Precision of Ratings

Anastasia Kartasheva Bilge Yılmaz

The Wharton School, University of Pennsylvania

CRAs performance during the crisis and reform proposals

- Credit ratings are widely used in many sectors of the economy
  - CRAs rate securities in various asset classes: financial institutions, corporate debt, insurance, ABS, municipal and sovereign bonds
  - Asset classes may differ in terms of market conditions and information asymmetries
- Performance of CRAs differs across various asset classes
  - Ample evidence of low precision and inflation of ratings of asset back securities prior to crisis
  - Performance of ratings in corporate bond market, utilities and insurance was stable
- Reform proposals
  - standardization of ratings symbols, regulation of rating fees, expert liability, reduction of the regulatory reliance on ratings

Research questions

- What determines the precision of ratings?
- How does CRA's rating precision depend on the market conditions?
  - aggregate value of liquidity, information asymmetries
- Does CRA have incentives to produce information when information asymmetries are more severe?
  - asset backed securities vs. sovereign bonds
- What is the effect of policy proposals on the precision of ratings?
  - Dodd-Frank Act, SEC, IOSCO

Framework

- A model of information intermediation (Lizzeri 99)
  - Issuers are privately informed about the quality of an issue
  - Investors compete for the issue
  - A monopolistic CRA commits to a rating technology and charges a flat fee for ratings
- Two key distinctions from Lizzeri's basic model
  - Issuers have a type dependent outside option
  - Presence of informed and uninformed investors

Model: Basics

- Three groups of agents: Issuers, Investors, CRA
- Issuer owns an asset and has liquidity needs
  - The asset is worth v to investors and δv to an issuer
  - $\delta < 1$ measures the aggregate value of liquidity
- Issuers are privately informed about v
- Investors and CRA share the same prior on v
  - $\Pr(v_j) = \lambda_j$, $0 = v_1 < v_2 < v_3$

Model: Investors

- Uninformed investors
- Purely competitive
- The group is large enough to buy the entire issue

Model: CRA

- CRA chooses an information structure I
- Cost of every information structure to the CRA is zero
- CRA charges a flat fee ϕ and discloses the signal realization to investors
- (I, ϕ) defines the rating technology of the CRA
- CRA does not trade on the asset

Timing

- $t = 0$
  - The nature chooses issuer's types $v \in V$ according to λ
  - CRA chooses (I, ϕ). Issuers and investors observe (I, ϕ)
- $t = 1$
  - Issuers decide whether to solicit a rating
  - CRA learns the signal s for each issuer who solicited a rating
  - CRA announces the ratings of rated issuers to investors
- $t = 2$
  - Issuers set the price of subscription b
- $t = 3$
  - Knowing whether an issuer is rated and the rating from $t = 1$ and the price from $t = 2$, investors decide whether to subscribe to an issue

Result 1: Ratings are informative but noisy and inflated

- Profit of CRA is a product of market penetration and a fee
- The fee is determined by the willingness to pay of the lowest rated issuer
- CRA can increase this issuer's willingness to pay by assigning high ratings with a positive probability
- However, the CRA is limited by the high quality issuer's outside option

Example

- Issuer types $v_1 = 0$, $v_2 = 5$, $v_3 = 7$, $\lambda = (\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$
- Market conditions: Aggregate value of liquidity $\delta = \frac{3}{4}$
- Signal space $S = \{s_1, s_2, s_3\}$
- Expected value of an asset is $E[v] = \frac{1}{3} \cdot 7 + \frac{1}{3} \cdot 5 + \frac{1}{3} \cdot 0 = 4$
- Gains of trade under complete information is $v - \delta v$
  - ex-ante market surplus is $(1 - \delta)E[v] = 1$
- In the absence of CRA, gains of trade are not realized

Perfectly informative ratings

- Ratings precision $p_{ij} = \Pr(s_i | v_j)$

	v_3	v_2	v_1
s_3	1	0	0
s_2	0	1	0
s_1	0	0	1

- Investors' assessment is $U_3 = 7$, $U_2 = 5$, $U_1 = 0$
- Issuers' value of a rating is $R_3 - \delta v_3 = 7 - \frac{3}{4} \cdot 7 = \frac{7}{4}$, $R_2 - \delta v_2 = \frac{5}{4}$ and $R_1 - \delta v_1 = 0$
- CRA rates v_2 and v_3 and charges $\phi = \frac{5}{4}$ and gains $(\frac{1}{3} + \frac{1}{3})\frac{5}{4} = \frac{5}{6}$
- Issuers type v_3 gain $\frac{1}{3}(\frac{7}{4} - \frac{5}{4}) = \frac{1}{6}$, v_2 and v_1 gain zero
- Market surplus is maximized $\frac{5}{6} + \frac{1}{6} = 1$

Noisy ratings

	v_3	v_2	v_1
s_3	1	$\frac{1}{7}$	0
s_2	0	$\frac{6}{7}$	0
s_1	0	0	1

- Investors' assessment is

$$U_3 = \Pr(v_3|s_3)\cdot 7 + \Pr(v_2|s_3)\cdot 5 = \frac{\frac{1}{3}\cdot 1}{\frac{1}{3}\cdot 1+\frac{1}{3}\frac{1}{7}}\cdot 7 + \frac{\frac{1}{3}\cdot\frac{1}{7}}{\frac{1}{3}\cdot 1+\frac{1}{3}\frac{1}{7}}\cdot 5 = \frac{27}{4}$$
$$U_2 = \Pr(v_3|s_2)\cdot 7 + \Pr(v_2|s_2)\cdot 5 = 0\cdot 7 + 1\cdot 5 = 5,\ U_1 = 0$$

- Issuers' v_j value of a rating is

$$R_j - \delta v_j = \Pr(s_3|v_j)U_3 + \Pr(s_2|v_j)U_2$$
$$R_3 - \delta v_3 = 1\cdot U_3 - \tfrac{3}{4}7 = \tfrac{3}{2} \text{ and } R_2 - \delta v_2 = \tfrac{1}{7}U_3 + \tfrac{6}{7}U_2 - \tfrac{3}{4}5 = \tfrac{3}{2}$$

- CRA rates v_2 and v_3, charges $\phi = \frac{3}{2}$ and gains $(\frac{1}{3}+\frac{1}{3})\frac{3}{2} = 1$
- Issuers gain zero

Result 2: Precision of ratings depends on the market conditions

- When the value of liquidity is high (δv is low), issuers are willing to accept a higher discount to sell the asset
- CRA is less constrained by the high quality issuers participation decision
- Higher value of liquidity leads to less precise ratings
- There exists $\overline{\delta}$ such that for all $\delta > \overline{\delta}$ the optimal information structure has rating inflation: It assigns higher signals with a positive probability
    - assigning a low rating to v_3 may lead to no trade

Result 3: Differentially informed investors

- CRA's information structure affects the size of surplus
  - more informative ratings reduce the adverse selection problem, and increase the surplus
  - but more informative ratings also reduce the ability of the CRA to extract surplus
- As the extend of winner's curse problem increases, the CRA reduces the precision of ratings
- When the winner's curse problem is substantial, the CRA reduces the market coverage and it leads to inefficiency

Differentially informed investors: Basics

- Uninformed investors
- Informed investors
  - Prior to subscribing, informed investors observe v
  - Demand of informed investors is not sufficient to absorb the offer of the issuers
- Winner's curse problem (Rock 1986)
  - uninformed investors are more likely to obtain an issue when informed investors do not subscribe
  - Rationing rule for uninformed investors
    - demand for *underpriced* security is fulfilled with probability q
    - demand for *overpriced* security is fulfilled with probability 1
- q measures the severity of the winner's curse problem
  - When $q = 1$, all investors are uninformed
  - As q decreases, the share of informed investors increases

Timing

- $t = 0$
  - The nature chooses issuer's types $v \in V$ according to λ
  - CRA chooses (I, ϕ). Issuers and investors observe (I, ϕ)
- $t = 1$
  - Issuers decide whether to solicit a rating
  - **Informed investors learn the asset value for each issuer**
  - CRA learns the signal s for each issuer who solicited a rating
  - CRA announces the ratings of rated issuers to investors
- $t = 2$
  - Issuers set the price of subscription b
- $t = 3$
  - Knowing whether an issuer is a rated and the rating from $t = 1$ and the price from $t = 2$, investors decide whether to subscribe to an issue
  - **The demand of investors is fulfilled according to the rationing rule** (q)

Optimal rating precision

- There exists $\overline{q}$ such that if $q > \overline{q}$, the optimal rating system induces types v_2 and v_3 to solicit a rating; if $q < \overline{q}$, only v_3 is rated and v_2 does not trade
  - winner's curse problem reduces lower type willingness to pay for the rating
  - when only v_3 is rated, it is revealed
  - when types v_2 and v_3 are rated, the optimal rating precision is $p_{22} < 1$

	v_3	v_2	v_1
s_3	1	$1 - p_{22}$	0
s_2	0	p_{22}	0
s_1	0	0	1

Result 4: Winner's curse, market conditions and ratings precision

- As the share of uninformed investors increases, ratings become less informative, $\frac{dp_{22}}{dq} < 0$
- As the aggregate value of liquidity increases, ratings become less informative, $\frac{dp_{22}}{d\delta} < 0$
- As high quality assets become more scarce, ratings become less informative, $\frac{dp_{22}}{d(\frac{\lambda_2}{\lambda_3})} < 0$
- There exists $\overline{\delta}(q)$ such that for $\delta > \overline{\delta}(q)$ rating inflation is necessary for the optimal rating system
    - As the winner's curse problem increases, rating inflation holds for a larger set of parameters, $\frac{d\overline{\delta}}{dq} > 0$

Evaluation of policy proposals

- Positive effect on market efficiency
  - Regulating rating fees
  - Reducing reliance on ratings in regulation
- Negative effect on market efficiency
  - standardization of precision for different asset classes
  - standardization of precision for different ratings
  - introducing expert liability

Concluding remarks

- CRA's optimal information structure is noisy and asymmetric
- Precision of ratings depends on the market conditions
  - as the value of aggregate liquidity increases, ratings become less precise
  - as the winner's curse problem increases, ratings become less precise
- Policy implications
  - standardization of rating symbols, expert liability may have adverse effects on ratings precision
  - reducing the reliance on ratings in regulation and regulating rating fees may have a positive effect