

FINAL PROJECT FINANCIAL DATA VISUALIZATION



COMPARATIVE ANALYSIS OF EARLY 1990'S AND EXPECTED 2Q23'S RECESSION THROUGH DATA VISUALIZATION: EVIDENCE FROM U.S. MARKET

Project By:

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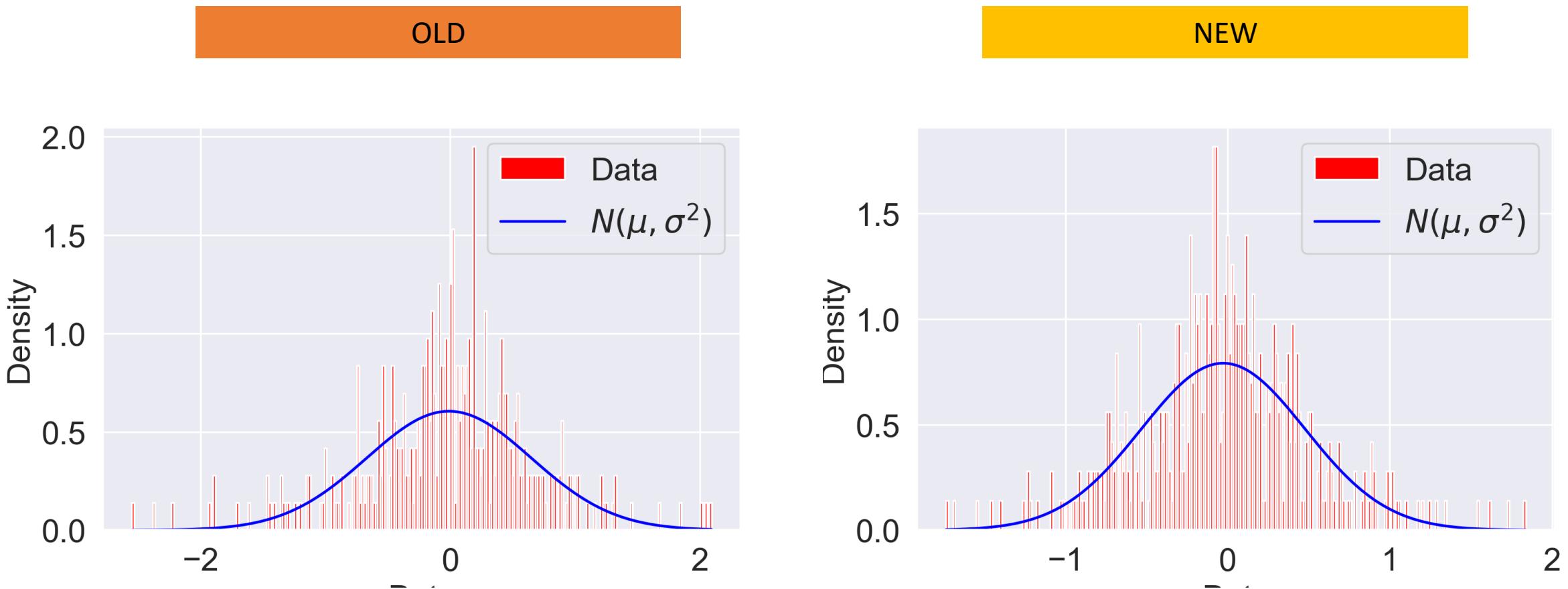
Project Background & Aim

- Fitch Ratings, Inc. (2022):
 1. U.S. economy to enter genuine recession territory — albeit relatively mild by historical standards — in 2Q23.
 2. The projected recession is quite similar to that of 1990–1991, which followed similarly rapid Fed tightening in 1989–1990.
 3. Nevertheless, downside risks stem from nonfinancial debt-to-GDP ratios, which are much higher now than in the 1990s.
- In general, this project aims at:
 - observing potential recession risks by means of comparative analysis on leading financial and microeconomic indicators prior to the Early 1990's and Expected 2Q23's recession.
- The output of this project provides additional insights for:
 1. **DECISION MAKERS** in their risk anticipation and strategic planning to mitigate the effects of the incoming Expected 2Q23's recession.
 2. **RETAIL INVESTORS** in overseeing a group of investments that meet their financial objectives and risk tolerance during the Expected 2Q23's recession.

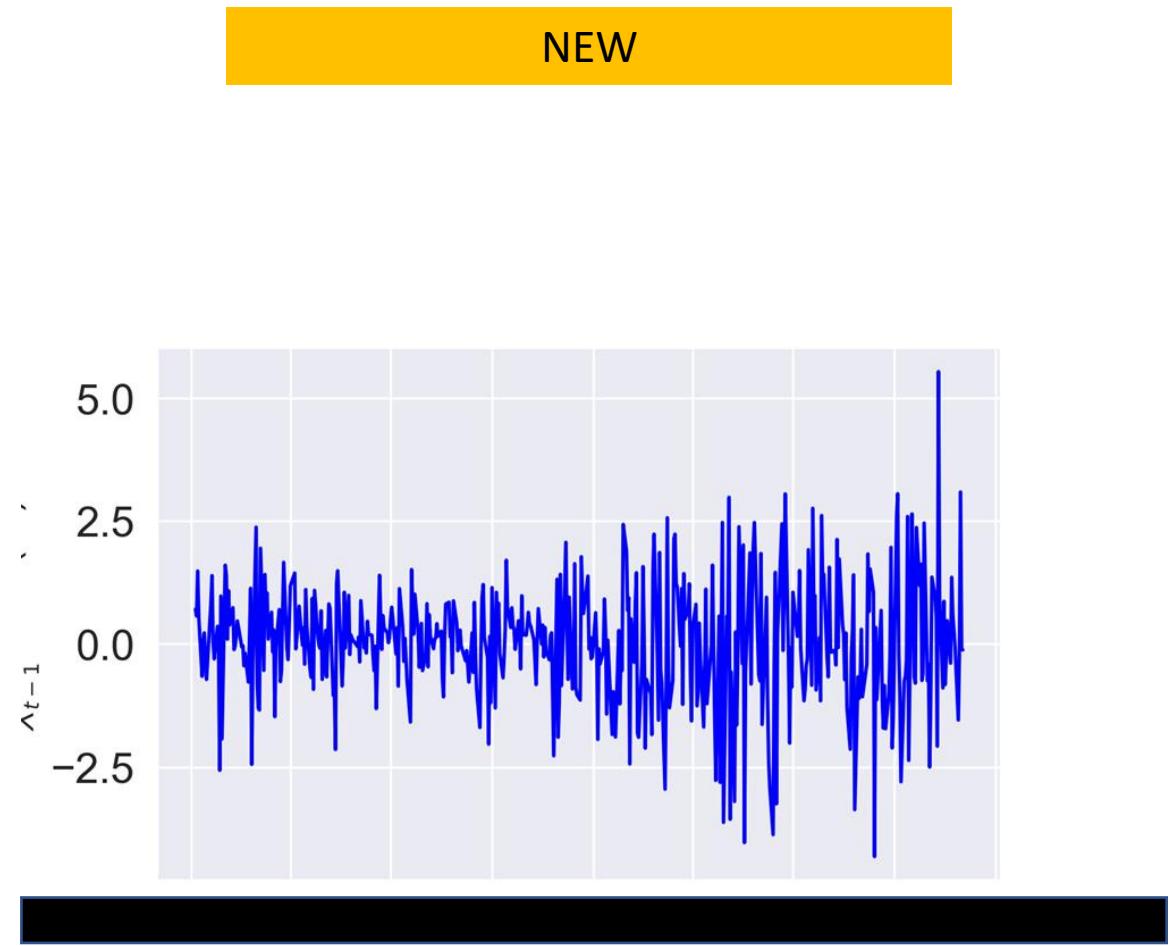
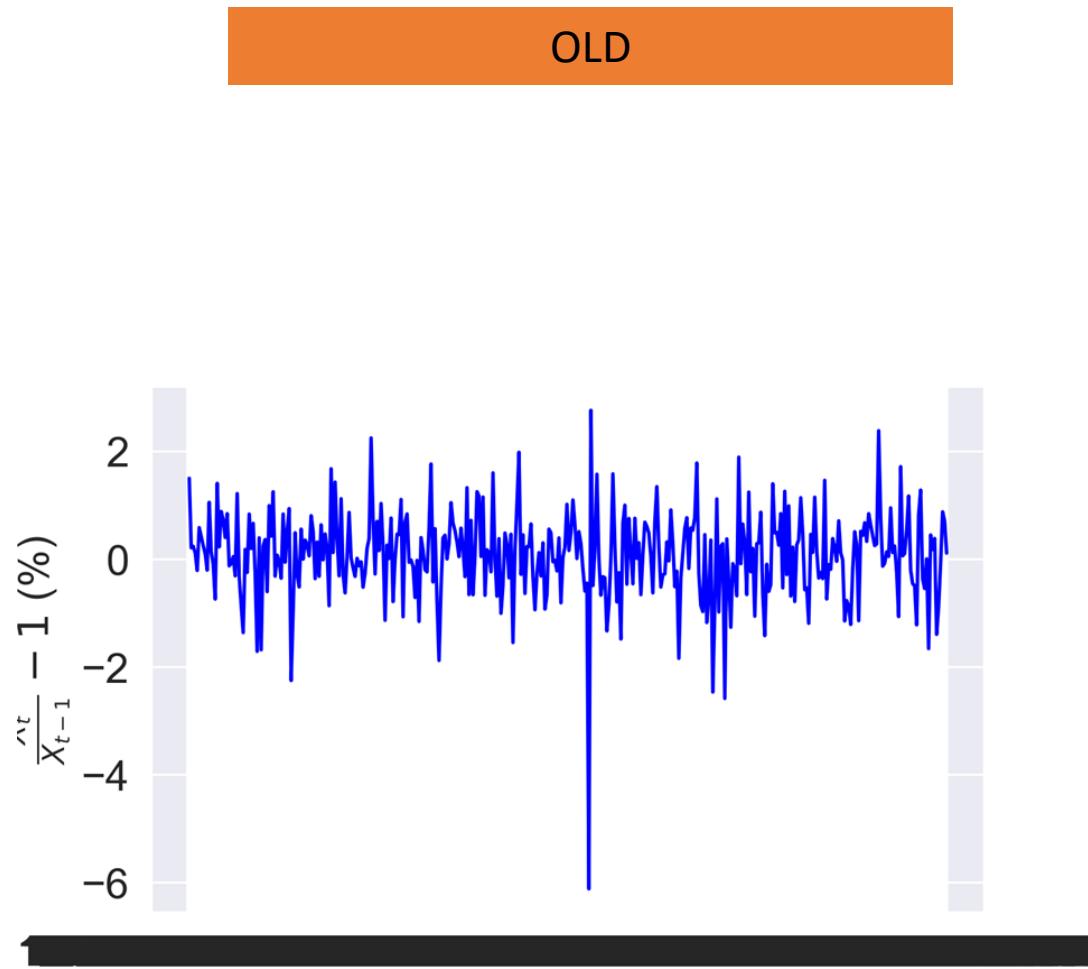
STORY 1

Story	Objective	Techniques	Indicators	Source of Data	Time-Frame
1	<p>A comparative analysis on key indicators during the historical circumstances contributed to the recession in the period:</p> <ul style="list-style-type: none"> • 1989-1990 (OLD) • 2021-2022 (NEW) 	<ul style="list-style-type: none"> - Time series plot - Histogram - Scatter plot 	<p>Set 1</p> <p>GBP/USD_{old} vs RetOil_{old} GBP/USD_{old} vs SPX_{old} GBP/USD_{old} vs Gold_{old}</p> <p>Set 2</p> <p>EUR/USD_{new} vs RetOil_{new} EUR/USD_{new} vs SPX_{new} EUR/USD_{new} vs Gold_{new}</p>	<p>Yahoo Finance Google Finance</p> <p>Fred.stlouisfed.org</p>	<ul style="list-style-type: none"> • 1989 – 1990 • 2021 - 2022

CURRENCY COMPARAISON



SP500 COMPARAISON



OIL COMPARAISON



STORY 2

Story	Objective	Techniques	Indicators	Source of Data	Time-Frame
2	<p>During the two periods (OLD and NEW) contributing to recessions:</p> <ul style="list-style-type: none"> • How do industries in the U.S. evolve over time? • Which industries show higher stock returns? • Can the industry-level stock return differences be explained by the differences in industry characteristics? 	<ul style="list-style-type: none"> - Histogram - Pie chart - Line graph - Winsorized line graphs - Scatter plots - Slopes comparison 	<p>Set 1 (OLD) and Set 2 (NEW)</p> <ul style="list-style-type: none"> • GICS Sector • Number of firms • Weights of each industry • Industry value-weighted return • Solvency (liquidity) • Efficiency Ratio • Profitability 	WRDS – Financial Ratio Industry Level (See next slide)	<ul style="list-style-type: none"> • 1989 – 1990 • 2021 - 2022

Project Overview: Story 2 Model

Solvency (liquidity)

- Quick ratio (+) (≥ 1.00)
- Current ratio (+) (≥ 2.00)
- Current liabilities to net worth (-) ($\geq 66.67\%$)
- Current liabilities to inventory (-) (too high)
- Total liabilities to net worth (-) ($\geq 100\%$)
- Fixed assets to net worth (-) ($\geq 75\%$)

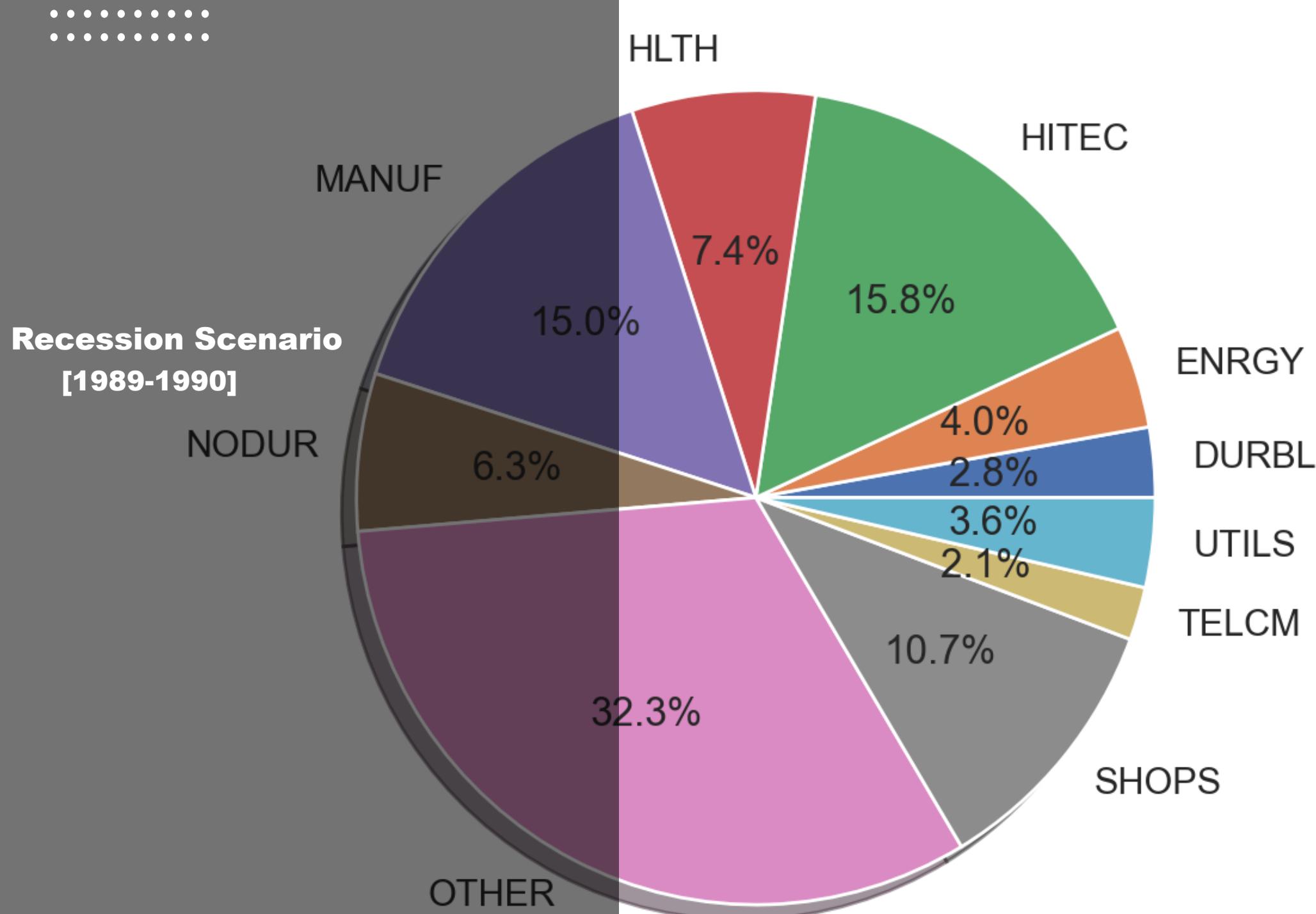
Efficiency

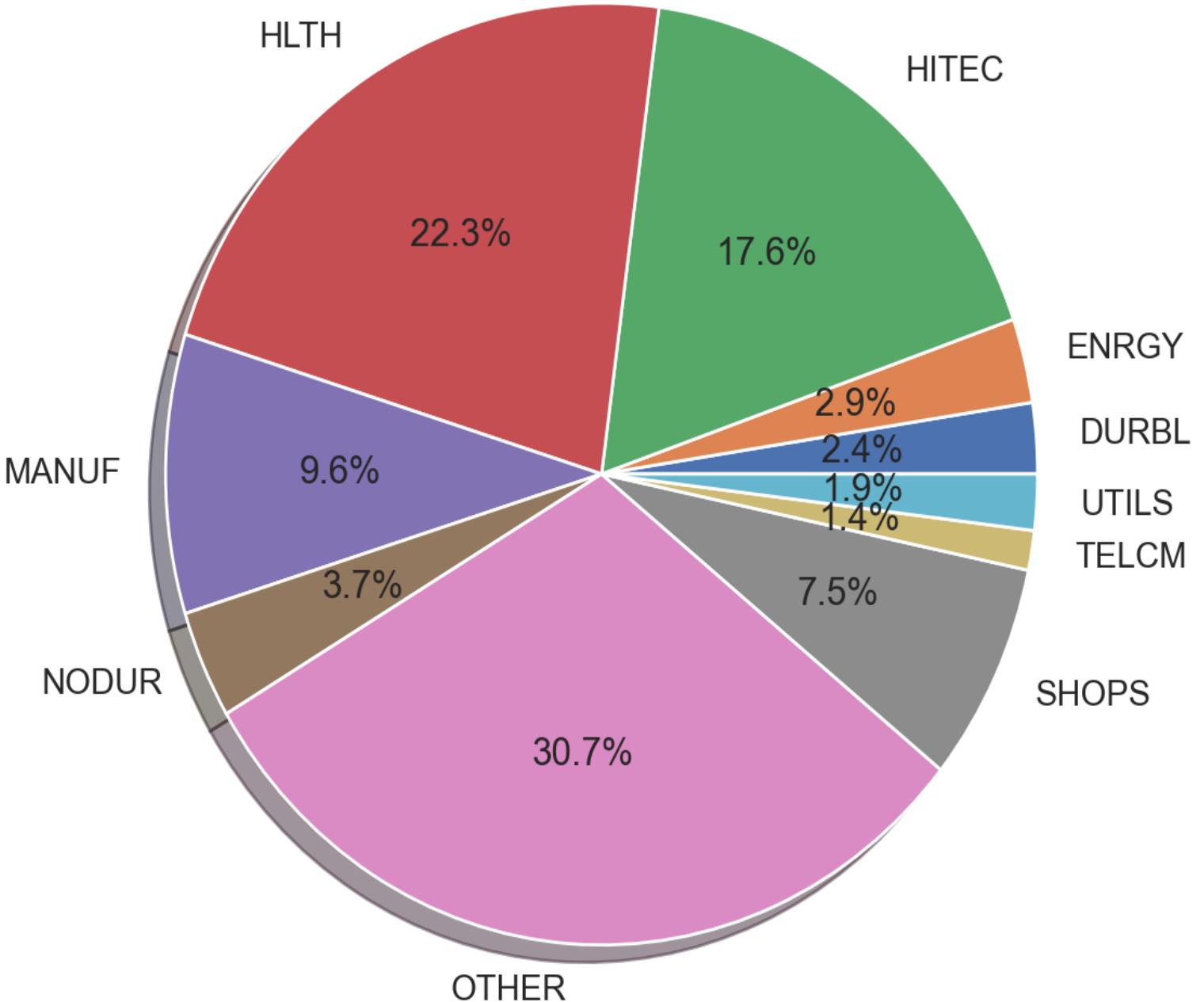
- Collection period (-) (\geq one-third higher than norm)
- Sales to inventory (+) (within range)
- Assets to sales (+) (within range)
- Sales to net working capital (-) (higher than norm)
- Accounts payable to sales (-) (higher than norm)

Profitability

- Return on sales (profit margin)
- Return on assets
- Return on net worth (return on equity)

A model of ideal financial performance based on financial ratios by [Evans & Mathur \(2013\)](#)

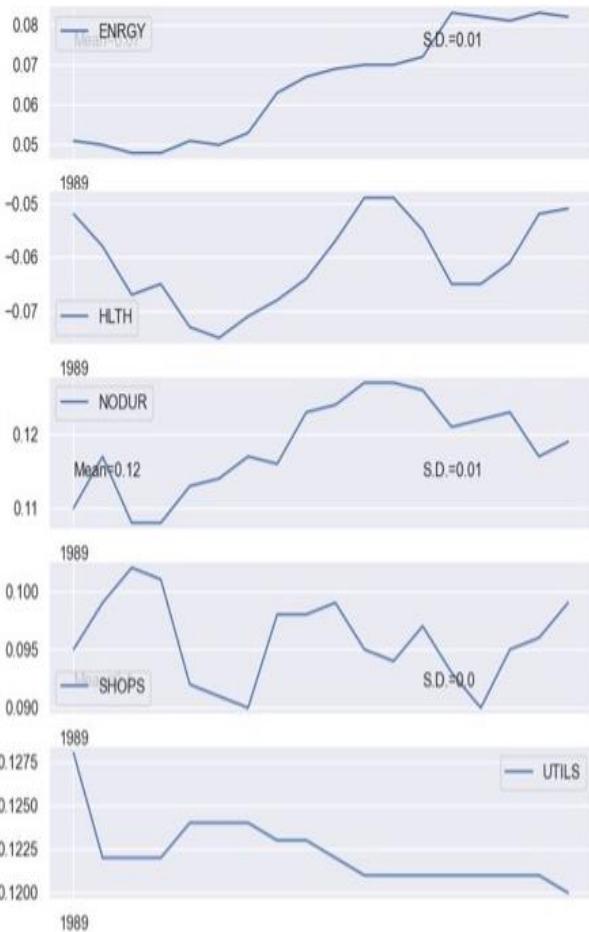
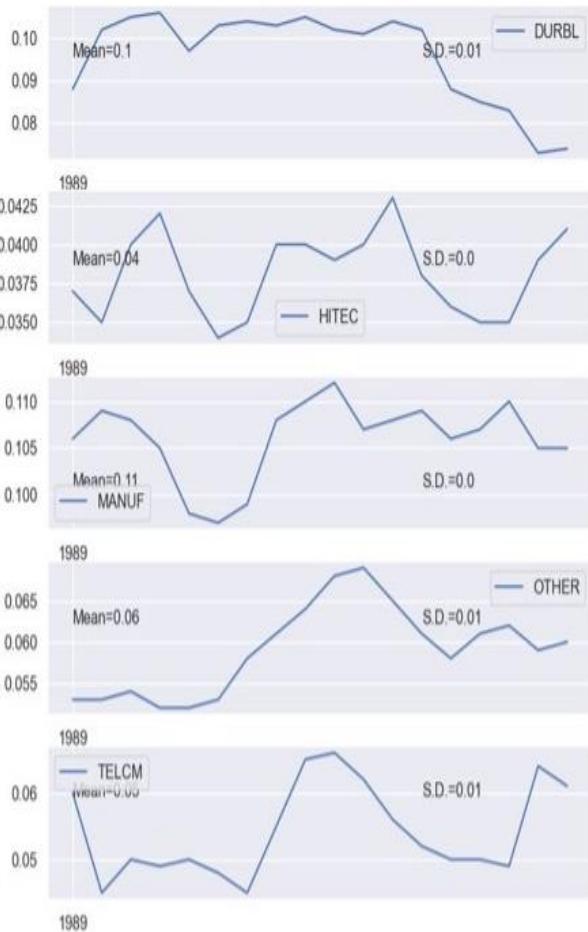




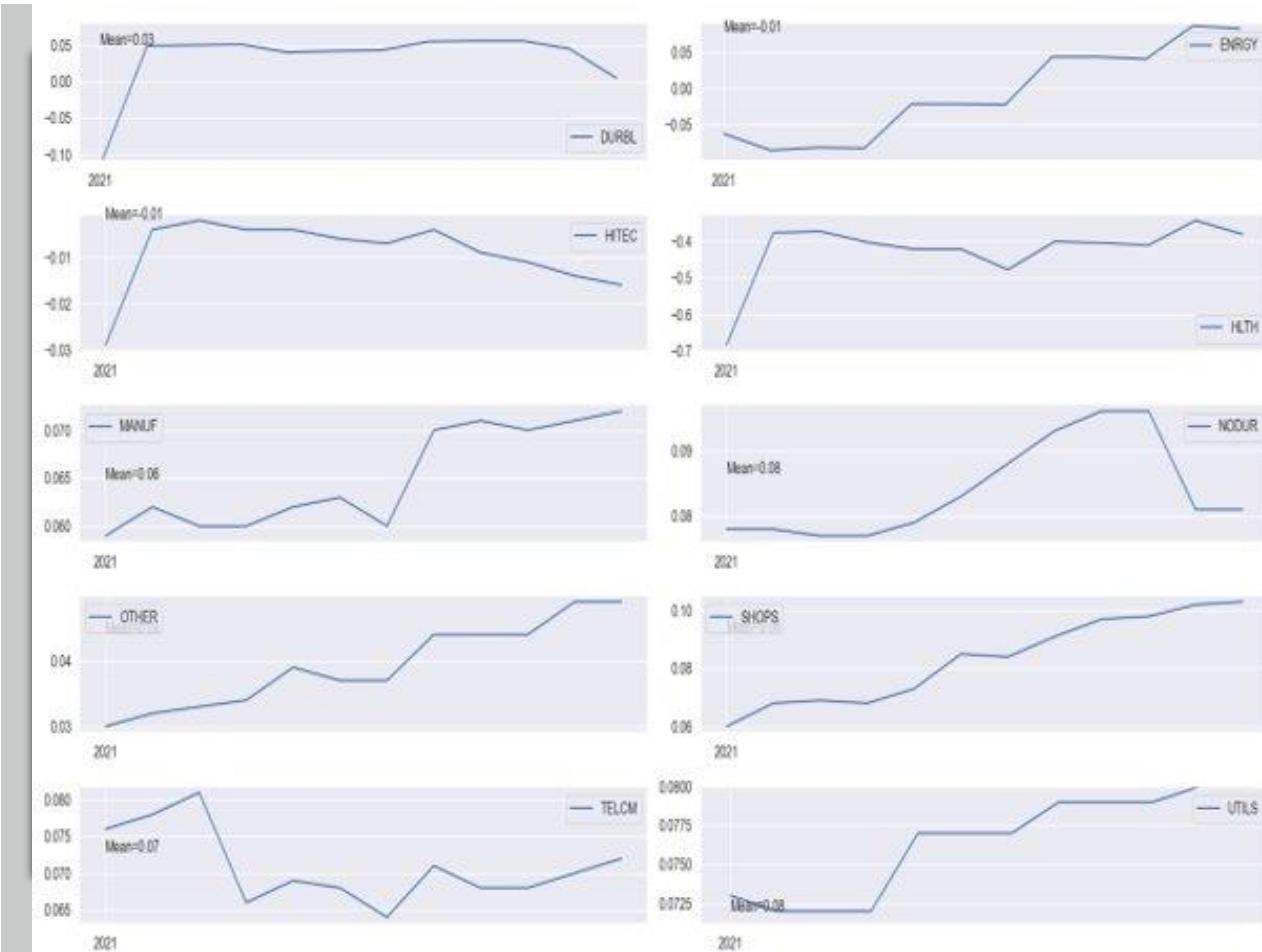
Profitability Ratios

Return on Assets

1989-1990



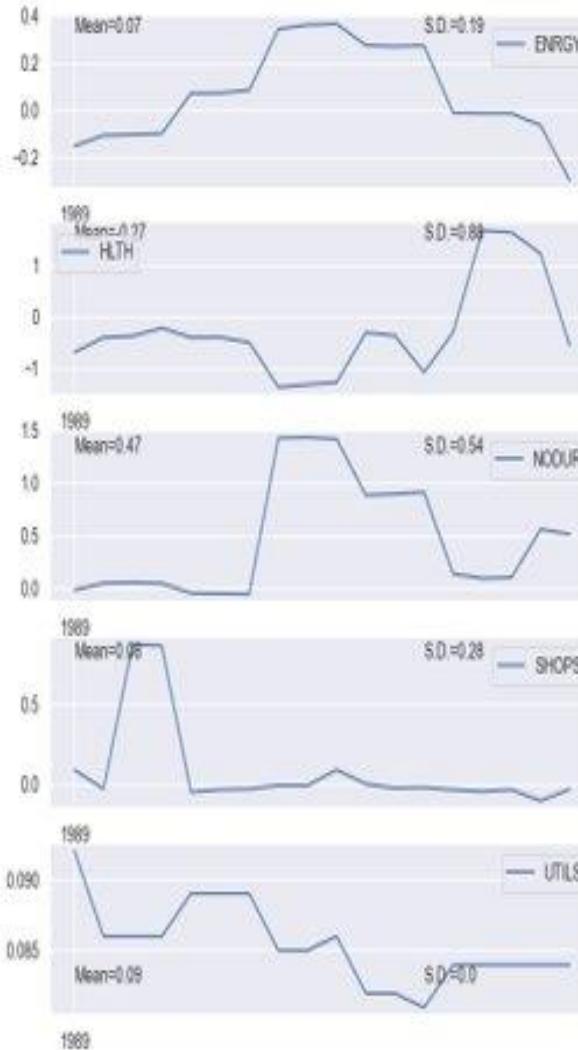
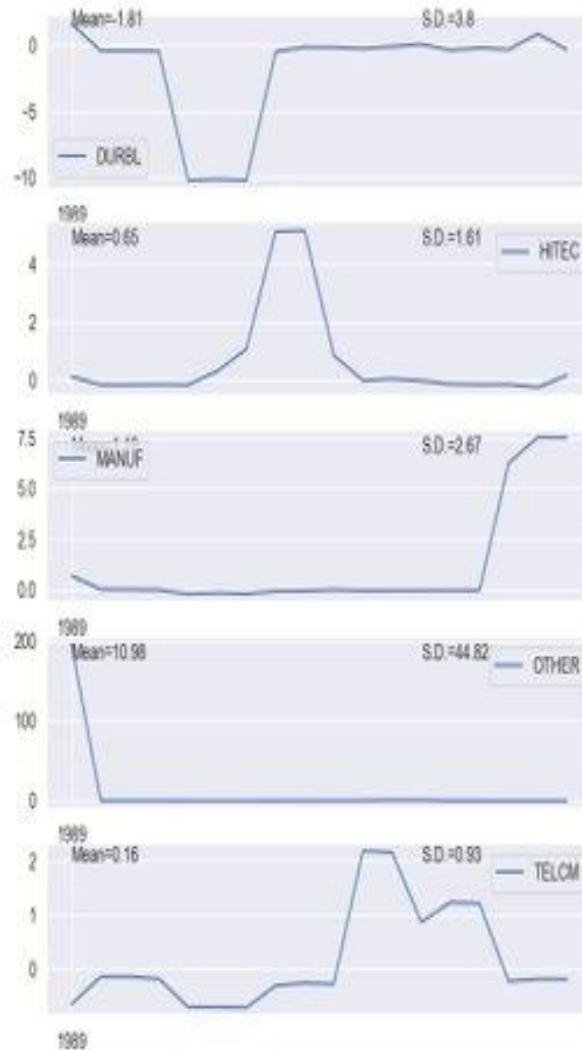
2021-2022



Profitability Ratios

Return on Equity

1989-1990

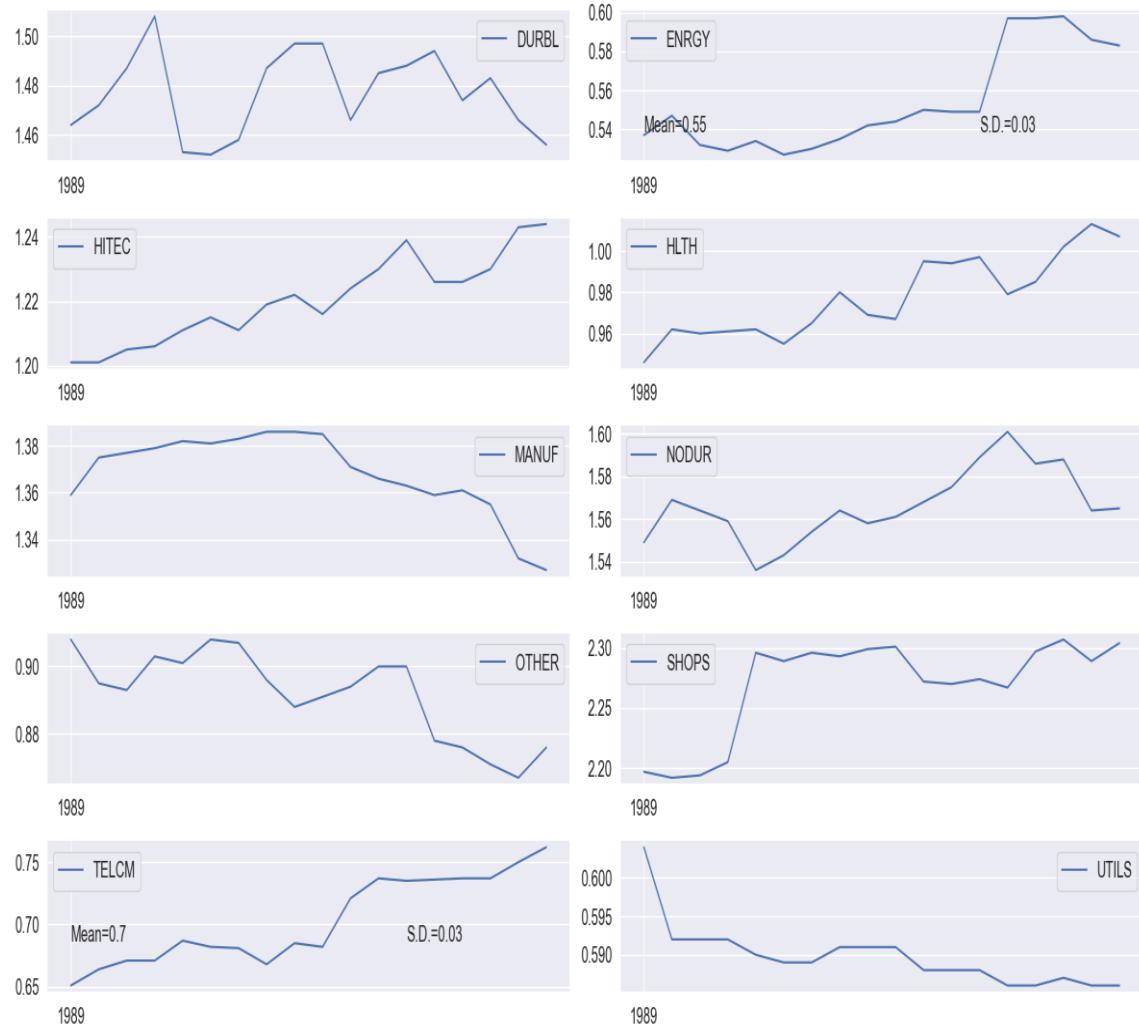


2021-2022



Efficiency Ratios: Asset Turnover Ratio

1989-1990

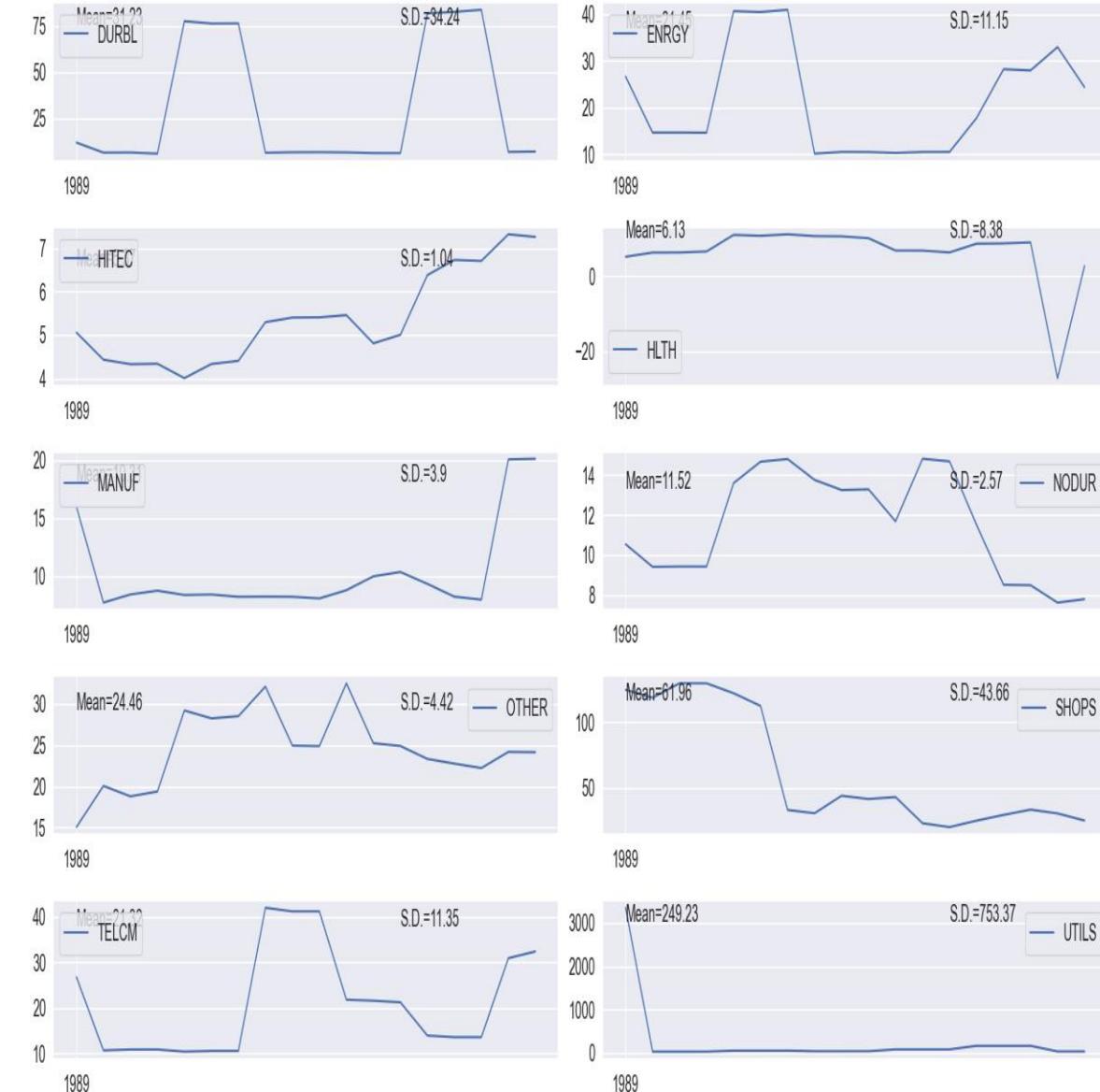


2021-2022

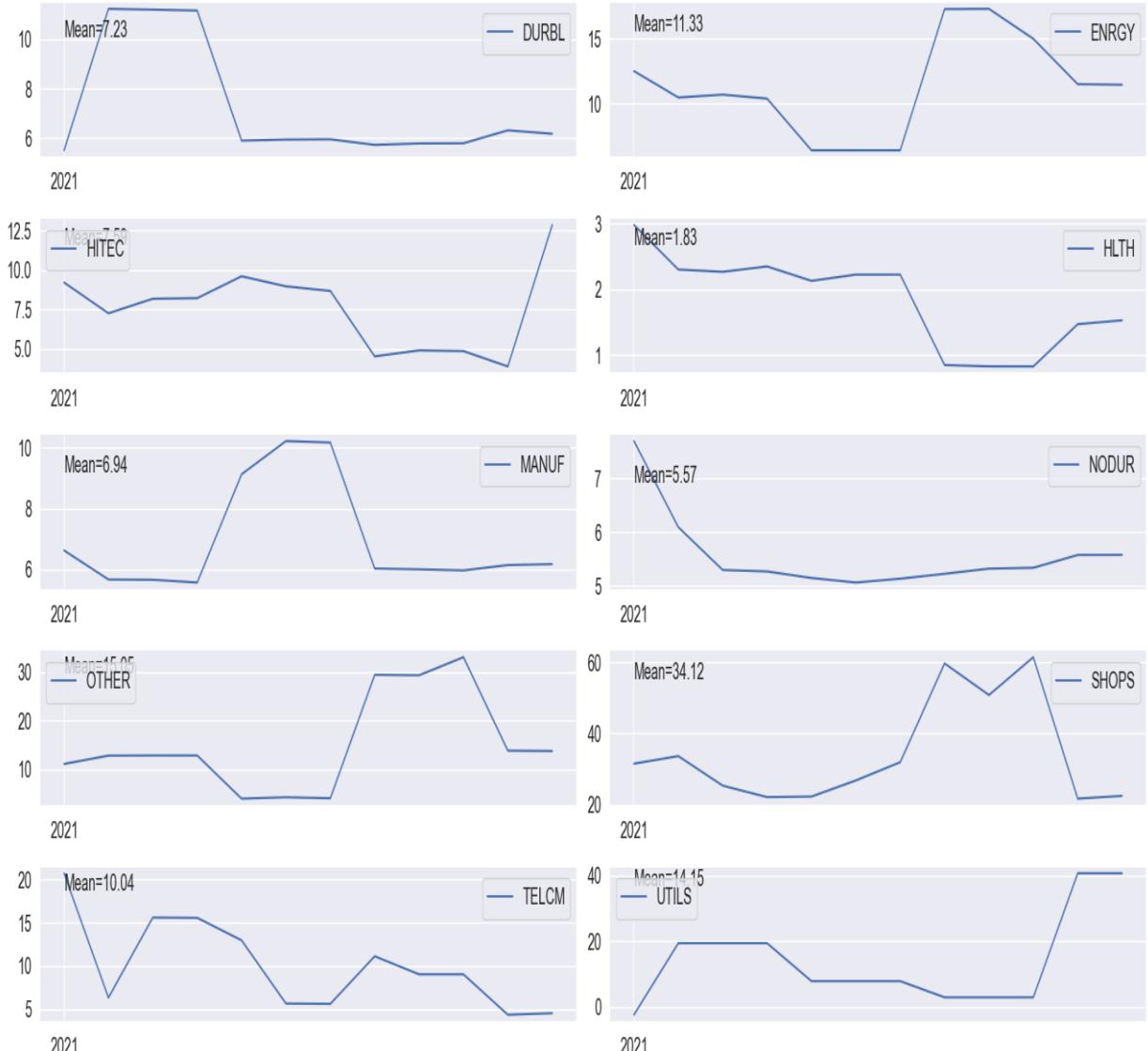


Efficiency Ratios: Net Working Capital turnover Ratio

1989-1990

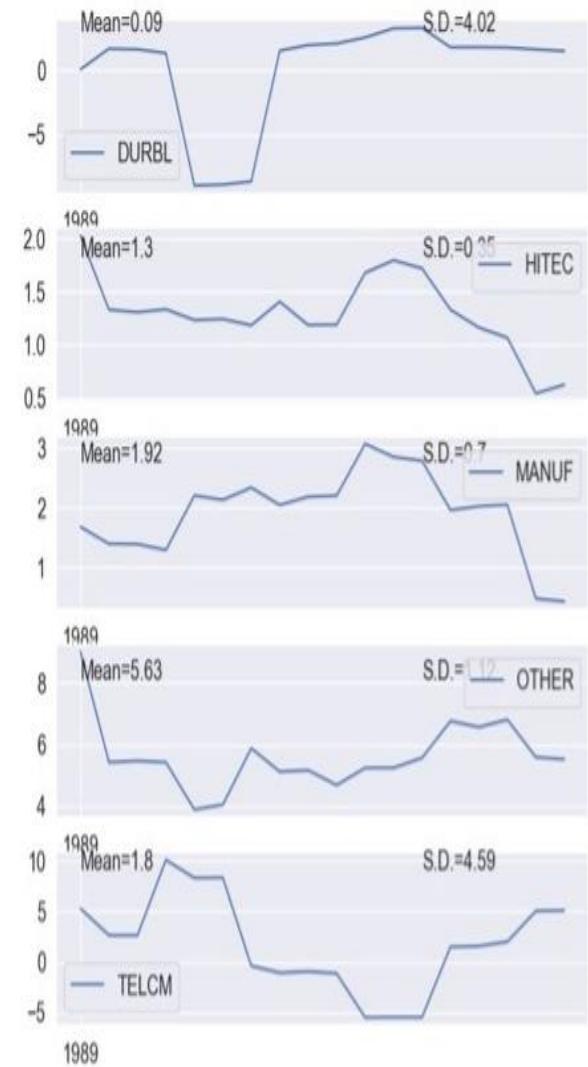


2021-2022

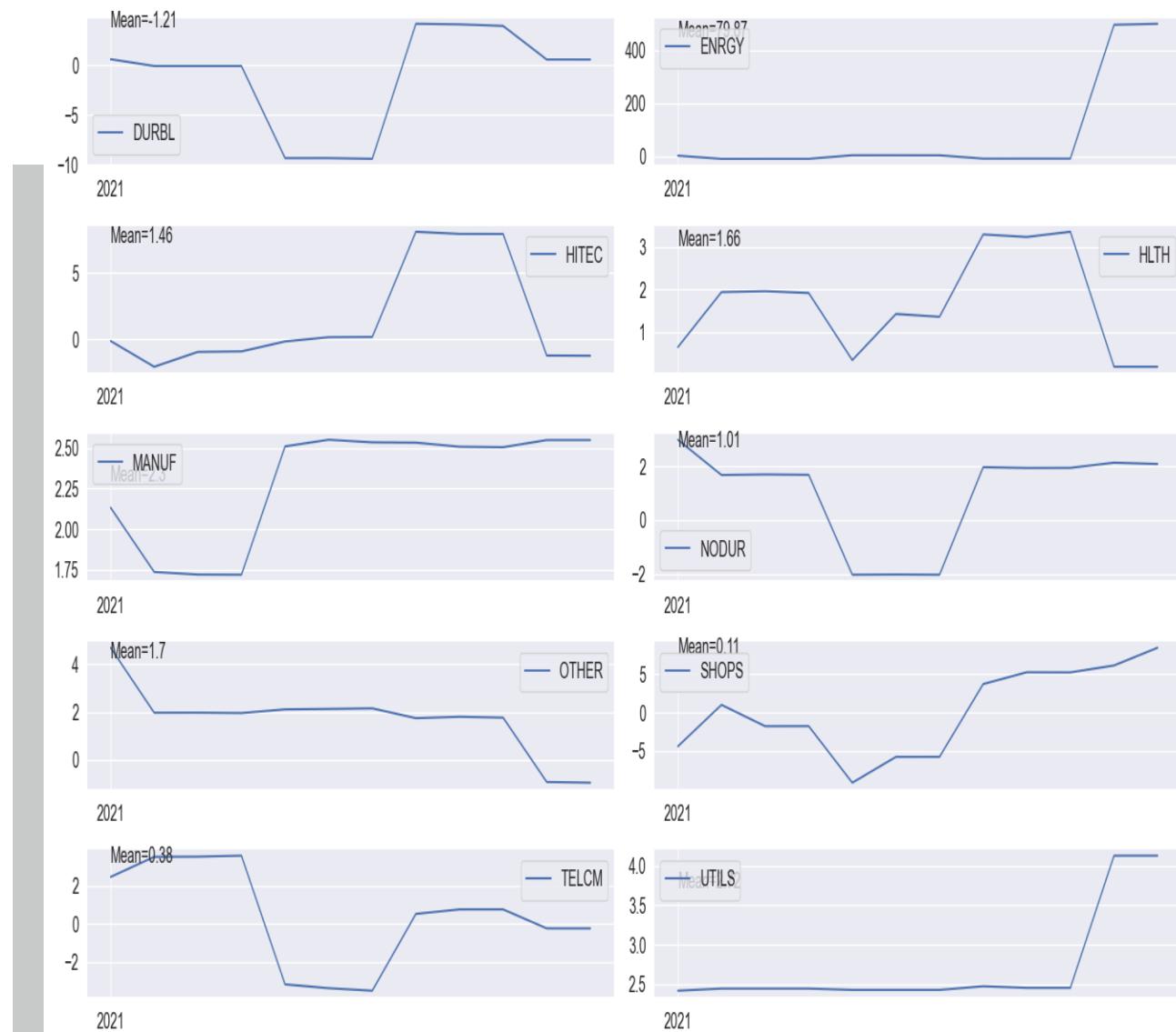


Solvency Ratios: Debt to Equity Ratio

1989-1990

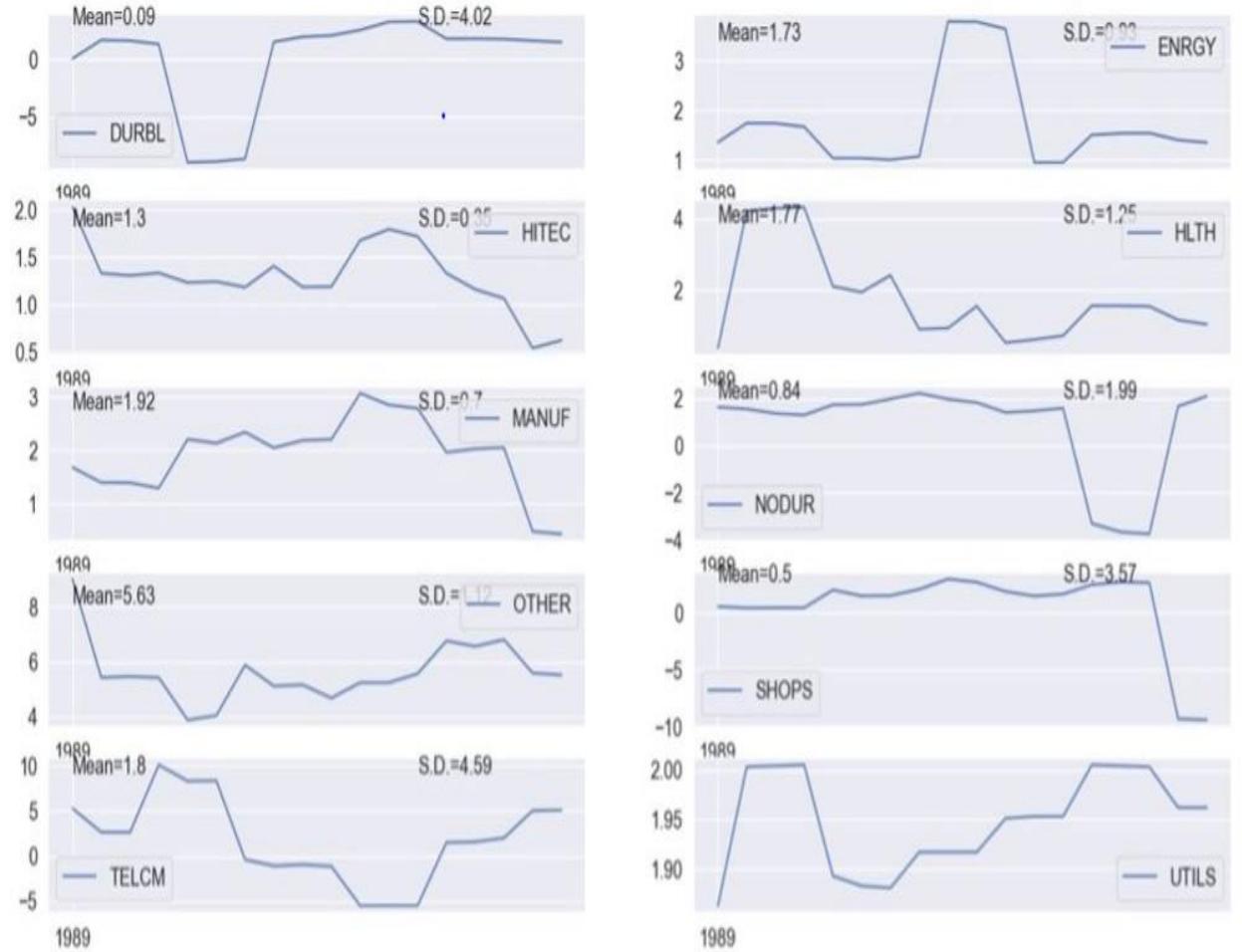


2021-2022

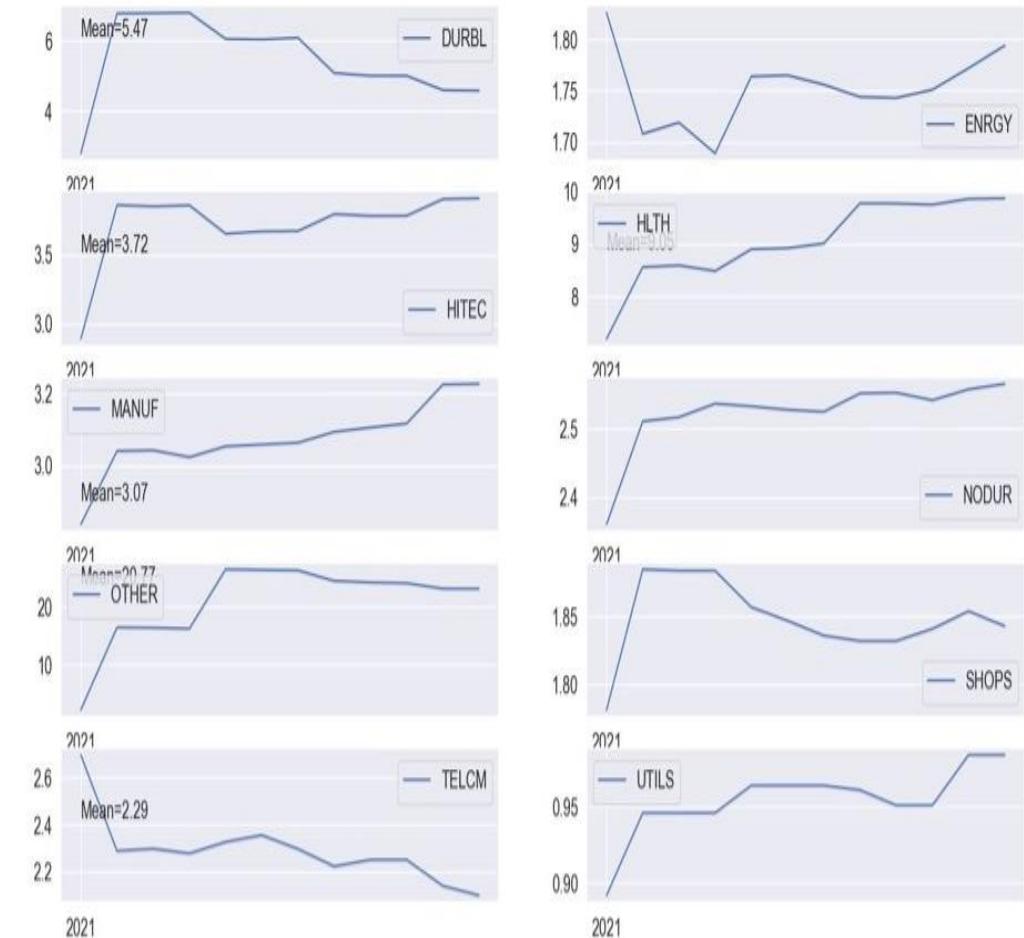


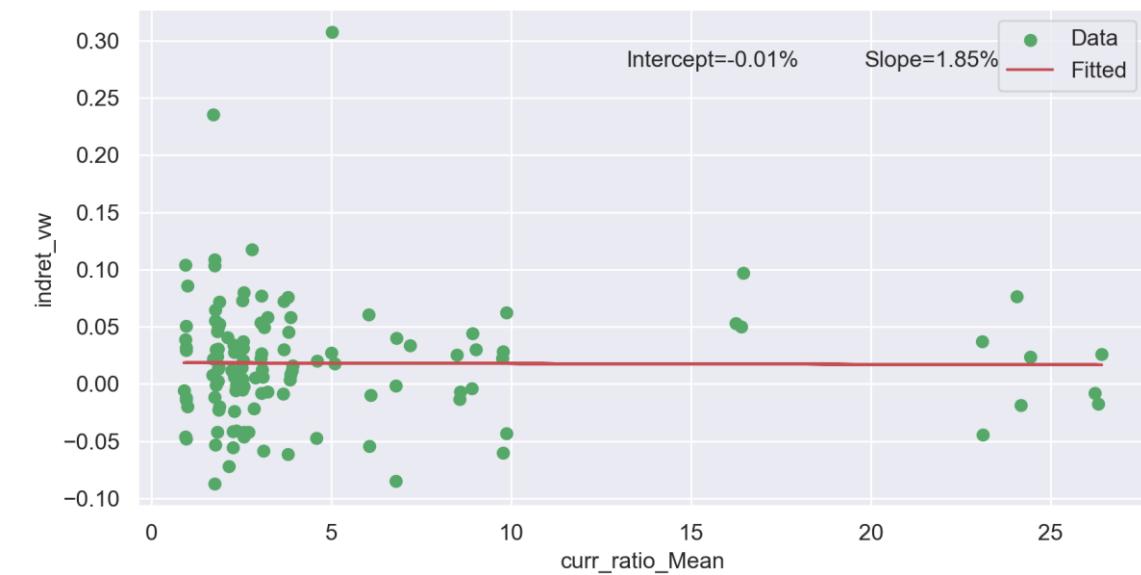
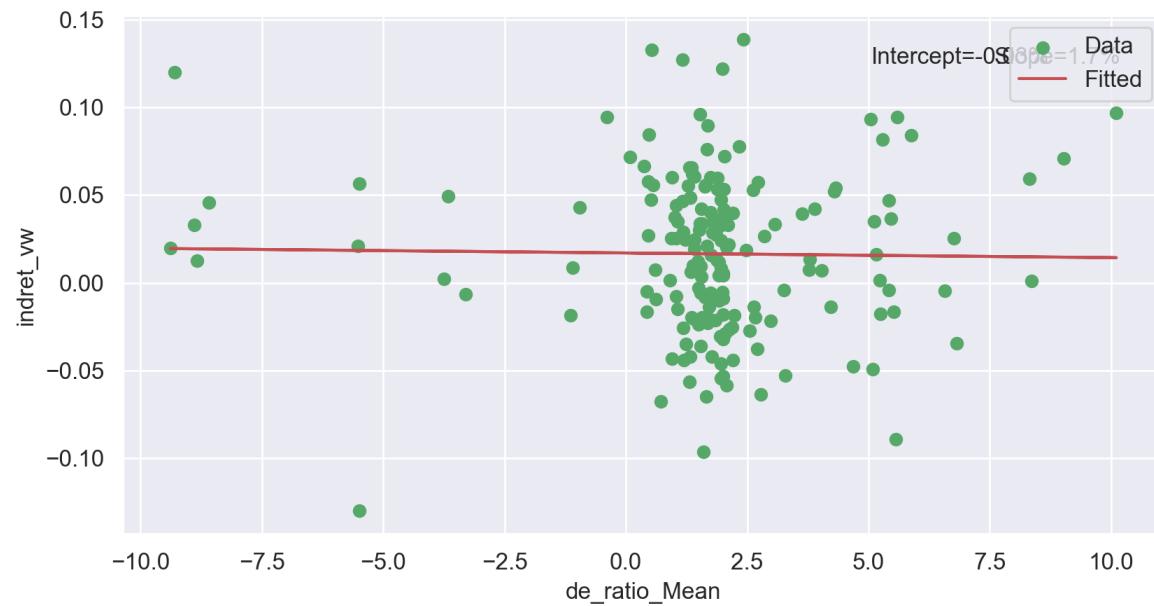
Solvency Ratios: Current Ratio

1989-1990

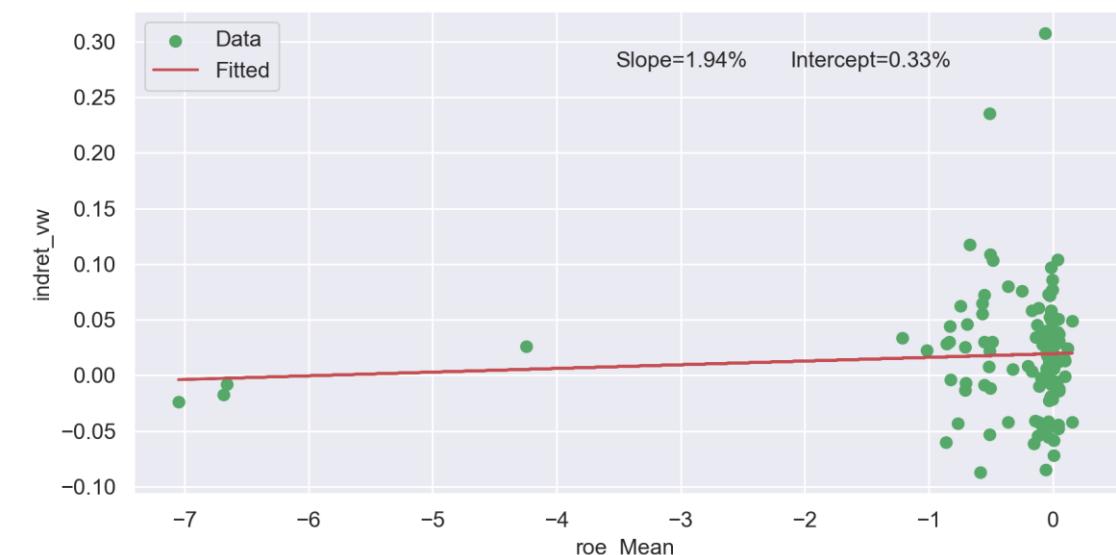
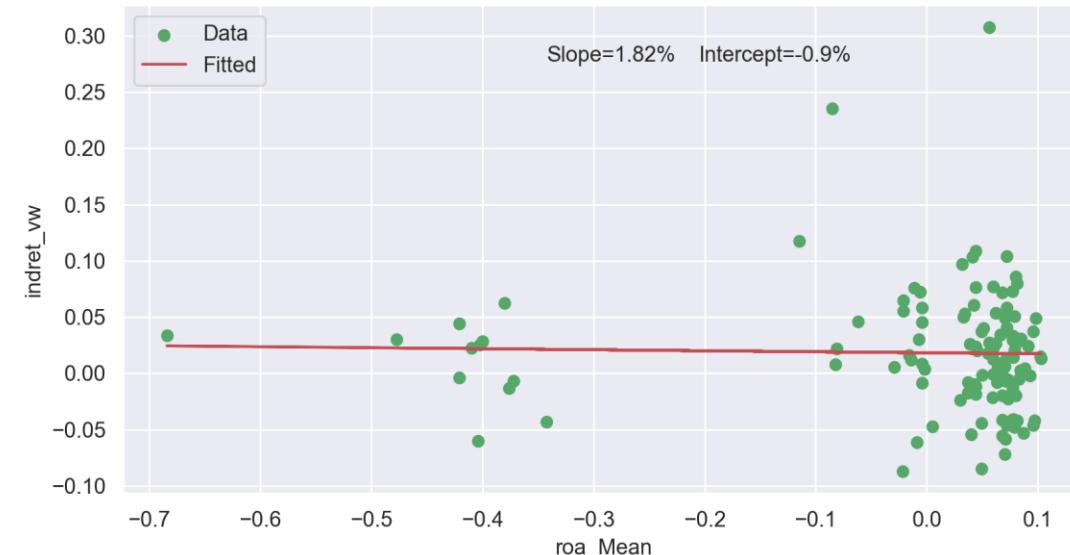


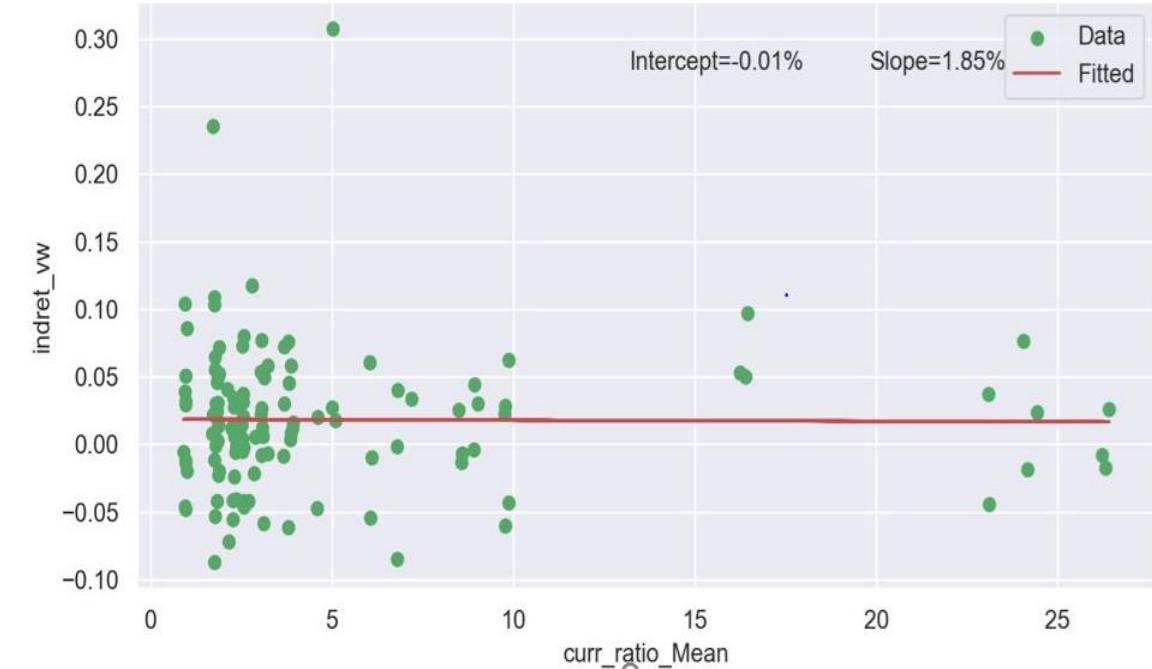
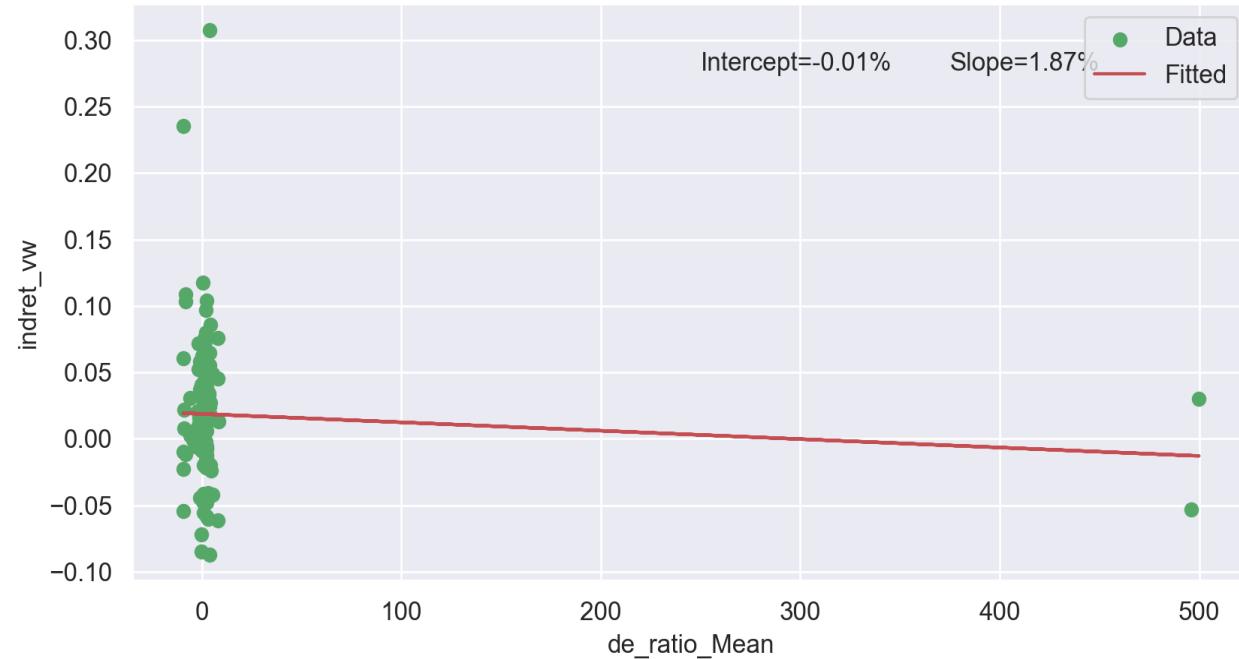
2021-2022



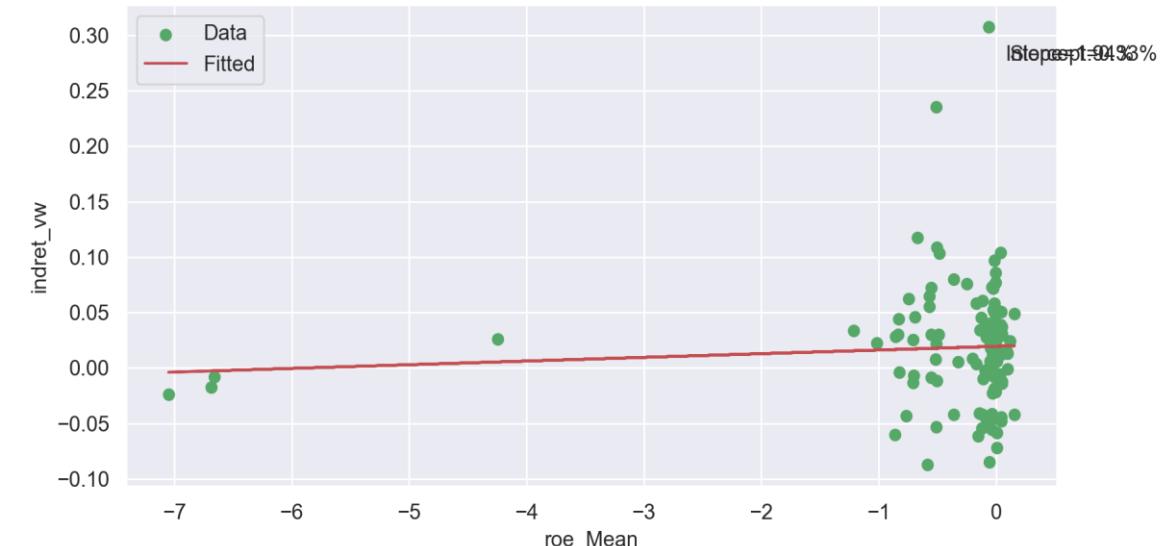
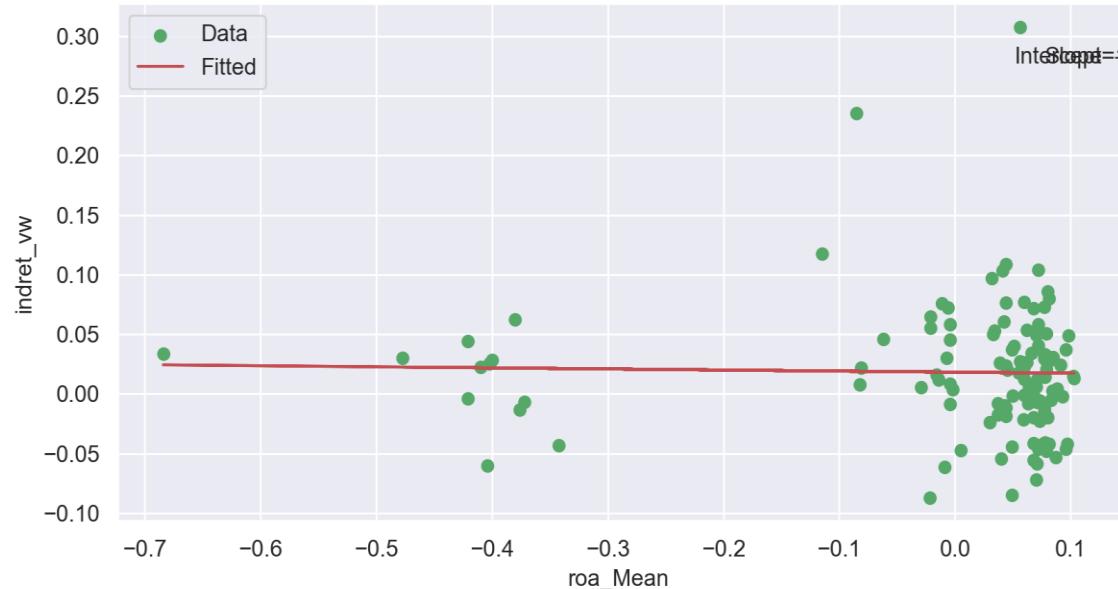


1989-1990





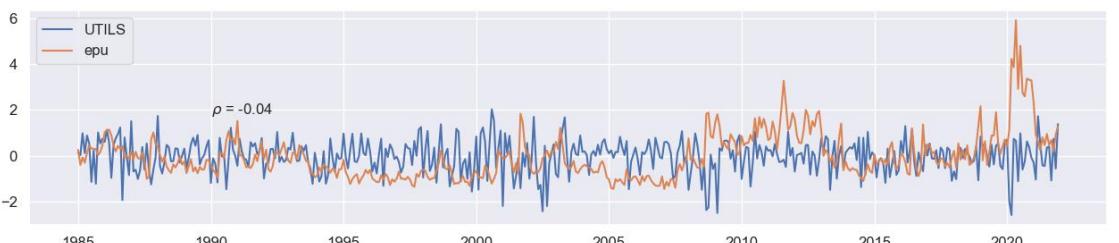
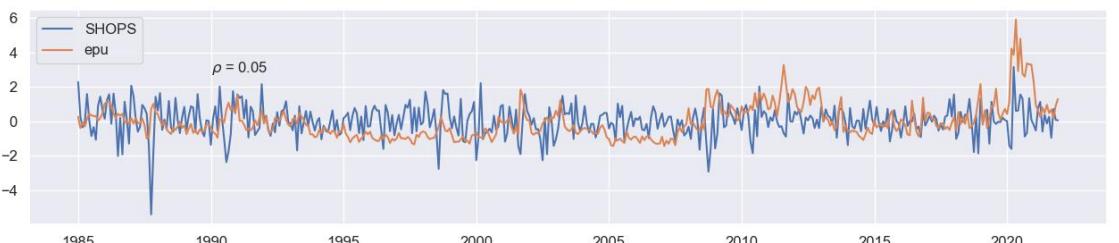
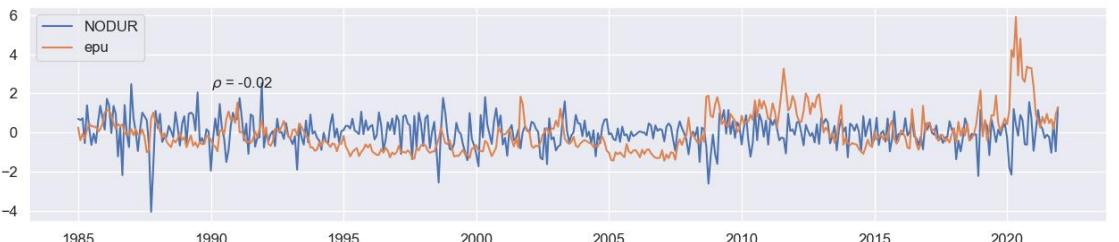
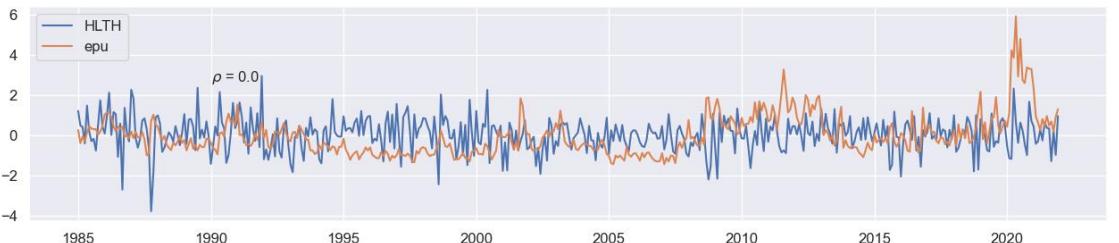
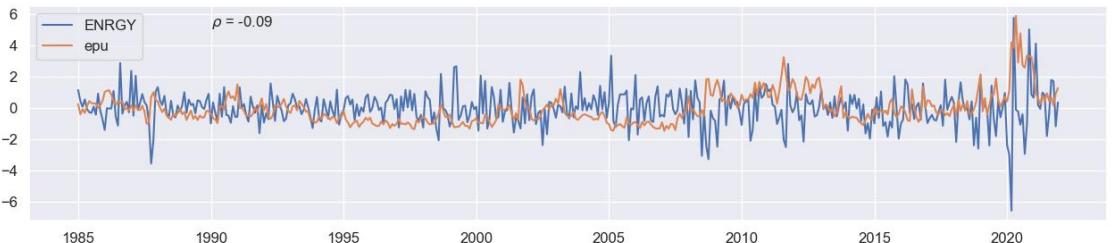
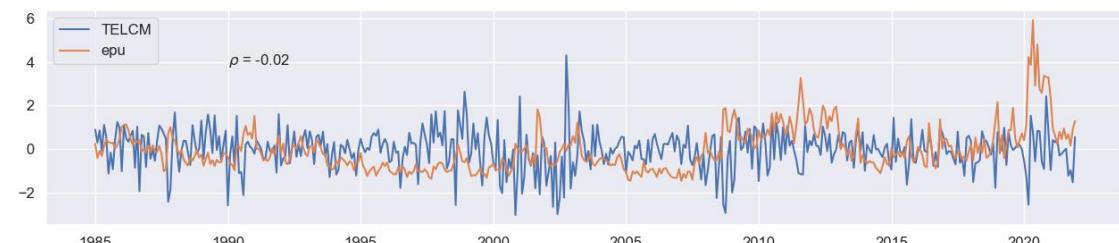
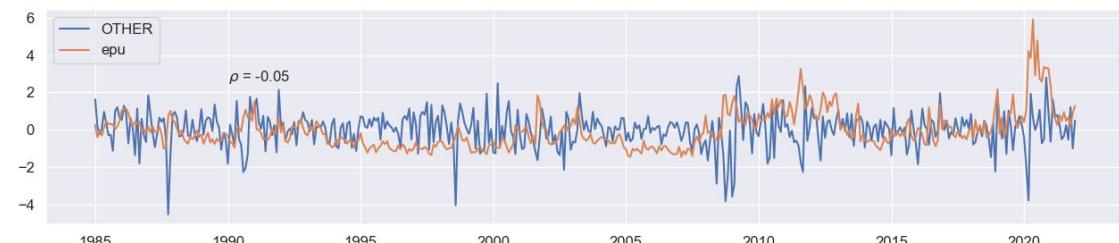
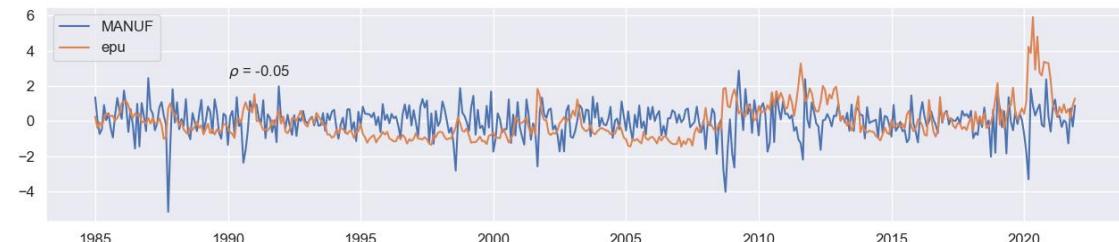
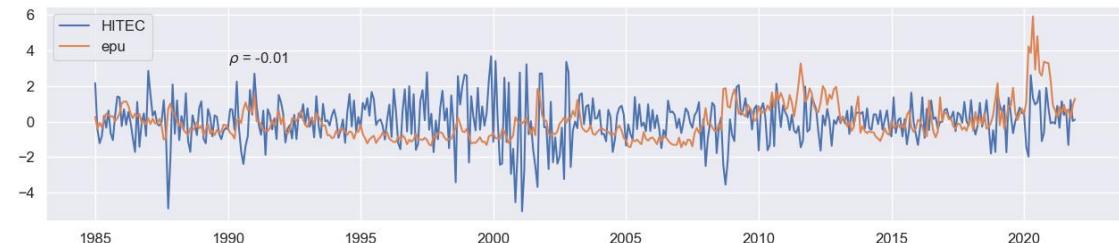
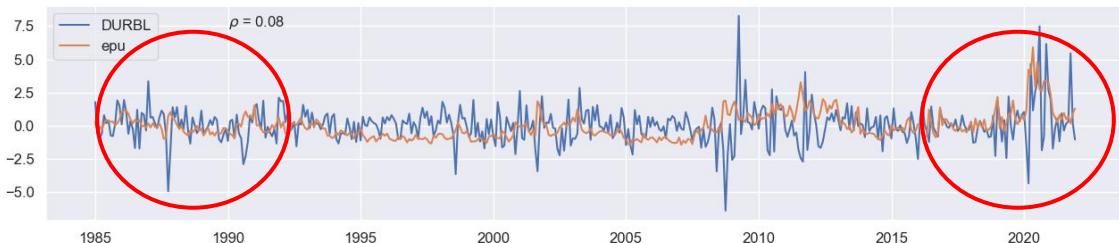
2021-2022



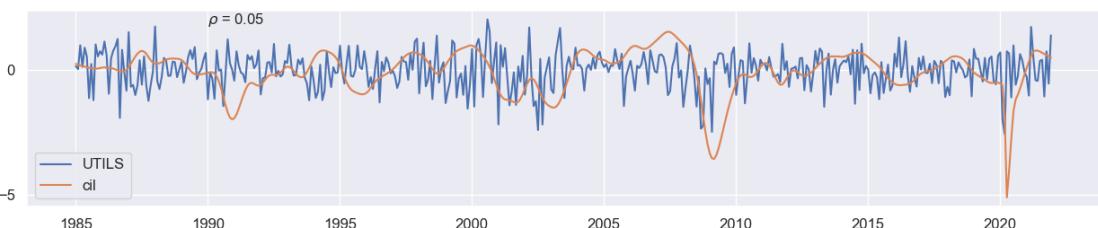
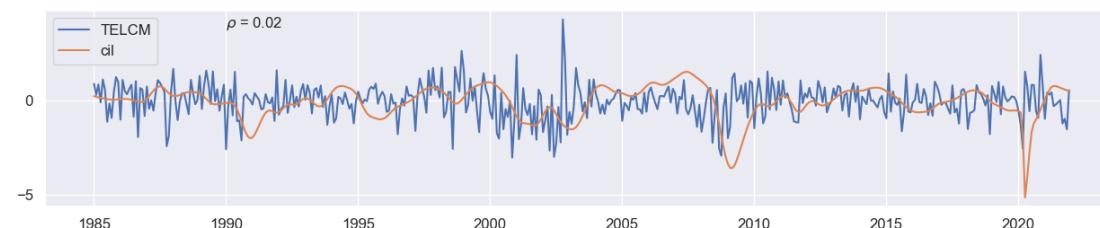
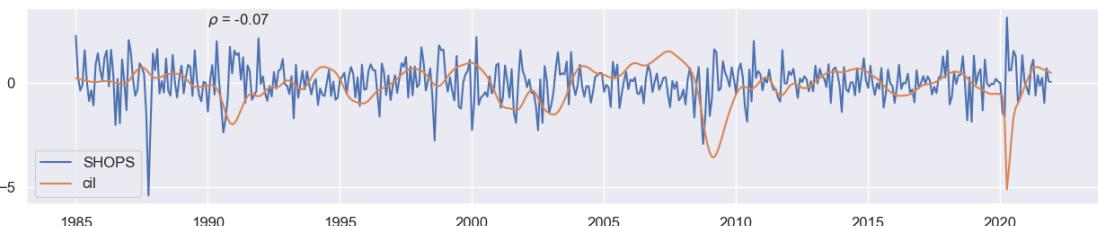
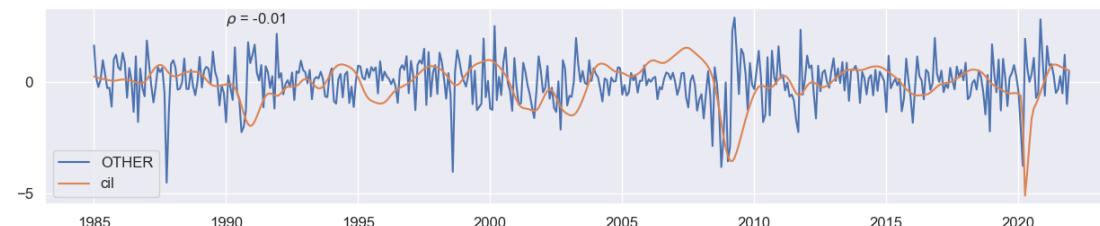
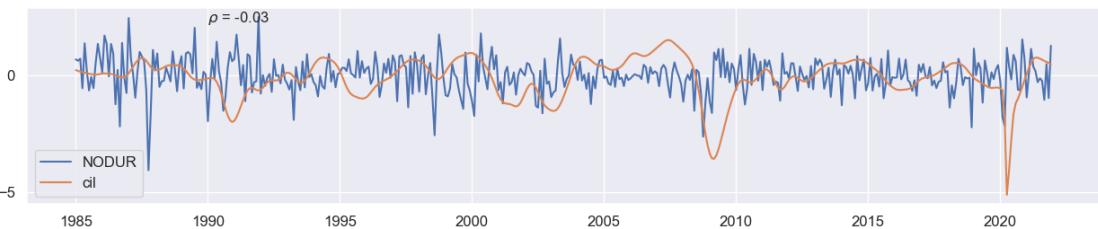
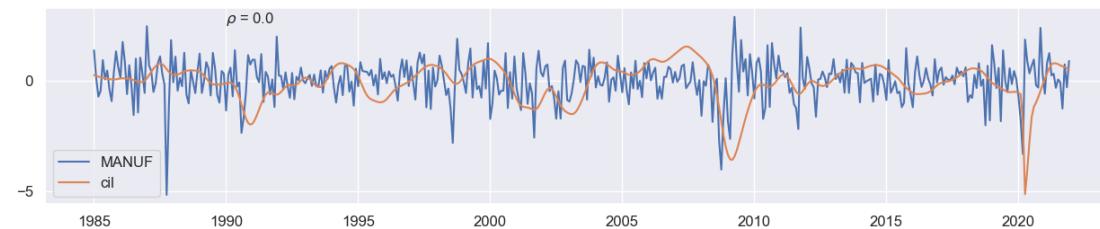
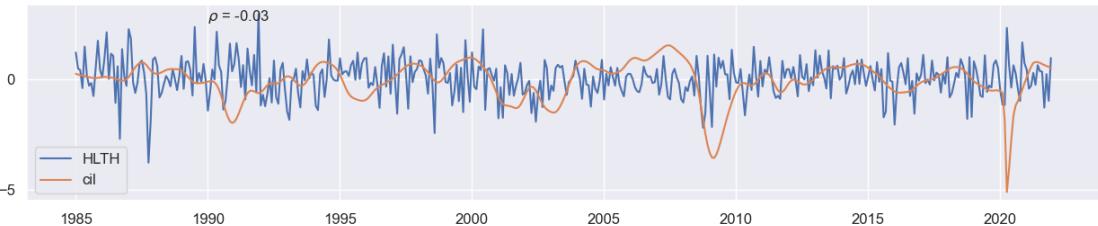
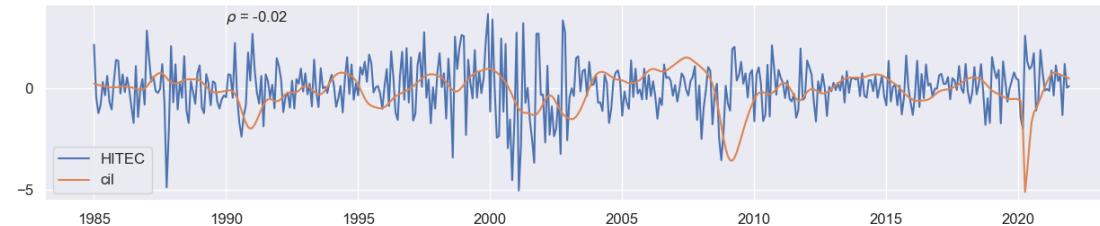
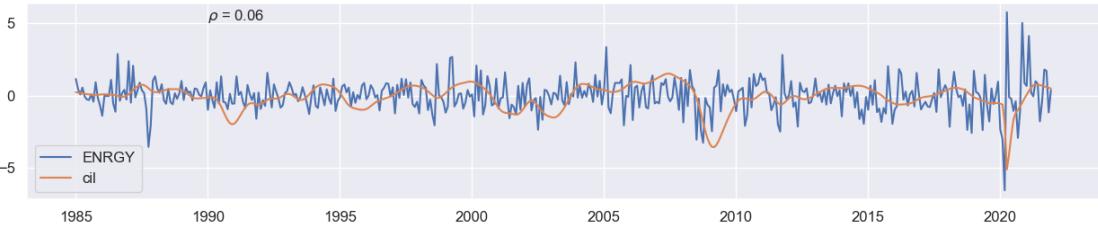
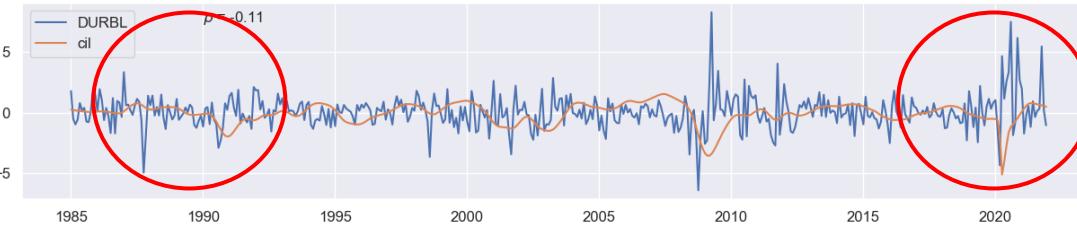
STORY 3.1

Story	Objective	Techniques	Indicators	Source of Data	Time-Frame
3 Opt.1	<p>During the two periods (OLD and NEW) contributing to recessions:</p> <ul style="list-style-type: none"> • Do stock returns move together with macroeconomic variables? • Do all industry stock returns show the same level of sensitivity? • Which macroeconomic variable is the stronger driver of the stock returns? 	<ul style="list-style-type: none"> - Standardization - Line graphs (dynamics) of two variables - Box plot - Violin plot - Scatter plot - Kernel density - Histogram - Hexagonal - Regression - Scatter plot (Type 2) 	<p>Set 1 (OLD) and Set 2 (NEW)</p> <ul style="list-style-type: none"> • Industry value-weighted returns • Industrial Production Index • Unemployment Rate • Consumer Price Index • Federal Funds Effective Rate • Economic Policy Uncertainty Index • Leading Indicators OECD 	<ul style="list-style-type: none"> • WRDS – Financial Ratio • FRED® Economic Data 	<ul style="list-style-type: none"> • 1989 – 1990 • 2021 - 2022

Economic Policy Uncertainty Index

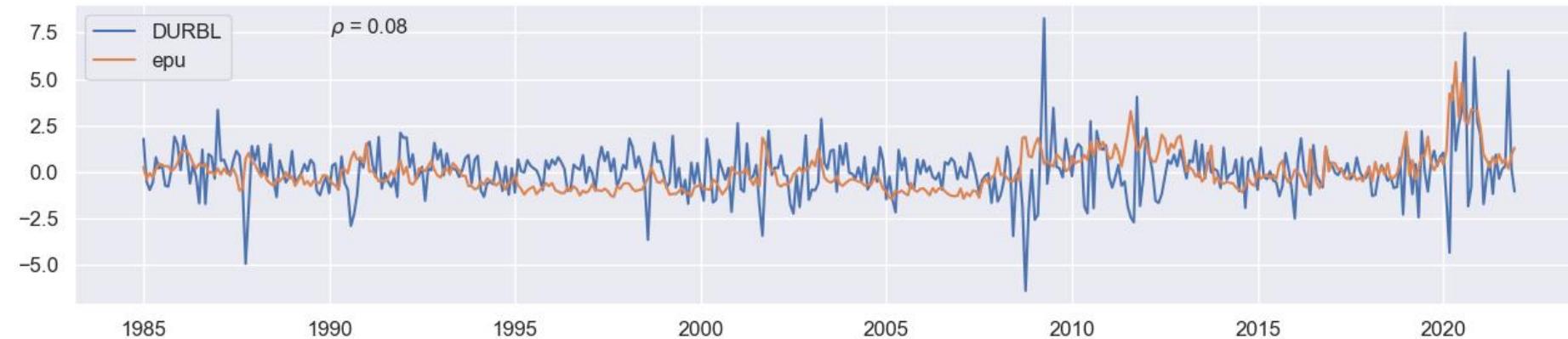


Leading Indicators OECD (Combined Macrovariables)

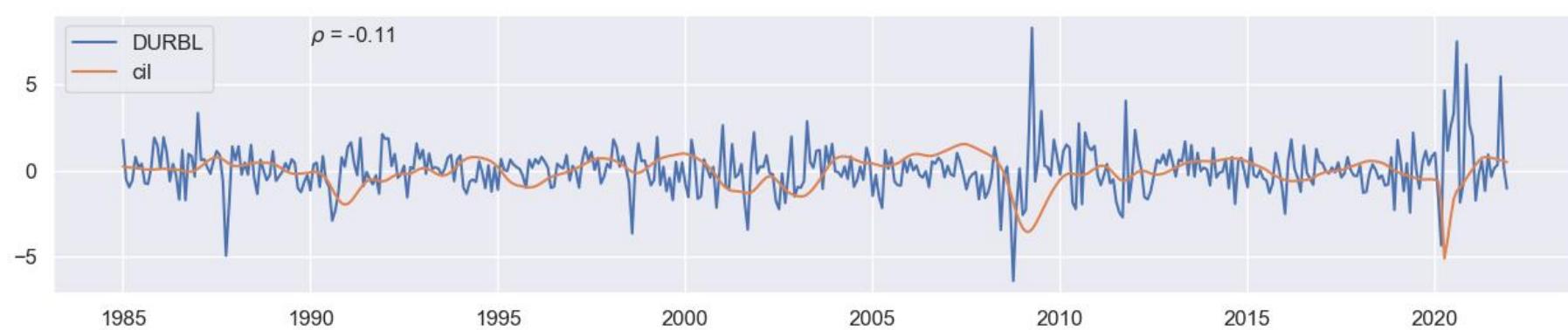


Comparison

Economic Policy Uncertainty Index



Leading Indicators OECD

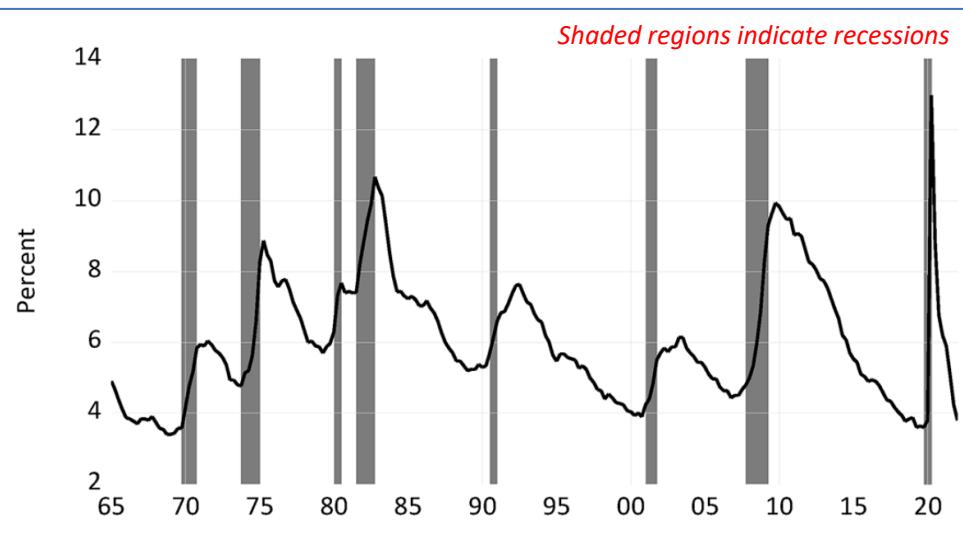


STORY 3.2 - Comparison

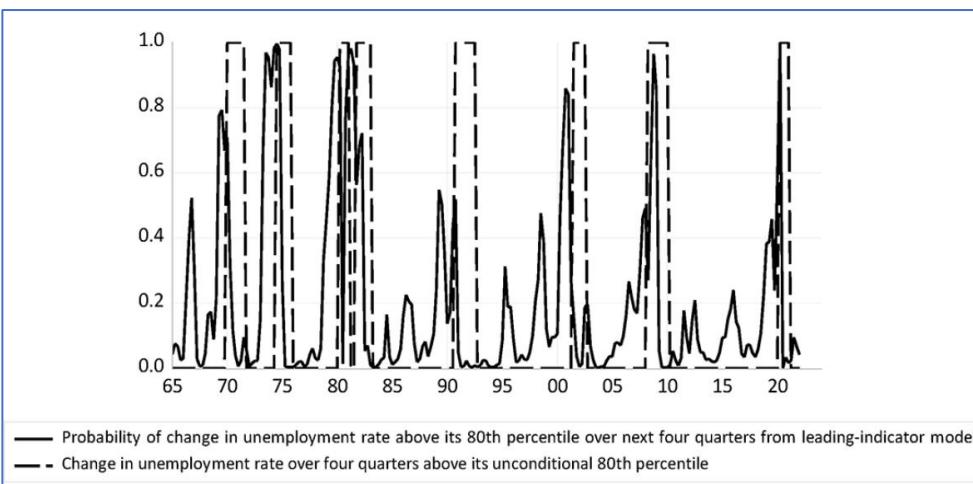
Story	Objective	Techniques	Indicators	Source of Data	Time-Frame
3 Opt2	<p>During the two periods (OLD and NEW) contributing to recessions:</p> <ul style="list-style-type: none"> How do the financial and Macroeconomic Indicators predict the <u>Probability of Recession Risk?</u> 	<ul style="list-style-type: none"> - Standardization - Line graphs (dynamics) of two variables - Box plot - Violin plot - Scatter plot - Kernel density - Histogram - Hexagonal - Regression - Scatter plot (Type 2) 	<p>Set 1 (OLD) and Set 2 (NEW)</p> <ul style="list-style-type: none"> • Federal Funds Effective Rate [FEDFUNDS] • Yield on U.S. Treasury Securities at 10-Year Constant Maturity [DGS10] • Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year Treasury Constant Maturity [BAA10YM] • Leading Indicators OECD [USALOLITONOSTSAM] • Consumer Price Index for All Urban Consumers [CPIAUSCL] • Unemployment Rate [UNRATE] <p>Ref: Kiley (2022)</p>	FRED® Economic Data	<ul style="list-style-type: none"> • 1989 – 1990 • 2021 - 2022

STORY 3.2 - Comparison

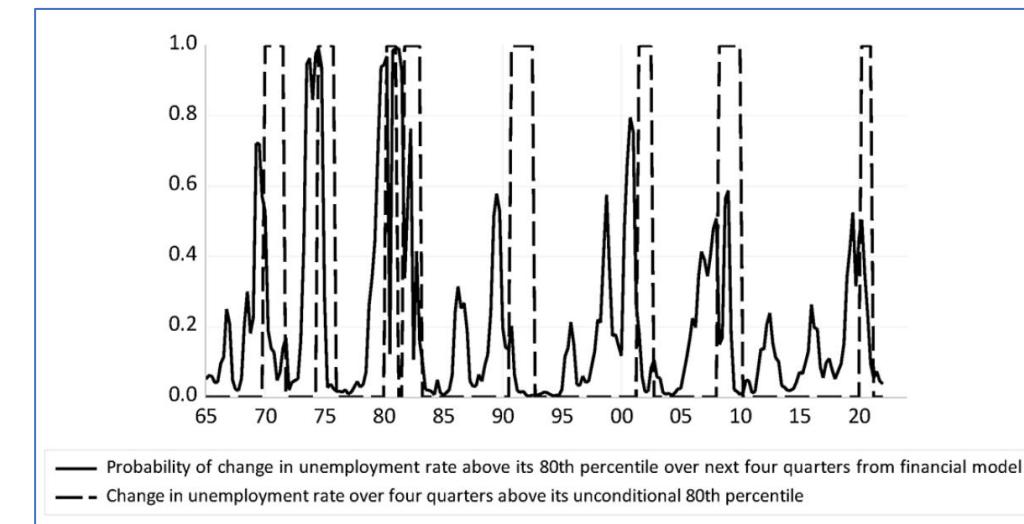
Unemployment Rate, 1965Q1 to 2022Q1



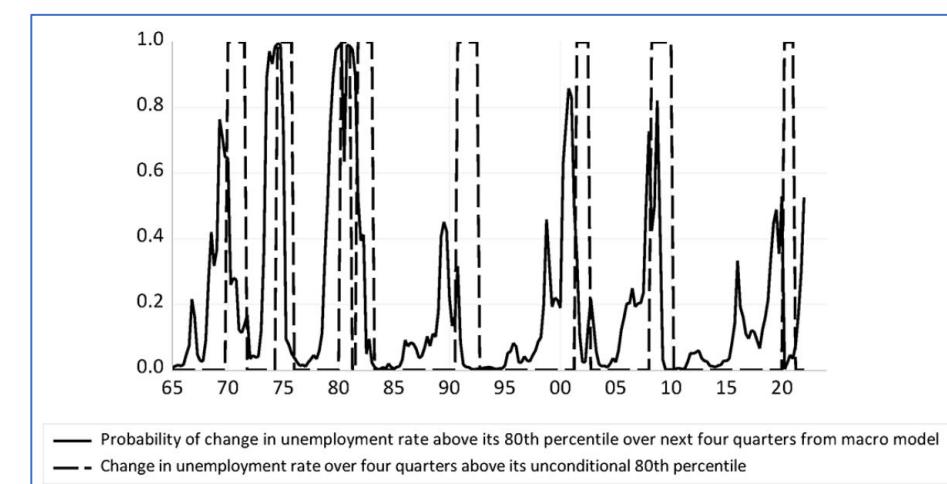
Recession probability (next four quarters) from leading indicators model



Recession probability (next four quarters) from financial model



Recession probability (next four quarters) from macroeconomic indicators model

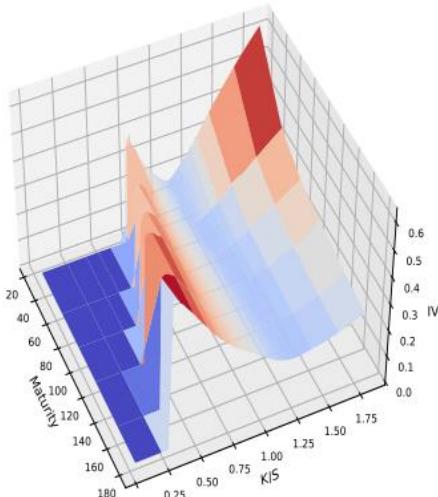


Project Overview

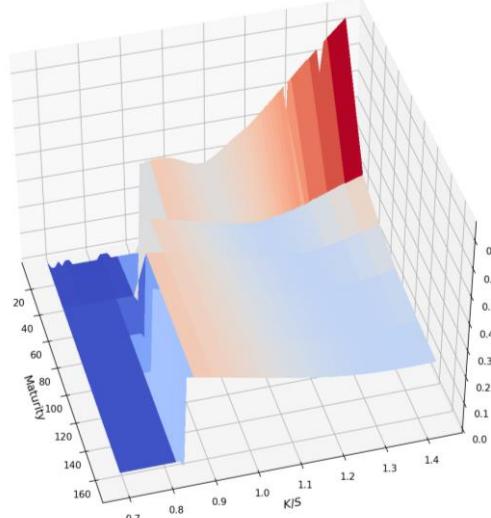
Story	Objective	Techniques	Indicators	Source of Data	Time-Frame
4	<p>A. To explore the following across strikes and maturities of SPX, NDX, XEO:</p> <ul style="list-style-type: none"> • The option value—implied volatility • The sensitivity measures—the Greeks • Trading activities—Volume and Open Interest • Transaction costs—Bid-Ask spread • Whether the above quantities differ by calls/puts <p>B. To provide comparative analysis for risk management through hedging</p>	<ul style="list-style-type: none"> - 3D-plots - Mesh grid - delta surface - put - gamma surface-call - Volume 3D scatters - ABAS Scatter vs calls/puts - RABS Scatter vs calls/puts 	<p>SPX – Quotes Dashboard NDX – Quotes Dashboard XEO – Quotes Dashboard</p> <p>Recession → Volatility → hedging → options → more flexible for retail investors</p>	CBOE	<p>Expiration date:</p> <ul style="list-style-type: none"> • December 2022 • January-Dec 2023 (where available)

Implied Surface Volatility – Calls (Top) & Puts (Bottom)

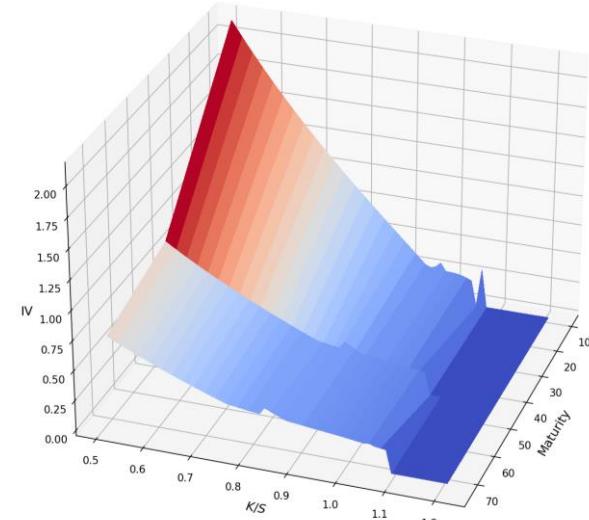
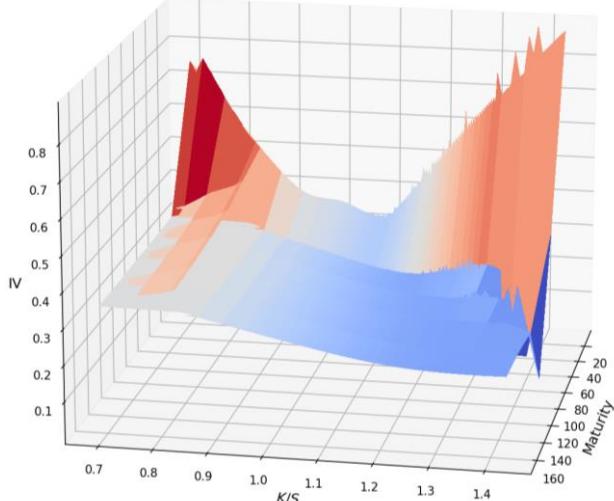
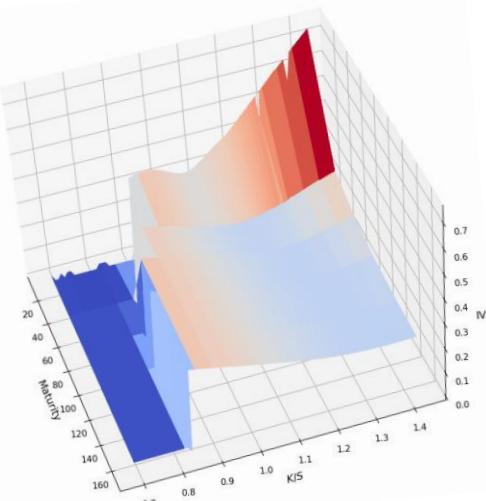
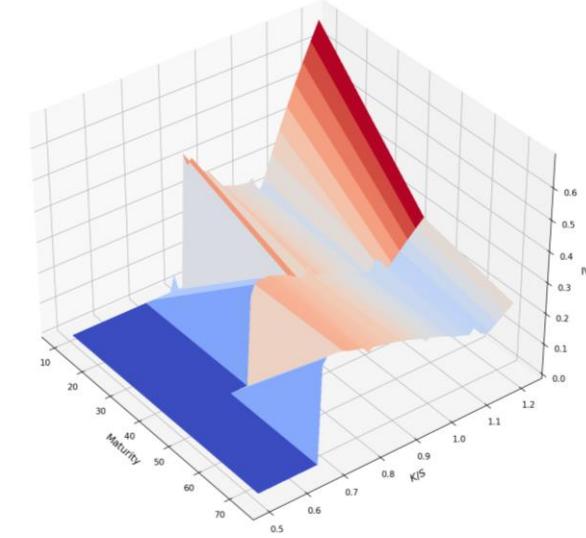
SPX



NDX

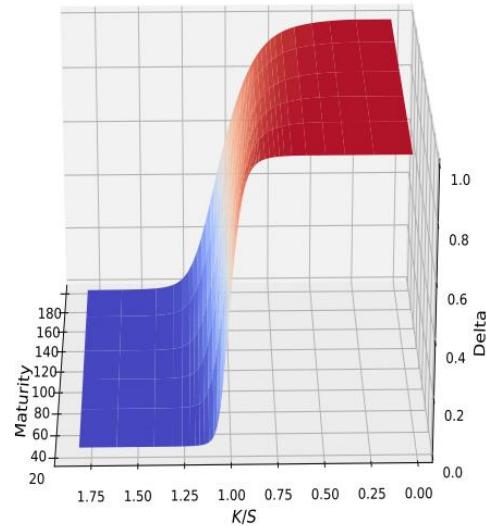


XEO

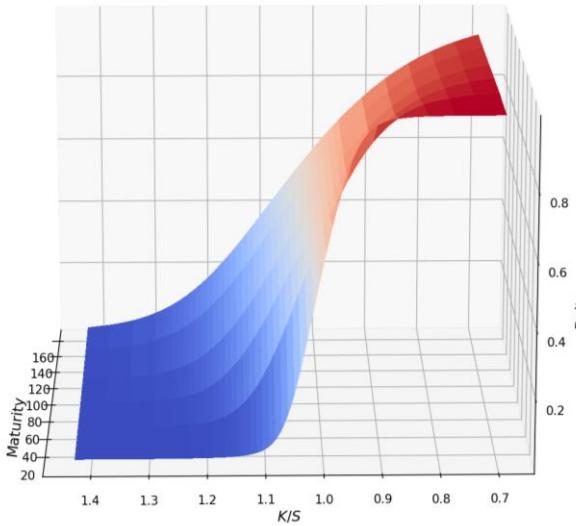


Delta – Calls (Top) & Puts (Bottom)

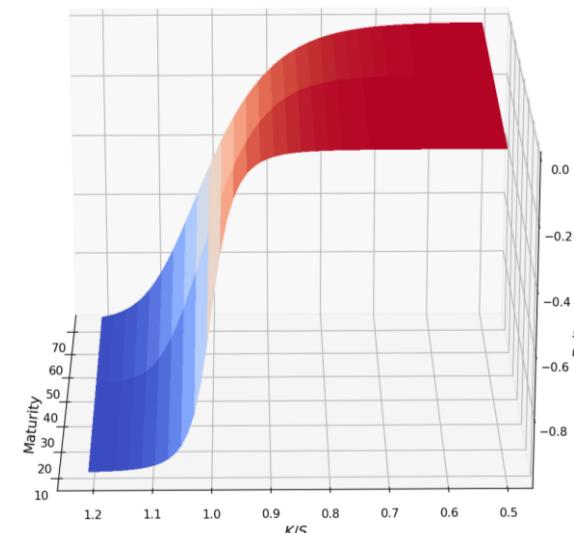
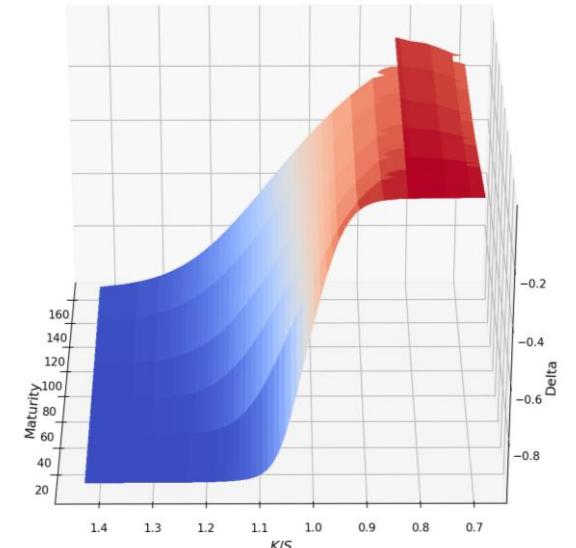
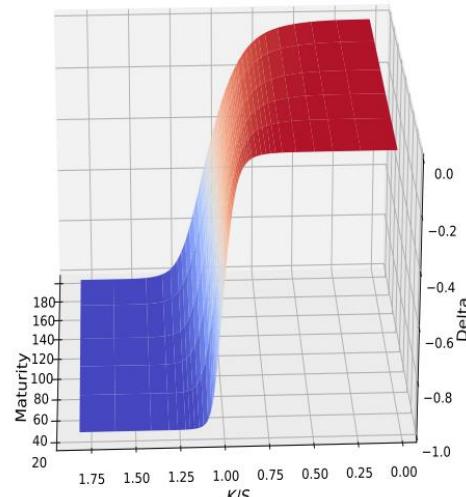
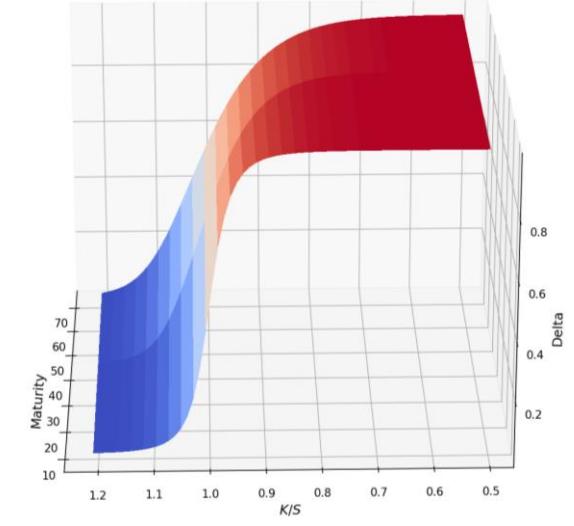
SPX



NDX

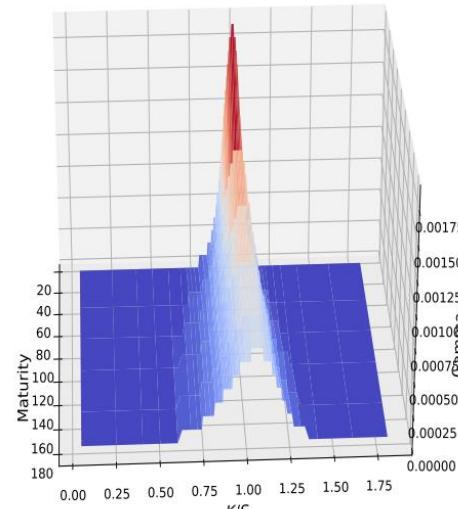


XEO

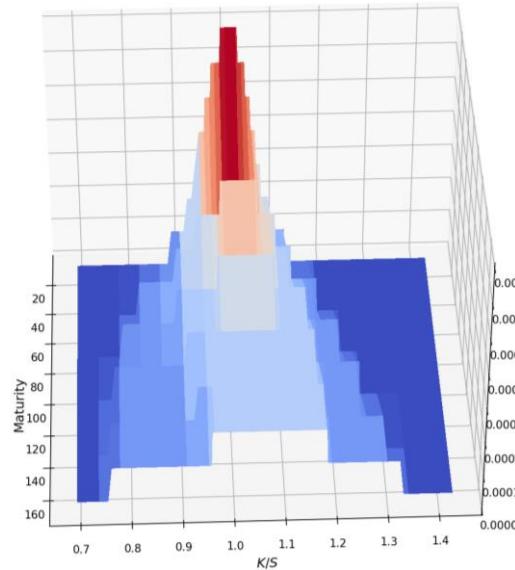


Gamma – Calls (Top) & Puts (Bottom)

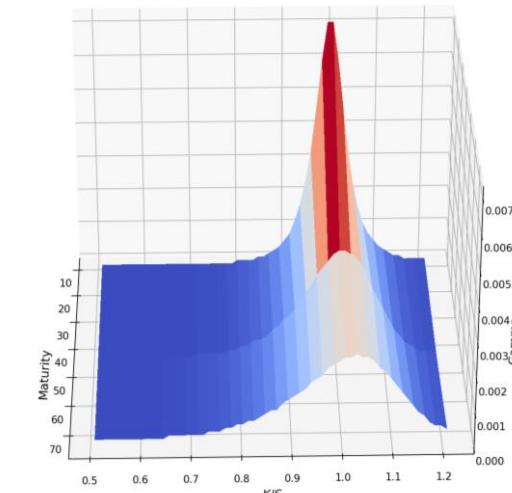
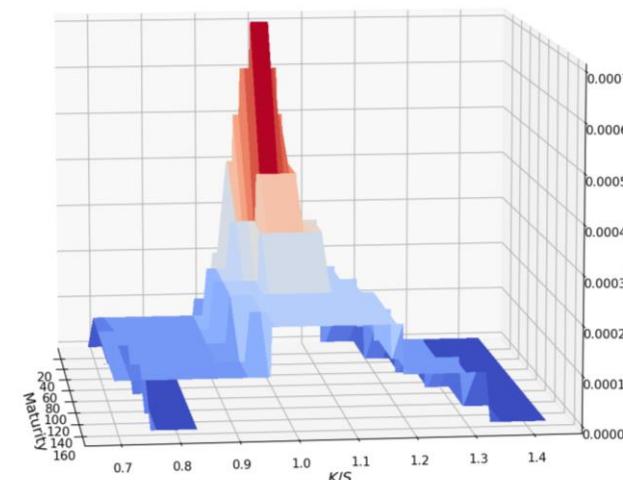
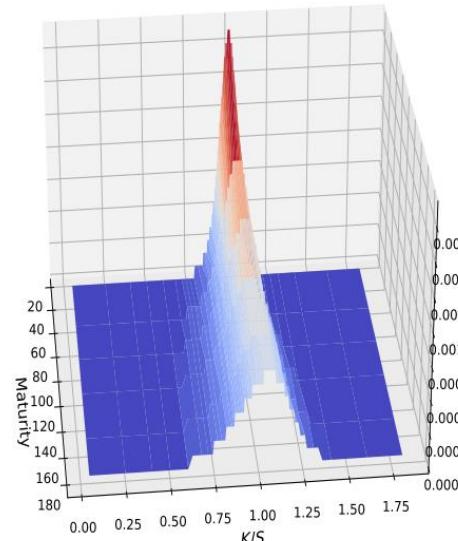
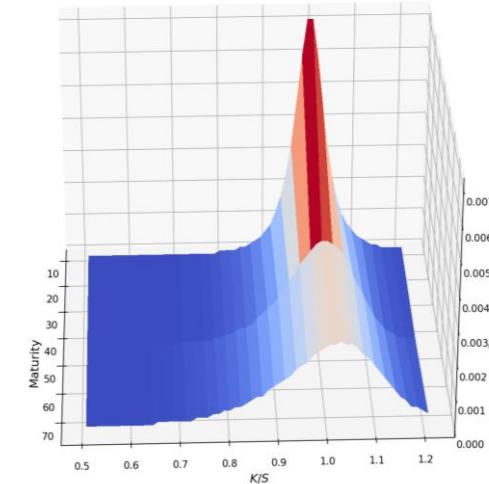
SPX



NDX

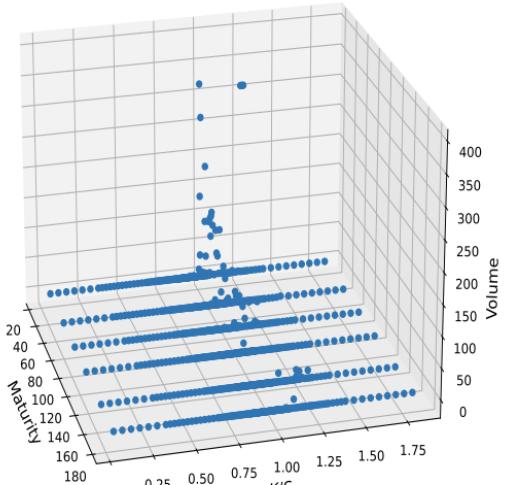


XEO

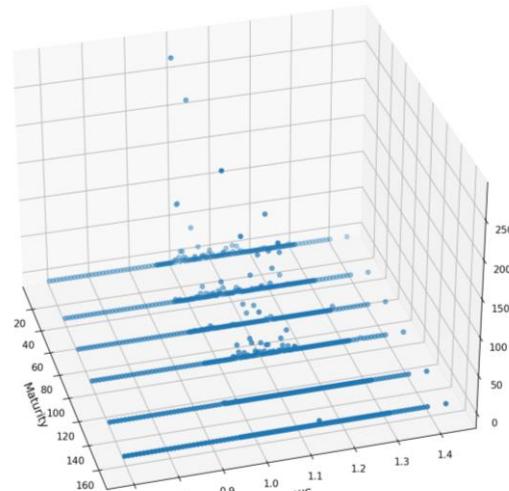


Volume 3-D Scatter – Calls (Top) & Puts (Bottom)

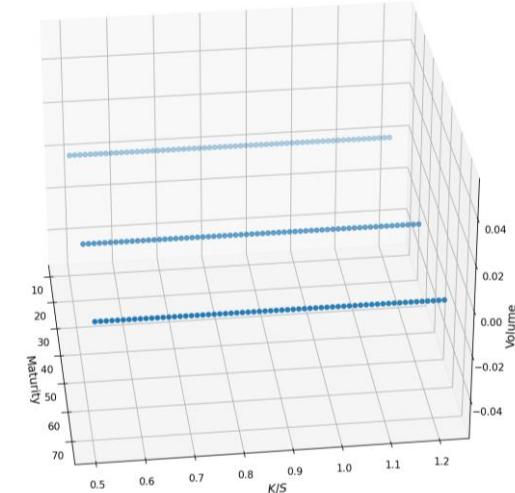
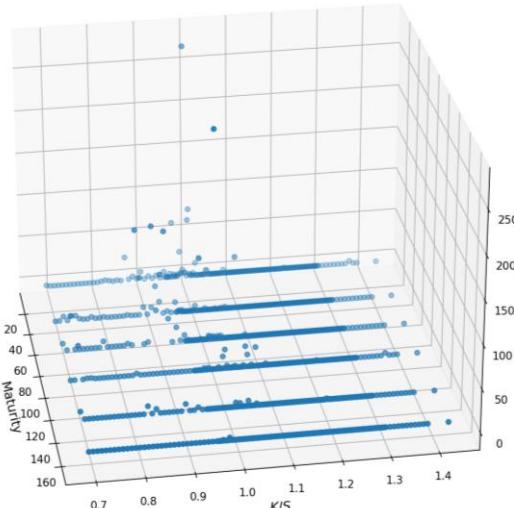
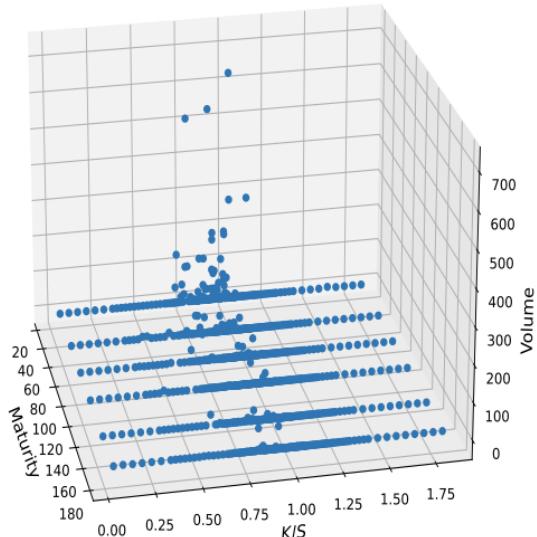
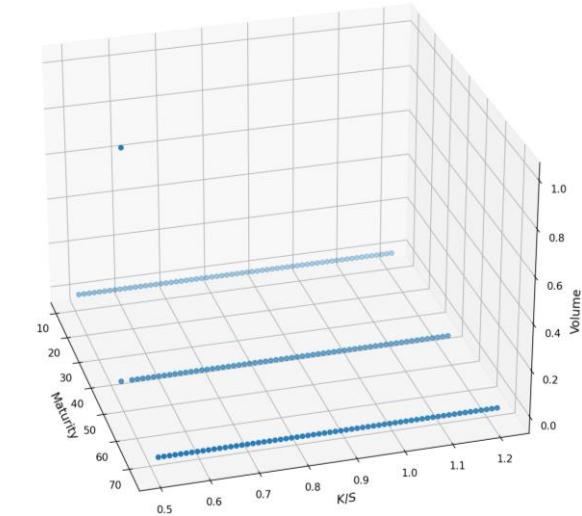
SPX



NDX

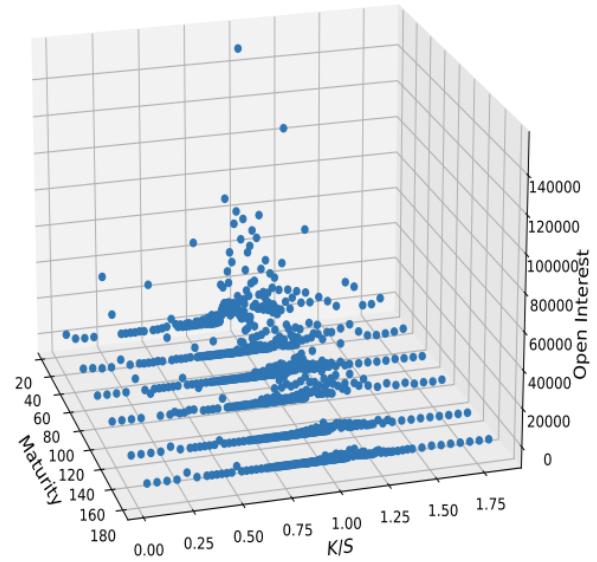


XEO

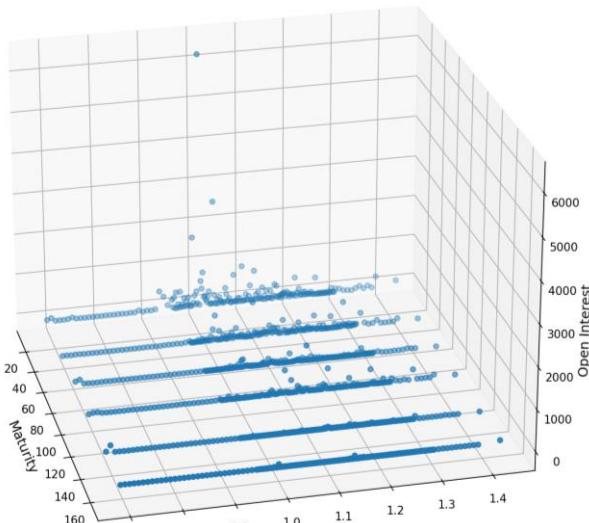


Open Interest 3-D Scatter – Calls (Top) & Puts (Bottom)

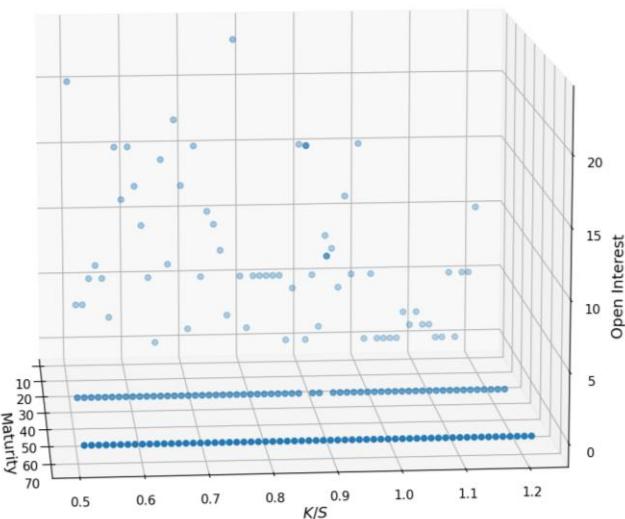
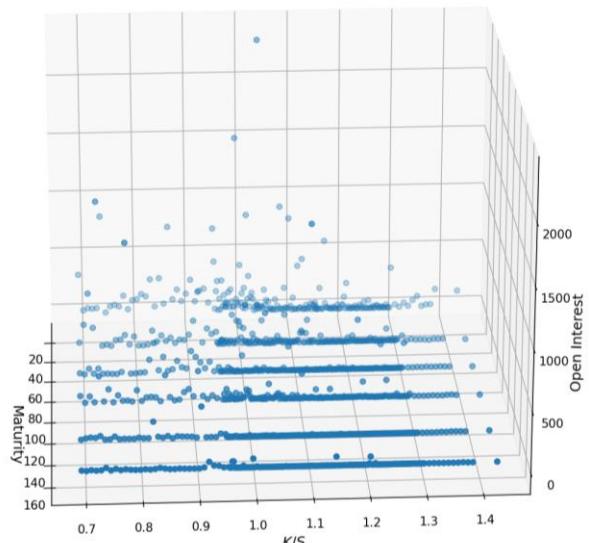
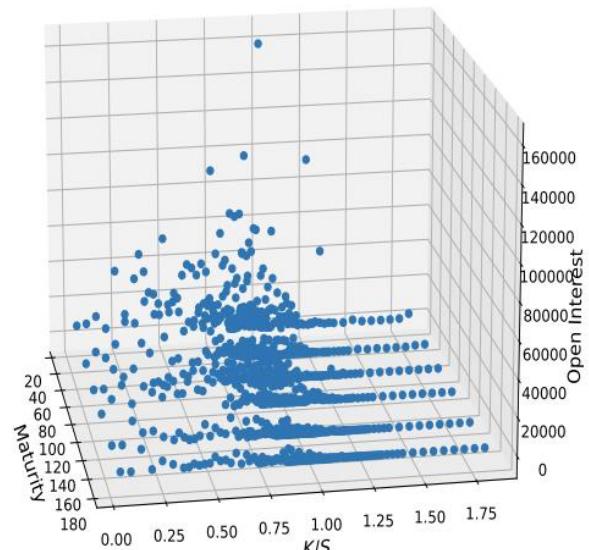
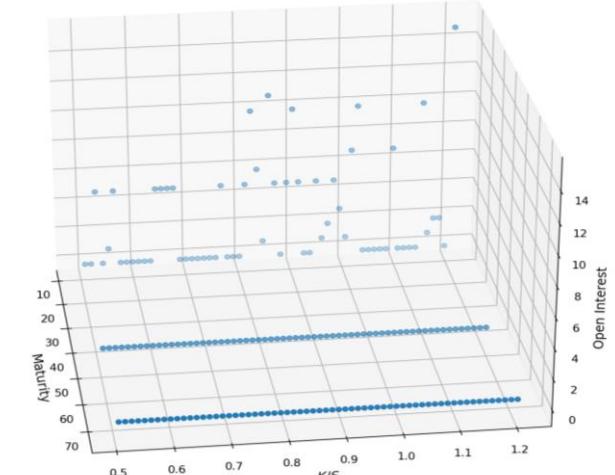
SPX



NDX

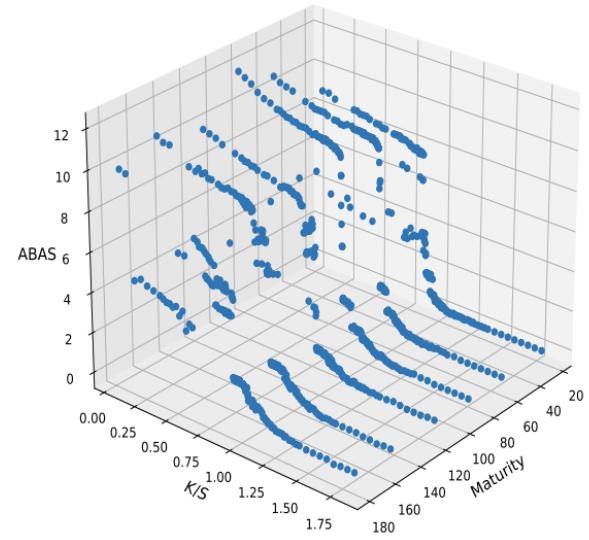


XEO

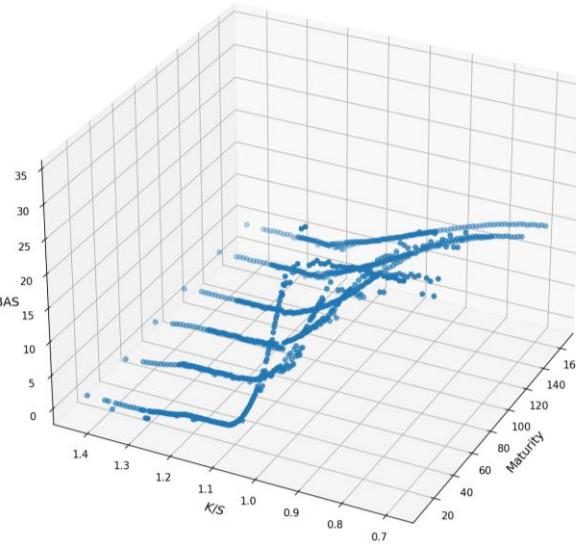


ABBAS 3-D Scatter – Calls (Top) & Puts (Bottom)

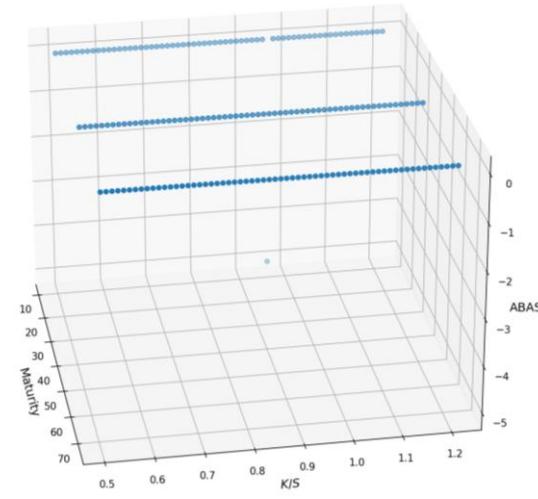
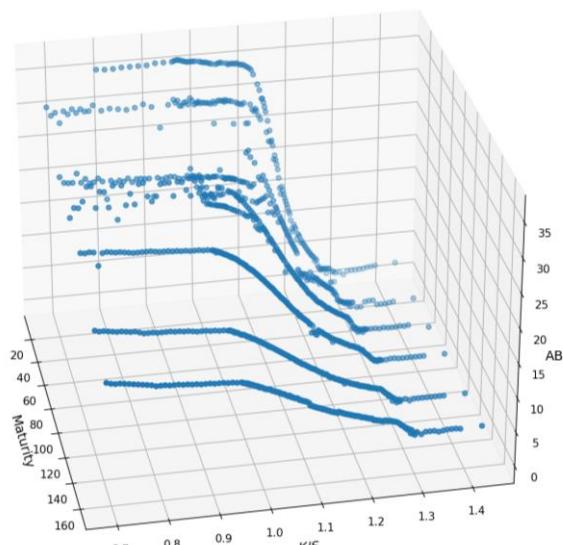
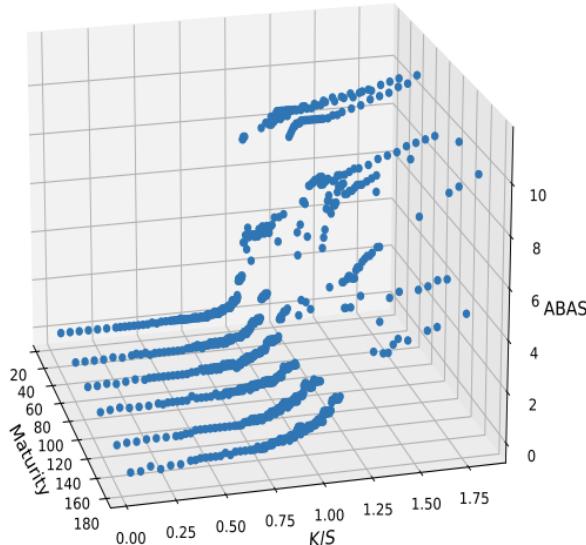
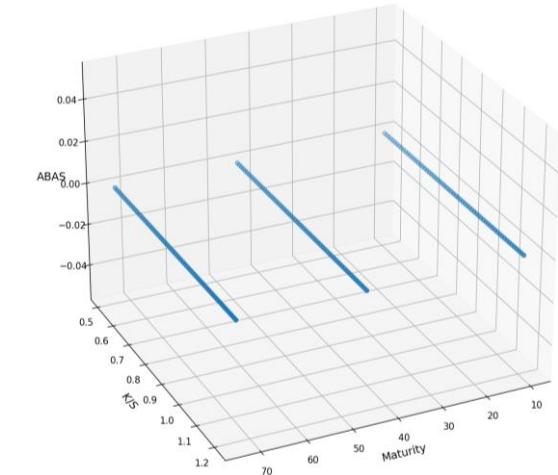
SPX



NDX

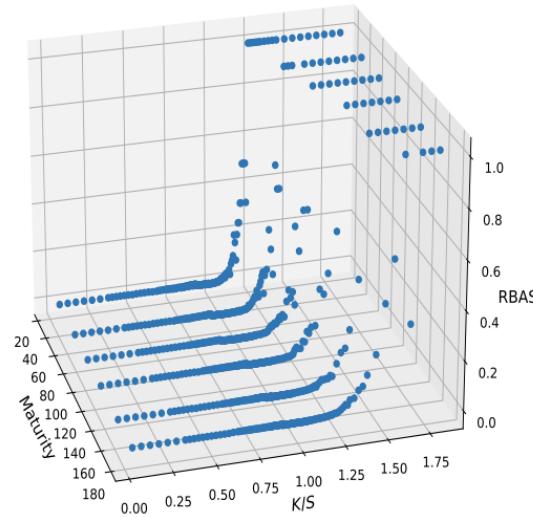


XEO

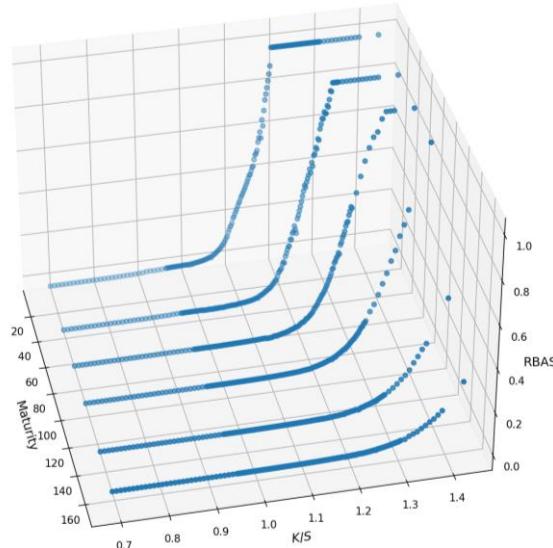


RBAS 3-D Scatter – Calls (Top) & Puts (Bottom)

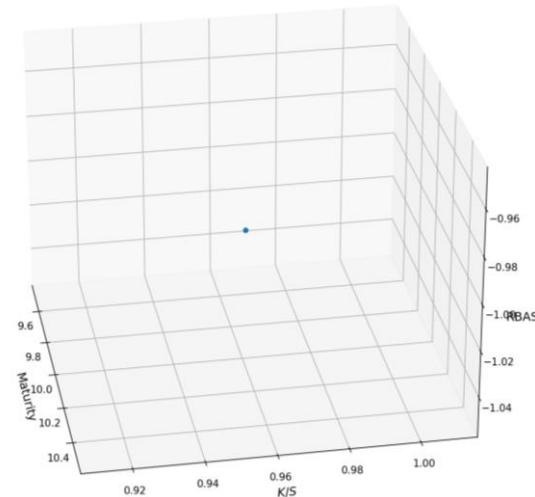
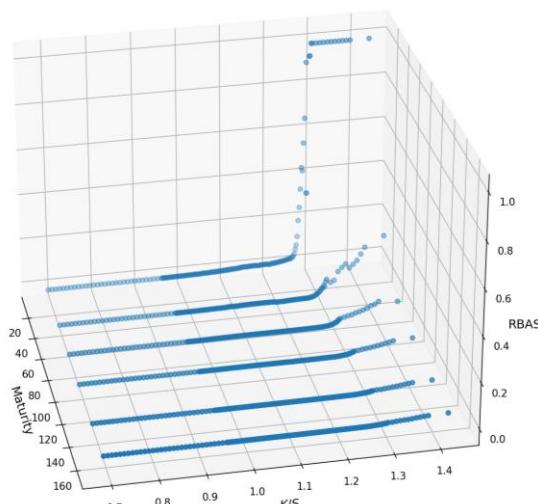
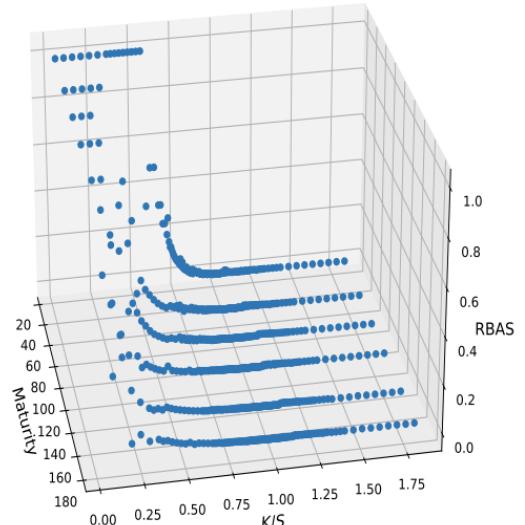
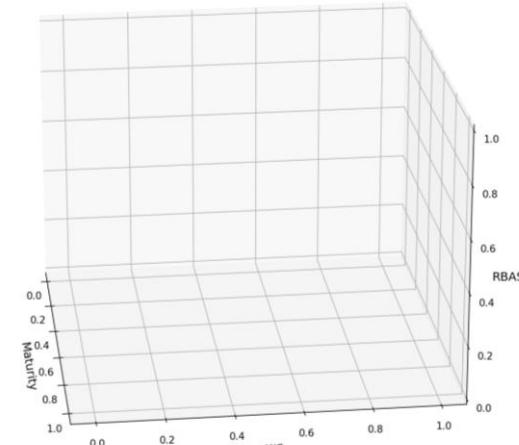
SPX



NDX



XEO



Conclusion

DECISION MAKERS

- There are some similarities and unsimilarities between the two contributing conditions prior to recession in Early 1990's and 2Q23
- The analysis herein highlights how **financial**, **leading indicator**, and **other macroeconomic variables** provide **different signals** regarding the risk of a recession.

RETAIL INVESTORS

- **Historically**, buying stocks during a downturn has been very profitable, but many investors are not comfortable doing it.
- **Selling put options** during a downturn can be a viable alternative to buying stocks.
- The **high volatility of bear markets** makes selling options more profitable than usual.
- Less-experienced investors should only sell puts on stocks that they would want to own.
- This type of strategy has been successful enough that **put-selling** exchange-traded funds (ETFs) are now available for the S&P 500.

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