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The University of Texas at Austin
McCombs School of Business

ASSIGNMENT #2 REAL OPTIONS STRATEGY

Analytic Finance, Spring 2024

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KEY MOTIVATION:

- Stock Prices reflect the value of a company if the market fully understands what the company is doing
- **If the market does not fully understand what is going on there may be discrepancies, where Prices do not reflect underlying Value**

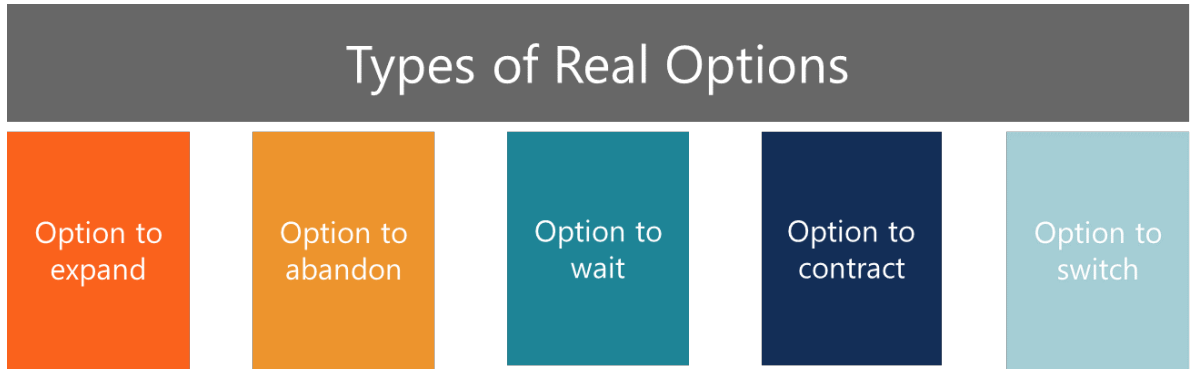
- **Goal: Identify drivers of discrepancies**

IDEA: REAL OPTIONS

Definition:
A Company's right but not obligation to make a business decision with some economic value

Rationale:
- It is difficult for the market to proper assess the intrinsic values of real options
- This might drive discrepancies between the price and intrinsic value

Expectation:
- Companies with high level of real options may be systematically undervalued

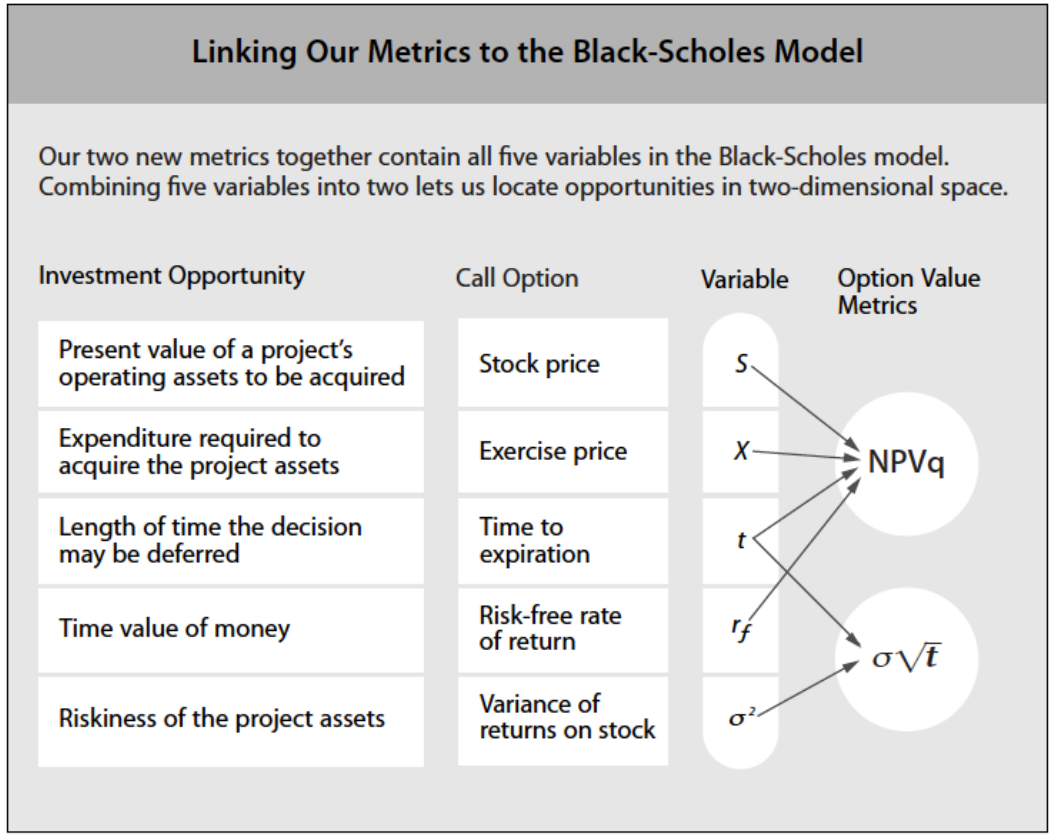


IDEA: REAL OPTIONS

Hypothesis:
"Companies with high levels of real options are systematically undervalued"

Sorting Variable Strategy:
- Has to be based on economic foundations without being too complex
- Must be calculated solely on accounting data

REAL OPTIONS – SORTING VARIABLE



Investment Opportunities as Real Options, Luehrman, HBR

Factor	*Call Value*	*Put Value*
Increase in underlying asset's value	Increases	Decreases
Increase in Strike Price	Decreases	Increases
Increase in variance of underlying asset	Increases	Increases
Increase in time to expiration	Increases	Increases
Increase in interest rates	Increases	Decreases
Increase in dividends paid	Decreases	Increases

The Promise and Peril of Real Options, Damodaran, NYU

REAL OPTIONS – SORTING VARIABLE

$\sigma x t$

Time the decision may be deferred
Need Proxy Variable

Variance of Assets

Standard Deviation of FCFE

FCFF_5yr_stdev / FCFF_5yr_mean

<u>Drivers of Ability to defer decision</u>

- Exclusive Rights (e.g. Patents)
- Competitive Advantage

"The number of years for which the firm can be expected to have these advantages is the life of the option"

(Damodaran)

REAL OPTIONS – SORTING VARIABLE

Morningstar's Five Sources of Moat

Moat investing is based on a simple concept: Invest in companies with sustainable competitive advantages trading at attractive valuations. One of the first steps in implementing this approach is finding companies with a moat.

A company's moat refers to its ability to maintain the competitive advantages that are expected to help it fend off competition and maintain profitability into the future. Morningstar has identified five sources of moat:

Sources of Moat	Description
	Switching Costs Switching costs give a company pricing power by locking customers into its unique ecosystem. Beyond the expense of moving, they can also be measured by the effort, time and psychological toll of switching to a competitor.
	Intangible Assets Though not always easy to quantify, intangible assets may include brand recognition, patents and regulatory licenses. They may prevent competitors from duplicating products or allow a company to charge premium pricing.
	Network Effect A network effect is present when the value of a product or service grows as its user base expands. Each additional customer increases the product's or service's value exponentially.
	Cost Advantage Companies that are able to produce products or services at lower costs than competitors are often able to sell at the same price as competition and gather excess profit, or have the option to undercut competition.
	Efficient Scale In a market limited in size, potential new competitors have little incentive to enter because doing so would lower the industry's returns below the cost of capital.

INTANO = INTAN – GDWL

INTANO_Z = (INTANO – INTANO_sector_avg) / INTANO_sector_stdev

GM_Z = (GM – GM_sector_avg) / GM_sector_stdev

t-variable = Mean(INTANO_Z, GM_Z)

CONCERNS ADDRESSED

Sigma x SQRT(t)

- Square Root inappropriate as this is not a “real time” variable
- **Solution: Remove Square Root**

Number of Observations

- Subindustries may not have sufficient observations in each year
- **Solution: Use Sectors Instead**

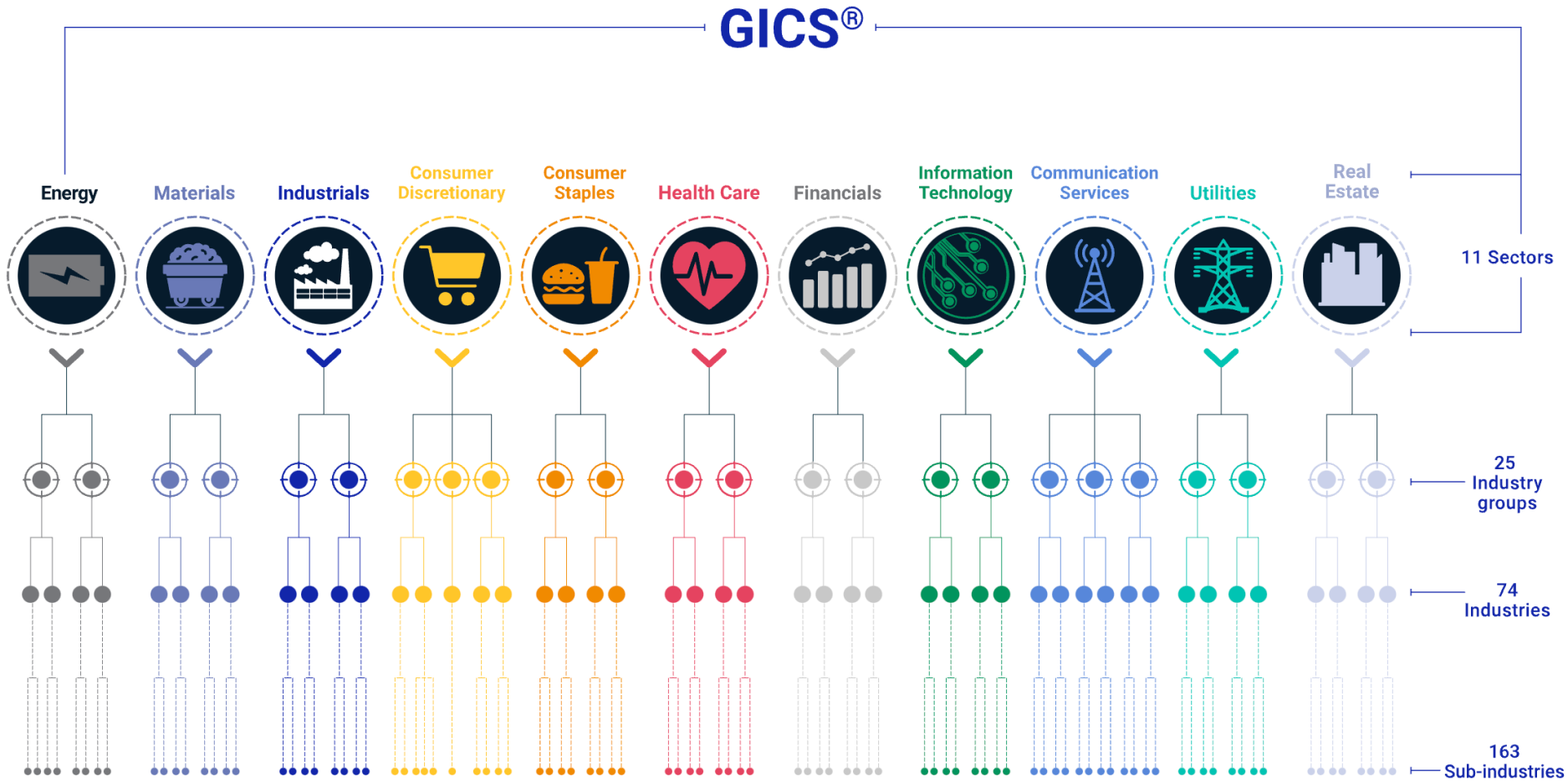
INTAN includes Goodwill

- This would skew results as companies that overpay for M&A would get rewarded
- **Initial Solution: Use INTANO, excluding Goodwill**
- Issue: For some reason INTANO was only available after 1999 and 0 for all prior years
- **Solution: Create own INTANO through INTAN – GDWL**

Include Market Share in t-variable

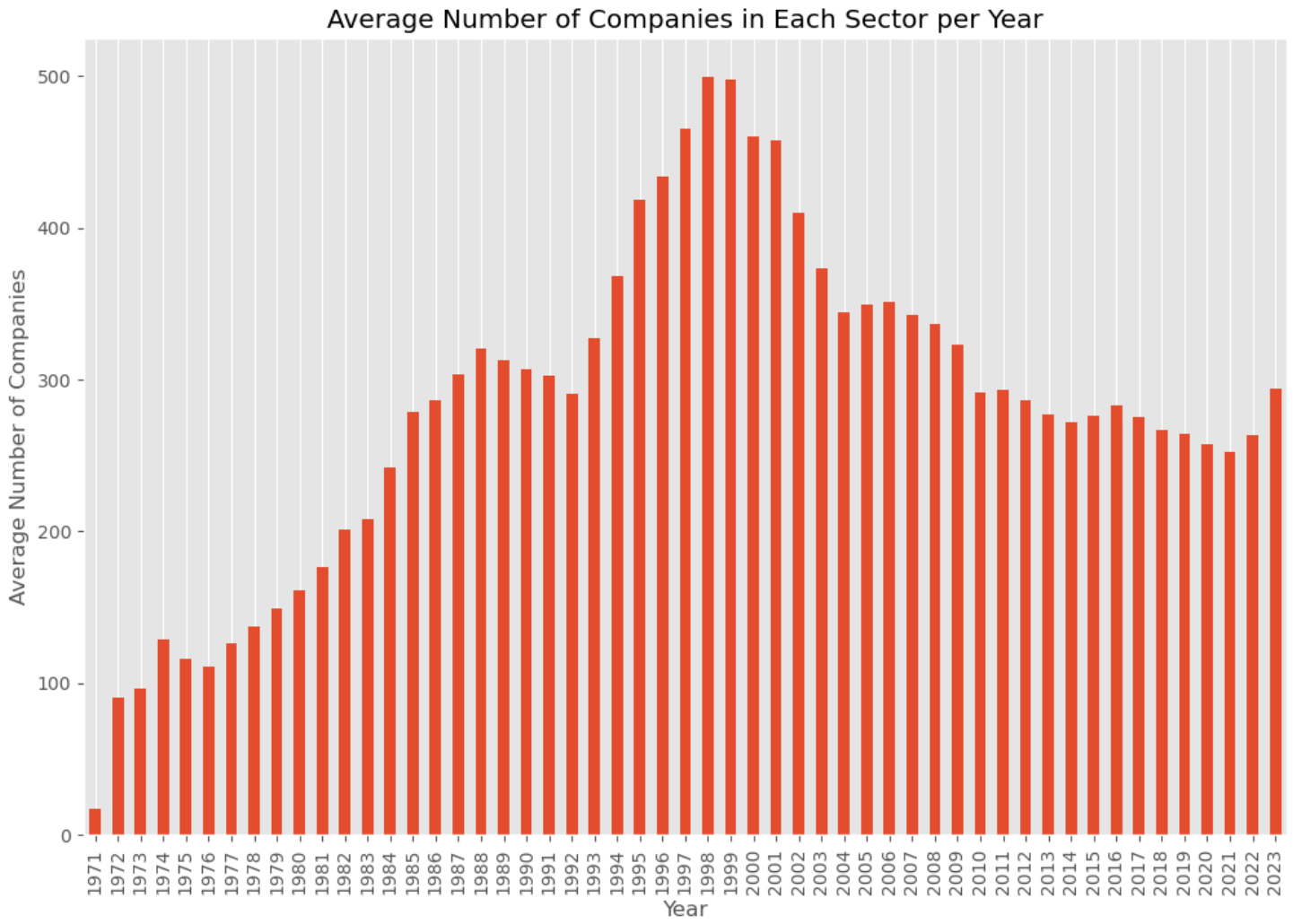
- Include standardized Market Share in t-variable as a measure of competitive advantage
- **Slightly worse alphas, less significance, did not end up adopting it in final model**

GICS



as of March 17, 2023

EDA


Average Number of Companies in Each Sector per Year
Average Number of Companies
0
100
200
300
400
500
Year
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
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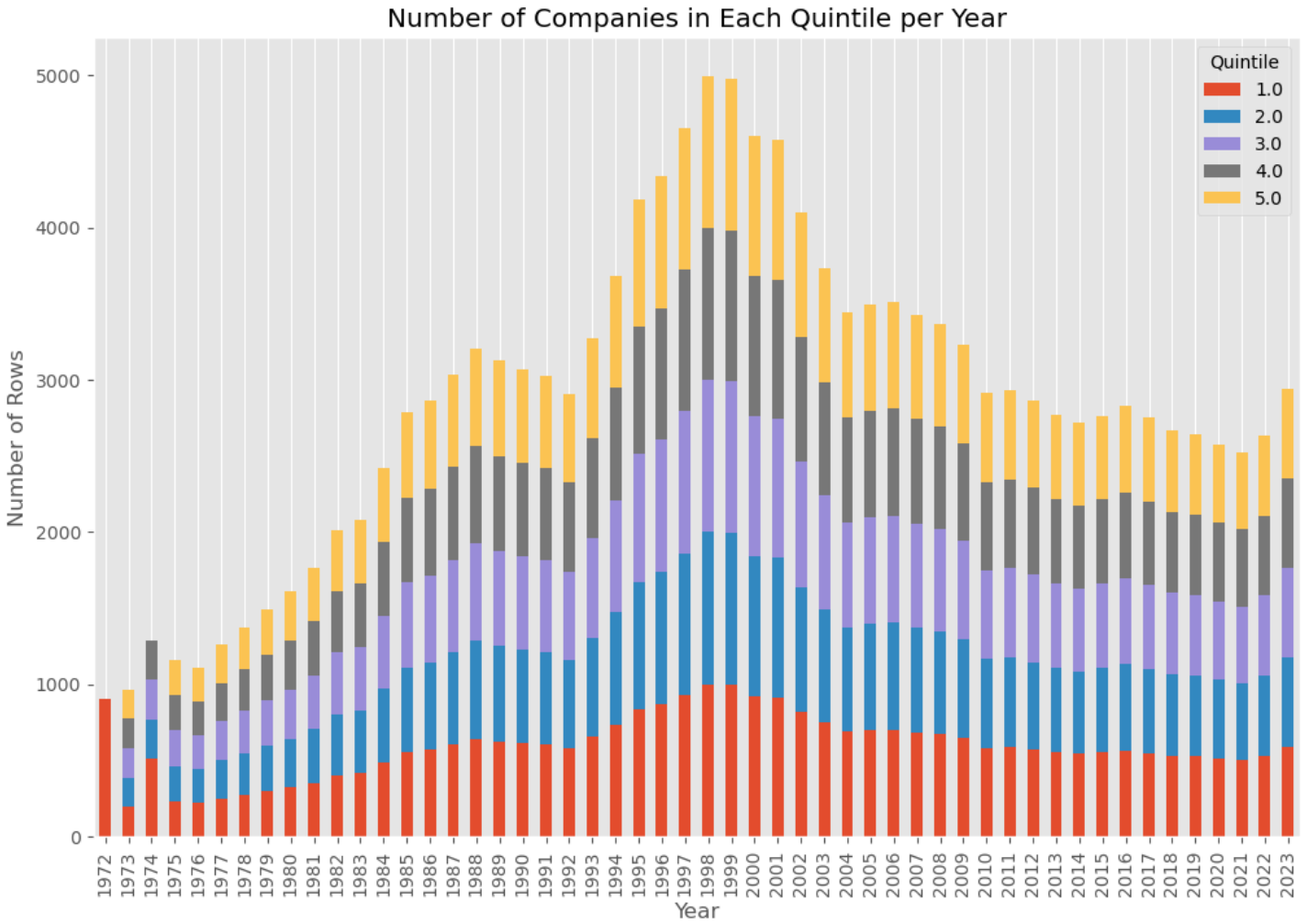
Number of Companies in Each Quintile per Year
Quintile
1.0
2.0
3.0
4.0
5.0
Number of Rows
0
1000
2000
3000
4000
5000
Year
1972
1973
1974
1975
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EQUAL WEIGHTED RETURNS

Returns in % per month	Q1_EW_returns	Q2_EW_returns	Q3_EW_returns	Q4_EW_returns	Q5_EW_returns
Full_sample 1981-07 - 2012-12	0.823	1.153	1.203	1.144	1.196
Pre_2000 1981-07 - 1999-12	0.853	1.125	1.114	1.210	1.245
Post_2000 2000-01 - 2012-12	0.781	1.192	1.329	1.050	1.126
Extended_period 2013-01 - 2022-12	0.763	0.999	1.174	0.945	1.130

VALUE WEIGHTED RETURNS

Returns in % per month	Q1_VW_returns	Q2_VW_returns	Q3_VW_returns	Q4_VW_returns	Q5_VW_returns
Full_sample 1981-07 - 2012-12	1.013	1.086	0.915	1.000	1.008
Pre_2000 1981-07 - 1999-12	1.354	1.399	1.177	1.354	1.326
Post_2000 2000-01 - 2012-12	0.528	0.641	0.543	0.496	0.555
Extended_period 2013-01 - 2022-12	0.813	0.855	1.236	1.046	1.075

EQUAL WEIGHTED CAPM REGRESSION

Regression_EW_CAPM_Full_Sample 1981-07 - 2012-12								
	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**	**R-Squared:**	**Annual Sharpe:**
const	0.4376	0.107	**4.087**	0.000	0.227	0.648	0.056	0.612
Mkt-RF	-0.1093	0.023	-4.696	0.000	-0.155	-0.064		
Regression_EW_CAPM_Pre-2000 1981-07 - 1999-12 1981-07 - 1999-12								
const	0.4470	0.128	**3.484**	0.001	0.194	0.700	0.018	0.728
Mkt-RF	-0.0572	0.029	-2.003	0.046	-0.114	-0.001		
Regression_EW_CAPM_Post-2000 2000-01 - 2012-12 2000-01 - 2012-12								
const	0.4101	0.179	**2.295**	0.023	0.057	0.763	0.136	0.557
Mkt-RF	-0.1848	0.038	-4.915	0.000	-0.259	-0.111		
Regression_EW_CAPM_Extended Period 2013-01 - 2022-12 2013-01 - 2022-12								
const	0.4868	0.243	**2.000**	0.048	0.005	0.969	0.04	0.489
Mkt-RF	-0.1186	0.054	-2.202	0.030	-0.225	-0.012		

VALUE WEIGHTED CAPM REGRESSION

Regression_VW_CAPM_Full_Sample 1981-07 - 2012-12								
	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**	**R-Squared:**	**Annual Sharpe:**
const	-0.0151	0.119	-0.127	0.899	-0.248	0.218	0.007	0.014
Mkt-RF	0.0422	0.026	1.639	0.102	-0.008	0.093		
Regression_VW_CAPM_Pre-2000 1981-07 - 1999-12								
const	0.0107	0.146	0.073	0.942	-0.278	0.299	0.001	-0.006
Mkt-RF	-0.0160	0.033	-0.491	0.624	-0.080	0.048		
Regression_VW_CAPM_Post-2000 2000-01 - 2012-12								
const	0.0396	0.196	0.202	0.840	-0.349	0.428	0.044	0.077
Mkt-RF	0.1091	0.041	2.639	0.009	0.027	0.191		
Regression_VW_CAPM_Post-2000 2013-01 - 2022-12								
const	0.3634	0.179	**2.031**	0.045	0.009	0.718	0.037	0.504
Mkt-RF	-0.0844	0.040	-2.131	0.035	-0.163	-0.006		

EQUAL WEIGHTED FF3 REGRESSION

Regression_EW_FF3_Full_Sample 1981-07 - 2012-12								
	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**	**R-Squared:**	**Annual Sharpe:**
const	0.4001	0.097	**4.127**	0.000	0.209	0.591	0.252	0.612
Mkt-RF	-0.0541	0.022	-2.475	0.014	-0.097	-0.011		
SMB	-0.2798	0.033	-8.582	0.000	-0.344	-0.216		
HML	0.0784	0.034	2.274	0.024	0.011	0.146		
Regression_EW_FF3_Pre-2000 1981-07 - 1999-12								
const	0.4267	0.119	**3.598**	0.000	0.193	0.660	0.216	0.728
Mkt-RF	-0.0516	0.030	-1.731	0.085	-0.110	0.007		
SMB	-0.3310	0.045	-7.388	0.000	-0.419	-0.243		
HML	-0.0958	0.052	-1.845	0.066	-0.198	0.007		
Regression_EW_FF3_Post-2000 2000-01 - 2012-12								
const	0.3594	0.155	**2.325**	0.021	0.054	0.665	0.387	0.557
Mkt-RF	-0.1327	0.033	-3.987	0.000	-0.198	-0.067		
SMB	-0.1970	0.046	-4.246	0.000	-0.289	-0.105		
HML	0.2278	0.047	4.882	0.000	0.136	0.320		
Regression_EW_FF3_Extended-Period 2013-01 - 2022-12								
const	0.3616	0.185	1.953	0.053	-0.005	0.728	0.458	0.489
Mkt-RF	-0.0210	0.042	-0.495	0.622	-0.105	0.063		
SMB	-0.6471	0.073	-8.827	0.000	-0.792	-0.502		
HML	0.1735	0.051	3.382	0.001	0.072	0.275		

VALUE WEIGHTED FF3 REGRESSION

Regression_VW_FF3_Full_Sample 1981-07 - 2012-12								
	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**	**R-Squared:**	**Annual Sharpe:**
const	-0.0324	0.118	-0.275	0.783	-0.264	0.199	0.053	0.0138
Mkt-RF	0.0706	0.027	2.658	0.008	0.018	0.123		
SMB	-0.1489	0.040	-3.760	0.000	-0.227	-0.071		
HML	0.0360	0.042	0.859	0.391	-0.046	0.118		
Regression_VW_FF3_Pre-2000 1981-07 - 1999-12								
const	0.0473	0.144	0.328	0.744	-0.237	0.332	0.092	-0.006
Mkt-RF	-0.0399	0.036	-1.100	0.273	-0.111	0.032		
SMB	-0.2435	0.055	-4.467	0.000	-0.351	-0.136		
HML	-0.1623	0.063	-2.569	0.011	-0.287	-0.038		
Regression_VW_FF3_Post-2000 2000-01 - 2012-12								
const	0.0126	0.196	0.064	0.949	-0.374	0.399	0.1	0.077
Mkt-RF	0.1345	0.042	3.190	0.002	0.051	0.218		
SMB	-0.0950	0.059	-1.617	0.108	-0.211	0.021		
HML	0.1151	0.059	1.948	0.053	-0.002	0.232		
Regression_VW_FF3_Extended-Period 2013-01 - 2022-12								
const	0.2896	0.162	1.785	0.077	-0.032	0.611	0.228	0.504
Mkt-RF	-0.0294	0.037	-0.789	0.432	-0.103	0.044		
SMB	-0.3417	0.064	-5.319	0.000	-0.469	-0.214		
HML	-0.0143	0.045	-0.318	0.751	-0.103	0.075		

THANK YOU