

Fundamental Signals Strategy

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Recap

Fundamental Signal Persistence

	(1) Sharpe Ratio	(2) β	(3) β^-	(4) <i>Skewness</i>	(5) Proba ($r_t < -2\sigma$)	(6) Signal Persistence
Market - short rate	.47	1	1	-.13	.031	.
Low vol	.43	-.015	0	-.06	.032	.99
Book to Market	.2	.029	.11	.035	.025	.98
Repurchasers	.55	.01	.04	-.053	.019	.96
Momentum	.43	-.041	-.1	-.007	.025	.88
Industry Leaders	.48	-.016	-.14	.008	.029	.15
Accruals	.77	.014	-.027	.027	.018	.95
ROE	.55	-.025	-.033	.021	.01	.97
Cash-Flows	1.2	-.016	-.055	.06	.021	.97
ROA	.46	-.025	-.054	.08	.01	.99

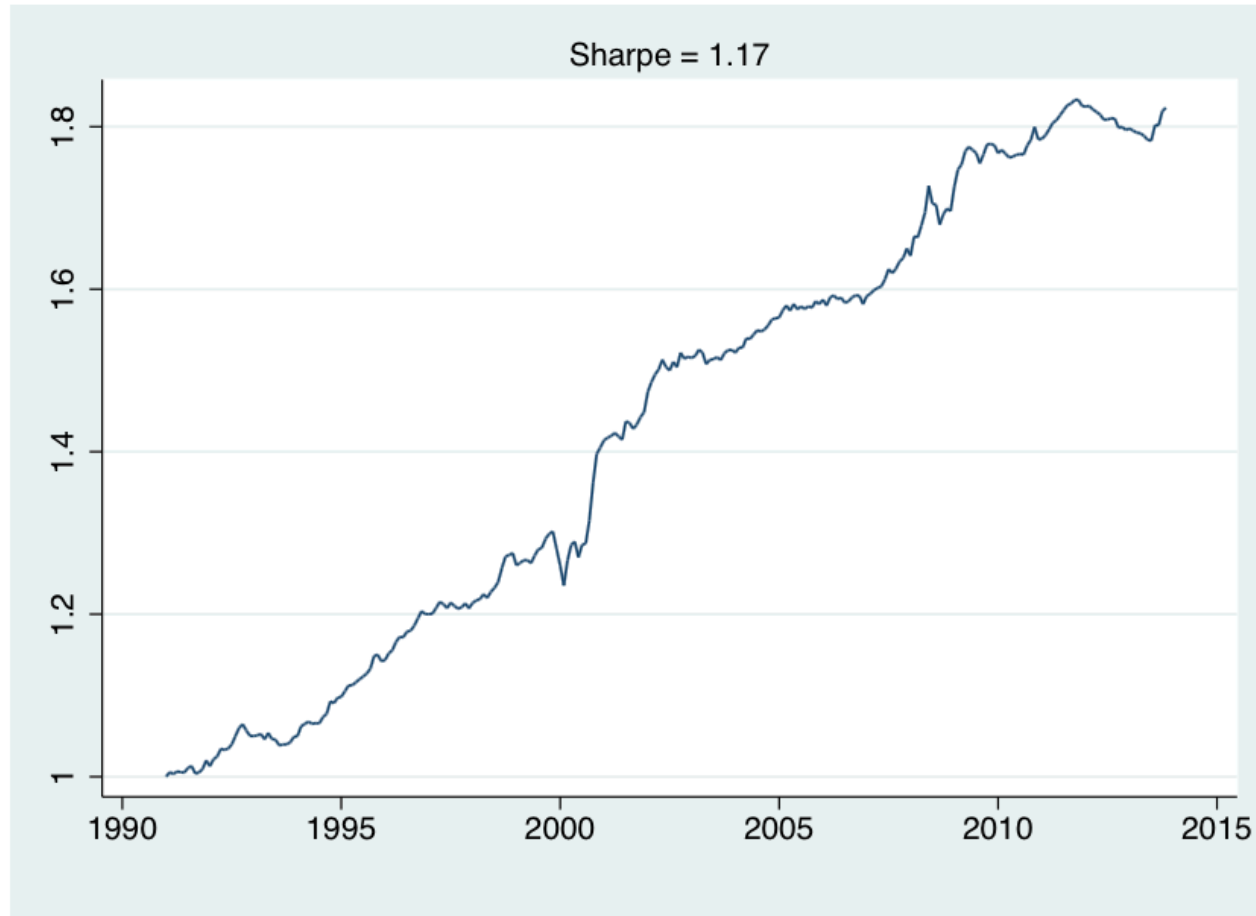
The Excess Returns of “Quality” Stocks: A Behavioral Anomaly
Bouchaud, Cilberti, Landier, Simon, Thesmar (2016)

The Fundamental Quality Anomaly

	Panel A: Long Sample (U.S. , 1956 - 2012)					Panel B: Broad Sample (Global , 1986 - 2012)				
	QMJ	Profitability	Safety	Growth	Payout	QMJ	Profitability	Safety	Growth	Payout
Excess Returns	0.40 (4.38)	0.27 (3.81)	0.23 (2.06)	0.12 (1.63)	0.31 (3.37)	0.38 (3.22)	0.34 (3.30)	0.19 (1.33)	0.02 (0.24)	0.38 (3.41)
CAPM-alpha	0.55 (7.27)	0.33 (4.78)	0.42 (4.76)	0.08 (1.06)	0.46 (6.10)	0.52 (5.75)	0.43 (4.61)	0.34 (3.07)	0.02 (0.18)	0.49 (5.29)
3-factor alpha	0.68 (11.10)	0.45 (7.82)	0.59 (8.68)	0.20 (3.32)	0.43 (6.86)	0.61 (7.68)	0.53 (6.11)	0.50 (5.40)	0.14 (1.92)	0.44 (5.17)
4-factor alpha	0.66 (10.20)	0.53 (8.71)	0.57 (7.97)	0.38 (6.13)	0.21 (3.43)	0.45 (5.50)	0.49 (5.34)	0.39 (4.00)	0.29 (3.91)	0.19 (2.26)
MKT	-0.25 (-17.02)	-0.11 (-8.08)	-0.34 (-20.77)	0.05 (3.35)	-0.20 (-14.47)	-0.24 (-14.36)	-0.16 (-8.33)	-0.28 (-13.74)	0.00 (-0.06)	-0.18 (-10.50)
SMB	-0.38 (-17.50)	-0.21 (-10.21)	-0.41 (-17.00)	-0.05 (-2.53)	-0.30 (-14.82)	-0.33 (-9.46)	-0.20 (-5.07)	-0.31 (-7.48)	-0.18 (-5.62)	-0.23 (-6.58)
HML	-0.12 (-5.03)	-0.28 (-12.16)	-0.23 (-8.50)	-0.44 (-18.81)	0.39 (16.68)	-0.01 (-0.31)	-0.16 (-3.95)	-0.22 (-5.23)	-0.38 (-11.62)	0.36 (9.89)
UMD	0.02 (0.82)	-0.07 (-3.80)	0.01 (0.64)	-0.17 (-8.55)	0.21 (10.79)	0.15 (5.54)	0.03 (1.01)	0.10 (3.07)	-0.14 (-5.64)	0.24 (8.57)
Sharpe Ratio	0.58	0.51	0.27	0.22	0.45	0.62	0.63	0.26	0.05	0.66
Information Ratio	1.46	1.25	1.14	0.88	0.49	1.16	1.13	0.84	0.83	0.48
Adjusted R2	0.57	0.37	0.63	0.40	0.60	0.60	0.34	0.58	0.35	0.52

Quality Minus Junk
Asness, Frazzini, Pedersen (2013)

Figure 1: Cumulative Return of a Quality Anomaly



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Defining “Quality”

$$Quality = z(Profitability + Growth + Safety + Payout)$$

Profitability/ Growth	Safety	Payout
GPOA	BAB	EISS
ROE	IVOL	DISS
ROA	LEV	NPOP
CFOA	O-Score	
GMAR	Z-Score	
ACC	EVOL	

Quantitative Warren Buffet: Quality at a Reasonable Price (QARP)

- As one would expect, the outperformance of quality is inversely related to the premium paid for said companies
- Accordingly, the historical outperformance of fundamentally quality stocks varies over time depending on the “quality premium”
- Sharpe ratios of 0.7 and 0.9 for the US and Global stock universes were achieved using a basic QARP that used book-to-market as the value indicator

Enhancing QARP

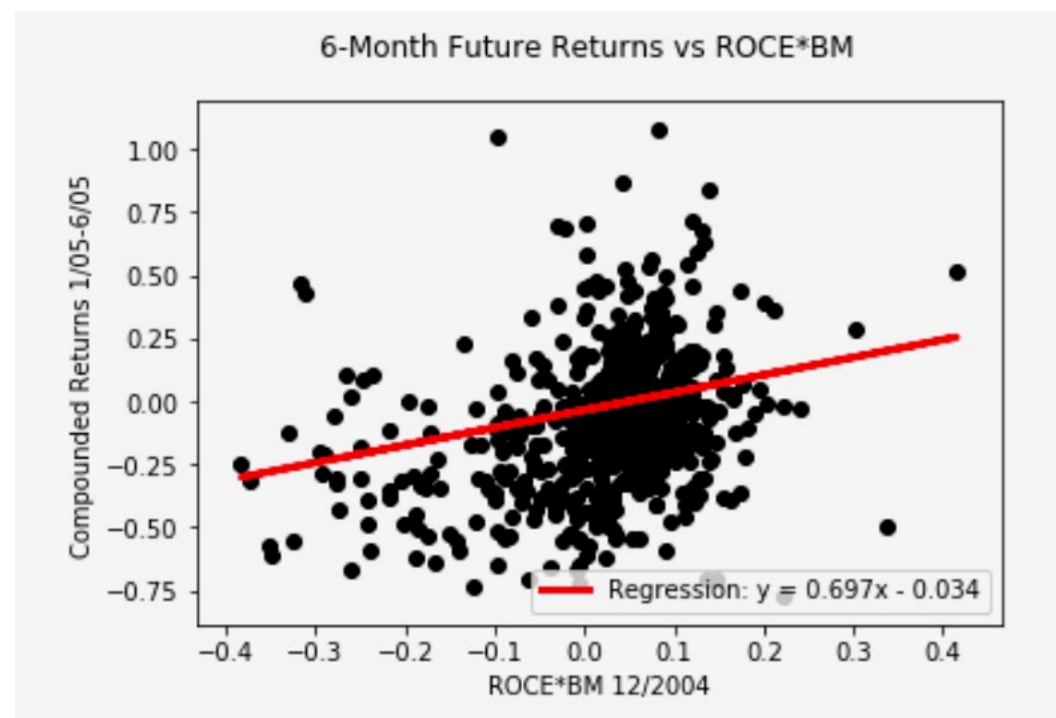
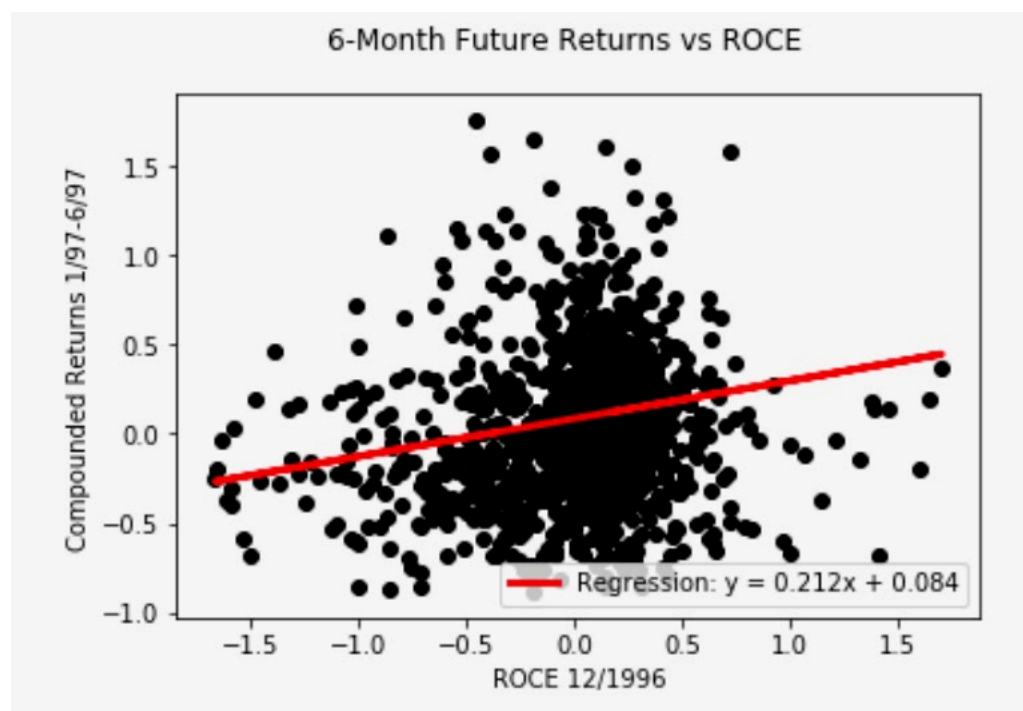
- Defining value and incorporating it into the overall signal
- Finding the ideal weightings between all variables
- Deciding linear or nonlinear combinations (e.g. quality + value vs. quality*value)
- Deciding which categories to focus on

Data and Research

Data Preparation

- Merging Initial Datasets
 - PERMNOs
- Data Cleaning
 - Remove Missing Values
 - Find and Remove extreme data points
- Preprocessing
 - Creating 3-month, 6-month, and 1-year future returns
 - Standardization

The Quality Anomaly Illustrated



Research on Individual Fundamentals

- From our Wharton research database, we selected 40 of 70 fundamentals with the potential to indicate one of the four categories of quality
- Using standard assumptions we ran two single linear regressions on each z-scored fundamental versus z-scored future return (3-month and 6-month) for all US stocks
- Filtering for p-values under 0.05, we ranked signal strength for each fundamental by the magnitude of its coefficient and then selected the top 12 fundamentals appearing in both return windows

3-month_ret

```
---- roa ----
Coefficient: /n 0.06107589945194121
p-value: /n 0.0
r2: /n 0.0037302654938636283
---- ocf_lct ----
Coefficient: /n 0.06040861674481992
p-value: /n 0.0
r2: /n 0.0036492009770225393
---- roe ----
Coefficient: /n 0.06034728289235338
p-value: /n 0.0
r2: /n 0.003641794552489727
---- cash_debt ----
Coefficient: /n 0.04891110088785186
p-value: /n 1.191019077663599e-297
r2: /n 0.002392295790061625
---- roce ----
Coefficient: /n 0.04383086461667993
p-value: /n 3.783734717784843e-242
r2: /n 0.001921144693045723
---- ps ----
Coefficient: /n -0.04321043338331969
p-value: /n 4.177417783877513e-234
r2: /n 0.0018671415531743055
---- roe ----
Coefficient: /n 0.04104724503176234
p-value: /n 1.5402482215652414e-207
r2: /n 0.0016848763246975374
---- bm ----
Coefficient: /n 0.03521852212373669
p-value: /n 3.019836185825817e-154
r2: /n 0.0012403443005801341
---- GProf ----
Coefficient: /n 0.029139526852746143
p-value: /n 3.1611923083910485e-109
r2: /n 0.0008491120252019147
---- cash_lt ----
Coefficient: /n -0.023919730971725443
p-value: /n 3.705035884046135e-74
r2: /n 0.0005721535297597211
---- rect_act ----
Coefficient: /n 0.0224087009511717
p-value: /n 4.7141880482080975e-55
r2: /n 0.0005021498783190427
---- cfm ----
Coefficient: /n 0.0209386574175141
p-value: /n 1.7052171848729248e-56
r2: /n 0.00043842737444801895
---- npm ----
Coefficient: /n 0.020396839450069388
p-value: /n 4.320057028773824e-54
r2: /n 0.0004160310595519052
---- quick_ratio ----
Coefficient: /n -0.01968701599174346
p-value: /n 6.062331802503726e-43
r2: /n 0.00038757859865916236
---- opmad ----
Coefficient: /n 0.019303275543765385
p-value: /n 1.262879385888264e-48
r2: /n 0.0003726164467185299
---- opmbd ----
Coefficient: /n 0.019157447726316716
p-value: /n 6.397796988724069e-48
r2: /n 0.0003670078033865566
```

6_month_ret

```
---- roa ----
Coefficient: /n 0.07608533160136624
p-value: /n 0.0
r2: /n 0.00578897768488986
---- ocf_lct ----
Coefficient: /n 0.07518700043081517
p-value: /n 0.0
r2: /n 0.005653085033783397
---- roe ----
Coefficient: /n 0.07167661067100652
p-value: /n 0.0
r2: /n 0.005137536517283053
---- cash_debt ----
Coefficient: /n 0.059346288319372074
p-value: /n 0.0
r2: /n 0.0035219819372860417
---- bm ----
Coefficient: /n 0.05630492509935517
p-value: /n 0.0
r2: /n 0.003170244590443999
---- ps ----
Coefficient: /n -0.05553319230373514
p-value: /n 0.0
r2: /n 0.003083935447443624
---- roce ----
Coefficient: /n 0.04704847747895677
p-value: /n 1.3917472308593605e-278
r2: /n 0.0022135592330879035
---- roe ----
Coefficient: /n 0.042899419904306
p-value: /n 2.145895757884988e-226
r2: /n 0.0018403602281259724
---- cash_lt ----
Coefficient: /n -0.03603221872125644
p-value: /n 8.772901225353591e-166
r2: /n 0.0012983207859764631
---- quick_ratio ----
Coefficient: /n -0.031061880720905436
p-value: /n 3.826351305724154e-104
r2: /n 0.000964840433919757
---- GProf ----
Coefficient: /n 0.03100606874826707
p-value: /n 2.3431626571739368e-123
r2: /n 0.000961376299222639
---- rect_act ----
Coefficient: /n 0.03063337770423184
p-value: /n 3.180630569309106e-101
r2: /n 0.0009384038295701275
---- debt_assets ----
Coefficient: /n 0.028155323934686654
p-value: /n 3.1539055531764654e-102
r2: /n 0.0007927222658671413
---- curr_ratio ----
Coefficient: /n -0.026604203543925738
p-value: /n 6.817747800582344e-77
r2: /n 0.0007077836462066297
---- pretret_noa ----
Coefficient: /n 0.0264272227406736
p-value: /n 2.0698021061526831e-75
r2: /n 0.000698398101785174
---- npm ----
Coefficient: /n 0.026274752959098743
p-value: /n 1.65928647826224e-88
r2: /n 0.00069036264306167
```

Building Our Model

Training LASSO

- Cross-validated training and validation sets
- Fine tuning hyper parameters
- 4 different variations
- Extracting final models

Our QARP Signal

	Predictor	Signal Magnitude
Value	Book / Market	0.042330506
	Price / Sales	0.015901132
Safety	Receivables / Current Assets	0.000481912
	Operating CF/ Current Liabilities	0.041922074
	Cash Flow / Total Debt	0.013048011
	Cash Balance / Total Liabilities	0.018602827
	Quick Ratio	0.012558456
Profitability	Return on Assets	0.008317245
	Return on Capital Employed	0.009377227
	Return on Equity	0.021725955
	Gross Profit / Total Assets	0.006045664
	Net Profit Margin	0.01141551

- Each coefficient is standardized, as well as the overall signal
- Weights are assigned based on their coefficients in the Lasso Regression

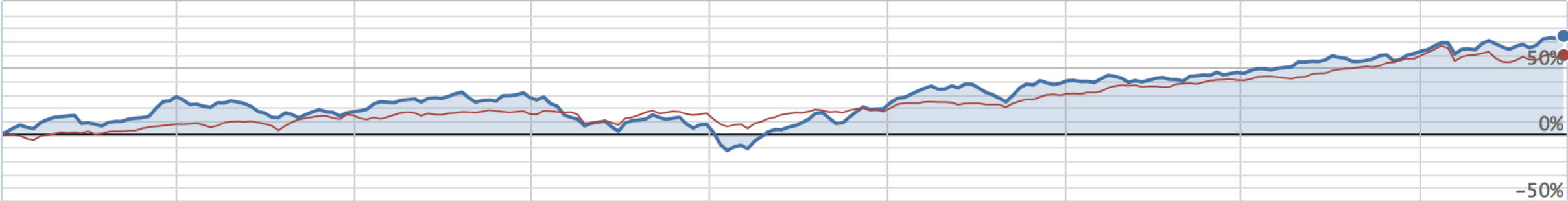
Portfolio Performance and Next Steps

Backtesting Results

RETURNS	ALPHA	BETA	SHARPE	DRAWDOWN
73.94%	0.03	1.01	0.76	-35.43%

■ Algorithm 73.99% ■ Benchmark (SPY) 59.63%

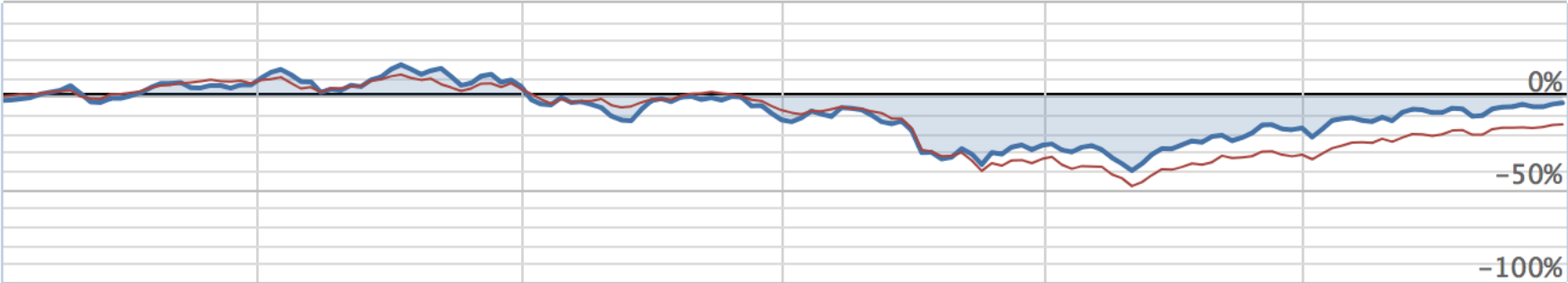
2013 - Present



RETURNS	ALPHA	BETA	SHARPE	DRAWDOWN
-4.04%	0.05	0.96	0.11	-50.58%

■ Algorithm -0.89% ■ Benchmark (SPY) 2.28%

2007 - 2010



Backtesting Results

- Portfolio constructed via Markowitz optimization, maximizing the QARP signal
- From 2013 to the present, we achieved a Sharpe ratio of **0.76**
- Constraints:
 - Maximum level of historical volatility equal to that of SPY
 - Long US equities only
 - No equity over 2.5% of portfolio
 - No leverage

Ideas for Expansion

- Using volatility correlation in MPT to calculate portfolio risk, rather than average variance
- We searched for the most persistent quality and value signal, but “nothing lasts forever”
 - A dynamic research process could enhance performance by discovering more transient signals as the market mutates over time
- Data mining more fundamentals and applying White’s data snooping “reality check” when evaluating p-values
- Performing data transformations to improve the assumptions of linear regression