Bank Profitability and Risk-Taking in a Low Interest Rate Environment: The Case of Thailand

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Low interest rates in Thailand

Monetary policy rate



- stays at 1.5% for 13 consecutive quarters
- has not been raised since 2011Q3 => 27 quarters

(as of 21 June 2018)

Low interest rate environment



Short-term interest rates in major advanced countries

Introduction Data & Stylized Facts Methodology Main Results C

Research Questions

- Does low policy rate lead to lower **bank profitability** and greater **loan risk-taking**?
- What **types of banks** are more sensitive to the policy rate?
- What types of firms are more affected by bank risk-taking behavior?



Introduction Data & Stylized Facts Methodology Main Results Con	clusion
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Interest rates and **bank profitability**



Altavilla, Boucinha, and Peydró (2017) Alessandri and Nelson (2015) Borio, Gambacorta, and Hofmann (2017) Claessens, Coleman, and Donnelly (2017)

Conclusion

Interest rates and **bank loan risk**



Ioannidou et al. (2015) Jiménez et al. (2007, 2012, 2014) Dell'Ariccia et al. (2017) De Nicolò et al. (2010) Delis & Kouretas (2011) Abuka et al. (2015)

Introduction	Data & Stylized Facts	Methodology	Main Results
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Data and Stylized Facts



Source	Data	Period	Frequency	Data level	Bank-level data	Loan-level data
DMS	Banks' financial statements	2004-2017	Quarterly	Bank level	23 banks (non-entry, non-exit)	10 million accounts from
BOT	Interest rates, macro variables and estimates	2003-2017	Quarterly	Aggregate	Quarterly 2004Q1 – 2017Q3	39 banks Monthly
LAR	Loan characteristics	2003-2017	Monthly	Loan account		2004M1 – 2017M9
	Collaterals	2003-2015	Monthly	Collateral		
CPFS	Firm characteristics	1999-2015	Yearly	Firm level		

Data overview



Loans to firms vs. individuals



ntrodu	ction
IIIIUuu	CUUII

Share of new loans by loan type



Trade finances = bills, notes, and loans for export and import purposes.

Working capital = overdraft, notes that are not considered trade finance, and factoring.

General loans = short- and long- terms loans such as general business loans, leasing, hire purchase, real estate loans, and bank guarantees.

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Loan characteristics by loan type

		Working	Trade	Credit cord	Genera	I loans
		capital	finance	Credit Card	Short-term	Long-term
Size of loans	Median	1,800	1,650	3	7,657	4,154
(thousand)	Mean	11,436	7,194	13	168,223	40,589
Maturity	Median	2.0	3.0	1.0	2.0	60.0
(months)	Mean	4.3	4.3	15.1	2.5	86.3
Share of corporate loans		85.4%	98.6%	92.3%	82.4%	65.4%
Share of collateralized loans		25.4%	22.4%	1.9%	19.4%	53.0%
Share of defaulted loans		1.6%	1.1%	0.2%	3.1%	7.2%
Share of SM and defa	ulted loans	4.0%	4.9%	2.1%	5.4%	17.3%

Note: Maturity is an optional field in LAR and it is replaced with the actual duration of the loan when maturity is missing or inconsistent. Short- and long-term loans refer to loans with adjusted maturity not more than one year, and more than one year respectively.

roduction Data & Stylized Facts	Methodology	Main Results	Conclusion
roduction Data & Stylized Facts	Ivietnodology	Iviain Results	Conclusion

Bank profitability and its components



- in recent years under the low rate
- But the dispersion of net interest income

Median

Conclusion



Bank profitability by bank size



Note: Only includes 23 non-exit, non-entry banks. The lines represent median value for each group of banks. All variables are ratios in percentage.

Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion
--------------	-----------------------	-------------	--------------	------------

Measures of bank risk

Bank-level measures:

- ✓ Non-performing loans (NPL)
- ✓ Risk-weighted assets (RWA)
- ✓ Bank Z-score
- Expected default frequency (EDF)

Loan-level measures:

- ✓ Time to default
- ✓ Past delinquency
- ✓ Ex-post default
- ✓ Uncollateralized loans
- Loan approval rate
- Credit risk rating





- Calculated over eight quarters
- The higher the lower risk



14

Note: Only includes 23 non-exit, non-entry banks. RWA are percentages of total assets. NPL are percentages of total loans.

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Measures of loan quality



Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion

Methodology

Empirical strategy

	Data	Method	Robustness check	Dependent variables (Y)
Profitability	Bank level	Fixed-effects panel regression	Dynamic panel regression	ROA, ROE, NII/TA, NNI/TA, LLP/TA
	Bank level	Fixed-effects panel regression	Dynamic panel regression	Z-score, RWA/TA, NPL/TL
Risk taking	Loan level	Survival analysis	Probit regression	 Time to default/Hazard rate Past borrower default, loan ex-post default, loans with collaterals

 $Y_{i,t} = \alpha_i + \delta Y_{i,t-1} + \beta_1 M P_t + \beta_2 YieldSpread_t + \Phi MacroControls_t + \Omega BankChars_{i,t-1} + \varepsilon_{i,t}$

Duration Analysis and Timing of Variables



Introduction Data & Stylized Facts Methodology Main Results Conclusion

Explanatory variables

Main variable:	Monetary policy rate (MP)
Interest rate conditions:	Yield spread, low-for-long indicators (0/1)
Macroeconomic controls:	GDP growth, CPI growth, Credit-to-GDP gap, crisis dummy (0/1), Herfindahl Hirschman Index (HHI), expected GDP growth, expected inflation
Bank characteristics:	Capital ratio, liquidity ratio, total assets, funding composition, efficiency ratio, ROA, loans/total assets, NPL, bank size (large, medium, small)
Loan characteristics:	Type of loans, loan size, collateralization (0/1)
Borrower characteristics:	Past default (0/1), number of bank relationships
Firm characteristics:	Firm age, size, ROA

Main Results

Bank-Level Profitability & Risk

Dependent variable	ROA	ROE	NII/TA	NNI/TA	LLP/TA	ROA
Policy rate _t	0.135**	0.784***	0.010*	0.011	0.065**	0.075
	(2.811)	(3.213)	(1.949)	(1.047)	(2.245)	(1.277)
Policy rate _t x Medium banks (0/1)						-0.170***
						(-3.205)
Policy rate _t x Small banks (0/1)						0.130***
						(2.969)
Lagged dependent variable	0.381***	0.511***	0.713***	0.164***	0.823***	0.373***
	(4.048)	(14.267)	(9.146)	(7.154)	(18.091)	(4.094)
Observations	1,197	1,197	1,197	1,197	1,197	1,197
R-squared	0.250	0.313	0.678	0.071	0.822	0.263

Positive effect of interest rate on ROA and ROE

• Net interest income increases with policy rate

But **loan loss provision** also increases with rate

21

Small banks more sensitive to policy rate, while **medium banks** less sensitive

Dependent variable	Z-score	RWA/Assets	NPL/Loans
Policy rate _t	-3.339	0.126	0.315
	(-1.439)	(0.415)	(1.489)
Lagged dependent variable	0.798***	0.825***	0.749***
	(44.048)	(34.566)	(10.364)
Observations	1,038	1,197	1,197
R-squared	0.690	0.723	0.734

No evidence of the effect of interest rate on bank risk at the bank level

The standard errors are clustered at the bank level and robust t-statistics are reported in parentheses. All regressions include bank fixed-effects. *** p<0.01, ** p<0.05, * p<0.1. Explanatory variables omitted to preserve space are macroeconomic controls and bank characteristics.

Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion
--------------	-----------------------	-------------	--------------	------------

Loan Duration Model by Loan Type

Dependent variable: Hazard rate

		Sub sample k	oy loan types
	All loans	Long-term loans	Non long-term loans
Policy rate _{τ-1}	-0.014	-0.357***	0.198***
	(-1.337)	(-17.651)	-15.168
Policy rate _{$\tau+T$}	0.276***	0.795***	0.102***
	(45.331)	(57.108)	-12.668
GDP growth _{τ-1}	-0.006***	-0.011***	0.001
	(-4.370)	(-4.465)	-0.639
GDP growth $_{\tau+T}$	-0.004***	-0.043***	-0.003*
	(-2.865)	(-12.079)	(-1.844)
Past default (0/1)	1.176***	0.680***	1.409***
	(120.465)	(33.878)	-124.191
Collateralized (0/1)	-0.360***	-0.420***	-0.188***
	(-32.673)	(-20.760)	(-14.270)
ln(Loan size) $_{\tau}$	0.050***	-0.045***	0.097***
	(44.441)	(-24.107)	-61.716
Bank relationship $_{\tau}$	-0.989***	-0.527***	-1.222***
	(-79.116)	(-17.215)	(-86.125)
Observations	5,040,315	178,273	4,862,042
Pseudo-R	0.0255	0.0235	0.0357
log likelihood	-630120	-143037	-464989

For **full sample**, no effect of interest rate on loan hazard rate

But, low rate leads to higher hazard rate for **long-term general loans**

Higher interest rate at end of duration, the higher is default risk

The estimates are based on ML estimation of cox proportional hazards model. Non long-term loans includes working capital, trade finance, credit cards, and other short-term loans. τ is the month the loan was granted. T is the time to default or repayment of the loan. Explanatory variables omitted to preserve space are yield spread, HHI, and bank characteristics. The z-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1 22

Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion
--------------	-----------------------	-------------	--------------	------------

Duration Model – Bank Characteristics

	Hazard rate
Policy rate _{τ-1}	-0.008
	(-0.768)
Bank ROA _{t-1}	-0.072***
	(-13.122)
Capital ratio _{τ-1}	-0.009***
	(-3.564)
Liquidity ratio _{τ-1}	-0.028***
	(-17.783)
NPL/Loans _{τ-1}	0.040***
	(32.724)
Loans/Assets _{τ-1}	-0.000
	(-0.623)
Medium banks (0/1)	0.099**
	(2.500)
Small banks (0/1)	0.186***
	(5.178)
Policy rate _{τ-1} x Medium banks (0/1)	-0.044***
	(-3.435)
Policy rate _{τ-1} x Small banks (0/1)	-0.094***
	(-7.698)
Observations	5,040,315
Pseudo-R	0.0254
log likelihood	-630188

Loans issued by medium and small banks tend to have higher hazard rate

Medium and small banks are more responsive to policy rate in terms of loan risk-taking

23

Explanatory variables omitted to preserve space are other monetary conditions, macroeconomic controls, and loan/borrower characteristics. The z-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Introduction Data & Stylized Facts Methodology	Main Results	Conclusion
--	--------------	------------

Duration Model – Firm Characteristics

	Hazard rate
Policy rate _{τ-1}	-0.147***
	(-7.374)
Firm size (0/1) _{τ-1}	-1.029***
	(-29.291)
Firm size _{τ-1} (0/1) x Policy rate _{τ-1}	0.075***
	(6.750)
Firm $age_{\tau-1}$	-0.065***
	(-3.594)
Firm $age_{\tau-1} \times Policy rate_{\tau-1}$	-0.005
	(-0.831)
Firm $ROA_{\tau-1}$	-0.822***
	(-20.182)
Firm $ROA_{\tau-1} \times Policy rate_{\tau-1}$	0.017
	(1.316)
Observations	4,072,616
Pseudo-R	0.0380
log likelihood	-402533

Smaller, younger, and less profitable firms tend to be associated with higher hazard rate

Small firms' default risks are more sensitive to interest rates
 → More affected by bank risk-taking behavior

Explanatory variables omitted to preserve space are other monetary conditions, macroeconomic controls, bank characteristics, and loan/borrower characteristics. The z-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion
--------------	-----------------------	-------------	--------------	------------

Indicators of low-for-long interest rates







Three alternative indicators to capture the **prolonged** low interest rates

- a. Measure that counts the **number of quarters the policy rate does not increase**
- b. Binary indicator that equals one when the policy rate is **below sample median**
- c. Binary indicator that equals one when the residuals of Taylor rule are negative



Conclusion

Methodology

Duration Model – Low-for-long

Dependent variable: Hazard rate

	(1)	(2)	(3)
Policy rate _{τ-1}	0.012		
	(1.143)		
Policy rate _{$\tau+T$}	0.225***		
	(32.941)		
In(Quarters rate not increase) $_{\tau-1}$	0.268***		
	(40.472)		
$ln(Quarters rate not increase)_{\tau+T}$	-0.238***		
	(-38.163)		
Rate below median _{τ-1} (0/1)		-0.004	
	_	(-0.295)	-
Rate below median $_{\tau^+\tau}$ (0/1)		-0.496***	
		(-43.087)	
Negative Taylor residual _{τ-1} (0/1)	-		0.118***
			(11.507)
Negative Taylor residual _{$\tau+T$} (0/1)			0.392***
			(40.499)
Observations	5,040,315	5,040,315	5,040,315
Pseudo-R	0.0272	0.0253	0.0253
log likelihood	-629038	-630252	-630289

'Low for longer' leads to an increase in bank risk-taking in **new loans**

... but low interest rate at the end of loan duration helps lower the default risk for **existing loans**

Explanatory variables omitted to preserve space are yield spread, macroeconomic controls, bank characteristics, and loan/borrower characteristics. The z-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1 26

Introduction Data & Stylized Facts Methodology Main Results Conclusion	Introduction	Data & Stylized Facts	Methodology	Main Results	Conclusion
--	--------------	-----------------------	-------------	--------------	------------

Loan Risk – Probit Model

Dependent variable	Past borrower default (0/1)	Loan ex-post default (0/1)	Collateralized (0/1)
Policy rate $_{\tau-1}$	-0.027***	-0.042***	-0.138***
	(-20.899)	(-15.933)	(-102.231)
$GDP\ growth_{\tau\text{-}1}$	-0.007***	-0.018***	-0.013***
	(-41.320)	(-49.308)	(-84.790)
$Bank\ relationship_\tau$	0.411***	-0.332***	-0.296***
	(401.433)	(-130.705)	(-271.471)
Observations	9,978,690	9,978,690	8,248,799
Pseudo-R	0.033	0.081	0.102
log likelihood	-3681862.9	-784501.66	-4074432.7

Low interest rates increase the likelihood of:

- granting new loans to borrowers with past default
- granting new loans that eventually default
- granting new loans that require collateral

Explanatory variables omitted to preserve space are yield spread, macroeconomic controls, and bank characteristics. The z-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Introduction Data & Stylized Facts Methodology Main Results Conclusion
--

Conclusion and Policy Implication

Key Takeaways

Does low interest rate affect bank profitability?

- ✓ Yes
 - mainly through net interest income

Does low interest rate increase bank's risk-taking?

- × No, at the bank level
- ✓ Yes, at the loan level
 - for long-term loans

Who are more sensitive to low interest rate?

Small banks and small firms

Policy Implication

- ✤ Potential unintended side effects

 of unusually accommodative
 monetary policy
 → Financial stability
- ✤ Heterogeneity of bank risk-taking
 → Distributional consequences

Introduction

Thank you