

SYSTEMATIC RISK AND MEASURES OF MONOPOLY POWER

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AGENDA

1. Purpose and Value
2. Data & Measures of Power
3. Regressions
4. Conclusion

Appendix

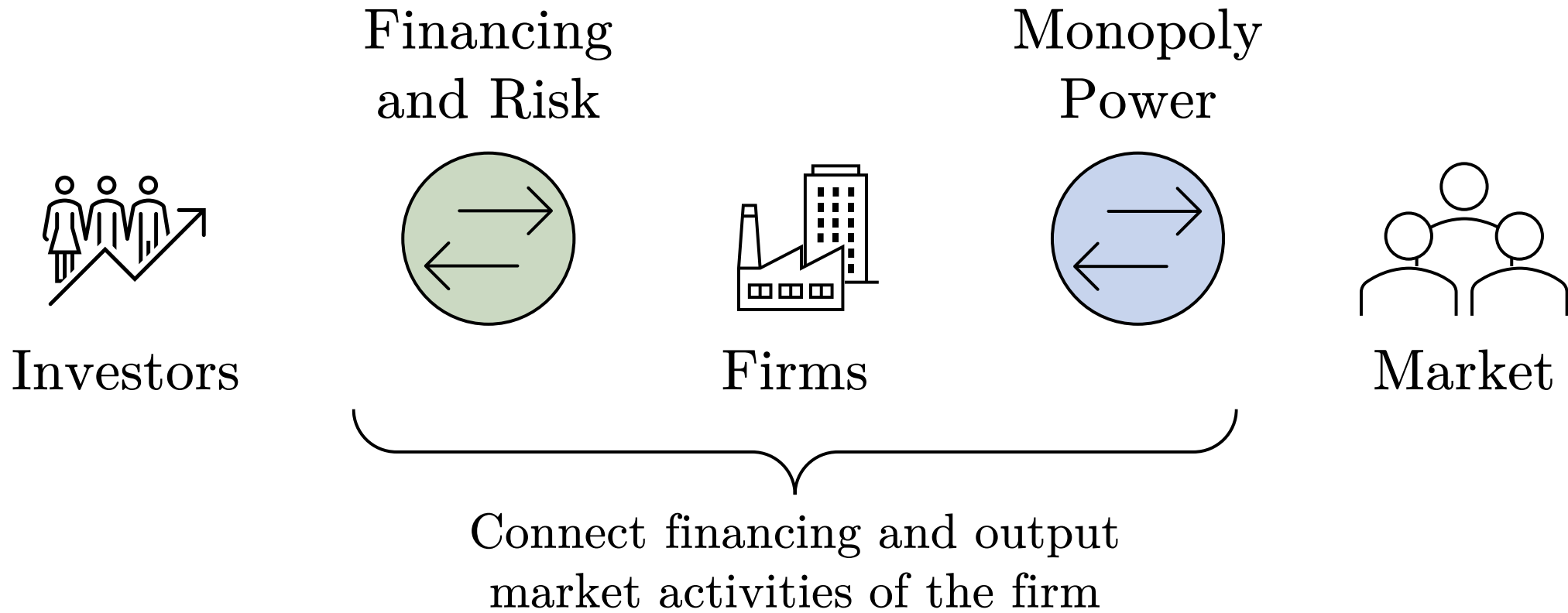
- 1. Robustness Checks*
- 2. Detailed Measures of Power*

*Why is the relationship
between Risk and Monopoly
Power important?*

WHY RELATE RISK AND POWER?

- Understand firm decision making
 - Managers, risk, and reward
 - Interaction between risk and power
- Investors and valuation
 - How much is monopoly power worth?
- Better measures of power
 - Measuring risk is easy
 - Measuring monopolism is tricky

WHY RELATE RISK AND POWER?



MY CONTRIBUTION

My paper adds to the literature by comparing several measures of monopoly power with the same data, resulting in an apples-to-apples comparison.

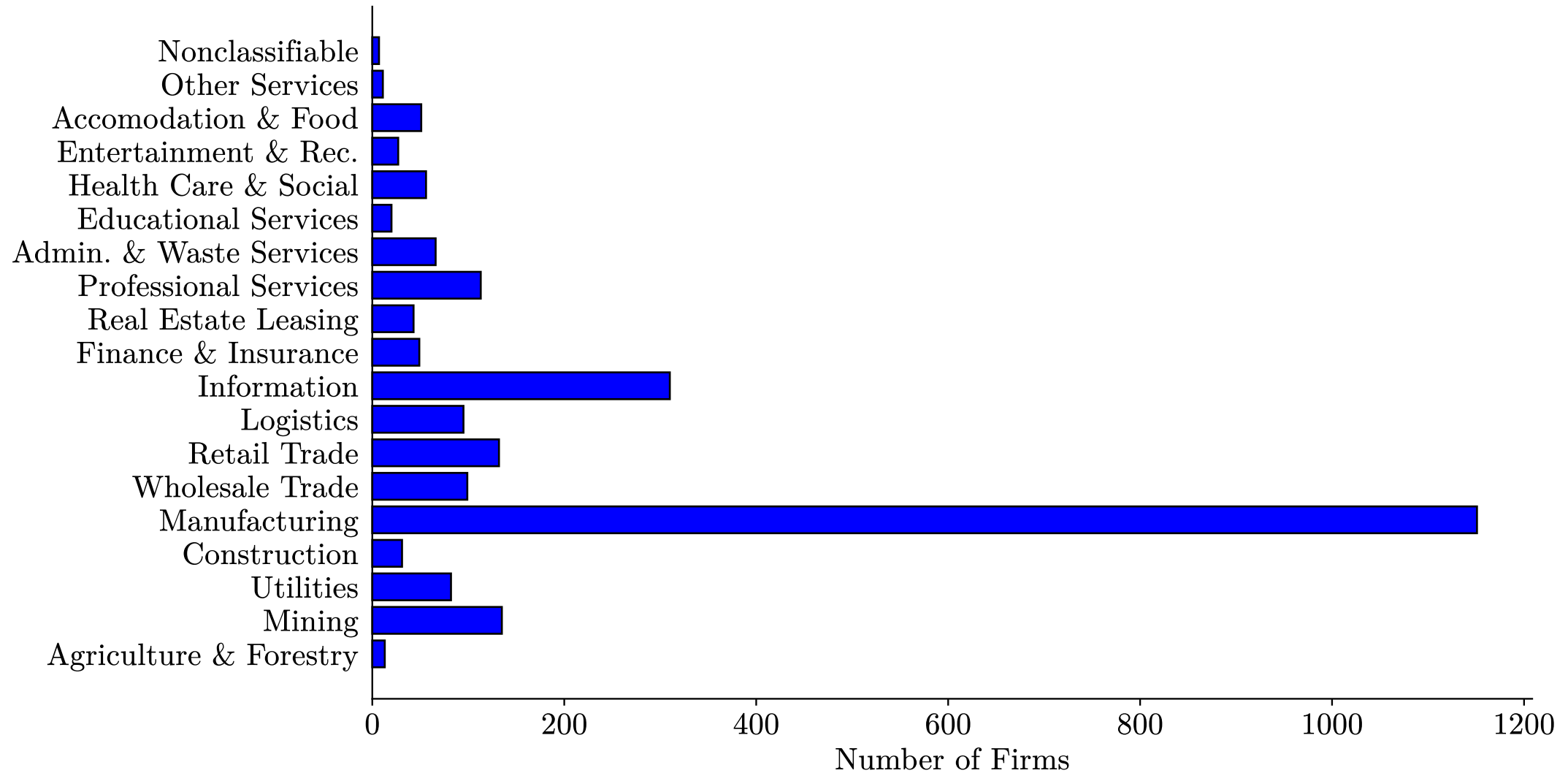
I also use the Lerner Index, unused by previous studies, which is more theoretically rigorous.

DATA

WHARTON RESEARCH DATABASE

- CompustatIQ
- Quarterly financial data
 - Revenues, earnings, costs, taxes, assets, debt, etc.
- Monthly stock price data
 - Total return and price return
 - I use total return to calculate systematic risk
- My subset includes only US-traded non-financial firms
- Used commonly in literature

FIRMS BY INDUSTRY



MEASURES OF POWER

- Marginal Profit
 - Lerner (Economic Profit)
 - Price-Cost Margin (Accounting Profit)
 - *Regression-based statistics*
- Concentration
 - Market Share
 - Hirshman-Herfindahl Index (weighted average market share)
- Valuation
 - Tobin's Q

CORRELATION AMONG MEASURES

Lerner	1.00	0.18	0.01	-0.01	0.02	0.01	0.11
PCM	0.18	1.00	-0.10	-0.06	-0.08	-0.02	0.15
Mkt Share 4	0.01	-0.10	1.00	0.63	0.42	0.17	-0.03
HHI4	-0.01	-0.06	0.63	1.00	0.12	0.25	-0.04
Mkt Share GICS	0.02	-0.08	0.42	0.12	1.00	0.45	-0.03
HHI GICS	0.01	-0.02	0.17	0.25	0.45	1.00	-0.02
Tobin's Q	0.11	0.15	-0.03	-0.04	-0.03	-0.02	1.00
	Lerner	PCM	Mkt Share 4	HHI4	Mkt Share GICS	HHI GICS	Tobin's Q

REGRESSIONS

REGRESSIONS

1. UL Beta \sim Monopoly Stat + Controls & FEs
2. UL Beta \sim Monopoly Stat \times Revenue + Controls & FEs

Measures of power are

- Lerner, PCM, Tobin's q , MS_4 , HHI_4 , MS_{GICS} , HHI_{GICS}

All regressions are heteroskedastic

MODEL 1: BETA VS MONOPOLY STATS

$$\beta_{UL,it} = a_0 + b_1(\text{Monopoly Metric}_{it}) + b_2(\text{Mkt. Cap}_{it}) + b_3(\ln(\text{Stock Price})_{it}) \\ + b_4(\text{Current Ratio}_{it}) + \Gamma_{I,Y}$$

MODEL 1: BASIC REGRESSION

Model 1	Lerner	PCM	MS ₄	HHI ₄	MS _{GICS}	HHI _{GICS}	Q
b_1 Coefficient	-0.240 (0.012)	0.052 (0.013)	0.063 (0.012)	0.078 (0.012)	-0.042 (0.021)	-0.049 (0.019)	-0.002 (0.001)
Z-Score	-20.568	3.843	5.308	6.623	-2.049	-2.628	-1.459
$\Delta\beta_{UL}$ for $1\sigma \Delta$ in monopoly metric	-0.041	0.008	0.012	0.015	-0.004	-0.006	-0.003
(Corresponding change in cost of capital assuming ERP = 7%)	-0.287%	0.055%	0.084%	0.106%	-0.031%	-0.039%	-0.021%

Observations: 45,349 firm-quarters; Firms: 2,491

MODEL 2: INTERACTION WITH REVENUE

$$\beta_{UL,it} = a_0 + b_1(\text{Monopoly Metric}_{it}) + b_2(\text{Mkt. Cap}_{it}) + b_3(\text{Revenue}_{it}) \\ + b_4(\text{Current Ratio}_{it}) + b_5(\text{Revenue}_{it} \times \text{Monopoly Metric}_{it}) + \Gamma_{I,Y}$$

MODEL 2: REVENUE INTERACTION

- Maybe size interacts with monopoly power
- Relationship between measures and power could change as a firm grows larger

For large firms ($> \$7.7\text{B}$ quarterly revenue), the relationship between PCM and beta is negative, like the Lerner index.

MODEL 2: REVENUE INTERACTION

Model 2	Lerner	PCM	MS ₄	HHI ₄	MS _{GICS}	HHI _{GICS}	Q
b_1 Coefficient	-0.219 (0.012)	0.042 (0.014)	0.105 (0.012)	0.050 (0.012)	0.079 (0.022)	-0.077 (0.019)	0.000 (0.001)
Z-Score	-17.940	3.040	8.655	4.119	3.587	-3.986	0.144
b_3 Revenue	-4.21E-06 (3.14E-07)	-3.95E-06 (3.46E-07)	-5.92E-06 (4.11E-07)	-5.50E-06 (4.00E-07)	-6.61E-06 (4.63E-07)	-6.53E-06 (5.18E-07)	-5.51E-06 (3.53E-07)
Z-Score	-13.411	-11.428	-14.398	-13.769	-14.278	-12.601	-15.604
b_5 Interaction	-3.89E-06 (1.69E-06)	-5.41E-06 (1.98E-06)	3.66E-06 (9.86E-07)	4.58E-06 (1.13E-06)	5.60E-06 (1.14E-06)	8.81E-06 (1.79E-06)	1.91E-06 (3.18E-07)
Z-Score	-2.308	-2.730	3.710	4.034	4.899	4.933	6.009
Quarterly Revenue	Mean: \$2,673; Median: \$475; Std. Dev: \$8,451 million per quarter						

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CONCLUSION

CONCLUSIONS

- Relationship between risk and power depends on the measure
 - Lerner consistently negative relationship
 - Concentration measures have mixed results
 - Size and industry also important factors that change the relationship
- Complex relationship between risk and power
 - Needs to be investigated more

FUTURE RESEARCH

- Different industries
 - “Information” and “Manufacturing”
- Better industry definitions for market share and HHI
- Different measures of risk

QUESTIONS

Thank you

APPENDIX

ROBUSTNESS CHECKS

ROBUSTNESS CHECKS

- Weaker Filters
 - Middle 95% instead of 90%
 - Shows that filters don't really impact the results
 - As long as we exclude the unreasonable extremes
- Split Manufacturing and Everything Else
 - Manufacturing makes up half of all firms
 - Maybe there is a different relationship for different industries
- Large Firms (Quarterly Revenue $>$ \$7.76 Billion)
 - Model 2 suggests large firms' measures of power have a different relationship with systematic risk

FILTERING AND MANUFACTURING

Model 1	Lerner	PCM	MS ₄	HHI ₄	MS _{GICS}	HHI _{GICS}	Q
<i>b</i> ₁ Weaker Filters	-0.143	0.076	0.058	0.075	-0.103	-0.061	-0.001
<i>58,636 obs.</i>	(0.007)	(0.010)	(0.012)	(0.012)	(0.021)	(0.018)	(0.001)
Z-Score	-20.535	7.593	4.731	6.282	-4.961	-9.306	-2.104
<i>b</i> ₁ Manufacturing	-0.188	0.051	0.242	0.228	0.061	0.024	-0.008
<i>21,595 obs.</i>	(0.017)	(0.021)	(0.022)	(0.018)	(0.031)	(0.028)	(0.002)
Z-Score	-11.119	2.455	11.211	12.430	1.939	0.860	-4.407
<i>b</i> ₁ excl. Manuf.	-0.290	0.064	-0.028	-0.039	-0.158	-0.131	0.002
<i>23,754 obs.</i>	(0.016)	(0.018)	(0.014)	(0.015)	(0.028)	(0.025)	(0.001)
Z-Score	-18.116	3.585	-2.026	-2.588	-5.667	-5.244	1.706

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Manuf. demonstrates positive relationship, non-manuf. the opposite.
S&T suggests capital intensity...

LARGE FIRMS

Mod. 1 Rev > \$8B	Lerner	PCM	MS ₄	HHI ₄	MS _{GICS}	HHI _{GICS}	Q
b_1 Coefficient	-0.307 (0.038)	-0.268 (0.053)	0.379 (0.035)	0.454 (0.044)	0.391 (0.038)	0.590 (0.058)	0.010 (0.007)
Z-Score	-8.088	-5.091	10.690	10.281	10.202	10.176	1.392
$\Delta\beta_{UL}$ for $1\sigma \Delta$ in monopoly metric	-0.052	-0.041	0.073	0.088	0.042	0.067	0.020
(Corresponding change in cost of capital assuming ERP = 7%)	-0.367%	-0.288%	0.508%	0.619%	0.291%	0.468%	0.140%

Observations: 3,191 firm-quarters; Firms: 162

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PCM now negatively associated, but concentration measures all positive and stronger.

MEASURES OF POWER

UNLEVERED BETA

- Explanation by the S&P 500
- 252-day rolling regressions
- $\beta > 1$, higher systematic risk
- $\beta < 1$, lower systematic risk
- Unlevered beta adjustment used in the literature and by practitioners
 - Jose & Stevens, 1987

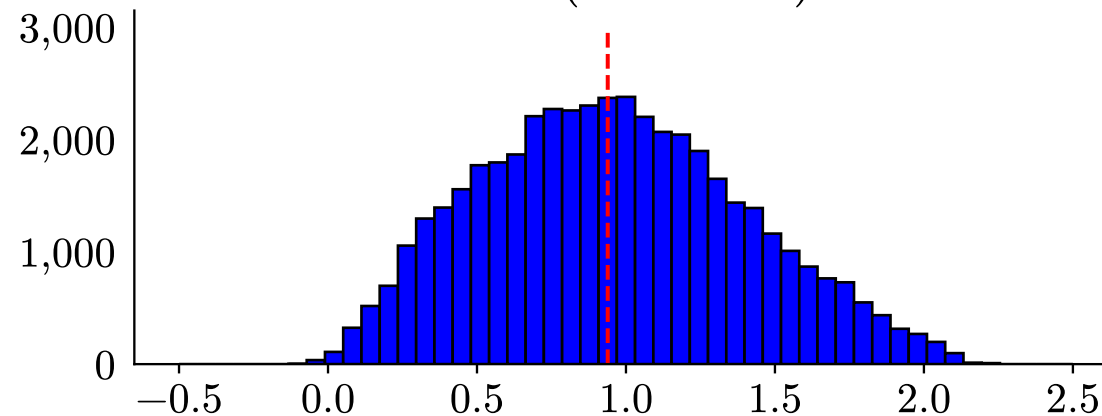
Unlevered Beta

$$\beta_{UL} = \frac{\beta_L}{1 + (1 - \tau)\left(\frac{\text{Debt}}{\text{Equity}}\right)}$$

Unlevered Beta

Count	45,349
Mean	0.957
Std. Dev	0.441
Minimum	-0.082
25th Percentile	0.628
Median	0.939
75th Percentile	1.261
Maximum	2.243

Beta (unlevered)



LERNER INDEX

- Marginal profit over price
- Common in literature
- Positive values imply monopoly power
- Hard to interpret the competitive environment

$$\text{Lerner Index} = \frac{P - C}{P}$$

$$(EBIT - RR_{IC}) \approx \Pi = Pq - cq - FC$$

$$\Pi = (P - c)q - FC$$

$$\Pi = \left(\frac{P - c}{q} \right) Pq - FC$$

Estimate Lerner with

$$(EBIT - RR) = c_0 + m_{\text{Lerner}}(\text{Revenue})$$

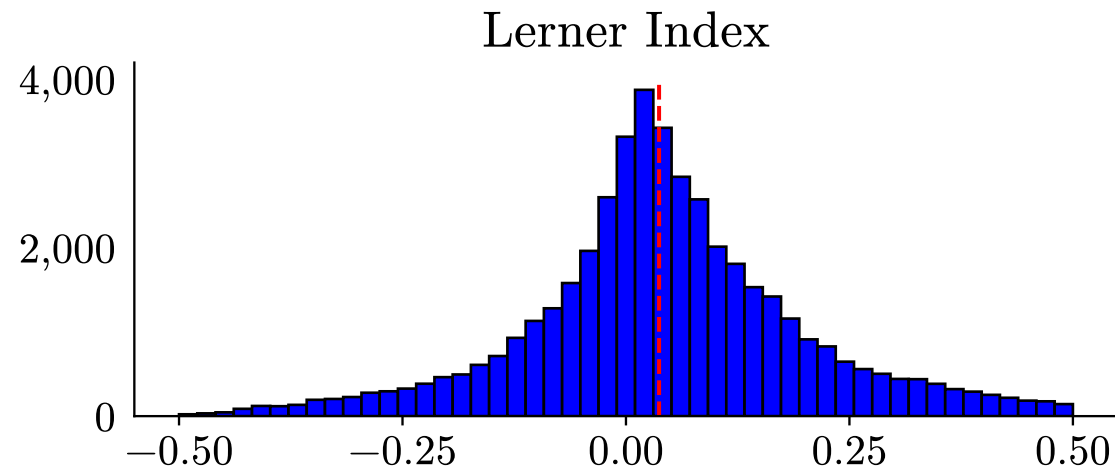
Calculate Required Return with

$$RR = IC(\beta_{UL} \times ERP + RFR)$$

LERNER INDEX

- Marginal profit over price
- Common in literature
- Positive values imply monopoly power
- Hard to interpret the competitive environment

Lerner Index	
Count	45,349
Mean	0.051
Std. Dev	0.171
Minimum	-0.624
25th Percentile	-0.034
Median	0.037
75th Percentile	0.131
Maximum	0.947



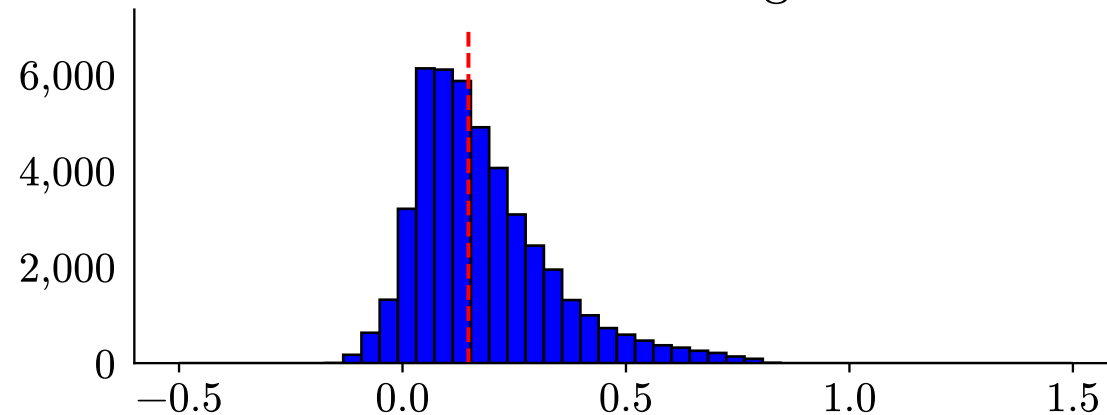
PRICE-COST MARGIN

- “Marginal Profit Margin”
- Like the Lerner, but no consideration for required return to capital
- Used in literature

Price-Cost Margin

Count	45,349
Mean	0.180
Std. Dev	0.154
Minimum	-0.133
25th Percentile	0.071
Median	0.148
75th Percentile	0.255
Maximum	0.842

Price-Cost Margin



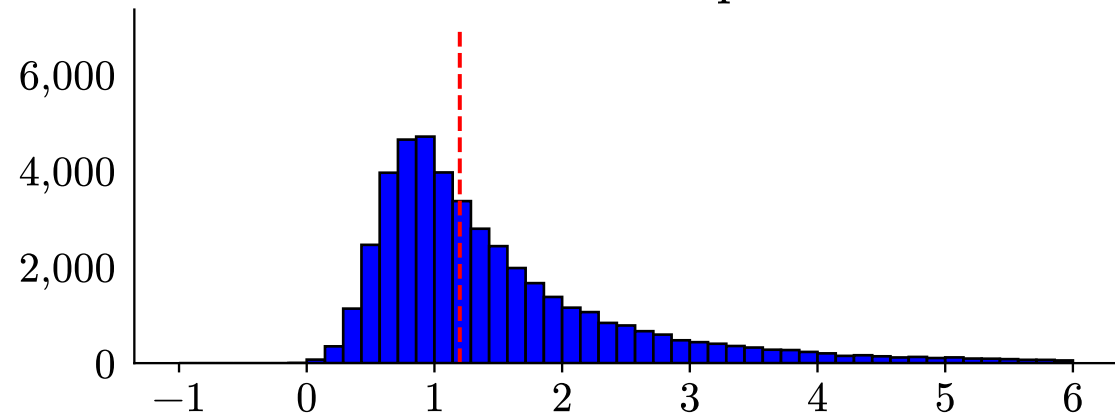
TOBIN'S Q

- Ratio of a firm's replacement value to its current market value
 - Higher implies monopoly power (whole is worth more than the sum of the parts)
- I use total assets instead of replacement value
 - Replacement value hard to calculate in practice
- Enterprise Value (debt plus equity market values) as numerator

Tobin's q

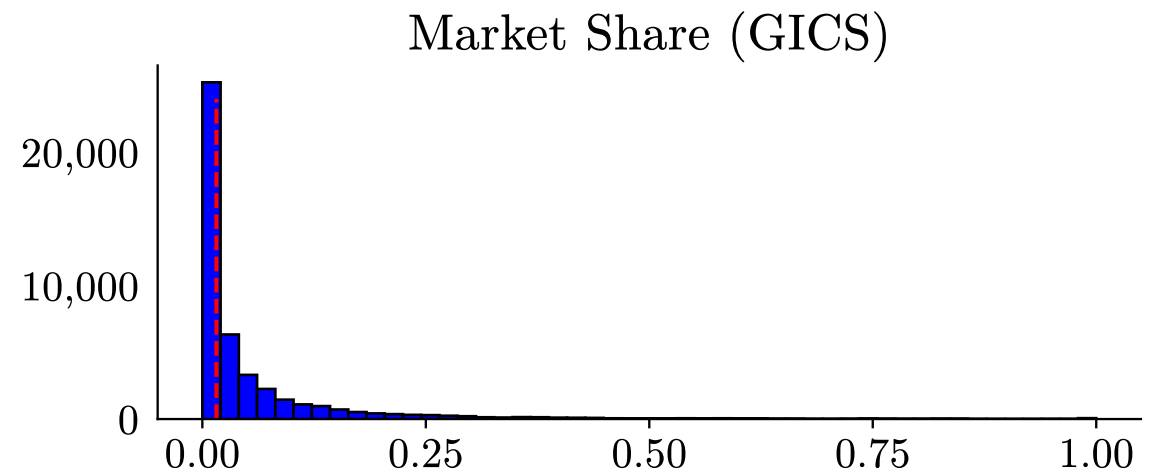
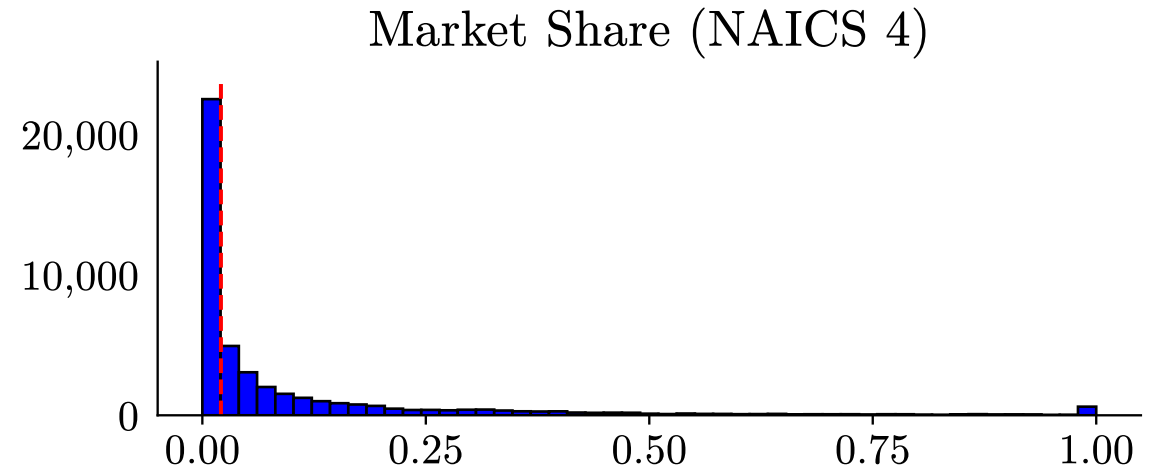
Count	45,349
Mean	1.668
Std. Dev	2.046
Minimum	-2.91E-02
25th Percentile	0.819
Median	1.199
75th Percentile	1.905
Maximum	2.25E+02

Tobin's q



MARKET SHARE

$$\text{Market Share} = \frac{\text{Revenue}_{\text{Firm}}}{\text{Revenue}_{\text{Industry}}}$$



HHI

$$\text{HHI} = (\text{MS}_1)^2 + (\text{MS}_2)^2 + \dots + (\text{MS}_n)^2$$

