Debt Covenants and Distressed Equity Issuance: Optimal Financing in the Presence of Monitoring

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Motivation

- **Old Question**: How should a firm that is subject to agency problems be financed in a fully optimal way?

- Direct monitoring remains relatively unexamined in dynamic settings and in security design.
  - **Refined Question**: How should management be monitored dynamically, and how does this affect how a firm issues claims?

- Monitoring is a vital feature of debt (and covenants):
  - Rights in bankruptcy encourage information gathering (Rajan and Winton (1995)).
  - Covenants as a form of “automated” monitoring:
    Bad performance (violations) lead not to liquidation but instead to more restrictive financial policies.
    Chava and Roberts (2008), Roberts and Sufi (2008), Black, et al (2004), etc.
  - Opportunity cost.
Objective/Contribution

- We solve a dynamic principal-agent problem with monitoring and characterize the optimal contract. We implement the contract with securities: debt (with covenants) and equity.

- If the principal uses direct monitoring, the agent can experience more losses before termination. In the implementation, the firm can be re-capitalized rather than liquidated.

- Match empirical facts regarding covenants and equity financing. Make new (testable) predictions.

Distressed Equity Issuance is very common:

- Surprising, because the fact goes against static theories of debt overhang and managerial agency.
Optimal Contracting

- Risky project to be financed.
- Project manager can divert cash flows (moral hazard).
- Costly liquidation.
- Investors (the principal) can offer incentives through:
  - Pay for performance
  - Costly monitoring
- Our modeling contribution: Parsimonious dynamic monitoring.
The Contracting Model

- **Project:** Time is continuous: \([0, \infty)\). The cumulative cash flow is \(Y_t\), with

\[
dY_t = (\bar{\mu} - s_t)dt + \sigma dB_t
\]

The manager can steal \(s_t\) and receive consumption \(\alpha s_t\). \(\alpha < 1\).

- **Outside Options (Costly Liquidation):** \(V_R\) for the agent, \(L\) for the principal.

\[
\gamma V_R + r L < \bar{\mu}
\]

- **Risk Neutrality in Consumption.** Discounted with \(\gamma > r\).

\[
U^A = E \left[ \int_0^T e^{-\gamma t} dC_t + e^{-\gamma \tau} V_R \right] \quad U^P = E \left[ \int_0^T e^{-rt} (dY_t - dC_t) + e^{-r \tau} L \right]
\]
Incentives: Performance Based: Principal pays the agent $dC_t$ based on $dY_t$.

Monitoring: $m_t$ is the cost of monitoring, intensity of monitoring.

$N_t$ is a Poisson process with intensity $\lambda$ that can reveal diversion:

$$\lambda_t = m_t s_t$$

Assumption: If caught cheating, the principal can reduce the agent’s outside option.

$$V_F < V_R$$
The Contracting Solution – The Agent

- The agent’s continuation value: \( V_t = E_t \left[ \int_t^\tau e^{-\gamma u} dC_u + e^{-\gamma \tau} V_R \right] \).

\[
dV_t = \gamma V_t dt - dC_t - \alpha s_t + \beta_t (dY_t - (\bar{\mu} - m_t - s_t) dt) + \psi_t (\lambda_t - dN_t)
\]

- **Promise Keeping**
- **Pay for Performance**
- **Monitoring**

- **Incentive Compatibility:**

\[
\beta_t + \psi_t m_t \geq \alpha
\]

Gain from reporting cash plus the effectiveness of monitoring is greater than the benefit to stealing.
The Contracting Solution – Principal

Choose \( \{\beta_t, m_t, \psi_t, dC_t\} \), to maximize expected profits.

\[
F(V_t) = \max_{\beta_t, m_t, \psi_t, dC_t} E_t \left[ \int_t^T e^{-rs} (dY_s - dC_s) + e^{-r\tau L} \right]
\]

Use Standard Hamilton-Jacobi-Bellman equation to solve.
The monitoring technology has no false positives, so maximize punishment ($\psi_t = V_t - V_F$) to minimize costs.

Costly Default: $F(V_t)$ is concave ($F''(V_t) < 0$), so principal chooses minimum volatility so that the IC binds:

$$\beta_t + (V_t - V_F) m_t = \alpha$$

Choose $m_t$ to maximize

$$-m_t + \frac{1}{2} \beta_t (m_t)^2 \sigma^2 F''(V_t)$$

When the principal is more sensitive to risk ($F''(V_t)$ is more negative), he chooses to monitor more, and rely less on performance based incentives ($\beta_t$).

Proposition: There exists an $L^*$ such that there is default in equilibrium if and only if $L > L^*$. If punishment is sufficiently effective, monitoring is decreasing in the past history of cash flows ($V_t$).
\[ R^f_1 = (\mu - \gamma V)/r \]

Agent Continuation Value: \( V \)

Value Function: \( F(V) \)

Monitoring: \( m(V) \)

Variable Pay: \( \beta(V) \)
Three securities: common stock, preferred stock, and a line of credit (debt).

The agent’s inside value \((V_t - V_R)\) becomes the firm’s financial slack (remaining draw on the line of credit).

Monitoring is now done “automatically” through debt covenants and implied liquidation threats.

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Securitization Details

- **Securities:**
  - **Common Stock:** receives dividends $dDiv_t$. Share issuance $dEQ_t$.
  - **Preferred Stock:** receives dividends $X_t dt$.
  - **Line of Credit:** interest rate $\gamma$. Credit limit is $\bar{M} = \frac{1}{\alpha}(V^C - V_R)$.

  The manager receives a share $\alpha$ of all common stock dividends.

  $$dM_t = \gamma M_t dt + X_t dt + dDiv_t - dY_t - dEQ_t$$

- **Decision Rights:**
  - **Manager:** Reporting policy ($dY_t$). Dividend policy ($dDiv_t$).
  - **Debt Holders:** To lend or withhold funds (competitive).
  - **Outside Common Equity Holders:** Equity Issuance $dEQ_t$. 


Implementation

- The line of credit implements monitoring:
  - Covenants restrict the flexibility of management (opportunity cost): intensity of covenants \( m_t \) given by the debt contract.
  - The debt holder can take over the firm when covenants are violated. \((dN_t\) process\). The manager wishes to avoid this.

- The outside equity holders choose \( dEQ_t = -\frac{1}{\alpha} (\alpha - \beta_t) \sigma dB_t \). Equity issuances offset losses and repurchases offset gains.

- With these choices, we have \( M_t = \frac{1}{\alpha} (V^C - V_t) \)
  
The manager reports accurately and chooses the optimal dividend payout policy \((dDiv_t = \frac{1}{\alpha} dC_t)\).
Properties of the Implementation

- Access to the line of credit provides sufficient flexibility to cover low income realizations. Agent’s inside value is the firm’s financial slack.

- Covenants implement costly monitoring. They lower the likelihood of default by allowing re-capitalizations through equity issuance in distress.
Decentralization – Equity

- **Equity as an Option**: Equity is a sequence of options: if the firm survives, equity gets another option. Since the project is positive NPV, there is an equity-specific cost of bankruptcy.

- **Debt Overhang**: Equity holders want to avoid the loss of future options, so they will use equity issuance to repay debt. Not concerned about raising capital for debt holders.

- **Incentive Slack**: Stricter monitoring from covenants allows the firm’s financing constraints to be relaxed. Less flexibility for managers implies more flexibility in capital raising. Result: distressed equity issuance and later repurchase.

- Static asset substitution/debt overhang invalid! Dynamics matter!
Empirical Content

- **Equity Issuance**: Explain/justify distressed equity issuance.

- **Covenants**: Consistent with covenants based on leverage ratios and operating performance; covenants more numerous and stricter with more leverage; covenants used more frequently when agency problems are strongest.

- **Executive Compensation**: Consistent with leverage being negatively related to pay-performance sensitivity for CEOs (Ortiz-Molina (2006)).

- **Predictions**: Firms leaving distress will re-purchase shares.
  
  Lower recovery rates in default should result in: more frequent equity issues, more restrictive covenants, lower conditional likelihood of actual default (rather than technical default), lower average profitability while in operation.
Conclusion

- We have set up and solved a dynamic contract and securitization model that matches stylized facts about covenants and explains why distressed equity issuance is useful. We make additional testable predictions.

- Contribution to the contracting literature: a simple, one variable dynamic model with monitoring.

- Contribution from securitization: the role of covenants and equity issuance.
  - Equity as an option in a dynamic model
  - Debt overhang in a dynamic model
  - Monitoring allows other incentive devices to be loosened. This allows the firm to raise cash in distress.