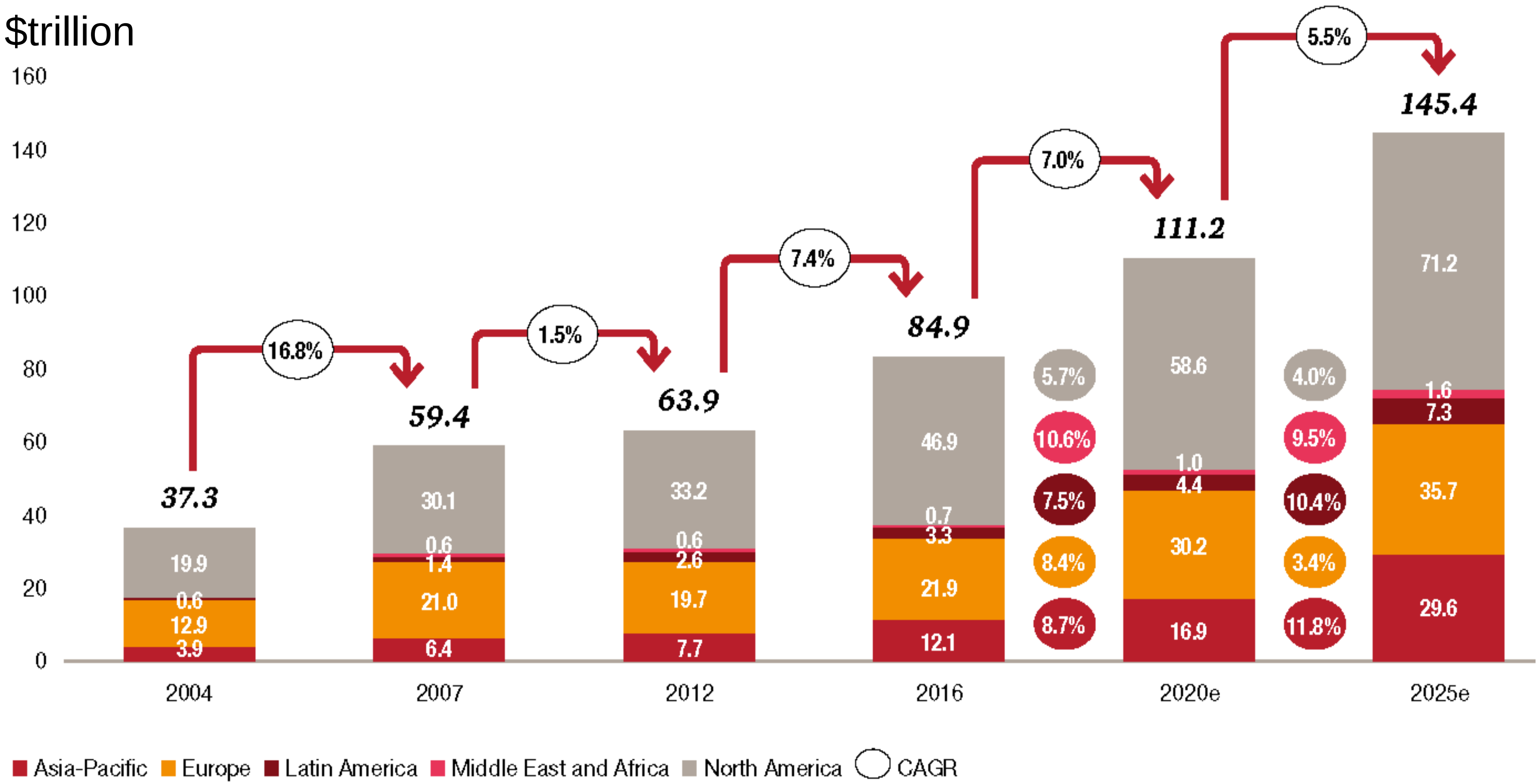
The Benchmark Inclusion Subsidy

Anil Kashyap	**Natalia Kovrijnykh**	**Jian Li**	**Anna Pavlova**
Chicago Booth and Bank of England	Arizona State University	University of Chicago	London Business School

*The views here are those of the authors only and not necessarily of the Bank of England

Global Assets Under Management



Sources: PwC AWM Research Centre analysis. Past data based on Lipper, ICI, EFAMA, City UK, Hedge Fund Research and Preqin

Source: PWC, Asset and Wealth Management Revolution, 2017

Benchmarking in Asset Management

- Money Managed Against Leading Benchmarks

1.	S&P 500	≈$10 trillion
2.	FTSE-Russell (multiple indices)	≈$8.6 trillion
3.	MSCI All Country World Index	≈$3.2 trillion
4.	MSCI EAFE	≈$1.9 trillion
5.	CRSP	≈$1.3 trillion

- Existing research: asset pricing implications of benchmarking

- No analysis of implications of benchmarking for corporate decisions

This Paper

- Asset managers are evaluated relative to benchmarks
- Such performance evaluation creates incentives for managers to hold the benchmark portfolio
  - Regardless of its variance
- Firms inside the benchmark end up effectively subsidized by asset managers
- The value of a project differs for firms inside and outside the benchmark
  - Higher for a firm inside the benchmark
  - The difference is the “benchmark inclusion subsidy”

This Paper (cont.)

- Firms inside and outside the benchmark have different decision rules for M&A, Spinoffs & IPOs

- The “benchmark inclusion subsidy” also varies with firm characteristics
    - Gives novel cross-sectional predictions

None of this is what we usually teach in Corporate Finance

Related Literature

- Index effect
  - Harris and Gurel (1986), Shleifer (1986). Chen, Noronha, and Singal (2004) document price increase of 6.2% post additions
  - Interpretations: Merton (1987), Scholes (1972)
- Asset pricing with benchmarking
  - Brennan (1993), Cuoco and Kaniel (2011), Basak and Pavlova (2013), Buffa, Vayanos, and Woolley (2014)
- Style investing
  - Barberis and Shleifer (2003)
- Stein (1996) – non-CAPM based valuation

Simplified Model: Environment

- Two periods, $t = 0, 1$
- Three risky assets, 1, 2, and y, with uncorrelated cash flows D_i

$$D_i \sim N\left(\mu_i, \sigma_i^2\right), \quad i = 1, 2, y$$

- Asset price denoted by S_i
- Supply of 1 share each
- Riskless asset, with interest rate *r =0*
  - Infinitely elastic supply

Simplified Model: Investors

- Two types of investors
  - Conventional investors (fraction λ_C)
  - Asset managers (fraction λ_{AM})

- All investors have CARA utility:

$$U(\mathrm{W}) = -Ee^{-\alpha W}$$

W is terminal wealth (compensation for asset managers)
α is absolute risk aversion

Baseline Economy: No Asset Managers

- Conventional investors' optimal portfolio (number of shares):

$$x_i = \frac{\mu_i - S_i}{\alpha\, \sigma_i^2} \qquad \text{(mean-variance portfolio)}$$

- Asset prices: $S_i = \mu_i - \alpha\sigma_i^2$

- Consider combining assets i & y to form a single entity
- New optimal portfolio demand: $x_i' = \dfrac{\mu_i + \mu_y - S_i'}{\alpha(\sigma_i^2 + \sigma_y^2)}$
- Price of the combined asset:

$$S_i' = \mu_i + \mu_y - \alpha\left(\sigma_i^2 + \sigma_y^2\right) = \boldsymbol{S_i + S_y}$$

Adding Asset Managers

- Asset managers' compensation: $w = a\, r_x + \boldsymbol{b}(r_x - r_{\boldsymbol{b}}) + c$

r_x – performance of asset manager's portfolio

$r_{\boldsymbol{b}}$ – performance of benchmark

a – fee for absolute performance

b – fee for relative performance

c – independent of performance (e.g., based on AUM)

See Ma, Tang, and Gómez (2018) for evidence

Economy with Asset Managers

- Conventional investors' optimal portfolio:

$$x_i^C = \frac{\mu_i - S_i}{\alpha\, \sigma_i^2} \quad \text{(standard mean-variance)}$$

- Asset managers' optimal portfolio:

Suppose asset 1 is **inside** the benchmark

$$x_1^{AM} = \frac{1}{a+b} \frac{\mu_1 - S_1}{\alpha\, \sigma_1^2} + \boldsymbol{\frac{b}{a+b}}$$

Suppose asset 2 is **outside** the benchmark

$$x_2^{AM} = \frac{1}{a+b} \frac{\mu_2 - S_2}{\alpha\, \sigma_2^2}$$

- Mechanical demand for $\boldsymbol{\frac{b}{a+b}}$ shares of asset 1 (or whatever is in the benchmark)

Economy with Asset Managers (cont.)

- Market clearing: $\lambda_{AM} x_i{}^{AM} + \lambda_C x_i{}^C = 1$

- Asset prices:

$$S_1 = \mu_1 - \alpha\Lambda\sigma_1^2 \left(1 - \boldsymbol{\lambda_{AM} \frac{b}{a+b}}\right) \quad \text{(benchmark)}$$

$$S_2 = \mu_2 - \alpha\Lambda\sigma_2^2 \quad \text{(non-benchmark)}$$

$$S_y = \mu_y - \alpha\Lambda\sigma_y^2 \quad \text{(non-benchmark)}$$

where $\Lambda = \left[\frac{\lambda_{AM}}{a+b} + \lambda_C\right]^{-1}$ modifies the market's effective risk aversion

Suppose y is Acquired by Firm 2

- This merger leaves y **outside** of the benchmark

- New optimal portfolios:

$$x_2^{C\prime} = \frac{\mu_2+\mu_y - S_2'}{\alpha(\sigma_2^2+\sigma_y^2)} \qquad \text{(Conventional investors)}$$

$$x_2^{AM\prime} = \frac{1}{a+b}\frac{\mu_2+\mu_y - S_2'}{\alpha(\sigma_2^2+\sigma_y^2)} \qquad \text{(Asset managers)}$$

- New price of non-benchmark stock 2:

$$S_2' = \mu_2 + \mu_y - \alpha\Lambda\,(\sigma_2^2+\sigma_y^2) = \boldsymbol{S_2 + S_y}$$

Suppose y is Acquired by Firm 1

- This merger moves y **inside** the benchmark.

- New optimal portfolios:

$$x_1^{C\,'} = \frac{\mu_1 + \mu_y - S_1'}{\alpha\,(\sigma_1^2 + \sigma_y^2)} \qquad \text{(Conventional investors)}$$

$$x_1^{AM\,'} = \frac{1}{a+b}\,\frac{\mu_1 + \mu_y - S_1'}{\alpha\,(\sigma_1^2 + \sigma_y^2)} + \frac{\boldsymbol{b}}{\boldsymbol{a+b}} \qquad \text{(Asset managers)}$$

- New price of stock

$$S_1' = \mu_1 + \mu_y - \alpha\Lambda\,(\sigma_1^2 + \sigma_y^2)\left(1 - \lambda_{AM}\frac{b}{a+b}\right)$$

$$= S_1 + S_y + \underbrace{\boldsymbol{\alpha\Lambda\,\sigma_y^2\,\lambda_{AM}\frac{b}{a+b}}}_{\text{benchmark inclusion subsidy (increasing in } \boldsymbol{\sigma_y^2}\text{)}} > S_1 + S_y$$

Conclusions from the Simplified Model

1. Cost of capital differs for benchmark and non-benchmark firms; investment decisions NOT determined only by asset characteristics.

2. Benchmark firms will undertake acquisitions that non-benchmark firms would not.

3. The riskier the acquisition, the higher the benchmark inclusion subsidy.

4. Spinoffs work the other way, more costly to sell assets if they move outside the benchmark.

More General Model

- Assume *N* assets, with *K* inside the benchmark
- Allow *y* to be an investment (or existing firm)
- Allow correlation among all assets

- Compare investments in y by firms in and out. Assume $\sigma_{in} = \sigma_{out} = \sigma$ and $\rho_{in,y} = \rho_{out,y} = \rho_y$.
- Then the benchmark inclusion subsidy is

$$\boxed{\Delta S_{in} - \Delta S_{out} = \alpha \Lambda \left(\sigma_y^2 + \rho_y \sigma \sigma_y\right) \lambda_{AM} \frac{b}{a+b}}$$

Additional Implications

- Benchmark inclusion subsidy: $\alpha\Lambda\left(\sigma_y^2 + \rho_y \sigma \sigma_y\right)\lambda_{AM} \frac{b}{a+b}$

- Subsidy is positive iff $\sigma_y^2 + \rho_y \sigma \sigma_y > 0$

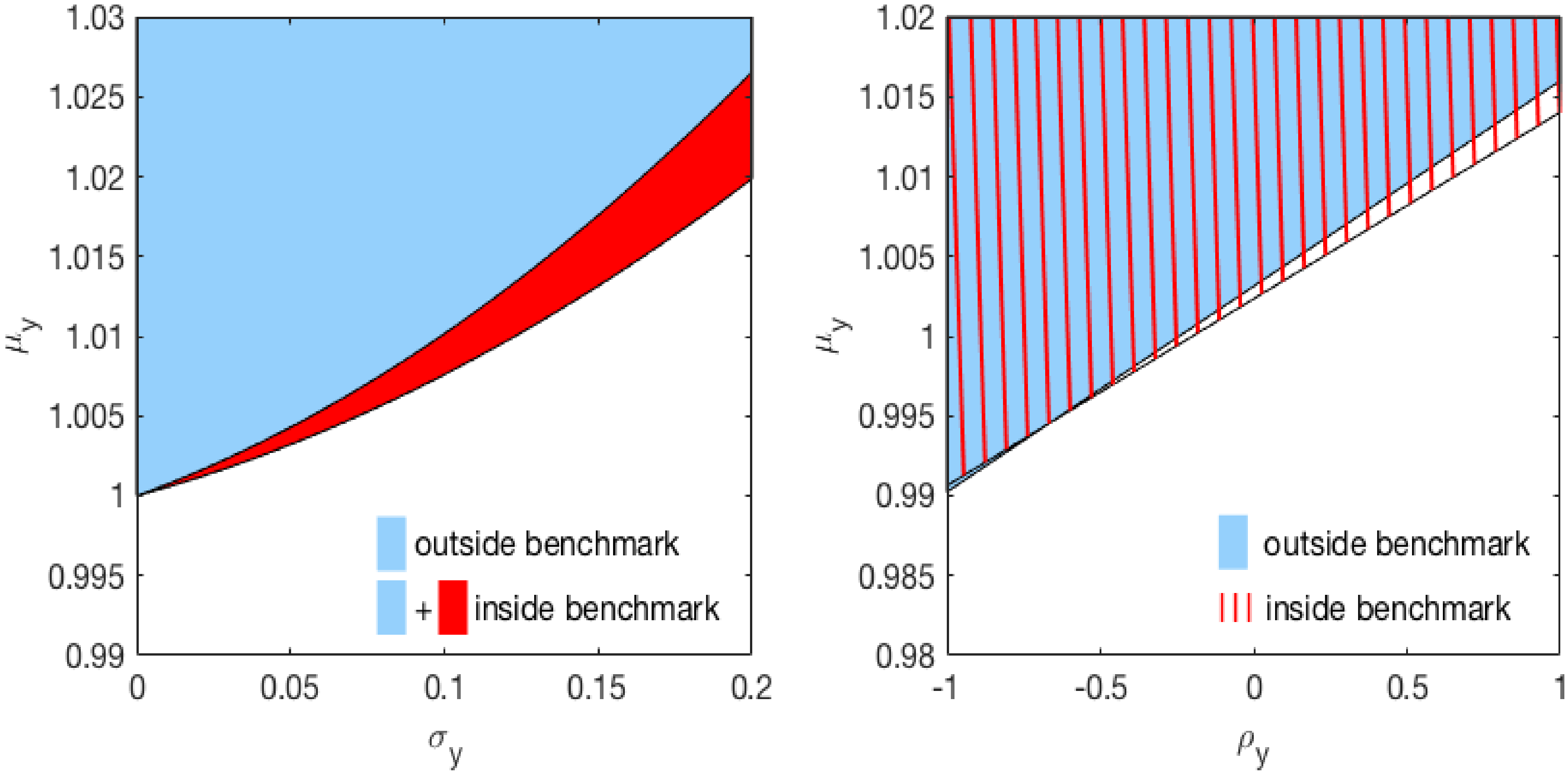
- No subsidy for riskless projects

- Subsidy larger if project is more correlated with existing assets (high ρ_y) or if risk aversion is big (high α)

- Subsidy larger with more AUM (λ_{AM})

  or for large “b” (= passive management)

Investment Regions



Firms inside the benchmark are more willing to take riskier projects and to clone themselves

More on Correlations

- Change in stockholder value (for any firm i):

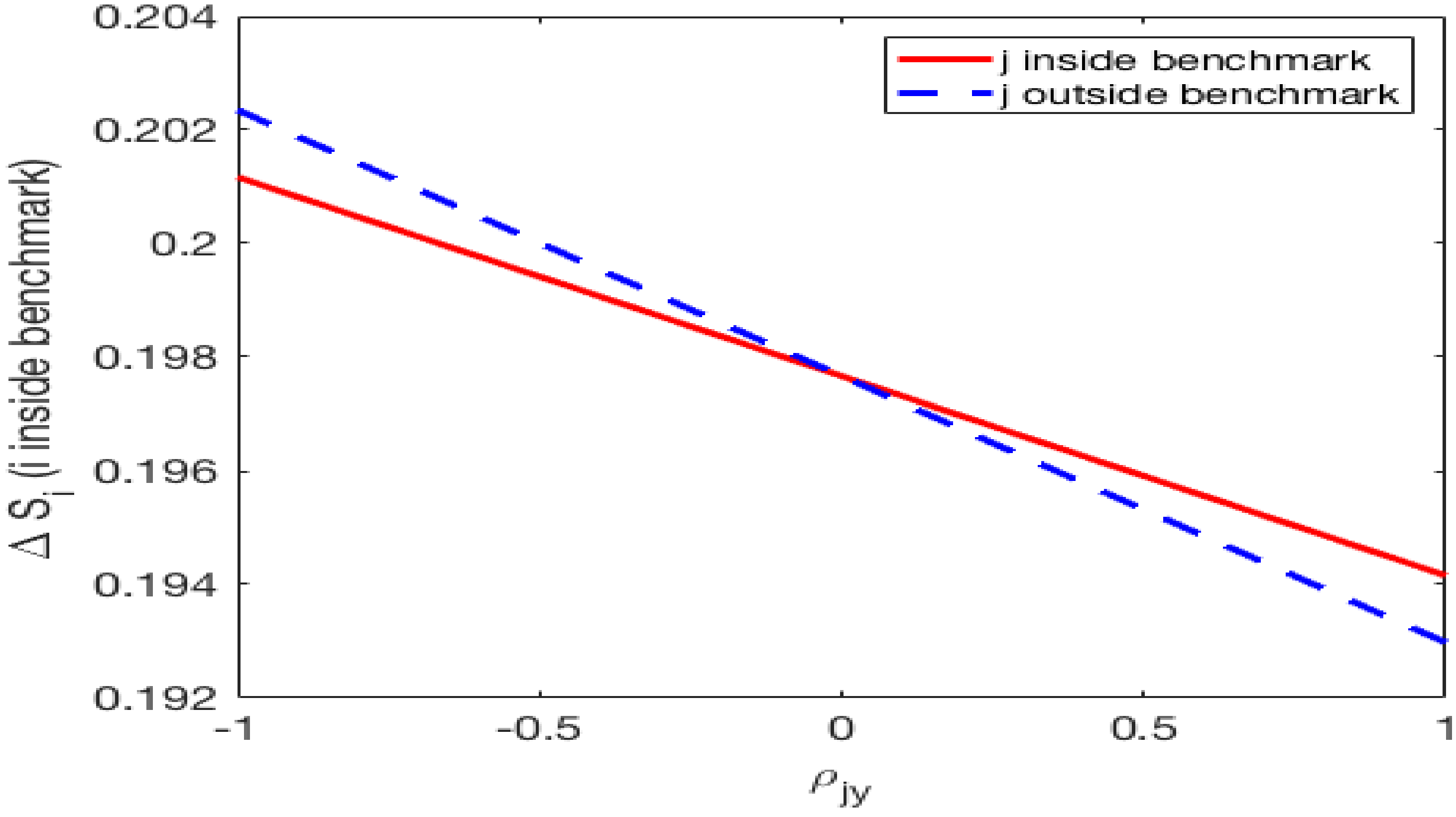
$$\Delta S_i = \mu_y - I$$

$$-\alpha\Lambda\left(\sigma_y^2 + \rho_{iy}\sigma_i\sigma_y\right)\left(1 - \lambda_{AM}\frac{b}{a+b}1_{\mathrm{i\in Benchmark}}\right)$$

$$-\alpha\Lambda\sum_j \rho_{jy}\sigma_j\sigma_y\left(1 - \lambda_{AM}\frac{b}{a+b}1_{\mathrm{j\in Benchmark}}\right)$$

- Asset managers effectively subsidize projects correlated with the benchmark

More on Correlations (cont.)



Benchmarking leads to rise in fundamental firm-level cashflow correlations

More on the Benchmark Inclusion Subsidy

- The subsidy is: $\Delta S_{in} - \Delta S_{out} = \alpha\Lambda\left(\sigma_y^2 + \rho_y\sigma_{in}\sigma_y\right)\lambda_{AM}\frac{b}{a+b}$
- Asset managers subsidize the variance of a benchmark firm's post-investment cash flow

$$\sigma_y^2 + 2\rho_y\sigma_{in}\sigma_y + \sigma_{in}^2$$

- The variance σ_{in}^2 washes out when taking the difference ΔS_{in}
- Of the two covariances $\rho_y\sigma_{in}\sigma_y$, one is subsidized for both benchmark and not-benchmark firms
  - ➢ Projects correlated with the benchmark are valued more, even if a non-benchmark firm undertakes them
  - ➢ Investors value the stock of such non-benchmark firm because of its exposure to the benchmark without being in the benchmark itself
- Hence, one of the two covariances drops out from the difference-in-differences

Incentives to Join the Benchmark

- IPOs more attractive if firm joins the benchmark
- Similar logic applies to firms outside the benchmark
    - Have incentives to accept an apparently negative NPV project or merger to qualify for benchmark inclusion
- Firms on the margin would more likely alter their behaviour to try to get into or stay in the index

Adding Passive Managers

- Fraction λ_{AM}^{A} active and λ_{AM}^{P} passive

- For passive managers, b=∞

- The benchmark inclusion subsidy:

$$\Delta S_{in} - \Delta S_{out} = \alpha \Lambda \left(\sigma_y^2 + \rho_y \sigma \sigma_y \right) \left(\lambda_{AM}^{A} \frac{b}{a+b} + \lambda_{AM}^{P} \right)$$

Related empirical evidence

- Consistent with the index effect – though also brings many additional cross-sectional predictions.

- Benchmark ≠ Index, benchmark matters
  - Sin stocks, Hong and Kacperczyk (2009)

- Benchmark firms invest more and employ more people
  - Bena, Ferreira, Matos, and Pires (2017)

- Bigger subsidy, when λ_{AM} is larger
  - Chang, Hong, and Liskovich (2015)

Conclusions

- Benchmark inclusion subsidy matters for a host of corporate actions

- Some untested predictions $(\alpha\Lambda\left(\sigma_y^2 + \rho_y \sigma \sigma_y\right)\lambda_{AM} \frac{b}{a+b})$

  - IPOs propensities vary with ease of benchmark inclusion
  - Acquisition targets priced differently for firms inside and outside the benchmark
  - Incentives to invest in assets with cash flows that are correlated with the benchmark

- Benchmark construction determines which firms get a subsidy