

Expectations and Bank Lending

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Bank of Canada Annual Economic Conference

Behavioral Macroeconomics and Finance: Implications for Central Bankers

Motivation

Supply of credit a central issue for research and policy

- **Expectations of lenders** often thought to be key, but mainly indirect evidence
 - ▶ **Limited data** on lenders' expectations & connections to economic outcomes
 - ▶ Research on lending has primarily focused on current conditions of bank balance sheets

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- Empirical research on expectations: mostly expectations of central tendencies
 - ▶ But **expectations about downside** are also central, especially for lending
 - ▶ **Limited data** on expectations about downside

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This paper: analyze bank-specific economic projections of largest lenders in US

- **All MSAs each year**; **Baseline + Downside** (FR Y-14A)
 - ▶ House price index growth, unemployment rate; since 2014
- Link to **US “credit registry”**: loans & firm outcomes (FR Y-14H1)

What Do We Study?

Examine properties of banks' projections

- Worse downside projections for places with worse outcomes in financial crisis
 - ▶ Not the case for baseline projections
- Substantial heterogeneity (e.g., within same MSA-year)
- Little relationship between projections and current balance sheet conditions

Find strong relationship between banks' downside views and future lending decisions

- Worse downside projections \Rightarrow lower loan growth and higher rates
- Real effects: firms invest less, especially small/bank-dependent/risky borrowers
- COVID-19

Road Map

- 1 Overview
- 2 Data**
- 3 Determinants of Banks' Economic Projections
- 4 Expectations and Bank Lending

Data Sources

FR Y-14A: bank projections of **house price index (HPI)**, **unemployment rate**.

- For **392 MSAs**, each year: 2014—2019.
- For both **severely adverse scenario** and **baseline scenario**.
 - ▶ Severely adverse: a potential major recession.
 - ▶ Baseline: macro condition according to average Blue Chip projections.
 - ▶ Over nine quarter horizon. Projections reflect conditional outcomes, not probabilities.
- Banks typically have internal regional economic analyses.

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FR Y-14H1: bank lending data à la **credit registry**.

- Outstanding loans, issuance. Also firm-level financials.
 - ▶ See also [Chodorow-Reich et al 21](#), [Greenwald-Kraimer-Paul 21](#), [Ivanov-Pettit-Whited 21](#), etc.
- We focus on C&I lending (limited risky lending in mortgages in this period).

Summary Statistics: Bank Projections

	# MSAs	# Banks	N	mean	p50	sd	25th	75th
SA HPI Drop	392	11	19,609	19.75	19.96	9.16	14.25	25.31
Baseline HPI Drop	392	8	14,975	-0.60	-0.66	1.66	-1.19	-0.05
SA Unempl Incr	392	8	9,439	4.72	4.74	2.00	3.53	5.85

- SA: severely adverse. Larger value means worse outcome.
 - ▶ HPI Drop (%): $(\text{jumpoff HPI} - \text{min HPI}) / \text{jumpoff HPI}$
 - ▶ Unempl Incr (%): $(\text{max unemployment rate} - \text{jumpoff unempl rate})$
 - ▶ Unemployment projections have less coverage (fewer years; not as many banks)
- Projections are internally consistent (HPI vs. unemployment, SA vs. baseline)
 - ▶ HPI projections reflect general economic outlook too (not just real estate collateral value)

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What Explains the Projections?

	HPI Drop		Unempl Incr
	SA	Baseline	SA
L.MSA HPI Growth	0.126 (0.112)	-0.020 (0.015)	
L.MSA Unempl Rate			-0.199 (0.161)
HPI Growth 06—09	-0.149*** (0.032)	0.007** (0.003)	
Unempl Increase 06—09			0.578*** (0.057)
L.Bank Tier 1	-0.583 (0.402)	0.040 (0.032)	0.128 (0.121)
L.Bank ROA	-1.363 (1.865)	0.233 (0.140)	-0.605 (1.100)
L.Bank MSA Exposure	0.292** (0.131)	0.029*** (0.007)	0.010 (0.014)
L.Log (Bank Assets)	-0.865 (2.256)	0.462 (1.221)	0.040 (0.316)
L.Projection	0.612*** (0.068)	0.327*** (0.100)	-0.508 (0.453)
Observations	9,414	8,273	6,436
R^2	0.559	0.173	0.260

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Overall Properties

- Baseline and downside tail projections respond to past tail events differently
 - ▶ Tail expectations “scarred” in the spirit of [Kozlowski-Veldkamp-Venkateswaran 19](#), but baseline expectations not “scarred” by past crisis
 - ▶ Or expectations of crisis state separate from normal shocks as in [Krishnamurthy-Li 21](#)
 - ▶ Different from predictions of single shock Gaussian models
- Will vulnerability in future downturns follow past experiences?

Overall Properties

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 - ▶ Or expectations of crisis state separate from normal shocks as in [Krishnamurthy-Li 21](#)
 - ▶ Different from predictions of single shock Gaussian models
- Will vulnerability in future downturns follow past experiences?
- Rationality difficult to test directly, especially for downside projections
 - ▶ But downside tail projections matter most for lending (later)
 - ▶ Baseline projections have low MSE (better than simple econometric projections)

MSE

Heterogeneity

- Substantial heterogeneity in projections (e.g., larger dispersion within MSA-year)
 - ▶ Heterogeneity can arise from different signals, weights, priors, etc. (Woodford 03, Scheinkman-Xiong 03, Simsek 13, Angeletos-La'O 13)
 - ▶ Dispersion larger for locations with more volatile past GDP growth

	MSA-Year			Bank-MSA			Bank-Year		
	Within SD	FE	R^2	Within SD	FE	R^2	Within SD	FE	R^2
SA HPI Drop	7.80	0.36		5.78	0.60		6.39	0.46	
Base HPI Drop	1.09	0.17		1.13	0.28		0.97	0.13	
SA Unempl Incr	1.29	0.56		1.37	0.43		1.75	0.27	

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	MSA-Year			Bank-MSA			Bank-Year		
	Within SD	FE	R^2	Within SD	FE	R^2	Within SD	FE	R^2
SA HPI Drop	7.80	0.36		5.78	0.60		6.39	0.46	
Base HPI Drop	1.09	0.17		1.13	0.28		0.97	0.13	
SA Unempl Incr	1.29	0.56		1.37	0.43		1.75	0.27	

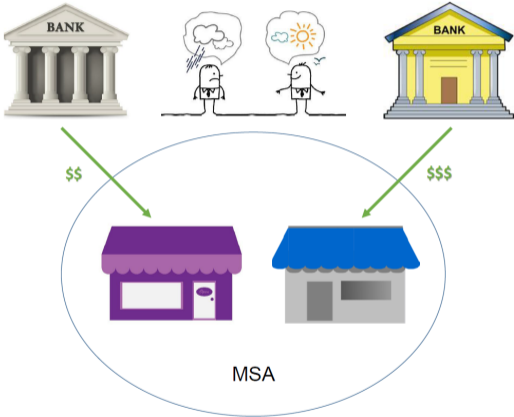
Going forward (testing impact on lending decisions):

- Exploit idiosyncratic variations in expectations to pin down credit supply effect
- Absorb common & bank-invariant variations: MSA-year/firm-year + bank-MSA FE

Road Map

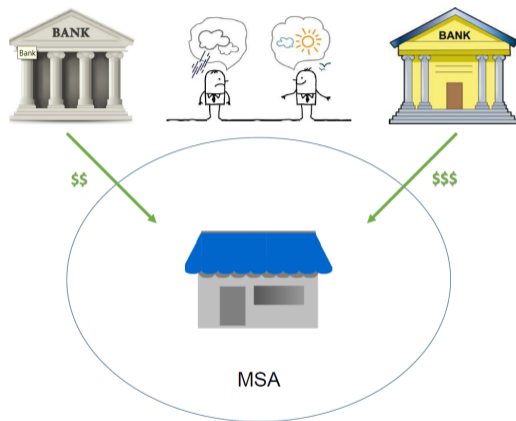
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Empirical Setup: Firm Level



Expectations of banks & firm outcomes

Empirical Setup: Loan Level



Expectations of banks & loan attribute
(subsample of firms with multiple banks à la [Khwaja-Mian 08](#))

Firm-Level Results

	Firm-Level Loan Growth		
	(1)	(2)	(3)
SA HPI Drop	-0.277*** (0.033)		-0.275*** (0.069)
Baseline HPI Drop		0.238 (0.263)	0.050 (0.268)
SA Unempl Incr			
L.Bank Tier 1	-0.318 (0.213)	-1.418*** (0.186)	-0.887*** (0.259)
L.Bank ROA	0.067*** (0.016)	0.035** (0.017)	0.085*** (0.019)
L.Bank MSA Exposure	-0.434** (0.217)	-0.731*** (0.172)	-0.682*** (0.188)
L.Log (Bank Assets)	-17.725*** (1.886)	-26.414*** (3.179)	-29.545*** (4.130)
Firm Controls		Yes	
Fixed Effects		Firm, MSA*Year, Industry*Year	
Observations	333,593	240,978	239,361
R^2	0.191	0.210	0.211

Firm-Level Results

	Firm-Level Loan Growth				
	(1)	(2)	(3)	(4)	(5)
SA HPI Drop	-0.277*** (0.033)		-0.275*** (0.069)		-0.266** (0.106)
Baseline HPI Drop		0.238 (0.263)	0.050 (0.268)		
SA Unempl Incr				-3.139*** (1.012)	-2.852*** (1.065)
L.Bank Tier 1	-0.318 (0.213)	-1.418*** (0.186)	-0.887*** (0.259)	-1.235*** (0.202)	-1.077*** (0.222)
L.Bank ROA	0.067*** (0.016)	0.035** (0.017)	0.085*** (0.019)	-0.319*** (0.068)	-0.257*** (0.096)
L.Bank MSA Exposure	-0.434** (0.217)	-0.731*** (0.172)	-0.682*** (0.188)	0.122 (0.550)	0.086 (0.438)
L.Log (Bank Assets)	-17.725*** (1.886)	-26.414*** (3.179)	-29.545*** (4.130)	-21.972*** (2.567)	-21.570*** (2.519)
Firm Controls		Yes			
Fixed Effects		Firm, MSA*Year, Industry*Year			
Observations	333,593	240,978	239,361	183,558	182,738
R^2	0.191	0.210	0.211	0.283	0.281

Loan-Level Results

	Loan Growth			
	(1)	(2)	(3)	(4)
SA HPI Drop	-0.235** (0.101)		-0.260** (0.113)	
SA Unempl Incr		-0.743*** (0.254)		-1.005*** (0.277)
L.Bank Tier 1	-1.034* (0.591)	0.507 (0.737)	-1.078 (0.685)	0.858 (0.986)
L.Bank ROA	7.031 (8.475)	-10.715 (12.571)	8.354 (10.254)	-15.514 (16.292)
L.Bank MSA Exposure	0.376 (0.235)	1.153** (0.438)	0.391 (0.282)	1.089* (0.601)
L.Log (Bank Assets)	-21.800** (9.087)	-15.302*** (4.080)	-20.817** (9.379)	-20.142** (7.367)
Fixed Effects		Bank*MSA		
	Firm, Industry*Year, MSA*Year		Firm*Year	
Observations	180,301	79,338	180,301	77,577
R ²	0.110	0.184	0.346	0.479

Magnitude

SA HPI Drop:

- Point estimate: ~ -0.25
- Inter-quartile range of variable: $\sim 11\text{pp}$
- Implied difference in loan growth: -2.8pp

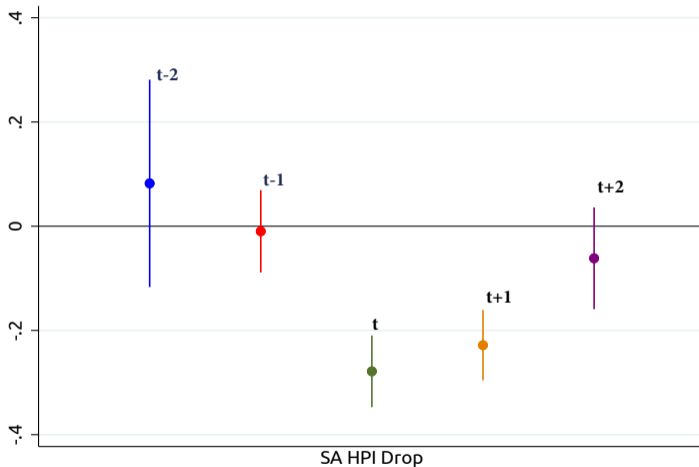
SA Unemployment Increase:

- Point estimate: ~ -1
- Inter-quartile range of variable: $\sim 2.4\text{pp}$
- Implied difference in loan growth: -2.4pp

Average loan growth: 0.11pp. Raw inter-quartile range: 8.5pp.

Differences in projections $\Rightarrow 20\%$ of variations of loan growth across banks for MSA-year

Timing



Regression coefficient of loan growth on lender projections at the end of year $t - 1$

Interest Rates

- If pessimistic lenders cut credit supply, they should also charge higher interest rates
 - ▶ Firms with limited substitution: stay, pay higher rates, borrow less
 - ▶ Firms with more substitution: can leave and get financing elsewhere (e.g., bonds)
 - ▶ \Rightarrow Observe higher rates especially for firms with limited substitution

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 - ▶ Firms with limited substitution: stay, pay higher rates, borrow less
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 - ▶ \Rightarrow Observe higher rates especially for firms with limited substitution
- Interest rate results further support lender expectations affect *credit supply*
 - ▶ Not pessimistic lenders matched with firms with less credit demand
In that case more pessimistic lenders \Rightarrow lower loan growth, lower rates
 - ▶ Should not see higher rates if strong balance sheet banks report pessimistic expectations

Interest Rates

	All	Size		Bank Dependent		Risk	
		Small	Large	Yes	No	NonIG	IG
SA HPI Drop	0.006** (0.003)	0.010** (0.004)	0.001 (0.001)	0.011** (0.005)	0.002 (0.002)	0.007*** (0.003)	-0.001 (0.003)
L.Bank Tier 1	-0.042** (0.019)	-0.050 (0.031)	-0.018* (0.010)	-0.090 (0.059)	-0.009** (0.004)	-0.031** (0.013)	-0.090** (0.037)
L.Bank ROA	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.004*** (0.001)	-0.001* (0.001)	-0.001 (0.001)	-0.000 (0.001)
L.Bank MSA Exposure	0.013* (0.007)	0.026** (0.013)	-0.008 (0.005)	0.051** (0.022)	-0.007 (0.007)	0.017** (0.008)	0.001 (0.007)
L.Log (Bank Assets)	0.064 (0.077)	-0.063 (0.066)	0.241 (0.188)	-0.050 (0.121)	0.331* (0.183)	0.137* (0.082)	-0.017 (0.124)
Firm Controls				Yes			
Fixed Effects				Firm, MSA*Year, Industry*Year			

- Bank dependent: loan > 50% of total debt. NonIG/IG based on internal risk ratings.

Real Effects

	All	Size		Bank Dependent		Risk	
		Small	Large	Yes	No	NonIG	IG
Panel A. Total Credit							
SA HPI Drop	-0.038*** (0.010)	-0.048*** (0.013)	-0.006 (0.014)	-0.037*** (0.010)	-0.011 (0.021)	-0.037*** (0.011)	-0.027 (0.030)
Panel B. Capital Expenditure							
SA HPI Drop	-0.007** (0.003)	-0.012*** (0.003)	0.004 (0.008)	-0.015** (0.006)	0.015** (0.007)	-0.009** (0.004)	-0.015* (0.008)
Firm Controls	Yes						
Fixed Effects	Firm, MSA*Year, Industry*Year						

Real effects especially strong among firms w/ limited financing sources

Bank Expectations & COVID-19 Crisis

COVID-19 and Credit Supply

Pre-COVID pessimists have less past due, downgrades (reminiscent of [Geanakoplos 10](#))

	Past Due in 2020				Downgrade in 2020			
SA HPI Drop 14-19	-0.0001*** (0.000)	-0.00012* (0.000)			-0.0005*** (0.000)	-0.0034*** (0.000)		
SA Unempl Incr 14-19			-0.0004	-0.0007**			-0.0094***	-0.0112***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Fixed Effect	MSA \times Quarter, Industry \times Quarter							

COVID-19 and Credit Supply

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Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Fixed Effect	MSA × Quarter, Industry × Quarter							

But overall impact of COVID-19 on bank balance sheets has been mild:

- Past due: 0.6% pre-COVID, 0.75% in 2020.
Downgrade: 7% pre-COVID to 12% in 2020.

COVID-19 and Credit Supply

Pre-COVID pessimists still more pessimistic and *lend less*

- Direct effect of expectations dominate potential indirect balance sheet feedback

Firm-Level Loan Growth in 2020				
SA HPI Drop 14-19	-0.232***	-0.183***		
	(0.018)	(0.018)		
SA Unempl Incr 14-19			-2.188***	-1.940***
			(0.163)	(0.182)
Bank Controls	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes
Fixed Effect	MSA × Quarter, Industry × Quarter			

Direct effect of expectations continues to shape credit supply following COVID-19

- Magnitude similar to pre-COVID

Summary

- Useful to collect more data on banks' expectations.
 - ▶ Credit supply not just about current bank balance sheet conditions.
- Banks' expectations, especially about downside, are important for lending
 - ▶ Loan growth and interest rates.
 - ▶ Firm investments and total borrowing, especially for risky/small borrowers.
- Expectations about downside much less understood.
 - ▶ Can be shaped in different ways than expectations about average outcomes.
 - ▶ Past downside events have lasting impact. Are they reliable guide for the future?
 - ▶ Heterogeneity and bank-specific views matter too.

Thank You

Accuracy of Baseline HPI Projections

Mean Squared Error of Baseline HPI Projections

	Mean	Median
Individual Bank Projection	4.97	1.26
Average Bank Projection	3.29	1.30
Poor Man	9.26	5.63

back

Summary Statistics: Firms and Loans

Firm Level	mean	p50	sd	p25	p75
Assets (Million)	1343.0	14.0	9704.0	6.0	63.0
Sales Growth (%)	15.0	8.9	24.9	1.0	21.5
Return on Assets (%)	15.7	10.9	17.4	5.1	20.2
Book Leverage (%)	34.5	31.3	26.8	10.1	55.2
Loan Share in Total Debt (%)	63.7	80.5	39.2	23.8	100.0
Av # of Banks	1.5	1.0	1.1	1.0	3.0
Average Annual Loan Growth (%)	0.2	-0.4	32.7	-7.4	2.3

Loan Level	mean	p50	sd	p25	p75
Loan Size (Million)	15.48	3.61	44.31	1.64	12.00
Loan Rate	3.58	3.50	1.48	2.53	4.40
Secured by Real Estate (1/0)	0.14				
Loan for Real Estate Purpose (1/0)	0.14				
Unsecured (1/0)	0.22				

$$\text{Loan Growth}_{it} = 100 \times (\text{Loan}_{it} - \text{Loan}_{it-1}) / (0.5\text{Loan}_{it} + 0.5\text{Loan}_{it-1})$$

MSA vs. Economy-Wide Expectations

	All	Size	
		Small	Large
SA HPI Drop for MSA	-0.169*** (0.044)	-0.155*** (0.043)	-0.165 (0.142)
Average HPI Drop for Bank-Year	-0.129 (0.081)	-0.085 (0.071)	-0.379* (0.213)
L.Bank Tier 1	-0.207 (0.154)	-0.712** (0.324)	0.420 (0.388)
L.Bank ROA	0.011 (0.013)	0.002 (0.012)	0.086* (0.046)
L.Bank MSA Exposure	-0.640*** (0.172)	-0.577*** (0.146)	-0.769*** (0.229)
L.Log (Bank Assets)	-44.397*** (4.068)	-57.261*** (4.459)	-38.004*** (3.654)
Fixed effects	Firm, MSA*Year, Industry*Year		
Observations	333,593	232,279	100,914
R^2	0.192	0.196	0.197

- Small is assets less than \$50 million