What happened in 2020 Stock Market?

Financial and Accounting Analytics of Stock Returns during COVID-19 Pandemic in 2020

by (Bruce) Chang-Hung Hou

Introduction

What happened in 2020 stock market?

- Unprecedented plunge in March after COVID shock
- Dramatic rebound in the rest of the year
- Polarized stock performance across industries

What made this happen?

- Financial Statement in previous year
- Industries
- Other Economic or Business Factors

Data-Driven Delivery

STEP 1
Prepare Data
- Separate stock return in two terms
- Remove missing values
- Invert financial ratio to balance dataset

STEP 2
Classify Industry
- SIC, NAICS, and GICS (GSECTOR, and GGROUP)
- Select the best industries separation method

STEP 3
Filter Financial Ratio
- Absolute correlation with stock return
- Statistically significance in regression

STEP 4
Discover Story Behind Data
- What cause the stock return difference across industries?
- Financial ratio perspective
- Other Economic factors

Data Preparation

**Separate Stock Return into two terms**

- Based on stock bottom point in 2020
- First term (RetEarly2020): Total stock return from January to March
- Second Term (RetLate2020): Total stock return from April to December

Remove Missing Value in Financial Data

- Drop columns with high portion of missing values
- Drop all missing values by row in remaining columns
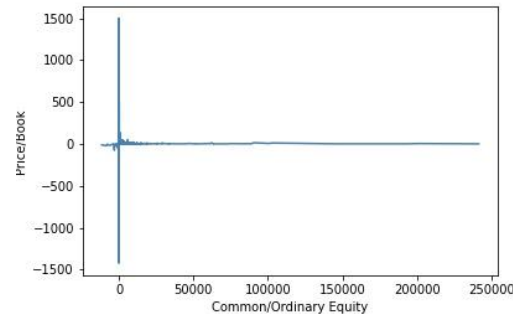
Invert Certain Financial Ratio

- Visualize distribution of financial ratio
- Invert those with lots of extreme value near 0 to balance data (ex: Price/Book)
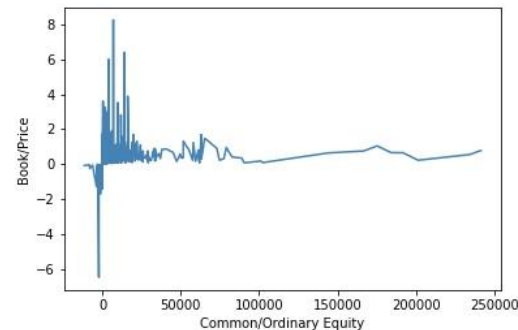- Better for linear regression
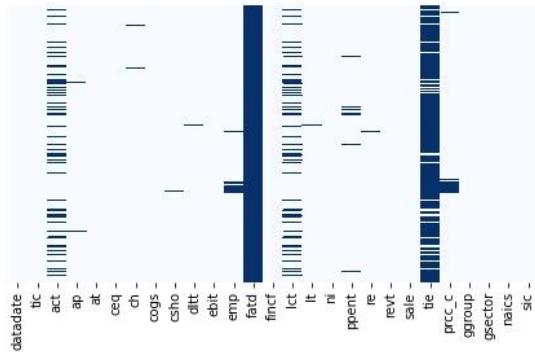
Missing values (dark blue) before dropping columns
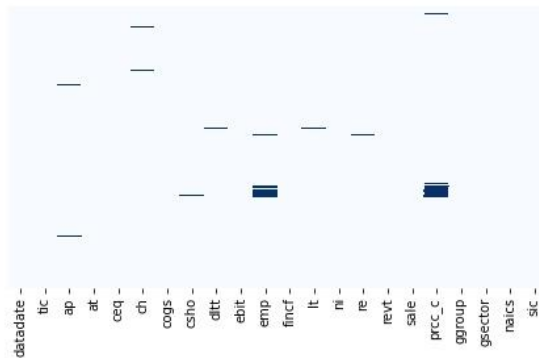
Missing values (after) before dropping columns

Data Distribution of Original Financial Ratio

Data Distribution of Inverse Financial Ratio

Industry Classification

Selecting best classification method are based on three criteria:

- Adjust R-square from fixed effect regression
- Distribution of companies among each industry
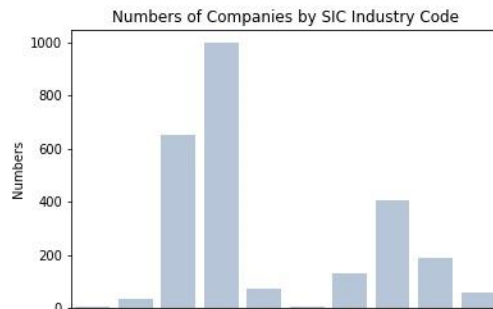- Numbers of industry in total

We prefer GSECTOR due to…

- Second highest adjust r-square
- Balanced distribution of companies
- Reasonable numbers of industry in total

SIC (Standard Industrial Classification)
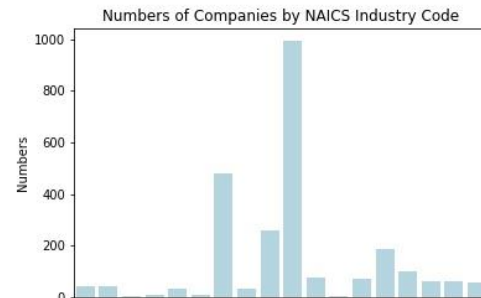NAICS (North American Industry Classification System)
GICS (Global Industry Classification Standard)
'Early' here refers to stock return in early 2020. 'Late' here refers to stock return in late 2020
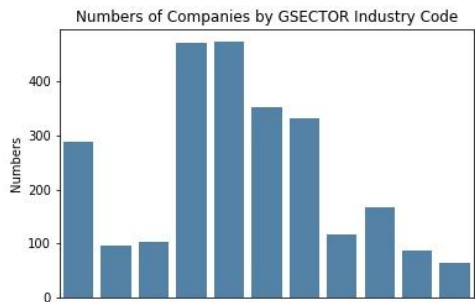

SIC
Adjust r-square: 0.09 for early and 0.09 for late
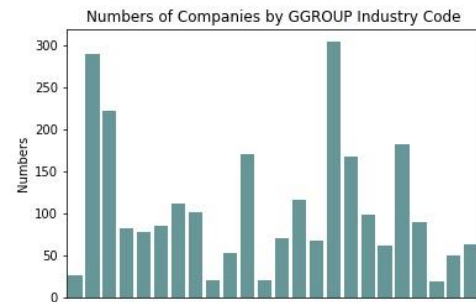Numbers of industries: 10

NAICS
Adjust r-square: 0.12 for early and 0.10 for late
Numbers of industries: 18

GSECTOR (GICS)
Adjust r-square: 0.19 for early and 0.12 for late
Numbers of industries: 11

GGROUP (GICS)
Adjust r-square: 0.21 for early and 0.14 for late
Numbers of industries: 24

Financial Ratio

Process

15 financial variables

▼ Correlation matrix:
Highest absolute
correlation value

10 financial variables

▼ Linear regression:
P value < 0.05

6 - 7 financial variables

Ratio that correlates with Return Early

- Return Early: Stock return in early 2020
- Negative correlation: EBIT/Price, Earning/Price, Book/Price, Retained Earnings/Price, Sales/Price, and Debt Ratio
- Positive correlation: None
- Debt ratio makes economic sense as higher ratio reflects higher debt by assets

Ratio that correlates with Return Late

- Return Late: Stock return in late 2020
- Negative correlation: Earning/Price, Retained Earning/Total Assets, and EBIT/Total Assets
- Positive correlation: Sales/Price, Asset Turnover Ratio, Cash/Total Assets, and Long-term Debt/Total Assets
- Cash/Total Assets makes sense as higher ratio refers to relatively more cash
- Sales/Total Assets makes sense as higher ratio stands for relatively higher sales
- Asset Turnover ratio may make sense as higher ratio means less reliance on assets for operation

Story Behind Data: Combine financial Ratio and Industry Together

Does correlation between stock return and financial ratio in general applies to all industries (Industry-level analysis)?

TERM

- From January to March in 2020 (RetEarly2020)
- From April to December in 2020 (RetLate2020)

INDUSTRY

- Top 2 highest stock return
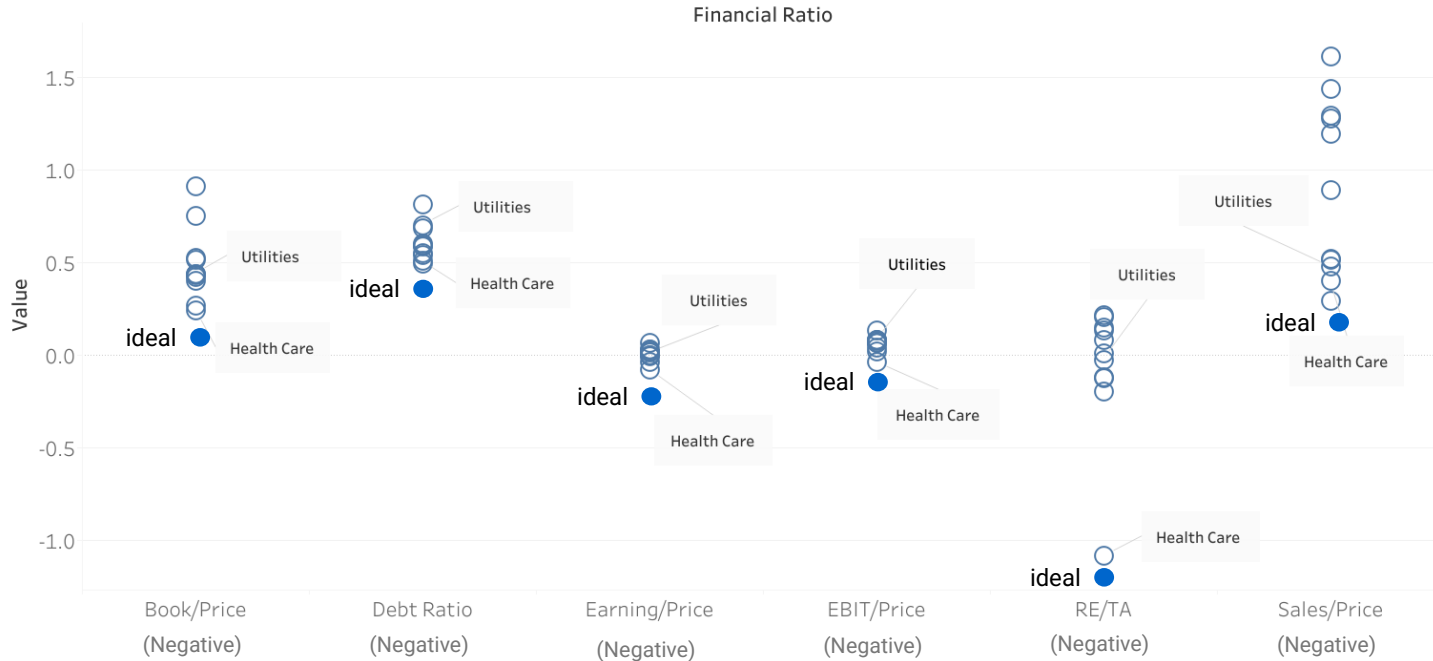- Top 2 lowest stock return

FINANCIAL RATIO

- Top absolute correlation value
- Statistically significance in regression
- With and without economic sense (economic hypothesis in previous page may be incorrect)

Story Behind Data

Healthcare industry matches correlation between financial ratio and stock return in general.

Financial Ratio from Highest Stock Return Industries in Early 2020

- 'Negative' at the bottom refers to negative correlation between financial ratio and stock return in general
- Negative correlation: Industries with highest stock return should have lowest financial ratio
- RE/TA: Retained Earnings/ Total Assets

Story Behind Data

Consumer discretionary industry mostly matches correlation between financial ratio and stock return in general.

Financial Ratio from Lowest Stock Return Industries in Early 2020
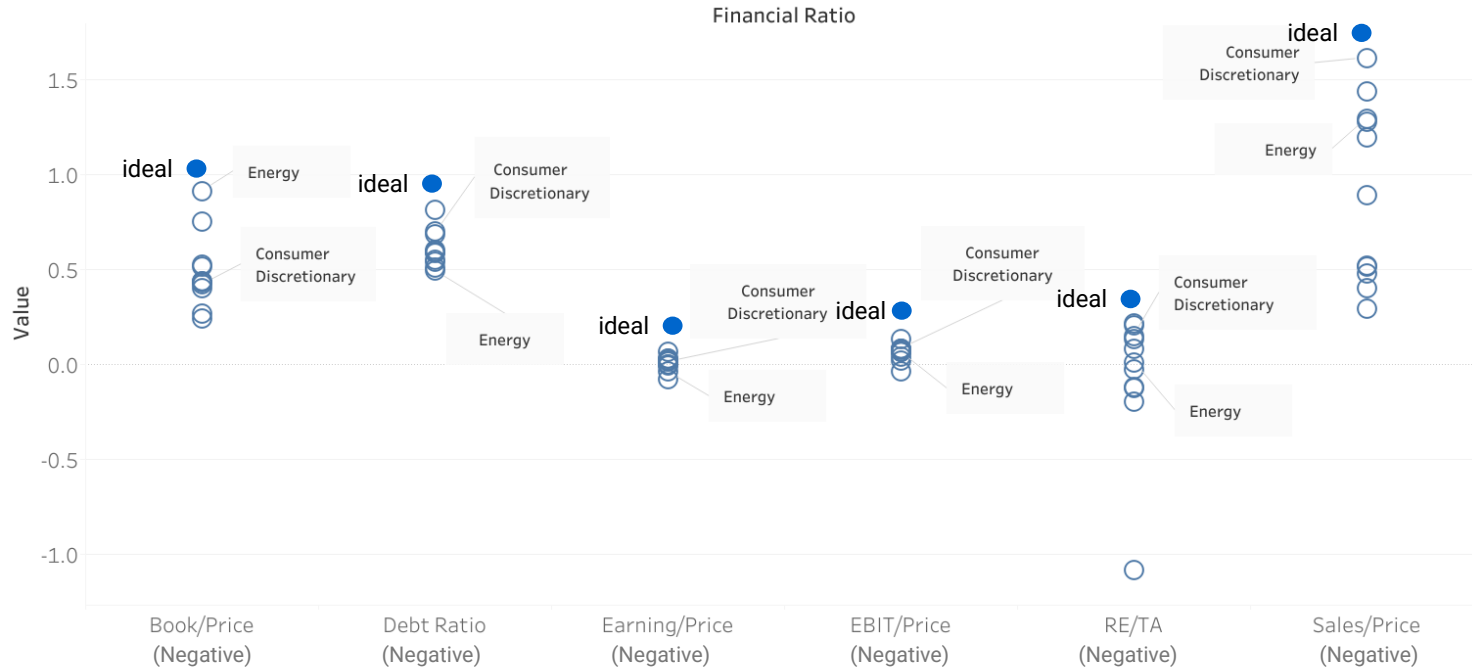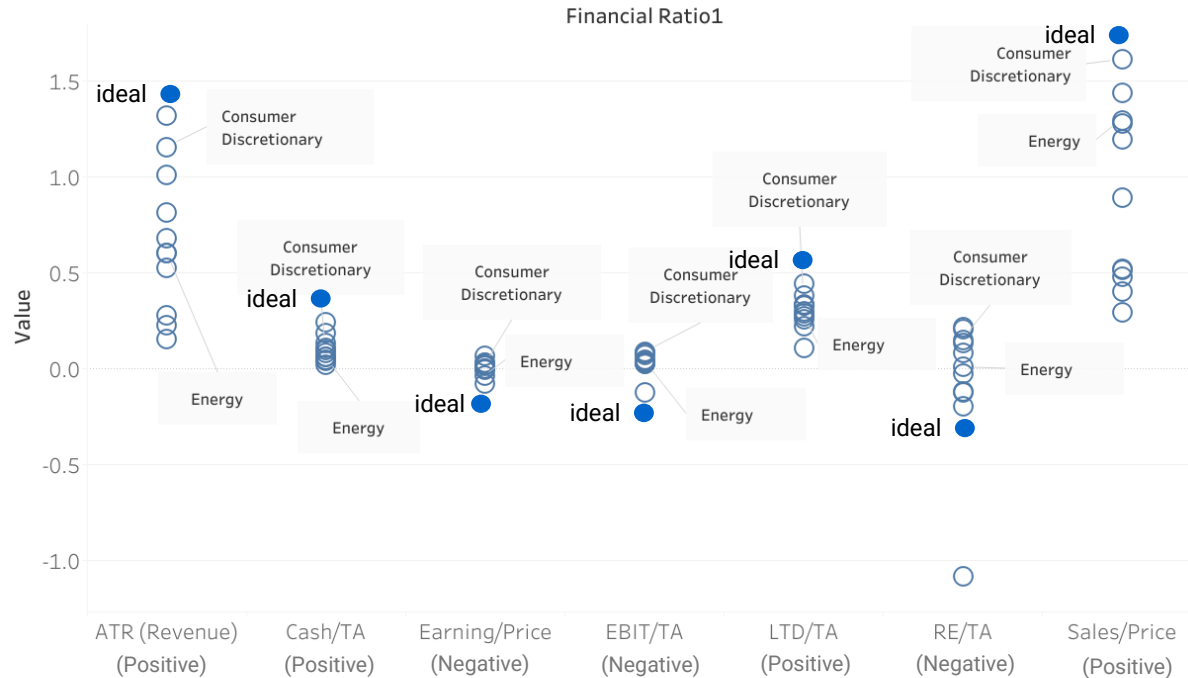
- 'Negative' at the bottom refers to negative correlation between financial ratio and stock return in general
- Negative correlation: Industries with lowest stock return should have highest financial ratio
- RE/TA: Retained Earnings/ Total Assets
- Consumer Discretionary: Hotels, Restaurants, Educational Services, etc.

Story Behind Data

Consumer discretionary industry partially matches correlation between financial ratio and stock return in general.

Financial Ratio from Highest Stock Return Industries in Late 2020

- 'Negative' at the bottom refers to negative correlation between financial ratio and stock return in general (vice versa in 'Positive')
- Negative correlation: Industries with lowest stock return should have highest financial ratio (vice versa in 'Positive')
- Consumer Discretionary: Hotels, Restaurants, Educational Services, etc.
- ATR (Revenue): Asset Turnover Ratio
- Cash/TA: Cash/Total Assets
- EBIT/TA: Earnings before interest and taxes/Total Assets
- LTD/TA: Long-Term Debt/Total Assets
- RE/TA: Retained Earnings/Total Assets

Story Behind Data

Neither Utilities nor Real Estate matches correlation between financial ratio and stock return.

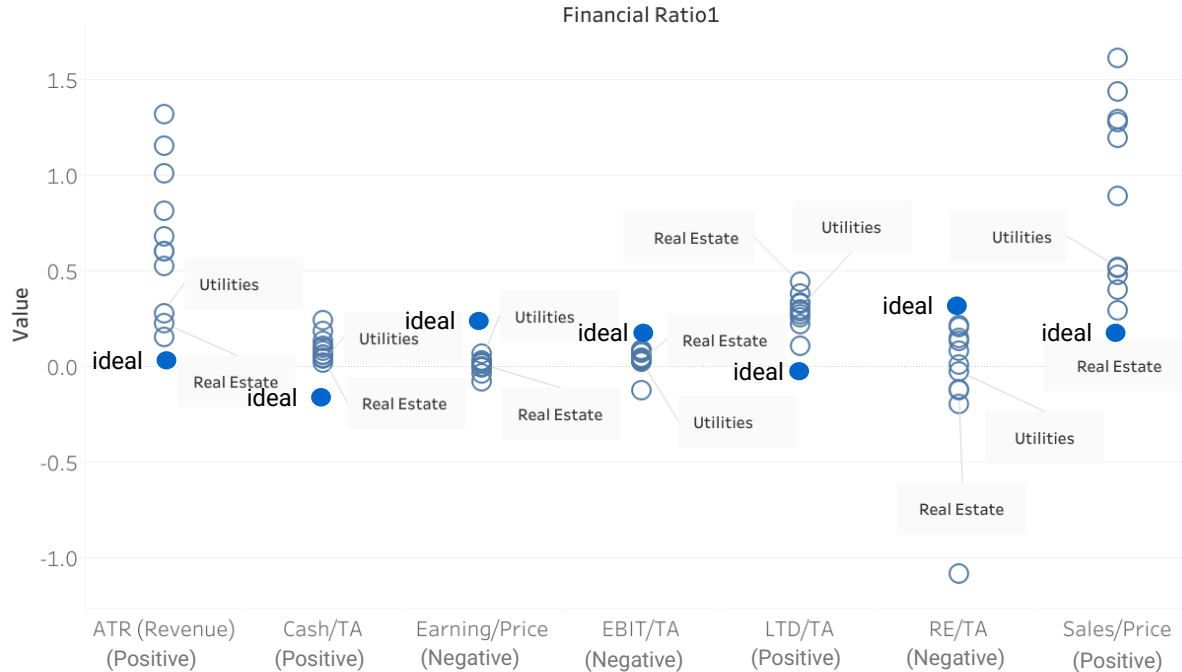Financial Ratio from Lowest Stock Return Industries in Late 2020

- 'Negative' at the bottom refers to negative correlation between financial ratio and stock return in general (vice versa in 'Positive')
- Negative correlation: Industries with lowest stock return should have highest financial ratio (vice versa in 'Positive')
- Consumer Discretionary: Hotels, Restaurants, Educational Services, etc.
- ATR (Revenue): Asset Turnover Ratio
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- RE/TA: Retained Earnings/Total Assets

Business Insights

General: Correlation Between Stock Return in 2020 and Financial Ratio in 2019

- Not all makes economic sense.
- Low interpretability: investor trade stocks based on other factors
- Investors who make decision based on 2019 financial data: they may believe financial health changes dramatically under COVID

Industry-level: Correlation Between Stock Return in 2020 and Financial Ratio in 2019

- Correlation between stock return and financial ratio in general only applies to some industries.
- Healthcare industry
  - Poorer financial health: low Book Price, Earning/Price, EBIT/Price, Retained Earnings/Total Assets, and Sales/Price
  - High stock return in early 2020
  - Hypothesis: High market demand under pandemic, investors are more confident with future financial health
- Consumer Discretionary
  - Stronger financial health: high Earning/Price, EBIT/Price, Retained Earnings/Total Assets, and Sales/Price
  - Low stock return in early 2020
  - Hypothesis: Very low market demand under pandemic, investors are less confident with future financial health

Thank you~

Any questions?