Monetary Policy Transmission in Thailand*

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Literature Review

Monetary Policy Transmission

- Most literature used VAR and SVAR model to study the transmission mechanism of monetary policy.
  - VAR: ***[All] Disayatat and Vongsinsirikul (2002, TH)***, [Basic] Taguchi and Kato (2011, TH), [ER] Taguchi and Wanasilp (2017, TH), ***[All] Phiromswad (2015, TH)***, [IR+BL] Charoenseang and Manakit (2007, TH), etc.
  - SVAR: Łyziak, [ER] Przystupa and Wróbel (2008, PL), ***[All] Cevik and Teksoz (2012, GCC countries)***, [ER] Anwar and Nguyen (2018, VN), ***[All] Razmi, Mohamed & Habibullah (2015, TH)***, etc.
  - VECM and Cointegration: [ER] Hesse (2007, TH), [DELAY] Łyziak, Przystupa and Wróbel (2008, PL), [DELAY] Charoenseang and Manakit (2007, TH), etc.
  - Threshold VAR: [BL] Aikman, Lehnert, Liang and Modugno (2017, US)

Note: [IR] = Interest rate channel, [ER] = Exchange rate channel, [BL] = Bank lending channel, [AP] = Asset price Channel, [All] = All channel (IR+ER+BL+AP), [DELAY] = Adjustment speed

Literature Review

Monetary Policy Transmission

- In Thailand, most literature using VAR and SVAR used the recursive identification, mostly Choleski decomposition, to identify the monetary policy shocks.

- However, international literature recently turned to use the sign restriction as the monetary policy shocks identification strategy.
  - Jääskelä and Jennings (2010), Carillo and Elizondo (2015), and Shijaku (2015) found the the sign restriction could deliver more plausible impulse responses than recursive identification.

Literature Review

Monetary Policy Transmission [using sign restriction]

Sign Restrictions	Output	Price	Bank lending rate	Bank loans	Consumption growth	Core inflation	Monetary base	Money supply	Exchange rate	NEER	REER	Nominal interest rate	Output*	Price*	Nominal interest rate*	Financial mkt cond.
Kamada and Sugo (2006)																
Halvorsen and Jacobsen (2009)		at h=0														
Musso (2009)																
Busch et al.(2010)																
Migliardo (2010)																
Jääskelä and Jennings (2010)																
Deryugina and Ponomarenko (2011)																
Peersman (2011)																
Tamási and Vilási (2011)																
Hristov et al. (2012)																
Mateju (2013)																
Kim (2014)																
Robstad (2014)	at h=0	at h=0			at h=0	at h=0										
Forero (2015)	at h=0	at h=0														
Carillo and Elizondo (2015)																
Shijaku (2015)																
Kabashi and Suleva (2016)																
Kim and Lim (2016)																
Kumamoto and Zhou (2017)																
Mateju (2019)	0 (at t=0) ? (at short run) - (at MP horizon)	0 (at t=0) ? (at short run) - (at MP horizon)							+ (at t=0+short run) ? (at MP horizon)			+ (at t=0+short run) ? (at MP horizon)				

<0	0	>0
No restriction	Not included	Multiple restrictions at different horizon

Theoretical Framework

Monetary Policy Transmission

1) Direct Interest Rate Channel: through cost of capital

$$M \uparrow \rightarrow P \uparrow \rightarrow i^{real} \downarrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

2) Exchange Rate Channel: through net export (NX)

$$M \uparrow \rightarrow i^{real} \downarrow \rightarrow e \uparrow (depreciate) \rightarrow NX \uparrow \rightarrow Y \uparrow$$

Theoretical Framework

Monetary Policy Transmission

3) Asset Price Channel: through relative value of market value of firms and replacement cost of capital & wealth effect

Relative value: $M \uparrow \rightarrow P^{Equity} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$

Wealth effect: $M \uparrow \rightarrow P^{Equity} \uparrow \rightarrow wealth^{HH} \uparrow \rightarrow C \uparrow \rightarrow Y \uparrow$

Theoretical Framework

Monetary Policy Transmission

4) Credit Channel: through net worth of firms

$$M \uparrow \rightarrow P^{Equity} \uparrow \rightarrow networth^{firm} \uparrow \rightarrow \boxed{loans} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

Methodology

Vector Autoregression (VAR) & Impulse Response Function (IRF)

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t = \sum_{i=1}^{p} A_i Y_{t-i} + \varepsilon_t \ ,$$

where $Y_t = \left[GDP_t^{Real} \quad CPI_t^{Headline} \quad Channel_t \quad i_t \right]'$

Solving recursively,

$$Y_t = \Phi_0 \varepsilon_t + \Phi_1 \varepsilon_{t-1} + \Phi_2 \varepsilon_{t-2} + \ldots = \sum_{i=0}^{\infty} \Phi_i \varepsilon_{t-i}$$

where $\Phi_s = \sum_{j=1}^{s} \Phi_{s-j} A_j$ and $\Phi_0 = I$

$\sum_{i=0}^{\infty} \Phi_i$ represents the impulse response function

Methodology

Shock Identification

Choleski Decomposition

Multiply reduced form VAR(p) process with inverse of impact matrix to arrive structural form VAR(p) (SVAR)

$$B^{-1}Y_t = B^{-1}\sum_{i=1}^{p} A_i Y_{t-i} + B^{-1}\varepsilon_t = B^{-1}\sum_{i=1}^{p} A_i Y_{t-i} + u_t$$

where u_t is structural shocks and $\varepsilon_t = Bu_t$

- Choleski Decomposition assumes B to be lower triangular matrix, which implies that the first (n-1) variables are not contemporaneously affected by the last variable.

Methodology

Shock Identification

Sign Restriction: Uhlig (2005)

a) Estimate VAR to obtain estimate of coefficients and covariance of residuals

b) Extract orthogonal innovations using Cholesky decomposition (P)

c) Draw random othogonal matrix S (orthogonal and scaled to unit length) > using Givens rotation algorithm

$$S = \prod_{i \neq j} S_{ij}(\theta_k) \quad \text{, where } S_{ij}(\theta_k) = \begin{pmatrix} & i & j & & \\ i & \cos\theta_k & -\sin\theta_k & \cdots & 0 \\ j & \sin\theta_k & \cos\theta_k & \ldots & 0 \\ & 0 & 0 & \ddots & 0 \\ & 0 & 0 & \cdots & 1 \end{pmatrix} \text{ , and } \theta_k \sim uniform(0, \pi)$$

d) Compute $B = PS$

e) Using B to generate impulse response

f) Retain those satisfy the sign restriction and continue the process until there are N accepted draws

g) The IRF is the median of all generated impulse response function

Result

Data

Level (2000Q1 - 2018Q4)	Mean	Max	Min	Median	S.D.	Unit root*
log(Real GDP)	14.47	14.83	14.06	14.49	0.21	I(1)
log(CPI)	4.46	4.62	4.25	4.48	0.13	I(1)
RP14D (%)	2.26	5.00	1.24	1.97	0.99	I(1)
log(SET)	6.69	7.50	5.61	6.63	0.55	I(0)
log(Real Credit)	5.05	5.48	4.72	4.96	0.23	I(1)
log(REER)	4.55	4.70	4.39	4.57	0.09	I(1)
log(USDTHB)	3.57	3.82	3.39	3.55	0.13	I(1)
FED (%)	1.76	6.51	0.07	1.01	2.00	I(0)
VIX	19.75	58.32	10.30	17.41	8.04	I(0)
log(M2)	9.27	9.88	8.69	9.22	0.39	I(1)

* ADF test at 5% significance level

Growth (2000Q1 - 2018Q4)	Transformation from level	Mean	Max	Min	Median	S.D.	Unit root*	Transformation to stationarity
Real GDP	%ΔYoY	4.07	15.47	-4.28	3.97	3.04	I(0)	-
CPI	%ΔYoY	2.12	7.46	-2.73	2.00	1.95	I(0)	-
RP14D	ΔYoY	-0.03	2.48	-2.33	-0.05	1.00	I(0)	-
SET	%ΔYoY	11.05	90.77	-51.44	10.01	26.41	I(0)	-
Real Credit	%ΔYoY	2.82	10.42	-14.99	3.77	6.08	I(1)	Δ
REER	%ΔYoY	1.00	15.56	-8.42	1.31	4.79	I(0)	-
USDTHB	%ΔYoY	-0.57	17.45	-16.59	-0.92	7.33	I(0)	-
FED	ΔYoY	-0.19	2.03	-4.36	0.02	1.44	I(0)	-
VIX	ΔYoY	-0.59	36.27	-35.35	-0.83	9.13	I(0)	-
M2	%ΔYoY	6.65	16.20	0.76	6.11	3.25	I(1)	Δ

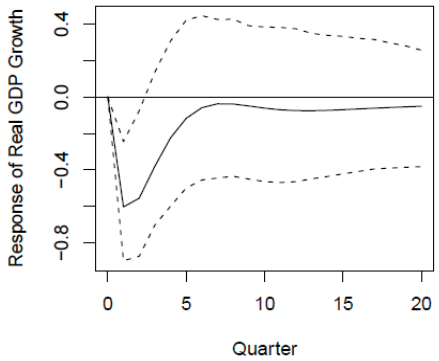
* ADF test at 5% significance level

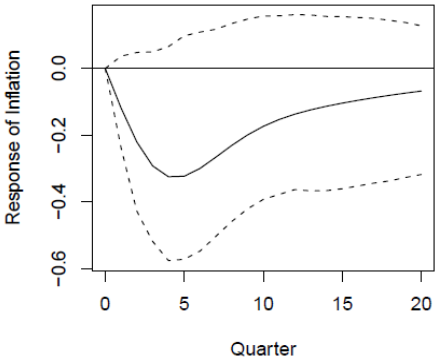
- Quarterly data from 2000Q1-2018Q4
- RP14D, exchange rate, FED, and VIX are transformed from quarterly to monthly using quarterly average.
- M2 is transformed from quarterly to monthly using end-of-quarter.
- The SIC (Schwartcz information criterion), and HQ (Hannan-Quinn criterion) criteria suggest 2 lag length.

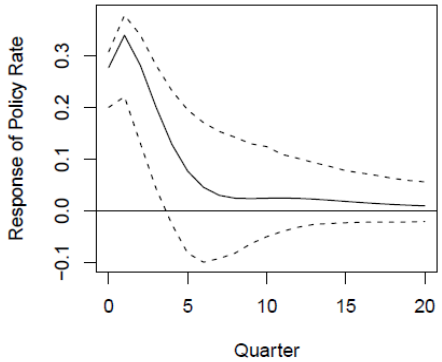
Result

Basic Model

- Endogenous variables: Real GDP Growth, Headline Inflation, RP14D Change
- Exogenous variables: Fed Funds Rate Change, Change in VIX Index
- An increase in policy rate reduces both real GDP growth and inflation as expected.
- No price puzzle



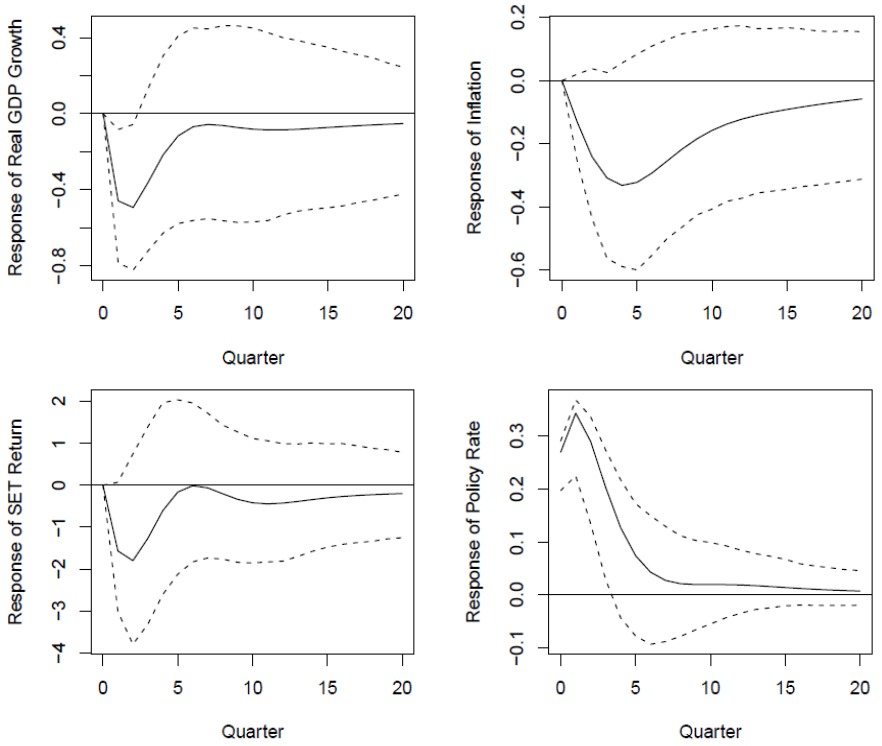




Result

Asset Price Channel

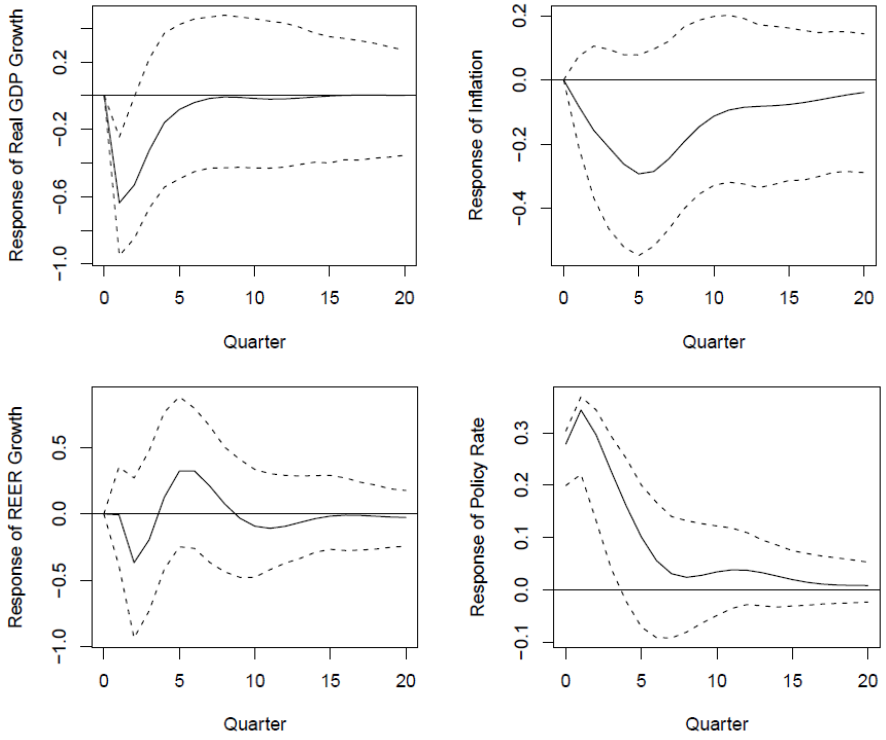
- Endogenous variables: Real GDP Growth, Headline Inflation, SET Index Returns, RP14D Change
- Exogenous variables: Fed Funds Rate Change, Change in VIX Index
- An increase in policy rate reduces stock market returns, inflation, and real GDP growth.



Result

Exchange Rate Channel

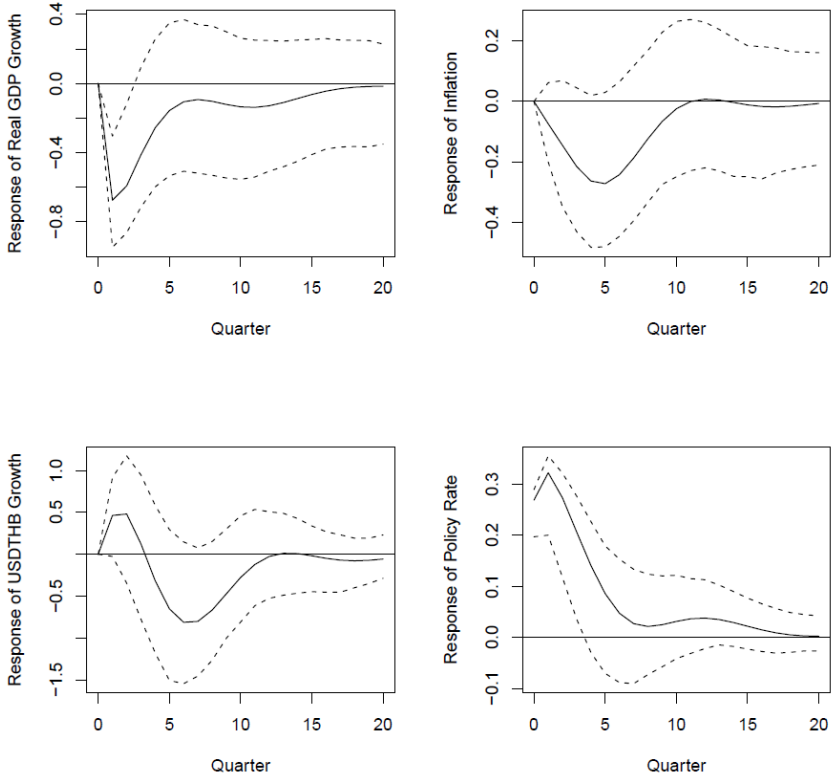
- Endogenous variables: Real GDP Growth, Headline Inflation, REER Returns, RP14D Change
- Exogenous variables: Fed Funds Rate Change, Change in VIX Index
- A tightening monetary policy depreciates REER in short and long terms, while, in the medium term, REER is appreciated.
- Both Real GDP growth and inflation decrease after a monetary policy tightening.



Result

Exchange Rate Channel (Cont.)

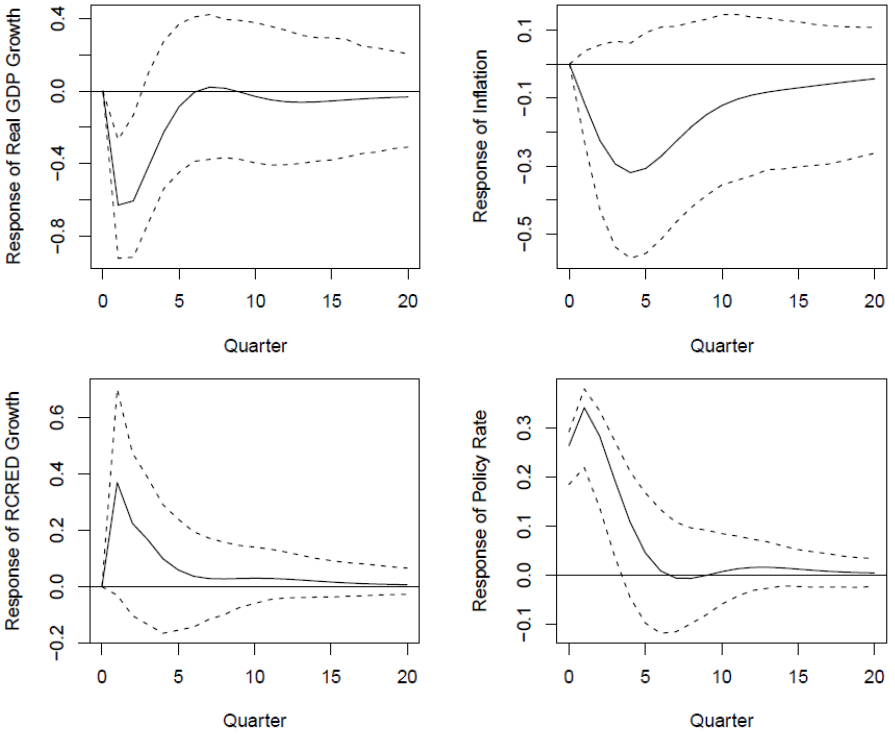
- Endogenous variables: Real GDP Growth, Headline Inflation, USDTHB Returns, RP14D Change
- Exogenous variables: Fed Funds Rate Change, Change in VIX Index
- Using nominal bilateral exchange rate yields the same results as the REER case.



Result

Bank Lending Channel

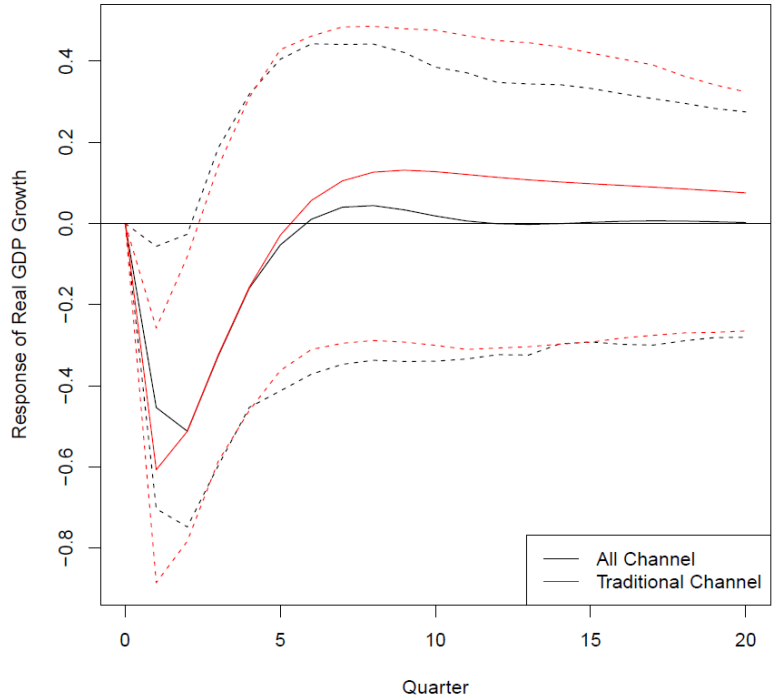
- Endogenous variables: Real GDP Growth, Headline Inflation, Total Real Private Credits, RP14D Change
- Exogenous variables: Fed Funds Rate Change, Change in VIX Index
- The monetary policy tightening is ineffective in reducing real credits.



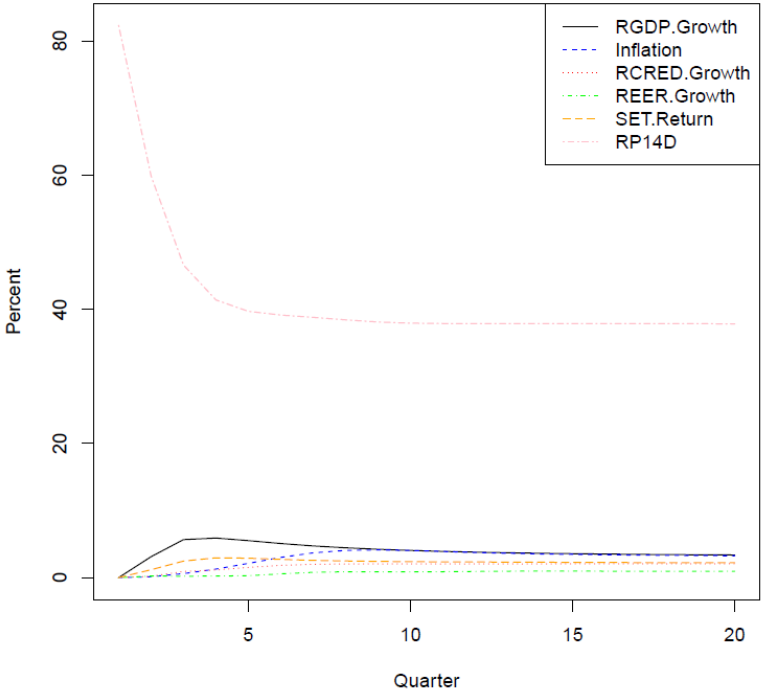
Result

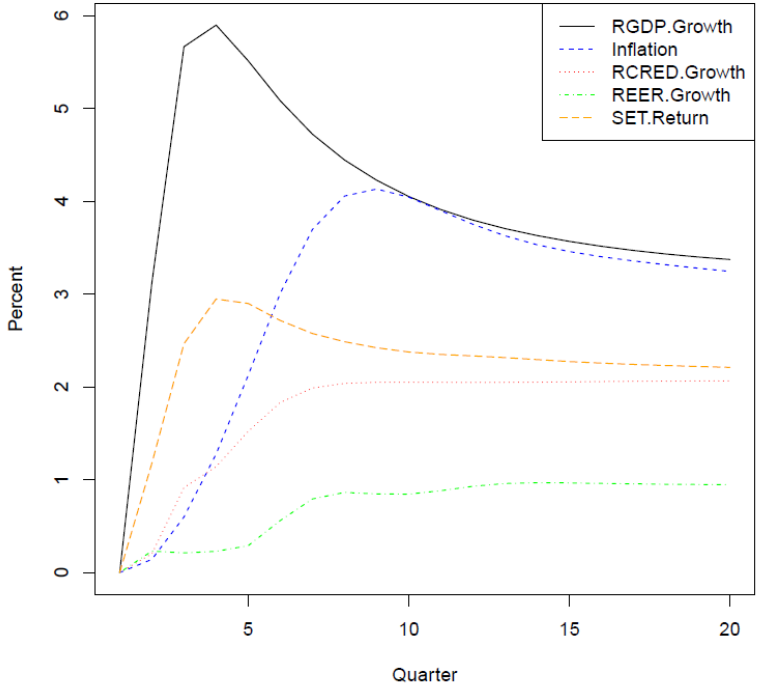
Direct Interest Rate Channel

- Obtained by blocking all other channels, asset price, exchange rate, and bank lending
- Other channels dampen the effect of monetary policy tightening on real GDP growth.



Result (VDC)

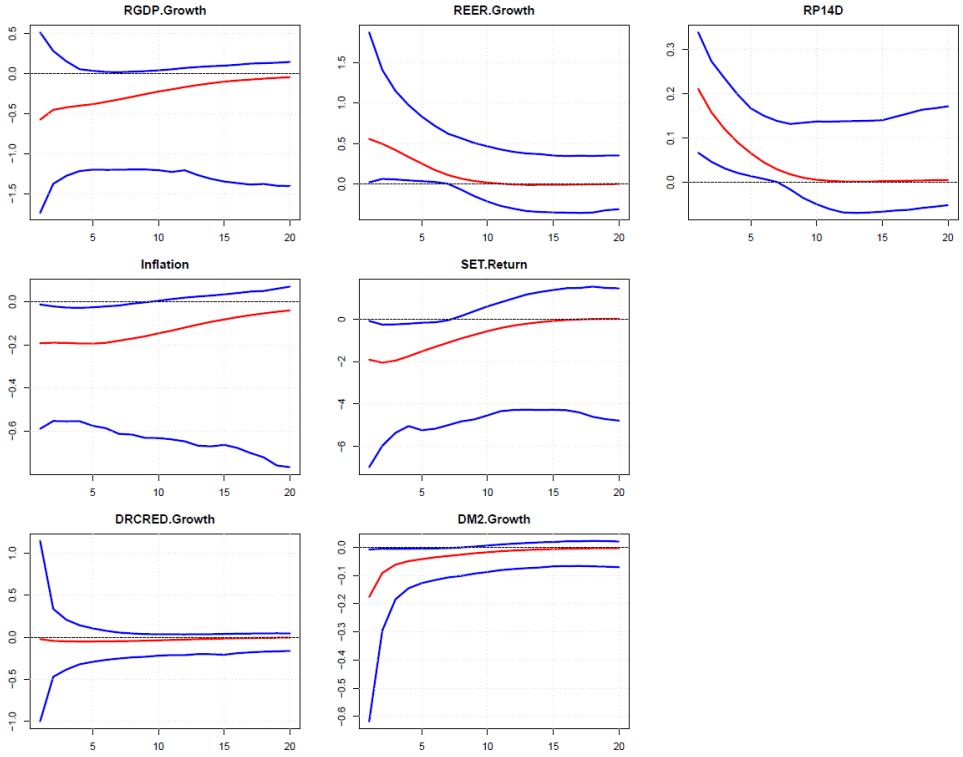

RGDP.Growth
Inflation
RCRED.Growth
REER.Growth
SET.Return
RP14D
Percent
Quarter
0
20
40
60
80
5
10
15
20


RGDP.Growth
Inflation
RCRED.Growth
REER.Growth
SET.Return
Percent
Quarter
0
1
2
3
4
5
6
5
10
15
20

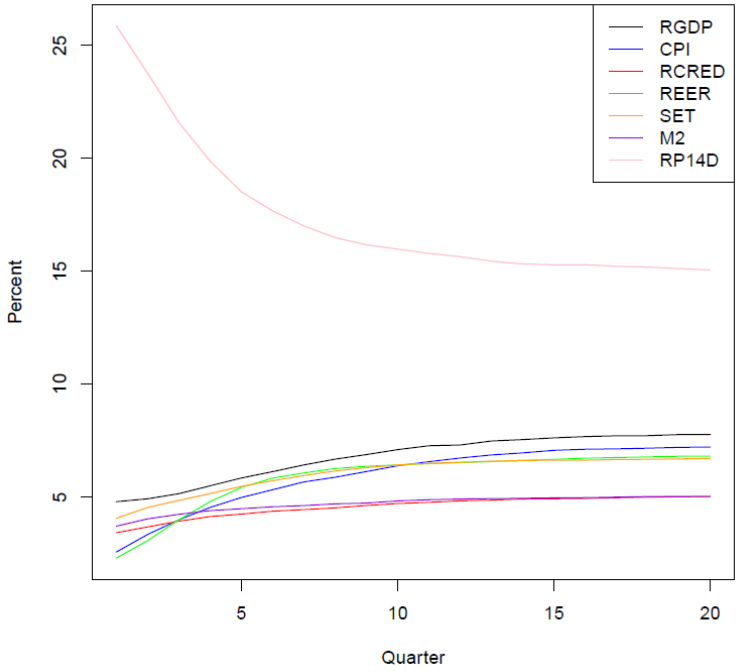
Result

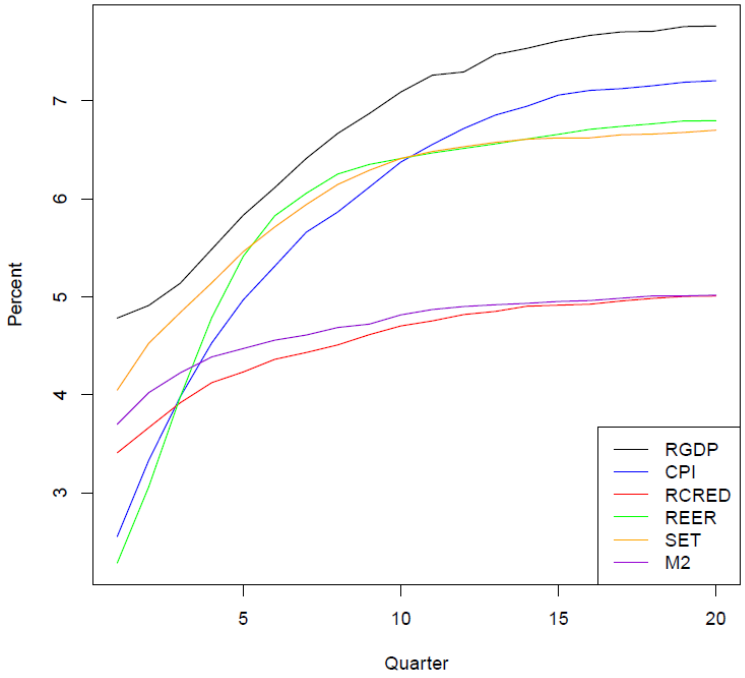
Sign Restricion: MP shocks

- Lag = 1
- Restriction: +Policy Rate, -M2, -SET , +REER (Appreciate), -Inflation
- A positive monetary policy shocks
  1. Reduce equity returns
  2. Appreciate local currency
  3. Slightly reduce credit growth
  4. Reduce real GDP growth and inflation



Result (VDC)

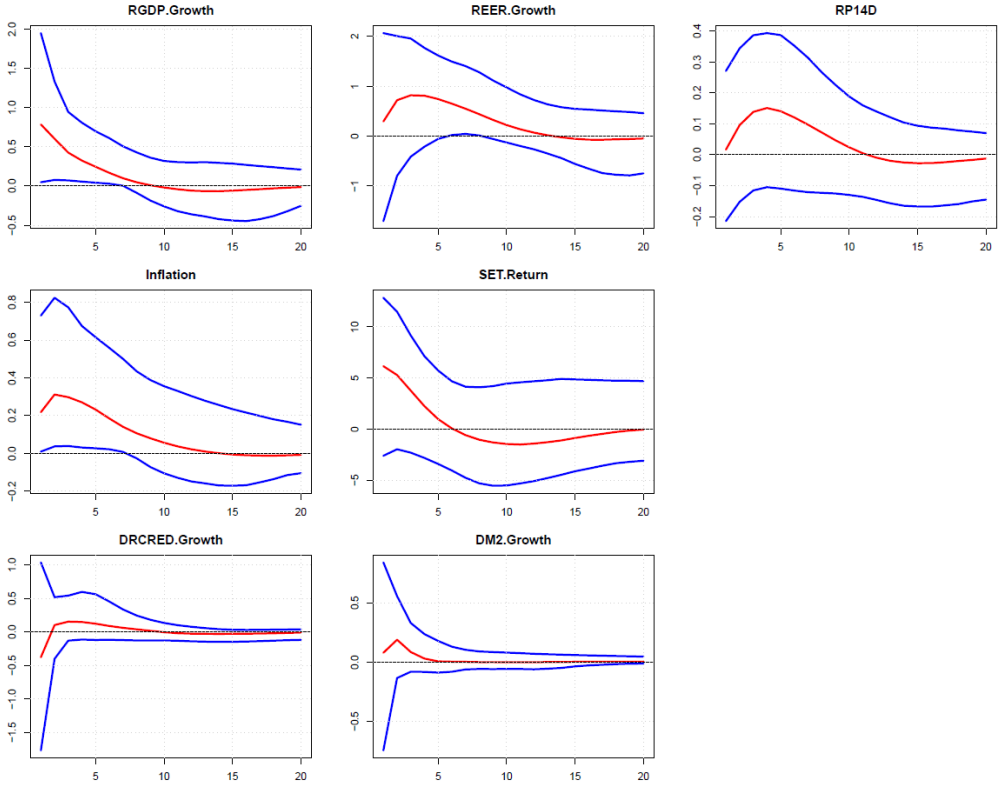

RGDP
CPI
RCRED
REER
SET
M2
RP14D
Percent
Quarter
5
10
15
20
25


RGDP
CPI
RCRED
REER
SET
M2
Percent
Quarter
3
4
5
6
7
5
10
15
20

Result

Sign Restricion: AD shocks

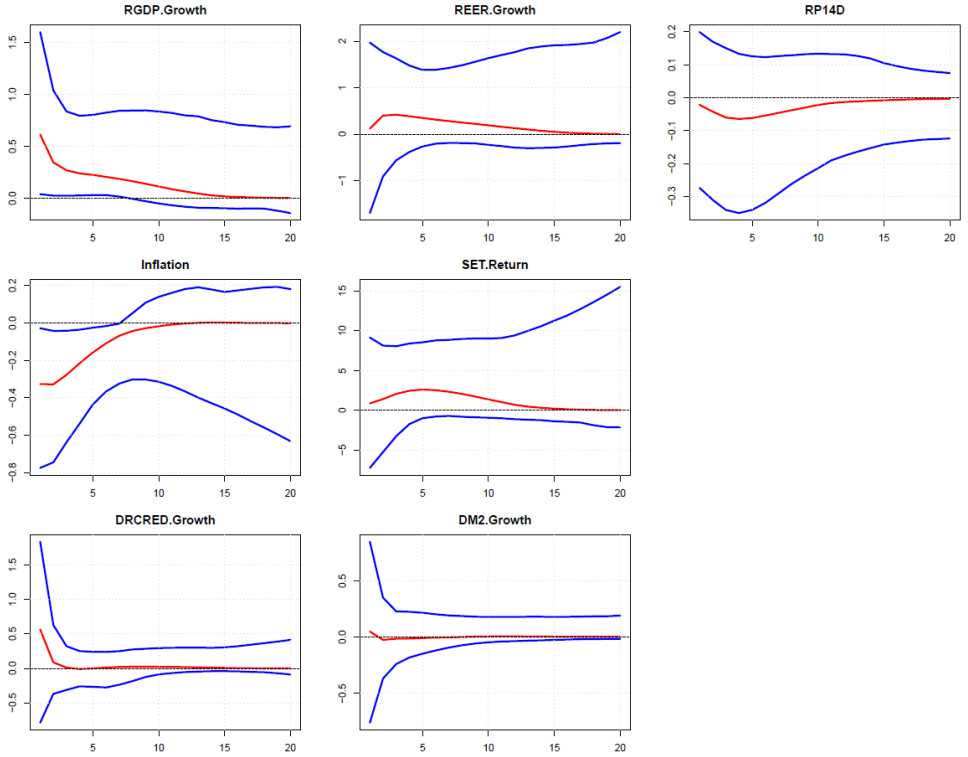
- Lag = 1
- Restriction: +Real GDP, +Inflation
- A positive AD shocks
  1. Increase real GDP growth and inflation
  2. Induce MP tightening
  3. Increase equity returns
  4. Appreciate local currency
  5. Slightly increase credit growth



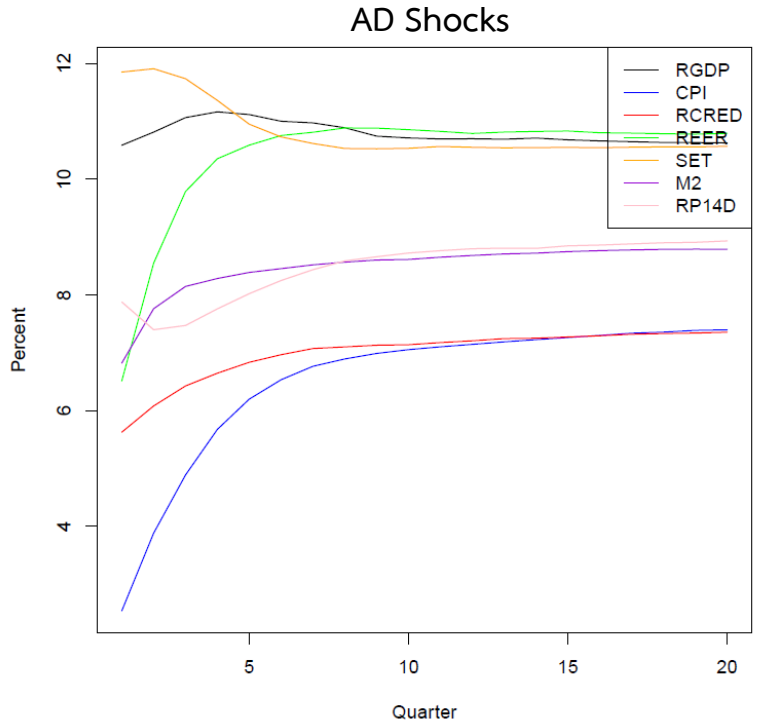
Result

Sign Restricion: AS shocks

- Lag = 1
- Restriction: +Real GDP, -Inflation
- A positive AS shocks
  1. Increase real GDP growth, but reduce inflation
  2. Induce MP loosening
  3. Increase equity returns
  4. Appreciate local currency
  5. Increase credit growth



Result (VDC)


AD Shocks
RGDP
CPI
RCRED
REER
SET
M2
RP14D
Percent
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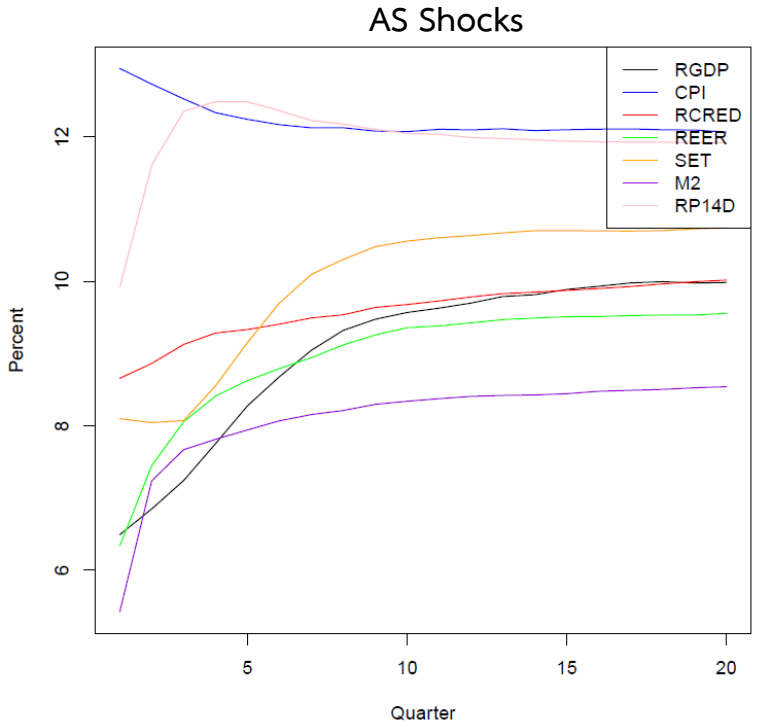
AS Shocks
RGDP
CPI
RCRED
REER
SET
M2
RP14D
Percent
Quarter
6
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20

Conclusion

Impulse Response Function

- Monetary policy tightening > Asset price↓, Exchange rate appreciation, Inflation↓, Output↓ but effect on Real credit is inconclusive (increase in Choleski, while slightly reduce in sign restriction)
- AD shocks lead to monetary policy tightening with both increasing in both inflation and output.
- AS shocks lead to monetary policy loosening with decreasing in inflation, while output increase.

Variance Decomposition

- Monetary policy shocks can explain output, inflation, asset price, and exchange rate forecast errors.
- AD shocks can explain output, asset price, and exchange rate forecast error.
- AS shocks can explain inflation and policy rate forecast error.