Resource Allocation within Firms and Financial Market Dislocation: Evidence from Diversified Conglomerates (RFS 2014)

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Background


- Efficient and Inefficient Capital Markets
  - Bright Side (Stein (1997))
  - Dark Side (Scharfstein and Stein (2000), Rajan, Servaes, and Zingales (2000))

- Dark side and managerial socialistic concerns
Motivation

- Are these two views mutually exclusive? Can there be a model that can nest these two views?

- Can this model explain the pattern observed in the data?
  - EV of a diversified firm with higher dispersion in productivity increases compared to a similar diversified firm with lower dispersion when TED spread increases

- Can the diversification discount be time-varying?
The Model Set-Up

- A utility maximizing manager with time-varying cost of external financing

- Manager, sits in the headquarter, and derives utility in "minimizing diversity of profits" among divisions

- Headquarters allocates funds to divisions for investment and collects any surplus funds divisions generate
Brief Theory (I)

- Managerial valuation of the profit from division $j$ is:

\[ z_{tj}k_{tj} - \lambda(z_{tj} - z^*) \times k_{tj} \]  
\hspace{1cm} \text{(1)} \]

- Manager’s per-period utility is therefore:

\[ u_t = \sum_j (z_{tj}k_{tj} - \Phi(l_{tj}, k_{tj})) - C(f_t | \zeta_t, \sum_j k_{tj}) - \]

\[ L(p_t | \sum_j k_{tj}) \times \lambda(z_{tj} - z^*)k_{tj} \]  
\hspace{1cm} \text{(2)} \]

where,

\[ L(p_t | \sum_j k_{tj}) = l_0 p_t + l_1 \frac{p_t}{\sum_j k_{tj}} \]  
\hspace{1cm} \text{(3)} \]
Manager’s Problem

- The manager then solves the problem:

\[
V(k_t, z_t, p_t, \zeta_t; \sigma; \theta) = \max_{\sigma} E \sum_{t=0}^{\infty} \beta^t u_t(k_t, z_t, p_t, \zeta_t; \theta) \tag{4}
\]

\[
s.t., \quad -k_{tj} = (1 - \delta)k_{t-1,j} + i_{t-1,j} \tag{5}
\]

\[
p_t = p_{t-1} + f_{t-1} + \pi_{t-1} \tag{6}
\]
Estimation Stage II

- Stage 1 estimates Tobit specifications of $I_{tj}$, $f_t$, $p_t$ using COMPUSTAT division level data from 1980-2006.
- Estimate the structural parameters: $\theta = [1, \lambda, \phi_0, ..., l_1]$
- Intuition: Any other set of policy at the true value of the parameters will have less utility and thus less valuation of the firm.
- Choose $\theta$ such that:

$$\hat{\theta} = \min_{\theta} \frac{1}{n_p n_s} \sum_{i=1}^{n_p} g(s, \sigma_n) g(s, \sigma_n)$$

(7)

where, $g(s, \sigma_n) = \max(0, (W_t(s; \sigma_n) - W_t(s; \sigma_*))\theta)$

By perturbing the policy and the state transition functions with the residuals from the respective equations in Stage 1.
Dark and Bright Sides

- **Dark Side**: \( \lambda = 0.69 \implies \) At an average ratio of productivity of 1.32, the manager values the revenues of the stronger division at 0.92 and weaker division at 1.11

- **Bright Side**:
  - Average cost of financing: Fixed Cost of 8.6% and marginal cost of 5%
  - Marginal Cost of holding cash is 28% (Cost of Cash/Total Amount of Cash)
Mediating Financial Sector Shocks

- Through counterfactual analysis
Implications

- 16% change in relative valuation in conglomerates
- Of the 5 percentage point increase in EV (Table 6, Panel B), 3.5 percentage points is attributable to financial market conditions
  - Reduced form conglomerate valuations may overstate the effect of capital reallocation by 30%
Conclusion

- Corporate Socialism plays a major role in conglomerates driving valuation discounts in conglomerates

- Internal capital markets help when external financing conditions are worse

- Reduced form analysis might overstate the benefit of reallocation of internal capital by 30%
Conclusion

Thank You
Theory (I)

- Total cost of investment of a division:
  \[
  \Phi(I_{tj}, k_{tj}) = I_{tj} + \phi_0 I_{tj} > 0 + \phi_1 k_{tj} I_{tj} > 0 + \phi_2 \frac{I_{tj}^2}{k_{tj}}
  \]
  - Fixed Cost
  - Convex Adj Cost

- Cash stock of the firm:
  \[
  p_{t+1} = p_t + f_t + \pi_t
  \]
  - Prev period Cash
  - external fin
  - profit

- Cost of External Financing:
  \[
  C(f_t|\zeta_t, \sum_j k_{tj}) = I_{ft} > 0 (c_0 + c_1 \zeta_t + c_2 \zeta_t^2 + c_3 \frac{1}{\sum_j k_{tj}}) + \]
  - fixed cost
  - variable cost
  \[
  I_{ft} > 0 \times f_t \times (c_4 + c_5 \zeta_t + c_6 \zeta_t^2 + c_7 \frac{1}{\sum_j k_{tj}})
  \]
Estimation Stage 1

- Estimate Policy function \( (l_{tj} \text{ and } f_t) \) as Tobit regression from:

\[
l_{tj} = \max(0, Q_2(k_t, z_t, \zeta_t, p_t; \beta_l) + \epsilon_{l_{tj}})
\]
\[
f_t = Q_2(k_t, z_t, \zeta_t, p_t; \beta_f) + \epsilon_{f_t}
\]

- Estimate state transition function \( (k_{t+1,j}, z_{t+1}, \zeta_{t+1}) \) and finally \( p_{t+1} \) as tobit regression from:

\[
p_t = \max(0, Q_2(k_t, z_t, \zeta_t, p_t, l_t, f_t; \beta_p) + \epsilon_{p_{tj}})
\]