

Credit Ratings and Stock Liquidity

by

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Outline

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Intuition

- Debt ratings should reflect uncertainty about the future value of the firm.
 - Microstructure measures of equity-market adverse selection should also reflect uncertainty about the future value of the firm.
- ⇒ Firms with higher uncertainty should have both poorer debt ratings and higher adverse selection. (There should be a relationship between debt ratings and equity-market adverse selection measures.)

Basic Questions

- Q1: Are debt ratings and adverse selection measures related as predicted?
- Q2: After controlling for the impact of published financial data, is the information in adverse selection measures still important for debt ratings?
- Q3: Do adverse selection measures capture changes in uncertainty in advance of ratings?

Model: Asset Value Evolution

Evolution of logged asset value (Longstaff and Schwartz (1995)):

$$\ln(A_t) = \ln(A_{t-1}) + \beta\gamma_t + \eta_t + I_t\iota_t.$$

γ_t is the economy-wide (“systematic”) shock in day t ,

β is the firm’s sensitivity to the economy-wide shock,

η_t is a publicly-observed unsystematic shock,

$$I_t = \begin{cases} 1 & \text{wp } \alpha \text{ (i.e., when an information event occurs on day } t) \\ 0 & \text{wp } 1-\alpha \end{cases}$$

ι_t is the conditional value of the information event if it occurs.

γ_t , η_t and ι_t are normally distributed with $\mu=0$ and standard deviations σ_γ , σ_η and σ_ι , respectively.

γ_t , η_t , ι_t and I_t are jointly and serially independent.

Model: Default

- Let D represent the face value of the firm's debt (assumed to remain constant).
- Define $X_t = \ln(A_t) - \ln(D) = \ln(A_t/D)$.
- X_t has the same transition equation as $\ln(A_t)$.
- Insolvency condition: $\ln(A_t) < \ln(D) \Leftrightarrow X_t < 0$
- Recovery rate in the event of default: ρ

Model:

Default and Debt Ratings

For any two firms A and B:

- (i) If $P[X_t^A < 0] < P[X_t^B < 0]$ for every $t > 0$ and $\rho^A = \rho^B$, then A has a higher debt rating than B.
- (ii) If $\rho^A > \rho^B$ and $P[X_t^A < 0] = P[X_t^B < 0]$ for every $t > 0$, then A has a higher debt rating than B.

Model: Implications

Proposition 1:

All else equal, a lower probability of information events (α) implies a higher debt rating.

Proposition 2:

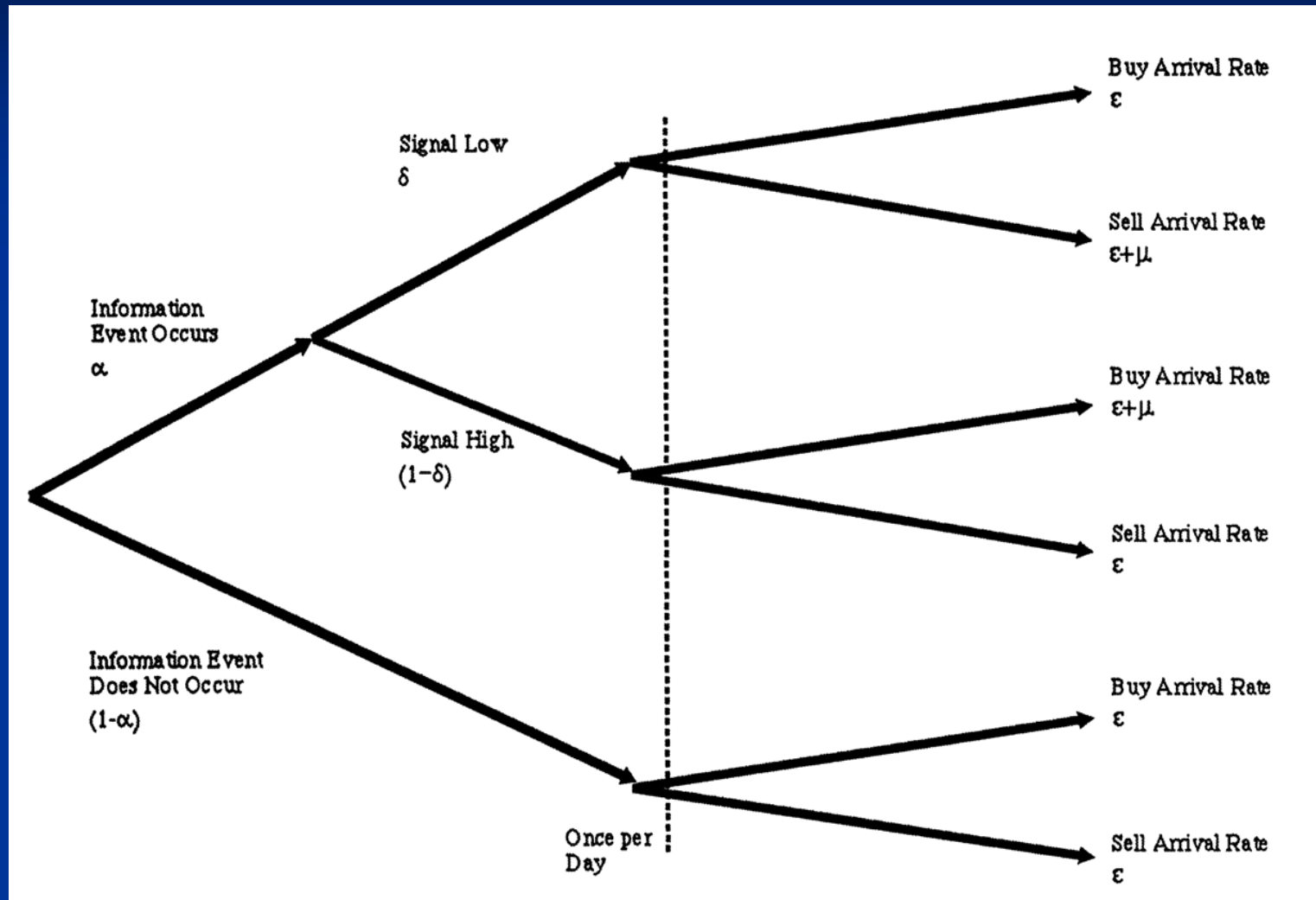
All else equal, a lower magnitude of information events (captured by σ_I) implies a higher debt rating.

We test these propositions empirically using standard adverse selection measures that capture α and σ_I .

Adverse Selection Measures

- Spread-Based Measures (Relative)
 - Time-weighted average quoted spreads
 - Average effective spreads
 - Adverse selection component of the spread (Glosten and Harris (1988))
 - Information-based price impact measure (Hasbrouck (1991))
- Probability of Informed Trading (Easley, Kiefer, O'Hara, and Paperman (1996))

EKOP (1996)



Source: Easley et al. (1996)

Link Between the Measures and the Model

- Key parameters:

α = probability of a private information event

σ_1 = magnitude of information event

- The probability of an information event (α) is the same as in the EKOP model.
- Spread-based measures reflect both α and σ_1 . An increase in either α or σ_1 will increase adverse selection and decrease the firm's debt rating.

Data Sources

- Firm characteristics
 - CRSP
 - Compustat
- Debt ratings
 - Fixed Income Securities Database (FISD)
- Intraday trades and quotes
 - TAQ
- News stories
 - Lexis-Nexis (Business Wire)

Sample Selection

- 24 calendar quarters from January 1995 through December 2000
- Subset of 3,000 largest NYSE, Nasdaq, and Amex firms
 - Common stocks trading on the NYSE
 - Publicly traded debt rated by at least one nationally recognized statistical ratings organization

Debt Ratings

- Agencies: Moody's, S&P, and Fitch
- Assign a numerical score to each rating category
36 = best possible rating (Aaa1 / AAA+)
- Debt rating variable = weighted average (by amount outstanding) of numerical ratings across all issues and agencies at the start of each quarter
 - 30% below investment grade (24 or less)
 - 30% Baa/BBB range (25 to 27)
 - 30% A range (28 to 30)
 - 10% Aa and Aaa range (31 to 36)

Estimation of Adverse Selection Measures

- Computed quarterly (Easley, Kiefer, and O'Hara (1997)) using TAQ data
- Trades signed using Lee and Ready (1991) and checked using Odders-White (2000)
- Trades within 5 seconds of one another at the same price are aggregated
- Spread-based measures are scaled by price

Q1: Are debt ratings and adverse selection measures related as predicted?

- Panel data regressions of debt rating variable on:
 - Chosen logged adverse selection measure
 - Control variables: $\ln(D/A)$, asset beta, residual news, industry dummies, and yearly intercepts
- Results (Table 6): Lower debt ratings are associated with higher adverse selection.

Example:

A 20% increase in the effective spread results in a 0.1 decrease in the predicted ratings category.

Q1: Are debt ratings and adverse selection measures related as predicted?

- Standard adverse selection measures also reflect trading frequency and capital structure.
Model: $\Delta \ln(A_t) \approx \Delta A/A$ per *day*
GH measure: $\Delta E/E$ per *trade*, $\Delta E = \Delta A$
- Run panel data regressions using decomposed measures ($\ln(\alpha\sigma_1)$), along with $\ln(\text{imbalance})$ and $\ln(E/A)$.
- Results (Table 7): Negative relationship between debt ratings adverse selection holds for decomposed measures, as well. LR tests reject the models in Table 6 in favor of those in Table 7.

Q2: Do the adverse selection measures contain incremental information?

Add additional variables to the previous regression:

- S&P “Corporate Ratings Criteria”
 - Business risk: $\ln(\text{market capitalization})$
 - Financial risk: Return on assets, profit margin, interest coverage, $\ln(\text{FCF ratio})$
- Existing academic literature
 - Determinants of debt ratings: BE/ME, D/P, past 6-month return
 - Determinants of liquidity: $\ln(P)$, $\ln(\text{volatility})$

Q2: Do the adverse selection measures contain incremental information?

Results (Table 8):

- Even after controlling for other factors, the negative relation between debt ratings and adverse selection still holds.
- Statistical significance: Significant at 1% level for decomposed quoted and effective spreads and α .
- Economic significance: Similar across all spread-based measures.

Q3: Do adverse selection measures capture changes in uncertainty in advance of debt ratings?

- Approach: Ordered probit analysis of ratings changes to examine the ability of changes in adverse selection to predict future ratings changes
- For all quarters in which ratings are unchanged, define an indicator variable:
 - 1 => downgrade in subsequent quarter
 - +1 => upgrade in subsequent quarter
 - 0 => no change in subsequent quarter
- Regress indicator on:
 - Changes in $\ln(\alpha\sigma_v)$, $\ln(\text{imbalance})$, and $\ln(E/A)$
 - Changes in $\ln(D/A)$, asset beta, and residual news

Ordered Probit Model Results (Table 9)

- \uparrow Adverse selection $\Rightarrow \uparrow P(\text{downgrade})$ & $\downarrow P(\text{upgrade})$
E.g., A 50% increase in the spread translates into a 60% increase in the probability of a downgrade and a 40% decrease in the probability of an upgrade.
- Statistical significance: More confidence in estimates for quoted and effective spreads.
- Economic significance: Similar across various measures.
- Changes in capital structure (and liquidity to a lesser extent) are also statistically significant predictors of future ratings changes.

Conclusions

- Debt ratings contain information related to asset-value uncertainty (and, in particular, to private information events reflected in equity-market adverse selection measures).
- The information in the adverse selection measures is not captured entirely by other easily observable variables.
- Adverse selection measures can be used to predict future ratings changes.

Implications

■ Academics

- The results establish a link between distinct lines of research.
- The findings validate both debt ratings and adverse selection measures.

■ Practitioners

- Adverse selection measures may be used to assess credit risk on a more timely basis.