MFE 431: Statistical Arbitrage

Problem Set 3

Group Québec

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Problem1   Risk Model

The optimum shrinkage intensities (60×1) are defined as the weight placed on shrinkage target ($\bar{\sigma}I$). Therefore, we have

$$\text{Shrinkage Intensity} = 1 - \hat{\beta}$$

The shrinkage estimators and shrink intensities are stored as follows

	shrink ✕				covariance ✕	
	60x1 double				1x60 struct with 1 field	
	1	2		Fields	🔁	cov
1	0.0941			1	175x175 double	
2	0.0955			2	179x179 double	
3	0.0940			3	180x180 double	
4	0.1032			4	183x183 double	
5	0.0973			5	182x182 double	
6	0.0939			6	183x183 double	
7	0.0854			7	180x180 double	
8	0.0852			8	176x176 double	
9	0.0753			9	176x176 double	
10	0.0631			10	178x178 double	

The evolution of shrinkage intensity on each trading day is shown below
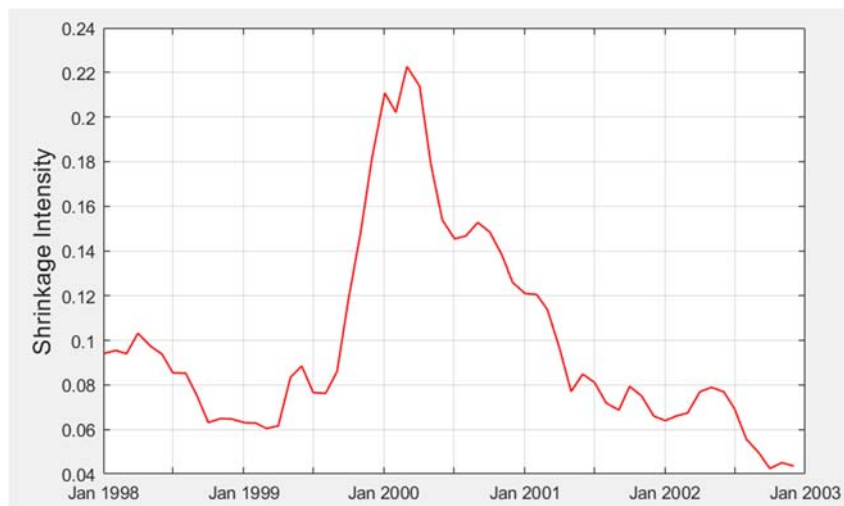
Problem2   Alphas

The alphas have been cross-sectionally demeaned, standardized and windsorized everyday before and after blending up.

$$\alpha = \sum_{i=1}^{4} w_i \alpha_i$$

where α_i represent short-term contrarian (mean-eversion alpha), short-term procyclical (analyst recommendation alpha), long-term contrarian (value) and long-term procyclical (momentum alpha).

Problem3   Beta Neutral

The "Europe_3_Factors_Daily.csv" is downloaded from Kenneth French Data Library online. The market return and risk-free rate data have been used to estimate market beta for each active stock on each trading day.

		Mkt-RF	SMB	HML	RF			
1	This file was created using the 201907 Bloomberg database.							
2								
3	Missing data are indicated by -99.99.							
4								
5								
6								
7		Mkt-RF	SMB	HML	RF			
8	19900702	0.99	0.05	-0.53	0.03			
9	19900703	0.33	-0.12	-0.03	0.03			
0	19900704	0.24	-0.01	-0.14	0.03			
1	19900705	-0.64	0.19	0.06	0.03			
2	19900706	0.08	-0.19	0.14	0.03			
3	19900709	0.49	0.03	-0.27	0.03			
4	19900710	0.01	0.36	-0.39	0.03			
5	19900711	-0.34	-0.49	-0.05	0.03			
6	19900712	0.61	-0.16	-0.02	0.03			
7	19900713	0.48	-0.61	0.03	0.03			
8	19900716	0.31	-0.21	-0.22	0.03			
9	19900717	0.55	0.15	0.26	0.03			
20	19900718	0.12	-0.08	-0.03	0.03			
21	19900719	-0.13	0.3	-0.19	0.03			
22	19900720	0.34	-0.1	0.11	0.03			
23	19900723	-0.07	0.66	-0.01	0.03			
24	19900724	-0.38	0	0.17	0.03			

Problem4   Optimization and Back Test

The first trading day starts on $t_0 = 246$. The optimization parameters controlling turnover and book size have been chosen as $\lambda = 0.001$ and $\mu = 0.1$.
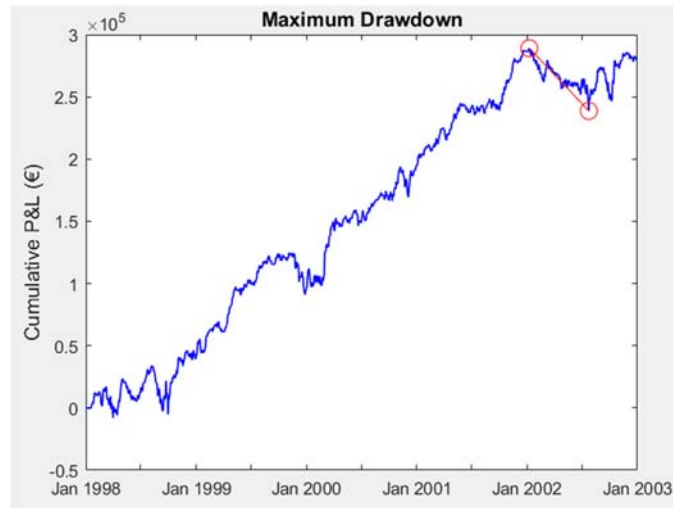
The annualized Sharpe Ratio is obtained as 1.44.