Financial Markets with Externalities

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Overview

Motivation:

- Index funds offer diversification benefits to investors but typically lack significant stakes in their portfolio firms.
- In contrast, active funds can hold substantial shares, influencing portfolio firms and potentially providing externalities, at the cost of diversification.

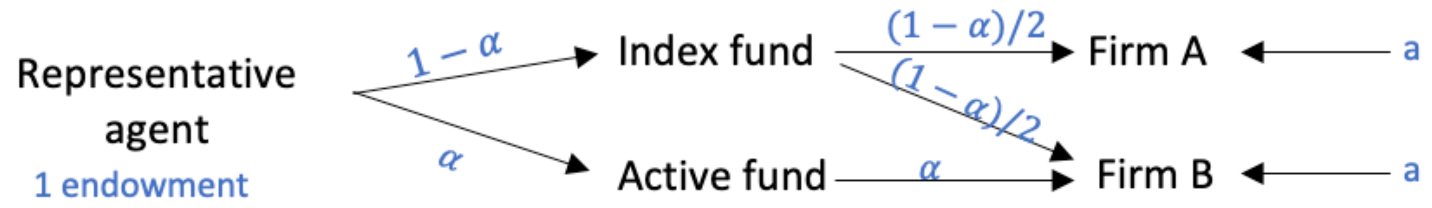
Research Questions:

- How do investors trade-off between diversification and concentration for influence?
- How do active funds determine their degree of activism?
- Can investors collectively achieve a welfare improving outcome?

Main Results:

- When investor is large, he holds just enough shares through active fund to influence portfolio firms.
- When investors are dispersed, active fund acts as a coordination device to offer contract for heterogeneous agents.

Model Setup



Firms:

- Two firms A and B, random production technology negatively correlated:
  - With prob p, $z_A = z + \sigma$ and $z_B = z - \sigma$; with prob $1-p$, $z_B = z + \sigma$ and $z_A = z - \sigma$.
- Profits $\pi_j = z_j I_j$, $j = A, B$. Firm j receives investment I_j.
- Firm B can generate externalities:
  - at a cost of c from the profit π_B
  - externalities happens with probability $\theta \sim U[0,1]$.

Key features - Externalities:

- Public good H(c): everyone benefits once its in place.
  - $H(0) = 0, H'(c) > 0, H''(c) < 0$
- Private good h(α,c, χ): only active fund investor can enjoy.
  - "Worm-glow" utility, extra financial return..

Funds:

- Active fund: invests all (total α) in the firm that can generate externalities (firm B).
  - has influence over firm B if enough investment received (holing $> k$ fraction of firm B);
  - offers degree of activism c at a monitoring cost Ω(c).
  - Payoff $\alpha R - \Omega(c)$, per unit investment fee R.
- Index fund: invests (total $1-\alpha$) equally in both firm A and B.

Agents:

- 1 continuum, each with 1 endowment, utility function $U_i(c, \alpha, \eta_i) = E[\Pi_i(\alpha)] - \frac{\gamma}{2} var(\Pi_i(\alpha)) + T_i(c, \alpha, \eta_i,)$
  - $\Pi_i(\alpha)$ is the return on portfolio, $V_i(c, \alpha, \eta_i)$ is utility from externalities.
  - $T_i(c, \alpha, \eta_i,)$ = θ [H(c)+ h(α,c, χ)]
- Receives private signal $\theta_i = \theta + \epsilon_i$, $\epsilon_i \sim U[0,1]$, of the likelihood of externalities.
- External investors with money $a < 1$ in both A and B.

Timing:

- T=1, active fund decides degree of activism c;
- T=2, investors make investment decisions;
- T=3, payoffs realize.

One Investor Equilibrium

Lemma

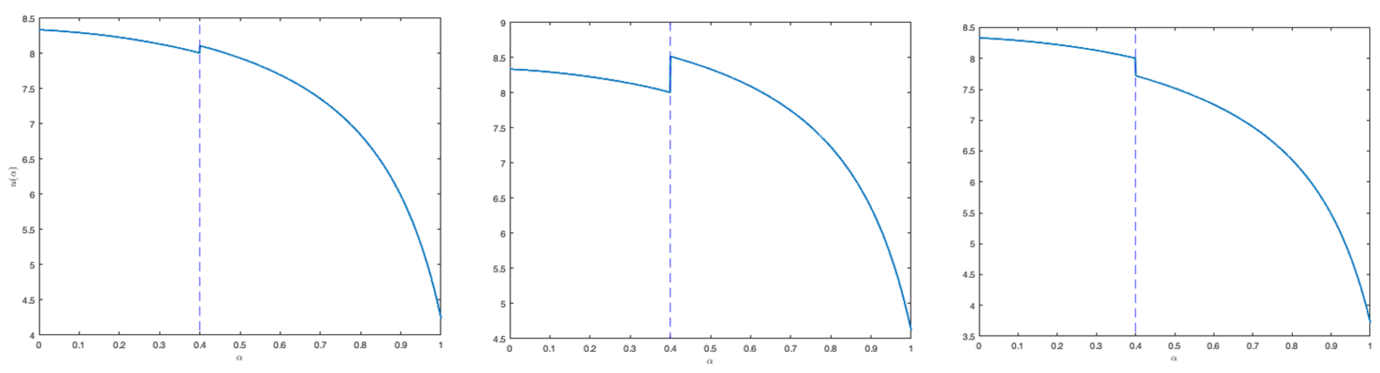
Equilibrium active fund size, α, can only takes two values. $\alpha^* = \frac{(2a+1)k}{2-k}$ if

$$\underbrace{\theta H(c) + \chi}_{externality\ \ gains} \geq \underbrace{[\frac{a+1}{3a - ak + 1}]c}_{Expected\ \ profit\ \ loss} + \underbrace{\frac{\nu\sigma^2}{2}(\frac{2ak+k}{2-k})^2}_{Volatility\ \ loss} + \underbrace{\frac{2ak+k}{2-k}R}_{Fund\ \ fees}$$

Otherwise, $\alpha^* = 0$.

T=2:

- Investor's utility decreases when deviates away from index fund, as index fund provides the best mean-variance portfolio.
- Active fund investment gives jump (up or down) to utility once externalities are in place.
- Depending on the degree of activism from active fund, investing with active fund may increase of decrease investor's utility.
- Investor either invests fully with index fund or holds just enough shares to have control of firm B.



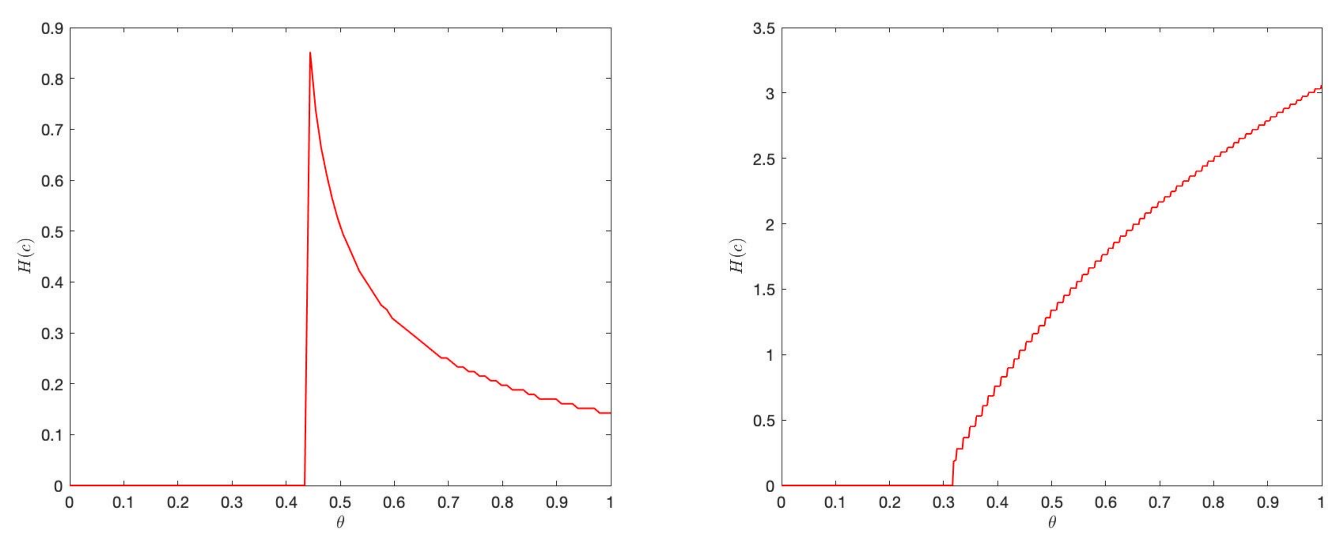
T=1:

- Monitoring cost may reduce incentive for active fund to provide the degree of activism at the first-best level for the investor.
- Instead, active fund picks lowest possible c that makes investor indifferent between investing with active and index fund.
- Active fund size depending on how easy it is to influence firm B.
- Define a set F as all possible c that makes $\alpha > 0$.

Lemma

The equilibrium are characterised as follows:

- *If $F \neq \varnothing$ and $\min\{F\} > 0$, $c^* = \min\{F\}$ and $\alpha^* = \frac{(2a+1)k}{2-k}$*
- *Otherwise, $c^* = 0$ and $\alpha^* = 0$.*



Proposition

When active fund size is large enough, the level of public good decreases when the likelihood of externalities increases.

Key intuitions:

- Active fund only provides the degree of activism that makes investor indifferent between index and active fund.
- Increasing likelihood of the externalities meaning less externalities required to make investor indifferent.
- In a second-best world where social planner considers payoffs of both investor and active fund, the equilibrium level of public good increases with the likelihood.
- Always not enough externalities provided comparing to the social planner's level.

Dispersed Investors Equilibrium

T=2:

- Pay off function of dispersed investor follows:

	$\alpha < \frac{2ak+k}{2-k}$	$1 > \alpha \geq \frac{2ak+k}{2-k}$
Activists fund ($\eta = 1$)	$z - \frac{\nu}{2}\sigma^2 - R$	$z - \frac{c}{a+0.5(1+\alpha)} - \frac{\nu}{2}\sigma^2 - R + \theta_i(H(c) + h(c, \alpha, \chi))$
Index fund ($\eta = 0$)	z	$z - \frac{c}{a+0.5(1+\alpha)} + \theta_i H(c)$

- Depending on the investment decision and the equilibrium size of active fund, the payoff for investor differs.
- Denote $u(\eta, \alpha, x)$ is the payoff for investor choosing action η, give active fund size α and private signal x.
- He compares his payoff between investing with active fund and index fund:

$$V(\alpha, x) = u(1, \alpha, x) - u(0, \alpha, x) = \begin{cases} -\frac{\nu\delta^2}{2} - R & \text{if } \alpha < \frac{2ak+k}{2-k} \\ -\frac{\nu\delta^2}{2} - R + xh(c, \alpha) & \text{if } \alpha \geq \frac{2ak+k}{2-k} \end{cases}$$

- He invests with active fund if $V(\alpha, x) \geq 0$.
- As investor's payoff from investing in active fund increases with more people doing so, the investor faces strategic complementarity.
- At the same time, the better the signal an investor receives, the more likely he would invest with active fund.
- Look for monotone Bayesian Nash equilibrium.

Proposition

There exists a cut-off θ^* such that for all investor i with $\theta_i \geq \theta^*$, $\eta_i = 1$ and $\eta_i = 0$ otherwise, where

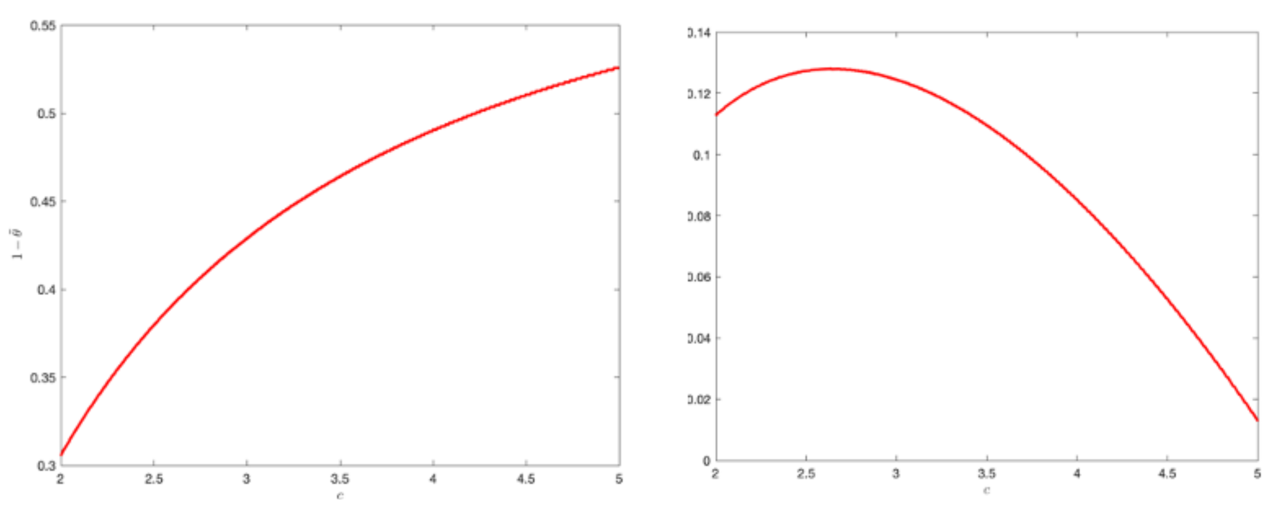
$$\theta^* = \frac{1}{h(c^*, \alpha)}(\frac{\nu\delta^2}{2} + R)\frac{2-k}{2-2k-2ak}$$

Active fund chooses:

$$c^* = \arg\max_c (1-\theta^*)R - \Omega(c)$$

Key Intuitions:

- As the degree of activism (c) increases, the expected payoff from investing with active fund also increases, and the expected active fund size increases as well.
- This creates incentive for active fund to provide higher degree of activism, getting closer to the first-best level for investors.
- The active fund always stays in the market ($\alpha > 0$), and the size decreases with the volatility (δ), fund fee(R), control threshold (k) and outside investors (a).



T=1:

- Monitoring cost gives concavity of the payoff of active fund.
- Instead of picking the lowest possible level of c, active fund now offers the level of c that maximises his payoff.
- Potential welfare increase comparing to the case with one large investor. The uncertainty in payoff creates incentive for coordination among investors.
- The degree of activism offered by active fund coordinates across heterogenous investors with different signals.

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