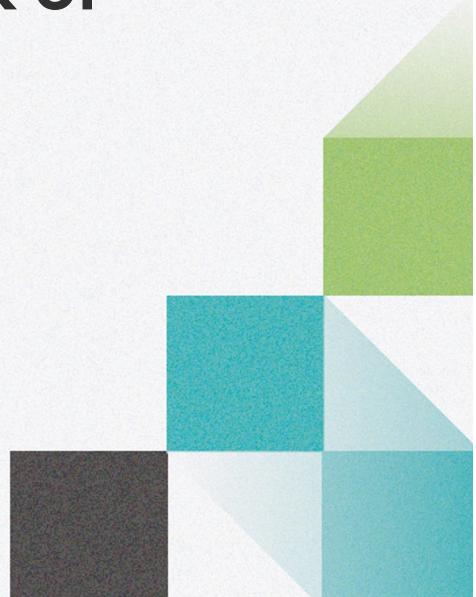




# **Financial and Accounting Analytics of Stock Returns During Market Shock of Early 2022**



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BA 870 – Session B1  
04/28/2022

# RISK EXPOSURES



## Monthly Stock Return Data

- For **1875** company stocks, each has **60 monthly risk exposures**
- For rest **11** company stocks, each only **lacks one monthly value → No Effect!**

# of monthly risk exposures	count
0	60 1875
1	59 11

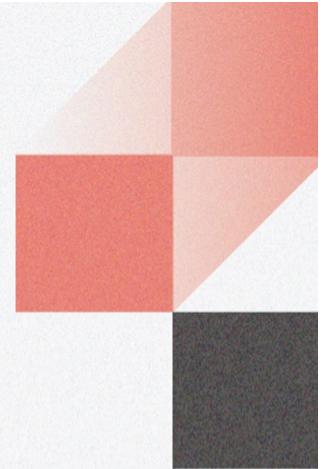


## Fama-French 3-Factor Model

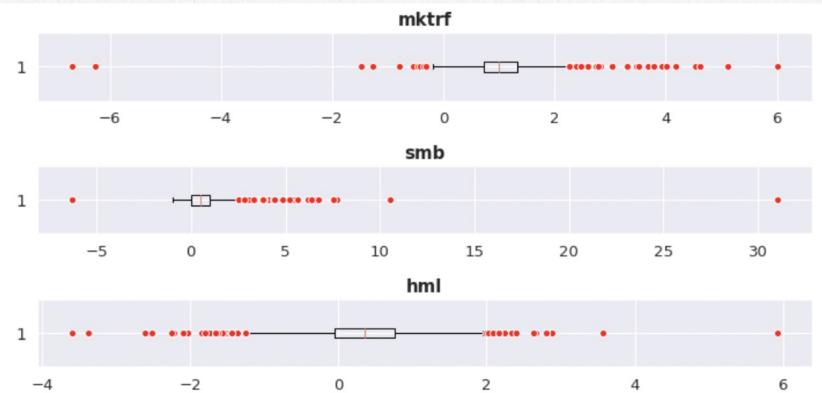
```
# Define a Linear Regression function for FF model
def ffmodel(data,i):
    y = data[i]["RET"] - data[i]["rf"]
    X = data[i][['mktrf', 'smb', 'hml']]
    # Use statsmodels
    X = sm.add_constant(X) # adding a constant
    model = sm.OLS(y, X).fit()

#return regression output
return (i, model.rsquared, model.rsquared_adj,
        model.params[0], model.params[1],
        model.params[2],model.params[3])

for i in list(stockret_ff.keys())[:]:
    output.loc[len(output.index)] = ffmodel(stockret_ff, i)
```



# RISK EXPOSURES



## Descriptive Analysis

**Median factor betas** indicate that **50% of company stocks** are at least **0.76% more volatile** than the market's return, **more than 76%** are classified as **small companies** and **73%** are classified as **value stocks**.

## Handling Outliers

According to the boxplots, although 3 factor betas have several outliers on both sides, the **outlier percentages** are all **less than 4%**. To increase the model explanatory power, I decided to **keep those outliers** due to **small sample size**.

Risk Factor	Outlier Ratio	
0	mktrf	0.04
1	smb	0.04
2	hml	0.03

	count	mean	std	min	25%	50%	75%	max
R-squared	1886.0	0.382156	0.185622	0.002022	0.235846	0.380695	0.516755	0.866154
Adj. R-squared	1886.0	0.349054	0.195568	-0.051441	0.194909	0.347518	0.490867	0.858983
const	1886.0	0.004178	0.017644	-0.079578	-0.003677	0.002600	0.009878	0.433986
mktrf	1886.0	1.065523	0.624864	-6.676723	0.720385	1.007568	1.337691	6.002016
smb	1886.0	0.667360	1.232145	-6.286219	0.016011	0.501588	1.019407	31.005941
hml	1886.0	0.317198	0.699372	-3.593321	-0.047773	0.360752	0.760726	5.919490

# FINANCIAL RATIOS



## Market Value Ratio

- Price/Book
- Price/Equity
- Price/EBIT
- Price/Sales



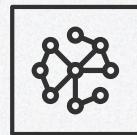
## Efficiency Ratio

- Retention Ratio
- Quick Ratio



## Debt Management Ratio

- Debt Ratio



## Profitability Ratio

- Return on Assets
- Return on Equity
- Asset Turnover Ratio

# FINANCIAL RATIOS



## Data Imputation

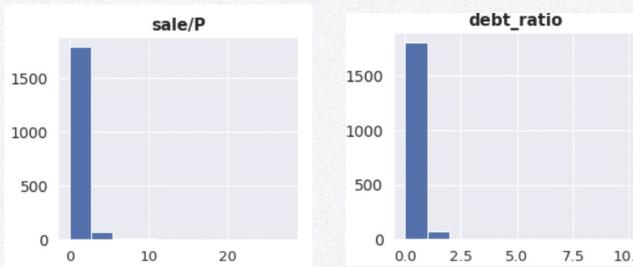
- Replace missing values with “**Median**” for “**inventory**”, “**total liability**” and “**retained earnings**”
- Impute missing values using **Random Forest ( $R^2 = 0.95$ )** and **Linear Regression ( $R^2 = 0.94$ )** for “**current assets**” and “**current liability**”



## Handling Outliers

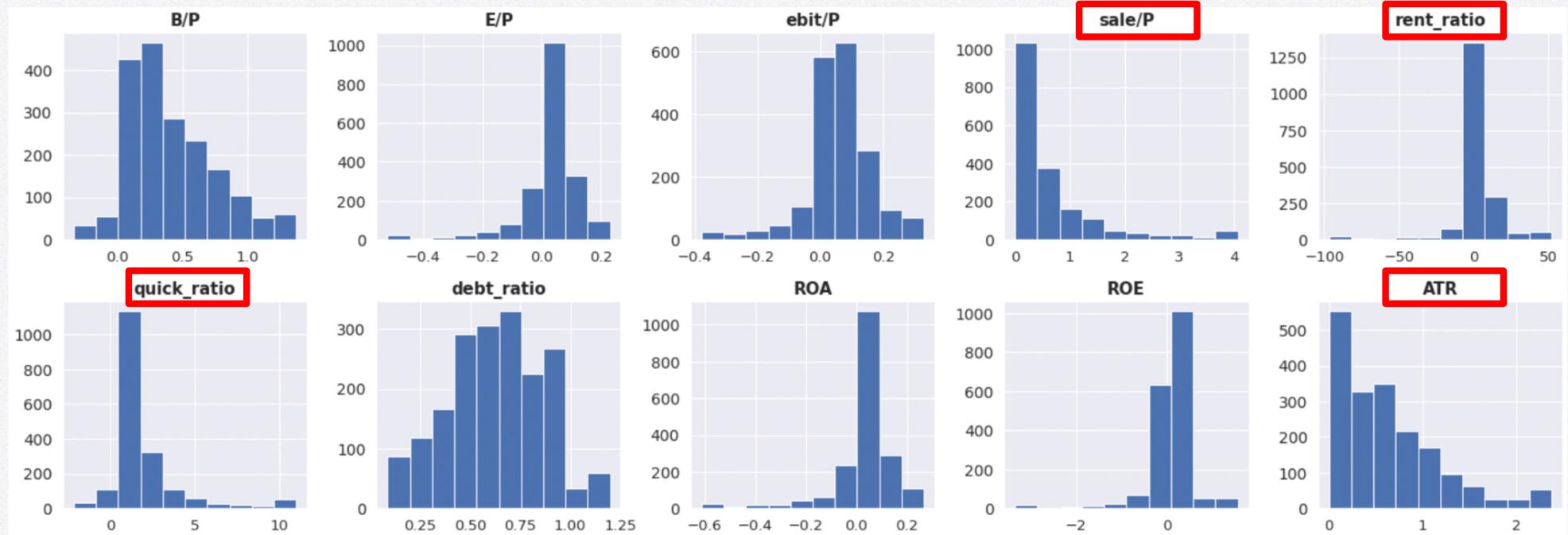
- Most ratios follow a normal distribution, but the distribution of **Sale / Price**, **Debt Ratio** and **Asset Turnover Ratio** are **right skewed**
- Use **Winsorization** method to deal with outliers before establishing the linear regression models

fin variable	count
18 lct	455
12 act	455
17 invt	34
19 lt	5
21 re	3



# FINANCIAL RATIOS

10 Ratio Distributions After Winsorization



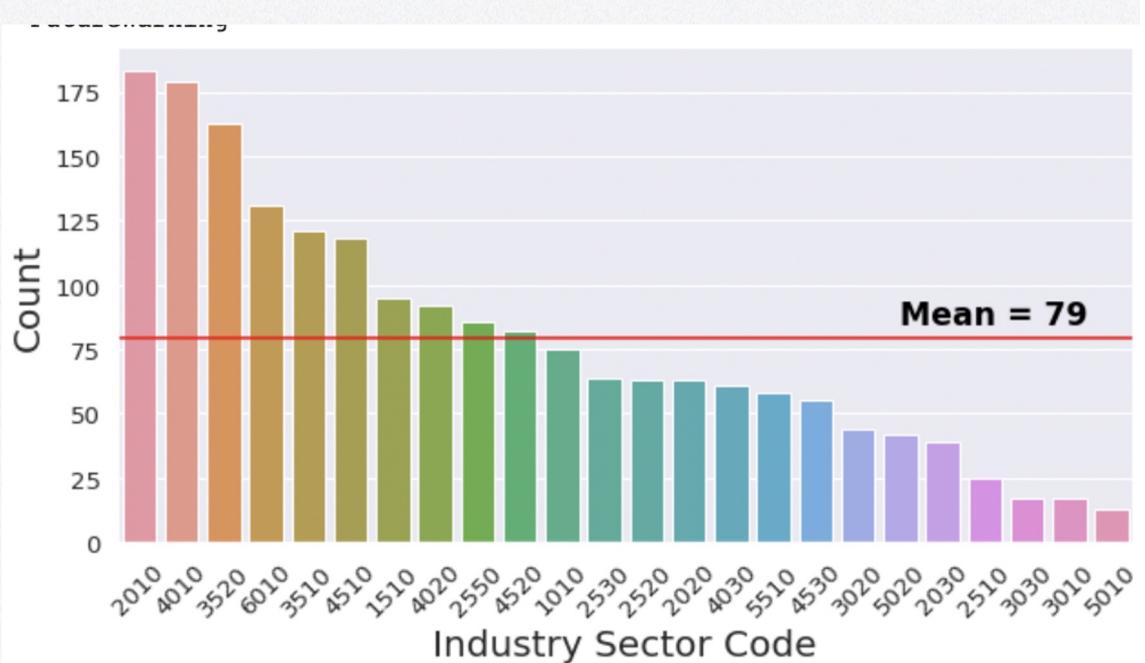
# INDUSTRIES

## Dataset Characteristics

- **1886** company stocks with **no missing values**
- **24** unique industry sectors
- Ex. **Banks, Pharmaceuticals, Real Estate**

## Descriptive Analysis

- “**Capital Goods**” industry has the **most** company stocks (**183**)
- “**Telecommunication**” industry has the **least** company stocks (**13**)



# LINEAR REGRESSION



	Risk Exposures	Financial Ratios	Industry Indicators	Combination w/ variable*
Coefficients	Size Risk Beta* Value Risk Beta*	B/P*, E/P*, Sale/P*, ROA*, ATR*	All*(24-1)=23	All* (3)+(5)+(24-1)=31
R squared	9.5%	8.9%	32.6%	<b>38.6%</b>
Adj R squared	9.3%	8.5%	31.7%	<b>37.6%</b>

“Energy”

\*: Coefficients are significant at 5% level of significance

All\*: 3 Risk Exposures + ['B/P', 'sale/P', 'debt\_ratio', 'ROA', 'ATR'] + 23 industry indicators w/o ggroup1010

# LINEAR REGRESSION



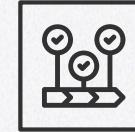
## Risk Exposure

- In 1886 company stocks, **76% are small company stocks** which indicates that **positive Size Risk Exposure Beta** will have a corresponding **negative coefficient**, which **drop the RetYTD**
- **73% are value company stocks** which shows that **positive Value Risk Exposure Beta** will have a corresponding **positive coefficient**, which **increase RetYTD**
- **Value Risk Exposure Beta** will cause the **most impact** and a increase in RetYTD



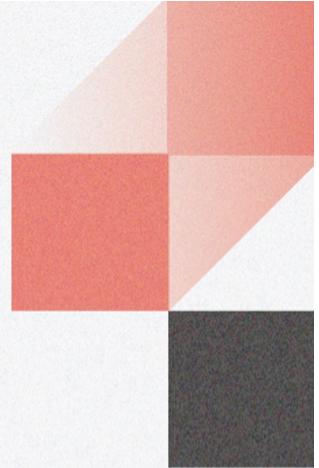
## Financial Ratio

- **Based on coefficients only, E/P(-0.39) and ROA(+0.39)** will have **more significant effect** on the **valuations of stocks in 2022**
- The main reason is that **E/P has directly relationship** to the **company's value** in the market.
- Furthermore, **ROA** could be a **good indicator of companies' profitability in the future**. For instance, high ROA suggests that the more profit is being generated from each dollar invested in assets.



## Industry Indicator

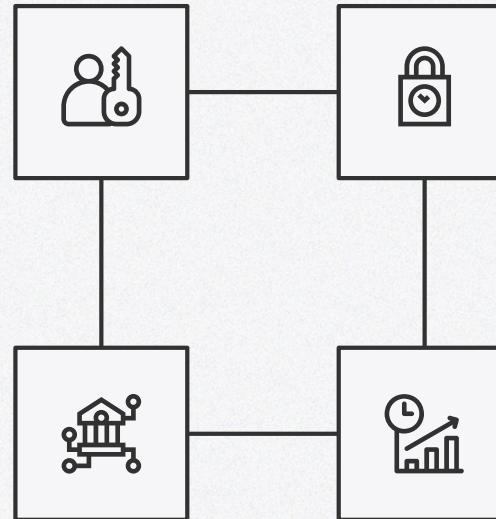
- The **lowest average stock returns** is around **-0.25** in **Semiconductors** due to the **increased risk of consumer spending decreasing**. The recent **tension between Russia and Ukraine** and accompanying sanctions on Russia have **cut off raw materials (Neon, xenon and krypton)**
- The **highest average stock returns** is **0.52 in Energy**. With the gradual reopening, the demand in oil has incredibly increased. However, **the total oil inventories have declined due to rising tensions amid Russia/Ukraine war exacerbated the oil shortage**, which in turn highly increase the oil prices



# CONCLUSION

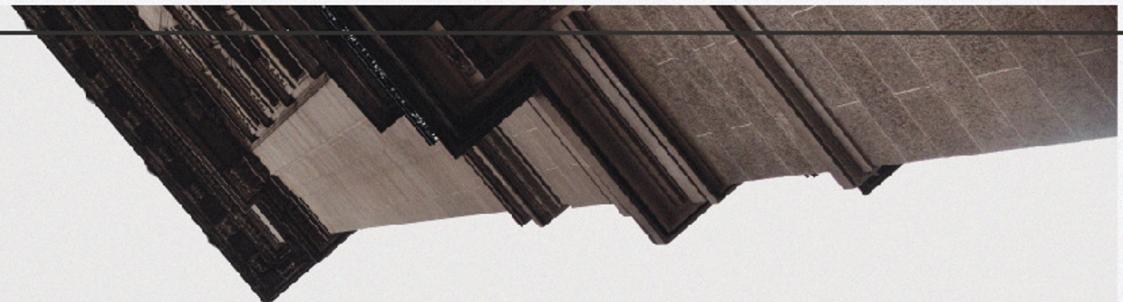
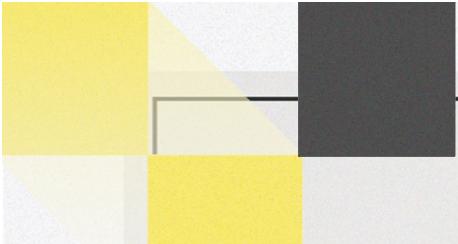
Gather more data to reduce biases

Set a reasonable metrics expectation



Data Imputation with customized methods

Probe into the model results



**Thanks!**