Optimal Regulation of Credit Lines

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Credit lines: An overview

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- Important item in banks and firms’ financial statements
  → CLs represent 42% of Spanish firms’ bank financing (*Jiménez et al., 2009*)
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• Important item in banks and firms’ financial statements
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• Despite their importance, the literature on CLs is relatively scarce
Introduction

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  → Riskier firms may be denied funding (due to violation of financial covenants)
  → Financially distressed banks may not be able to extend funding
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• To prevent this, firms may run on their CL
  → Funds are drawn down even though they are still not needed
This paper

- A contract-theoretical model of CLs w/
  → Aggregate uncertainty
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  → Firms and banks agree on CL contractual terms (interest rates + fees)
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  → Cash-strapped firms w/o funding are liquidated (at fire-sale prices)
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  → Cash-strapped firms w/o funding are liquidated (at fire-sale prices)
  → Anticipation of high liquidity needs may trigger a run
Literature review

• Contracting literature
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- Bank runs
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  → Ivashina and Scharfstein (2010), Ippolito et al. (2016), Fernandez-Lafuerza and Gutierrez (2022)
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• Bank regulation
Environment

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     - 1 unit of funds at date \( \tau \in \{1, 2\} \) may be needed to avert their liquidation
     - Access to an alternative but inefficient investment
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  1. **Firms**
     - 1 unit of funds at date $\tau \in \{1, 2\}$ may be needed to avert their liquidation
     - Access to an alternative but inefficient investment
  2. **Banks** channel funds from investors to firms by means of CLs
     - (Junior) pre-funding $E$ is raised at $t = 0$
     - $D_1$ and $D_2$ are raised at $t = 1$ and 2, respectively, as needed
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3. **Investors** demand $R_i$ at $t = 3$ for funds that are lent to banks at date $i = 0, 1, 2$

   $$R_0 > R_1 > R_2 = 1$$
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- At $t = 1$, the fraction $\alpha$ of firms in need of funds is publicly revealed
  
  - Firms privately learn at $t = 1$ whether and when cash will be needed
Sequence of events

$t = 0$
- Banks offer CL contracts $(B, E)$:
  - $B_s$: Payment scheme
  - $E$: Junior pre-funding

$t = 1$
- $\alpha$ is realized
- Firms learn $\tau$
- If $\ell$ is met or not needed, firm produces $X$ and payment $B_s$ is made to the bank
- If $\ell$ is not met, firm is liquidated at value $Q$

$t = 2$
- Remaining firms decide CL usage
- If needed, banks raise $D_2$

$t = 3$
- For each firm:
  - If $\ell$ is met or not needed, firm produces $X$ and payment $B_s$ is made to the bank
  - If $\ell$ is not met, firm is liquidated at value $Q$
Firms (I)

- **Measure one** of identical firms that may need $\ell = 1$ at date $\tau \in \{1, 2\}$
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• Firms’ demand for liquidity will be equal to \( \alpha \equiv \alpha_1 + \alpha_2 \leq 1 \)
• **Simplification:** \( \alpha_1 = 0 \) and \( \alpha = \alpha_2 \sim f(\cdot) \) is publicly revealed at \( t = 1 \)
Firms (II)

• At $t = 3$, the firm produces a cash flow

$$\tilde{x} = \begin{cases} 
X, & \text{if not liquidated}, \\
Q(z), & \text{if liquidated}, 
\end{cases}$$

where $z$ is the aggregate size of liquidations and $Q' < 0$. 
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- At most \( Y < X \) can be pledged to outsiders
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• At most $Y < X$ can be pledged to outsiders

• Access to an alternative investment that yields a private return $\rho < 1$
Assumptions

**A1.** Continuation return $> \text{Liquidation return}$

\[ X - R_1 > Q(0) \]
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**A2.** Spot lending is not feasible

$$Y < R_2 = 1$$
Assumptions

**A1.** Continuation return $> \text{Liquidation return}$

\[ X - R_1 > Q(0) \]

**A2.** Spot lending is not feasible

\[ Y < R_2 = 1 \]

**A3.** Firms in need of funds prefer investing funds in the project over investing them at $\rho$

\[ \rho < X - Y \]
Banks

- Representative bank offers CL contract \((B, E)\) with sequential service constraint to the continuum of firms at \(t = 0\)
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  → Payment scheme \(B_s \leq Y\)

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B_s = \begin{cases} 
B_1, & \text{if drawdown happens at } s = 1, \\
B_2, & \text{if drawdown happens at } s = 2, \\
B_3, & \text{if no drawdown happens}
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-> The bank commits to raise pre-arranged funding per committed funds equal to \(E\) and invest it in cash at \(t = 0\)
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→ The bank commits to raise pre-arranged funding per committed funds equal to \(E\) and invest it in cash at \(t = 0\)
→ Pre-arranged funding \(E\) is junior to funding raised at \(t = 1, 2\) (e.g., LT debt or equity)
The Allocation Problem

- In high liquidity need states, $\alpha$ may not be met: $D_1 + D_2 < \alpha - E$
  \[ \rightarrow \text{Loan requests are granted sequentially (in random order) until no more funding can be raised by the bank} \]
The Allocation Problem

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• Junior pre-funding $E$ helps to sustain lending over a wider range of $\alpha$’s
  $\rightarrow$ Claims associated to $E$ can be diluted to raise additional funds at $t = 1, 2$
  $\rightarrow$ Yet, pre-funding $E$ demands a higher return
Solving for the unregulated CL contract

The representative bank’s problem:

- Given aggregate liquidations \( z(\alpha) \), the expected payoff of the representative firm is maximized subject to
  1. Some incentive compatibility constraints that prevent opportunism
  2. The participation constraint of investors who provide \( E \)
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(+) Symmetric eq. can fully characterize the unregulated CL $(B^U, E^U)$
CL performance given \((B, E)\) for every \(\alpha\)
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\[ L_1, L_2 \]

\[ 45\text{-degree line} \]

\[ \text{NR} \]

\[ \begin{array}{c}
L_2: \text{Loans at } t = 2 \\
L_1: \text{Loans at } t = 1
\end{array} \]

Full-insured \(\alpha\)
CL performance given \((B, E)\) for every \(\alpha\)

\[
\begin{align*}
L_1, L_2 \\
1 &
\end{align*}
\]

45-degree line

Full-insured \(\alpha\)

\(L_2\): Loans at \(t = 2\)

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CL performance given \((B, E)\) for every \(\alpha\)
Unregulated CL contract

• Trade-off of increasing $E$:
  → Wider realizations of $\alpha$ can be insured
  → Financing $E$ is costlier
Unregulated CL contract

- Trade-off of increasing $E$:
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- If high realizations of $\alpha$ are rare, $E$ is optimally chosen s.t. the unregulated CL contract features liquidations & runs
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• If high realizations of $\alpha$ are rare, $E$ is optimally chosen s.t. the unregulated CL contract features liquidations & runs

• Banks do not internalize the effect of liquidations on eq. liquidation values
  → Scope for regulation
Solving for the constrained efficient CL contract

The social planner’s problem:

- The expected payoff of the representative firm is maximized subject to
  1. Some incentive compatibility constraints that prevent opportunism
  2. The participation constraint of investors who provide $E$
  3. **Aggregate liquidations**
Constrained efficient CL contract

• Trade-off of increasing $E$:
  → Wider realizations of $\alpha$ can be insured + excessive liquidations can be avoided
  → Financing $E$ is costlier
Constrained efficient CL contract

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• Socially desirable to increase $E > E^U$
Implementation

• By means of a regulation that requires banks to pre-finance CL drawdowns with a minimum $E$ of pre-arranged junior funding (e.g., Basel III liquidity ratios)
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**Result**

If $E = E^*$, then the regulated eq. is constrained efficient.
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- By means of a regulation that requires banks to pre-finance CL drawdowns with a minimum $E$ of pre-arranged junior funding (e.g., Basel III liquidity ratios)

**Result**

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- Effects of regulation:
  - CLs become more expensive
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  → Fewer costly liquidations in 'bad times'
  → A higher liquidation value is obtained if a liquidity need is not covered
  → A reduction in the occurrences of CL runs
Final Remarks

- In the unregulated competitive eq.,
  - CL terms (& banks’ pre-funding) are chosen in a privately efficient manner
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  - More lending in high liquidity need states
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  → More lending in high liquidity need states
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  → Less frequency of runs
Appendices
Commercial and Industrial Bank Credit in the U.S.

Source: Ivashina and Scharfstein (2010)