Phase 3 - Team 14 Progress Report

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0 - Index

1. Project Overview
2. Detailed Approach
3. Progress
4. Next Steps
5. Challenges
6. Literature + Hypotheses
7. Code
8. Video
9. Sources

1 - Project Overview

The goal of our analysis is to identify stock attributes and performance trends which are indicative of resilience during economic downturns. To do so, we plan to leverage data for securities in the S&P 500 during several 'down markets' - identifying the stocks which outperform the market and analyzing the traits they have in common (e.g. industry, company size, etc).

2 - Detailed Approach

Step I: Observe market performance during several recession periods in the United States. Identify the securities which outperform the market in those periods, based on Jensen's Alpha. Translate output into a binary response (outperformed - yes or no?) using a threshold for the Jensen's Alpha values.

- Recession Periods: the 8 US recession periods identified by FRED, based on GDP
- Jensen's Alpha (regression model):
  $\text{Return}_{\text{Stock}} - \text{Return}_{\text{Risk Free}} = \alpha_{\text{Stock}} + B_1 [\text{Return}_{\text{GSPC}} - \text{Return}_{\text{Risk Free}}]$
  - Stock Sample: all S&P 500 component securities for which we have data
  - Market: we will use the GSPC index as our market proxy
- Jensen's Alpha threshold, informing binary response (outperformed - yes or no?)

- For each period, we will rank all securities based on their Jensen's Alpha
- Stocks with positive alphas, ranking in the top 30% for their period will be marked as 'outperformers'. The rest will be marked as 'non-outperformers'

Step II: Determine which stock attributes and performance trends are most predictive of the outperformance identified in Step I. We will do this using logistic regression, with the binary outperformance variable from above as the dependent variable, and several stock and macro factors as the explanatory variables.

- Logistic Regression Model:
  'Outperformer (1 or 0)' $_{Stock}$ = B_0 + B_1 * [LTM Returns] + B_2 * [LTM Volatility] + B_3 * [Industry] + B_4 * [Size] + B_5 * [Interest Rate] + B_6 * [Unemployment Rate] + …
- Coefficients that are large and statistically significant will be indicative of the factors which are most indicative of resilience during economic downturns

3 - Progress

We have made progress on Step I, producing Jensen's Alpha for every S&P stock for which we had data during the 'Great Recession' (December 2007 - June 2009). This has enabled us to identify which stocks and industries outperformed the market during that period:

**monthly values, informed by Dec '07 - Jun '09 period, GSPC as market index*

Rank	Ticker	Company Desc	Sector	Jensen's Alpha *(Monthly)*
1	F	Ford Motor	Consumer Discretionary	11.1%
2	MAC	Macerich	Real Estate	8.9%
3	MGM	MGM Resorts International	Consumer Discretionary	8.9%
4	SIG	Signet Jewelers	Consumer Discretionary	8.3%
5	PFG	Principal Financial Group	Financials	8.3%
6	PRU	Prudential Financial	Financials	6.2%
7	LNC	Lincoln National	Financials	5.8%
8	RCL	Royal Caribbean Cruises Ltd	Consumer Discretionary	5.7%
9	FFIV	F5 Networks	Information Technology	5.7%
10	HIG	Hartford Financial Svc.Gp.	Financials	5.5%
11	BAC	Bank of America Corp	Financials	5.4%
12	ALGN	Align Technology	Health Care	5.2%
13	NFLX	Netflix Inc.	Information Technology	5.2%
14	FITB	Fifth Third Bancorp	Financials	5.1%
15	WDC	Western Digital	Information Technology	5.0%
16	GT	Goodyear Tire & Rubber	Consumer Discretionary	5.0%
17	HST	Host Hotels & Resorts	Real Estate	4.9%
18	HBI	Hanesbrands Inc	Consumer Discretionary	4.9%
19	IP	International Paper	Materials	4.8%
20	BLK	BlackRock	Financials	4.8%

**monthly values, informed by Dec '07 - Jun '09 period, GSPC as market index, sector values are averages of component stocks*

Sector	Jensen's Alpha *(Monthly)*
Consumer Discretionary	2.6%
Real Estate	2.3%
Materials	1.9%
Financials	1.9%
Information Technology	1.8%
Health Care	1.2%
Industrials	1.1%
Energy	1.0%
Consumer Staples	0.8%
Telecommunication Services	0.0%
Utilities	-0.1%

As can be seen above, our preliminary findings indicate that companies in the Consumer Discretionary and Real Estate sectors were some of the biggest outperformers during the Great Recession.
We run the model using 2 different methods to cross check the output of the Alpha.
Method 1 (regression model) output: data
Method 2 (tq_performance with CAPM) output: data

4 - Next Steps

Discussion below references the 'Steps' identified in the 'Detailed Approach' section

Step 1: Though we've made progress on this step, we need to expand the set of periods for which we evaluate market outperformance.

- In our research thus far, we focused exclusively on the 'Great Recession' period (December 2007 - June 2009)
- We need to conduct the same analysis for the other 7 periods in our FRED data set. This will provide us with a more robust evaluation of market performance, as we will be able to separate 'period-specific' trends from trends which are consistently indicative of resilience during economic downturns

We also need to translate the Jensen's Alpha values into a binary response variable (outperformed - yes or no?). As discussed in the 'Detailed Approach' section, we will do this by identifying thresholds, informed by alpha's in the top 30th percentile for a given downturn period.

Step 2: We will execute the logistic regression highlighted in the 'Detailed Approach' section. To do this, we will conduct several additional data sourcing exercises:

- We will leverage tidyquant to calculate performance trends for each stock in each period. These performance trends will serve as explanatory variables in our logistic regression and include (but are not limited to):
    - LTM Return: return for the stock in the 12 month period leading into the recession
    - LTM Volatility: standard deviation of the monthly returns for the stock in the 12 month period leading into the recession
- We will also pull company-specific descriptive data for each stock in each period. This includes things like company sector (as included in the 'Progress' section), company size (large cap, small cap), etc.

We will finally apply the resulting logistic regression model to present-day market performance, to understand which companies may be good investments if we enter a prolonged recession period.

5 - Challenges

The stocks which make up the S&P 500 vary over time. Identifying these component stocks historically has proven challenging. For example, for our Jensen's Alpha analysis for the 'Great Recession' period, we were only able to identify ~300 stocks in the S&P 500.

Moving forward, we will either need to identify a broader data source. Or, we will need to identify a method for ensuring our data set is unbiased (e.g. eliminating the survivorship bias which stems from using stocks which are still publicly listed today).

Data availability for institutions historically is limited and not "free" which limits our options on gathering data that can be used to analyze.

6 - Literature + Hypotheses

We have identified two papers which explore investment strategy during economic downturns Sources [1,2].

Through this research, we have formed several hypotheses about which types of companies might outperform in recession.

Researchers suggest that 'vice stocks' tend to outperform as folks resort to 'bad habits' (e.g. drinking, smoking, gambling) during times of unemployment Sources [2].

They also find that healthcare companies are resilient, as demand can be relatively inelastic for medical care Sources [1].

Finally, they identify manufacturing companies as under-performers, as investment in development is lower during times of high uncertainty [Sources 1].

7 - Code

https://github.com/MGT-6203-Edx-Summer-2022/Team-14/blob/main/Recession-Proof_Portfolio/Scripts/Detailed_Analysis.R

8 - Video

Our video progress update is linked here.

9 - Sources

1 - Woszczyk K, 2019, 'Do mutual funds invest in recession-proof industries prior to crisis?', MSc thesis, Erasmus University Rotterdam, Rotterdam (link)

2 - Ozkan F C, Xiong Y, 2009, 'Wise Investing: Analysis of the recession-proof sin stocks', MBA thesis, Simon Fraser University, British Columbia (link)

3 - Tidyquant, source of stock data (via Yahoo) and macroeconomic times series (via Fred) (link)

4 - Kaggle, guidance for performing S&P 500 Analysis in R (link)

5- Schwab, 'Macro-economic factors of fundamental analysis' (link)

6 - Stijn Claessens, M. Ayhan Kose, and Marco E. Terrones, 2008, 'What Happens During Recessions, Crunches and Busts?' (link)