Dynamic Investment Decisions and Capital Structure under Asymmetric Information

- Project draft -

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Outline

1. Motivation
2. Literature
3. Basic model
4. Extensions
Problem: firm has opportunity to invest in a project

firm’s considerations with respect to the valuation of the project:

- timing of investment → real option framework
- financing decision
  - debt vs. equity
  - asymmetric information
  - assets-in-place

⇒ investment decision more involved than simple NPV rule
Pecking Order Theory

- internal financing $\succ$ external financing
- if no internal financing sources:
  - debt $\succ$ equity
- model explaining those central elements of the pecking order theory: Myers and Majluf (1984, JFE)
Model by Myers and Majluf (1984)
Morellec and Schürhoff (2011, JFE)
Questions of interest

- How does asymmetric information affect
  - the investment decision?
  - the financing decision?
- How do investment and financing decisions interact?
  Driving factors?
- Do information asymmetries in a dynamic setting lead to a financing hierarchy as in the static case (pecking order)?
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Information asymmetries in a dynamic setting

Hennessy, Livdan and Miranda (2010, RFS)
- bad types do not use debt, good types always use the least information-sensitive way of financing (i.e. debt over equity)

Morellec and Schürhoff (2011, JFE)
- informational asymmetries may not translate into a financing hierarchy
- equity in many cases preferred to debt

Our contribution:
- compared to Hennessy et al. (2010): signal from investment as well as financing decision
- compared to Morellec and Schürhoff (2011): additional dimension of asymmetric information
**Empirical tests of the pecking order**

**Helwege and Liang (1996, JFE)**
- equity is issued even though firms could have obtained bank loans
- greater asymmetry of information does not lead to higher probability of debt issuance

**Frank and Goyal (2003, JFE)**
- small high-growth firms often favor equity over debt

**Leary and Roberts (2010, JFE)**
- pecking order often not able to accurately classify observed financing decisions
# Outline

1. Motivation
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Model setup

- based on model by Morellec and Schürhoff (2011)
- firms’ investment and financing decision
- investment produces a stochastic stream of cash flows that depends on firm type
  - profit flow after investment: $\Lambda_k X_t - f$
  - $X_t$ is an observable cash flow shock, evolves according to $dX_t = \mu X_t dt + \sigma X_t dZ_t$
- firm types are private information
  - two types of firms: $\Lambda_g > \Lambda_b > 0$
Investment timing under symmetric information
Results I

Symmetric information

- standard real option problem
- good types invests before the bad type as seen from investment threshold
  \[ \bar{X}_k = \frac{\xi}{\xi-1} \frac{r-\mu}{\Lambda_k} (F + I) \]

Asymmetric information

- timing of investment can serve as a signal
  - mimicking the early investment of the good type has a benefit (overpriced securities) and a cost (lower threshold value reduces the stake of the incumbent shareholders)
- debt issuance serves as signal (due to bankruptcy costs)
Results II

Three different types of equilibria

- **Separation in equity**
  - early investment as signal
  - abnormal announcement returns

- **Separation in debt**
  - debt as signal
  - good type invests late
  - abnormal announcement returns

- **Pooling in equity**
  - good types invest late
  - bad type early
  - no announcement returns
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Including the decision to stop

- costs arise after exercising the real option (operating expenses)
- what if the profit flow $\Lambda_k X_t - f$ becomes sufficiently negative?
Including the decision to stop II

\[ X_k = \frac{\beta_2}{\beta_2 - 1} \frac{r - \mu}{\Lambda_k} F \]

- additional option value for shareholders
- increases the value of equity → can the separation in equity sustain?
- possibly no separation in debt equilibrium
Including assets-in-place

- Assume that the firm has assets-in-place.
- Initial shareholders obtain cash-flow even before investment \( \lambda_k X_t \), after investment \((\lambda_k + \Lambda_k)X_t - f\).
- Asymmetric information concerning the assets-in-place.

Motivation:

- Decision to issue equity is taken as a signal that the assets-in-place have a relatively low value.
  \( \Rightarrow \) reasoning for pecking order theory as such.