Leveraged Loans, Systemic Risk and Network Interconnectedness

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Main Results Summary

We study the U.S. syndicated market and make the following contributions:

- First, by analyzing the leveraged loans we show that they have already exceeded the pre-financial crisis level, which may pose financial stability concerns. We illustrate to which industrial sectors and regions the leveraged borrowers belong to.
- Second, we gauge the leveraged interconnectedness of the lead arrangers and study its relationship with their systemic risk. To achieve this result we disentangle the leveraged loans from all the other loans.
- Finally, we graphically illustrate how the lead arrangers’ interconnectedness has increased over the last two decades. We propose novel measures of risk and investigate possible implications for the future.

Methodology

Starting from the normalized Euclidean measure developed by Cai et al. (2018), we first of all disentangle the leveraged lead arrangers’ portfolios from the ones that do not belong to that class and then we introduce two novel measures of risk. Let us define:

- $\lambda_i$ as the dummy variable equal to one if the loan belongs to the leveraged class, while zero otherwise.
- $W_i = w_{i,j} = w_{i,k}$ and $Z_i = z_{i,j} = z_{i,k}$ are the differences between the lead arrangers $i$ and $k$ portfolios weights ($i \neq k$). They are calculated as the amount lent of respectively leveraged and others borrowers within 12 months prior to month $t$, summed by specialization (industry or region).
- Where:

$$\sum_{j=1}^{n} w_{i,j} = 1 \quad \text{and} \quad \sum_{j=1}^{n} z_{i,j} = 1$$

The L2-norms:

$$|W_i| = \sqrt{\sum_{j=1}^{n} W_{i,j}^2} \quad \text{and} \quad |Z_i| = \sqrt{\sum_{j=1}^{n} Z_j^2}$$

are the Euclidean distances in the 3-dimension space between lead arranger $i$ and $k$ ($i \neq k$), calculated respectively for the leveraged and others loans’ portfolio weights.

The financial institution $i$ and in month $t$, the normalized distance and interconnectedness measures are defined as follow:

$$\text{Distance}(\lambda_i, \lambda_k) = \frac{1}{n} \sum_{i,j} | W_{i,j} |, \quad \text{if} \quad X(1) = 1$$

$$\text{Distance}(\lambda_i, (1)) = \frac{1}{n} \sum_{i,j} | Z_{i,j} |, \quad \text{otherwise}$$

and

$$\text{Interconnectedness}(\lambda_i) = 1 - \frac{1}{n} \sum_{i,k} \text{Distance}(\lambda_i, \lambda_k) \quad \text{if} \quad X(1) = 1$$

$$\text{Interconnectedness}(\lambda_i) = 1 - \frac{1}{n} \sum_{i,k} \text{Distance}(\lambda_i, (1)) \quad \text{otherwise}$$

The weighting schemes are the same developed by Cai et al. (2018).

We now integrate two novel risk measures. Let us define the following measures:

- $a_{i,k}$ and $b_{i,k}$ are respectively the amount of leveraged and other loans for which the financial institution $i$ has a lead arranger role (within 12 months prior to month $t$)
- $n_{a,k}$ and $n_{b,k}$ are respectively the number of leveraged and other loans for which the financial institution $i$ has a lead arranger role (within 12 months prior to month $t$)

$$\beta(A_{a,k}) = \frac{a_{i,k}}{n_{a,k}} + \frac{b_{i,k}}{n_{b,k}}$$

$$\beta(A_{a,k}) = \frac{n_{a,k}}{n_{a,k}} + \frac{n_{b,k}}{n_{b,k}}$$

It follows that:

$$0 \leq \beta(A) \leq 1 \quad \text{and} \quad 0 \leq \beta(N) \leq 1$$

Thus, as the amount ($n_{a,k}$) or number ($n_{b,k}$) of leveraged loans of lead arranger $i$ increases, the risk measures converge to their maximum value.

The two interconnectedness measures previously defined $\text{Interconnectedness}(\lambda_i)$ and $\text{Interconnectedness}(\lambda)$, are now summed and weighted by the risky measure $\beta$. The new measure become:

$$\text{Interconnectedness}(A_{a,k}) = \beta(A_{a,k}) \cdot (|\lambda(1,1)| + |\lambda(0,1)|)$$

$$\text{Interconnectedness}(N_{a,k}) = \beta(N_{a,k}) \cdot (|\lambda(1,1)| + |\lambda(0,1)|)$$

Results

References