Can information imprecision be valuable? The case of credit ratings

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Motivation

What we do?

- There is a continuum of default probabilities, but only about two dozens or so credit ratings; so, ratings are imprecise. Can information imprecision be valuable?
- We develop a model consistent with the following stylized facts:
  1. Ratings are coarse.
  2. Ratings are more precise during economic downturns.
  3. Competition among CRAs may lead to more or less precision.
- There is scope for regulatory intervention.

Model

Set-up

- There are three types of risk-neutral agents: firms, CRAs, and investors.
- A penniless firm has access to a project that needs investment of 1 unit at $t = 0$.
- Investment occurs at $t = 0$ and returns are realized at $t = 1$.
- If a project succeeds, it generates a cash flow, $X > 0$, and if it fails, it generates 0.

Set-up

- A fraction α of the firms, g, have good projects, a fraction β of firms, m, have intermediate quality projects, and a fraction $1-\alpha-\beta$, b, have bad projects.
- A firm succeeds with probability, $p_i \in \{p_g, p_m, p_b\}$, and fails with $1-p_i$; firm-types differ only with respect to the probability of success. p_i is private information of the firm.
- Intermediate firms can exert hidden effort at cost, c, to increase success probability by δ.
- CRAs learn firm-type coarsely at zero cost and precisely at a cost, $k \geq 0$. CRAs announce which policy (precise or coarse) they will adopt and the fee that they will charge.

Parametric Assumptions

- **A1:** $p_g X - k > 1 > p_m X > p_b X$
- **A2:** $p_g X - 1 > (p_m + \delta)X - 1 > c > \frac{\delta}{p_m + \delta}((p_m + \delta)X - 1) \equiv c_s$
- **A3** and **A4:** $\alpha + \beta$ is small.

Benchmarks

Benchmark 1: Observable types and effort

In the first-best equilibrium:

1. only good and intermediate firms obtain financing.
2. intermediate firms exert effort.

The interest rates consistent with zero profits of investors are as follows:

$$R_g = \frac{1+f}{p_g} \tag{1}$$

$$R_m = \frac{1+f}{p_m+\delta} \tag{2}$$

Benchmark 2: Observable types and unobservable effort

- Consider the effort incentive constraint of an intermediate firm:

$$(p_m + \delta)(X - R) - c \geq p_m(X - R)$$
$$\implies R \leq X - \frac{c}{\delta} \equiv \underline{R} \tag{3}$$

- An intermediate firm exerts effort only if the interest rate is sufficiently small, $R < \underline{R}$.

- $R_m > \underline{R}$ since $c > c_s$: with accurately priced debt, intermediate firms do not exert effort and are excluded from the market.

Outcome under each CRA policy separately

Outcome under no/precise ratings policy

- In the absence of credit ratings, no firm obtains financing (market breakdown).
- Under precise ratings, only good firms obtain financing. $f \in [k, f_p]$ where $f_p = p_g X - 1$.

Outcome under coarse ratings

- Coarse ratings pool good and intermediate types. Under coarse ratings, the debt issued by the good and intermediate firms is priced according to the average quality of the pool.
- If the ratio of good to intermediate firms is sufficiently high, $\frac{\alpha}{\beta} \geq \gamma$, the average NPV across the good and intermediate firms is positive; otherwise, it is negative.

$$\gamma \equiv \frac{1 - p_m X}{p_g X - 1} \tag{4}$$

- If $f \leq \bar{f}_c$, intermediate firms exert effort. If $\bar{f}_c < f \leq \hat{f}_c$, they obtain financing but do not exert effort. $\bar{f}_c$ is the IC fee and $\hat{f}_c$ is the max fee.

Equilibrium

Monopolist CRA

- Ratings are coarse if $k > \min(k_1, k_2)$, which comes from:

$$(\alpha + \beta) f_c > \alpha(f_p - k) \tag{5}$$

- $f_c = \max(\bar{f}_c, \hat{f}_c)$. Is $\bar{f}_c > \hat{f}_c$ feasible?
  - a small pie + $(\delta X - c)$ = a big pie
  - the whole of the small pie may be smaller than a fraction of the big pie.
- Under coarse ratings, the fee is $\bar{f}_c$ and intermediate firms exert effort if $c \leq \bar{c}$.

Competition among CRAs

- The fee equals the marginal cost of producing a rating; i.e., $f = k$ for precise ratings and $f = 0$ for coarse ratings.
- The equilibrium is coarse if $k \geq \sigma_e$, and precise if $k < \sigma_e$, where σ_e is the subsidy from good to intermediate borrowers in a pool.

Monopoly vs. Competition

- Monopoly – f_c is increasing in X. Higher X leads to more coarseness.
- Competition – σ_e does not change in X.
- Competition leads to more (less) coarseness when X is low (high).

Implications & extensions

Policy implications

If $c > c_p$ intermediate firms do not exert effort even if $f = 0$:

$$c_p \equiv \delta X - \frac{\delta(\alpha + \beta)}{\alpha p_g + \beta(p_m + \delta)} \tag{6}$$

1. If $c \leq c_p$, the efficient outcome entails coarse ratings & low fees. Put a ceiling on the fee.
2. If $c > c_p$, the efficient outcome entails precise ratings. Put a floor on the fee.

Empirical implications

1. Ratings precision is countercyclical – consistent with Griffin and Tang, 2012.

2. Higher competition among CRAs may lead to more or less precise ratings – consistent with conflicting empirical findings.

   - Empirical tests of the effect of competition on the degree of ratings coarseness should control for borrowers' profitability.

3. A lower cost of information production by CRAs leads to lower investment.

Extensions

1. Randomization. Some coarseness is valuable as long as k is small.

2. N-types. All types face moral hazard constraint, but the constraint becomes more binding in borrower's success probability.

Concluding remarks

Related papers

- In the ratings inflation literature investors are naive and ratings are incorrect (e.g., Bolton et al. 2012), while in our model ratings are imprecise, but, on average, correct.
- There are a few papers which show that imprecise information can arise as an equilibrium outcome (e.g., Lizzeri 1999, Goel and Thakor 2015) – in these papers, imprecise information either has no effect on welfare, or reduces it.
- Some papers model the feedback effect of ratings (e.g., Boot et al. 2006, Manso 2013). In these papers, new information arises after ratings are produced.

Conclusion

- We present a model of credit ratings in which coarse ratings may arise as an equilibrium outcome and enhance net social surplus.
- Competition among CRAs may lead to more or less coarseness.
- The efficient outcome is obtained by regulating the fee charged by CRAs.