

REGULATORY COLLATERAL REQUIREMENTS AND
DELINQUENCY RATE IN A TWO-AGENT NEW KEYNESIAN
MODEL

AICHA KHARAZI
UNIVERSITY OF EXETER

FRANCESCO RAVAZZOLO
BI NORWEGIAN BUSINESS SCHOOL
AND FREE UNIVERSITY OF
BOZEN-BOLZANO

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- ▶ Unanimous view: credit growth is essentially driven by
 - Changes in the condition of borrowers (demand side).
 - Regulatory rigidities (supply side).
- ▶ Credit crisis:
 - Firms and individuals default on their loans.
 - The level of uncollectible debt increases + bank losses increase. [▶ Next slide](#)
 - This erodes banks capital \Rightarrow a general inclination to tight collateral policy.
 - If the bank is constrained then they are forced to reduce lending.
- ▶ A decline in credit supply worsens the downturn.

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▶ Question:

- Our goal is to understand the effectiveness of collateral policy within our framework in preventing the default event.
- How does a collateral policy affect the aggregates over time?
- More specifically, the effects of collateral requirement on output, consumption, and debt.

▶ Approach:

- Proposes a model with two agents to estimate the effects collateral requirement have on the economy.
- Uses bank data (FDIC) for the period 1984 to 2021.

▶ Main Findings:

- An active collateral policy amplifies the responses of main aggregates after a monetary policy shock.
- Conducting an active collateral policy can be effective in preventing the risk of crises (\downarrow charge-offs rate).
 - A contractionary monetary policy: \uparrow interest rate \rightarrow \downarrow charge-offs rate.

- ▶ **Financial frictions and banking intermediation:** Bernanke et al. (1999), Gertler and Kiyotaki (2010), Gertler and Karadi (2011), Jermann and Quadrini (2012), Brunnermeier and Sannikov (2014), Curdia and Woodford (2016), He and Krishnamurthy (2012), Bianchi and Saki (2022), Akinci and Queralto (2022)
- ▶ **Effects of macro-prudential policies:** Kim and Mehrotra (2018), Franz (2020), Aikman et al. (2021), Martin et al. (2021), Van der Ghote (2021), Ottonello et al. (2022).
- ▶ **Collateral:** Iacoviello (2015), Justiniano et al. (2015), Becard and Gauthier (2022), Guerrieri and Iacoviello (2017), Guerrieri and Lorenzoni (2017), Mendicino et al. (2020), Ottonello and Song (2022), Christensen et al. (2009), Alpandaa and Zubairy (2017), Lambertini et al. (2013), Rubio and Carrasco-Gallego (2014), Bianchi and Mendoza (2018), Drechsel and Kim (2022).
- ▶ **Contribution:**
 - We account for a regulator who can conduct a liberal or tight collateral policy that generates macroeconomic fluctuations.
 - We consider a different approach by focusing on the collateral channel that limits the borrowing capacity of firms and households.

Motivating Evidence

Do Banks Alter their Collateral Policies?

- ▶ A recent survey, reveals that banks conduct a tight collateral policy during uncertain times.
- ▶ A bank becomes more prudent during hard times

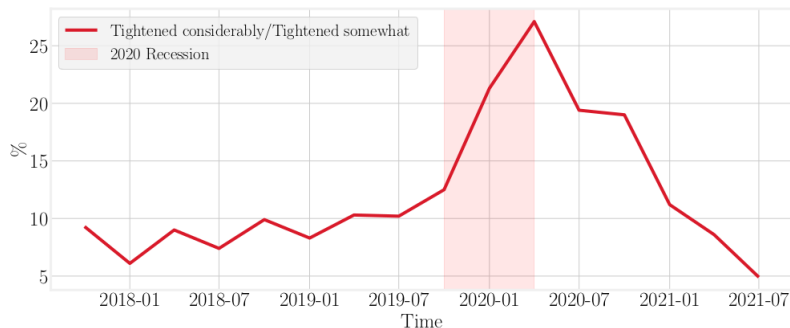


Figure 1: Percentage of Banks Reporting a Change in Collateral Requirement

Source: Federal Reserve Bank of Kansas City. Small Business Lending Survey - Aggregate Data (Section D.2)

Inverse Relationship Between Debt and Net Charge of Rate

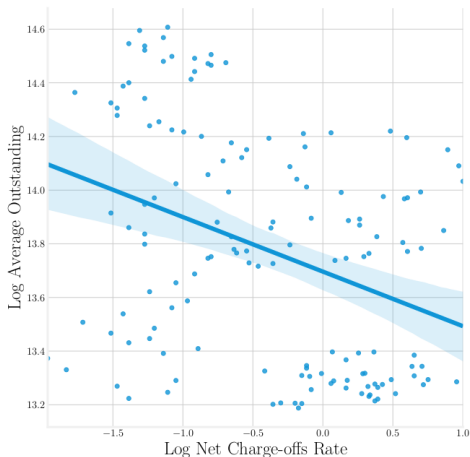


Figure 2: Correlation between average outstanding Debt and Net charge-offs rate

-Loans to Households

▶ Next slide

-Business loan

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Collateral Requirement Shocks: Bank-level Evidence

To show how collateral requirement tightness affects loan supply, we construct a measure of collateral requirement tightness

$$\Delta\theta_t = \theta_t - \theta_{t-1}$$

where θ_t represents the percentage of banks reporting tightness in collateral requirements.

We then estimate the quantile model of the form

$$Q_{m_i|\Delta\theta_i}(\tau | \Delta\theta_i) = \alpha_\tau \Delta\theta_i^T + \epsilon_{i,t}$$

where $\Delta\theta_i$ is the observed collateral requirement tightness indicator over the period 2017Q4-2021Q3, $\tau \in (0, 1)$ is the τ^{th} quantile of m_i . $Q_{m_i|\Delta\theta_i}(\tau | \Delta\theta_i)$ is the conditional τ^{th} quantile loan supply given collateral requirements $\Delta\theta_i$. α_τ is the coefficient that measures the impact of collateral requirements on loan supply m at the bank level i for a given τ .

Collateral Requirement Shocks: Bank-level Evidence

- Evidence of heterogeneity in the banks' credit supply with respect to tightness in collateral requirements.
- Banks in the upper tail of the conditional credit supply distribution face a significant decrease in credit supply after tightening collateral conditions.
- There is little effect of collateral conditions on credit supply for lower quantiles.

Table 1: Quantile-regression Estimates

	Coefficient	Lower Bound	Upper Bound
Quantile-regression			
0.1	0.00	-8.82	8.82
0.2	0.00	-12.80	12.80
0.3	-26.41	-44.61	-8.20
0.4	-112.20	-136.38	-88.02
0.5	-191.28	-221.45	-161.10
0.6	-269.61	-305.54	-233.67
0.7	-343.58	-385.18	-301.99
0.8	-412.69	-460.36	-365.02
0.9	-491.66	-545.87	-437.46
Ordinary least squares			
$\Delta\theta$	-191.28	-221.45	-161.10
Observations	84004		

Note: The table shows the estimates of quantile regression: $Q_{m_i|\Delta\theta_i}(\tau | \Delta\theta_i) = \alpha_\tau \Delta\theta_i^T + \epsilon_{i,t}$, and the estimates of ordinary least squares: $m_{i,t} = \beta \Delta\theta_{i,t} + \epsilon_{i,t}$.

Model and Estimation

Model Setup

- ▶ We consider an economy with price and wage stickiness
- ▶ Two type of households
 - Constrained households
 - key ingredient: they face a collateral constraint and can default on their loans.
 - Unconstrained households
- ▶ Firms produce goods
- ▶ Capital producers face adjustment cost
- ▶ Entrepreneurs
 - key ingredient: financially constrained entrepreneurs
 - Entrepreneurs: purchase capital good from capital producers, obtain loan from bank, face a collateral constraint, rent capital to firms, then repay their loan. Some entrepreneurs can pay back some don't.

- ▶ Banks produce transaction services and have a zero profit condition.
- ▶ Macroprudential collateral policy
 - **key ingredient:** Regulator adjust the level of collateral requirements to loan charge-off rate.
 - Collateral policy: regulatory changes to collateral requirement
- ▶ The monetary policy rule is given by

$$r_t - r = \rho_p(r_{t-1} - r) + (1 - \rho_p)[a_\pi(E_t p_{t+1} - p_t) + a_{\Delta y}(y_t - y)] + \epsilon_t$$

► Two type of households:

- Unconstrained Households

$$\text{maximize } E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \zeta_{c,t} (\log(c_{u,t} - b_u c_{u,t-1})) - \psi_l \frac{(l_{u,t})^{1+\sigma_l}}{1+\sigma_l} \right\} \quad (0.1)$$

$$\text{subject to } p_t c_{u,t} + d_t \leq w_t l_{u,t} + (1+r_t) d_{t-1}$$

- Collateral Constrained Households

$$\text{maximize } E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \zeta_{c,t} (\log(c_{c,t} - b_c c_{c,t-1})) - \psi_l \frac{(l_{c,t})^{1+\sigma_l}}{1+\sigma_l} + \chi \log(h_t) \right\}$$

$$\text{subject to } p_t c_{c,t} + q_t^h h_t + d_{t-1}^h (1+r_{t-1}^e) \leq w_t l_{c,t} + q_t^h h_{t-1} + d_t^h$$

$$\phi_t^h q_t^h h_t \geq (1+r_t^e) d_t^h$$

(0.2)

Collateral constrained households face

$$\phi_t^h \sim F(\phi_{t-1}^h, \chi_{t-1}^h)$$

is a shock that follows an exogenous process

$$\phi_t^h = \rho^{\phi^h} \phi_{t-1}^h + (1 - \rho^{\phi^h}) \alpha^h \chi_{t-1}^h + \epsilon_t^{\phi^h}$$

- Each entrepreneur purchases capital good k_{t-1} at price q_{t-1}^k using loans m_{t-1} obtained from banks and net worth n_{t-1}^e .

$$k_{t-1}q_{t-1}^k = m_{t-1} + n_{t-1}$$

- Entrepreneurs maximize the expected net worth subject to participation constraint and collateral constraint.

We define the collateral constraint

$$\phi_t^e (1 + r_t^k) q_{t-1}^k k_{t-1} \geq (1 + r_t^e) m_{t-1}$$

We assume that the collateral requirement

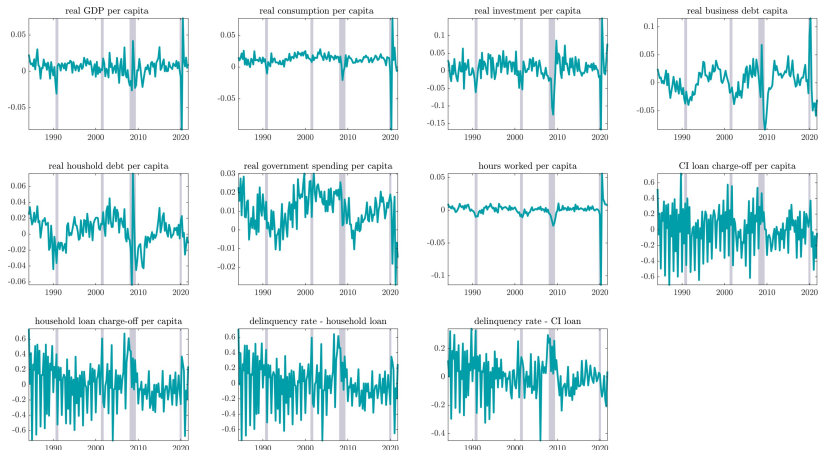
$$\phi_t^e \sim F(\phi_{t-1}^e, \mathcal{X}_{t-1}^e)$$

is a shock that follows an exogenous process

$$\phi_t^e = \rho^{\phi^e} \phi_{t-1}^e + (1 - \rho^{\phi^e}) \alpha^e \mathcal{X}_{t-1}^e + \epsilon_t^{\phi^e}$$

Data and Estimation

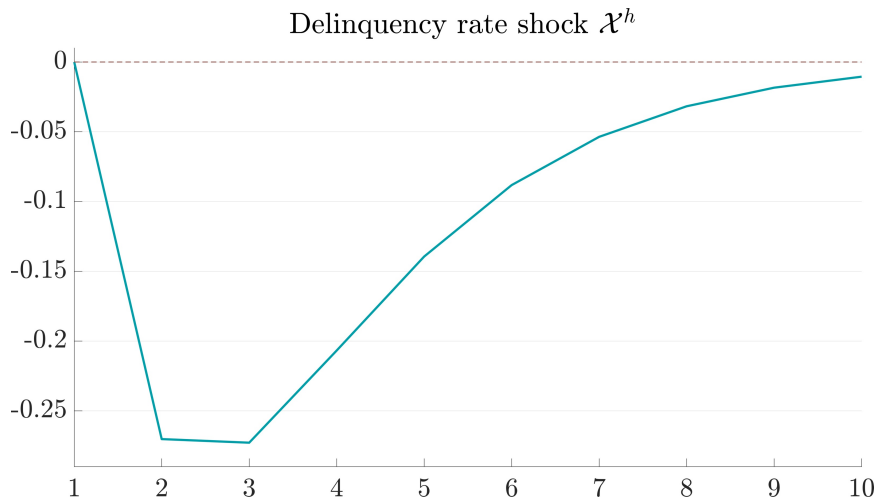
- ▶ The sample period covers 1984Q1 to 2021Q2. Data from the FRED and the FDIC.
- ▶ These time series are normalized to have mean zero.
- ▶ Unknown parameters and shocks are estimated using Bayesian methods.



What Happens When Borrowers Condition Deteriorates?

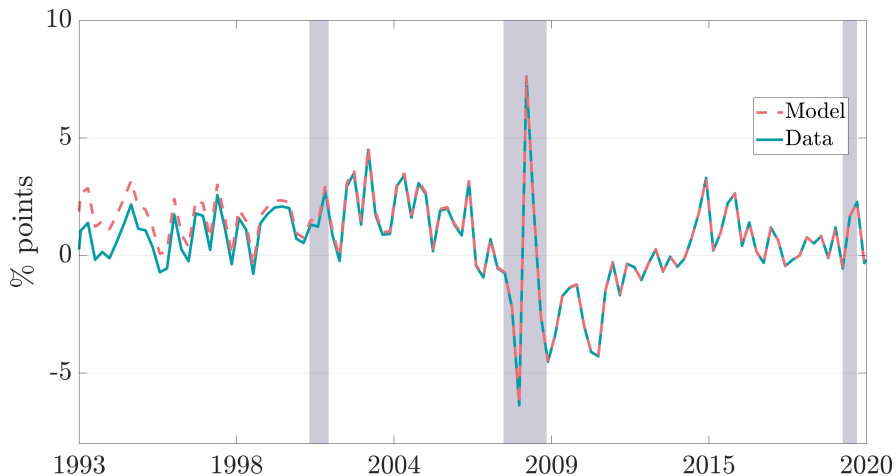
Collateral Requirement and Delinquency Rate

- ▶ Banks have incentive to tight their collateral requirement when the condition of the borrowers deteriorates.



Loan Supply during the IT Bubble in the 1990s and the Great Recession

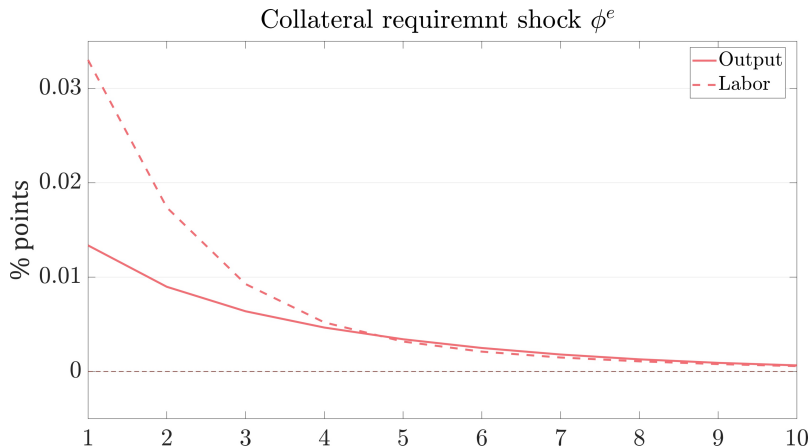
- ▶ Crises are typically preceded by high credit growth and relaxation of lending conditions (high collateral requirement).
- ▶ When the default rate reaches a high level, regulators will lower the collateral requirement in an effort to reduce the expansion in debt.



The Effect of an Increase in Collateral Requirement and Credit Supply Expansion

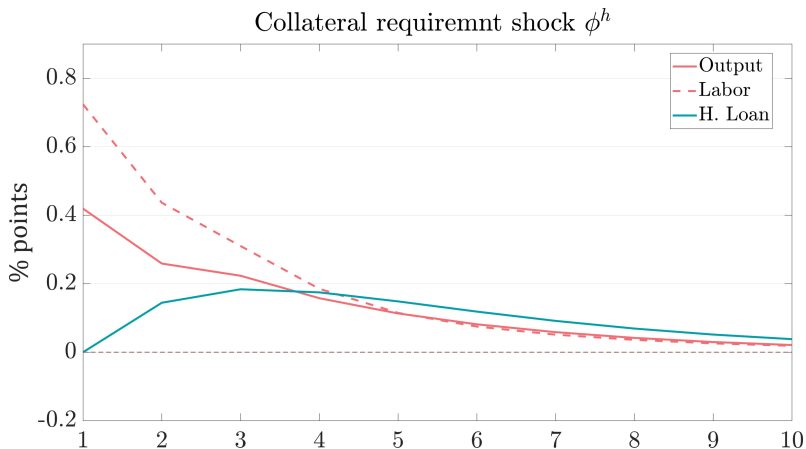
Effects of an \uparrow in Collateral Requirement - Business Sector

- ▶ In the presence of a collateral channel, a liberal collateral policy leads to an increase in output and labor.



Effects of an \uparrow in Collateral Requirement - Real Estate Loan

- ▶ Increasing the collateral requirement to constrained households will increase loan supply and boosts aggregate demand causing output and labor to increase.



Effects of Collateral Policy

The Effects of a Contractionary Monetary Policy

- ▶ We compare the impulse responses to monetary policy under two scenarios:
 - **Scenario 1:** Regulator does not observe the loan charge-off rate.
Collateral requirement

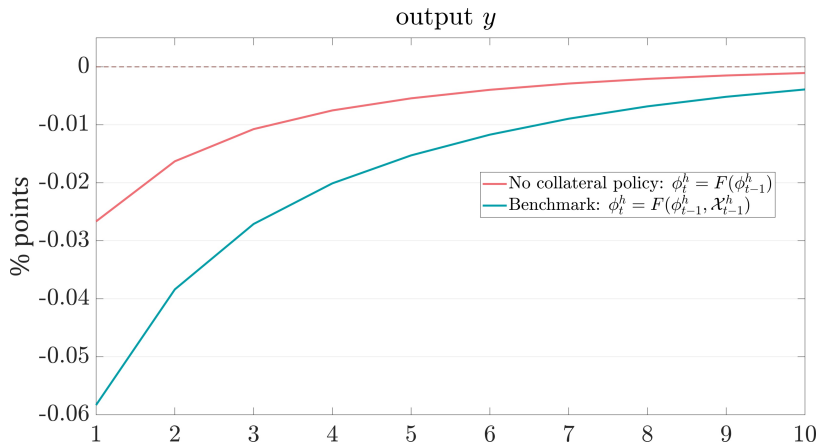
$$\phi_t \sim F(\phi_{t-1})$$

- **Scenario 2:** Regulator does observe the loan charge-off rate.
Collateral requirement

$$\phi_t \sim F(\phi_{t-1}, \mathcal{X}_{t-1})$$

A Contractionary Monetary Policy

- ▶ An active collateral policy - regulator do observe the loan charge-off rate - leads to an amplification of the responses of output to a monetary policy shock.



Short and Long-run Effects of MP on Delinquency Rate

- ▶ If CB were to conduct a contractionary monetary policy
 - Interest rate would rise.
 - Mortgage and business loan will become harder to get.
 - Eventually, delinquency rate would fall.

Table 2: Effects of monetary policy on business loan delinquency rate χ^e

Effects in %	Time			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Short run	-2.45	1.61	1.03	0.68
<hr/>				
	8th Quarter	12th Quarter	16th Quarter	20th Quarter
Long run	0.06	0.02	0.01	0.01

Table 3: Effects of monetary policy on mortgage loan delinquency rate χ^h

Effects in %	Time			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Short run	-3.20	-2.12	0.21	0.77
<hr/>				
	8th Quarter	12th Quarter	16th Quarter	20th Quarter
Long run	0.75	0.28	0.09	0.03

- ▶ When the condition of the borrowers deteriorates, banks have an incentive to tight their collateral requirement
- ▶ A macroprudential policy (collateral policy) that adjusts mechanically to the level of delinquency rate can amplify the monetary policy shock and contain the charge-offs rate.
 - In the presence of a collateral channel, a contractionary monetary policy can be effective in preventing the risk of crises (\downarrow charge-offs rate).
 - An active collateral policy amplifies the responses of main aggregates after a monetary policy shock.
- ▶ **Bottom Line:**
 - Banks should adjust their collateral requirement policies to take account of changes in the severity of the borrower's condition.
 - A mix of macroprudential collateral policy and monetary policy emerges as a potential tool to prevent the risk of delinquency.

Thanks!

Bank Losses-Collateral Liquidation 1984-2019

- ▶ Collateral liquidation lagged the delinquent debt

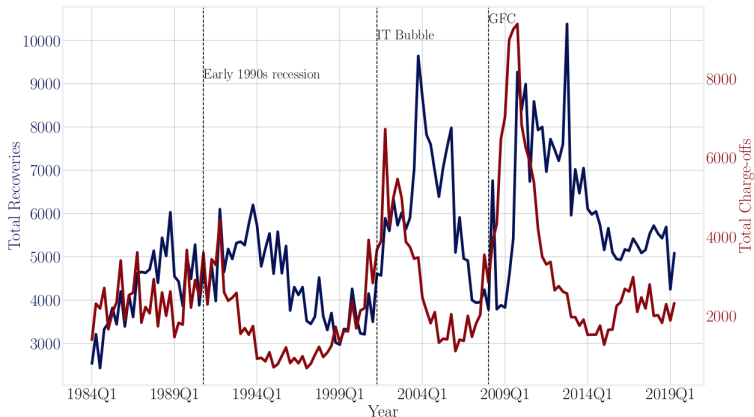
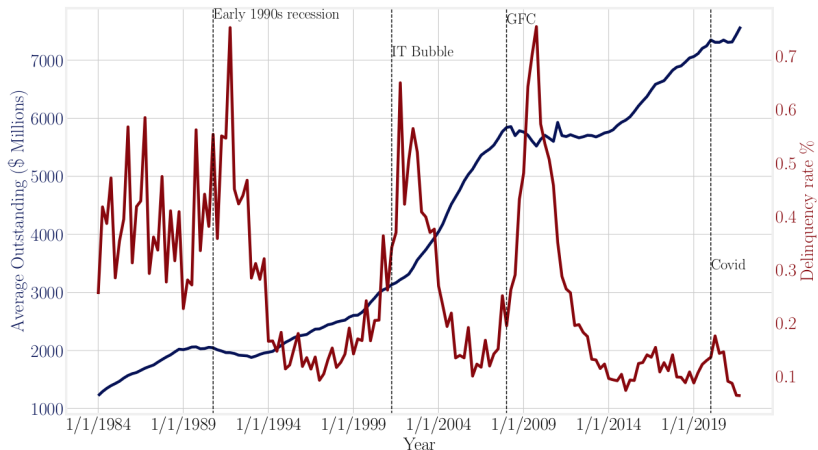


Figure 3: US Banks' Total Recoveries and Loan Charge-offs

Note: Quarterly data retrieved from FDIC; Sample: 1984Q1-2019Q2

Loans to Households

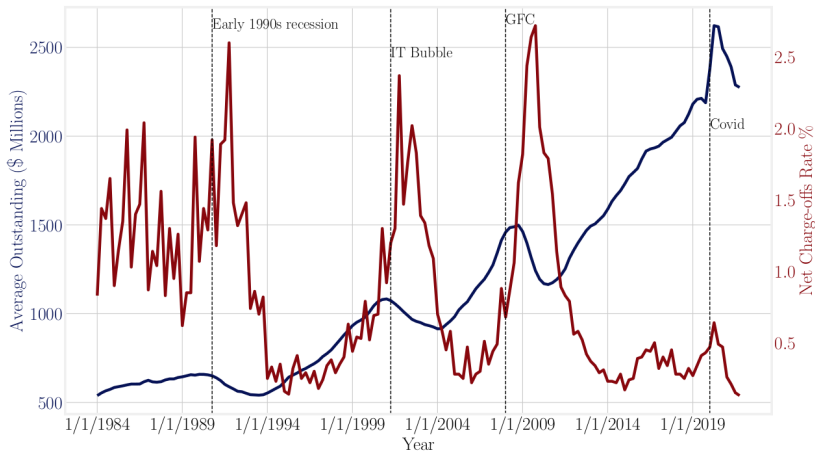
- ▶ Loan to households: a steady supply
- ▶ Though, defaults on household lending are rising



Source: FDIC. Sample: 1984Q1-2021Q2

Business Loan

- ▶ Businesses' credit is seemingly correlated to the default rates.



Source: FDIC. Sample: 1984Q1-2021Q2