Valuing intangible capital in agribusinesses: A re-examination of the neoclassical theory of investment

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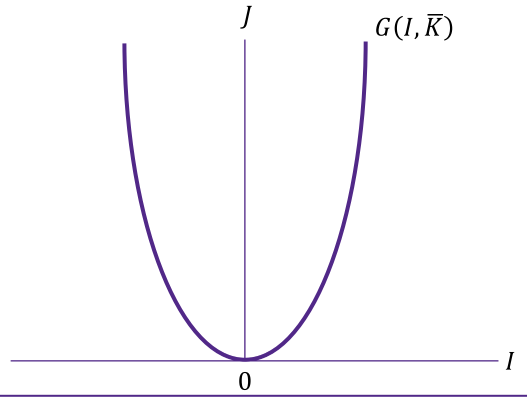
Objective

1. Estimate the importance of intangible capital for U.S. publicly listed agribusinesses
2. Address the measurement error problem using higher-order cumulant estimators
3. Assess the role of cash flow on investment

Data

- Compustat–Capital IQ financial statement data
- 1,180 U.S. publicly traded agribusinesses
- Data spans from 1963-2022
- 15,402 firm observations

Convex Adjustment Costs



Methods

Following Peters and Taylor (2017):

$$V_{it} = \max_{I^{phy}_{i,t+s}, I^{int}_{i,t+s}} \int_0^{\infty} E_t \left[\Pi\left(K^{tot}_{i,t+s}, \varepsilon_{i,t+s}\right) - \left(p^m I^m + K^{tot} \left[\zeta_i^m \frac{I^m}{K^{tot}} + \frac{\gamma_i^m}{2} \left(\frac{I^m}{K^{tot}} \right)^2 \right] \right) \right] e^{-rs} ds \quad (1)$$

$$subject\ to:\ \dot{K}_t^m = \frac{dK^m}{dt} = (I^m - \delta K^m), m = phy, int. \quad (2)$$

$p^{phy}_{it}, p^{int}_{it}, \varepsilon_{it}$ *fluctuate according to a general stochastic diffusion process:*

$$d\theta_{it} = \mu(\theta_{it})dt + \sigma(\theta_{it})dz_{it}, where\ \theta_{it} = \left[\varepsilon_{it}\ \ p^{phy}_{it}\ \ p^{int}_{it}\right]'. \quad (3)$$

$$\frac{\partial V_{it}}{\partial K^{phy}_{it}} = \frac{\partial V_{it}}{\partial K^{int}_{it}} = \frac{\partial V_{it}}{\partial K^{tot}_{it}} = \frac{V_{it}}{K^{phy}_{it} + K^{int}_{it}} = \frac{V_{it}}{K^{tot}_{it}} \equiv q^{tot}\left(\varepsilon_{it}, p^{phy}_{it}, p^{int}_{it}\right). \quad (4)$$

The firm's optimal investment rates are:

$$\iota^{phy}_{it} = \frac{I^{phy}_{it}}{K^{tot}_{it}} = \frac{1}{\gamma^{phy}_{it}} q^{tot} \quad (5)$$

$$\iota^{int}_{it} = \frac{I^{int}_{it}}{K^{tot}_{it}} = \frac{1}{\gamma^{int}_{it}} q^{tot} \quad (6)$$

$$\iota^{tot}_{it} = \frac{I^{phy}_{it} + I^{int}_{it}}{K^{tot}_{it}} = \frac{1}{\gamma^{tot}_{it}} q^{tot} \quad (7)$$

Results & Conclusion

- Total q is a better proxy of investment opportunities than standard q
- Higher convex adjustment (installation) costs for financially unconstrained firms (8.0645) compared to financially constrained firms (1.0730)
- Higher convex adjustment (installation) costs for intangible capital (28.329) compared to physical capital (5.747)
- Cash flows are important for financially constrained firms

References

Peters, R. H., & Taylor, L. A. (2017). Intangible capital and the investment-q relation. Journal of Financial Economics, 123(2), 251–272.

Sensitivity Analysis