Equity Risk Factors Toolkit

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Abstract
A number of firm characteristics have been shown in the literature to affect equity returns. Some examples can be found in the resources of the **toolkit main website**. Using combinations of such characteristics we can create (long-short) portfolios of stocks and study their performance over time. The portfolios may capture various equity risk factors. This is a customized report of a specific combination of risk factors (firm characteristics) selected using the toolkit.

[1]This report has been generated using the **Equity Risk Factors Toolkit**.
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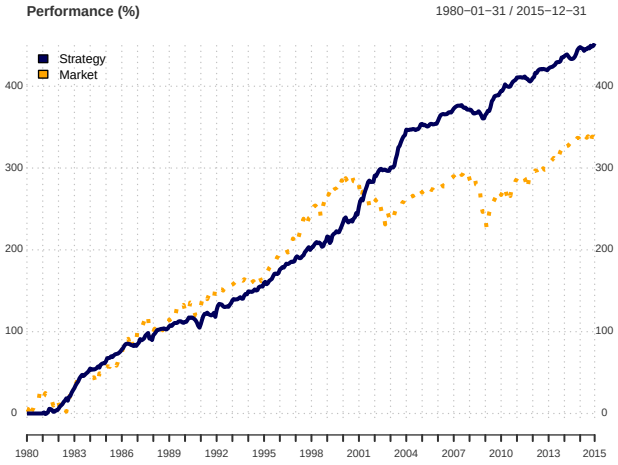

Figure 1. The monthly performance of the strategy

Introduction

This report contains the results of a specific strategy using the **Equity Risk Factors Toolkit** [1]. The Toolkit computes the P&L of long-short strategies based on combinations of firm characteristics. For each selected characteristic, at the beginning of each month all selected US public firms (available at the CRSP database that month) are sorted based on the value of that characteristic the one before last day of the previous month. The top and bottom firms (for the chosen percentile or number of firms thresholds) are then selected, an equal weighed long (short) portfolio is created for the top (bottom - depending on the user's choice) firms, and finally a 50-50 long-short portfolio is constructed using these long and short portfolios. Hence for each firm characteristic we have a simple "trading strategy" with a monthly portfolio rebalancing - with no hindsight, and no transaction costs considered.

1. Strategy details

The design of a portfolio (and corresponding "trading strategy") is done in three steps:

- First, the universe of all public US firms (from the CRSP database) are filtered each month based on a number of choices such as the size of the firm or its share price that month. The filters used for this report, if any are selected, are described in Section 1.1;
- A number of firm characteristics (e.g. from Compustat) are selected based on which (long-short) portfolios are created. The ones selected for this report are discussed in Section 1.2. For each of the selected firm characteristics the top and bottom firms are selected based on user defined thresholds. The thresholds defining the number (or percentile) of top/bottom firms in this report are shown in Section 1.3;

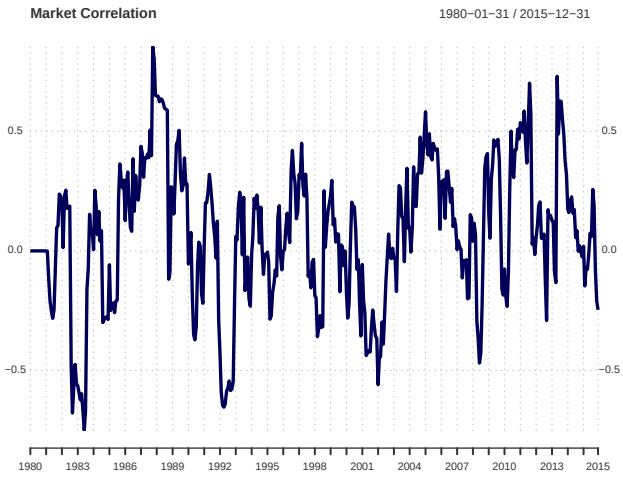

Figure 2. 12-month rolling correlation with S&P

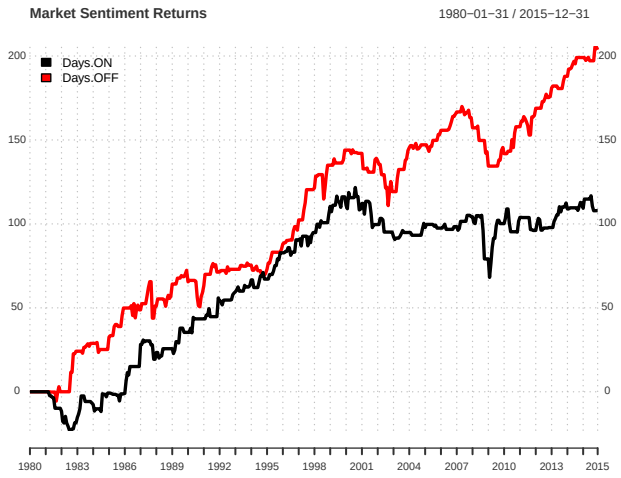

Figure 3. Returns based on market sentiment

- Finally, each month firms are selected to be used in long (short) portfolios using the selected firm characteristics, and a final (long-short) portfolio is created each month based on the ”factor combination” approach described in Section 1.4,

Note that all selections (e.g. of firms) for the (long-short) portfolios are done each month with *no* hindsight as only firm characteristics available at most the day before last of the previous month are used every time. Hence all ”strategy performances” described below are with no hindsight (other than the experimentation with various factors the user may have done). The portfolio is rebalanced monthly, although many of the firm characteristics only change yearly (as they are reported for example at Compustat) hence rebalancing may happen less frequently. No transaction costs are considered.
Disclaimer: Performances of the developed trading strategies are not indicative of future returns. It should not be assumed that the strategies will be profitable or that they will not result in losses if used in practice. Moreover, there is no guarantee that the tool is bug free. The tools and customized reports are for educational purposes only.

1.1 Filtering

Market capitalization filter: values 150 to 1e+07 million USD. Price filter: values 1 to 1e+11 USD. Only companies in major stock exchanges (NYSE, AMEX and NASDAQ) were used. Companies from all industries were used.

1.2 Factor definitions

The chosen factors were predefined and are detailed in table 2 in the appendix.

Going long the companies with high values for a particular factor implies that higher values of the factor are indicators of superior company performance. Going long the companies with low values for a particular factor implies that lower values of the factor are indicators of superior company performance.

1.3 Long-short percentiles

For the long-short strategy the chosen percentiles were:

- Top number of companies to go long: 150
- Bottom number of companies to go short: 80

1.4 Factor combination

Factors can be combined in two ways. For the first, “continuous”, at each month each factor is ranked using the empirical cumulative distribution function across all the companies for which there are available data. Then the rankings for each month are added per company and averaged by the number of factors. For the second way of combining factors, “capital across factors”, each factor is allocated an equal part of the total capital. Therefore, the P&L of the portfolio is the average of the P&L of as many distinct portfolios as there are factors.

The current report’s results were computed using “continuous” factor combination.

2. Strategy performance

The following results are reported:

1. The returns of the customized trading strategy (for the selected firm characteristic(s));
2. The 12-months rolling correlation of the trading strategy with S&P;
3. The returns of the S&P index the months after which the last month returns of the strategy are above the previous 6 months average returns of the strategy (”ON days”)
4. The returns of the S&P index the months after which the last month returns of the strategy are below the previous 6 months average returns of the strategy (”OFF days”)
5. The number of long and short positions over time

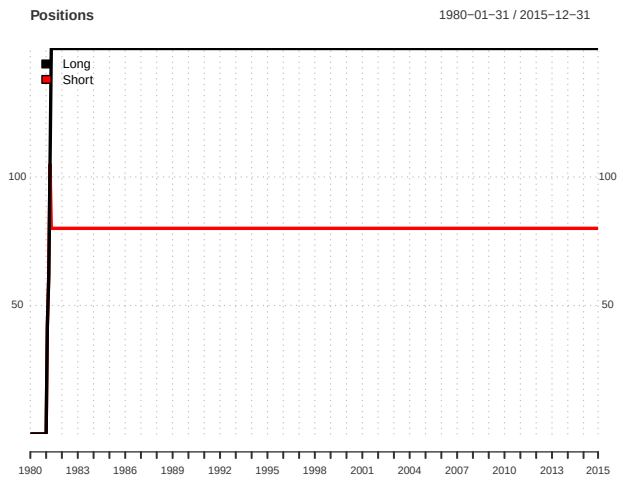

Figure 4. Number of long and short positions over time

2.1 Trading Strategy Performance

For the monthly returns of the strategy see figure 1 on page 1 and table 1 in the appendix. The 12-month rolling correlation of the strategy with the S&P, is shown in figure 2.

The key statistics of the strategy are:

- Mean annualized return is 12.6%;
- Annualized volatility is 7.8%;
- Annualized Sharpe ratio is 1.67;
- Maximum drawdown is 16.3%.

2.2 Market sentiment

The percentage of up months for ON months is 56.85%. The percentage of up months for OFF months is 67.07%. See Figure 3 for more details.

Acknowledgments

The Equity Risk Factors Toolkit has been developed by T. Evgeniou, O. Tsinalis, V. Kapartzianis, N. Nassuphis and D. Spinellis.

References

[1] Equity Risk Factors Toolkit. **Toolkit main website**. *Website*, 2016.

Appendix

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
1981	0.00	1.30	-2.00	0.73	1.48	4.23	-0.37	-1.14	-2.20	0.34	1.37	0.25	**3.91**
1982	1.69	2.54	1.69	1.56	2.55	1.93	2.60	-2.94	4.61	1.26	4.07	2.94	**27.21**
1983	2.56	3.23	2.71	2.24	3.84	2.31	1.82	-1.44	1.52	1.62	1.28	1.87	**26.18**
1984	2.89	-1.59	0.74	-0.41	0.70	1.09	1.94	-1.37	3.45	1.35	0.53	0.04	**9.64**
1985	2.52	3.67	0.21	0.12	2.01	-1.04	2.07	1.31	0.46	0.34	1.19	1.60	**15.36**
1986	2.23	1.67	3.05	1.94	0.55	-0.16	-0.40	-0.93	-0.52	-0.89	1.68	-1.50	**6.78**
1987	2.18	1.70	4.47	-1.50	0.86	1.53	3.44	1.60	1.54	-6.86	0.98	-2.79	**6.84**
1988	5.98	1.69	2.31	2.40	0.23	0.55	0.50	0.11	0.58	-0.87	-0.46	1.33	**15.14**
1989	2.49	1.18	-0.72	1.88	1.64	0.03	-0.03	1.79	0.41	-0.17	-1.36	-0.46	**6.82**
1990	1.09	0.14	2.34	3.01	-0.59	0.72	-0.63	-1.36	-1.37	-2.88	-4.02	-2.38	**-6.00**
1991	4.50	5.16	4.48	2.81	-0.12	1.53	-1.93	-0.78	-0.69	1.22	2.00	-5.01	**13.45**
1992	8.35	5.09	2.52	-0.50	-0.33	-2.23	-0.87	0.32	0.43	-0.50	2.55	2.07	**17.74**
1993	3.25	1.67	-0.69	0.33	0.03	1.46	1.19	-1.87	-0.03	3.73	2.13	-0.53	**11.03**
1994	3.56	-0.06	-0.35	-0.18	1.36	1.72	-1.34	0.39	3.59	0.89	0.23	-0.30	**9.79**
1995	4.63	1.16	-2.91	1.17	3.09	1.02	1.29	3.51	2.72	0.25	-0.66	1.09	**17.38**
1996	4.41	1.40	1.57	-0.56	2.43	2.44	-0.61	0.82	1.34	1.00	-0.46	0.71	**15.36**
1997	4.30	1.86	-1.11	-1.27	0.25	2.24	1.14	3.62	1.98	2.45	1.86	-3.35	**14.61**
1998	2.84	0.34	2.65	2.26	1.54	-1.50	0.88	-1.58	-3.59	0.75	4.45	1.73	**11.00**
1999	5.53	-0.42	-7.52	2.49	6.71	2.01	0.96	2.33	-1.39	0.18	3.84	3.92	**19.41**
2000	4.28	4.50	1.56	-4.00	-2.20	1.31	1.27	-1.51	3.50	1.84	5.15	-1.92	**14.14**
2001	9.72	6.59	2.94	-1.96	7.34	5.05	4.67	5.35	1.89	-1.81	0.19	-0.02	**47.06**
2002	7.66	-0.78	2.82	3.46	2.35	0.48	-1.83	0.83	0.04	-1.28	-0.30	0.09	**13.99**
2003	3.98	0.28	-0.25	2.22	8.07	5.59	8.63	1.91	4.77	3.99	2.87	1.59	**52.93**
2004	6.71	-0.30	-0.17	0.62	-0.11	0.72	-0.22	-1.09	0.92	0.16	2.27	3.77	**13.82**
2005	0.42	-1.67	0.64	-1.36	-0.85	0.72	2.14	0.57	-0.81	0.17	0.46	0.16	**0.53**
2006	3.44	3.64	3.36	0.93	0.66	-0.49	0.09	0.27	1.97	0.26	-0.44	2.22	**16.97**
2007	2.63	1.55	1.16	0.84	0.10	-0.18	0.85	-2.37	-1.13	0.36	-2.27	-0.26	**1.19**
2008	0.13	-0.16	-2.15	-2.33	-0.09	0.62	0.38	1.67	-2.27	-3.15	-3.34	0.07	**-10.25**
2009	4.21	1.76	3.37	-0.35	4.74	7.29	2.28	3.80	0.62	0.46	-0.01	2.96	**35.61**
2010	2.40	0.15	3.22	4.69	-1.79	-0.84	-0.50	0.70	3.29	2.34	1.34	1.00	**16.98**
2011	2.92	0.04	0.17	0.11	-0.57	0.02	1.39	-2.53	-0.25	-2.23	-1.13	1.50	**-0.69**
2012	2.79	1.13	5.24	-0.30	2.95	1.39	0.59	-0.57	0.83	-0.58	-0.43	-0.81	**12.73**
2013	2.14	1.22	0.51	0.47	1.28	1.18	2.90	0.42	-0.19	1.22	4.55	-0.03	**16.73**
2014	1.64	1.18	0.94	-2.16	-2.16	-1.29	0.02	0.72	2.11	3.55	4.53	2.47	**11.92**
2015	1.12	-1.05	-0.86	-2.67	2.01	-0.03	2.06	-1.05	3.29	-1.06	0.92	3.08	**5.71**

Table 1. The monthly performance of the strategy per year

Appendix (contd.)

	Factor	Description	Compustat	Long
1	Asset Growth (Yearly)	Yearly percentage change in total assets.	(AT(t) - AT(t-12)) / AT(t-12), where t is the current month	Low
2	Market Beta	Market Beta		Low
3	Net Operating Assets	The difference between operating assets and operating liabilities.	AT - CHE -(LT - (DLTT + DCVT + DLC)	Low
4	Operating Leverage	The sum of cost of goods sold and selling, general and administrative expense divided by total assets.	(COGS + XSGA) / AT	High
5	Total Net External Financing	(Sale of Common and Preferred Stock - Cash Dividends - Purchase of Common and Preferred Stock + Sale of Long-Term Debt - Purchase of Long-Term Debt) / Total Assets	(SSTK - DV - PRSTKC + DLTIS - DLTR) / AT	Low

Table 2. Risk Factors