The Consequences of Index Investing on Managerial Incentives

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Motivation

- Index investing has surged in popularity over the past few decades, and such a shift in the composition of investors is bound to affect the informational content of stocks.
- Companies use stock-based compensation to incentivize managers to act in the best interest of shareholders. Thus, any change in how a manager's actions are reflected in financial markets should alter the optimal contract.
- **Research Question:** How does optimal managerial compensation change as more investors index?

Model

Firms:

- Two firms: $k \in \{1, 2\}$. Each firm k generates an independent and normally distributed payoff x_k. The mean is determined by the manager's effort.
- The manager of each firm is paid a wage ω_k.
- Each firm pays out the difference between the payoff and the manager's wage as a dividend to its shareholders.

Contracting Problem:

- Standard moral hazard problem with a risk-neutral principal and risk-averse manager.
- The principal maximizes the firm's expected dividends. The manager impacts the firm's mean payoff through his expected utility-maximizing effort choice.
- Wage is linear in the stock prices of both firms: $\omega_k = l_k + m_k P_k + n_k P_j$.

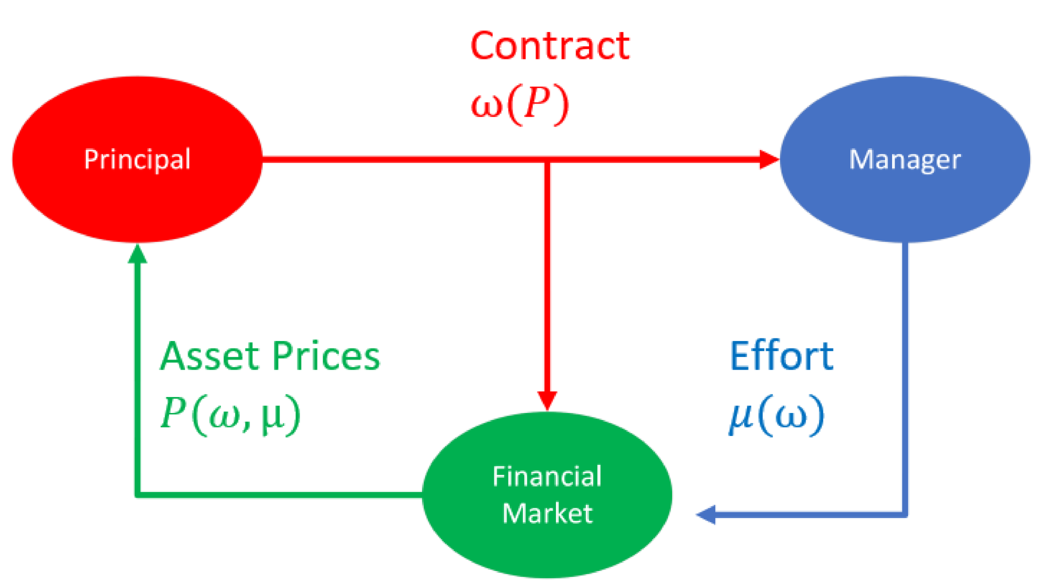
Financial Market:

- Noisy rational expectations equilibrium model of financial markets.
- There are three assets: a risk-free asset, firm 1's stock, and firm 2's stock.
- There exists a unit mass of traders with CARA utility over terminal wealth. Traders choose ex-ante to be active or indexed. They are indifferent in equilibrium.
  - Active traders pay a fee, but have an unconstrained portfolio problem. Indexed traders pay no fee, but can only purchase an index of risky assets.
- There exist noise traders with random demand for each risky asset.

Information Structure:

- Active investors get private signals for both aggregate and relative cash flows.
- Index investors get a private signal about aggregate cash flows.

Model Diagram



Timing

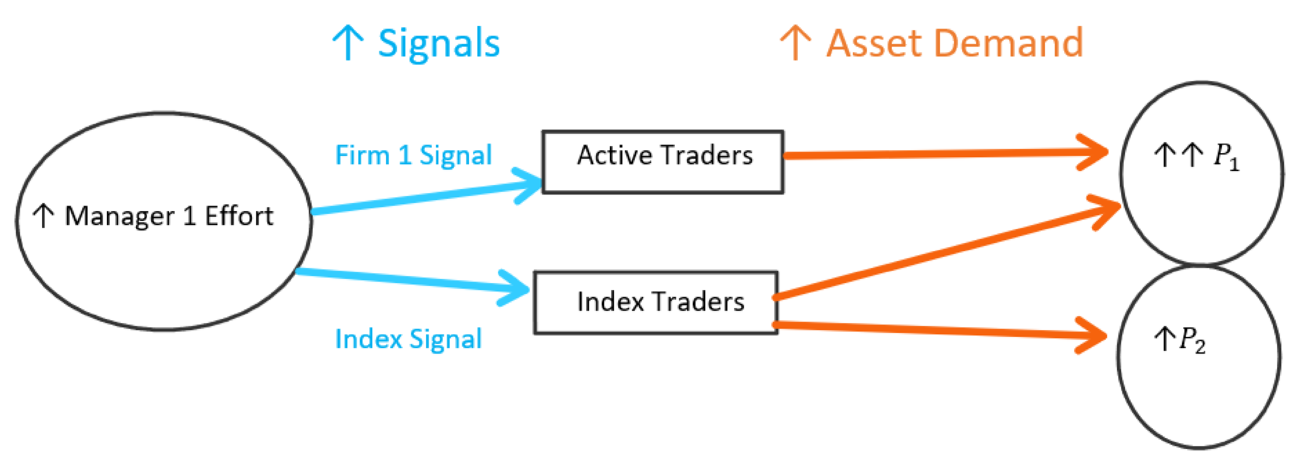
1. The principal and manager agree on a contract and publicly announce it. The manager exerts effort.
2. Investors make a rational inference about μ_k given the contract. They decide whether to become active or indexed.
3. Investors receive their private signals and trade on their information sets, the managers' contracts, and their type (active or indexed). Equilibrium prices are generated.
4. Principal of each firm k receives wage ω_k.
5. Gross payoffs x_k are realized.

Solution

- I conjecture and verify that asset prices (P_1, P_2) are linear in both firms' payoffs and noise demands. I then apply the following normalization:

$$q_k = (1+m_k)P_k + n_k P_j + l_k \equiv b_0 + b_1 x_k + b_2 x_j + b_3 z_k + b_4 z_j$$

I find that $b_1, b_2, b_3 \geq 0$ and $b_4 \leq 0$. The positive sign on b_2 is due to the synchronized demand of index traders.



- The manager's wage is linear in both (normalized) prices:

$$\omega_k = \hat{l}_k + \hat{m}_k q_k + \hat{n}_k q_j \tag{1}$$

- The principal's contracting problem is:

$$\max_{\hat{l}_k, \hat{m}_k, \hat{n}_k} E(x_k - \omega_k) \tag{2}$$

$$\text{s.t. } E(\omega_k) - \frac{1}{2}\mu_k^2 - \frac{1}{2}Var(\omega_k) \geq 0 \tag{IR}$$

$$\mu_k \in \underset{\mu_k}{\text{argmax}}\, E(\omega_k) - \frac{1}{2}\mu_k^2 - \frac{1}{2}Var(\omega_k) \tag{IC}$$

- Solving the contracting problem then gives us the following solutions:

$$\hat{m}_k{}^* = \Gamma * \left(\frac{b_1}{b_2} - \frac{Cov(q_1, q_2)}{Var(q)}\right) \geq 0 \tag{3}$$

$$\hat{n}_k{}^* = \Gamma * \left(\frac{b_2}{b_1} - \frac{Cov(q_1, q_2)}{Var(q)}\right) \tag{4}$$

with $\Gamma > 0$

- Easy to see that $\hat{m}^* > 0$. Will have $\hat{n}^* > 0$ if and only if

$$\frac{b_2}{b_1} > \frac{Cov(q_1, q_2)}{Var(q)}$$

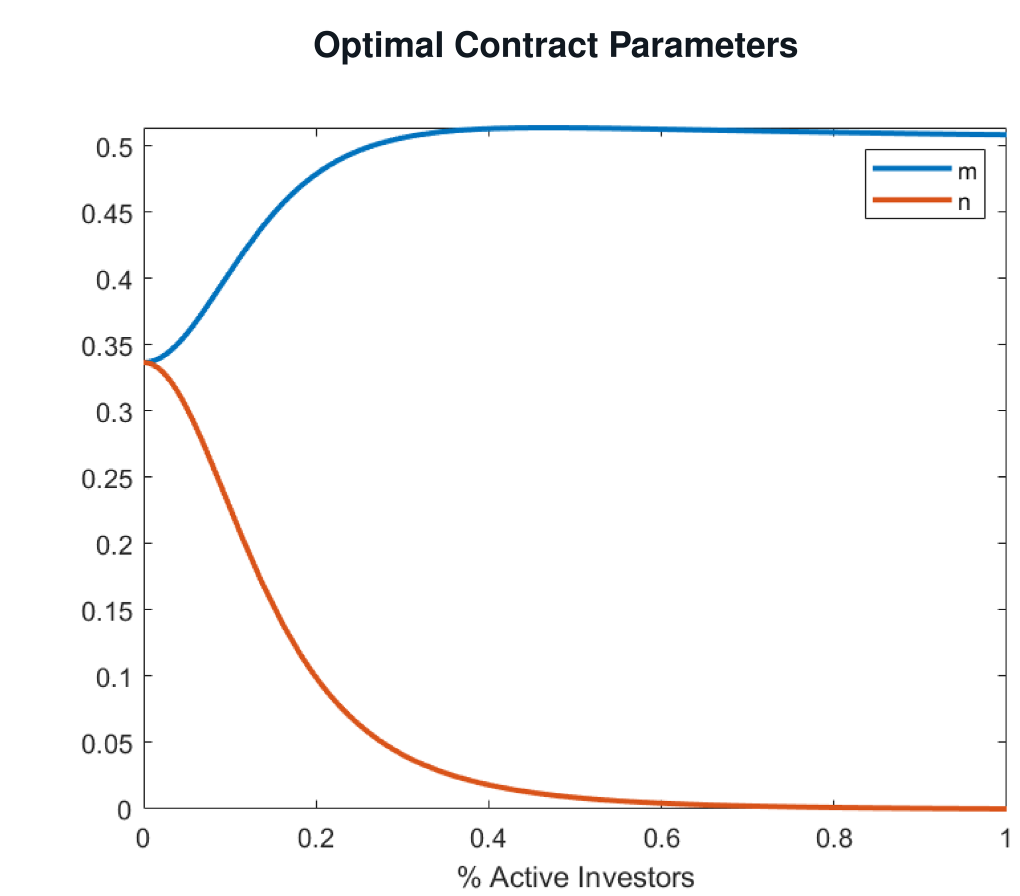
Effort Sensitivity Effect > Hedging Effect

- **Main Result: I find that the effort sensitivity effect is always greater than the hedging effect, so the optimal contract puts a positive weight on the other firm's stock price. That is, $\hat{n}^* \geq 0$.**

Interpretation of Results

- Two motivations for tying the manager's contract to the performance of the other firm:
  - **Effort Sensitivity Effect**: The other firm's stock price is positively related to and provides unique information about the manager's effort. *Implication: want $n^* > 0$.*
  - **Hedging Effect**: The stock prices have common sources of noise. The contract can reduce the manager's risk by hedging out this noise. *Implication: want n^* to have the opposite sign of $Cov(q_1, q_2)$.*
- Why is $n^* \geq 0$? Increased indexing allows noise traders to play a greater role in determining relative prices, and noise traders reduce the importance of the hedging effect. Why?
  - Noise traders decrease the benefits of hedging by lowering the covariance (through the negative b_4).
  - Noise traders make any given hedge riskier through a larger variance.

Numerical Example



Conclusion

- I develop a model that analyzes how changes in the fraction of index investors in financial markets impact optimal managerial contracts.
- Index investors are constrained to purchase all risky assets in the same proportion, so information that affects their demand for the index gets reflected in the prices of the underlying stocks.
- This mechanism distributes the index investors' information about the manager's effort to all stocks in the index.
- Thus, the prices of other index firms are positively related to and contain unique information about the manager's effort. The optimal contract, therefore, puts a positive weight on the performance of other index stocks.