Discussion: Agency Conflicts, Investment and Asset Pricing by Albuquerque and Wang

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Research question

▶ How does the level of investor protection affect

1. aggregate investment

2. aggregate dividends

3. asset prices

▶ Part of broader research literature: how do corporate finance issues affect asset prices?

▶ Main contribution: paper provides a theoretical framework which nests exchange and production economy
- Dividends and investment determined endogenously
- Asset prices determined in terms of dividends – exchange economy approach
- Asset prices determined in terms of investment and capital stock – production economy approach

▶ Weaker investment protection leads to over-investment
Model summary

- Break from representative agent approach – use 2 agents – both have power utility – same relative risk aversion $\gamma$

- Agent 1: Controlling shareholder – chooses dividends and steals from representative firm output
  - Investment is firm output less dividends and theft
  \[ I(t) = \frac{\text{output}}{Y(t)} - \frac{\text{dividends}}{D(t)} - \frac{\text{theft}}{s(t)Y(t)} \]

- Agent 2: Minority shareholder: standard investor – choose consumption and portfolio policy

- Get equilibrium asset prices via market clearing
Controlling shareholder’s problem

Controlling shareholder’s objective function

\[ J_1 (K_0) = \sup_{D,s} E \int_0^\infty e^{-\rho t} u (C_1 (t)) \, dt, \]

\[ C_1 (t) = \text{dividends} \underbrace{\alpha D (t)}_{\text{stolen output}} \underbrace{\alpha D (t)}_{\text{cost of stealing}} \underbrace{s (t) Y (t)}_{\Phi (s (t), Y (t))} \]

Firm output is a constant multiple of the capital stock

\[ Y (t) = hK (t), \]
Shocks to growth rate of capital stock scaled by investment-capital ratio

\[
\frac{dK(t)}{K(t)} = \left( \frac{I(t)}{K(t)} - \delta \right) dt + \epsilon \frac{I(t)}{K(t)} dZ(t).
\]

Bellman pde

\[
\sup_{D,s} \left\{ u(C_1) - \rho J_1 + \left( \frac{I}{K} - \delta \right) K J_{1,K} + \frac{1}{2} \left( \frac{I}{K} \right)^2 K^2 J_{1,KK} \right\} = 0
\]
Results: Stealing, dividends and investment

- Proportion of output stolen is higher when investor protection is weaker
  \[ s = \frac{1 - \alpha}{\eta} \equiv \phi \]

- Dividend-capital ratio is lower when investor protection is weaker
  \[ d = (1 - \phi) h - i \]

- Investment-capital ratio is higher when investor protection is weaker
  \[ i = \text{In terms of } \alpha, \eta, \gamma, h, \delta, \epsilon \]
Minority shareholder’s problem

► Minority investor owns fraction $1 - \alpha$ of representative firm’s shares (can trade them!) at price $P(t)$

► Objective function

$$\sup_{C_2, \omega} E \int_0^\infty e^{-\rho t} u(C_2(t)) \, dt,$$

► Standard dynamic budget constraint

$$\frac{dW_2(t)}{W_2(t)} = \left( r(t) + \omega(t) \lambda(t) - \frac{C_2(t)}{W_2(t)} \right) dt + \omega(t) \sigma_P(t) \, dZ(t),$$

• $\omega(t)$ – proportion of her wealth the minority investor puts in the stock market

• $\lambda(t)$ – risk premium

• $\sigma_P(t)$ – stock market return volatility

► via market clearing these policies determine

• Price-dividend ratio, $\frac{P(t)}{D(t)}$, and

• Price-capital ratio, $\frac{P(t)}{K(t)}$, i.e. Tobin’s $q$
Summary: understanding the model

Model nests two standard approaches to asset pricing

1. Exchange economy
   • Relates stock price, $P(t)$, and riskfree rate, $r(t)$, to dividends, $D(t)$

   $$\frac{P(t)}{D(t)} = \frac{1}{\hat{\mu}_P - \mu_D}$$

2. Production economy
   • Relates stock price, $P(t)$, and riskfree rate, $r(t)$, to investment, $I(t)$ and capital stock, $K(t)$

   $$\frac{P(t)}{K(t)} = q$$
Equilibrium results

- Discount rate is higher when investor protection is weaker
  \[ \hat{\mu}_P = r + \gamma \sigma_D^2 \]

- Riskless rate is higher when investor protection is weaker
- Dividend growth volatility is higher when investor protection is weaker
  \[ \sigma_D = i \epsilon \]

- Price-dividend ratio is lower when investor protection is weaker, if \( \gamma > 1 \)
  Gordon growth model:
  \[ \frac{P(t)}{D(t)} = \frac{1}{\hat{\mu}_P - \mu_D} \]
  - Increase in \( \hat{\mu}_P \) dominates increase in \( \mu_D = i - \delta \)
  \[ \hat{\mu}_P - \mu_D = \rho + (\gamma - 1) \left( \mu_D - \frac{1}{2} \gamma \sigma_D^2 \right) \]
• $\mu_D - \frac{1}{2} \gamma \sigma_D^2$ is higher when investor protection is low

Tobin's $q$(market-to-book) is lower when investor protection is weaker

$$q = \frac{P(t)}{K(t)} = \left(1 + \frac{1 - \alpha^2}{2\eta \alpha d h}\right)^{-1} \frac{1}{1 - \gamma e^{2i}},$$

and

$$\frac{dq}{d\eta} = \frac{1}{y} \left[ \frac{1 - \alpha}{\eta^2} - \frac{d}{d\eta} \left(1 + \frac{1 - \alpha^2}{2\eta \alpha d h}\right)^{-1} \left(\frac{1 - \alpha^2}{2\eta \alpha d h} + \gamma\right) \right] > 0,$$

because

$$\frac{di}{d\eta} < 0.$$
Comments

1. Extend to Epstein-Zin preferences – separate relative risk aversion $\gamma$ from elasticity of intertemporal substitution $EIS$ – Price-dividend ratio result is reversed

- Price-dividend ratio is higher when investor protection is weaker, if $EIS > 1$

- Recent empirical estimates: $EIS > 1$, Attanasio and Vissing-Jorgensen (2003)
  - Increase in $\hat{\mu}_P$ does not dominate increase in $\mu_D = i - \delta$

$$\hat{\mu}_P - \mu_D = \rho + \left( \frac{1}{EIS} - 1 \right) \left( \mu_D - \frac{1}{2} \gamma \sigma_D^2 \right)$$
2. With Epstein-Zin preferences, Tobin’s q is still lower when investor protection is weaker

\[
\frac{dq}{d\eta} = \frac{1}{y} \left[ \frac{1 - \alpha}{\eta^2} h - \frac{di}{d\eta} \left( 1 + \frac{1 - \alpha^2}{2\eta\alpha d} h \right)^{-1} \left( \frac{1 - \alpha^2}{2\eta\alpha d} h + \frac{1}{EIS} \right) \right] > 0,
\]

because

\[
\frac{di}{d\eta} < 0.
\]

Suggestion: Explain why effect of investor protection on the price-dividend ratio depends on whether \( EIS \) is \(<\) or \(>\) 1, but this does not matter for Tobin’s q
3. Price-dividend ratio is a constant:

   - Equity premium puzzle
     \[ \lambda = \gamma \sigma_D^2 \]

   - Excess volatility puzzle
     \[ \sigma_P = \sigma_D \]

4. Paper has many results – what is the main result?
Summary

- Nice model – looks at effects of agency on asset prices

- Attractive feature – nests exchange and production economy

- Model does not match asset price data – provides a way of thinking about how asset prices are affected by corporate finance considerations via fundamentals such as dividends and investment
References