Non-linearity in Monetary Policy Transmission:

Roles of Liquidity and SFIs in Bank Lending Channel

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INTRODUCTION

- Monetary Policy Transmission
- Bank Lending Channel
- Role of Liquidity and SFIs
- Non-linearity

INTRODUCTION

- **Bank Lending Channel**
  - Asymmetric info. → Financial Intermediary

M ↑

Bank Reserves/ Deposits ↑

Bank Loan ↑

I ↑

Y ↑

INTRODUCTION

- **Specialized Financial Institutions (SFIs):**
  - provide a limited range of financial services to a targeted sector

Government Savings Bank	Bank for Agriculture & Agricultural Co-operatives	Government Housing Bank	Islamic Bank of Thailand	Export-Import Bank of Thailand	SMEs Development Bank of Thailand

LITERATURE REVIEW

- **Bank Lending Channel**
  - **Few prior study for Thailand** (e.g. *Disyatat and Vongsinsririkul* (2002), *IMF* (2002), and *Charoensaeng and Manakit* (2007)
- **Role of Liquidity**
  - *Kashyap and Stein* (2000):

> *"Monetary policy is more effective for the bank with **less liquid** balance sheet"*

LITERATURE REVIEW

- **Specialized Financial Institutions**
  - SFIs **intensify** the **competition** for liquidity among banks.

> "SFIs should **improve the effectiveness** of monetary policy transmission"

- **Non-Linearity in MP Transmission**
  - induced by different '**states**' of **liquidity** and '**degree**' of **competition** driven by SFIs.

Methodology

ECONOMIC SPECIFICATION

1. Autoregressive Distributed Lag (ARDL)

$$\Delta \log(L_t) = \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j \Delta \log(RP_{t-j}) + \varepsilon_t$$

- AR: allowing for delays in MP transmission
- DL: explaining the absence in other economic variables

ECONOMIC SPECIFICATION

$$\Delta \log(L_t) = \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j \Delta \log(RP_{t-j}) + \varepsilon_t$$

- "***Long-run***" multiplier of MP stance and commercial banks' lending

$$B = \sum_{j=0}^{12} \beta_j$$

  - Wald Test: $H_0: B < 0$ $H_a: B \geq 0$

ECONOMIC SPECIFICATION

2. **Threshold Model**: allowing for different "***Liquidity***" regime

$$\Delta \log(L_t) = \begin{cases} \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j^{(h)} \Delta \log(RP_{t-j}) + \varepsilon_t, & \text{if } z_t > c; \\ \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j^{(l)} \Delta \log(RP_{t-j}) + \varepsilon_t, & \text{if } z_t \le c. \end{cases}$$

- z_t denotes ***exogeneous*** regime indicator
- c denotes threshold for ***two*** states of liquidity

ECONOMIC SPECIFICATION

- More succinct by introducing dummy I_t

$$\Delta \log(L_t) = \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j \Delta \log(RP_{t-j}) + \sum_{j=0}^{12} \gamma_j \Delta \log(RP_{t-j}) \times I_t + \varepsilon_t$$

  - $I_t = 1$ if $z_t > c$ (high regime or less liquid)

$$\Gamma = \sum_{j=0}^{12} \gamma_j$$

  - Wald Test: $H_0: \Gamma < 0$ $H_a: \Gamma \geq 0$

ECONOMIC SPECIFICATION

3. **Second Threshold**: for different degree of competition for liquidity due to "***SFIs***"

$$\Delta \log(L_t) = \eta + \sum_{i=1}^{12} \alpha_i \Delta \log(L_{t-i}) + \sum_{j=0}^{12} \beta_j \Delta \log(RP_{t-j}) + \sum_{j=0}^{12} \gamma_j \Delta \log(RP_{t-j}) \times I_{1t}$$
$$+ \sum_{j=0}^{12} \lambda_j \Delta \log(RP_{t-j}) \times I_{2t} + \varepsilon_t .$$

- z_{2t} : ***exogeneous*** aggressiveness indicator
- c_2 : threshold for ***two*** states of aggressiveness
- $I_{2t} = 1$ if $z_{2t} > c_2$ (aggressiveness in fund raising)

ECONOMIC SPECIFICATION

$$\Lambda = \sum_{j=0}^{12} \lambda_j$$

– Wald Test: $H_0: \Lambda < 0$ $H_a: \Lambda \geq 0$

- We effectively have four cases:
  I. Tight liquidity & aggressive SFIs actions: Best for MP
  II. Tight liquidity & nonaggressive SFIs actions
  III. Loose liquidity & aggressive SFIs actions
  IV. Loose liquidity & nonaggressive SFIs actions: Worst for MP

DATA (Monthly: Jan 07 – Mar 13)

- **Loans(L)**: O/D, borrowings, non-nego bills, including accrued interests net of interbank lending
- **Policy Rate (RP)**: one-day repurchase rate
- z_{1t}: (i) loan-to-deposit (LD) or
  (ii) loan-to-deposit-and-B/E (LDB) ratio
- z_{2t}: (i) y-o-y % change of SFIs' deposits or
  (ii) y-o-y % change of SFIs' loans

ESTIMATION PROCEDURE

- **Model (1)**: OLS
- **Model (2)**: choosing threshold ($\hat{c}_1$) that minimize RSS [i.e. maximizing R^2] by running OLS "T" times [i.e. order O(T)]; where T is number of observation
- **Model (3)**: same as model (2) but choosing a pair of threshold ($\hat{c}_1$,$\hat{c}_2$)instead [i.e. order $O(T^2)$]

Main Results

RESULTS

1. Role of Liquidity
   a) Total vs Business & Retails Loans
   b) Large vs Medium vs Small Banks
   c) Long- vs Short-maturiy Loans
2. Role of Liquidity + SFIs
   a) Total vs Business & Retails Loans
   b) Large vs Medium vs Small Banks
   c) Long- vs Short-maturiy Loans

THE IMPACT OF LIQUIDITY

1. For entire sector
   a) Total Loans
   - On model (1): unexpected positive sign of $\hat{B}$
   - On model (2): more in line with theory
     - ***The incremental effect of tight liquidity regime*** $\hat{\Gamma}$ has negative sign but weakly significant (at 10%).
     - ***The long-run multiplier of MP transmission in tight liquidity regime*** $(\hat{B} + \hat{\Gamma})$ is negative; though not significant.

   a) Business & Retails Loans: ***more fit*** the data

LIQUIDITY: TOTAL LOANS

Specification	(1)	(2) z = LD	(2) z = LDB
$\hat{B}$	0.053	0.137	0.104
(p-value)	*(0.179)*	*(0.006)*	*(0.032)*
$\hat{\Gamma}$		-0.196	-0.163
(p-value)		*(0.095)*	*(0.230)*
$\hat{B}+\hat{\Gamma}$		-0.059	-0.059
(p-value)		*(0.503)*	*(0.599)*
R-squared	0.446	0.685	0.659
Adj. R-squared	0.157	0.342	0.288
Q(24)	*0.938*	*0.992*	*0.955*

LIQUIDITY: BIZ & RETAILS

Specification	(1)	(2) z = LD	(2) z = LDB
$\hat{B}$	0.066	0.136	0.167
(p-value)	*(0.015)*	*(0.000)*	*(0.006)*
$\hat{\Gamma}$		-0.119	-0.106
(p-value)		*(0.005)*	*(0.049)*
$\hat{B}+\hat{\Gamma}$		0.017	0.061
(p-value)		*(0.451)*	*(0.033)*
R-squared	0.670	0.805	0.796
Adj. R-squared	0.498	0.593	0.575
Q(24)	*0.995*	*0.820*	*0.864*

THE IMPACT OF LIQUIDITY

2. By bank size
   - ***The larger a bank, the less sensitive;*** but the result does not suggest so.
   - The ***medium size*** is the most sensitive; yet long run multiplier is not significant.
   - When LD is replaced by LDB, the long run multiplier become more significant.

LIQUIDITY: BY BANK SIZE

Endogenous variable	Large			Medium			Small		
Specification	(1)	(2) z = LD		(1)	(2) z = LD	(2) z = LDB	(1)	(2) z = LD	
$\hat{B}$	0.081	0.066	0.054	0.031	0.192	0.049	0.023	0.039	0.132
(p-value)	*(0.094)*	*(0.257)*	*(0.482)*	*(0.352)*	*(0.032)*	*(0.114)*	*(0.513)*	*(0.462)*	*(0.108)*
$\hat{\Gamma}$		-0.037	-0.016		-0.224	-0.943		-0.021	0.390
(p-value)		*(0.506)*	*(0.820)*		*(0.030)*	*(0.012)*		*(0.835)*	*(0.631)*
$\hat{B}+\hat{\Gamma}$		0.029	0.037		-0.032	-0.895		0.017	0.522
(p-value)		*(0.464)*	*(0.491)*		*(0.495)*	*(0.014)*		*(0.824)*	*(0.520)*
$\hat{c}$		94.60%	85.832		94.37%	90.14%		101.10%	90.65%
$\hat{\pi}$		58.67%	64.00%		62.67%	20.00%		20.00%	17.33%
R-squared	0.560	0.791	0.701	0.463	0.663	0.652	0.635	0.769	0.797
Adj. R-squared	0.331	0.563	0.376	0.184	0.296	0.274	0.444	0.517	0.576

THE IMPACT OF LIQUIDITY

3. By loan maturity
   - Use LD rather than LDB since it yield higher R^2.
   - Loans with long maturity should be more sensitive, and the result said so.
   - Bank lending channel ***exists in case of long-term loans when liquidity is tight***.

LIQUIDITY: BY MATURITY

Endogenous variable	Long-term		Short-term	
Specification	(1)	(2) z = LD	(1)	(2) z = LD
$\hat{B}$	0.017	0.151	0.142	0.099
(p-value)	*(0.778)*	*(0.007)*	*(0.073)*	*(0.224)*
$\hat{\Gamma}$		-0.427		0.662
(p-value)		*(0.000)*		*(0.000)*
$\hat{B}+\hat{\Gamma}$		-0.276		0.761
(p-value)		*(0.001)*		*(0.000)*
$\hat{c}$		100.99%		101.48%
$\hat{\pi}$		21.33%		17.33%
R-squared	0.459	0.729	0.457	0.689
Adj. R-squared	0.177	0.435	0.175	0.352

THE IMPACT OF SFIs

Use LD as an indicator and only model (3)

1. For entire sector

   a) Total Loans

   – Deposit Growth: explosive results

   – Loan Growth: unexpected result on ***the incremental effect of SFIs' aggressiveness*** $\hat{\Lambda}$

   a) Business & Retails Loans

   – Deposit Growth: yield expected result

   – Loan Growth: unexpected result

SFIs: TOTAL v BIZ&RETAIL

	z_2 = SFIs' Deposit growth		z_2 = SFIs' Loan growth	
Endogenous variable	Total CB Loans *incl.* Interbank	CB Business + Retail Loans	Total CB Loans *incl.* Interbank	CB Business + Retail Loans
$\hat{B}$	0.066	1.899	0.036	0.128
(p-value)	*(0.398)*	*(0.003)*	*(0.667)*	*(0.002)*
$\hat{\Gamma}$	6.597	-0.297	-0.575	-0.470
(p-value)	*(0.002)*	*(0.000)*	*(0.099)*	*(0.000)*
$\hat{B}+\hat{\Gamma}$	6.663	1.602	-0.539	-0.342
(p-value)	*(0.001)*	*(0.007)*	*(0.057)*	*(0.008)*
$\hat{\Lambda}$	-6.961	-1.704	0.293	0.373
(p-value)	*(0.001)*	*(0.006)*	*(0.122)*	*(0.004)*
$\hat{B}+\hat{\Lambda}$	-6.895	0.195	0.329	0.501
(p-value)	*(0.001)*	*(0.000)*	*(0.186)*	*(0.000)*
$\hat{B}+\hat{\Gamma}+\hat{\Lambda}$	-0.298	-0.102	-0.247	0.031
(p-value)	*(0.000)*	*(0.010)*	*(0.200)*	*(0.123)*

THE IMPACT OF SFIs

Use LD and SFIs' deposit growth as indicators

2. By bank size
   - Yield unexpected result for ***small bank***.
   - Large bank yield expected but not much significant results.
   - ***Medium size banks*** are most sensitive.
3. By loan maturity
   - ***Long term loans*** are more sensitive.

SFIs: TOTAL v BIZ&RETAIL

Classification	By bank size			By maturity	
Endogenous variable	Large	Medium	Small	Long-term	Short-term
$\hat{B}$	0.076	0.642	0.179	1.276	0.170
(p-value)	*(0.288)*	*(0.000)*	*(0.263)*	*(0.439)*	*(0.087)*
$\hat{\Gamma}$	-0.011	-0.217	-1.249	-0.514	0.025
(p-value)	*(0.912)*	*(0.005)*	*(0.000)*	*(0.002)*	*(0.862)*
$\hat{B}+\hat{\Gamma}$	0.065	0.424	-1.070	0.762	0.194
(p-value)	*(0.314)*	*(0.006)*	*(0.000)*	*(0.640)*	*(0.067)*
$\hat{\Lambda}$	-0.130	-0.504	1.067	-1.124	-0.330
(p-value)	*(0.154)*	*(0.001)*	*(0.000)*	*(0.489)*	*(0.003)*
$\hat{B}+\hat{\Lambda}$	-0.054	0.138	1.247	0.152	-0.161
(p-value)	*(0.688)*	*(0.006)*	*(0.000)*	*(0.028)*	*(0.205)*
$\hat{B}+\hat{\Gamma}+\hat{\Lambda}$	-0.065	-0.079	-0.003	-0.361	-0.136
(p-value)	*(0.212)*	*(0.106)*	*(0.963)*	*(0.013)*	*(0.144)*

Conclusion

CONCLUSION

- Both ***liquidity*** and ***SFIs*** improve effectiveness of MP, with dominant effect from SFIs.
  - Competitiveness improves effectiveness.
- ***Medium banks*** seem to be the major conveyor.
- ***Long-term loans*** seem to be the credit most sensitive to the MP.

Q&A

APPENDIX A

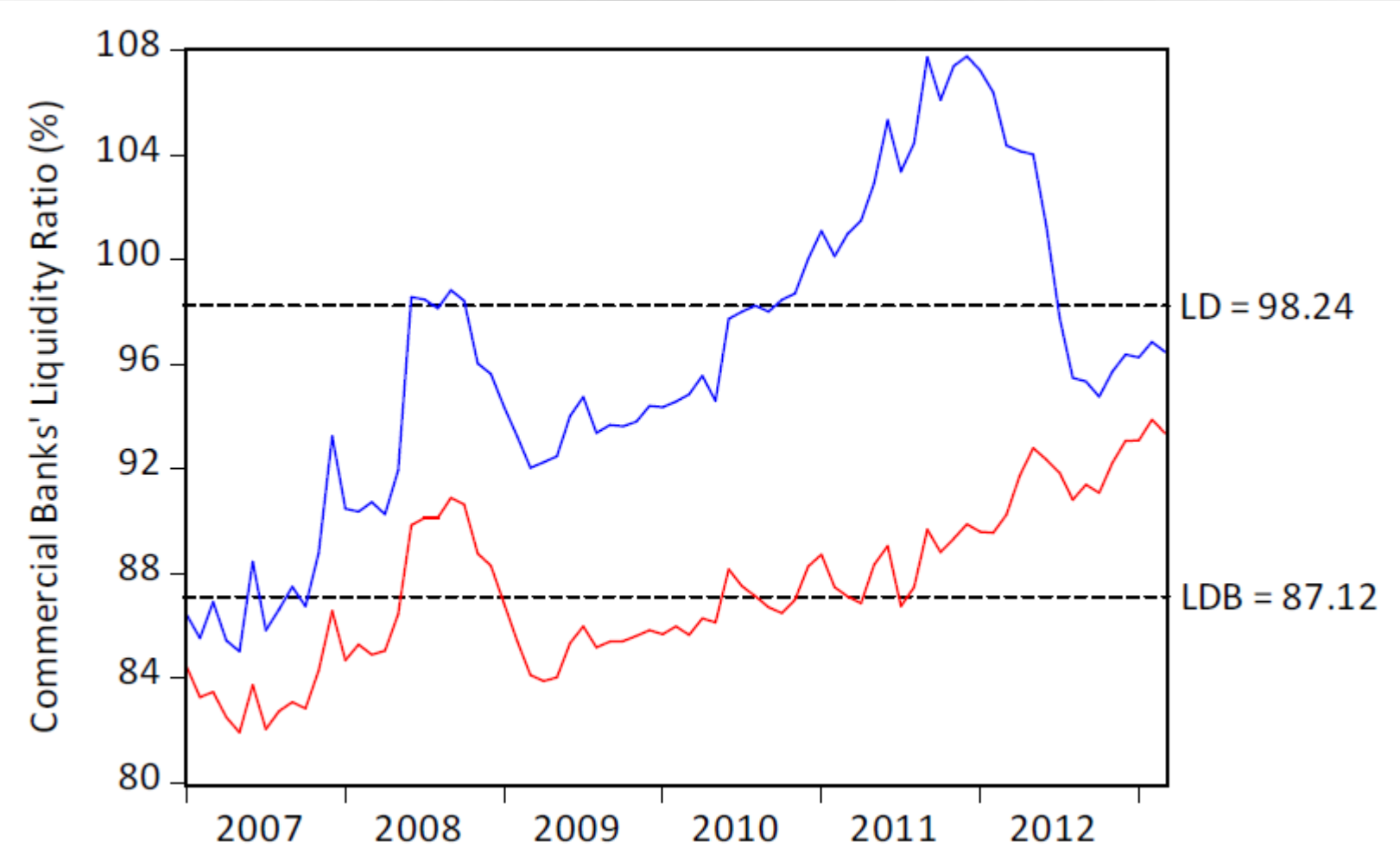
- The second model improve the first one.

$$B^{(1)} = (1-\pi)B^{(2)} + \pi(B^{(2)} + \Gamma) = B^{(2)} + \pi\Gamma$$

  - where $\pi = \Pr(I_t = 1) = \Pr(z > c)$

- The first B muddles up the liquidity regime-dependent variable (Γ).

LIQUIDITY BY LD&LDB RATIO



CROSS-REGIMES