How important is corporate governance? Evidence from machine learning

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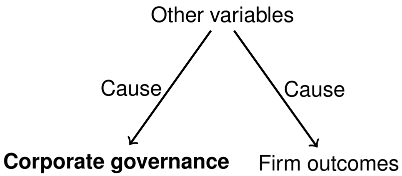
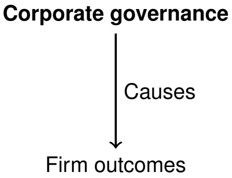
Two views on governance research

Governance is an endogenous choice



Governance is "out-of-equilibrium"



Causal claims

- To infer causality, research often uses observational data[1]

  "There is some evidence, both in our sample and from other authors, that weak shareholder rights **caused poor performance** in the 1990s."

- . . . controls for firm characteristics

  "While our sample does not include a natural experiment to **identify G as the cause of operational differences**, we attempt to control for 'expected' cross-sectional differences . . . "

- . . . causal stories loaded with cautionary language

  "Since this is an experiment without random assignment, **no analysis of causality can be conclusive**"

[1] Quotes from Gompers et al. (2003)

Mixed results: Board independence

- Increases firm value (Rosenstein and Wyatt, 1990)
- Decrease firm performance (Agrawal and Knoeber, 1996)
- No relation (e.g., Hermalin and Weisbach, 2003)
- Subsequent research has refined analysis
  - social ties to CEOs (e.g., Hwang and Kim, 2009)
  - prior favorable views of the firm (e.g, Cohen et al., 2012)
  - connections to CEOs (e.g., Fracassi and Tate, 2012)
  - cost of information (Duchin et al., 2010)

This paper

- Measurement and prediction
  - Paper is intellectual descendant of Larcker, Richardson, and Tuna (2007) and Daines, Gow, and Larcker (2010)
- Casual effects
  - Re-evaluate broad research approach on its own terms
  - Takes results at face value and **puts aside endogeneity**
  - If causality holds, causal relations should also be predictive

Out-of-sample prediction via machine learning

- Flexible measure of corporate governance
- Exploit the link between explanation and prediction
  - **Causal explanation must also be predictive on new data**
  - E.g.,Hempel and Oppenheim (1948), Freedman (1991), Manski (2009), Watts (2014), Yarkoni and Westfall (2017), Hofman et al. (2017)
- Evaluate upper bound of predictability for firm outcomes

Prediction benchmarks

- Uninformed baseline, i.e., an average outcome
- Firm-characteristics-only models
- Firm- and corporate-governance-characteristics models

Data sources

- FactSet's SharkRepellent for takeover defences
- WhaleWisdom for institutional holdings
- Equilar for compensation and board structure
- AuditAnalytics for litigation and bankruptcies
- CRSP and Compustat for firm characteristics

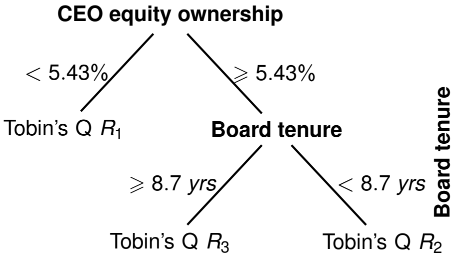
Over a hundred of governance features

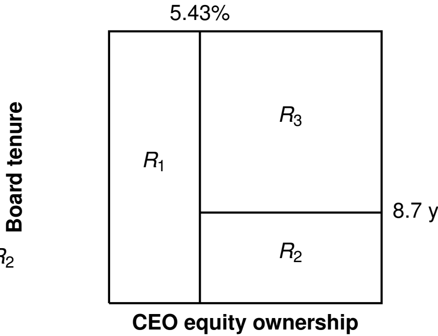
- Institutional investor holdings
- Anti-takeover provisions
- Executive compensation
- Board's financial expertise
- Board characteristics

Prediction models

- Boosted regression trees (Friedman, 2001)
- Rolling cross-validation for tree depth and model size
  - depth (highest level of interactions) $\{1, 2, 3, 5, 7\}$
  - shrinkage 0.01
  - maximum number of trees $50,000$
- Last three years as a test sample
- Use features at t to predict outcomes at $t + 1$ or $t + 3$

Boosting with trees





Models for restatements

	$t+1$			
Model	Obs.	Tree depth	Trees	Error
	Models with firm characteristics			
Firm	31,872	5	160	0.221
Firm, All govern.	31,872	7	215	0.213
	Models without firm characteristics			
Inst. hold.	31,872	7	365	0.244
Anti-takeover	31,872	7	190	0.247
Comp.	31,872	2	900	0.229
Fin. expert	31,872	3	405	0.240
Board	31,872	3	1,490	0.228
All govern.	31,872	2	1,120	0.221

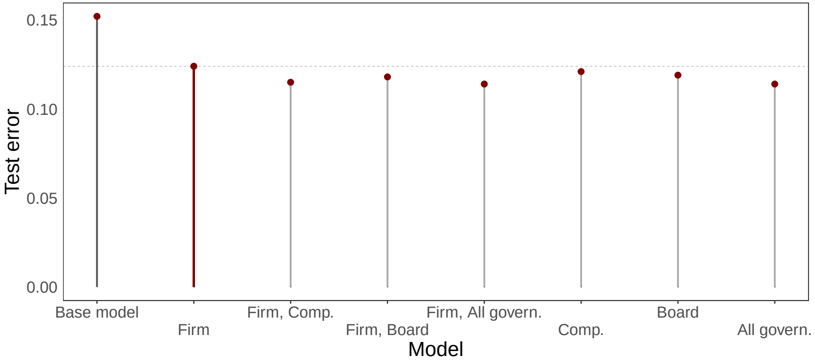
Models for return on assets, adj.

	$t+1$			
Model	Obs.	Tree depth	Trees	Error
	Models with firm characteristics			
Firm	37,345	3	1,050	0.086
Firm, All govern.	37,345	3	1,380	0.086
	Models without firm characteristics			
Inst. hold.	37,345	1	2,350	0.159
Anti-takeover	37,345	5	660	0.167
Comp.	37,345	7	9,700	0.148
Fin. expert	37,345	2	640	0.166
Board	37,345	7	23,500	0.149
All govern.	37,345	7	42,700	0.138

Models for S&P credit rating

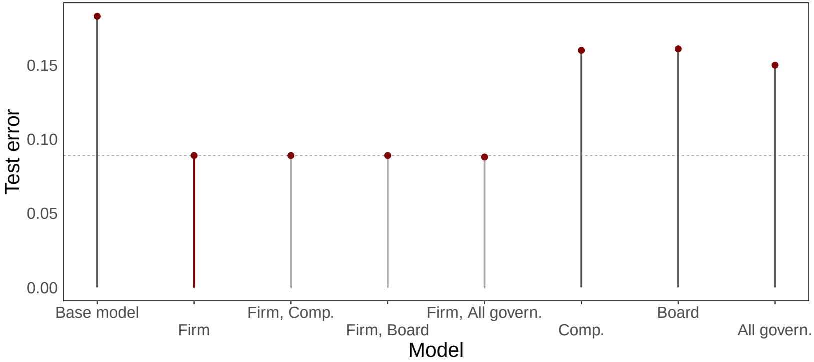
	$t+1$			
Model	Obs.	Tree depth	Trees	Error
	Models with firm characteristics			
Firm	12,969	7	5,100	0.562
Firm, All govern.	12,969	7	20,650	0.486
	Models without firm characteristics			
Inst. hold.	12,969	5	590	0.969
Anti-takeover	12,969	5	3,550	1.057
Comp.	12,969	7	12,000	0.723
Fin. expert	12,969	2	1,170	0.959
Board	12,969	7	37,850	0.686
All govern.	12,969	7	40,850	0.618

Test errors for restatements



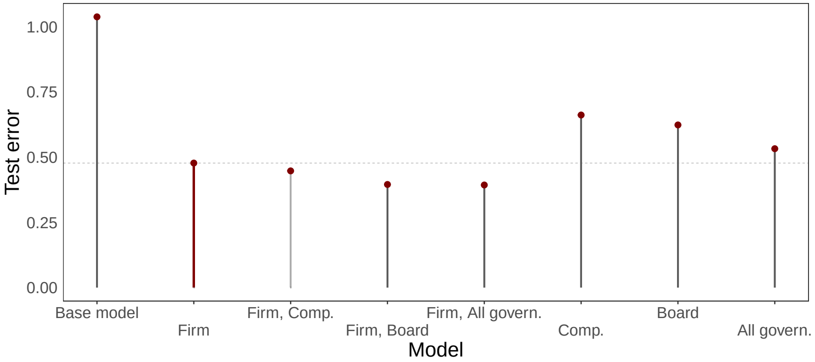
- No statistically signficant improvements over firm characteristics only

Test errors for return on assets, adj.



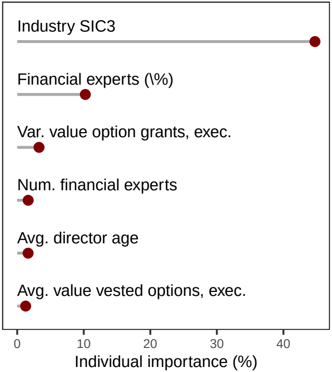
- Governance only worse than firm characteristics only

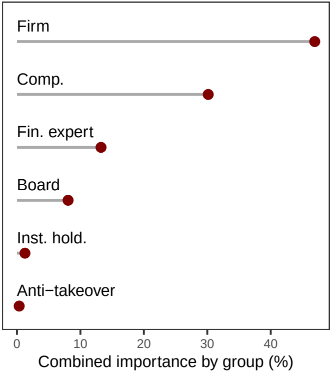
Test errors for S&P credit rating



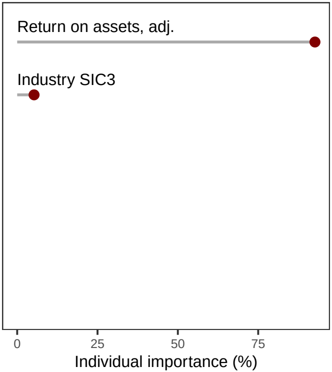
- Board characteristics **do** provide a meaningful improvement
- S&P evaluates governance of a firm as part of its process

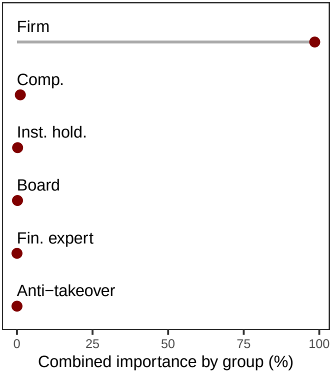
Variable importance for restatements



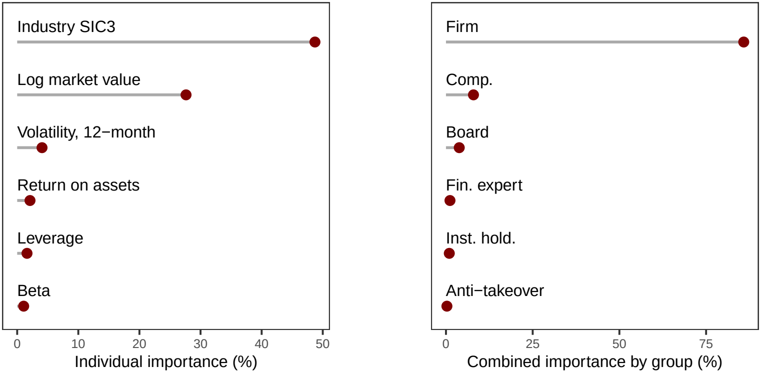


Variable importance for return on assets, adj.





Variable importance for S&P credit rating



Re-examination of Duchin et al. (2010)

- Re-examine credible instrumental-variable analyses
- Consider intention-to-treat specification
- Does random assignment to different treatments predict firm outcomes incremental to controls?

Re-examination of Duchin et al. (2010)

	ΔROA	Δln(Q)	Mean return
Noncomply dummy	2.573*	11.575*	0.613***
	(1.422)	(6.225)	(0.197)
InfoCost	−3.639*	−41.892***	−0.660**
	(2.112)	(8.435)	(0.279)
Noncomply dummy × InfoCost	−5.596*	−31.487**	−1.109**
	(2.973)	(12.144)	(0.420)
		...	
Observations	897	905	805
R^2	0.139	0.414	0.365
Adjusted R^2	0.085	0.378	0.321

- Intention-to-treat analyses
- *Noncomply dummy* is a firm being not in compliance with SOX in 2000
- *InfoCost* is an information cost index
- $\Delta X = X_{2005} - X_{2000}$

Re-examination of Duchin et al. (2010)

Y	Base MSE	MSE without IV	MSE with IV	MSE decrease	p-value
Δln(Q)	1905.784	1285.532	1280.694	4.838	0.200
ΔROA	60.229	56.418	56.538	-0.120	0.632
Mean return	1.304	0.978	0.978	0.000	0.502

- *Base MSE* only industry dummies
- *MSE without IV* control variables, industry dummies, and *InfoCost*
- *MSE with IV* adds the exogenous shifter *Noncomply dummy*
- *p-value* obtained via randomization inference

What do we learn (1)

- Causality should result in out-of-sample predictive ability
- If no predictive ability, causality is unlikely
  - But prediction focuses on **bias-variance tradeoff**
  - Causal effect of omitted variables is weak
  - No loss if most of the inf. is already in included variables

What do we learn (2)

- Null results are easy to find
  - …but firm features still predict outcomes
- Governance matters in special cases
  - …but ML allows for firm-governance-features interactions
- Inf. in governance is subsumed by firm features
  - …but test against different firm features

Conclusions

- Corporate governance features do **not** improve on predictive ability over firm features
- No support for the existence of a strong causal effect of corporate governance on firm outcomes
- Cannot rule out that information in firm features (partially) subsumes information in corporate governance

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