

Notes on the Daniel-Moskowitz Momentum Portfolios

1 Introduction

Table 1: The table below shows the 12 sets of momentum decile portfolios available. Each file contains each portfolios' return for each return period, and the number of firms in each portfolio and the average market equity of the firms in each portfolio at the beginning of each return period.

filename	frequency	breakpoints	sort-variable
d_m_pt_ind.txt	daily	all firms	industry return
d_m_pt_res.txt			residual return
d_m_pt_tot.txt			total return
d_m_pt_nyse_ind.txt		NYSE firms	industry return
d_m_pt_nyse_res.txt			residual return
d_m_pt_nyse_tot.txt			total return
m_m_pt_ind.txt	monthly	all firms	industry return
m_m_pt_res.txt			residual return
m_m_pt_tot.txt			total return
m_m_pt_nyse_ind.txt		NYSE firms	industry return
m_m_pt_nyse_res.txt			residual return
m_m_pt_nyse_tot.txt			total return

Table 1 shows the 12 sets of momentum decile portfolios available. The sets of returns are differentiated on the basis of the return frequency, the set of firms used in the breakpoint calculations, and the sort-variables used in forming the portfolios:

1. **Sort-Variables:** Momentum decile portfolio returns are available for firms sorted on the basis of:
 - (a) total-return
 - (b) industry return
 - (c) firm-specific (or *residual*) return. This is just the individual firm's return, minus the return of the firm's industry.
2. **Breakpoint Calculations:** Breakpoints for the decile portfolios are based on either (1) all-firms (*i.e.*, NYSE, AMEX, and NASDAQ); or (2) just NYSE firms. For the all-firm breakpoint portfolios have an equal number of firms in each portfolio as of

the formation date. For the NYSE-breakpoint portfolios, there are an equal number of NYSE firms in each portfolios as of each formation date.

3. **Data Frequency:** Return files contain daily and monthly returns for the portfolios. Other files contain the average market equity of the portfolios, and the number of firms in each portfolio.

2 Portfolio Restrictions

1. All portfolios are formed on the basis of cumulative log returns (either total, industry, or residual) from months $t - 12$ through $t - 2$ (*i.e.*, a total of 11 months, skipping one month).
2. Portfolios are always formed/rebalanced at the end of each month.
3. All portfolios are value weighted.
4. Data restrictions are:
 - (a) CRSP Sharecode 10 or 11. (i.e, common stocks; no ADRs)
 - (b) CRSP exchange code of 1, 2 or 3 (NYSE, AMEX or NASDAQ)
 - (c) price at $t - 13$ not missing.
 - (d) $\text{ret}(t - 2)$ not missing.
 - (e) $\text{me}(t - 1)$ not missing.

If a firm doesn't meet all of these requirements, it isn't included in any portfolio.

5. Calculation of Ranking returns:
 - (a) "total" means that the raking return for each firm is its cumulative log return from month $t-12$ through month $t-2$
 - (b) "industry" means that the ranking return is the cumulative log return for the value-weighted industry portfolio of which that firm is a member. Industry definition is based on CRSP historical SIC code, and Ken French's 49 industry definition.

- (c) “residual” means that firms are ranked on the difference between their cumulative log return from month t-12 through month t-2 and the cumulative log return of the industry to which they belong over the same period.
- 6. If a firm in one of the portfolios is delisted, the delisting return is included in the portfolio as of the delisting date.

3 Comparison with Ken French’s momentum decile portfolios

The portfolios used in DM are formed in a manner largely consistent with the decile momentum portfolios in Ken French’s (KRF) data library.¹ The biggest difference is that the portfolio breakpoints for the KRF portfolios are set so that each of the portfolios has an equal number of NYSE firms (*i.e.*, he uses “NYSE breakpoints.”) In contrast, we set our breakpoints so that there are an equal number of firms in each portfolio. (*i.e.*, we use “all-firm breakpoints”).

We compare the Daniel Moskowitz baseline decile portfolio with the KRF decile portfolio in Table 2, and plot the cumulative returns to both sets of portfolios in Figure 2. In terms of the performance of the portfolios, the key difference is that our low momentum portfolio earn lower average returns than do those the KRF low-momentum portfolios. Specifically, over the period January 1927 – December 2012, our low-momentum portfolio earn a return that is about 3%/year lower than that of the KRF bottom decile portfolio. However, since the portfolios are virtually identical until 1963, all of this difference comes from the 1963:07-2012:12 period. Over this period, our bottom decile portfolio earns -3.3%/year, while the bottom decile KRF portfolio earns 1.8%/year. Also, in the subperiod, our top decile momentum portfolio outperforms the KRF top decile portfolio by about 1%/year (19.03% vs. 18.08%/year).

This difference arises only because of the different breakpoint methods. Figure 4 shows the numbers of firms in the bottom, median, and top deciles of each of our six sets of portfolios. (We’ll show in a moment that the KRF momentum portfolios are equivalent to the “nyse_tot” portfolios.) The portfolios with NYSE breakpoints have more firms in the bottom decile portfolios. Also, Figure 5 shows that the our bottom decile portfolio has a slightly smaller fraction of the total market capitalization at most points in time.

¹See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

To facilitate a comparison between our portfolios and those in the KRF data library, we also create a set of portfolios based on NYSE breakpoints, using firms' total return as the sort variable. Assuming we both constructed our portfolio correctly, these portfolio should have virtually identical returns.

Table 2: This table presents the mean returns, return standard deviation, and Sharpe-ratios (all annualized) for the monthly returns of the Daniel-Moskowitz total momentum portfolios, and for the decile momentum portfolios from the KRF data library. The time period is January 1927 - December, 2012. The final column gives the corresponding statistics for the portfolio which is long decile 10 and short decile 1, which we denote *wml*. The bottom panel presents the percent difference in the mean, standard deviation, and Sharpe-ratio for the corresponding DM and KRF portfolios.

		DM or KRF momentum decile portfolio										
		DM portfolios use all-firm breakpoints										
		1	2	3	4	5	6	7	8	9	10	wml
\mathfrak{S}	\bar{r} DM(%/yr)	0.751	6.245	6.284	9.770	10.476	10.464	12.612	13.746	14.744	18.694	17.943
	\bar{r} KRF(%/yr)	3.795	8.395	8.723	10.304	10.360	11.008	12.117	13.387	14.394	18.095	14.301
	σ_r DM (%)	36.462	30.510	25.848	23.162	21.308	20.180	19.430	19.023	20.325	23.711	30.021
	σ_r KRF (%)	34.054	28.334	24.472	22.387	20.763	20.221	19.315	18.732	19.746	22.723	27.429
	SR DM	-0.075	0.090	0.108	0.271	0.327	0.345	0.469	0.538	0.553	0.640	0.598
	SR KRF	0.009	0.173	0.214	0.304	0.330	0.371	0.446	0.528	0.552	0.642	0.521
	% diff \bar{r}	-80.214	-25.613	-27.957	-5.179	1.121	-4.945	4.084	2.681	2.435	3.308	25.471
	% diff σ_r	7.072	7.682	5.625	3.464	2.624	-0.204	0.591	1.558	2.933	4.346	9.451
	% diff SR	-934.856	-47.851	-49.459	-10.945	-0.865	-7.065	5.134	2.029	0.284	-0.238	14.637

Table 3: This table presents the correlations, in percent, between the monthly returns of the Daniel-Moskowitz total-return/NYSE decile momentum portfolios and the corresponding decile momentum portfolios from the KRF data library. The time period is January 1927 - December 2012.

KRF Port	DM Momentum Decile Portfolio, (Total-Ret/NYSE bkpts)									
	1	2	3	4	5	6	7	8	9	10
Low	99.8	93.3	90.6	88.3	86.5	83.3	77.7	72.9	69.3	59.9
2	93.3	99.9	93.9	92.3	90.5	88.3	81.9	76.9	72.0	60.8
3	90.2	94.1	99.9	94.4	93.0	90.6	85.1	80.3	75.3	62.5
4	88.1	92.2	94.4	99.9	93.5	92.2	88.2	84.1	79.1	66.4
5	86.4	90.8	93.1	93.6	99.9	93.8	90.2	86.6	82.2	69.9
6	83.0	88.0	90.5	92.3	93.6	99.8	93.6	90.5	87.6	75.7
7	77.5	82.0	85.0	88.3	90.2	93.6	99.9	92.7	90.2	78.9
8	72.8	76.8	80.3	84.3	86.5	90.6	92.8	99.9	93.4	84.6
9	69.1	71.8	75.0	79.1	81.8	87.4	90.0	93.4	99.9	88.9
High	59.7	60.4	62.3	66.6	69.4	75.6	78.6	84.6	88.6	99.9

Table 3 presents the matrix of correlations between the monthly returns of the Daniel-Moskowitz decile portfolios based on NYSE sorts with those from the KRF data library. The time period is January 1927 - December, 2012. Notice that the correlations between corresponding portfolios (KRF and DM) is never lower than 0.998.

Table 4 below gives annualized mean returns, return volatilities, and Sharpe-ratios over the January 1927 - December, 2012 period.² (mean returns and volatilities are in percent terms). The last three lines of the table gives the percent difference between the mean, volatility, and Sharpe-ratio for each of the corresponding decile portfolios. The mean returns and volatilities of our portfolios are almost all within 1% of the mean and volatility for the corresponding KRF portfolios.³

Finally Figure 1 presents cumulative monthly returns for our total-return/NYSE portfolios and to the KRF data library momentum decile portfolios. They are seen in this figure to be virtually identical, as suggested by the numbers in these two tables.

²Sharpe ratios are calculated using the monthly risk-free rate from Ken French's data library

³The one "large" percentage difference is the Sharpe-ratio for the bottom decile momentum portfolio; however this large percentage difference results from the fact that the mean returns of both portfolios are close to the average risk-free rate over the period, givins Sharpe-ratios of close to zero and a large percentage difference

3.1 Differences in Daily Momentum Portfolios

Our daily momentum portfolios are rebalanced only at the end of each month; firms change portfolio membership only at the end of each month. This means that the cumulative returns of portfolios, calculated from daily and monthly returns, are virtually identical (to see this visually, compare the right panel of Figure 1 with the right panel of Figure 3).

In contrast the portfolios in the KRF data library are rebalanced daily. This leads to some differences in the cumulative returns of our daily (NYSE) portfolios and those from the KRF data library.

Table 4: This table presents the mean returns, return standard deviation, and Sharpe-ratios (all annualized) for the monthly returns of the Daniel-Moskowitz total-NYSE decile momentum portfolios, and for the decile momentum portfolios from the KRF data library. The final column gives the corresponding statistics for the portfolio which is long decile 10 and short decile 1, which we denote *wml*. The time period is January 1927 - December, 2012. The bottom panel presents the percent difference in the mean, standard deviation, and Sharpe-ratio for the corresponding DM and KRF portfolios.

		DM or KRF momentum decile portfolio										
		DM portfolios use NYSE breakpoints										
		1	2	3	4	5	6	7	8	9	10	wml
∞	\bar{r} DM(%/yr)	3.745	8.451	8.729	10.330	10.298	10.993	12.181	13.455	14.335	17.951	14.206
	\bar{r} KRF(%/yr)	3.795	8.395	8.723	10.304	10.360	11.008	12.117	13.387	14.394	18.095	14.301
	σ_r DM (%)	33.911	28.534	24.494	22.418	20.673	20.162	19.256	18.699	19.739	22.495	27.244
	σ_r KRF (%)	34.054	28.334	24.472	22.387	20.763	20.221	19.315	18.732	19.746	22.723	27.429
	SR DM	0.008	0.174	0.214	0.305	0.329	0.371	0.450	0.532	0.549	0.642	0.521
	SR KRF	0.009	0.173	0.214	0.304	0.330	0.371	0.446	0.528	0.552	0.642	0.521
	% diff \bar{r}	-1.304	0.662	0.065	0.250	-0.594	-0.137	0.529	0.510	-0.409	-0.798	-0.664
	% diff σ_r	-0.421	0.706	0.092	0.140	-0.436	-0.292	-0.308	-0.174	-0.035	-1.003	-0.675
	% diff SR	-15.801	0.422	0.005	0.236	-0.464	0.097	1.053	0.853	-0.508	0.006	0.011

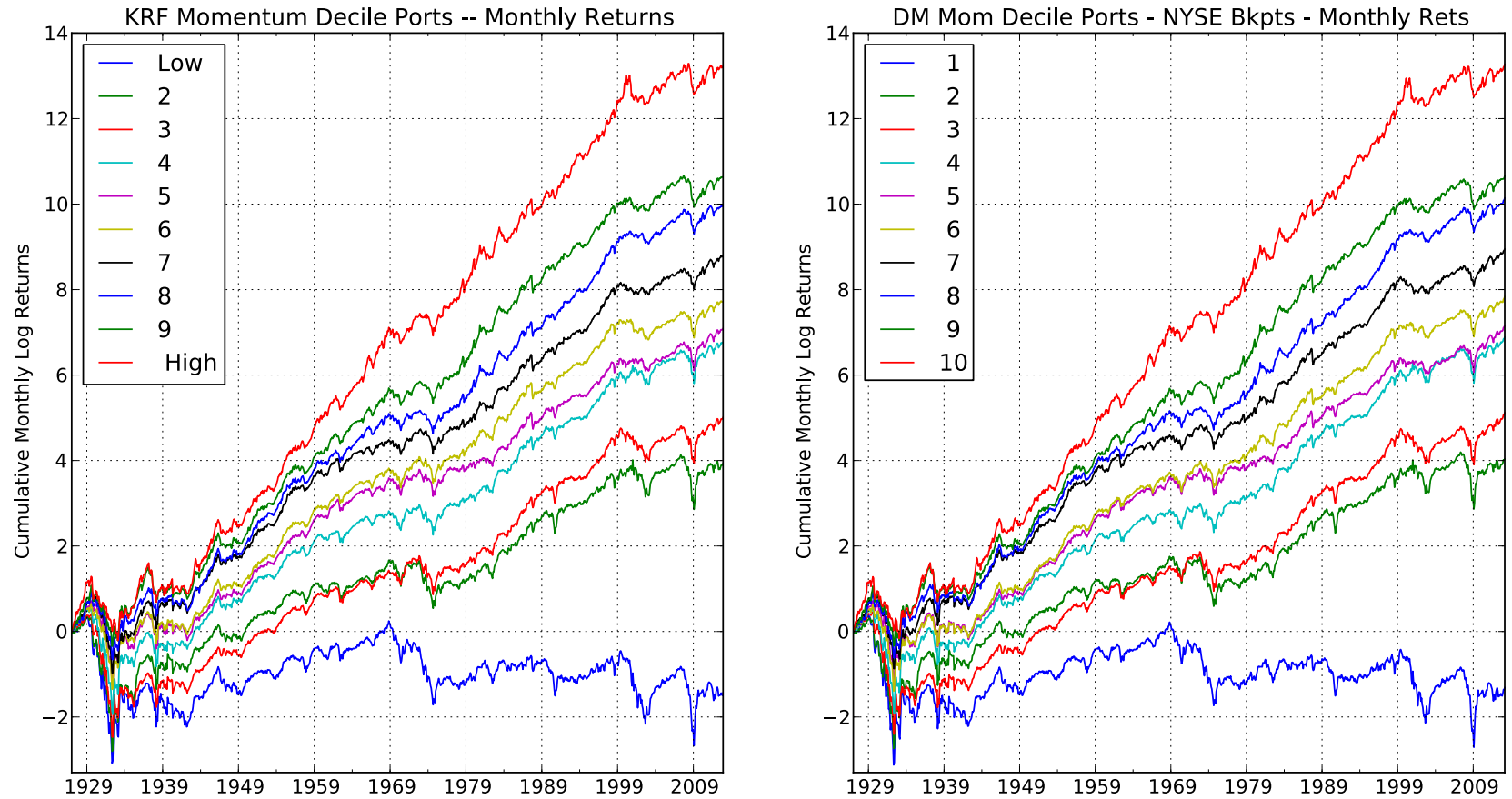


Figure 1: These two plots present cumulative monthly log returns to the decile portfolios formed on (12,2) momentum over the period from January 1927 through December 2012. The left panel uses the returns from the Ken French data library (as of 6/20/2013), and the right panel uses our total momentum portfolios formed using NYSE breakpoints.

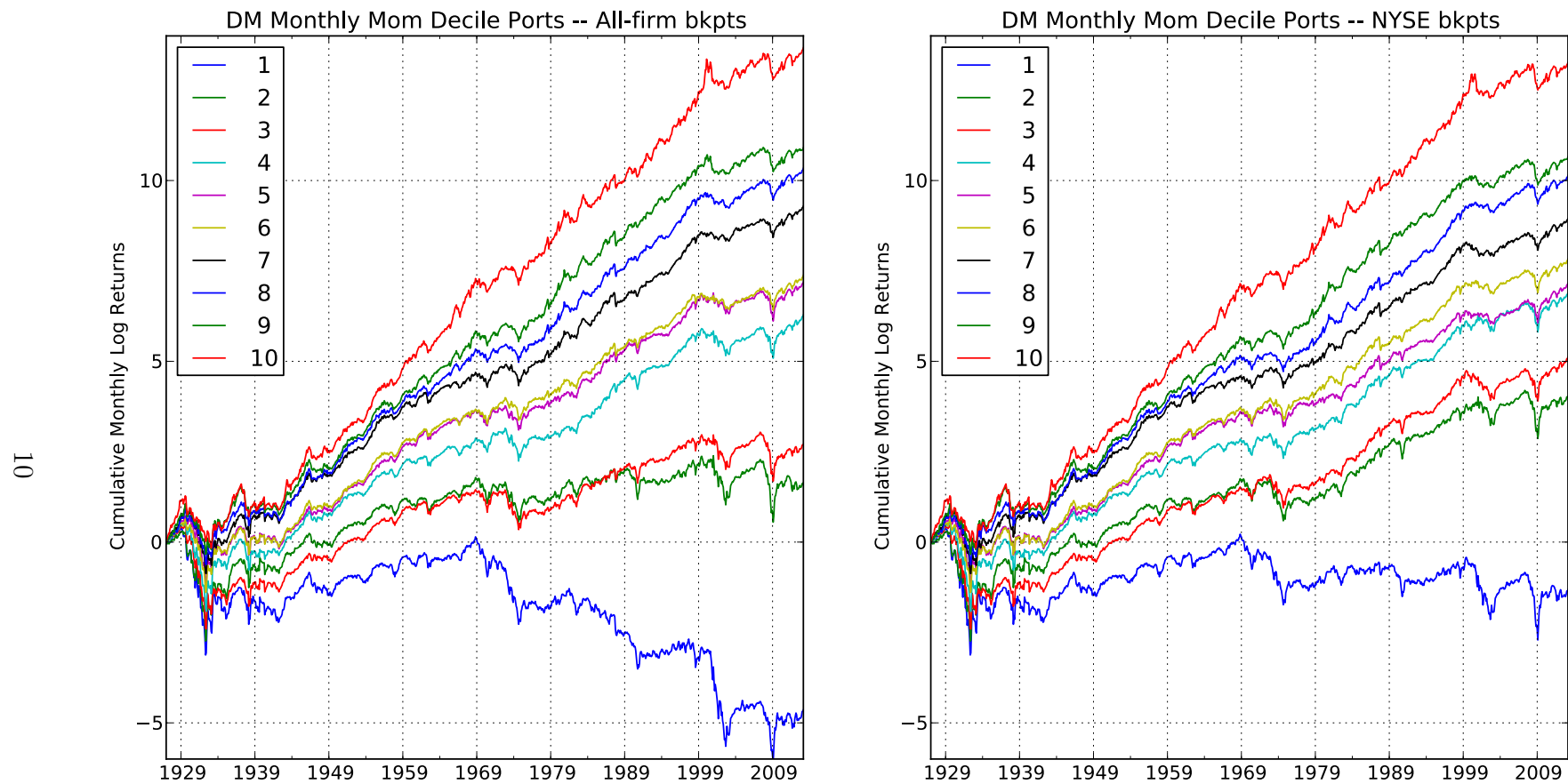


Figure 2: These two plots present cumulative monthly log returns to the decile portfolios formed on (12,2) momentum over the period from January 1927 through December 2012. The left panel uses our total momentum portfolios based on all-firm breakpoints, and the right panel uses portfolios formed using NYSE breakpoints.

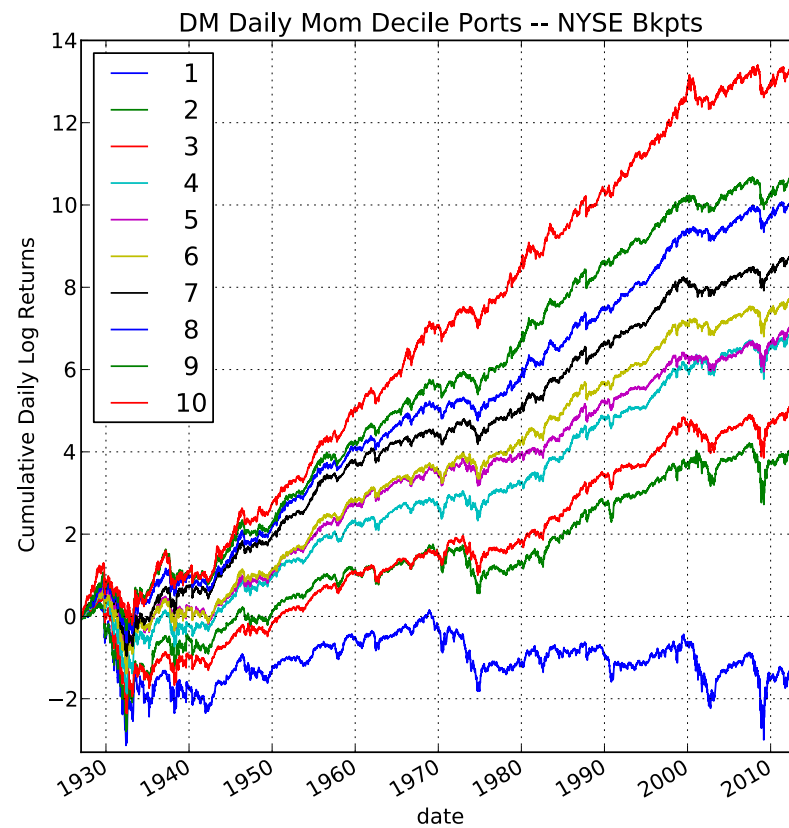
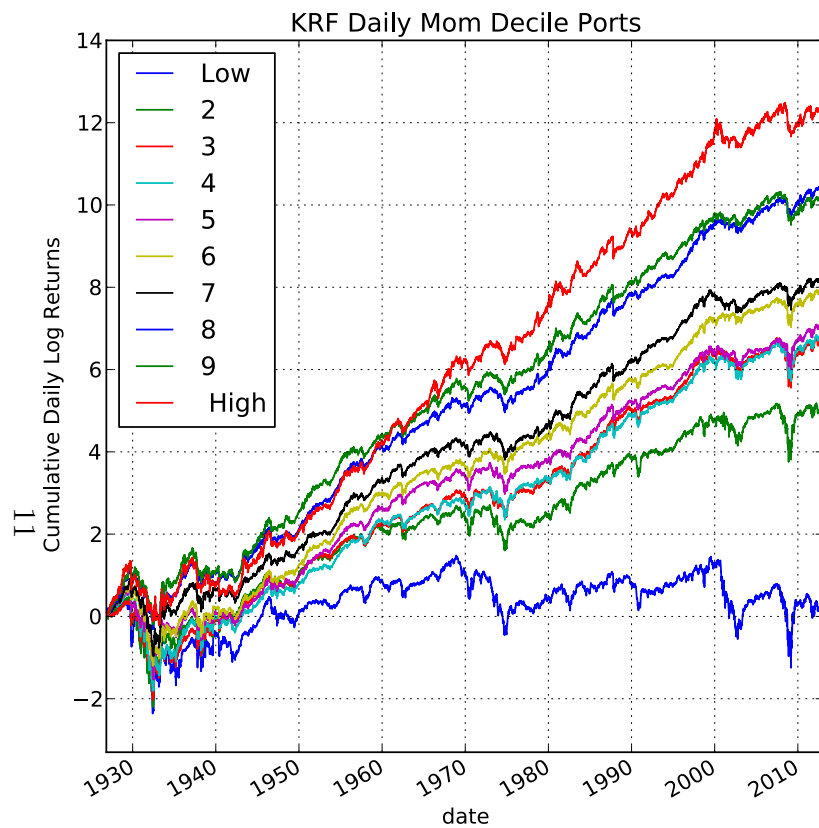


Figure 3: These two plots present cumulative daily log returns to decile portfolios formed on (12,2) momentum over the period from January 1927 through December 2012. The left panel uses the decile returns from the Ken French data library (as of 6/20/2013), and the right panel uses our total momentum portfolios formed using NYSE breakpoints.

Number of Firms, by Portfolio (Log Scale)

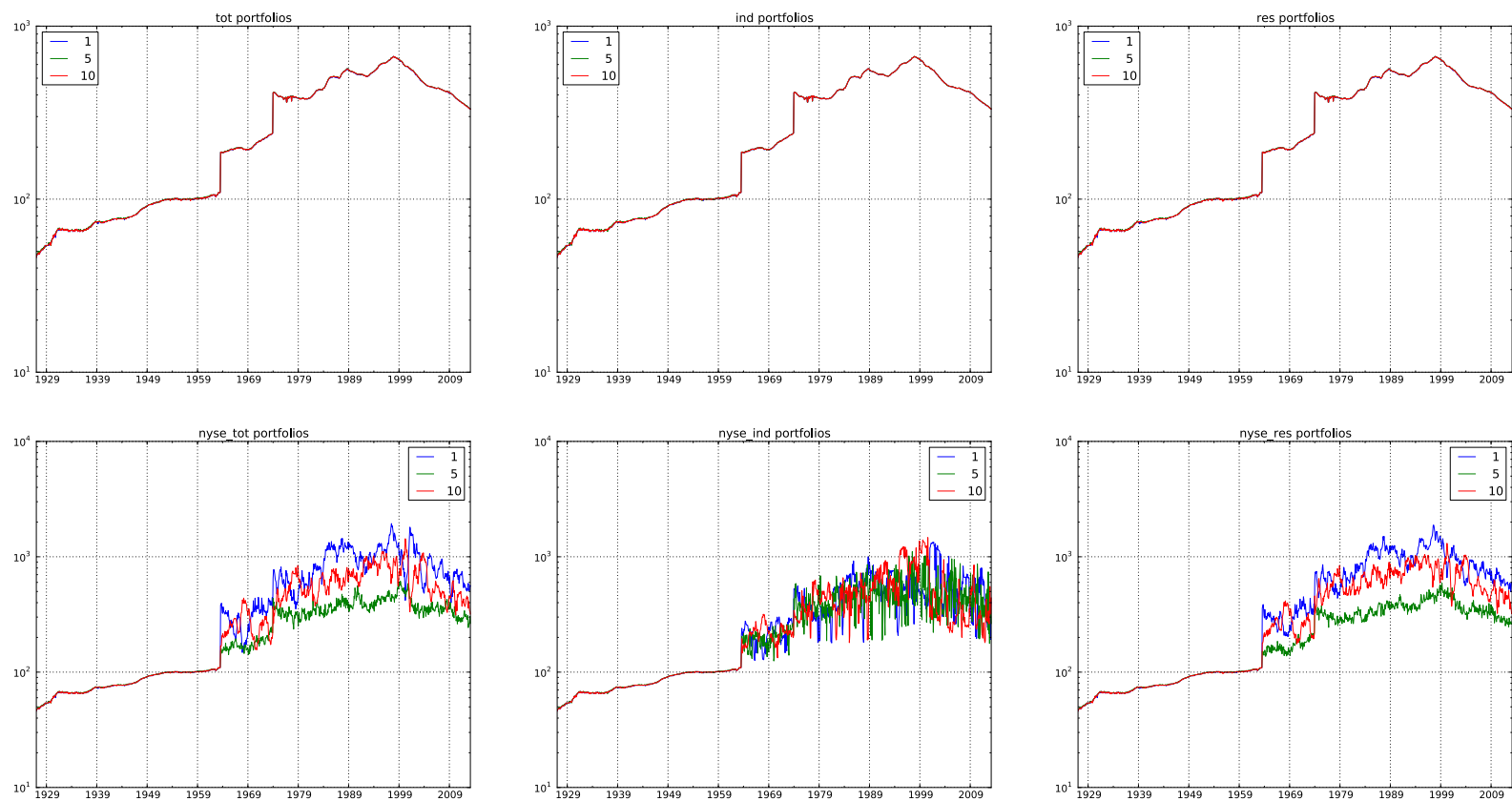


Figure 4: These plots presents the number of firms in each of portfolios 1,5, and 10, for the 6 set of test portfolios.

Fraction of Total ME, by Portfolio (Log Scale)

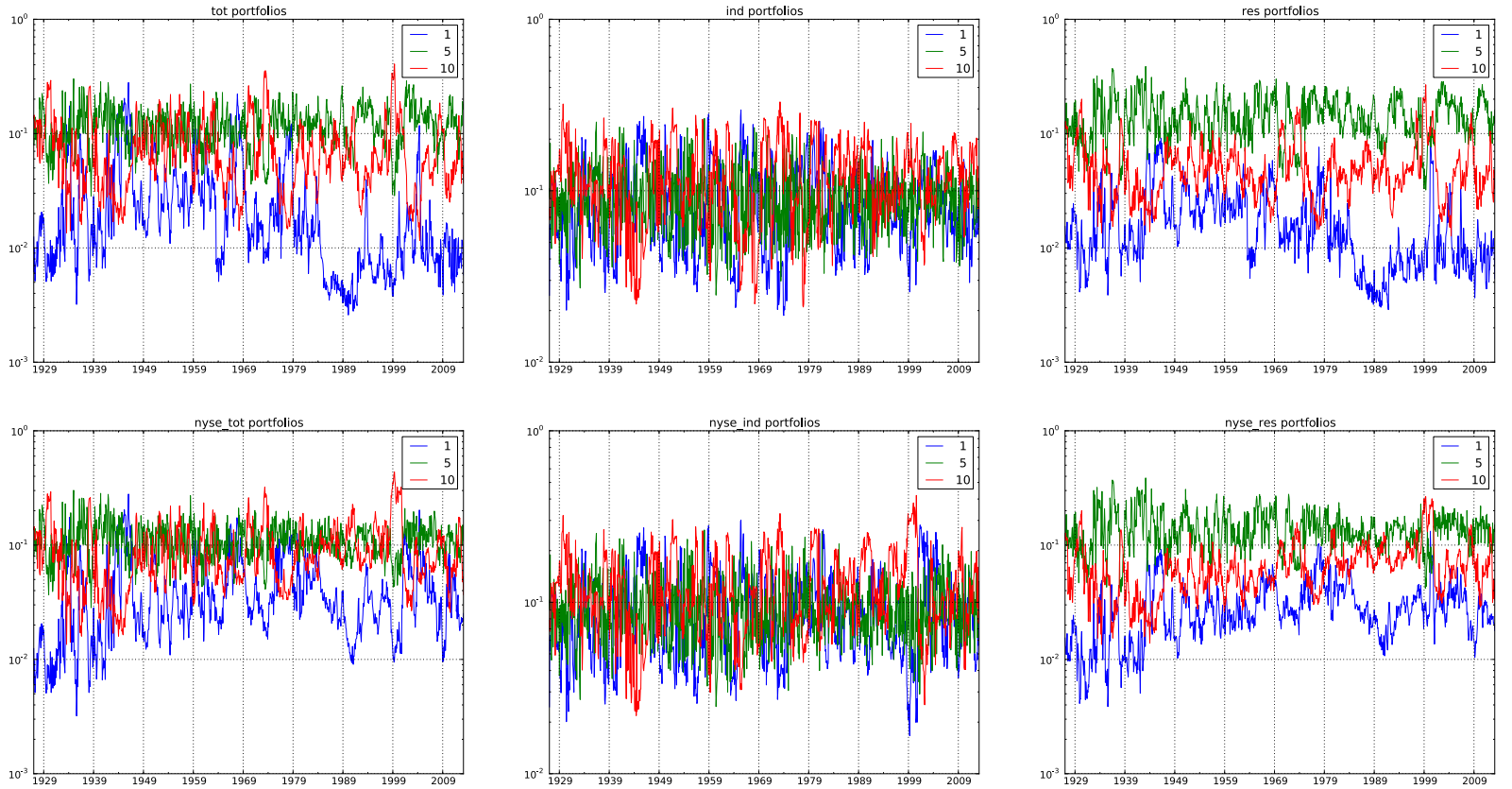


Figure 5: These plots present the fraction of market equity in in each of portfolios 1,5, and 10, for the 6 set of test portfolios.