

Análise de Carteiras usando o R - Parte 7

Bibliografia – BKM, cap. 10

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Aplicando o APT

O APT

- Como vimos em sala, o APT é um modelo de arbitragem.
- Ou seja, não há muita coisa em termos de teoria implícita.
- O que vamos fazer aqui é simplesmente estimar os betas dos fatores e depois os prêmios de risco.

MKT

- The Market Factor is the difference between the value-weighted daily return of the market portfolio (using all the eligible stocks as defined in Section 2) and the daily risk-free rate. The daily risk-free rate is computed from the 30-day DI Swap.
- The Eligibility Criteria – A stock traded in BOVESPA is considered “eligible” for year t if it meets 3 criteria:
 - The stock is the most traded stock of the firm (the one with the highest traded volume during last year);
 - The stock was traded in more than 80% of the days in year $t-1$ with volume greater than R\$ 500.000,00 per day. In case the stock was listed in year $t-1$, the period considered goes from the listing day to the last day of the year;
 - The stock was initially listed prior to December of year $t-1$.

SMB

- The Small Minus Big Factor (SMB) is the return of a portfolio long on stocks with low market capitalization (small) and short on stocks with high market capitalization (big).
- Every January of year t , we (ascending) sort the eligible stocks according to their December of year $t-1$ market capitalization, and separate them into 3 quantiles.
- Then, we compute the equal-weighted returns of the first portfolio (small stocks) and the third portfolio (big stocks). The SMB Factor is the return of the small stocks portfolio minus the return of the big stocks portfolio.

WML

- The Winners Minus Losers Factor (WML) is the return of a portfolio long on stocks with high past returns and short on stocks with low past returns.
- Every month t , we (ascending) sort the eligible stocks into 3 quantiles (portfolios) according to their cumulative returns between month $t-12$ and $t-2$.
- Then we compute the equal-weighted returns of the first portfolio (low past returns, i.e., "losers") and the third portfolio (high past returns, i.e., "winners").
- The WML Factor is the return of the winners portfolio minus the return of the losers portfolio.

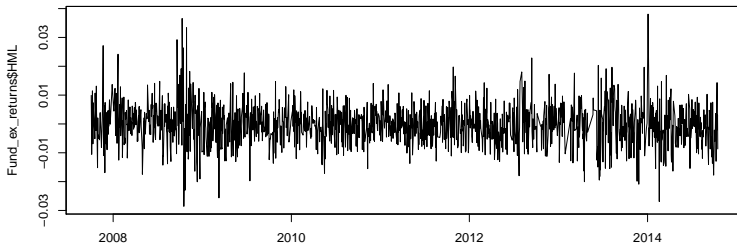
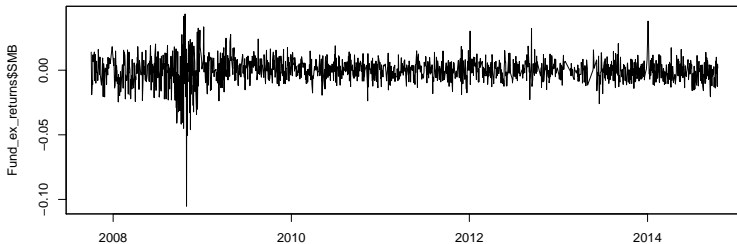
HML

- The High Minus Low Factor (HML) is the return of a portfolio long on stocks with high book-to-market ratio and short on stocks with low book-to-market ratio.
- Every January of year t , we (ascending) sort the eligible stocks into 3 quantiles (portfolios) according to the book-to-market ratio of the stocks in June of year $t-1$.
- Then, we compute the equal-weighted returns of the first portfolio (low book-to-market) and the third portfolio (high book-to-market). The HML Factor is the return of the high book-to-market stocks portfolio minus the return of the low book-to-market stocks portfolio.

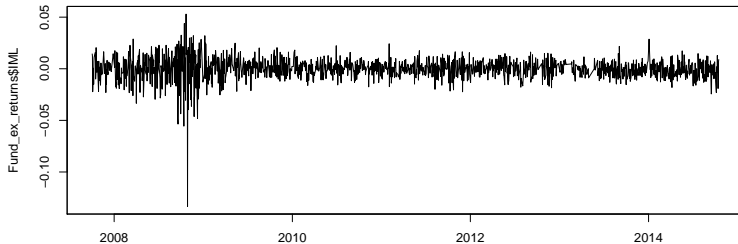
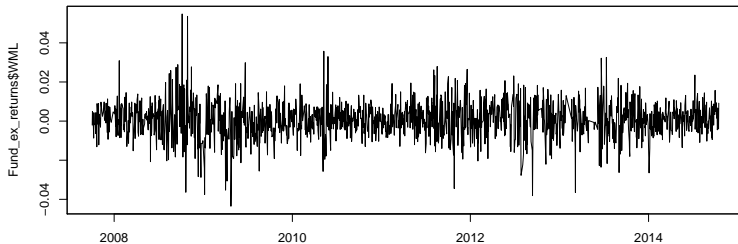
IML

- The Illiquid Minus Liquid Factor (IML) is the return of a portfolio long on liquid stocks (low) and short on illiquid stocks (high)
- Every month t , we (ascending) sort the eligible stocks into 3 quantiles (portfolios) according to their previous twelve month moving average of illiquidity, as in Amihud (2002).
- Then, we compute equal-weighted returns of the first portfolio (low illiquidity) and the third portfolio (high illiquidity). The IML Factor is the return of the liquid stocks portfolio minus the return of the illiquid stocks portfolio.

Visualizando os gráficos-SMB e HML



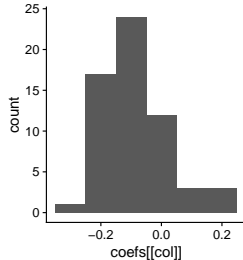
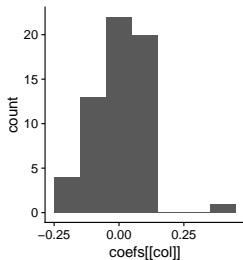
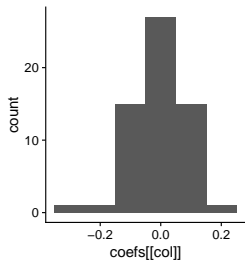
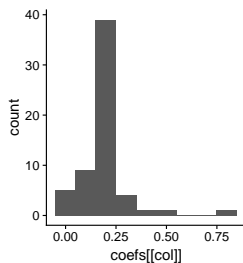
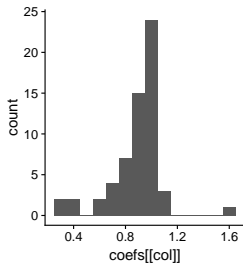
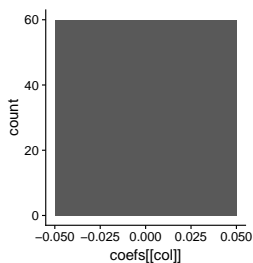
Visualizando os gráficos– WML e IML



Calculando o beta para um fundo – o 280

```
##
## Call:
## lm(formula = Fundo_280 ~ Rm_minus_Rf + SMB + WML + HML + IML,
##     data = Fund_ex_returns)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.037346 -0.005088 -0.000519  0.004684  0.068206
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0005207  0.0002271   2.293 0.021991 *
## Rm_minus_Rf  0.6889846  0.0192396  35.811 < 2e-16 ***
## SMB          0.1429056  0.0414543   3.447 0.000581 ***
## WML          0.0187619  0.0269671   0.696 0.486698
## HML         -0.0509708  0.0330801  -1.541 0.123558
## IML          0.0644765  0.0453268   1.422 0.155083
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.00905 on 1589 degrees of freedom
## Multiple R-squared:  0.5812, Adjusted R-squared:  0.5799
## F-statistic:  441 on 5 and 1589 DF,  p-value: < 2.2e-16
```

Calculando os betas



Estatísticas descritivas dos betas

##	(Intercept)	Rm_minus_Rf	SMB
##	Min. : -1.982e-03	Min. : 0.2600	Min. : -0.04751
##	1st Qu.: -2.161e-04	1st Qu.: 0.8263	1st Qu.: 0.15162
##	Median : -1.113e-04	Median : 0.9427	Median : 0.18578
##	Mean : -1.522e-04	Mean : 0.8897	Mean : 0.19531
##	3rd Qu.: -2.952e-05	3rd Qu.: 0.9877	3rd Qu.: 0.22192
##	Max. : 5.207e-04	Max. : 1.6363	Max. : 0.81552
##	WML	HML	IML
##	Min. : -0.3128700	Min. : -0.164618	Min. : -0.25681
##	1st Qu.: -0.0517064	1st Qu.: -0.051958	1st Qu.: -0.15999
##	Median : -0.0005494	Median : 0.004511	Median : -0.10705
##	Mean : -0.0067110	Mean : 0.007543	Mean : -0.08849
##	3rd Qu.: 0.0505182	3rd Qu.: 0.072168	3rd Qu.: -0.03571
##	Max. : 0.2030361	Max. : 0.381188	Max. : 0.19891

Estimando os prêmios de risco

```
##
## Call:
## lm(formula = E_pr ~ Rm_minus_Rf + SMB + HML + WML + IML, data = data_teste1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.775e-04 -6.941e-05  8.840e-06  9.929e-05  5.643e-04
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0003434  0.0001674   2.051  0.0451 *
## Rm_minus_Rf -0.0005061  0.0002003  -2.527  0.0145 *
## SMB          -0.0013352  0.0003140  -4.252 8.45e-05 ***
## HML          -0.0008645  0.0005076  -1.703  0.0943 .
## WML           0.0008803  0.0005905   1.491  0.1419
## IML          -0.0006730  0.0004379  -1.537  0.1302
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0002527 on 54 degrees of freedom
## Multiple R-squared:  0.5559, Adjusted R-squared:  0.5148
## F-statistic: 13.52 on 5 and 54 DF, p-value: 1.482e-08
```

Prêmios de Risco - Anualizados (% ao ano)

##	(Intercept)	Rm_minus_Rf	SMB	HML	WML	IML
##	8.654922	-12.752625	-33.646506	-21.784654	22.184126	-16.958618