Modelling demand deposits and interest rate risk sharing: Lessons from the Mexican banking regulation

By Mariela Dal Borgo

Banco de México, Financial Stability Directorate

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Interest rate risk in the banking book: Regulatory capital?

- Exposure to interest rate risk leads to volatility in earnings or equity value.
- No capital charge for interest rate risk in the banking book: Pillar II
- However:

  "The Committee remains convinced that interest rate risk in the banking book is a potentially significant risk which ***merits support from capital****"* *(Basel Committee,* 2006)

Interest rate risk in the banking book: Regulatory capital?

- Supervisors measure interest rate risk exposure by the maturity gap between assets and liabilities.
- If banks face a capital charge based on the size of the maturity gap, they may try to reduce that gap by:
  - lengthening liability maturity or
  - shorterning asset maturity
- Mexico, ideal setting: Capital requirements based on the size of the maturity gap imposed on all assets and liabilities.
  - **This paper:** Causes and consequences of banks' adoption of an internal model that allows to lengthen the maturity of demand deposits.

Modelling the maturity of demand deposits

- **Non-maturity deposits (NMDs):** Sight deposits, saving & checking acc.
- Measuring the maturity of NMDs is complex:
  - Stability: No stated termination date, but in practice very sticky.
  - Sensitivity to market rate: Banks can adjust rate to retain volumes.

Two approaches available to Mexican banks:

1. ***Standard approach (SA):*** Allows a maximum maturity of 2 years.
2. ***Internal model (IM):*** Maximum maturity approved by the regulator, in practice $\gg$ 2 years

- ***Why banks adopt the IM for deposits?***
- ***After adopting the IM, does the assets' repricing maturity increase?***

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Contributions

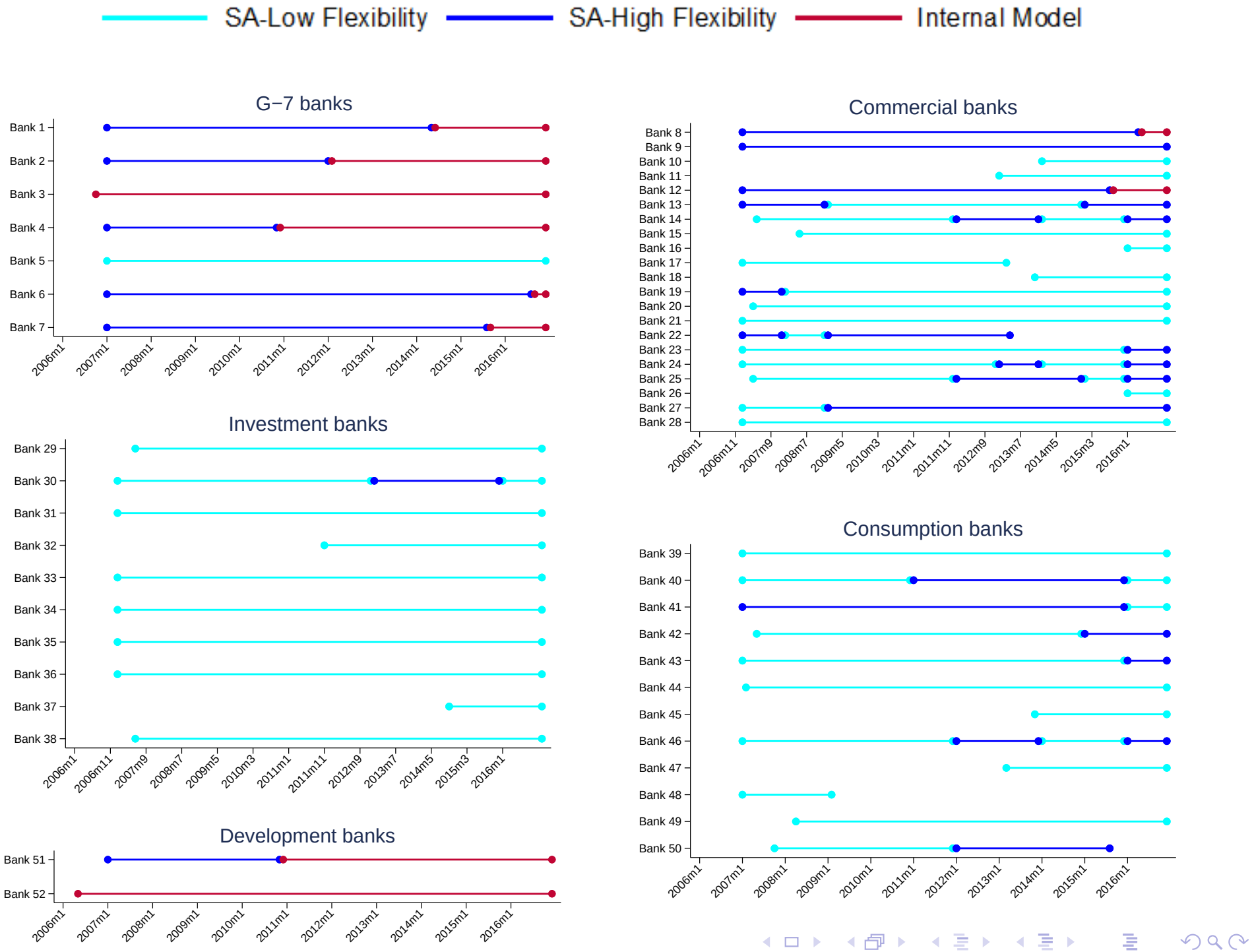
- Look at banks' response to capital requirements for market risk.
  - Optimal risk exposure and management: Diamond, 84'; Hellwig, 94'; Di Tella & Kurlat, 17'; Drechsler et al., 18'; Entrop et al., 13'; Esposito et al., 15'; Begenau et al., 15'; Rampini et al., 16'.
- Study the adoption of IM associated to market risk.
  - IM for credit risk: Behn et al., 16'
- Use granular data to examine the impact of liability regulation on assets' repricing maturity.
  - Hanson et al., 15'; Kirti, 17'

Banks adopt the IM to save on capital requirements

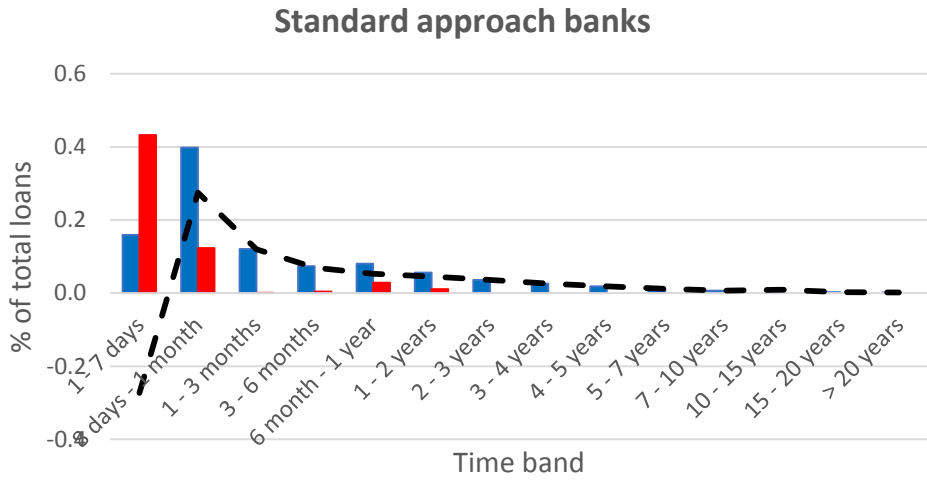
1. ***Which banks adopt the IM? Why?***
   - Banks with higher share of long-term, fixed-rate assets and more stable deposits: Higher asset & liability maturity.
   - Their regulatory maturity gap is overestimated under the SA.
   - The IM allows to lengthen deposits' maturity and reduce the regulatory gap.
2. ***After adopting the IM, does the assets' repricing maturity increase?***
   - In general, not for commercial loans, mortgages and securities.
   - Except commercial loans when the yield curve flattens.

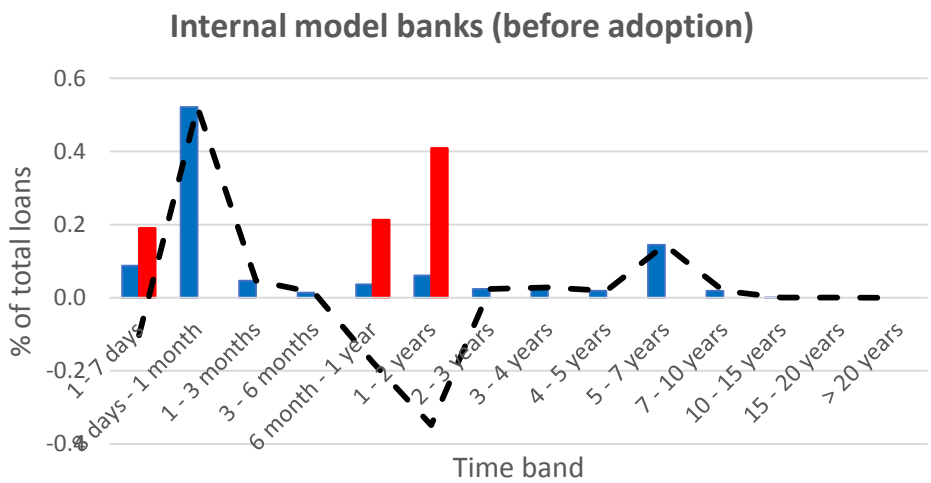
IRR regulations since Jan 06'

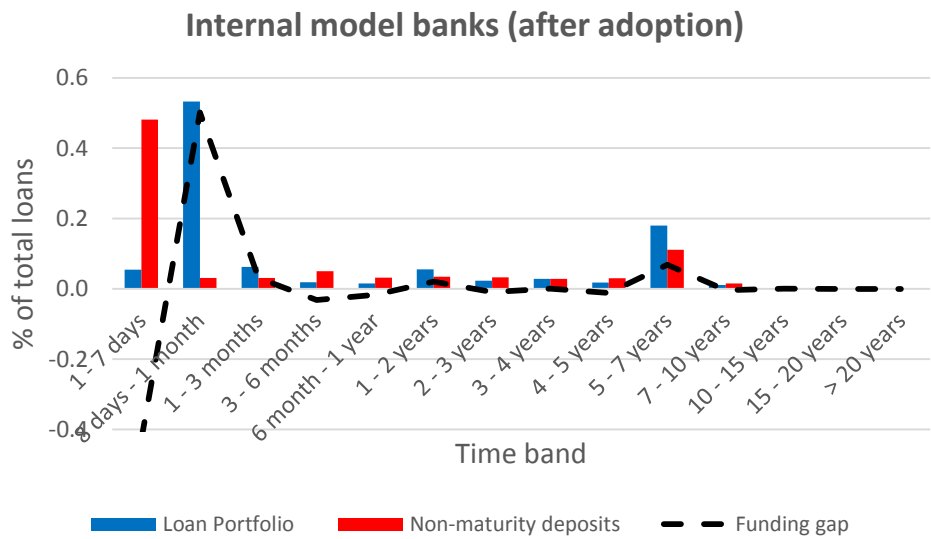
- Assets and liabilities are slotted into 14 time bands based on:
  - Repricing date: Floating rate instruments
  - Maturity or duration: Fixed rate instruments
- Higher time bands have higher capital requirements.
- NMDs can be allocated to bands:
  - ≤ 2 **years: SA banks**
    - Maximum of 0% / 10% / 45% / 80% of NMDs, based on Central Bank's annual estimates of NMDs' stability & sensitivity.
  - > 2 **years: IM banks**
    - Demonstrate sensitivity and stability of deposits to supervisor (CNBV).
    - Maximum forecasted percentages, optimized monthly within limits.


SA-Low Flexibility
SA-High Flexibility
Internal Model
G−7 banks
Bank 1
Bank 2
Bank 3
Bank 4
Bank 5
Bank 6
Bank 7
2006m1
2007m1
2008m1
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1
2015m1
2016m1
Commercial banks
Bank 8
Bank 9
Bank 10
Bank 11
Bank 12
Bank 13
Bank 14
Bank 15
Bank 16
Bank 17
Bank 18
Bank 19
Bank 20
Bank 21
Bank 22
Bank 23
Bank 24
Bank 25
Bank 26
Bank 27
Bank 28
2006m1
2006m11
2007m9
2008m7
2009m5
2010m3
2011m1
2011m11
2012m9
2013m7
2014m5
2015m3
2016m1
Investment banks
Bank 29
Bank 30
Bank 31
Bank 32
Bank 33
Bank 34
Bank 35
Bank 36
Bank 37
Bank 38
2006m1
2006m11
2007m9
2008m7
2009m5
2010m3
2011m1
2011m11
2012m9
2013m7
2014m5
2015m3
2016m1
Consumption banks
Bank 39
Bank 40
Bank 41
Bank 42
Bank 43
Bank 44
Bank 45
Bank 46
Bank 47
Bank 48
Bank 49
Bank 50
2006m1
2007m1
2008m1
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1
2015m1
2016m1
Development banks
Bank 51
Bank 52
2006m1
2007m1
2008m1
2009m1
2010m1
2011m1
2012m1
2013m1
2014m1
2015m1
2016m1

Average loans and NMDs by time band (Oct 15':Dec16')







Model

- Banks invest in assets with low- and high-repricing maturity in proportions α_t and $1-\alpha_t$ ("short- and long-term").
- Long-term liabilities: $\theta = (1-\beta)(1-\Omega)$
  - $1-\beta$: fraction of deposits insensitive to the market rate
  - $1-\Omega$: fraction of core deposits.
- Regulatory costs: $k^{IM} = h\left(\left|(1-\alpha_t) - \theta^{IM}\right|\right) + z \qquad \theta^{IM} = \theta$
  $k^{SA} = h\left(\left|(1-\alpha_t) - \theta^{SA}\right|\right) \qquad \theta^{SA} = \min\left[\theta, \overline{\theta}\right]$
- If $\alpha_t < 1 - \theta^{SA}$, banks adopt the IM when $k^{IM} < k^{SA}$, i.e. if $\theta^{IM} \gg \theta^{SA}$
- Banks can immunize against changes in interest rates by setting $\alpha_t = \beta$
  - The smaller β, the smaller can be α_t to ensure solvency.
  - Banks that adopt the IM have a high θ, associated to a low β.
  - If banks that adopt the IM choose a low $\alpha_t \rightarrow$ large SA maturity gap.

Data

- **Bank-level data** (Jan06' to Dec16'):
  - Financial statements for 52 banks.
  - Regulatory reports on capital information.
  - Assets and liabilities by band from supervisory reports to BoM (confidential).
- **Loan-level data** (Aug09' to Dec16'):
  - Supervisory dataset of all commercial and mortgage loans in Mexico.
  - 12,608,209 commercial loans to 225,015 firms from 42 banks.
  - 650,053 new mortgage loans from 24 banks.
- **Security-level data** (Jul10' to Dec16'):
  - Confidential bank reports to Bank of Mexico.
  - 10,406 securities from 48 banks.

Summary statistics

	Standard approach banks		Internal model banks			
			Before adoption		After adoption	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Panel A: Bank-Level Variables (Jan06':Dec16')						
Maturity gap (years)	0.153	0.436	0.239	0.257	0.216	0.310
Asset maturity (years)	0.702	0.921	1.000	0.500	1.271	0.587
Liability maturity (years)	0.549	0.863	0.760	0.490	1.056	0.536
Interest rate risk exposure (% total assets)	-0.320	0.826	-0.397	0.523	-0.387	0.662
Income or repricing gap (% total assets)	0.127	0.270	0.045	0.069	0.011	0.066
Short-term assets (% total assets)	0.864	0.179	0.783	0.116	0.743	0.124
Short-term liabilities (% total assets)	0.737	0.244	0.738	0.129	0.732	0.130
log(RWAs for market risk) (mill MXN $)	6.955	2.109	10.192	1.649	10.297	1.919
Capitalization index	0.429	0.867	0.160	0.046	0.174	0.050
log(Capitalization requirements) (mill MXN $)	6.264	1.690	9.053	1.512	9.106	2.148
Mortgage loan ratio	0.022	0.065	0.192	0.096	0.206	0.160
NMDs (% total liabilities)	0.156	0.222	0.247	0.097	0.346	0.098
NMDs' sensitivity	0.106	0.253	0.076	0.079	0.050	0.144
NMDs' 2-year decline (%)	0.821	0.245	0.320	0.283	0.273	0.169
log(Assets) (mill MXN $)	9.487	1.601	12.176	1.349	12.295	1.713
Nr. of observations	4,262		789		531	

Summary statistics

	Standard approach banks		Internal model banks			
			Before adoption		After adoption	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Panel B: Loan-Level Variables (Aug09':Dec16')						
Commercial loans						
Fixed interest rate fraction	0.153	0.345	0.191	0.363	0.230	0.390
IHS(Maturity) (years) - fixed rate	1.642	0.954	1.502	0.763	1.699	0.753
IHS(Maturity) (years) - floating rate	1.554	0.841	1.458	0.727	1.478	0.782
IHS(Repricing maturity) (years)	0.328	0.652	0.373	0.626	0.471	0.736
IHS(Repricing maturity $\times$ Amount committed)	15.987	2.153	15.402	2.149	15.537	2.413
Nr. of observations	1,504,089		4,342,200		6,761,920	
New mortgages						
IHS(Maturity) (years)	3.002	0.427	2.909	0.250	2.923	0.201
IHS(Maturity $\times$ Volume)	17.392	0.680	17.531	0.735	17.654	0.705
Nr. of observations	36,051		263,583		350,419	
Panel C: Security-Level Variables (Jul10':Dec16')						
Fixed interest rate	0.499	0.500	0.663	0.473	0.634	0.482
IHS(Maturity) (years) - fixed rate	1.524	1.321	2.049	0.993	2.299	0.983
IHS(Maturity) (years) - floating rate	2.237	0.501	2.246	0.414	2.438	0.482
IHS(Repricing maturity) (years)	0.843	1.171	1.406	1.216	1.507	1.310
IHS(Repricing maturity $\times$ Market value holdings)	19.663	3.338	22.460	3.694	22.130	3.887
Nr. of observations	51,155		18,440		35,043	

COX MODEL FOR THE TIME UNTIL ADOPTING THE IM

$$h_{t,b}\left(s|X_{t,b}\right) = h_0\left(s\right)\exp\left(\beta X_{t,b}\right)$$

	(1)	(2)	(3)	(4)
Maturity gap	3.878**			
	(1.682)			
Asset maturity		3.913**		
		(1.656)		
Liability maturity		-3.945**		
		(1.724)		
Mortgage loan ratio			12.981***	
			(3.954)	
NMDs' ratio			4.983***	30.044***
			(1.888)	(11.278)
NMDs' sensitivity				-.183
				(3.807)
NMDs' instability				-7.303***
				(2.830)
NMDs' ratio × NMDs' sensitivity				-14.995
				(19.928)
NMDs' ratio × NMDs' instability				-108.216***
				(40.710)
log(Assets)	.914***	.913***	.919***	-.936**
	(.224)	(.224)	(.301)	(.452)
Other bank controls	Yes	Yes	Yes	Yes
Observations	4,968	4,968	4,968	3,221

*Robust standard errors (clustered at the bank-level) are in parentheses. *p<0.10, **p<0.05, ***p<0.001*

ADOPTION OF THE IM AND IRR EXPOSURE

$$Y_{b,t} = \beta_1 IntMod_{b,t-1} + \beta_2 X_{b,t-1} + \gamma_t + \gamma_b + \varepsilon_{b,t}$$

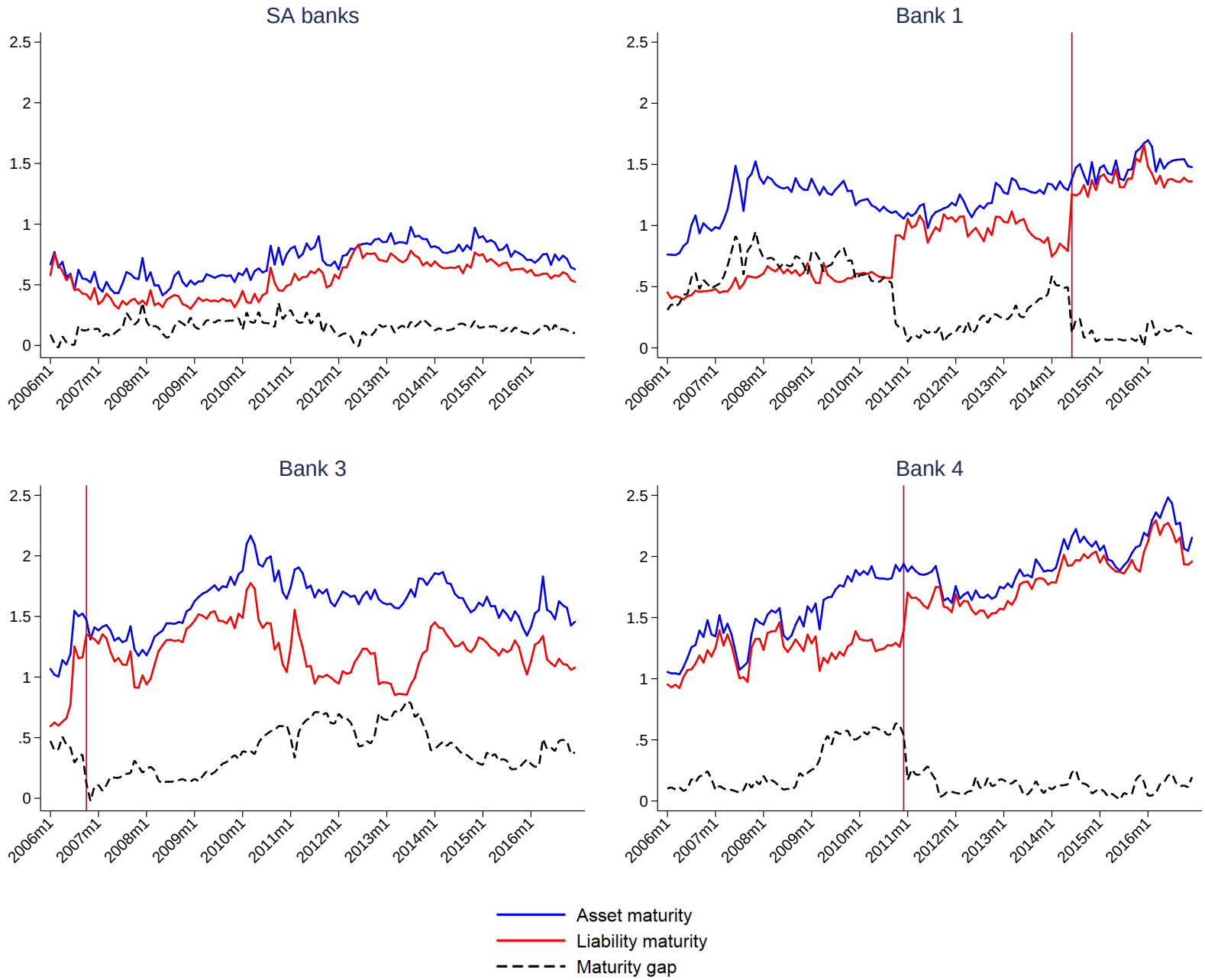
Dependent variable:	Maturity gap		IRR exposure	
		IM banks		IM banks
	(1)	(2)	(3)	(4)
Internal Model$_{t-1}$	-.155***	-.150***	.167***	.186***
	(-3.683)	(-3.538)	(2.137)	(2.433)
Mean dep. var.	.172	.228	-.337	-.388
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
R-squared	.046	.227	.059	.221
Observations	5,460	1,286	5,460	1,286

Cluster-robust t-statistics (wild bootstrap, 9,999 replications) at the bank level are reported in parentheses.
p<0.10,p<0.05,***p<0.01.*

$$GAP_{b,t} = \sum_{j=1}^{14} \frac{A_{b,t,j} - L_{b,t,j}}{\sum_{j=1}^{14} A_{b,t,j}} M_j \qquad IRR_{b,t} \approx -\sum_{j=1}^{14} \frac{A_{b,t,j} - L_{b,t,j}}{\sum_{j=1}^{14} A_{b,t,j}} W_j$$

- M_j: Maturity midpoint of band j
- W_j: Risk weight coefficient for band j estimated by the regulator

Average maturity of aggregate bank assets and liabilities



RISK-WEIGHTED ASSETS AND CAPITAL ADEQUACY RATIO

$$Y_{b,t} = \beta_1 IntMod_{b,t-1} + \beta_2 X_{b,t-1} + \gamma_t + \gamma_b + \varepsilon_{b,t}$$

Dependent variable:	log(RWAs for market risk)				Net capital / Total RWAs			
			IM banks				IM banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Internal Model$_{t-1}$	-.529***	.003	.048*	-.089**	.168***	.100**	.003	.006**
	(-2.628)	(.034)	(.454)	(-1.057)	(2.964)	(1.750)	(.610)	(1.978)
Mean dep. var.	7.748	7.748	10.239	10.344	.357	.357	.166	.151
Bank-level controls$_{t-1}$	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	.256	.670	.713	.491	.065	.100	.465	.359
Observations	5,484	5,484	1,310	397	5,484	5,484	1,310	397

Cluster-robust t-statistics (wild bootstrap, 9,999 replications) at the bank level are reported in parentheses. * *p<0.10,* ** *p<0.05,* *** *p<0.01*

Empirical strategy

- Fixed effect model for loan to firm i, borrowing from bank b, in period t:

$$Y_{i,b,t} = \beta_1 IntMod_{b,t-1} + \beta_2 X_{b,t-1} + \gamma_i + \gamma_t + \gamma_b + \varepsilon_{i,b,t}$$

- $Y_{i,b,t}$: Repricing maturity
- Explanatory variables:
  - $IntMod_{b,t-1}$: Dummy equal one after bank b starts using the IM for NMDs
  - $X_{b,t-1}$: Bank controls
    - size, liquidity ratio, capital ratio, credit risk
    - NMDs and term deposits (% of total liabilities)
    - mortgage loans (% total loans)
    - NMDs' sensitivity and fraction of overnight, 1-month and 2-year decline

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- $Y_{i,b,t}$: Repricing maturity $(\beta_1 > 0)$
- Explanatory variables:
  - $IntMod_{b,t-1}$: Dummy equal one after bank b starts using the IM for NMDs
  - $X_{b,t-1}$: Bank controls
    - size, liquidity ratio, capital ratio, credit risk
    - NMDs and term deposits (% of total liabilities)
    - mortgage loans (% total loans)
    - NMDs' sensitivity and fraction of overnight, 1-month and 2-year decline

Identification: Reverse causality, ommitted variables

1. ***The asset maturity profile drives the adoption of the IM***

   - Monthly data allows to track the timing of banks' decisions.
   - Control for cross-sectional correlation using within bank variation.
   - Control for bank-specific time trends.
   - Separate demand from supply using a broad array of FE.

2. ***Flexibility to slot NMDs confounded with banks' fundamentals***

   - Exploit plausibly exogenous variation in flexibility across SA banks.
     - SA flexibility based on regulator's coarse estimates of stability & sensitivity.
     - Control for more refined, higher frequency estimates of stability & stability.

REPRICING MATURITY OF COMMERCIAL LOANS

Dependent variable:	IHS(Repricing)			
				IM banks
	(1)	(2)	(3)	(4)
Internal Model$_{t-1}$	.167***	.148***	.021	.009
	(.029)	(.020)	(.030)	(.026)
Mean dep. var.	.663	.670	.670	.638
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes
Period FE	No	Yes	No	No
Bank FE	Yes	No	No	No
Bank $\times$ Firm FE	No	Yes	Yes	Yes
Period $\times$ Firm FE	Yes	No	No	No
Bank $\times$ Linear time trend	No	No	Yes	Yes
R-squared	.024	.025	.006	.010
Observations (mill)	5.7	12.4	12.4	10.9

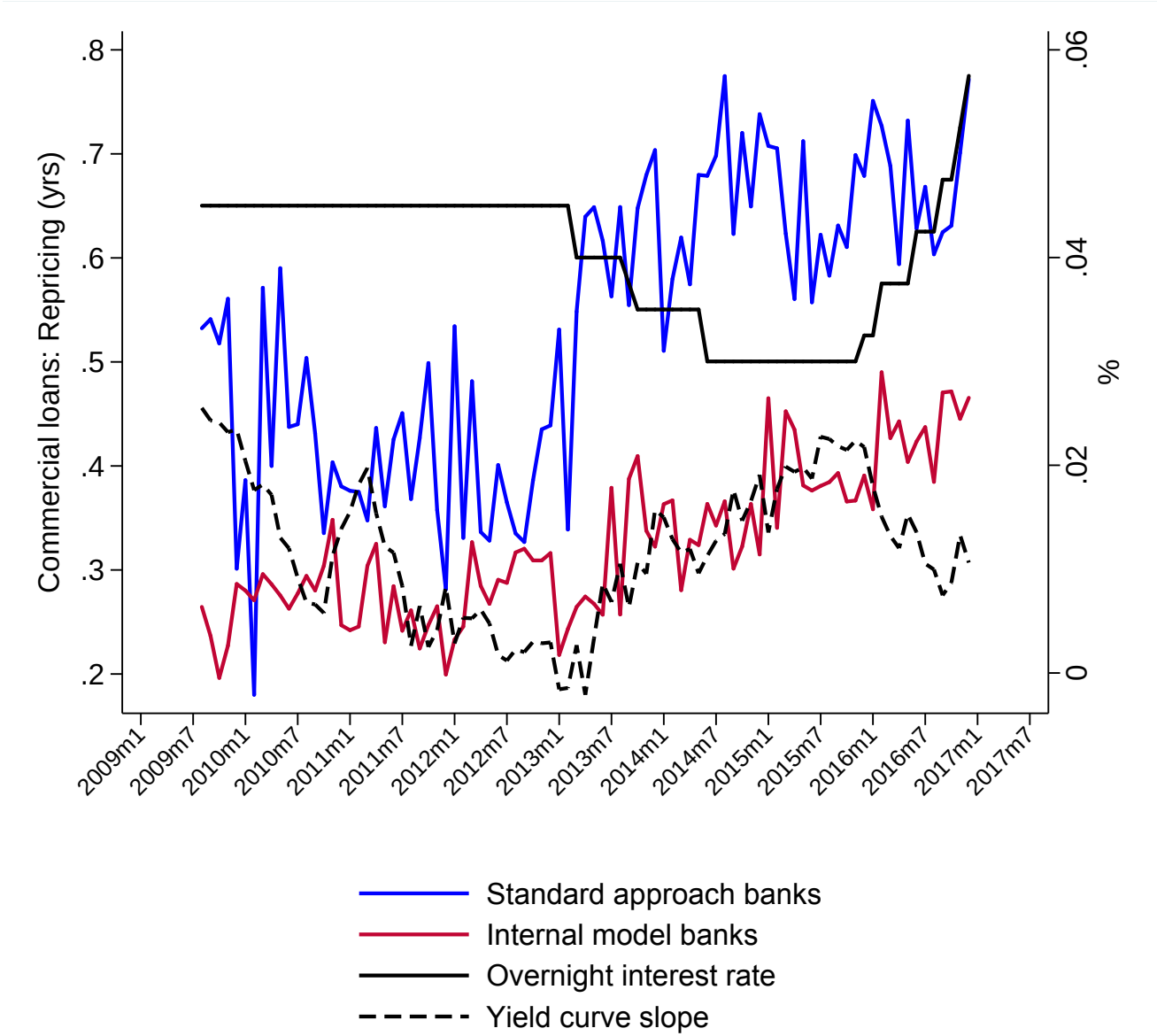
Robust standard errors adjusted for clustering at the bank $\times$ industry and year-month level are reported in parentheses.
p<0.10,p<0.05,***p<0.01.*

RESPONSE TO A STEEPENING/FLATTENING OF THE YIELD CURVE

Dependent variable:	Commercial loans: IHS(Repricing)			
Sample period:	2011:M1-2014:M12		2014:M1-2016:M12	
	(1)	(2)	(3)	(4)
$\text{IntMod}_{2013:M2} \times \text{Steepening}_t$	-.114***	-.060*		
	(.031)	(.031)		
$\text{IntMod}_{2015:M12} \times \text{Flattening}_t$			.067***	.121**
			(.023)	(.049)
Steepening_t		.051*		
		(.028)		
Flattening_t				-.039
				(.027)
Mean dep. var.	.290	.290	.284	.284
Bank controls_{t-1}	Yes	Yes	Yes	Yes
Period FE	Yes	No	Yes	No
Bank $\times$ Firm FE	Yes	Yes	Yes	Yes
Bank $\times$ Linear time trend	No	Yes	No	Yes
R-squared	.010	.004	.012	.010
Observations	1,348,414	1,348,414	961,079	961,079

*Robust standard errors adjusted for clustering at the bank $\times$ industry and year-month level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

Market rates and repricing maturity of new commercial loans



Conclusions

- IM adopted by banks with stable deposits and fixed-rate, long-term assets.
- After IM adoption:
  - The maturity gap declines.
  - Banks do not increase the asset repricing maturity.
    - Only when the yield curve flattens: Demand for fixed-rate, long-term loans.
- These results suggest a strong preference for a small maturity gap:
  - From a financial stability perspective, it does not eliminate earnings volatility risk.
  - If prevents to increase asset repricing maturity, interest rate risk will be passed from banks to firms and hhlds.

Thank you!

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MATURITY OF NEW MORTGAGE LOANS

Dependent variable:	IHS(Maturity)			
				IM banks
	(1)	(2)	(3)	(4)
Internal Model$_{t-1}$	.011	.013	.040*	.050*
	(.025)	(.023)	(.021)	(.029)
Mean dep. var.	2.936	2.935	2.935	2.922
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes
Period FE	No	Yes	No	No
Bank FE	Yes	No	No	No
Bank $\times$ Municipality FE	No	Yes	Yes	Yes
Period $\times$ Municipality FE	Yes	No	No	No
Bank $\times$ Linear time trend	No	No	Yes	Yes
R-squared	.025	.033	.035	.041
Observations (000's)	634	648	648	613

*Robust standard errors adjusted for clustering at the bank $\times$ borrower's employment sector and year-month level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

REPRICING MATURITY OF SECURITIES

	IHS(Repricing maturity)		
			IM banks
	(1)	(2)	(3)
Internal Model$_{t-1}$	.003	-.054	-.047
	(.067)	(.077)	(.074)
Mean dep. var.	.771	.769	.899
Bank controls$_{t-1}$	Yes	Yes	Yes
Bank FE	Yes	No	No
Period $\times$ Issuer FE	Yes	No	No
Bank $\times$ Issuer FE	No	Yes	Yes
Bank $\times$ Linear time trend	No	Yes	Yes
R-squared	.002	.001	.001
Observations	94,921	99,470	53,420

*Robust standard errors adjusted for clustering at the bank$\times$sector of the issuer (government, bank, private sector) and year-month level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

SA BANKS AND COMMERCIAL LOANS' MATURITY

Dependent variable:	IHS(Repricing)		IHS(Repricing × Committment)	
	(1)	(2)	(3)	(4)
SA-HighFlex$_{t-1}$	-.056***	-.025**	.000	-.057
	(.015)	(.012)	(.055)	(.053)
Mean dep. var.	.901	.901	13.737	13.737
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes
Period FE	Yes	No	Yes	No
Bank × Firm FE	Yes	Yes	Yes	Yes
Bank × Linear time trend	No	Yes	No	Yes
R-squared	.013	.027	.028	.043
Observations	1,501,491	1,501,491	1,501,491	1,501,491

*Robust standard errors adjusted for clustering at the bank × industry and year-month level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

NEW COMMERCIAL LOANS

Dependent variable:	IHS(Repricing)		IHS(Repricing × Committment)	
	(1)	(2)	(3)	(4)
Internal Model$_{t-1}$	.099***	-.044	.330***	-.038
	(.037)	(.048)	(.107)	(.110)
Mean dep. var.	.307	.307	12.079	12.079
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes
Period FE	Yes	No	Yes	No
Bank × Firm FE	Yes	Yes	Yes	Yes
Bank × Linear time trend	No	Yes	No	Yes
R-squared	.021	.039	.022	.052
Observations	2,403,682	2,403,682	2,403,682	2,403,682

*Robust standard errors adjusted for clustering at the bank × industry and year-month level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

HOLDINGS OF INTEREST RATE SWAPS

	Whether hold swaps			Notional amount/total assets			Pay-fixed minus pay-floating/ total assets		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Internal Model$_{t-1}$	-.254**	-.070	-.105	.012*	.002	.004	-.008	-.013	.031
	(-3.360)	(-1.197)	(-1.631)	(2.265)	(.487)	(1.104)	(-.268)	(-.213)	(.528)
Mean dep. var.	.514	.514	.488	.011	.011	.009	.085	.085	.110
Bank-level controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Excl. investment banks	No	No	Yes	No	No	Yes	No	No	Yes
R-squared	.557	.090	.134	.395	.106	.092	.043	.060	.163
Observations	5,042	5,042	4,380	2,590	2,590	2,137	2,587	2,587	2,134

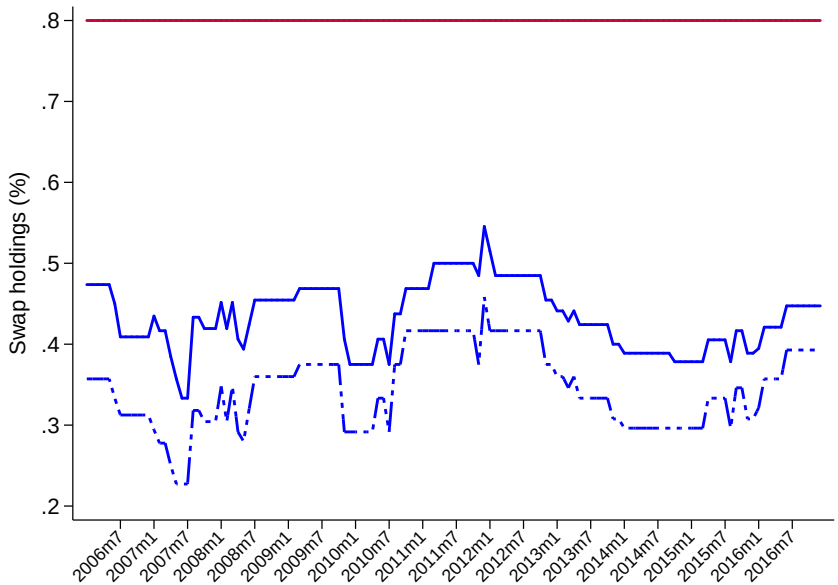
*Cluster-robust t-statistics (wild bootstrap, 9,999 replications) at the bank level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

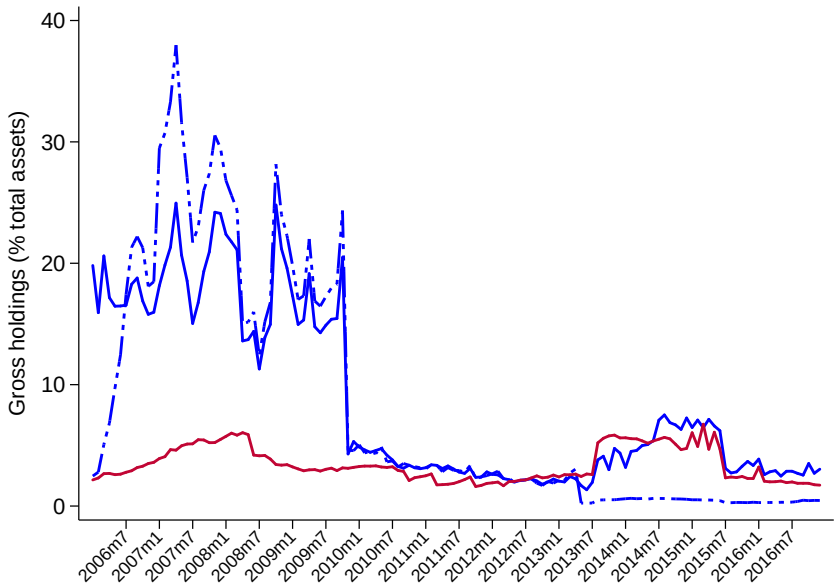
RESPONSE TO A STEEPENING / FLATTENING OF THE YIELD CURVE: NET HEDGING USING INTEREST RATE SWAPS

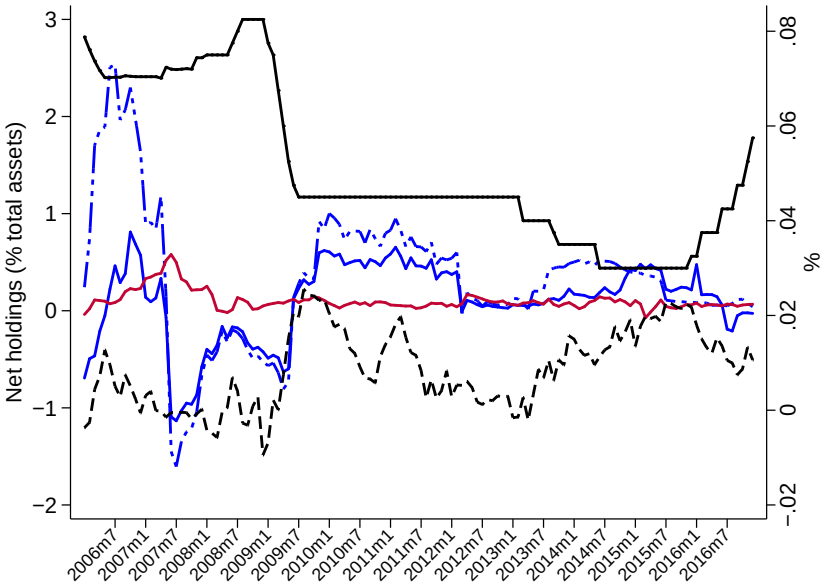
Sample period:	2011:M1-2014:M12		2014:M1-2016:M12	
	(1)	(2)	(3)	(4)
$\text{IntMod}_{2013:M2} \times \text{Steepening}_t$	-.044	-.060		
	(-1.034)	(-1.438)		
$\text{IntMod}_{2015:M12} \times \text{Flattening}_t$			.113	.018
			(1.676)	(.518)
$\text{IntMod}_{2013:M2}$	.032	-		
	(.736)			
$\text{IntMod}_{2015:M12}$			.027	-
			(1.051)	
Mean dep. var.	.073	.073	.096	.096
Bank-level controls_{t-1}	Yes	Yes	Yes	Yes
Period FE	Yes	Yes	Yes	Yes
Bank FE	No	Yes	No	Yes
R-squared	.413	.152	.179	.073
Observations	844	844	643	643

*Cluster-robust t-statistics (wild bootstrap, 9,999 replications) at the bank level are reported in parentheses. *p<0.10,**p<0.05,***p<0.01.*

Interest rate swaps holdings of SA and IM banks







Standard approach banks

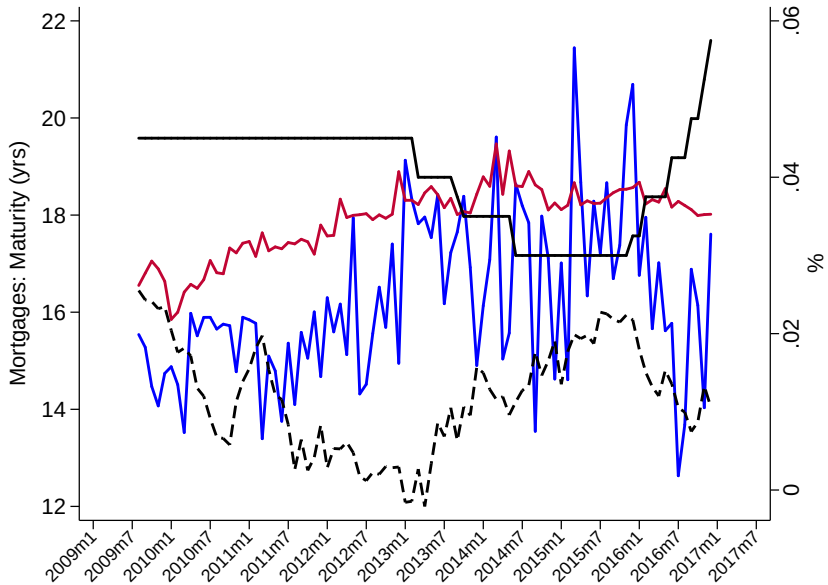
Standard approach banks (excl. investment)

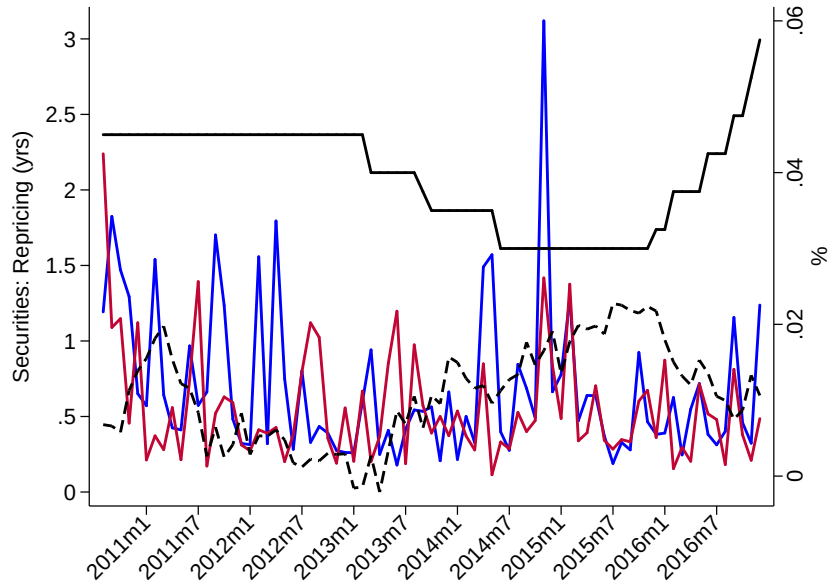
Internal model banks

Overnight interest rate

Yield curve slope

Market rates and repricing maturity of new mortgages and securities





Standard approach banks
Internal model banks
Overnight interest rate
Yield curve slope

Average net assets and liabilities by time band (Jul 09':Dec16')

OPERATIONS SUBJECT TO MARKET RISK - DOMESTIC CURRENCY, NOMINAL INTEREST RATE