iuf, impulse = dPI, and response = dPI.

. irf table fevd, response(dRIR) title(FEVD of dRIR)

FEVD of dRIR

	(1)	(1)	(1)	(2)	(2)	(2)
Step	fevd	Lower	Upper	fevd	Lower	Upper
0	0	0	0	0	0	0
1	.006076	-.020663	.032816	.993924	.967184	1.02066
2	.010906	-.020397	.042209	.989038	.957584	1.02049
3	.134881	.025337	.244424	.7861	.662012	.910188
4	.135998	.02654	.245456	.762485	.636244	.888727
5	.187588	.059102	.316073	.713332	.576089	.850574
6	.186527	.059973	.313081	.714949	.579656	.850242
7	.185887	.058493	.313282	.711394	.575413	.847375
8	.191133	.060733	.321532	.706279	.5684	.844158
9	.193835	.06128	.326391	.700283	.560528	.840039

10	.197694	.063556	.331833	.696949	.556194	.837704
11	.197451	.063557	.331346	.697082	.556594	.83757
12	.197151	.063717	.330586	.697571	.557512	.83763
13	.197277	.063448	.331106	.697191	.556942	.837439
14	.197376	.063585	.331167	.69702	.556741	.837299
15	.197513	.063423	.331602	.696484	.555662	.837307
16	.197459	.063482	.331435	.696493	.555784	.837203
17	.198137	.063239	.333035	.695861	.55457	.837153
18	.198385	.063261	.33351	.695565	.554057	.837072
19	.198455	.063108	.333802	.69549	.553859	.837121
20	.198543	.063082	.334004	.695396	.55363	.837162

	(3)	(3)	(3)
Step	fevd	Lower	Upper
0	0	0	0
1	0	0	0
2	.000056	-.002451	.002564
3	.07902	-.00161	.159649
4	.101517	.015542	.187492
5	.099081	.011899	.186263
6	.098524	.012619	.18443
7	.102718	.013408	.192029
8	.102588	.013005	.192171
9	.105881	.014813	.19695
10	.105356	.014977	.195735
11	.105467	.015312	.195621
12	.105277	.015201	.195354
13	.105532	.015215	.19585

14	.105604	.015254	.195953
15	.106003	.015181	.196825
16	.106048	.015353	.196743
17	.106002	.015314	.196689
18	.10605	.015294	.196806
19	.106055	.015301	.196808
20	.106061	.015276	.196846

95% lower and upper bounds reported.

(1) irfname = iuf, impulse = dGE, and response = dRIR.

(2) irfname = iuf, impulse = dRIR, and response = dRIR.

(3) irfname = iuf, impulse = dPI, and response = dRIR.

. irf table fevd, response(dGE) title(FEVD of dGE)

FEVD of dGE

	(1)	(1)	(1)	(2)	(2)	(2)
Step	fevd	Lower	Upper	fevd	Lower	Upper
0	0	0	0	0	0	0
1	1	1	1	0	0	0
2	.938547	.862697	1.0144	.000847	-.00864	.010335
3	.921928	.828881	1.01497	.000947	-.01	.011894
4	.897391	.782804	1.01198	.018135	-.031306	.067575
5	.899758	.785356	1.01416	.023156	-.037065	.083377
6	.898794	.780079	1.01751	.024421	-.041663	.090504
7	.884111	.758593	1.00963	.038148	-.040876	.117173
8	.869128	.739847	.998408	.051112	-.037075	.139299
9	.869488	.742836	.99614	.050571	-.036801	.137944

10	.868724	.742089	.995359	.050875	-.036091	.137841
11	.867247	.740019	.994475	.051816	-.035362	.138993
12	.86626	.739216	.993303	.051304	-.034967	.137576
13	.865147	.738176	.992119	.051074	-.034673	.136821
14	.864266	.737369	.991163	.051432	-.034415	.137278
15	.863397	.735887	.990907	.051454	-.034263	.13717
16	.862907	.734972	.990843	.05134	-.034208	.136887
17	.86269	.734924	.990456	.051171	-.034082	.136425
18	.862121	.734094	.990149	.051409	-.034026	.136844
19	.86174	.733464	.990016	.05146	-.033963	.136883
20	.861343	.732876	.989811	.051419	-.033942	.136779

	(3)	(3)	(3)
Step	fevd	Lower	Upper
0	0	0	0
1	0	0	0
2	.060605	-.015021	.136232
3	.077125	-.015741	.169992
4	.084475	-.020371	.189321
5	.077086	-.01928	.173453
6	.076785	-.020264	.173834
7	.077741	-.020139	.175621
8	.07976	-.015463	.174983
9	.079941	-.012064	.171946
10	.0804	-.01168	.172481
11	.080937	-.01203	.173905
12	.082436	-.010737	.175609
13	.083779	-.009249	.176806

```
     14 |  .084302    -.008734     .177339
     15 |  .085149    -.008681     .178979
     16 |  .085753    -.008613     .180119
     17 |  .086139     -.00815     .180427
     18 |   .08647    -.007978     .180918
     19 |    .0868    -.007969     .181569
     20 |  .087238    -.007802     .182278
--------------------------------------------
95% lower and upper bounds reported.
(1) irfname = iuf, impulse = dGE, and response = dGE.
(2) irfname = iuf, impulse = dRIR, and response = dGE.
(3) irfname = iuf, impulse = dPI, and response = dGE.


.
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  log type:  smcl
 closed on:  20 Jan 2024, 17:47:00
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