The Stock Return's Drivers:

Reasons and Emotions

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Motivations & Contributions

- The Intelligent Investor: Graham (1949)

- Principle: Life and Work: Dalio (2017)

- **Fundamental**
  - Fama and French (1993, 1995, 1996, 2015, 2018),
    Carhart (1997), Asness, Moskowitz, and Pedersen (2013),
    Hou, Xue, and Zhang (2015)

- **Behavioral**
  - De Bondt and Thaler (1985), Barberis, Shleifer, and Vishny (1998),
    Daniel, Hirshleifer, and Subrahmanyam (2001),
    Baker and Wurgler (2007),
    Bijl, et al. (2016), Irresberger, Konig, and Weib (2016)

- Not a lot of studies on rational and irrational factors simultaneously

Contributions

1) **Investor/Trader/Fund Manager**
   Long: too much pessimism
   Short: too much optimism
   Wait for the swings of pessimism/optimism

2) **Manager**
   Capital Budgeting: WACC

3) **Regulator/Stock Exchange**
   - Limit downside risk during pessimism period
   - Construct circuit breaker accordingly
   - Regulate the stock market better by including irrational factors

Questions

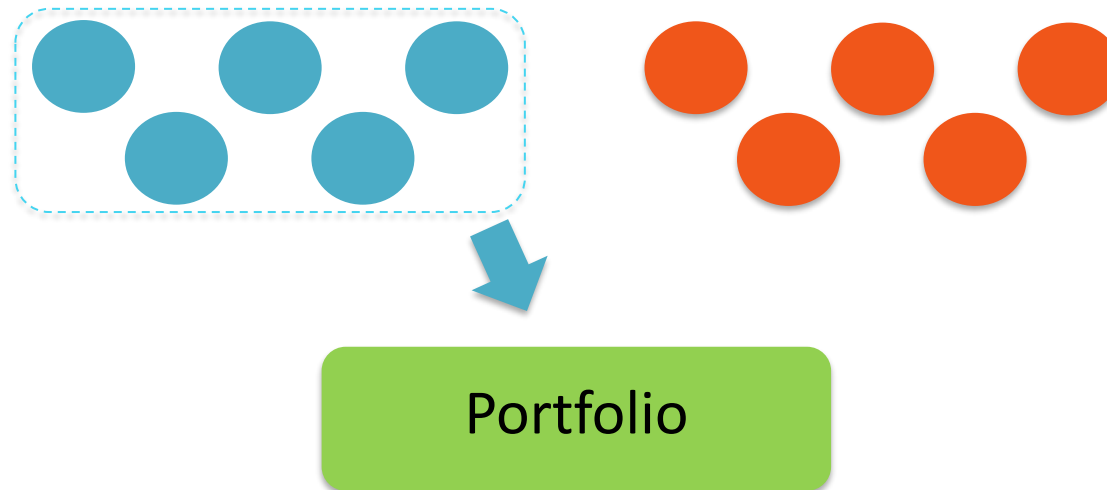- Do **the rational and irrational factors** explain the value and momentum portfolios?

    Yes! The rational and irrational factors **simultaneously** explain with different **weights,** depending on **investment styles** or even **investment periods**.

- Do the explanations change during **the financial crises**?

    Yes! During a financial crisis, we find **a significantly increased importance of the irrational factors**.

Methodology 1: Multiple Linear Regression
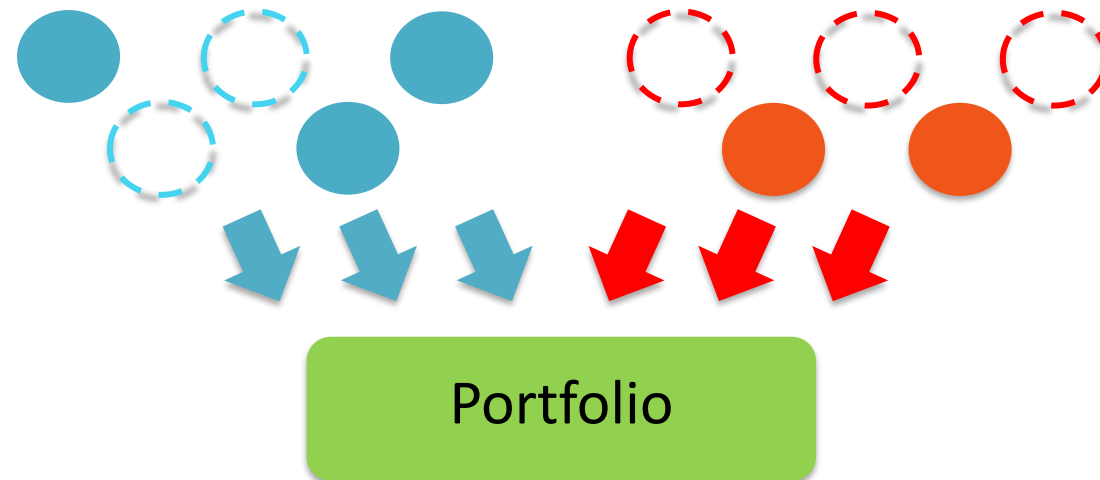
- Separately consider groups of rational and irrational factors

- Use R^2 to measure the explanatory power of rational or irrational factors

Methodology 2: Stepwise Linear Regression

- **Simultaneously** considering the rational and irrational factors

- Use adjusted R^2 to measure the explanatory power of the combination of rationalities and irrationalities

Portfolio

Two kinds of portfolios

I) Kenneth R. French's website

- Portfolios constructed on Value and Momentum

- Value portfolios formed on book-to-market ratio, and momentum portfolios formed on prior returns

II) Selective ETF portfolios in the US

- Four groups using Morningstar style boxes; 2007-2019

  - Large cap-value
  - Small cap-value
  - Large cap-growth
  - Small cap-growth

Summary of the Variables

	Period	Source
Conceptual Portfolios (Value and Momentum)	2004-2019	Kenneth R. French's Website
ETF Portfolios*	2007-2019	Yahoo! Finance
Fama-French 5 Factors	2004-2019	Kenneth R. French's Website
Google Search Volume Index (GSVI)	2004-2019	Google Trends
Trading Index (TRIN)	2004-2019	Yahoo! Finance
Volatility Index (VIX)	2004-2019	Yahoo! Finance
AAII Investor Sentiment	2004-2019	The American Association of Individual Investors
Trading Volume in NYSE	2004-2019	Yahoo! Finance

Value and Momentum

Table 1a. The results from the multiple regression model on each portfolio, with their *rational factors* during the period of 2004-2019

Portfolio	Intercept	Rational Factors					R²	Adjusted R²
		RPM	SMB	HML	RMW	CMA		
V01	-0.616500	0.8047***	0.040630	-0.67254**	-0.447630	-0.591190	0.2890	0.2699
(t-value)	-1.284	5.934	0.182	-3.065	-1.332	-1.566		
V10	0.527700	0.461100	1.7905***	0.456900	0.168500	-0.521600	0.1243	0.1008
(t-value)	0.462	1.431	3.370	0.876	0.211	-0.581		
M01	3.478400	-0.179200	4.3502*	0.417600	-0.209900	-1.933600	0.0455	0.0198
(t-value)	0.940	-0.171	2.524	0.247	-0.081	-0.664		
M10	0.395800	0.7483***	-0.111100	-0.375100	-0.333500	-0.767600	0.1461	0.1231
(t-value)	0.604	4.042	-0.364	-1.252	-0.727	-1.489		

Table 1b. The results from the multiple regression model on each portfolio, with their *irrational factors* during the period of 2004-2019

Portfolio	Intercept	Irrational Factors					R²	Adjusted R²
		GSVI	TRIN	VIX	AAII	VOL		
V01	0.233810	-0.020970	0.266820	-9.53592***	0.035170	-8.66809*	0.1687	0.1463
(t-value)	0.451	-0.168	0.402	-4.010	0.537	-2.468		
V10	1.297143	-0.009453	-0.513825	-13.026341*	0.109026	5.539227	0.0358	0.0099
(t-value)	1.084	-0.033	-0.336	-2.375	0.722	0.684		
M01	3.808300	-0.301200	-0.996400	-12.028700	-0.177000	22.963700	0.0072	-0.0195
(t-value)	1.009	-0.332	-0.207	-0.696	-0.372	0.899		
M10	1.250680	-0.043110	-0.276880	-10.76969***	0.011200	-3.711470	0.0875	0.0630
(t-value)	1.846	-0.265	-0.320	-3.470	0.131	-0.810		

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Value and Momentum

Table 1c. The results from the stepwise regression model on each portfolio, with their *rational factors and irrational factors* during the period of 2004-2019

Portfolio	Intercept	Rational Factors					Irrational Factors					R²	Adjusted R²
		RPM	SMB	HML	RMW	CMA	GSVI	TRIN	VIX	AAII	VOL		
V01	-0.405800	0.7169***		-0.5952**	-0.509300	-0.576000					-7.3706*	0.3106	0.2921
(t-value)	-0.845	5.321		-2.759	-1.596	-1.549					-2.421		
V10	0.521500	0.507500	1.814000									0.1203	0.1110
(t-value)	0.478	1.728	3.632***										
M01	3.321000		4.296**									0.0431	0.0381
(t-value)	0.958		2.926										
M10	0.338900	0.7132***				-1.1064*						0.1356	0.1264
(t-value)	0.540	4.617				-2.540							

ETFs

Table 2a. The results from the multiple regression model on each ETF portfolio in the US, with their *rational factors* during the period of 2007-2019

Portfolio	Intercept	Rational Factors					R²	Adjusted R²
		RPM	SMB	HML	RMW	CMA		
Large/Value	-0.0022454**	0.0092189***	-0.0014318***	0.0020259***	0.0012642*	0.0018342**	0.9591	0.9578
(t-value)	-3.138	49.677	-4.404	6.162	2.518	3.169		
Small/Value	0.597390	-0.010150	-0.370620	0.104540	-0.021400	-0.163490	0.0184	-0.0146
(t-value)	1.089	-0.071	-1.487	0.415	-0.056	-0.368		
Large/Growth	0.000581	0.010524***	-0.000112	-0.0025443***	0.000184	-0.0022022***	0.9672	0.9661
(t-value)	0.808	56.428	-0.344	-7.700	0.364	-3.786		
Small/Growth	-0.000128	0.009905***	0.008545***	-0.00163***	-0.000025	-0.002214***	0.9766	0.9758
(t-value)	-0.178	52.996	26.100	-4.922	-0.049	-3.799		

Table 2b. The results from the multiple regression model on each ETF portfolio in the US, with their *irrational factors* during the period of 2007-2019

Portfolio	Intercept	Irrational Factors					R²	Adjusted R²
		GSVI	TRIN	VIX	AAII	VOL		
Large/Value	0.0074155**	0.000556	-0.003421	-0.1079181***	0.000402	0.009256	0.4394	0.4206
(t-value)	2.801	0.858	-1.093	-9.504	1.320	0.539		
Small/Value	0.248920	0.180340	0.303280	2.847510	0.015040	1.775790	0.0248	-0.0080
(t-value)	0.456	1.347	0.469	1.215	0.239	0.501		
Large/Growth	0.0128401***	0.000669	-0.004014	-0.1204267***	0.000505	-0.010752	0.4774	0.4599
(t-value)	4.475	0.952	-1.183	-9.787	1.527	-0.578		
Small/Growth	0.0107619**	0.0021235*	-0.005580	-0.1348013***	0.000768	0.012560	0.4434	0.4247
(t-value)	3.064	2.468	-1.344	-8.950	1.899	0.551		

Reasons

Emotions

ETFs

Table 2c. The results from the stepwise regression model on each ETF portfolio in the US, with their *rational factors and irrational factors* during the period of 2007-2019

Portfolio	Intercept	Rational Factors					Irrational Factors					R^2	Adjusted R^2
		RPM	SMB	HML	RMW	CMA	GSVI	TRIN	VIX	AAII	VOL		
Large/Value	-0.0024182**	0.0093069***	-0.0014768***	0.0019504***	0.0012511*	0.0018567**					0.006617	0.9597	0.9581
(t-value)	-3.349	47.949	-4.541	5.885	2.501	3.220					1.485		
Small/Value	0.374400		-0.4541*				0.215500					0.0333	0.0206
(t-value)	0.721		-2.040				1.605						
Large/Growth	0.000179	0.0109613***		-0.0028714***		-0.0019102**	-0.000246		0.0096667*			0.9689	0.9679
(t-value)	0.241	44.841		-8.556		-3.344	-1.438		2.410				
Small/Growth	0.000112	0.009951***	0.0087018***	-0.0016730***		-0.0021636***	-0.000342					0.9772	0.9764
(t-value)	0.159	55.526	26.920	-5.127		-3.778	-1.913						

The US Subprime Mortgage Crisis (2007-2009)

The European Debt Crisis (2011-2013)

Value and Momentum

Table 3a. The anomaly of the market sentiment of the Value and Momentum portfolios in the US subprime mortgage crisis (2007-2009) comparing to the overall period (2004-2019)

Portfolio	Methodology	2004-2019 Adjusted R^2	2007-2009 Adjusted R^2	Compare with 2004-2019 (%)
V01	Reg. Rationality	0.2699	0.0573	-78.77%
	Reg. Irrationality	0.1463	0.0917	-37.29%
	Stepwise Reg.	0.2921	0.2038	-30.23%
V10	Reg. Rationality	0.1008	0.2750	172.82%
	Reg. Irrationality	0.0099	0.1252	1163.12%
	Stepwise Reg.	0.1110	0.3595	223.87%
M01	Reg. Rationality	0.0198	0.2312	1067.68%
	Reg. Irrationality	-0.0195	0.2211	1232.68%
	Stepwise Reg.	0.0381	0.3156	728.78%
M10	Reg. Rationality	0.1231	0.2028	64.74%
	Reg. Irrationality	0.1231	-0.0294	-123.87%
	Stepwise Reg.	0.1264	0.2279	80.30%

Table 3b. The anomaly of the market sentiment of the Value and Momentum portfolios in the European debt crisis (2011-2013) comparing to the overall period (2004-2019)

Portfolio	Methodology	2004-2019 Adjusted R^2	2011-2013 Adjusted R^2	Compare with 2004-2019 (%)
V01	Reg. Rationality	0.2699	0.3934	45.76%
	Reg. Irrationality	0.1463	0.1610	10.05%
	Stepwise Reg.	0.2921	0.5330	82.47%
V10	Reg. Rationality	0.1008	0.0947	-6.07%
	Reg. Irrationality	0.0099	-0.0963	-1071.95%
	Stepwise Reg.	0.1110	0.1757	58.29%
M01	Reg. Rationality	0.0198	0.0376	89.70%
	Reg. Irrationality	-0.0195	-0.0837	-328.53%
	Stepwise Reg.	0.0381	0.1023	168.64%
M10	Reg. Rationality	0.1231	0.0961	-21.96%
	Reg. Irrationality	0.1231	-0.0728	-159.16%
	Stepwise Reg.	0.1264	0.1526	20.73%

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	Stepwise Reg.	0.2921	0.2038	-30.23%
V10				
	Stepwise Reg.	0.1110	0.3595	223.87%
M01				
	Stepwise Reg.	0.0381	0.3156	728.78%
M10				
	Stepwise Reg.	0.1264	0.2279	80.30%

Table 3b. The anomaly of the market sentiment of the Value and Momentum portfolios in the European debt crisis (2011-2013) comparing to the overall period (2004-2019)

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The US Subprime Mortgage Crisis (2007-2009)   ETFs   The European Debt Crisis (2011-2013)

Table 4a. The anomaly of the market sentiment of the ETF portfolios in the US subprime mortgage crisis (2007-2009) comparing to the overall period (2007-2019)

Portfolio	Methodology	2007-2019 Adjusted R^2	2007-2009 Adjusted R^2	Compare with 2007-2019 (%)
Large/Value	Reg. Rationality	0.9578	0.9656	0.81%
	Reg. Irrationality	0.4206	0.2740	-34.85%
	Stepwise Reg.	0.9581	0.9657	0.79%
Small/Value	Reg. Rationality	-0.0146	0.9300	6482.98%
	Reg. Irrationality	-0.0080	0.2142	2793.32%
	Stepwise Reg.	0.0206	0.9370	4448.54%
Large/Growth	Reg. Rationality	0.9661	0.9773	1.16%
	Reg. Irrationality	0.4599	0.4550	-1.07%
	Stepwise Reg.	0.9679	0.9814	1.39%
Small/Growth	Reg. Rationality	0.9758	0.9837	0.81%
	Reg. Irrationality	0.4247	0.3640	-14.29%
	Stepwise Reg.	0.9764	0.9842	0.80%

Table 4b. The anomaly of the market sentiment of the ETF portfolios in the European debt crisis (2011-2013) comparing to the overall period (2007-2019)

Portfolio	Methodology	2007-2019 Adjusted R^2	2011-2013 Adjusted R^2	Compare with 2007-2019 (%)
Large/Value	Reg. Rationality	0.9578	0.9533	-0.47%
	Reg. Irrationality	0.4206	0.6502	54.59%
	Stepwise Reg.	0.9581	0.9545	-0.38%
Small/Value	Reg. Rationality	-0.0146	0.8449	5898.90%
	Reg. Irrationality	-0.0080	0.7474	9497.71%
	Stepwise Reg.	0.0206	0.8877	4209.22%
Large/Growth	Reg. Rationality	0.9661	0.9720	0.61%
	Reg. Irrationality	0.4599	0.5564	20.98%
	Stepwise Reg.	0.9679	0.9739	0.62%
Small/Growth	Reg. Rationality	0.9758	0.9748	-0.10%
	Reg. Irrationality	0.4247	0.6063	42.76%
	Stepwise Reg.	0.9764	0.9770	0.06%

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Large/Growth				
	Stepwise Reg.	0.9679	0.9739	0.62%
Small/Growth				
	Stepwise Reg.	0.9764	0.9770	0.06%

Conclusions and Discussions

- The rational and irrational factors simultaneously explain portfolios' returns, depending on investor's perspectives, investment styles, and investment periods

- The rational factors always explain volatilities of portfolios' returns greater than irrational factors

- During the European debt crisis, the results indicate a remarkable increase in the importance of the irrational factors, especially on the ETF portfolios

Thank you!