



# Finding diamonds in the rough

An exploration of sell-side analyst coverage versus company fundamentals to identify underfollowed companies

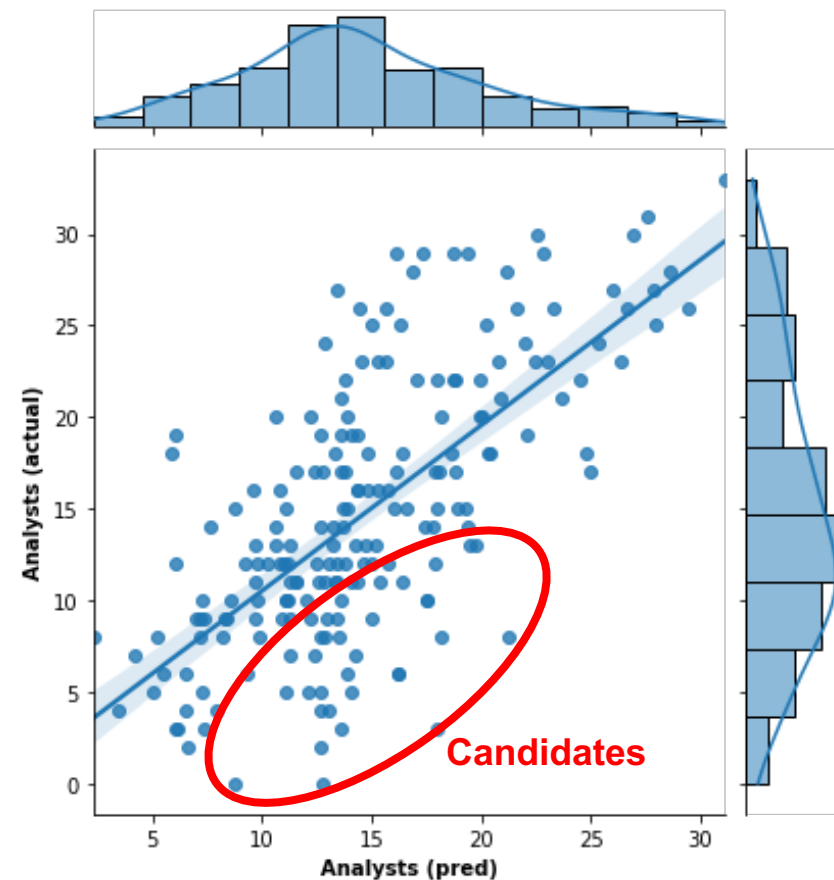
**Sam Reiff**

Aug 2021

# Executive summary

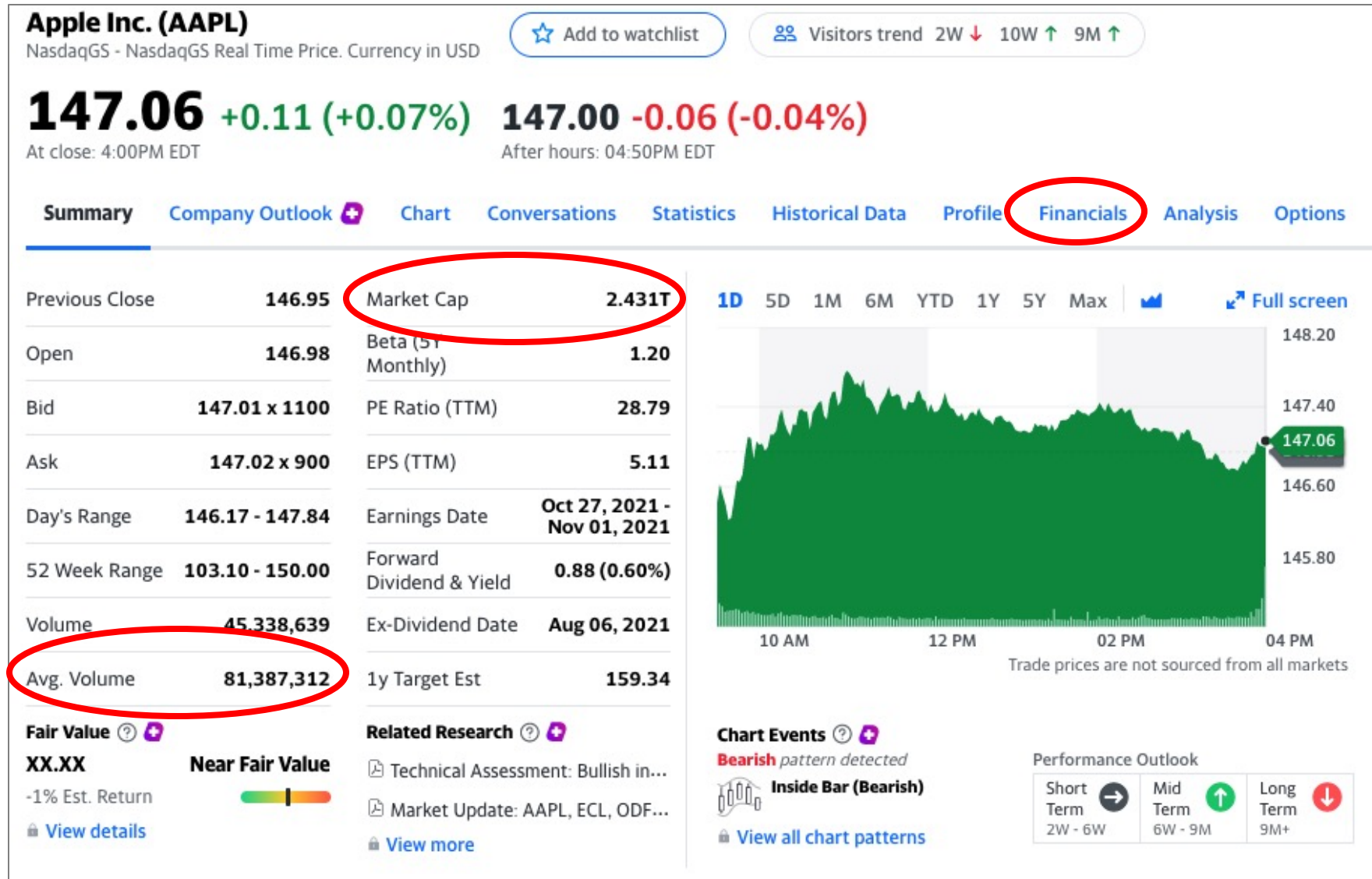
- **Motivation:** Investment opportunities could be uncovered by assessing a stock's sell-side research coverage, which proxies investor 'awareness'; equity research sample [here](#)
- **Objective:** Identify relationships between company fundamentals (e.g., revenue, profitability) and level of analyst coverage
- **Conclusion:** Fundamental features and coverage can be modeled with modest confidence
  - Target: Publishing analysts
  - Ridge  $R^2$  on test: 0.4598
  - Ridge MAE on test: 4.1630
  - Representative candidates identified

Ridge model predictions versus test set actuals



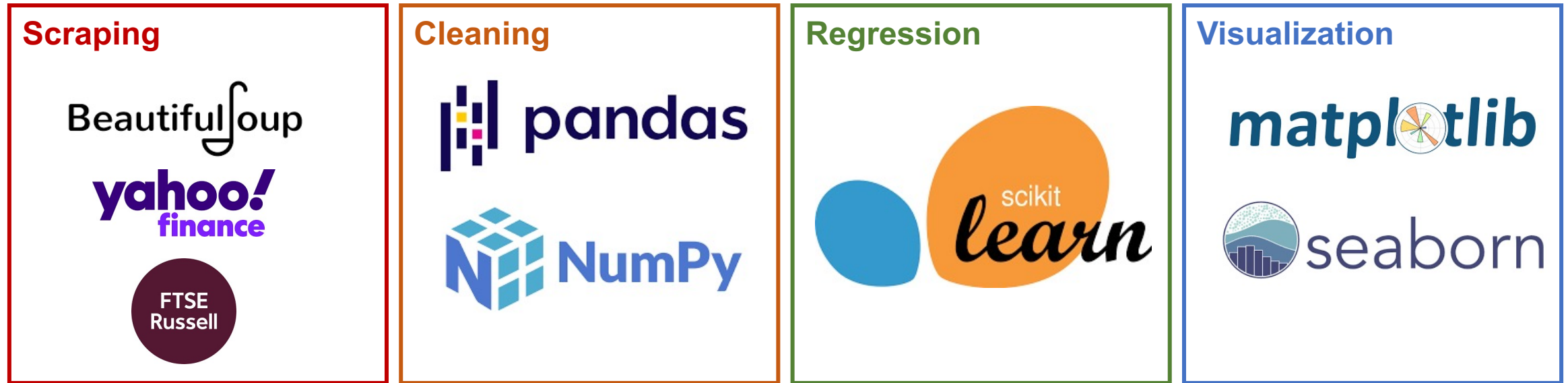
**A Ridge Regression Model may serve as a useful starting point for identifying undercovered equities**

# Primary data source: Yahoo! Finance



# Methodology

## Project workflow



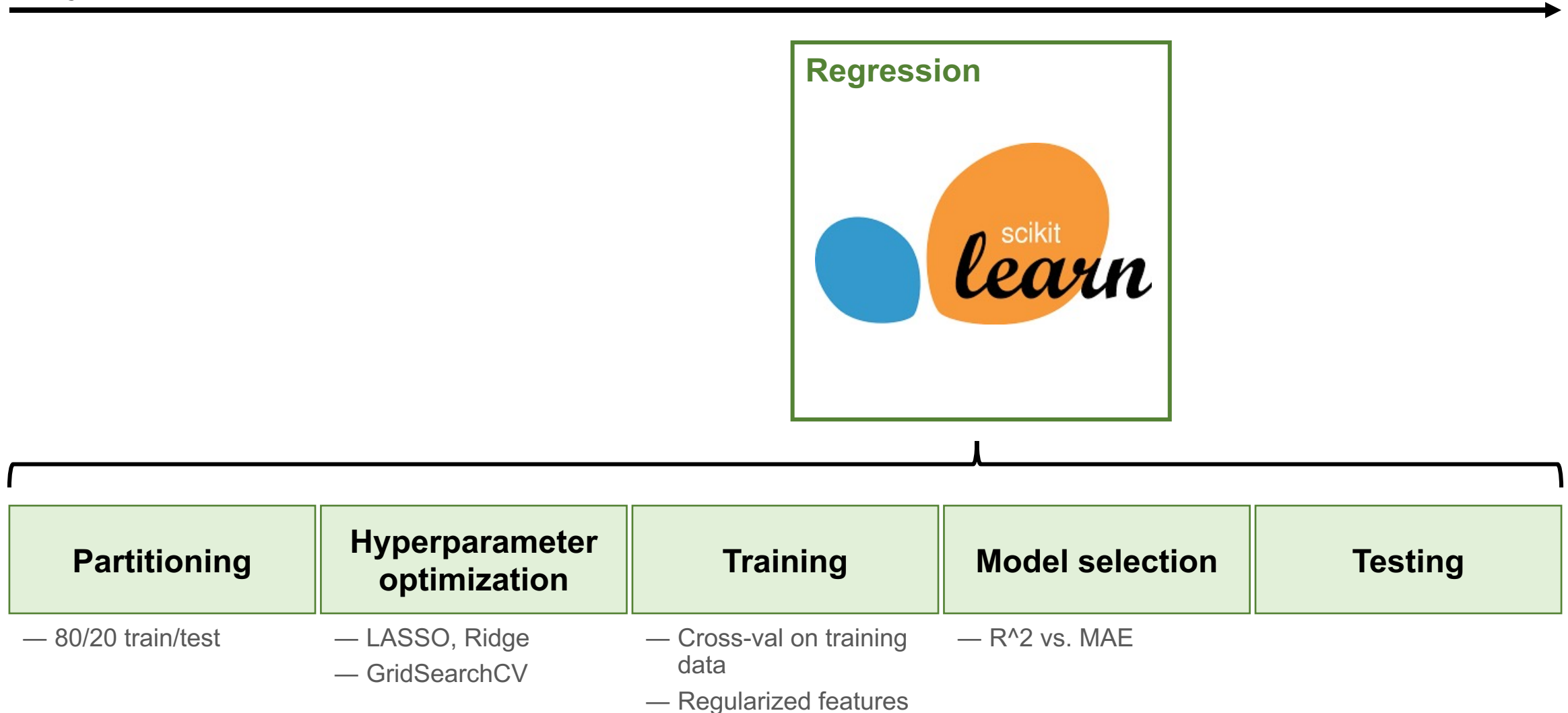
- **>1,020 equities analyzed**
- **>10 features scraped from >3,000 web pages**
  - Publishing analysts
  - Size: Enterprise value, market cap, trading volume, basic shares, float shares, revenues, assets
  - Profitability: Gross margin, operating margin, EBITDA margin, ROA, ROE
- **Supplemented with features via YF API**
  - Industry, sector, growth

Refer to glossary in the appendix for definition of financial terms

Non-scraped data was pulled via the Python yfinance package that leverages the YF API

# Methodology

## Project workflow



# Results

## Train

### ▪ Vanilla LR:

- CV score: 0.5140
- $R^2$  on train: 0.5425
- MAE on train: 3.9218 (analysts)

### ▪ LASSO:

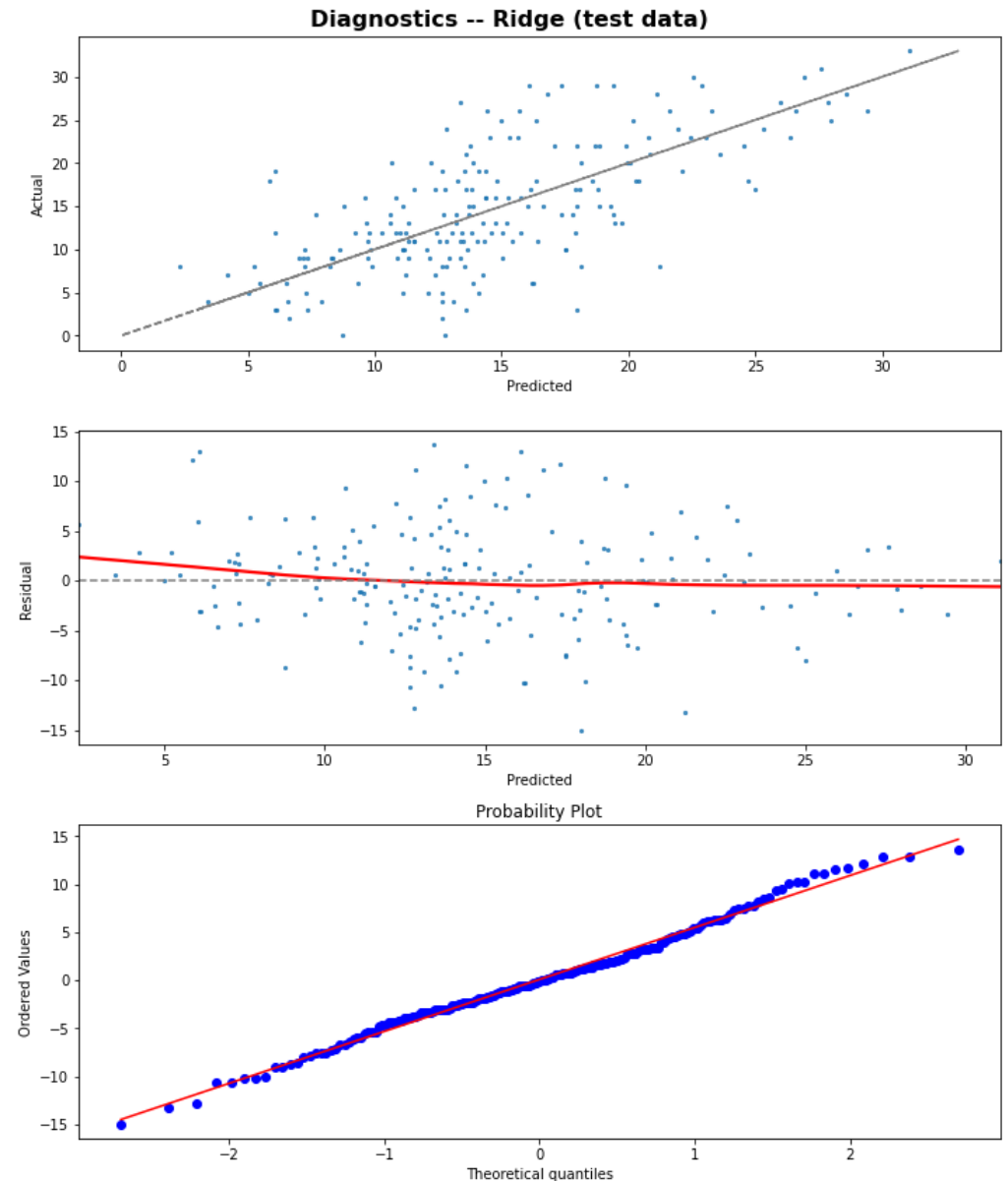
- CV score: 0.4650
- $R^2$  on train: 0.4848
- MAE on train: 4.1964 (analysts)

### ▪ Ridge:

- **CV score: 0.5148**
- $R^2$  on train: 0.5417
- MAE on train: 3.9361 (analysts)

## Test

Ridge  $R^2$ : 0.4598  
Ridge MAE: 4.1630 (analysts)



# Conclusions

## Target companies based on variance from Ridge model predictions

Equity	Name	Coverage	Pred. coverage	Industry	MC (\$)	Vol. (sh)	LTM revenue (\$)	MRQ assets (\$)	Notes
BEPC	Brookfield Renewable Corp	1	12	Utilities	7B	0.9M	3B	39B	Renewable energy rollup?
★ NUAN	Nuance Comms.	4	16	App. software	17B	5.0M	1B	4B	AI healthcare, could be very interesting.. poor ROA/ROE
PLTR	Palantir Technologies	8	21	Ent. software	42B	15.0M	1B	3B	Meme stock..
★ POOL	Pool Corporation	6	16	Leisure	20B	0.3M	5B	2B	Great ROE, COVID re-open play?
★ SCCO	Southern Copper Corp	8	18	Copper	50B	1.5M	10B	17B	Strong ROA, ROE
★ SCI	Service Corp. Int'l	4	16	Pers. services	11B	0.9M	4B	15B	Strong ROE, boring!!!

**The Ridge model isn't highly accurate, but can identify relevant companies with investment motifs that are worth considering for more further financial analysis**

# Further due diligence/future work

- **Feature inclusion**

- Forward-looking estimates
- # sell-side analysts per sector
- Time since IPO
- Stock return volatility
- Affinity for M&A

- **Scraping enhancement**

- **Broaden data set**

- Russell 2000
- Global SMID-large cap equities
- Sector-specific

- **Feature engineering/modeling**

- Polynomial feature transformation
- Regime changes in investor interest



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# Appendix

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# Glossary of financial terms

- **Equity:** A stock, ownership of a public or private entity
- **Publishing analyst:** Wall Street equity analyst who publishes investment research, typically by sector
- **Enterprise value** (“**EV**”): The value of a company’s operations; the value of its tangible and intangible assets
- **Market capitalization** (“**MC**”): The market value of the total equity of a company; differs from EV depending on outstanding debt of the company (equity = assets – liabilities)
- **Daily volume:** Average daily share volume traded for the company’s shares
- **MRQ assets:** “Most-recent-quarter” assets; the value of assets reported on the company’s balance sheet for the most recent quarter
- **LTM revenue:** “Latest twelve months” of revenue
- **Gross margin:** Profit after the cost of goods sold and other cost of sales
- **Operating margin:** Profit after cost of goods sold/other cost of sales and fixed costs (e.g., research and development)
- **EBITDA margin:** “Earnings before interest, taxes, depreciation, and amortization”
- **ROA:** Return on assets, a metric of profitability
- **ROE:** Return on equity, a metric of profitability

# Research sample

## COWEN

### EQUITY RESEARCH

November 18, 2018

- Semiconductors
- Semiconductor Capital Equipment
- Technology Hardware: Storage & Peripherals

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### INDUSTRY UPDATE

## ILLUMINATING IPHONE'S IMPACT ON MEMORY DEMAND

### THE COWEN INSIGHT

iPhone production cuts are well known across the radio frequency and 3D image sensor landscapes, but we delineate the lesser-known impact on memory-exposed semis. While negative for near-term supply/demand and ASPs, we expect only \$1.2B of total industry DRAM and NAND revenue at risk across DecQ/MarQ. Expect modest ~\$0.10 impact to MU and \$0.15 impact to WDC spread across CQ4/CQ1.

### Lower iPhone Build Shipments Don't Help Memory S/D Imbalance

Over the last 8 years, Apple has grown to become one of the largest procurers of memory as a result of the proliferation of iPhone units and increased memory content per device. Indeed, our analysis herein indicates the Apple iPhone represented ~10% of all NAND demand and ~5% of all DRAM demand over the last 12 trailing months ending CQ3:18. Over the last week, our own field work across the smartphone supply chain – underscored by outlooks from SWKS, QRV0, AMS and LITE – indicates a 20MM iPhone unit cut across CQ4:18 and CQ1:19. We estimate that every 20MM unit change in current iPhone production represents a 6% reduction to mobile NAND demand and 3% reduction to mobile DRAM demand. Ergo, the recent production cut from AAPL should, unfortunately, compound an already weak supply/demand backdrop for memory producers in CQ4:18 and CQ1:19 and should be deflationary to memory ASPs. Moreover, a 20MM unit reduction in iPhone production should translate into 65k fewer NAND wafers, or 2% of total capacity in CQ3, and 70k fewer DRAM wafers, or 2% of total capacity in CQ3.

### iPhone Impact On Memory Semis

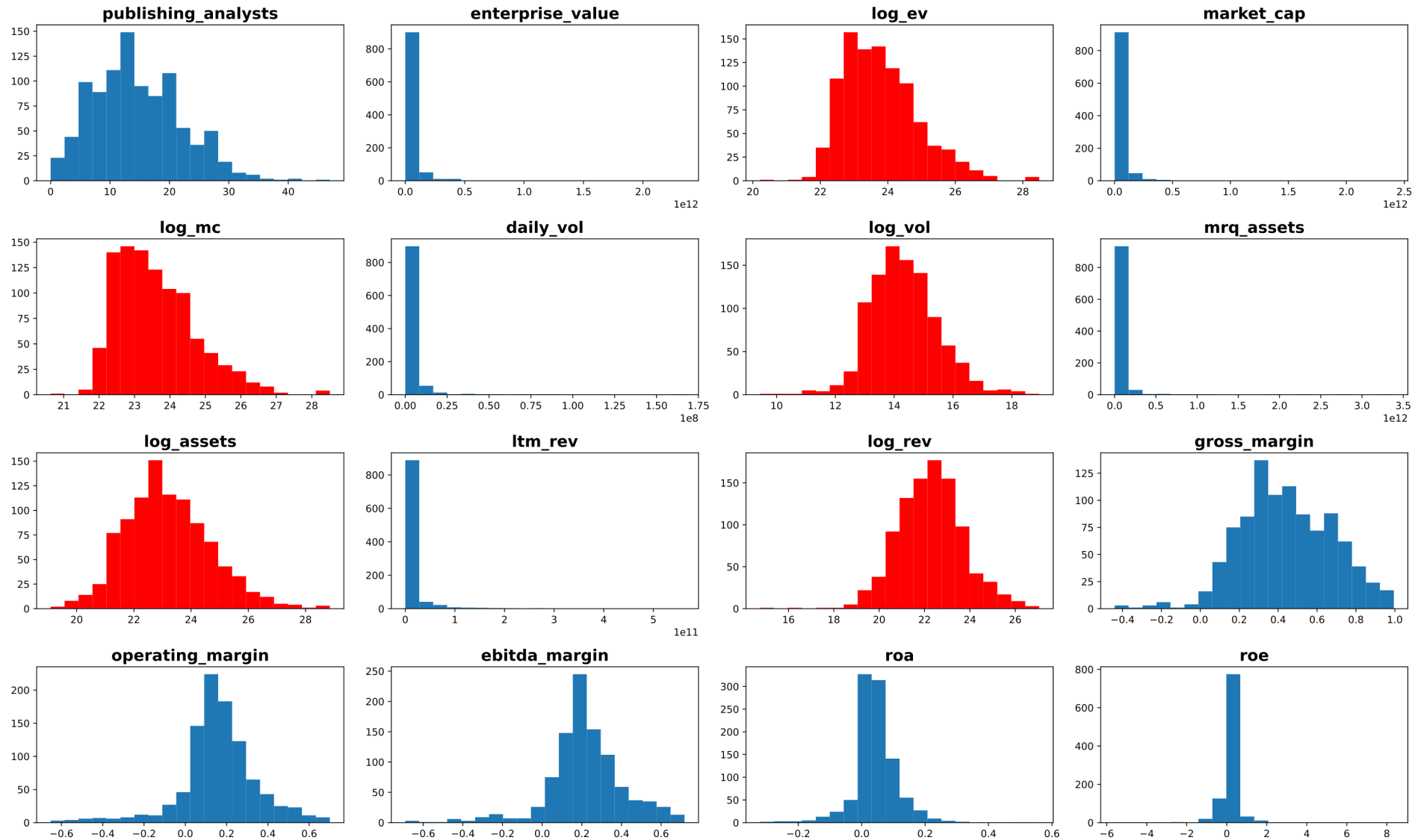
Based on our supply chain checks in Asia late last week, we now expect a 20MM reduction in iPhone builds across CQ4:18 and CQ1:19. Our analysis herein indicates these very recent supply chain cuts are more meaningful to bits than revenue for memory suppliers, and we expect a relatively modest ~\$0.10 headwind to MU and \$0.15 headwind to WDC across DecQ and MarQ from lower iPhone builds.

### iPhone Impact on Semicap and Memory WFE

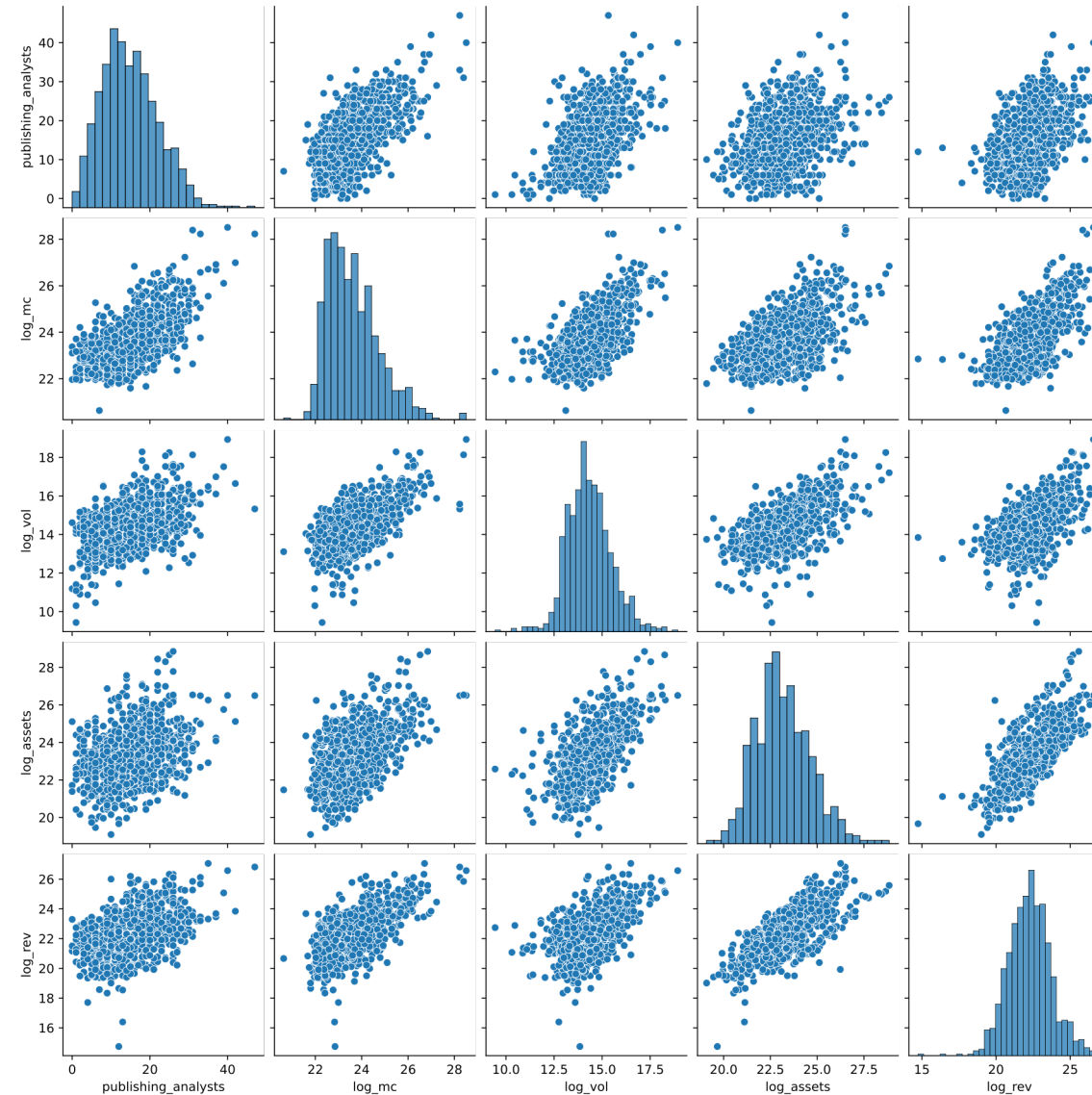
From a semicap SDE perspective, we estimate a 20M unit reduction in iPhone units could

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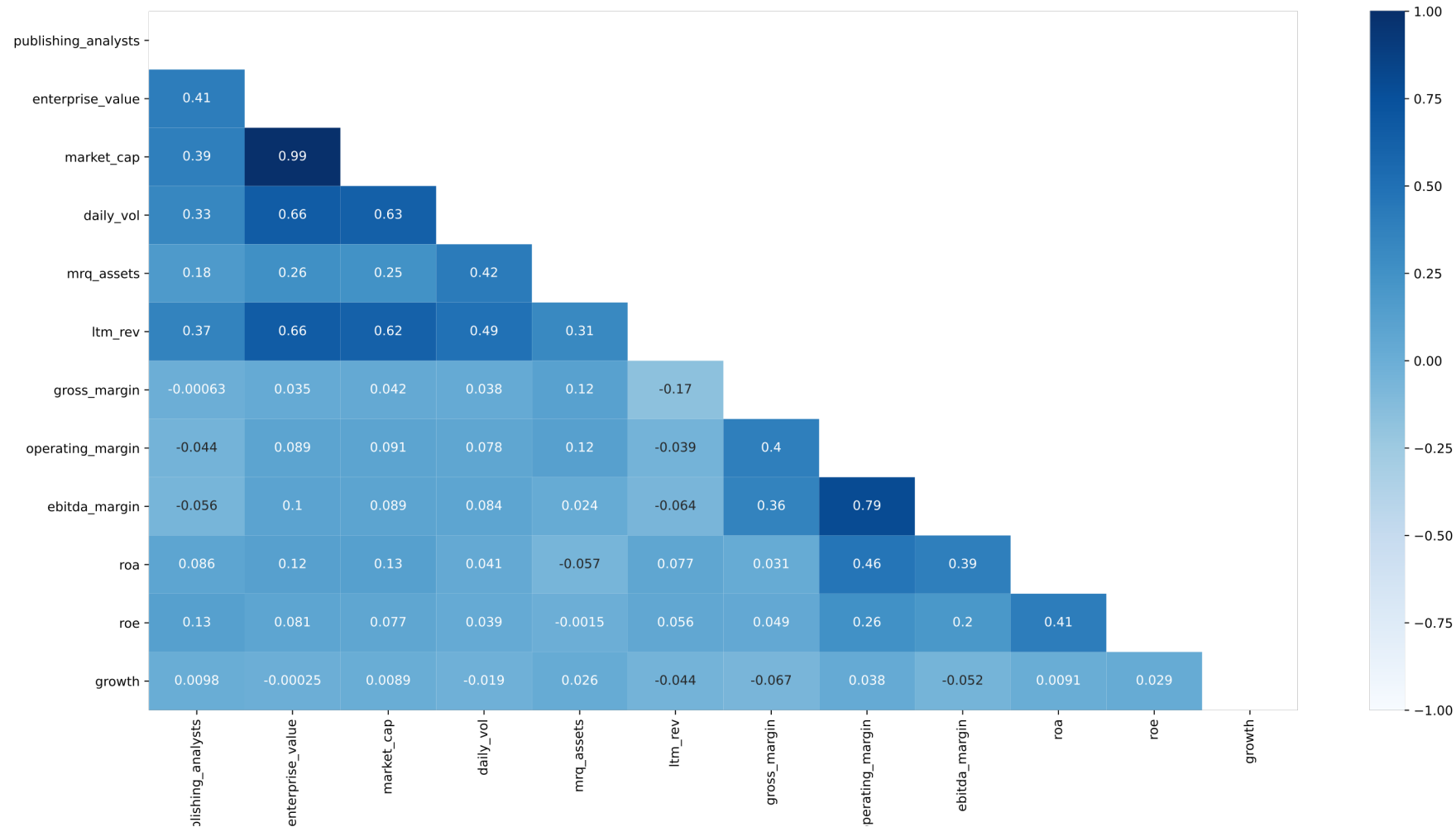
# Quantitative features considered



# Pairplot with major log features

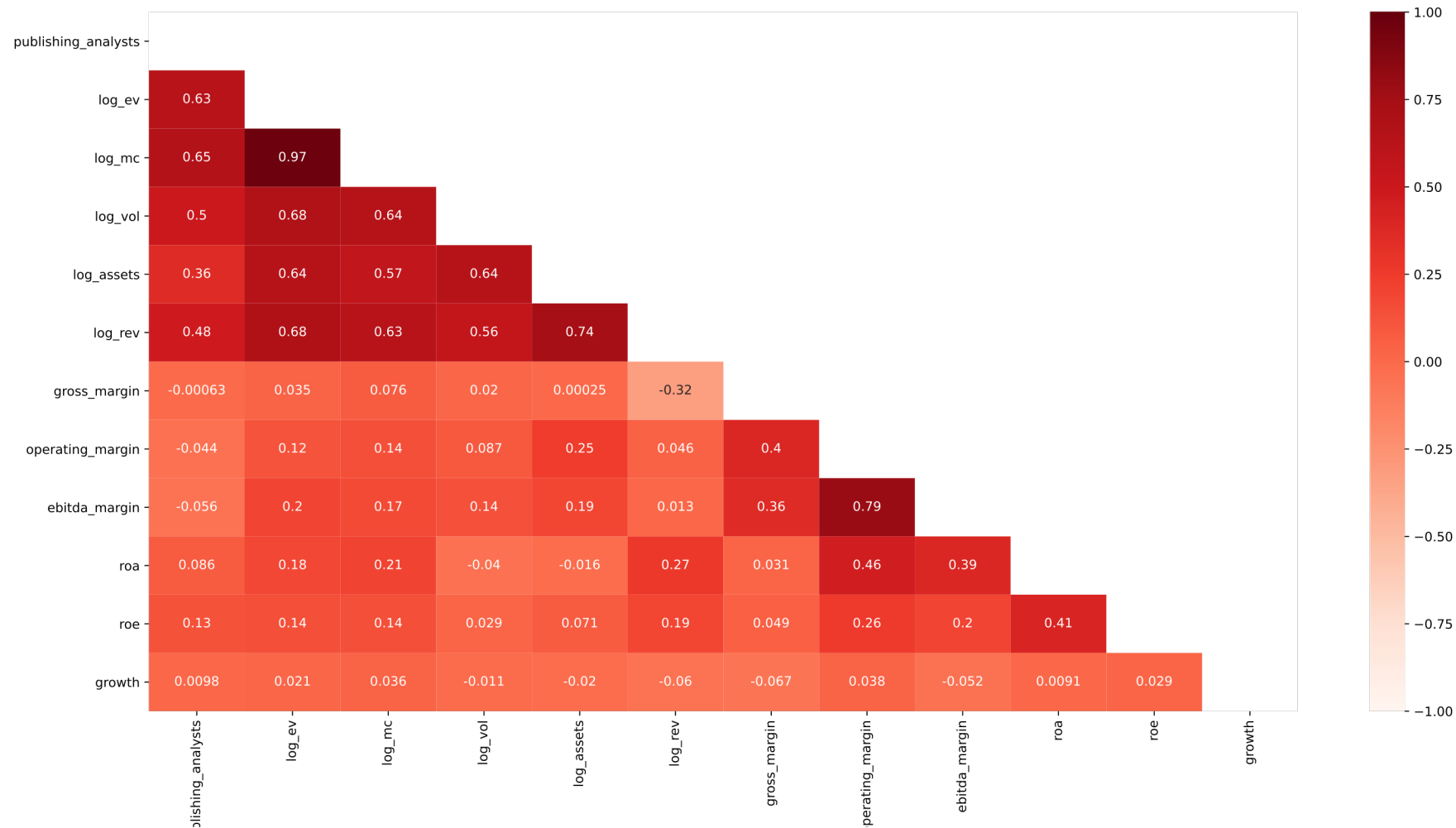


# Nominal feature correlation heatmap

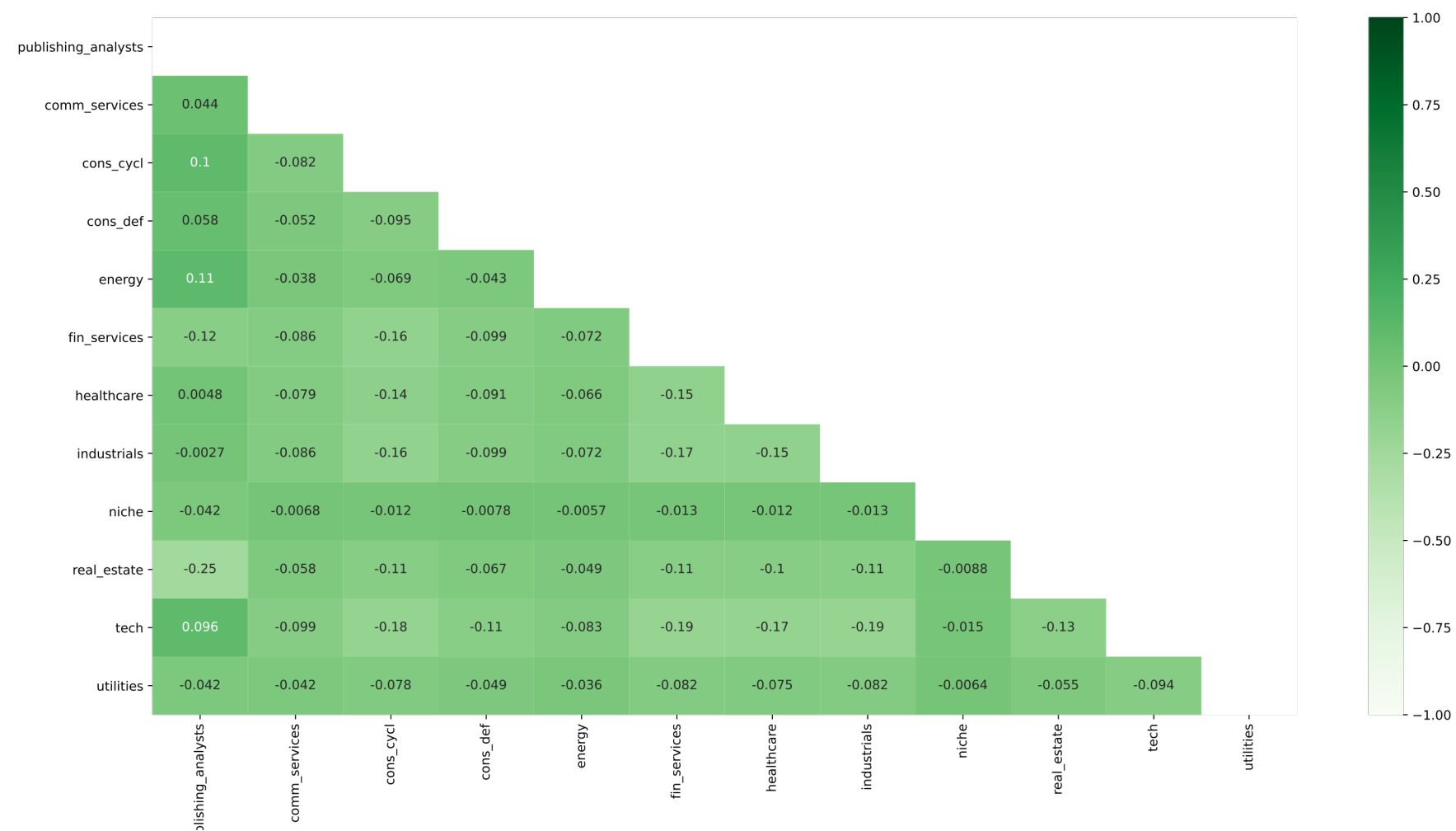




# Log feature correlation heatmap



# Sector feature correlation heatmap

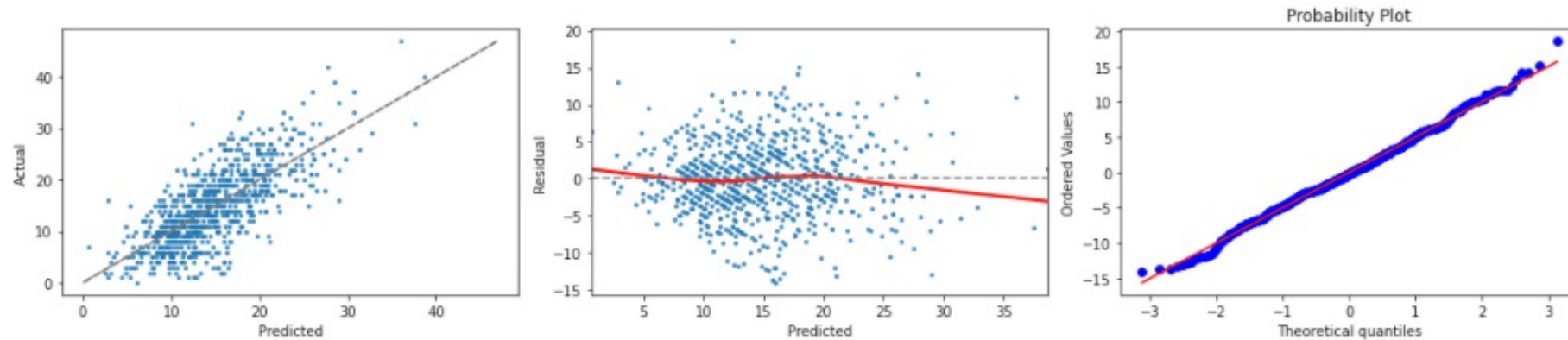


# Vanilla LR results on training data

## Vanilla linear model:

```
-----  
Vanilla LR cross-validation score: 0.514  
Vanilla R^2 on training data of: 0.5425  
Vanilla LR MAE on training data of: 3.9218  
-----
```

## Diagnostics -- vanilla LR (training data)

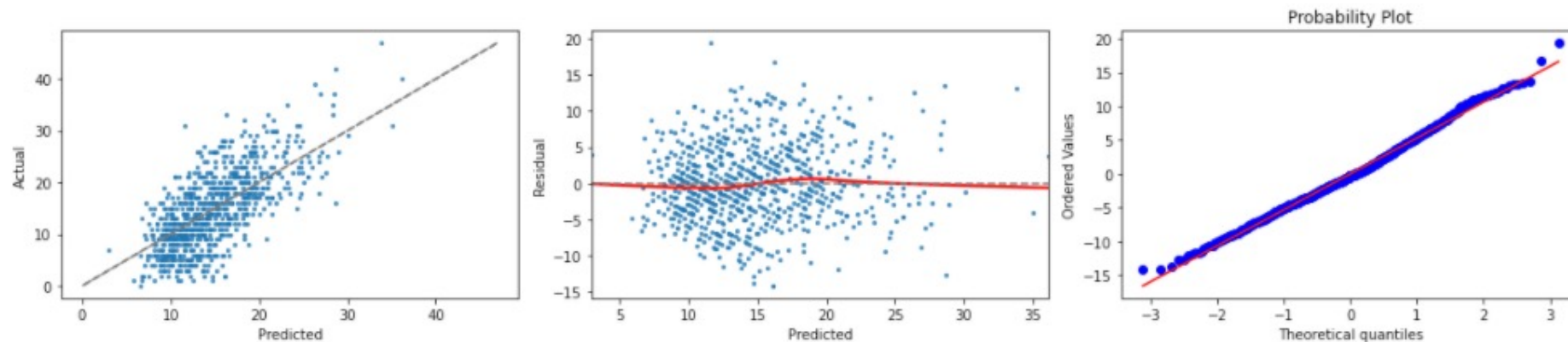


# LASSO results on training data

## Lasso model:

```
-----  
Optimal alpha: Lasso(alpha=0.250626566416031)  
Lasso cross-validation score: 0.465  
Lasso R^2 on training data of: 0.4848  
Lasso MAE on training data of: 4.1964  
-----
```

## Diagnostics -- Lasso (training data)



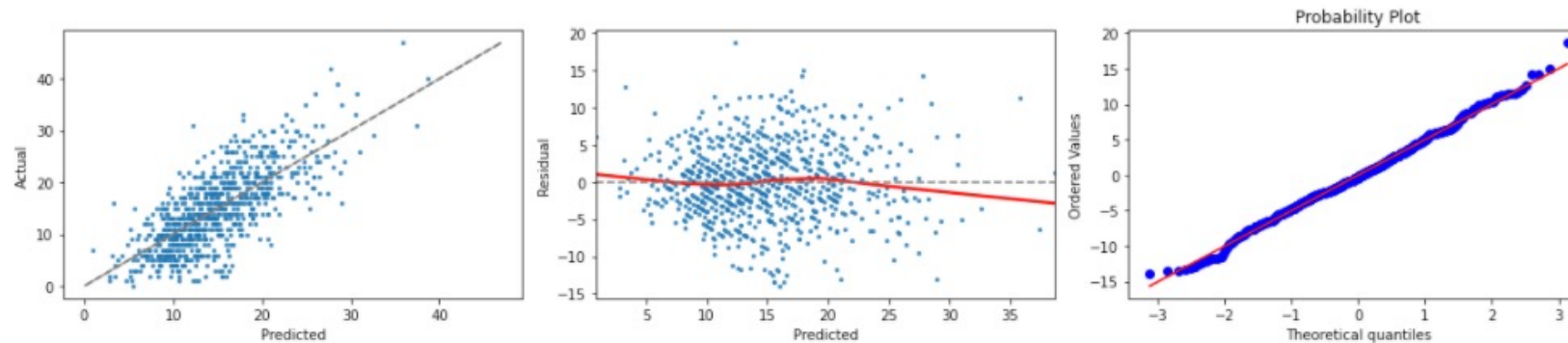
# Ridge results

## Ridge model:

```
-----  
Optimal alpha: Ridge(alpha=3.002001334222815)  
Ridge cross-validation score: 0.5148  
Ridge R^2 on training data of: 0.5417  
Ridge MAE on training data of: 3.9361
```

```
Ridge R^2 on test data of: 0.4598  
Ridge MAE on test data of: 4.163  
-----
```

Diagnostics -- Ridge (training data)



# Coefficients for LASSO and Ridge on train

Vanilla LR model coefficient assignment by feature:

```
Out[30]: [('log_mc', 4.035320181170686),
('log_vol', 1.1849758300298086),
('log_assets', 0.25304860053911193),
('log_rev', -0.10955040615800127),
('comm_services', -2.347199878348221),
('cons_cycl', 2.4644331094124827),
('cons_def', -0.2154348018241661),
('energy', 2.7068679993013487),
('fin_services', -2.579272229452887),
('healthcare', -1.3146057640936581),
('industrials', -0.194077073175095),
('niche', -3.977322048576674),
('real_estate', -6.9912878861159955),
('tech', 0.45117394248471565),
('utilities', -3.7815499302896964)]
```

Lasso model coefficient assignment by feature:

```
Out[57]: [('log_mc', 3.8743903984552825),
('log_vol', 0.9957844373421654),
('log_assets', 0.0),
('log_rev', 0.0998782070932138),
('comm_services', -0.02556271481189812),
('cons_cycl', 0.785469724456464),
('cons_def', 0.0),
('energy', 0.3820618175848931),
('fin_services', -0.3917166976973273),
('healthcare', -0.0),
('industrials', 0.0),
('niche', -0.0),
('real_estate', -1.296532756417945),
('tech', 0.20995032551268145),
('utilities', -0.2943377109710476)]
```

Ridge model coefficient assignment by feature:

```
Out[25]: [('log_mc', 3.7415949497316903),
('log_vol', 1.2275877904258856),
('log_assets', -0.2182229699540663),
('log_rev', 0.5577523740496148),
('comm_services', -0.6328251075179409),
('cons_cycl', 2.5084645488919857),
('cons_def', 0.2793728294105315),
('energy', 1.6855664542218896),
('fin_services', -1.0325872062268353),
('healthcare', -0.22296758758375318),
('industrials', 0.4822496955366807),
('niche', -0.10745274763003876),
('real_estate', -3.7112313575337454),
('tech', 1.2480083003480595),
('utilities', -1.3732253965319212)]
```

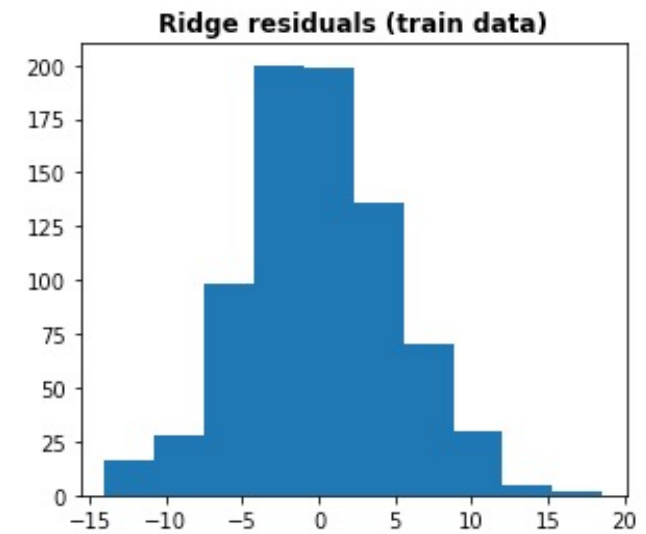
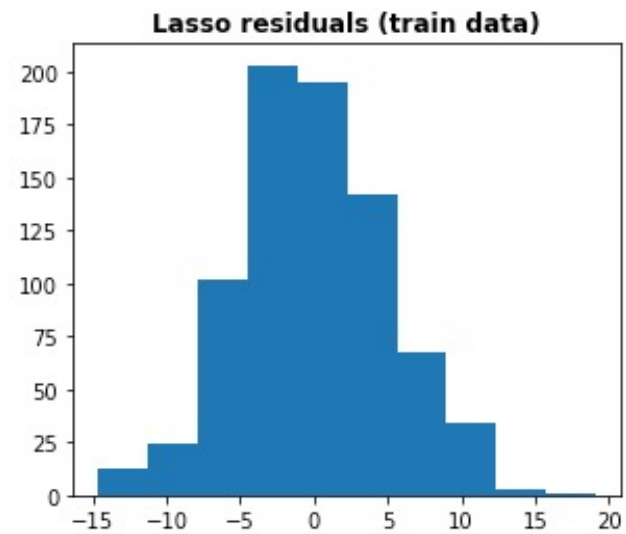
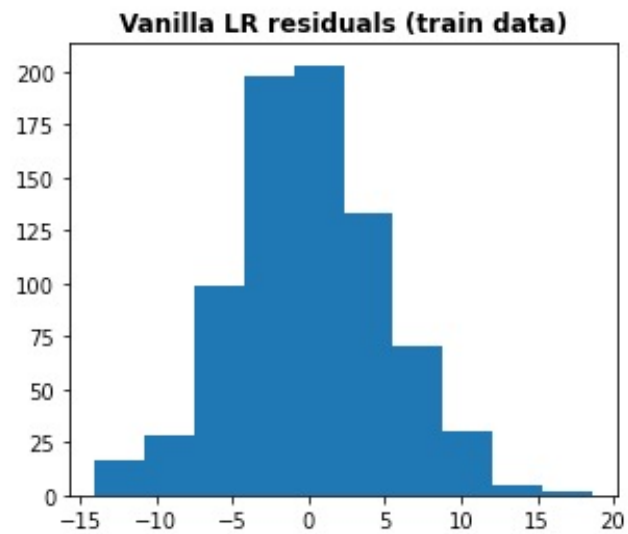
**Both regularized models de-emphasized assets and select sectors, and emphasized MC and volume; the standard linear model's treatment of revenue coefficient was negative**

# Model residual distributions

Vanilla LR resid. mean of:  $3.3805158219198644e-14$

Lasso resid. mean of:  $1.812609019796174e-16$

Ridge resid. mean of:  $5.890979314337565e-16$



# Regression data set sample

Out[8]:

	equity	publishing_analysts	industry	log_ev	log_mc	log_vol	log_assets	log_rev	comm_services	cons_cycl	cons_def	energy	fin_servic
0	A	17	Diagnostics & Research	24.595924	24.559056	14.922356	22.987837	22.484566	0	0	0	0	
1	AA	10	Aluminum	22.981899	22.719326	14.436839	23.421939	23.070824	0	0	0	0	
2	AAL	21	Airlines	24.508591	23.341391	15.675505	24.850529	23.651254	0	0	0	0	
3	AAP	26	Specialty Retail	23.524199	23.351551	13.379328	23.194719	23.097241	0	1	0	0	
4	AAPL	40	Consumer Electronics	28.485436	28.510648	18.931706	26.503664	26.573052	0	0	0	0	
5	ABBV	21	Drug Manufacturers—General	26.378348	26.070135	16.671981	25.737661	24.707237	0	0	0	0	
6	ABC	10	Medical Distribution	23.984051	23.959982	14.198253	24.513682	26.002808	0	0	0	0	
7	ABT	21	Medical Devices	26.141364	26.094648	16.683409	25.007514	24.417879	0	0	0	0	
8	ACC	3	REIT—Residential	23.135602	22.656235	14.131634	22.742315	20.591881	0	0	0	0	
9	ACGL	11	Insurance—Diversified	23.703377	23.462815	15.086170	24.491010	22.978759	0	0	0	0	
10	ACHC	10	Medical Care Facilities	22.679126	22.433454	13.691647	22.594970	21.479388	0	0	0	0	
11	ACI	19	Grocery Stores	23.898817	23.033819	13.604049	24.004102	24.945857	0	0	1	0	
12	ACM	11	Engineering & Construction	23.163001	22.953280	14.129445	23.288134	23.314033	0	0	0	0	
13	ACN	24	Information Technology Services	26.000666	26.030939	15.661158	24.336306	24.593425	0	0	0	0	
14	ADBE	25	Software—Infrastructure	26.410580	26.414233	15.373529	23.913084	23.389799	0	0	0	0	
15	ADI	24	Semiconductors	24.903788	24.841001	15.117064	23.789857	22.547815	0	0	0	0	
16	ADM	15	Farm Products	24.490494	24.230024	15.531540	24.629653	25.039687	0	0	1	0	
17	ADP	21	Staffing & Employment Services	25.214819	25.206042	15.261865	24.391062	23.431982	0	0	0	0	
18	ADPT	7	Biotechnology	22.225119	22.360319	13.726023	20.833388	18.568325	0	0	0	0	
19	ADS	12	Credit Services	23.672954	22.300181	13.086529	23.838872	22.172535	0	0	0	0	