

EMPIRICAL ASSET PRICING

The Cross Section of Stock Returns

TURAN G. BALI

ROBERT F. ENGLE

SCOTT MURRAY

WILEY

CONTENTS

PREFACE

PART I STATISTICAL METHODOLOGIES

1 Preliminaries

- 1.1 Sample, 3
- 1.2 Winsorization and Truncation, 5
- 1.3 Newey and West (1987) Adjustment, 6
- 1.4 Summary, 8
 - References, 8

2 Summary Statistics

- 2.1 Implementation, 10
 - 2.1.1 Periodic Cross-Sectional Summary Statistics, 10
 - 2.1.2 Average Cross-Sectional Summary Statistics, 12
- 2.2 Presentation and Interpretation, 12
- 2.3 Summary, 16

3 Correlation

- 3.1 Implementation, 18
 - 3.1.1 Periodic Cross-Sectional Correlations, 18
 - 3.1.2 Average Cross-Sectional Correlations, 19

- 3.2 Interpreting Correlations, 20
- 3.3 Presenting Correlations, 23
- 3.4 Summary, 24
 - References, 24

Persistence Analysis

- 4.1 Implementation, 26
 - 4.1.1 Periodic Cross-Sectional Persistence, 26
 - 4.1.2 Average Cross-Sectional Persistence, 28
- 4.2 Interpreting Persistence, 28
- 4.3 Presenting Persistence, 31
- 4.4 Summary, 32
 - References, 32

Portfolio Analysis

- 5.1 Univariate Portfolio Analysis, 34
 - 5.1.1 Breakpoints, 34
 - 5.1.2 Portfolio Formation, 37
 - 5.1.3 Average Portfolio Values, 39
 - 5.1.4 Summarizing the Results, 41
 - 5.1.5 Interpreting the Results, 43
 - 5.1.6 Presenting the Results, 45
 - 5.1.7 Analyzing Returns, 47
- 5.2 Bivariate Independent-Sort Analysis, 52
 - 5.2.1 Breakpoints, 52
 - 5.2.2 Portfolio Formation, 54
 - 5.2.3 Average Portfolio Values, 57
 - 5.2.4 Summarizing the Results, 60
 - 5.2.5 Interpreting the Results, 64
 - 5.2.6 Presenting the Results, 66
- 5.3 Bivariate Dependent-Sort Analysis, 71
 - 5.3.1 Breakpoints, 71
 - 5.3.2 Portfolio Formation, 74
 - 5.3.3 Average Portfolio Values, 76
 - 5.3.4 Summarizing the Results, 80
 - 5.3.5 Interpreting the Results, 80
 - 5.3.6 Presenting the Results, 81
- 5.4 Independent Versus Dependent Sort, 85
- 5.5 Trivariate-Sort Analysis, 87
- 5.6 Summary, 87
 - References, 88

6	Fama and Macbeth Regression Analysis	89
6.1	Implementation, 90	
6.1.1	Periodic Cross-Sectional Regressions, 90	
6.1.2	Average Cross-Sectional Regression Results, 91	
6.2	Interpreting FM Regressions, 95	
6.3	Presenting FM Regressions, 98	
6.4	Summary, 99	
	References, 99	
PART II	THE CROSS SECTION OF STOCK RETURNS	101
7	The CRSP Sample and Market Factor	103
7.1	The U.S. Stock Market, 103	
7.1.1	The CRSP U.S.-Based Common Stock Sample, 104	
7.1.2	Composition of the CRSP Sample, 105	
7.2	Stock Returns and Excess Returns, 111	
7.2.1	CRSP Sample (1963-2012), 115	
7.3	The Market Factor, 115	
7.4	The CAPM Risk Model, 120	
7.5	Summary, 120	
	References, 121	
8	Beta	122
8.1	Estimating Beta, 123	
8.2	Summary Statistics, 126	
8.3	Correlations, 128	
8.4	Persistence, 129	
8.5	Beta and Stock Returns, 131	
8.5.1	Portfolio Analysis, 132	
8.5.2	Fama-MacBeth Regression Analysis, 140	
8.6	Summary, 143	
	References, 144	
9	The Size Effect	146
9.1	Calculating Market Capitalization, 147	
9.2	Summary Statistics, 150	
9.3	Correlations, 152	
9.4	Persistence, 154	
9.5	Size and Stock Returns, 155	
9.5.1	Univariate Portfolio Analysis, 155	

- 9.5.2 Bivariate Portfolio Analysis, 162
- 9.5.3 Fama-MacBeth Regression Analysis, 168
- 9.6 The Size Factor, 171
- 9.7 Summary, 173
- References, 174

10 The Value Premium 175

- 10.1 Calculating Book-to-Market Ratio, 177
- 10.2 Summary Statistics, 181
- 10.3 Correlations, 183
- 10.4 Persistence, 184
- 10.5 Book-to-Market Ratio and Stock Returns, 185
 - 10.5.1 Univariate Portfolio Analysis, 185
 - 10.5.2 Bivariate Portfolio Analysis, 190
 - 10.5.3 Fama-MacBeth Regression Analysis, 198
- 10.6 The Value Factor, 200
- 10.7 The Fama and French Three-Factor Model, 202
- 10.8 Summary, 203
- References, 203

11 The Momentum Effect 206

- 11.1 Measuring Momentum, 207
- 11.2 Summary Statistics, 208
- 11.3 Correlations, 210
- 11.4 Momentum and Stock Returns, 211
 - 11.4.1 Univariate Portfolio Analysis, 211
 - 11.4.2 Bivariate Portfolio Analysis, 220
 - 11.4.3 Fama-MacBeth Regression Analysis, 234
- 11.5 The Momentum Factor, 236
- 11.6 The Fama, French, and Carhart Four-Factor Model, 238
- 11.7 Summary, 239
- References, 239

12 Short-Term Reversal

- 12.1 Measuring Short-Term Reversal, 243
- 12.2 Summary Statistics, 243
- 12.3 Correlations, 243
- 12.4 Reversal and Stock Returns, 244
 - 12.4.1 Univariate Portfolio Analysis, 244
 - 12.4.2 Bivariate Portfolio Analyses, 249
- 12.5 Fama-MacBeth Regressions, 263

CONTENTS

- 12.6 The Reversal Factor, 268
- 12.7 Summary, 270
 - References, 271

13 Liquidity

- 13.1 Measuring Liquidity, 274
- 13.2 Summary Statistics, 276
- 13.3 Correlations, 277
- 13.4 Persistence, 280
- 13.5 Liquidity and Stock Returns, 281
 - 13.5.1 Univariate Portfolio Analysis, 281
 - 13.5.2 Bivariate Portfolio Analysis, 288
 - 13.5.3 Fama-MacBeth Regression Analysis, 300
- 13.6 Liquidity Factors, 308
 - 13.6.1 Stock-Level Liquidity, 309
 - 13.6.2 Aggregate Liquidity, 310
 - 13.6.3 Liquidity Innovations, 312
 - 13.6.4 Traded Liquidity Factor, 312
- 13.7 Summary, 316
 - References, 316

14 Skewness

- 14.1 Measuring Skewness, 321
- 14.2 Summary Statistics, 323
- 14.3 Correlations, 326
 - 14.3.1 Total Skewness, 326
 - 14.3.2 Co-Skewness, 329
 - 14.3.3 Idiosyncratic Skewness, 330
 - 14.3.4 Total Skewness, Co-Skewness, and Idiosyncratic Skewness, 331
 - 14.3.5 Skewness and Other Variables, 333
- 14.4 Persistence, 336
 - 14.4.1 Total Skewness, 336
 - 14.4.2 Co-Skewness, 338
 - 14.4.3 Idiosyncratic Skewness, 339
- 14.5 Skewness and Stock Returns, 341
 - 14.5.1 Univariate Portfolio Analysis, 341
 - 14.5.2 Fama-MacBeth Regressions, 350
- 14.6 Summary, 359
 - References, 360

15 Idiosyncratic Volatility

- 15.1 Measuring Total Volatility, 365
- 15.2 Measuring Idiosyncratic Volatility, 366
- 15.3 Summary Statistics, 367
- 15.4 Correlations, 370
- 15.5 Persistence, 380
- 15.6 Idiosyncratic Volatility and Stock Returns, 381
 - 15.6.1 Univariate Portfolio Analysis, 382
 - 15.6.2 Bivariate Portfolio Analysis, 389
 - 15.6.3 Fama-MacBeth Regression Analysis, 402
 - 15.6.4 Cumulative Returns of $IdioVol^{FF-XM}$ Portfolio, 407
- 15.7 Summary, 409
 - References, 410

16 Liquid Samples

- 16.1 Samples, 413
- 16.2 Summary Statistics, 414
- 16.3 Correlations, 418
 - 16.3.1 CRSP Sample and Price Sample, 418
 - 16.3.2 Price Sample and Size Sample, 420
- 16.4 Persistence, 421
- 16.5 Expected Stock Returns, 424
 - 16.5.1 Univariate Portfolio Analysis, 425
 - 16.5.2 Fama-MacBeth Regression Analysis, 435
- 16.6 Summary, 438
 - References, 439

17 Option-Implied Volatility

- 17.1 Options Sample, 443
- 17.2 Option-Based Variables, 444
 - 17.2.1 Predictive Variables, 444
 - 17.2.2 Option Returns, 447
 - 17.2.3 Additional Notes, 448
- 17.3 Summary Statistics, 449
- 17.4 Correlations, 451
- 17.5 Persistence, 453
- 17.6 Stock Returns, 455
 - 17.6.1 $IVolSpread$, $IVolSkew$, and $Vol^M - IVol$, 456
 - 17.6.2 $AIVolC$ and $AIVolP$, 460
- 17.7 Option Returns, 469
- 17.8 Summary, 474
 - References, 474

18 Other Stock Return Predictors

- 18.1 Asset Growth, 478
- 18.2 Investor Sentiment, 479
- 18.3 Investor Attention, 481
- 18.4 Differences of Opinion, 482
- 18.5 Profitability and Investment, 482
- 18.6 Lottery Demand, 483
- References, 484

INDEX