Institutional Investors and Asset Prices

DIMITRI VAYANOS

London School of Economics, CEPR and NBER

Presidential Address

International Atlantic Economic Society

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Growth of Asset Management

Chart 1 Total AUM of US insurance companies, pension funds, mutual funds and other funds, 1946 – 2013

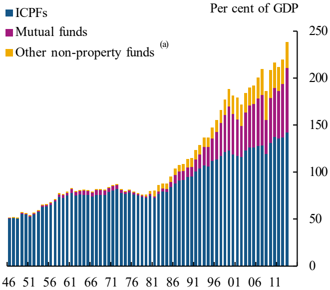
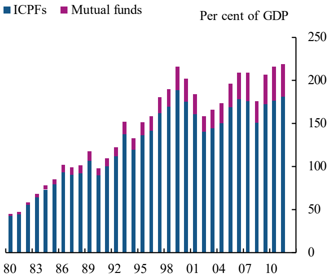


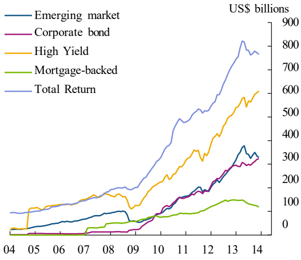
Chart 2 Total AUM of UK insurance companies, pension funds and mutual funds, 1980 – 2012



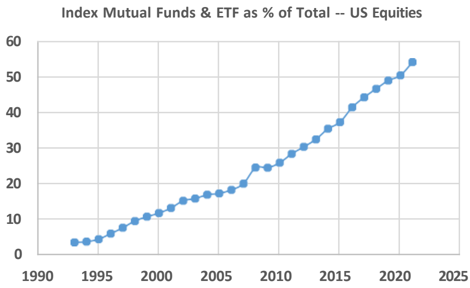
Source: Haldane (2014)

- Asset management in the US has grown four-fold as % of GDP over the past 70 years.
  - Same for the UK over the past 40 years.
- Growth has occurred in both retail sector (mutual funds) and institutional sector (insurance companies and pension funds).

Compositional Changes



Source: Haldane (2014)



Source: Investment Company Institute (2022)

- Specialist mutual funds (e.g., hedge funds, private equity) and mutual funds investing in specialist markets (e.g., emerging market, high yield bonds) have grown rapidly.
- Passive investing (index mutual funds and exchange-traded funds) has grown rapidly.
- Share of active mutual funds in traditional markets (large-cap equities and government bonds) has declined.

Questions

- What do previous trends imply for asset prices and the real economy?
  - Are asset prices more efficient? Less volatile?
  - Are firms better able to finance investment?
- Do previous trends have implications for regulation and policy?
  - Is there scope to improve market outcomes?

Agency Problems

- Asset managers are agents investing others' funds.
  - Investors are uncertain about asset managers' ability.
    - Evaluate asset managers' performance relative to benchmark indices.
    - Constrain funds' deviations from indices.
  - Asset managers are concerned about investors' perception of their ability.
    - Do not stray far from benchmark indices.
    - Window-dress.

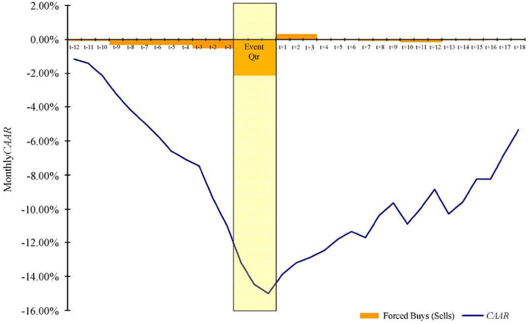
- Two layers of agency.
  - Asset managers are agents of fund trustees (pension funds, sovereign wealth funds, etc).
  - Fund trustees are agents of ultimate asset owners (workers, taxpayers, etc).

Roadmap

- Agency problems in asset management give rise to procyclical trading.
  - Investors chase performance by asset managers → Buy assets that rise in price.
  - Asset managers keep deviations from index in check → Buy assets that they underweight and that rise in price.
- Passive investing is not neutral.
  - Raises disproportionately stock prices of large or overvalued firms.
  - Raises level and volatility of aggregate stock market.
- Summary and policy implications.

Flow-Based Procyclicality

- Suppose that investors flow from underperforming to overperforming funds.
- → Price drops of underperforming assets are amplified.
- → Prices of underperforming assets drop below assets' fundamental values.



Source: Coval-Stafford (JFE 2007)

Momentum and Value

- Two of the most prominent financial anomalies are momentum and value.
  - Momentum: Assets with good (bad) recent performance continue overperforming (underperforming) in near future.
  - Value: Assets that are expensive (cheap) relative to measures of fundamental value tend to subsequently underperform (overperform).

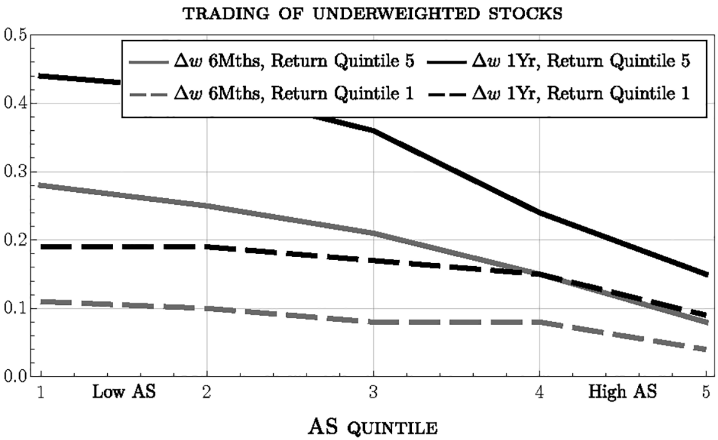
- Performance-chasing flows can explain these phenomena. *Barberis-Shleifer (JFE 2003), Lou (RFS 2012), Vayanos-Woolley (RFS 2013), Polk-Vayanos-Woolley (WP 2022)*
  - Negative shock hits fundamental value of some assets → Mutual funds holding these assets realize low returns → They experience outflows by investors → They sell assets they own, amplifying the shock.
  - Gradual flows → Momentum.
  - Prices move below fundamental values → Value.

Constraint-Based Procyclicality

- Suppose that asset managers keep deviations from index in check.
  - Contractual constraints or career concerns.
- → Asset managers buy assets that they underweight and that rise in price. Procyclical trading.
  - *Example:* Asset with 10% weight in index and 5% weight by managers.
  - Asset rises to 20% weight in index.
  - → Weight by managers rises to (approximately) 10%.
  - → Managers must buy asset to raise weight to 15%.
- → Asset managers sell assets that they overweight and that rise in price. Countercyclical trading.
  - Effect is weaker because constraints become looser when managers perform well.
- Overvalued assets account for larger fraction of market movements than undervalued assets.
  - → Constraints are more binding for overvalued assets.
  - → Overvaluation is associated with procyclical trading and high volatility. Inverted (negative) risk-return relationship.
  - → Overvaluation bias for aggregate asset market.

Buffa-Vayanos-Woolley (JPE 2022)

Evidence



Source: Buffa-Vayanos-Woolley (JPE 2022)

- Funds with lower active share (deviation from benchmark) buy more aggressively the stocks that they underweight and that rise in price.

Passive Investing

- Passive investing is less prone to procyclical trading.
  - No role for managerial ability → No performance-chasing flows.
  - Funds hold benchmarks → No constraint-induced trading.

- Passive investing generates other distortions.
  - Stock prices become less informative. *Grossman-Stiglitz (AER 1980)*
  - Prices of index firms rise relative to non-index firms. *Harris-Gurel (JF 1986), Shleifer (JF 1986)*
  - Prices of the largest firms in the economy rise the most—even when index includes all firms. *Jiang-Vayanos-Zheng (WP 2022)*

Flows into Passive Funds in CAPM World

- Suppose that passive flows are due to entry by new investors into the stock market.
- $\rightarrow$ Market risk premium drops.
- $\rightarrow$ Stock prices rise, especially for firms with high CAPM beta.
- Small firms have higher CAPM beta than large firms $\rightarrow$ Higher returns for small firms than for large firms.

Why Largest Firms Rise the Most?

- Stock prices rise → Price movements become larger in absolute terms.
- Resulting increase in risk attenuates increase in prices.
- Small and medium-size firms:
  - Only priced risk is systematic.
  - Attenuation effect is strong because systematic price movements pertain to investors' entire portfolio.
- Large firms:
  - Idiosyncratic risk is also priced because it accounts for non-negligible fraction of aggregate stock market movements. (Granular effects. *Gabaix (ECMA 2011)*)
  - Attenuation effect is weak because idiosyncratic price movements pertain to investors' position in only one firm.

Additional Results

- Passive flows raise stock return volatility for largest firms the most.
  - Risk premium for large firms' idiosyncratic risk declines → Idiosyncratic price movements become larger.
  - Volatility of aggregate stock market rises.

- Effects of passive flows are most pronounced for overvalued firms, holding size constant.
  - Attenuation turns into amplification.
  - Larger idiosyncratic price movements → Investors scale down short positions in overvalued firms → Firms' stock prices increase → Idiosyncratic price movements become even larger, and so on.

- Passive flows drive aggregate stock market up even when they are entirely due to a switch by investors from active to passive.
  - Negative effects of passive flows on small or undervalued firms are far smaller than positive effects on large or overvalued firms.

- Index addition effects are larger for larger or overvalued firms.

Model

- Continuous time t goes from zero to infinity.
- Riskless asset, exogenous return $r > 0$.
- N firms $n = 1, .., N$. Stock of firm n is in supply of $\eta_n > 0$ shares and pays dividend flow per share

$$D_{nt} = \bar{D}_n + b_n D^s_t + D^i_{nt}$$

  - $\bar{D}_n \geq 0$: Constant component.
  - $b_n D^s_t$: Systematic component. Systematic factor D^s_t follows square-root process

$$dD^s_t = \kappa^s \left(\bar{D}^s - D^s_t \right) dt + \sigma^s \sqrt{D^s_t} dB^s_t$$

    with $(\kappa^s, \bar{D}^s, \sigma^s)$ positive and b_n non-negative.
  - D^i_{nt}: Idiosyncratic component, follows square-root process

$$dD^i_{nt} = \kappa^i_n \left(\bar{D}^i_n - D^i_{nt} \right) dt + \sigma^i_n \sqrt{D^i_{nt}} dB^i_{nt}.$$

    with $\{\kappa^i_n, \bar{D}^i_n, \sigma^i_n\}_{n=1,..,N}$ positive, and $(B^s_t, \{B^i_{nt}\}_{n=1,..,N})$ mutually independent.
  - Normalizations: $\bar{D}^s = 1$ and $\bar{D}_n + b_n + \bar{D}^i_n = 1$.
- Square-root process: Tractable specification that ensures:
  - Positive prices.
  - Volatility of dividend per share *increases* with level of dividend per share.

Agents

- Experts (active investors).
  - Can invest in all firms without constraints.
  - Maximize $\mathrm{E}_t(dW_{1t}) - \frac{\rho}{2}\mathrm{Var}_t(dW_{1t})$ over number of shares $\{z_{1nt}\}_{n=1..,N}$ held in the stocks.
  - Measure μ_1.
- Non-experts (passive investors).
  - Can invest in riskless asset and capitalization-weighted index that includes η_n' shares of firm n, where $\eta_n' = \eta_n$ for $n \in \mathrm{I}$ and $\eta_n' = 0$ for $n \notin \mathrm{I}$.
  - Maximize $\mathrm{E}(dW_{2t}) - \frac{\rho}{2}\mathrm{Var}(dW_{2t})$ over fraction λ held in the index.
  - Measure μ_2.
- Noise traders demand inelastically u_n shares of firm n.
  - Noise traders are not essential for main result.

Equilibrium Prices

- **Proposition:** Stock price of firm n is

$$S_{nt} = \underbrace{\frac{\bar{S}_n}{r}}_{\text{PV of constant component, } \bar{S}_n} + \underbrace{b_n a_1^s \frac{\kappa^s + rD_t^s}{r}}_{\text{PV of systematic component, } b_n S^s(D_t^s)} + \underbrace{a_{n1}^i \frac{\kappa_n^i \bar{D}_n^i + rD_{nt}^i}{r}}_{\text{PV of idiosyncratic component, } S_n^i(D_{nt}^i)},$$

where

$$a_1^s = \frac{2}{r + \kappa^s + \sqrt{(r+\kappa^s)^2 + 4\rho \left(\sum_{m=1}^{N} \frac{\eta_m - \mu_2 \lambda \eta_m' - u_m}{\mu_1} b_m \right) (\sigma^s)^2}},$$

$$a_{n1}^i = \frac{2}{r + \kappa_n^i + \sqrt{(r+\kappa_n^i)^2 + 4\rho \frac{\eta_n - \mu_2 \lambda \eta_n' - u_n}{\mu_1} (\sigma_n^i)^2}},$$

and $\lambda > 0$ solves scalar equation.

- Price *and* price sensitivity to dividend shocks are decreasing in:
  - Systematic supply: $\sum_{m=1}^{N} \frac{\eta_m - \mu_2 \lambda \eta_m' - u_m}{\mu_1} b_m \, (\sigma^s)^2$.
  - Idiosyncratic supply $\frac{\eta_n - \mu_2 \lambda \eta_n' - u_n}{\mu_1} (\sigma_n^i)^2$.

Price Sensitivity and Supply – Intuition

- Positive shock to dividends of stock n
- → Expected future dividends rise *and* become riskier (square-root process).
- If supply is positive (experts hold a long position)
  - → Experts become more willing to sell stock n to reduce risk
  - → Stock price increases less than when supply is zero.
- If supply is negative (experts hold a short position)
  - → Experts become more willing to buy stock n to reduce risk
  - → Stock price increases more than when supply is zero.
- Difference with standard CARA-normal models.
  - Supply affects price but not price sensitivity.

Calibrated Example – Parameter Values

- Normalizations:
  - $\mu_1 + \mu_2 = 1$ in baseline case.
  - $\rho = 1$.

- $r = 3\%$.

- μ_1 and μ_2.
  - $\mu_1 = 0.9$, $\mu_2 = 0.1$ in baseline case. Passive 10% of active plus passive.
  - Raise μ_2 to 0.6. Two polar cases:
    - Passive flows due to entry into the stock market. $\mu_1 = 0.9$, $\mu_2 = 0.6$.
    - Passive flows due to switch from active to passive. $\mu_1 = 0.4$, $\mu_2 = 0.6$.

- Size distribution of firms. Power law with exponent one. *Gabaix (JEP 2016)*
  - Ten firms in supply of $3125\,\mathrm{E}\,\eta$ shares each. Size group 1. (Avg =$1tn)
  - 50 firms in supply of $625\,\mathrm{E}\,\eta$ shares each. Size group 2. (Avg = $207bn)
  - 250 firms in supply of $25\,\mathrm{E}\,\eta$ shares each. Size group 3. (Avg = $48.1bn)
  - 1250 firms in supply of $5\,\mathrm{E}\,\eta$ shares each. Size group 4. (Avg = $6.71bn)
  - 1250 firms in supply of η shares each. Size group 5. (Avg = $815mn)

Parameter Values (cont'd)

- Noise traders.
  - Absent in baseline case.
  - Alternative: Noise-trader demand equal to zero for half of stocks in each size group and to 40% of shares issued for remaining stocks.

- Index.
  - Includes all firms in baseline case.
  - Alternative: Includes only firms in size groups 3, 4 and 5. (S&P500)

- Dividend processes.
  - $\kappa^s = \kappa^i_n \equiv \kappa$ for all n.
  - $\bar{D}^i_n \equiv \bar{D}^i$ and $\sigma^i_n = \sigma^i$ for all n.
  - $\frac{\sqrt{\sigma^i}}{\bar{D}^i} = \frac{\sqrt{\sigma^s}}{\bar{D}^s} = \sigma^s$. Distributions of D^s_t and D^i_{nt} same when scaled by their long-run means.
  - $b_n = \bar{b} - (m - 3)\Delta b \geq 0$ for size group m. Size negatively related to CAPM beta when $\Delta b > 0$.

- $(\kappa, \bar{D}^i, \bar{b}, \Delta b, \sigma^s, \eta)$: Match expected return, return volatility, CAPM beta, and CAPM R-squared across firms' sizes.

No Noise Traders

- Return moments in baseline case.

Size Group	Expected Return (%)	Return Volatility (%)	CAPM Beta	CAPM R^2 (%)
1 (Smallest)	5.61	21.12	1.35	22.68
2	4.94	18.19	1.16	22.45
3	4.45	16.01	1.02	22.70
4	4.17	13.98	0.95	25.79
5 (Largest)	4.09	11.58	0.95	37.21

- % price change when μ_2 is raised to 0.6. Set $D^s_t = \bar{D}^s = 1$, $D^r_{nt} = \bar{D}^r$.

Size Group	Entry into the Stock Market		Switch from Active to Passive	
	All Stocks in Index	Size Groups 3-5 in Index	All Stocks in Index	Size Groups 3-5 in Index
1 (Smallest)	6.51	6.36	0	-0.52
2	5.60	5.32	0	-1.05
3	5.44	5.70	0	1.08
4	6.54	7.62	0	3.97
5 (Largest)	7.71	9.90	0	7.23

- Entry by new investors into the stock market:
  - Effect is *J*-shaped with size.
  - More so if index includes only medium and large stocks.
- Switch by investors from active to passive:
  - No effect if index includes all stocks.
  - Otherwise:
    - Effect increases with size.
    - Effect is *asymmetric:* aggregate market rises.

Passive Flows and Return Volatility

- Change in return volatility when μ_2 is raised to 0.6.

Size Group	Baseline Return Volatility	Change in Return Volatility			
		Entry into the Stock Market		Switch from Active to Passive	
		All Stocks in Index	Size Groups 3-5 in Index	All Stocks in Index	Size Groups 3-5 in Index
1 (Smallest)	21.12	-0.04	-0.04	0	0
2	18.19	0.11	0.11	0	-0.03
3	16.01	0.22	0.23	0	0.06
4	13.98	0.39	0.46	0	0.28
5 (Largest)	11.58	0.65	0.83	0	0.66

- Return volatility rises for large firms.
- Increase in price sensitivity to idiosyncratic component of dividends.

Noise Traders

- Return moments.

Size Group	Noise-Trader Demand	Expected Return (%)	Return Volatility (%)	Market Beta	CAPM R^2 (%)
1 (Smallest)	Low	5.17	21.10	1.34	24.95
	High	5.17	21.10	1.34	24.93
2	Low	4.58	18.25	1.16	24.78
	High	4.58	18.25	1.16	24.69
3	Low	4.16	16.10	1.03	25.11
	High	4.13	16.16	1.02	24.70
4	Low	3.91	14.10	0.96	28.40
	High	3.84	14.31	0.95	26.88
5 (Largest)	Low	3.86	11.75	0.95	40.06
	High	3.73	12.19	0.94	36.72

- Noise trader demand affects larger firms .
- Within larger size groups, it generates inverted risk-return relationship. High noise-trader demand:
  - Low expected return.
  - High volatility. High sensitivity to idiosyncratic component of dividends.

Passive Flows and Stock Prices

- % price change when μ_2 is raised to 0.6. Set $D^s_t = \bar{D}^s = 1$, $D^I_{nt} = \bar{D}^I$.

Size Group	Noise-Trader Demand	Increase in Market Participation		Switch from Active to Passive	
		All Stocks in Index	Size Groups 3-5 in Index	All Stocks in Index	Size Groups 3-5 in Index
1 (Smallest)	Low	6.97	6.83	-0.07	-0.87
	High	6.97	6.83	0.01	-0.80
2	Low	5.98	5.75	-0.18	-1.33
	High	5.97	5.73	0.13	-1.04
3	Low	5.66	5.84	-0.61	-0.18
	High	5.65	5.85	0.64	1.25
4	Low	6.36	7.12	-1.57	0.45
	High	6.72	7.77	2.28	6.78
5 (Largest)	Low	7.13	8.54	-2.09	0.91
	High	8.94	12.17	4.81	31.95

- Larger % price change for firms in high noise-trader demand (overvalued).
  - Increase in price sensitivity to shocks to idiosyncratic component does not attenuate and can even amplify price increase for these stocks.
- Asymmetric effect. Aggregate market rises even when flows are pure switch from active to passive.

Index Additions

- % price change and change in return volatility when a stock is added to the index. Set $\mu_2 = 0.6$.

Size Group	Noise-Trader Demand	Percentage Price Change		Change in Return Volatility	
		All Stocks in Index	Size Groups 3-5 in Index	All Stocks in Index	Size Groups 3-5 in Index
1 (Smallest)	Low	0.04	0.06	0.00	0.00
	High	0.04	0.06	0.00	0.00
2	Low	0.18	0.26	0.01	0.01
	High	0.19	0.26	0.01	0.01
3	Low	0.72	1.03	0.03	0.05
	High	0.77	1.10	0.04	0.05
4	Low	2.03	2.98	0.13	0.20
	High	2.64	3.92	0.17	0.25
5 (Largest)	Low	2.66	4.14	0.23	0.35
	High	5.03	8.42	0.41	0.68

- % price change is larger for larger and overvalued stocks.
- Change in volatility is larger for these stocks.

Empirical Evidence

- Flows into S&P500 index mutual funds and plain-vanilla ETFs.
- Stock prices, returns and index composition are from CRSP.
- S&P500 index mutual fund assets and flows are from ICI. Top three S&P500 index ETFs (account for almost all ETFs).
- Sample period is 1996-2020. Periods are quarters.

Returns – Large Stocks vs. Index

	$R^{ew}_{Large-Index}$	$R^{vw}_{Large-Index}$	$R^{ew}_{Large-Index}$	$R^{vw}_{Large-Index}$
$PassiveFlow$	0.00549 (3.60)	0.00550 (3.67)	0.00523 (4.14)	0.00525 (3.64)
R_{Index}			-0.0374 (-1.69)	-0.0203 (-0.70)
$L.R_{Index}$			-0.0104 (-0.41)	0.00773 (0.36)
VIX			0.00201 (1.35)	0.00271 (1.31)
Constant	-0.00146 (-0.90)	-0.00166 (-0.79)	-0.000197 (-0.10)	-0.00134 (-0.52)
Observations	99	99	99	99
Adjusted R^2	0.124	0.087	0.206	0.123

- Large = Top decile.
- Passive flows are associated with high contemporaneous return of large stocks relative to S&P500.
  - One standard deviation increase in passive flows → Quarterly excess return of large stocks increases by 0.55% ≡ one-third standard deviations.
  - → Rise in passive investing over past 25 years caused prices of 50 largest US firms to rise by 30% more than US stock market.

Return Volatility

	TotVol	*IdioVol*	*TotVol*	*IdioVol*
L.*PassiveFlow* × *Large*	21.66 (2.33)	19.30 (2.52)	22.34 (2.26)	18.41 (2.44)
L.*PassiveFlow*	20.51 (0.83)	20.64 (1.21)		
L.*Large*	-0.0354 (-2.38)	-0.0471 (-2.84)	-0.0401 (-3.26)	-0.0668 (-4.81)
L.R_{Index}	-0.350 (-1.41)	-0.356 (-1.93)		
L.*TotVol*	0.610 (15.33)		0.530 (29.59)	
L.*IdioVol*		0.628 (22.88)		0.456 (28.33)
Observations	45,737	45,737	45,737	45,737
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	No	Yes	Yes
Adjusted R^2	0.559	0.600	0.777	0.712

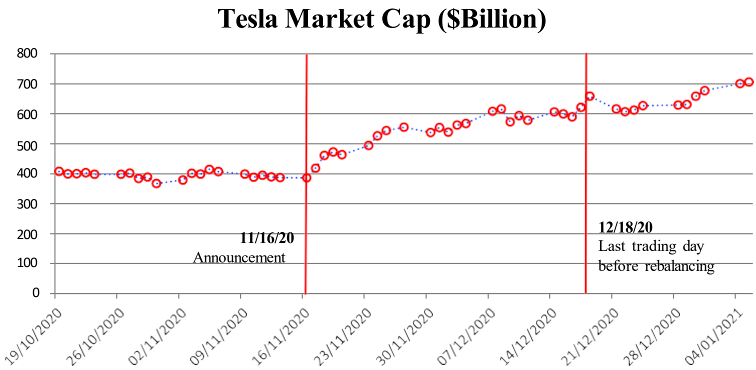
- Passive flows raise more the volatility of large stocks.
  - One standard deviation increase in passive flows → Total volatility increases by 1.85% for stocks outside top decile, and 3.80% for stocks in top decile.
  - Similar effects on idiosyncratic volatility.

Index Additions

	$CAR^m_{a,e-1}$	$CAR^m_{e-1,e}$	$CAR^m_{e,e+5}$
$Cap/\$SP500IndexCap$	27.92	8.066	-6.234
	(7.28)	(2.38)	(-2.62)
Constant	1.383	0.388	-0.610
	(2.84)	(1.19)	(-1.74)
Observations	426	426	426
Adjusted R^2	0.092	0.022	0.006

- Index additions raise more the prices of large stocks.

Case Study: Tesla



- Tesla's market capitalization rose by 50% in the month around its addition to the S&P500.

Summary and Policy Implications

- Agency problems in asset management give rise to procyclical trading.
- Passive investing is not neutral, but benefits largest firms.
- Common themes:
  - Inverted risk-return relationship.
  - Overvaluation bias for aggregate stock market.
- Implications for policy and practice:
  - Re-design asset management contracts and evaluation metrics in light of the incentives they generate.
  - Re-design benchmark indices in light of their pricing effects.