Evaluating Coronavirus Effect of on 2020 Stock Returns

Through Metrics, Ratios, and Classification

Chiebuka Onwuzurike
MSBA '21

01

Introduction

**Business Objectives
Data**

Business Objective

1. Determine the most predictive industry classifier (GIC, SIC, NAICS)

2. Determine which industries where most and least affected/bounced back

3. Determine the most and least predictive stock metrics and ratios

4. Run a combined Linear Regression with metrics, ratios, and best classifier.

Data

- Copustats data from Wharton Research Data Services (WRDS)

- Stock on the Russel 3000

- Metric data from fiscal year 2019

- Classification data from fiscal year 2019

- Return data from fiscal year 2020

02
Industry Classifier

GIC, SIC, NAICS

Industry Classifiers

	GIC	SIC	NAICS
Sector	11	64	23
Group	24	232	232
Industry	69	349	516
Sub-Industry	154		

Industry Classifiers Adj R^2

	GIC		SIC		NAICS	
	Count	Mean Adj R^2	Count	Mean Adj R^2	Count	Mean Adj R^2
Sector	11	0.103	64	0.107	23	0.073
Group	24	0.112	232	0.116	232	0.127
Industry	69	0.139	349	0.126	516	0.129
Sub-Industry	154	**0.167**				

GIC Sub Industry Classifiers Early 2020 Returns

Top

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Oil & Gas Drilling	**-0.7784**	0.145	-5.372	**0.000**	-1.063	-0.494
Oil & Gas Exploration & Production	**-0.6594**	0.048	-13.652	**0.000**	-0.754	-0.565
Oil & Gas Equipment & Services	**-0.6312**	0.059	-10.670	**0.000**	-0.747	-0.515
Department Stores	**-0.6250**	0.145	-4.313	**0.000**	-0.909	-0.341
Hotel & Resort REITs	**-0.5776**	0.077	-7.457	**0.000**	-0.729	-0.426

Bottom

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Specialized REITs	**-0.1622**	0.053	-3.066	**0.002**	-0.266	-0.058
Application Software	**-0.1598**	0.029	-5.458	**0.000**	-0.217	-0.102
Packaged Foods & Meats	**-0.1535**	0.050	-3.089	**0.002**	-0.251	-0.056
Biotechnology	**-0.1123**	0.020	-5.671	**0.000**	-0.151	-0.073
Health Care Equipment	**-0.0903**	0.034	-2.626	**0.009**	-0.158	-0.023

Adj R^2: 0.156

GIC Sub Industry Classifiers Late 2020 Returns

Top

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Housewares & Specialties	7.1362	0.566	12.618	0.000	6.027	8.245
Home Improvement Retail	3.6681	0.438	8.373	0.000	2.809	4.527
Automobile Manufacturers	3.3169	0.400	8.294	0.000	2.533	4.101
Homefurnishing Retail	3.0359	0.370	8.200	0.000	2.310	3.762
Heavy Electrical Equipment	2.5883	0.566	4.577	0.000	1.479	3.697

Bottom

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Research & Consulting Services	0.4729	0.196	2.414	0.016	0.089	0.857
Thrifts & Mortgage Finance	0.4694	0.146	3.214	0.001	0.183	0.756
Retail REITs	0.4587	0.189	2.433	0.015	0.089	0.828
Regional Banks	0.4264	0.063	6.814	0.000	0.304	0.549
Pharmaceuticals	0.3722	0.122	3.040	0.002	0.132	0.612

Adj R^2: 0.179

2020 ClassifiersReturns

Early 2020

Affected the Most

- Oil & Gas Drilling
- Oil & Gas Exploration & Production
- Oil & Gas Equipment & Services
- Department Stores
- Hotel & Resort REITs

Affected the Least

- Specialized REITs
- Application Software
- Packaged Foods & Meats
- Biotechnology
- Health Care Equipment

Late 2020

Bounce Back the Most

- Housewares & Specialties
- Home Improvement Retail
- Automobile Manufacturers
- Homefurnishing Retail
- Heavy Electrical Equipment

Bounce Back the Least

- Research & Consulting Services
- Thrifts & Mortgage Finance
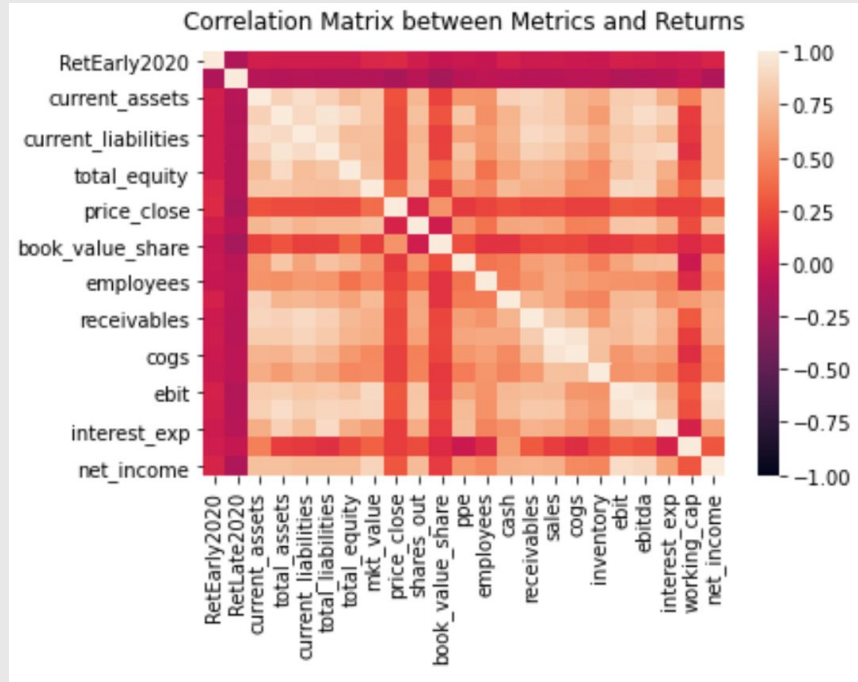- Retail REITs
- Regional Banks
- Pharmaceuticals

03

Metrics and Ratios

Russel 3000

21 Metrics

Correlation Matrix between Metrics and Returns

'current_assets', 'total_assets', 'current_liabilities', 'total_liabilities', 'total_equity', 'mkt_value', 'price_close', 'shares_out', 'book_value_share', 'ppe', 'employees', 'cash', 'receivables', 'sales', 'cogs', 'inventory', 'ebit', 'ebitda', 'interest_exp', 'working_cap', 'net_income'
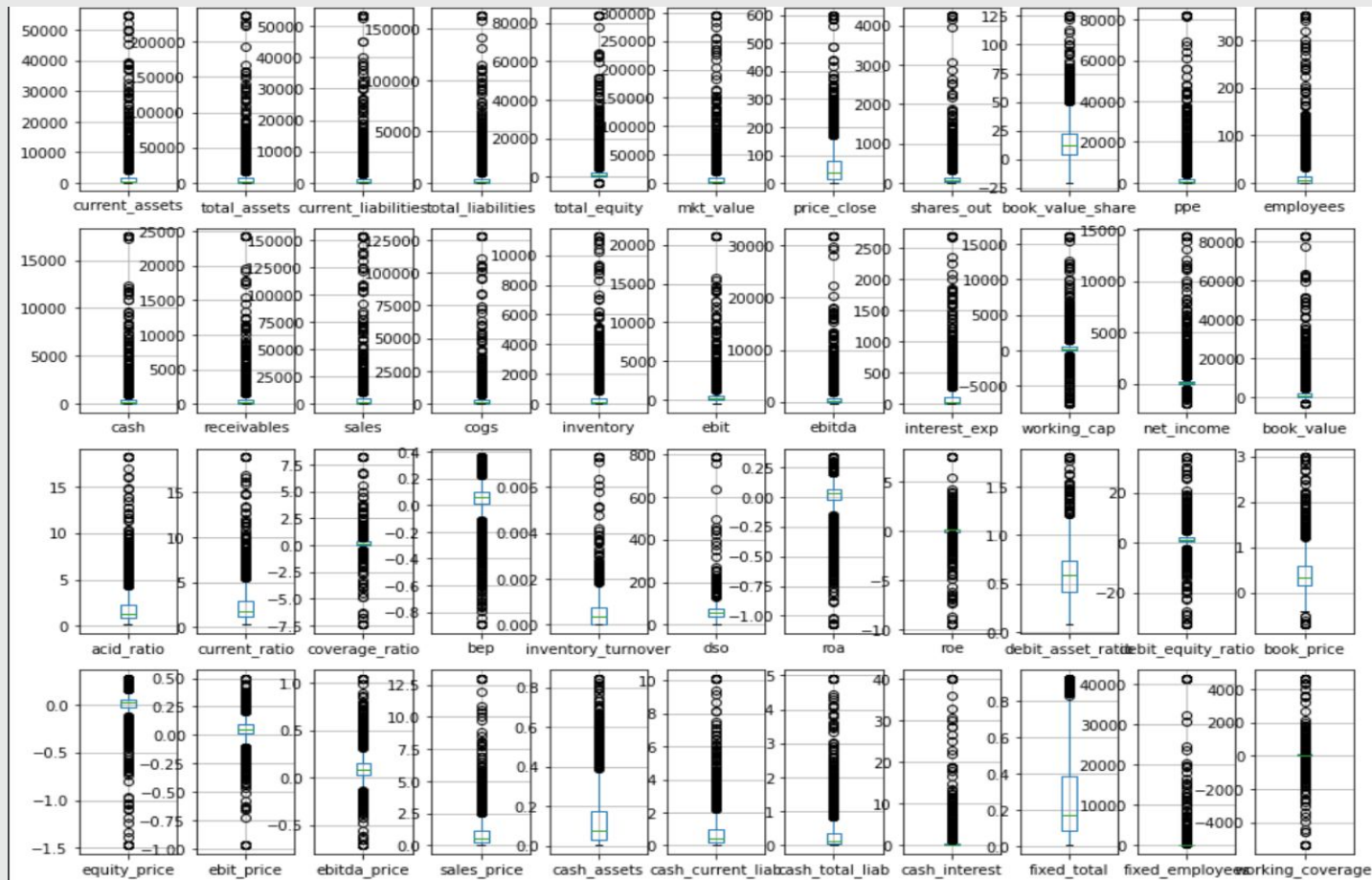
23 Ratios

Correlation Matrix between Ratios and Returns

'book_value', 'acid_ratio', 'current_ratio', 'dso', 'roa', 'roe', 'coverage_ratio', 'bep', 'inventory_turnover', 'debit_asset_ratio', 'debit_equity_ratio', 'book_price', 'equity_price', 'ebit_price', 'ebitda_price', 'sales_price', 'cash_assets', 'cash_current_liab', 'cash_total_liab', 'cash_interest', 'fixed_total', 'fixed_employees', 'working_coverage
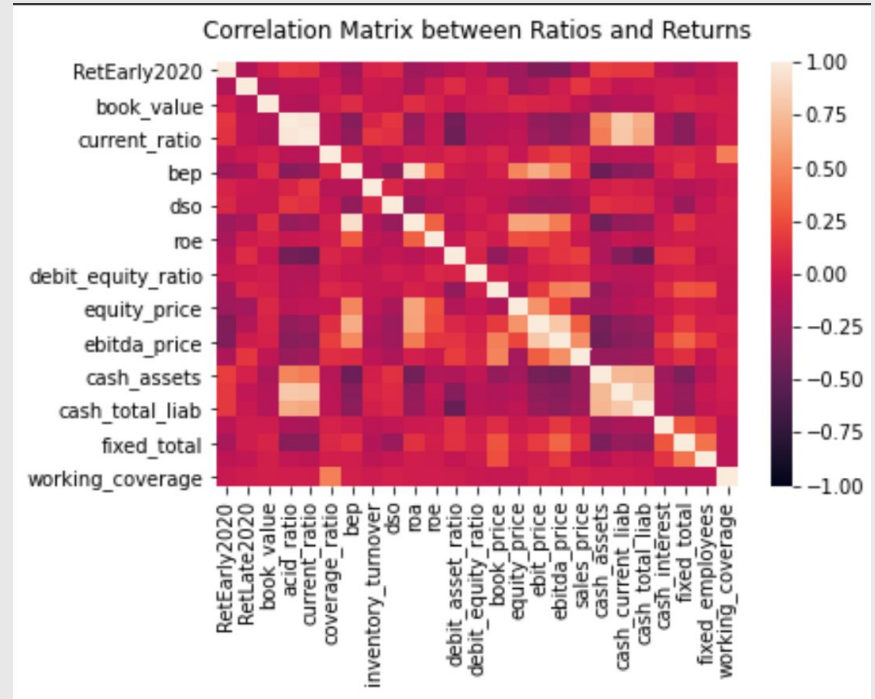
Winsorized Metrics and Ratios

Metrics & Ratios Early 2020 Returns

	Coef	Std Err	t	P>|t|	[0.025	0.975]
sales_price	**0.020500**	0.008000	2.698	**0.007**	0.006000	0.035000
price_close	**0.000300**	0.000000	2.007	**0.045**	0.000007	0.001000
net_income	**0.000049**	0.000014	3.517	**0.000**	0.000022	0.000076
ebitda	**-0.000029**	0.000014	-2.105	**0.035**	-0.000056	-0.000002
roe	**-0.030800**	0.007000	-4.377	**0.000**	-0.045000	-0.017000
book_price	**-0.122600**	0.028000	-4.370	**0.000**	-0.178000	-0.068000
const	**-0.136300**	0.045000	-3.037	**0.002**	-0.224000	-0.048000
debit_asset_ratio	**-0.149100**	0.048000	-3.117	**0.002**	-0.243000	-0.055000
equity_price	**-0.225800**	0.082000	-2.759	**0.006**	-0.386000	-0.065000
ebitda_price	**-0.230700**	0.117000	-1.975	**0.048**	-0.460000	-0.002000
ebit_price	**-0.467300**	0.162000	-2.888	**0.004**	-0.785000	-0.150000

Adj R^2: 0.182

Metrics & Ratios Late2020 Returns

	Coef	Std Err	t	P>|t|	[0.025	0.975]
ebitda_price	**1.4511**	0.410	3.537	**0.000**	0.646	2.256
const	**0.9297**	0.158	5.899	**0.000**	0.621	1.239
cash_total_liab	**0.1959**	0.088	2.216	**0.027**	0.022	0.369
roe	**0.0951**	0.025	3.843	**0.000**	0.047	0.144
sales_price	**0.0867**	0.027	3.250	**0.001**	0.034	0.139
book_value_share	**-0.0085**	0.002	-3.492	**0.000**	-0.013	-0.004
cash_current_liab	**-0.1231**	0.055	-2.241	**0.025**	-0.231	-0.015
ebit_price	**-2.4069**	0.569	-4.233	**0.000**	-3.522	-1.292

Adj R^2: **0.107**

2020 Metric Returns

Sales to Price

Top Positive Metric at the 95% Statisitcal Significant Level

- Was a postive statistcally significant variable for both Early and Late 2020 Returns
- Makes sense because Sales is a the top of the balance sheet.
- This, connected with a high price, is a great signals for investors and subsequently postive stock returns.

High top line health on the balance sheet means money is coming in the company:

EBIT to Price

Top Positive Metric at the 95% Statisitcal Significant Level

- Was a negative statistcally significant variable for both Early and Late 2020 Returns.
- Makes sense because EBIT is low on the balance sheet just above interest and taxes.
- This would mean low new income and stock holders equity, and combined with a low price, subsequently negative stock retutn

Low bottom line health on the balnce sheet means there isn't much to pay off Interest, Taxes, and/or Working Capital.

04
Final Model

Metrics, Ratios, and Classifiers

Metrics, Ratios, Classifiers Early 2020 Returns

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Integrated Telecommunication Services	0.525300	0.161000	3.255	0.001	0.209000	0.842000
bep	0.477100	0.179000	2.670	0.008	0.127000	0.828000
Health Care Distributors	0.305600	0.088000	3.490	0.000	0.134000	0.477000
Food Retail	0.274200	0.116000	2.358	0.019	0.046000	0.502000
Water Utilities	0.249500	0.111000	2.243	0.025	0.031000	0.46800
....	....	....	....	....	....	....
Oil & Gas Equipment & Services	-0.311700	0.070000	-4.445	0.000	-0.449000	-0.174000
Oil & Gas Exploration & Production	-0.347400	0.076000	-4.569	0.000	-0.497000	-0.198000
roa	-0.365800	0.168000	-2.181	0.029	-0.695000	-0.037000
Oil & Gas Drilling	-0.466100	0.170000	-2.748	0.006	-0.799000	-0.133000
ebit_price	-0.671600	0.176000	-3.806	0.000	-1.018000	-0.325000

Adj R^2: 0.218

Metrics, Ratios, Classifiers Late 2020 Returns

	Coef	Std Err	t	P>|t|	[0.025	0.975]
Housewares & Specialties	5.928100e+00	6.010000e-01	9.872	0.000	4.750000e+00	7.106000e+00
Automobile Manufacturers	3.472900e+00	5.460000e-01	6.362	0.000	2.402000e+00	4.544000e+00
Home Improvement Retail	3.066200e+00	5.620000e-01	5.457	0.000	1.964000e+00	4.168000e+00
Life & Health Insurance	2.370900e+00	1.030000e+00	2.302	0.021	3.510000e-01	4.391000e+00
ebitda_price	1.740300e+00	4.390000e-01	3.969	0.000	8.800000e-01	2.600000e+00
....	...	...	...	...	...	...
Commercial Printing	-9.262000e-01	4.670000e-01	-1.984	0.047	-1.842000e+00	-1.000000e-02
Gas Utilities	-9.668000e-01	3.430000e-01	-2.818	0.005	-1.640000e+00	-2.940000e-01
bep	-1.550600e+00	5.840000e-01	-2.654	0.008	-2.697000e+00	-4.040000e-01
Integrated Telecommunication Services	-1.572600e+00	5.280000e-01	-2.980	0.003	-2.608000e+00	-5.370000e-01
ebit_price	-2.575600e+00	5.770000e-01	-4.464	0.000	-3.707000e+00	-1.444000e+00

Adj R^2: 0.258

2020 Metric Returns

Early 2020

Top 5 Variables

- Integrated Telecommunication Services
- Basic Earning Power
- Health Care Distributors
- Food Retail
- Water Utilities

Bottom 5 Variables

- Oil & Gas Equipment & Services
- Oil & Gas Exploration & Production
- Return on Asset
- Oil & Gas Drilling
- EBIT to Price

Late 2020

Top 5 Variables

- Housewares & Specialties
- Automobile Manufacturers
- Home Improvement Retail
- Life & Health Insurance
- EBITDA to Price

Bottom 5 Variables

- Commercial Printing
- Gas Utilities
- Basic Earning Power
- Integrated Telecommunication Services
- EBIT to Price

Adjusted R^2

|	Early 2020 Adj R^2	Late 2020 Adj R^2
GIC Sub Industry Classifierrs	**0.156**	**0.179**
Metrics & Ratios	**0.182**	**0.107**
GIC Sub Industry Classifierrs Metrics & Ratios	**0.218**	**0.258**

Future Improvements

Holm-Bonferroni Method

To control for Multiple Variable Testing and avoid Data Mining in the financial sense

Better Metrics and Ratios

Metrics and Ratios had the most predictive power.
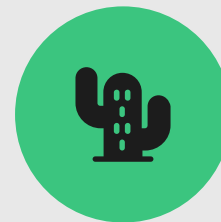
Use Different Model

Use a model instead of OLS that is more accurate but less interpretable
(Ex. Neural Network with Lime)