Easy Monetary Policy and Tight Capital Requirement: An Empirical Study of Bank Lending Behavior

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Content

Introduction

Risk-based Capital Requirements (RBC) - require banks to hold enough capital in terms of a ratio of capital to risk-weighted assets (loans ...): More lending requires more capital

Basel III

- Common Equity Tier 1 Capital Ratio [1] - 4.5%
- Tier 1 Capital Ratio [2] - 6%
- Total Risk-Weighted Capital Ratio [3] - 8%

The Stress Tests

- Risk-based capital ratio under stressed macroeconomic scenarios

[1] Mainly retained earnings and common stock equity
[2] Include preferred stock equity
[3] Include some bonds

Introduction - Motivation

Substantially Heightened Capital Requirements - Basel III and the Stress Tests since 2009:

- Pros - more capital buffer, stable banking system, more lending during bad times
- Cons - less profitable banks, unstable banking system [4], lending slowdown
- Capital Requirements and Monetary Policy [5]
  - Easing & Capital Constrained Banks: not effective
  - Easing & Capital unconstrained Banks: effective
  - Tightening & Capital Constrained Banks: effective
  - Tightening & Capital unconstrained Banks: not effective

Motivation: use bank-level data to evaluate the effects of risk-based capital ratio and monetary policy on bank lending

[4] Congdon & Hanke (2017); Gramm & Solon (2016); Sarin & Summers (2016)

[5] Kishan & Opiela (2006)

Introduction - Motivation - Why should one care?

- How does risk-based capital ratio affect banks' lending? Lending slowdown? More lending during bad time? Or doesn't matter?
- Should regulation be lifted?
- How is the effectiveness of monetary policy in boosting lending?

Background - Basel

Basel I (1988)

- Tier 1 Capital Ratio - 4%
- Total Risk-Weighted Capital Ratio - 8%

Basel II (2004)

- Give banks discretion when evaluating capital requirements
- Enhance supervision and transparency

Basel III (2010)

- Improve capital quality and quantity
- Common Equity Tier 1 Ratio (CET1) - 4.5% (7% if including conservation buffer)
- Tier 1 Capital Ratio - 6%

2013 - The U.S. will implement Basel III by 2019 on all sizes of banks except for BHCs with assets of less than $500 million

Background - Stress Tests

The U.S. Stress Tests

- 2009 - SCAP, implemented on the 19 largest U.S. BHCs
  - Require banks to raise capital, can overrule plan of stock repurchase and dividend payout
- 2011 - CCAR, same 19 largest BHCs, gradually expand to cover other large banks with assets of more than \$50 billion [6]
- 2013 - DFAST, company run stress tests on mid-size BHCs with assets of between \$10 - \$50 billion

[6] 34 BHCs in 2017

Literature Review - Credit Crunch

Limited support for supply-side credit crunch [7] , favor macro-demand factors, weak and unimportant RBC effects:

- Bernanke & Lown (1991): 1989 - 1991 state and bank level (New Jersey) data, lagged capital ratio on loan growth, significantly positive but small, 2 - 3 percentage points
- Hancock & Wilcox (1994): 1990 - 1991 bank level data, banks contract portfolios to shortfalls on either unweighted 4.75% or risk-weighted 8% capital standard, bank credit fall by \$4.5 for \$1 shortfall in unweighted standard, insignificant RBC when both are included
- Berger & Udell (1994): 1979 - 1992 quarterly bank level data, compare different hypotheses, RBC the worst explanation, inconsistent effects compared to predictions

[7] RBC, Leverage ratio standard, Perceived risks

Literature Review - Credit Crunch

Support for the significant effects of RBC:

- Peek & Rosengren (1996): 1988 - 1995 semiannual data on branches of Japanese banks operated in the U.S., natural experiment isolating supply from demand factors, Japanese stock market crush, economically and statistically significant, 1-percentage-point decline in parents RBC - 6% decline in total loans at U.S. branches

A newer study:

- Berrospide & Edge (2010): 1990 - 2008 quarterly BHCs data, panel and VAR, capital shortfall and capital ratio, modest long run effects on loan growth, 0.7 - 1.2 percentage points, favor perceived risk retrenchment and macro demand factors

Conclusion: mixed results on effects of capital, but worth to study because RBC has been substantially heightened in recent years

Literature Review - Monetary Policy

Interaction between monetary policy and capital requirements, an additional requirement beside the reserve requirement [8]:

- Kishan & Opiela (2006): 1980 - 1999 quarterly bank level data, policy-stance asymmetry, examine expansionary and contractionary policy separately on loan of low-capital and high-capital banks between pre-Basel and post-Basel periods, hold in post-Basel period, require certain level of stringency

- Gambacorta & Shin (2016): 1994 - 2012 annually data on international banks in G10, leverage ratio, GMM, smaller monetary tightening effects for high-capitalized banks, -1.1% and -1.7%, lower costs, 4 basis point cost reduction

Conclusion: Most studies do not explicitly differentiate between monetary stance, insufficient empirical evidence, stringent RBC and monetary easing

[8] Bliss & Kaufman (2002)

Data

1. FDIC - Bank level panel data, 6,000 - 9,000 FDIC insured institutions, quarterly data from 2001Q4 - 2017Q3, 64 quarters, 500,000 obs, unbalanced data due to enter and exit, number of banks decrease by average of 50 per quarter
2. FRED - Macro economics data, federal funds rate, real GDP, unemployment rate, inflation rate (CPI)
3. Bureau of Economic Analysis - State level personal income
4. Federal Reserve Bank of Chicago - BHC data, total assets

Large N, small T, System GMM, T around 25, divide data into sub-samples, before and after heightened requirements in 2009 [9], data for CET1 begins in 2015, use a proxy [10] before 2015

[9] First round of SCAP

[10] (Tier 1 capital - preferred stock equity)/risk-weighted assets

Model - Baseline Specification

The Standard Dynamic Lending Model based on Kashyap & Stein (1995), Gambacorta & Mistrulli (2004), Berrospide & Edge (2010), Gambacorta & Shin (2016), Borio & Gambacorta (2017)

$$\Delta \ln L_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \ \Delta \ln L_{i,t-j} + \eta \ CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \ \Delta MP_{t-j} + \phi \ Z_{i,t-j} + \epsilon_{i,t}$$

Quarterly data, 4 lags for serial adjustment
Unit root, differenced for stationarity

Model - Variables

Dynamic model, lagged dependent variables

Factors of interest:

- CET1R: Common equity tier 1 ratio, a measure of higher quality capital, unavailable before 2015, use proxy:

  $$(Tier\ 1\ capital - preferred\ stock\ equity)/risk\ weighted\ assets$$

  correlate with Tier 1 capital
- MP: Federal funds rate

Control variables (Z):

- Macroeconomic Control Variables - use 4 lags
  - Real GDP
  - Unemployment rate
  - Inflation rate
  - State level personal income

Model - Variable Continued

- Bank Specific Variables - use 1 lag
  - Credit risk: net-Charge offs to total assets ratio
  - Credit risk: non-performing loans to total assets ratio
  - Liquidity ratio: (cash + securities)/total assets
  - Profitability of lending: interest income from domestic loan to total assets ratio
  - Intermediation costs: non-interest expense to average assets
  - Bank size: log of bank's assets
- Dummy Variables
  - Period Dummy: 1 if after 2009, 0 other wise
  - Basel: 1 if bank or BHC assets over $500 million since 2013; 0 otherwise
  - Stress Test: 1 if BHC participates in SCAP, CCAR or DFAST since 2009 [11]; or 1 if bank or BHC assets over $10 billion [12] since 2013; 0 otherwise

[11] Largest BHCs

[12] Medium banks

Other Specifications

A specification with interaction (Gambacorta & Mistrulli, 2004):

$$\Delta \ln L_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \ \Delta \ln L_{i,t-j} + \eta \ CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \ \Delta MP_{t-j} + \sum_{j=1}^{4} \lambda_j \ CET1R_{i,t-1} \cdot \Delta MP_{t-j} + \phi \ Z_{i,t-1} + \epsilon_{i,t}$$

Undivided profit:

$$\Delta \%RE_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \ \Delta \%RE_{i,t-j} + \eta \ CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \ \Delta MP_{t-j} + \phi \ Z_{i,t-j} + \epsilon_{i,t}$$

Common stockholders' equity:

$$\Delta \ln CS_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \ \Delta \ln CS_{i,t-j} + \eta \ CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \ \Delta MP_{t-j} + \phi \ Z_{i,t-j} + \epsilon_{i,t}$$

Method

Dynamic Panel Model:

- Contain lagged dependent variable, endogenous, difference will not work, y_{t-1} correlates to ϵ_{t-1}
- pooled OLS and FE are not consistent

Literature: weak instruments, focus on improving efficiency

- Anderson & Hsiao (1981): instrument variable, y_{t-2}
- Arellano & Bond (1991): further lags, GMM
- Ahn & Schmidt (1995): non-linear GMM
- Blundell & Bond (1998): system GMM, lagged variables as instruments for difference equation, lagged difference as instruments for level equation

Lagged variables used also reduce endogeneity

Result - Without Dynamic Lags

	OLS		FE	
	pre 2009	post 2009	pre 2009	post 2009
Capital Ratio	0.00000391	-0.00000440*	0.0000566***	-0.00000421
	(0.56)	(-2.23)	(3.88)	(-1.33)
LD.FEDFUNDS	0.00105	0.00317	-0.00134	0.00926
	(0.23)	(0.34)	(-0.29)	(0.99)
L2D.FEDFUNDS	-0.00393	-0.00324	-0.00627	0.000402
	(-0.91)	(-0.37)	(-1.47)	(0.05)
L3D.FEDFUNDS	-0.00153	-0.00244	-0.00449	-0.00349
	(-0.26)	(-0.29)	(-0.77)	(-0.41)
L4D.FEDFUNDS	-0.0131*	-0.00493	-0.0185**	0.00159
	(-2.01)	(-1.02)	(-2.88)	(0.33)
Net Charge-off	-0.00897***	-0.0165***	-0.00388*	-0.00926***
	(-5.52)	(-15.14)	(-1.97)	(-7.23)
Nonperforming Loan	-0.00693***	-0.00428***	-0.00782***	-0.00506***
	(-16.44)	(-16.65)	(-13.16)	(-12.29)
Asset	-0.000192	0.00209***	-0.0942***	-0.0344***
	(-0.39)	(4.90)	(-27.67)	(-11.73)
Liquidity Ratio	-0.000340***	-0.000129***	0.00243***	0.00113***
	(-7.39)	(-3.46)	(19.88)	(12.11)
Observations	206697	242341	206697	242341

t statistics in parentheses

All Variables Are in Lag Form

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Result - With Dynamic Lags

	OLS		FE	
	pre 2009	post 2009	pre 2009	post 2009
Capital Ratio	0.00000145	-0.00000594**	0.0000403**	-0.00000823**
	(0.21)	(-3.08)	(2.81)	(-2.67)
LD.FEDFUNDS	-0.000653	-0.00147	-0.00674	0.00151
	(-0.14)	(-0.16)	(-1.49)	(0.17)
L2D.FEDFUNDS	-0.00431	-0.000478	-0.00489	0.000404
	(-1.00)	(-0.06)	(-1.17)	(0.05)
L3D.FEDFUNDS	-0.000867	0.000194	0.00298	-0.0000583
	(-0.15)	(0.02)	(0.52)	(-0.01)
L4D.FEDFUNDS	-0.0120	-0.00795	-0.0176**	-0.00696
	(-1.87)	(-1.68)	(-2.79)	(-1.48)
Net Charge-off	-0.00868***	-0.0248***	-0.00627**	-0.0228***
	(-5.38)	(-23.08)	(-3.24)	(-18.23)
Nonperforming Loan	-0.00709***	-0.00388***	-0.00965***	-0.00502***
	(-16.92)	(-15.42)	(-16.50)	(-12.56)
Asset	0.0000788	0.00249***	-0.0736***	-0.0169***
	(0.16)	(5.98)	(-21.88)	(-5.91)
Liquidity Ratio	-0.000602***	-0.000351***	0.00139***	0.000365***
	(-13.02)	(-9.58)	(11.50)	(4.02)
Observations	206697	242341	206697	242341

t statistics in parentheses

All Variables Are in Lag Form

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Result - One Step System GMM

	One Step		Robust	
	pre 2009	post 2009	pre 2009	post 2009
Capital Ratio	0.0000664**	0.0000114*	0.0000664	0.0000114
	(2.94)	(2.11)	(1.03)	(1.27)
LD.FEDFUNDS	-0.00417	0.101***	-0.00417	0.101***
	(-0.86)	(13.84)	(-0.49)	(3.73)
L2D.FEDFUNDS	-0.0278***	0.00767	-0.0278***	0.00767
	(-6.74)	(1.12)	(-3.47)	(0.33)
L3D.FEDFUNDS	-0.0507***	0.0465***	-0.0507***	0.0465*
	(-7.85)	(8.88)	(-3.60)	(2.25)
L4D.FEDFUNDS	-0.0306***	0.0142**	-0.0306*	0.0142
	(-4.57)	(3.02)	(-2.55)	(0.92)
Net Charge-off	0.0168***	-0.00590***	0.0168	-0.00590
	(6.49)	(-3.58)	(1.49)	(-0.45)
Nonperforming Loan	-0.00323**	-0.00295***	-0.00323**	-0.00295
	(-3.21)	(-4.04)	(-2.85)	(-1.47)
Asset	-0.518***	-0.441***	-0.518***	-0.441***
	(-69.14)	(-65.69)	(-5.55)	(-4.19)
Liquidity Ratio	0.0119***	0.00816***	0.0119***	0.00816***
	(45.83)	(42.73)	(5.80)	(4.99)
Observations	206697	242341	206697	242341

t statistics in parentheses

All Variables Are in Lag Form

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Result - Two Step Robust System GMM

	Two Step R		3 Lags IV	
	pre 2009	post 2009	pre 2009	post 2009
Capital Ratio	0.0000894	0.0000112	0.0000547	0.00000423
	(0.59)	(1.12)	(1.40)	(0.19)
LD.FEDFUNDS	-0.00702	0.0835***	-0.00719	0.0563**
	(-1.17)	(3.41)	(-1.92)	(2.86)
L2D.FEDFUNDS	-0.0184***	0.00804	-0.0186***	0.00847
	(-3.85)	(0.50)	(-4.86)	(1.25)
L3D.FEDFUNDS	-0.0379***	0.0357*	-0.0324***	0.0167
	(-4.96)	(2.30)	(-4.91)	(1.77)
L4D.FEDFUNDS	-0.0252**	0.0127	-0.0295**	0.00608
	(-3.04)	(1.08)	(-2.71)	(0.95)
Net Charge-off	0.00511	-0.00561	-0.00920	-0.000293
	(0.49)	(-0.47)	(-1.10)	(-0.04)
Nonperforming Loan	-0.00317***	-0.00323*	-0.00432***	-0.00415***
	(-5.34)	(-2.40)	(-5.65)	(-6.81)
Asset	-0.445***	-0.429***	-0.471***	-0.476***
	(-5.59)	(-4.11)	(-6.46)	(-3.48)
Liquidity Ratio	0.0101***	0.00778***	0.00754***	0.00629***
	(6.18)	(4.91)	(4.59)	(5.01)
Observations	206697	242341	206697	242341

t statistics in parentheses

All Variables Are in Lag Form

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Long Run Effects

$$(\beta_1 + \beta_2 + \beta_3 + \beta_4)/(1 - \alpha_1 - \alpha_2 - \alpha_3 - \alpha_4)$$

Conclusion

- Risk-based capital ratio might not matter or slowdown lending, so no need to relax regulation which might risk another crisis
- Factors such as monetary policy, perceived risks, bank size and liquidity ratio matter more in affecting lending

THANK YOU!

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