Asset Prices and Institutional Investors

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Incentives of Money Managers and Asset Pricing

- A large portion of trading volume is due to institutional investors
- In standard asset pricing theory, traders are utility-maximizing households
- Incentives of institutions can be markedly different
- Main question: How do these incentives influence asset prices?
- Framework: Conventional asset pricing model, but some funds are managed by money managers

Incentives to Do Well Relative to a Benchmark

- Money managers care about performance relative to their benchmarks
- Why?
  - Explicit incentives: bonuses for performance
  - Implicit incentives: fund flows
- In particular, money managers
  - Dislike to perform poorly when benchmark does well
  - Less concerned about performance when ahead of the benchmark

Main Results

- Institutions tilt their portfolios towards stocks that comprise their benchmark index $\Rightarrow$ index effect
- Institutions amplify index stock and the aggregate stock market levels and volatilities, while reducing Sharpe ratios
- Institutions induce excess correlation among stocks belonging to their index – an “asset-class” effect
- Asset pricing implications of popular policy measures:
  - For example, a side effect of deleveraging is a drop in the index

Related Literature

- Institutions and asset prices:
  Brennan (1993), Gomez and Zapatero (2003), Lieppold and Rohner (2008), Petajisto (2009), He and Krishnamurthy (2009), Cuoco and Kaniel (2010), Kaniel and Kondor (2010)

- Equilibrium effects of delegated money management:
  Dasgupta and Prat (2008), Dasgupta, Prat, and Verardo (2008), He and Krishnamurthy (2008), Guerreri and Kondor (2010), Malliaris and Yan (2008), Vayanos and Woolley (2010)

- Asset-class effect:
  Barberis and Shleifer (2003)

- Portfolio choice with fund flows and benchmarking considerations:
  Carpenter (2000), Ross (2004), Basak, Pavlova, and Shapiro (2007, 2008), Hodder and Jackwerth (2007), van Binsbergen, Brandt, and Koijen (2008), Chen and Pennacchi (2009)

Investment Opportunities

- Single stock = stock market index

$$dS_t = S_t[\mu_{St} dt + \sigma_{St} d\omega_t]$$

- Stock terminal payoff D_T, with its cash flow news:

$$dD_t = D_t[\mu dt + \sigma d\omega_t] \qquad \text{GBM}$$

- Money market account with rate $r = 0$
- Decision variable: risk exposure ϕ
  = fraction of portfolio invested in stock

Investors

- A "retail" investor $\mathcal{R}$

$$u_{\mathcal{R}}(W_{\mathcal{R}T}) = \log(W_{\mathcal{R}T})$$

- An "institutional" investor $\mathcal{I}$

$$u_{\mathcal{I}}(W_{\mathcal{I}T}) = (a + bS_T)\log(W_{\mathcal{I}T}), \qquad a, b > 0$$

  - marginal utility increasing in index level

- Initial endowments:
  - institutional investor: λS_0
  - retail investor: $(1 - \lambda)S_0$
  - λ represents size of institutions in economy

Investors' Portfolio Choice

- Retail investor's risk exposure:

$$\phi_{\mathcal{R}t} = \frac{\mu_{St}}{\sigma_{St}^2}$$

- Institutional investor's risk exposure:

$$\phi_{\mathcal{I}t} = \frac{\mu_{St}}{\sigma_{St}^2} + \underbrace{\frac{b\,e^{\mu(T-t)}D_t}{a + b\,e^{\mu(T-t)}D_t}\,\frac{\sigma}{\sigma_{St}}}_{\text{hedging portfolio} > 0}$$

  - Institution has a higher demand for risky stock

Stock Price, Volatility, and Index Effect

- Equilibrium stock market index in the benchmark (no institutions):
$$\overline{S}_t = e^{(\mu-\sigma^2)(T-t)} D_t$$
- In the economy with institutions:
$$S_t = \overline{S}_t \underbrace{\frac{a + b\, e^{\mu T} D_0 + \lambda\, b(e^{\mu(T-t)} D_t - e^{\mu T} D_0)}{a + b\, e^{\mu T} D_0 + \lambda\, b\, (e^{(\mu-\sigma^2)(T-t)} D_t - e^{\mu T} D_0)}}_{>1}$$
  - Stock market index is higher
  - The larger the institutions (higher λ), the higher the stock index
  - "Index effect"

Why?

- Institutions demand the risky stock for their hedging portfolio
- This creates excess demand for the risky stock
- The price pressure boosts the stock market index

Stock Market Volatility

- Volatility in the benchmark:

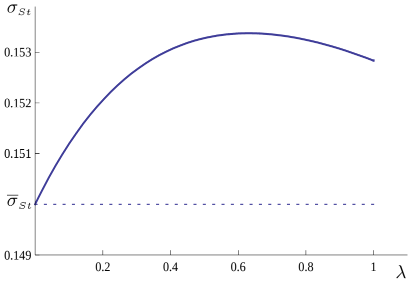
$$\overline{\sigma}_{St} = \sigma$$

- In the economy with institutions:

$$\sigma_{St} = \overline{\sigma}_{St} + \lambda\, b\, \sigma$$
$$\times \frac{\left(1 - e^{-\sigma^2(T-t)}\right)(a + (1-\lambda) b e^{\mu T} D_0) e^{\mu(T-t)} D_t}{\left(a + (1-\lambda)\, b\, e^{\mu T} D_0 + \lambda\, b\, e^{(\mu-\sigma^2)(T-t)} D_t\right)\left(a + (1-\lambda)\, b\, e^{\mu T} D_0 + \lambda\, b\, e^{\mu(T-t)} D_t\right)}$$

- In the economy with institutions
  - Volatility is stochastic
  - Volatility is higher

Index Volatility and Size of Institutions

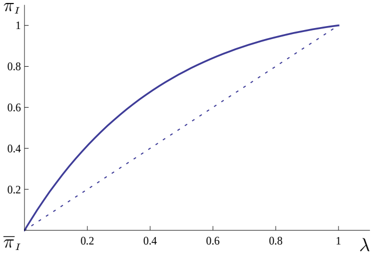


λ – fraction of institutions in economy

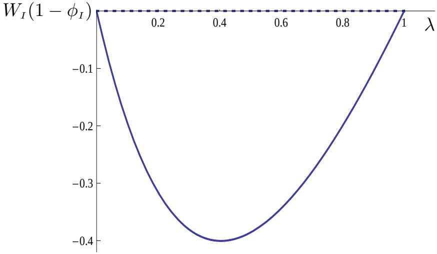
- Institutions desire more risky assets and more risk
- Markets have to clear
- The stock becomes less attractive (higher volatility)

Portfolio of Institutions: Stock and Bond Holdings

Stock holdings



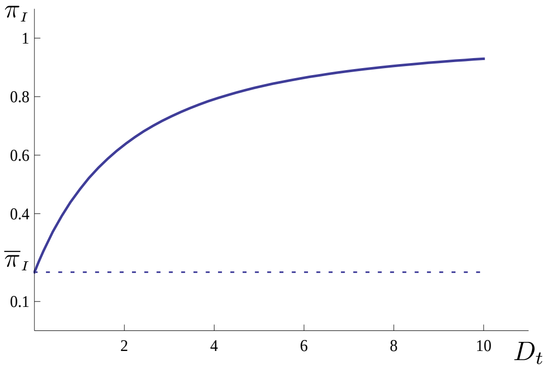
Bond holdings



λ – fraction of institutions in economy

- Institution “tilts” portfolio towards index
- Institution always levered

Stock Holdings and Cash Flow News



D_t – cash flow news

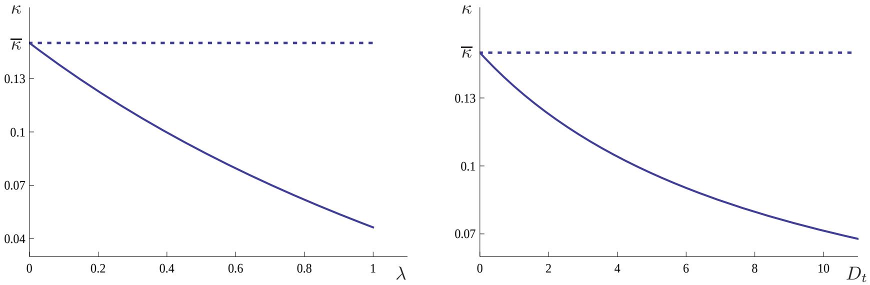
Intuition

- Following good cash flow news, everyone gets wealthier
- All investors demand more shares of stock (a wealth effect – e.g., Kyle and Xiong (2001))
- But the stock is in fixed supply
- Who buys? Who sells?
- Institutional portfolio is over-weighted in the risky stock
- Hence institutions benefit more from good cash flow news. They buy

Further Implications: Sharpe Ratio (μ_s/σ_s)

Effect of size of institutions

Effect of cash flow news



- Institutions bring down Sharpe ratio
- And especially so when times are good, leading to countercyclical Sharpe ratio

Asset Pricing Implications of Popular Policy Measures

Examine two policy prescriptions:

1. deleveraging (a mandate to reduce leverage)
2. transfer of capital to leveraged institutions

Findings:

- Lower leverage $\Rightarrow$ lower holdings of the risky asset by institutions
- Deleveraging reduces stock market level and volatility

Multiple Stocks Economy

- N risky stocks, N sources of risk $\omega = (\omega_1, \ldots, \omega_N)$ BM
- Stock j follows

$$dS_{jt} = S_{jt}[\mu_{S_j t} dt + \sigma_{S_j t} d\omega_t]$$

- Market portfolio

$$S_{MKT\,t} = \sum_{j=1}^{N} S_{jt}$$

- Index

$$I_t = \frac{1}{M} \sum_{i=1}^{M} S_{jt}$$

$M < N$ index stocks, N-M nonindex stocks

Multiple Stocks (cont.)

- Cash flow news of stock j, D_j, follow GBM
  - Cash flow news of stocks j and ℓ are uncorrelated
  - GBM for all stocks but the M^{th} and N^{th}

- Stock market is a claim to D_T,

$$dD_t = D_t[\mu dt + \sigma d\omega_t]$$

- Stock index has a terminal value I_T,

$$dI_t = I_t[\mu_I dt + \sigma_I d\omega_t]$$

  - Loads on the first M Brownian motions
  - Positively correlated with index stock cash flow news, uncorrelated with nonindex stock news

Investors

- Retail investor: as before
- Institutional investor

$$u_{\mathcal{I}}(W_{\mathcal{I}T}) = (a + bI_T)\log(W_{\mathcal{I}T}), \qquad a, b > 0$$

- Initial endowments:
  - institutional investor: $\lambda S_{MKT\,0}$
  - retail investor: $(1 - \lambda)S_{MKT\,0}$

Investors' Portfolio Choice

- Retail investor:

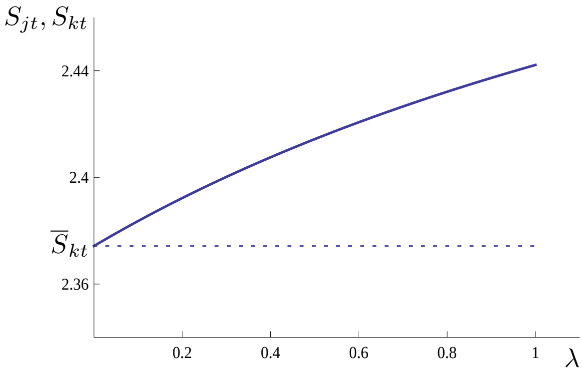
$$\phi_{\mathcal{R}t} = (\sigma_{st}\sigma_{st}^\top)^{-1}\mu_{st}$$

- Institutional investor:

$$\phi_{It} = (\sigma_{st}\sigma_{st}^\top)^{-1}\mu_{st} + \underbrace{\frac{b\, e^{\mu_I(T-t)} I_t}{a + b\, e^{\mu_I(T-t)} I_t}(\sigma_{st}^\top)^{-1}\sigma_I}_{\text{hedging portfolio} > 0}$$

- Institutional investor's hedging portfolio has
  - positive holdings in index stocks
  - zero holdings in nonindex stocks

Index Effect in the Model



index stock S_j

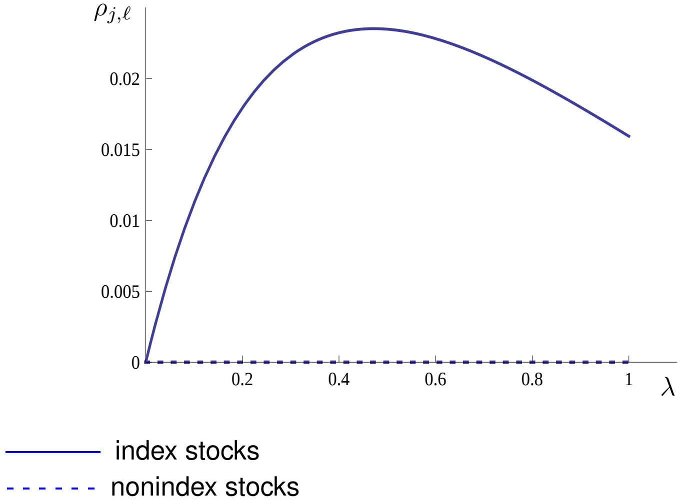
nonindex stock S_k (also retail-investors-only benchmark $\overline{S}_k$)

Prices of stocks added to the index rise on announcement and those of deleted stocks fall

Asset-class Effect

- Returns on stocks in the index are more correlated amongst themselves than with those outside the index
- Barberis, Shleifer and Wurgler (2005): S&P 500 stocks vis-à-vis rest of the market
- Boyer (2010): BARRA value and growth indices
  - “marginal value” stocks comove significantly more with the value index
  - “marginal growth” stocks – with the growth index
- Rigobon (2002): investment-grade vs. non-investment-grade bonds

Asset-class Effect in Our Model: Correlations of Index and Nonindex Stocks



Intuition

- The institutions hold a hedging portfolio, consisting of index stocks only
- Following good cash flow news, institutions get wealthier
- They demand more shares of index stocks (relative to retail-investor-only benchmark)
- This additional price pressure affects all index stocks at the same time
- ... inducing excess correlations among these stocks

Summary of Main Results

The presence of institutions gives rise to

- Index effect
- Amplification of shocks
- Time-varying Sharpe ratios (higher in bad times)
- Asset-class effect

Caution about popular policy prescriptions: effects on asset prices