Screening for Stable Funds:
A Bayesian Rating and Ranking Approach

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Abstract

In this article we present a case study of rating and ranking selected investments from the sponsored funds segment traded at the Swiss Exchange (SIX) in Zurich. We apply the conceptually new stability approach introduced recently by Setz and Würtz [2014]. The rating and ranking process relies on measures derived from a retroactive analysis of turning points, of structural breaks, and of non-stationarities. Results are demonstrated for 51 funds with a history of at least 10 years. The funds were selected randomly from the SIX universe of sponsored funds.

Introduction

Recently Setz and Würtz [2015] have introduced a new rating and ranking scheme to evaluate funds, portfolios, indices and other financial investments. The rating is done with respect to the stability of the dynamical behavior of the price process. In this case study we apply this approach to the rating and ranking of funds. Three major measures are used to rank the funds from highest to lowest stability. These include (i) *steadiness* computed from the logarithmic wealth curve, (ii) *structure* derived from the probability that a point in the price process is a structural change point, and (ii) *compactness* expressed by the homogeneity of the power spectrum of the price series.

These three factors are derived from the following analytics: a (i) "Turning Point Analytics" based on a cubic spline smoothing, a (ii) "Bayesian Change Point Analytics" using a "Markov Chain Monte Carlo approach", and a (ii) "Morlet Wavelet Spectral Analytics" for the time-frequency analysis. All three approaches are described in Setz and Würtz [2014], so we refer for details to this reference.

1   Stability Monitoring

Three pillars expressed by charts define our monitoring approach. First we look on the wealth and calculate traditional performance numbers, evaluate risk measures, and explore cyclic behavior by analyzing turning points. The second step performs a Bayesian change point analysis of the dynamics of the price process to locate structural breaks caused by turbulent periods. And in a third step we overall visualize the time-frequnecy behaviour by calculating the wavelet spectrum to detect non-stationarities in the time series.

We will demonstrate how the new rating and ranking approach explicitly works. We use as examples for our analysis *Sponsored Funds* traded at the Swiss Exchange [2015] in Zurich. Investors in the sponsored

funds segment get the benefits of regulated trading. They can buy and sell investment funds just as shares at any time to structure and manage their portfolio. Sponsored funds are traded in a market making segment, this means investors can rely on mark-to-market valuations combined with maximum transparency. In addition orders are executed instantaneously and processed automatically.

Code	ISIN	Fund Description	Asset Class
19458	CH0017007094	1741 Equity Active Indexing World Value	Equities
11286	CH0001630703	Sarasin Sustainable Equity Switzerland	Equities
11467	CH0001234068	Sarasin SaraSelect	Equities
12473	LU0068337053	Sarasin EmergingSar Global	Equities
15216	LU0122376428	Black Rock BGF World Energy Fund	Equities
14526	LU0154236417	Black Rock BGF US Flexible Equity Fund	Equities
17001	LU0072463663	Black Rock BGF Latin America Fund	Equities
17901	LU0124384867	Black Rock BGF New Energy Fund	Equities
17951	LU0130190969	Credit Suisse (Lux) Biotechnology Equity Fund	Equities
13671	LU0078040838	Credit Suisse (Lux) Portfolio Fund Balanced CHF	Strategy
11423	CH0005647661	Credit Suisse Equity Fund (CH) Swiss Small Cap Equity	Equities
10796	LU0129338272	Credit Suisse (Lux) Global Value Equity Fund EUR	Equities
15544	LU0159550150	DJE Finanz Dividende & Substanz EUR	Equities
11432	CH0002783535	Falcon Gold Equity Fund	Equities
19424	LU0159201655	Lombard Odier Funds Convertible Bond	Bonds
10353	LU0083363423	Lombard Odier Funds Technology	Equities
19334	LU0172583626	Lombard Odier Funds World Gold Expertise	Equities
13433	LU0104884860	Pictet Funds Water EUR	Equities
22971	LU0090689299	Pictet Funds Biotech USD	Equities
21484	LU0130732877	Pictet Funds USA Index USD	Equities
13487	LU0130731390	Pictet Funds Europe Index EUR	Equities
18405	LU0155303323	Pictet Funds Asian Equities Ex Japan USD	Equities
15132	LU0070964530	Pictet Funds Indian Equities USD	Equities
19968	LU0168449691	Pictet Funds Greater China USD	Equities
19609	LU0188501257	Pictet Funds Generics USD	Equities
13504	LU0130729220	Pictet Funds Emerging Markets USD	Equities
13001	LU0130728842	Pictet Funds Eastern Europe EUR	Equities
24870	LU0133061175	Robeco SAM Sustainable Water B	Equities
24850	LU0175571735	Robeco SAM Smart Energy B	Equities
24820	LU0186678784	Julius Baer BF Absolute Return	Bonds
23296	LU0107852195	Julius Baer BF Local Emerging BF	Bonds
11462	CH0002779640	Swisscanto (CH) Equity Fund Switzerland	Equities
11459	CH0002779608	Swisscanto (CH) Equity Fund Small & Mid Caps CH	Equities
11451	CH0004661267	Swisscanto (CH) Equity Fund Emerging Markets	Equities
11455	CH0009074300	Swisscanto (CH) Equity Fund Green Invest	Equities
12733	LU0069152568	UBS (Lux) Equity Fund Biotech	Equities
12730	LU0044681806	UBS (Lux) Equity Fund Australia AUD	Equities
19123	LU0198837287	UBS (Lux) Equity Sicav USA Growth	Equities
12750	LU0006391097	UBS (Lux) Equity Fund European Opportunity	Equities
12633	LU0086177085	UBS (Lux) Bond Fund Euro High Yield	Bonds
13012	LU0106959298	UBS (Lux) Equity Fund Asian Consumption	Equities
15230	LU0038842364	UBS (Lux) Equity Fund Small Caps USA	Equities
12766	LU0072913022	UBS (Lux) Equity Fund Greater China	Equities
12776	LU0085870433	UBS (Lux) Equity Fund Euro Countries Opport.	Equities
11557	DE0008491051	Union Investment UniGlobal	Equities
16105	LU0153585137	Vontobel Fonds European Equity	Equities
15825	LU0084408755	Vontobel Fonds Far East Equity	Equities
10805	LU0129602636	Vontobel Fonds Swiss Mid and Small Cap Equity	Equities
13878	CH0002795729	Vontobel Fonds Swiss Small Companies	Equities
16017	CH0011792469	ZKB Fonds Aktien Europa AA	Equities
16022	CH0002779509	ZKB Fonds FW Obligationen AA	Bonds

Figure 1: Listing of 51 randomly selected funds with a history of at least 10 years. The first column lists the *Swiss Fund Data* [2015] code, the second prints the ISIN Number, the third gives a short description of the fund, and the last column adds the name of the asset class. ∎

Our monitoring approach is based on measures derived from the following three charts:

Chart: Turning Points Analytics

The logarithmic wealth chart displays the performance (black curve) of the considered fund over the last 10 years beginning January 2005 and ending December 2014. The turning points (red dots) are derived

from the cubic spline smoothed curve (red line). On a logarithmic scale we expect for a good wealth an almost straight line (steelblue) with a constant (stable) slope over time. The orange (return) ruler on top of the chart gives a first impression about the expected variability of the slope. The blue half tone regions mark the major downturn periods.

What distinguishes a stable from a less stable fund? Several scores can be calculated. Here we use as a measure for stability the *steadiness* of the wealth curve. We express the steadiness by the ratio of the expectation of the monthly returns and the tracking error with respect to an artificial wealth with the mean monthly return.

Chart: Bayesian Change Point Analytics

The change point method performs a Bayesian change point analysis according to Barry and Hartigan [1993] in the framework of a Markov Chain Monte Carlo Simulation according to Emerson and Erdman [2008] as described by Setz and Würtz [2014]. The results are the posterior mean (performance), the posterior variance (risk), and the posterior probability (stability) that the next point will be a change point in the dynamical process of the unterlying price series. The chart displays several indicators derived from the posterior measures. The histogram-like grey bars with a black point on top give the numbers for the change point probabilities: close to *zero* means stable, close to *one* denotes an almost sure change in the dynamical process. The colored *rainow band* gives a measure for the overall smoothed strength of the probabilities: low values with a narrow surrounding band indicates stable dynamics. The black curve around the orange center line is a *twiggling indicator* for falling (obove the horizontal line) and rising (below the orange line) prices/indices. As an additional information the thin curve (red) on top of the chart measures the drawdowns D_t as $1 - D_t$.

Again the question is what makes a stable fund different from a less stable fund? To quantify this we propose to use the *structure* value that is the ratio of the twiggling mean (by definition 1/2) and the standard deviation of its least square error.

Chart: Morlet Wavelet Spectrum

For further information we perform a spectral analysis using a Morlet Wavelet according to Torrence and Compo [1997] that is an extension to the well known Fourier transformation. Both are time-frequency analysis tools, but wavelets can be used for non-stationary time series analysis. The wavelet power spectrum allows to filter out beside stationary also transient signals. Thus instabilities caused by bubbles, crashes, and any other kind of market turbulences can be extremely well visualized. That makes the value of the wavelet approach. First of all, the spectrum should be in its color as unique as possible. As a consequence the 5% area covering dark red isolated islands of high volatility should be as diverse as possible over the whole spectrum. Thus many small islands indicate a much better overall stability compared to a spectrum with only a few islands. In addition the maximum variability should be as small as possible. Its value is given by the right end side of the levelling ruler on top of the spectrum chart.

What kind of score can be extracted from the Morlet wavelet? Here we suggest to calculate the *compactness*, taht is the ratio given by the number of isolated islands in the power spectrum divided by the 5% variability level.

2 Stability Rating

First we calculate for each fund in the peer group of the 51 assets the *steadiness*, the *structure*, and the *compactness* measures. The numbers are obtained from the charts.
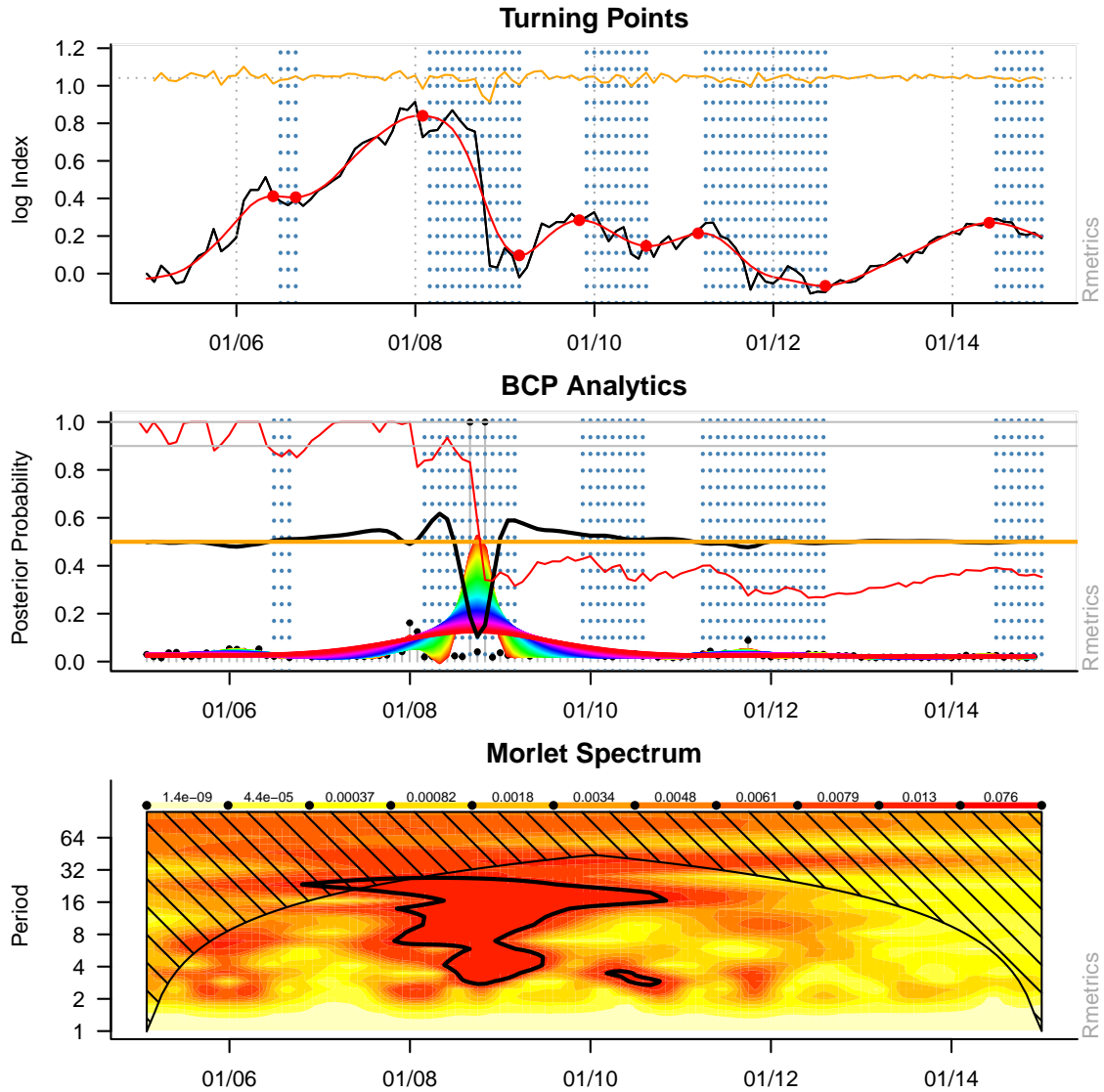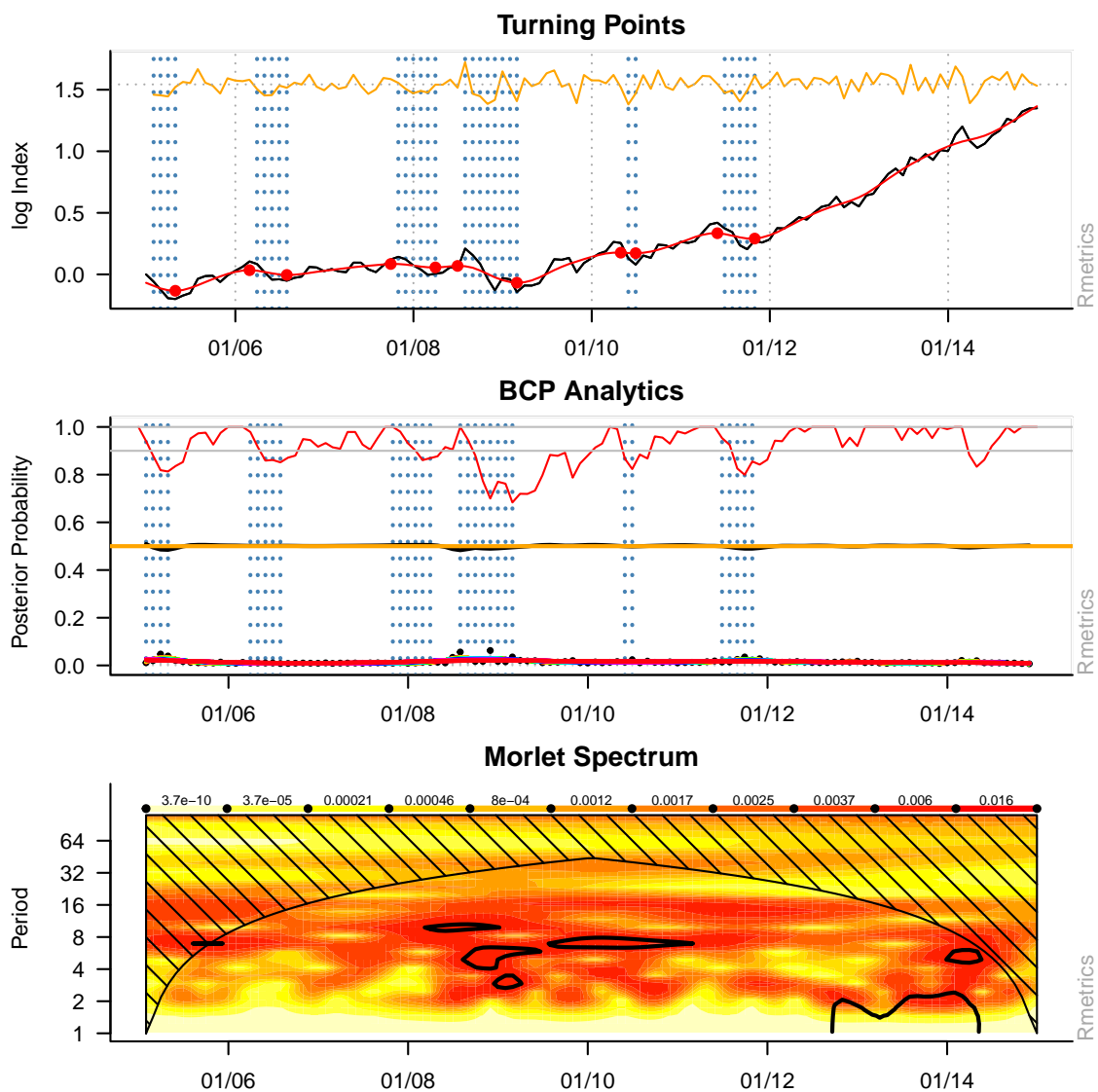
Figure 2: Turning points analytics, Bayesian change points analytics, and Morlet wavelet analytics for a low rated equity fund. ∎

As an example we compare the charts for a low and a high rated fund.

The typical features for a "low rated fund" are a small *steadiness* expressed by large deviations from a straight line connecting the first and last value of the true logarithmic wealth. The tracking error between the fund and the straight artificial wealth line will be high. The twiggling indicator that measures the *structure* by the probability of structural changes and breaks over time has a significant downdraft in 2008/2009. The least square error between the 0.5-line (orange) and the twiggling indicator (black) will be high. The Morlet wavelet shows a heterogenous power spectrum with only a few compact isolated islands surrounded by the 5% quantile level corresponding to a high volatility level. This results in a low value for the *compactness* ratio.

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Figure 3: Turning points analytics, Bayesian change points analytics, and Morlet wavelet analytics for a high rated equity fund. ∎

The situation for a "high rated fund" is just the opposite. Here the expected mean of the returns is high and the log wealth curve has a low tracking error with respect to the straight artificial wealth line. This yields a hight *steadiness* ratio. The twiggling indicator (black) is close to its 0.5 center line (orange), so the *structure* ratio will be also high. The Morlet wavelet spectrum contains several small isolated islands and has a low volatility level. As the other two ratios also the *compactness* ratio will take a high value.

To summarise, a "high rated fund" will show in comparison to a "low rate fund" higher scores for the *steadiness*, for the *structure*, and for the *compactness*.

5

Funds Rating
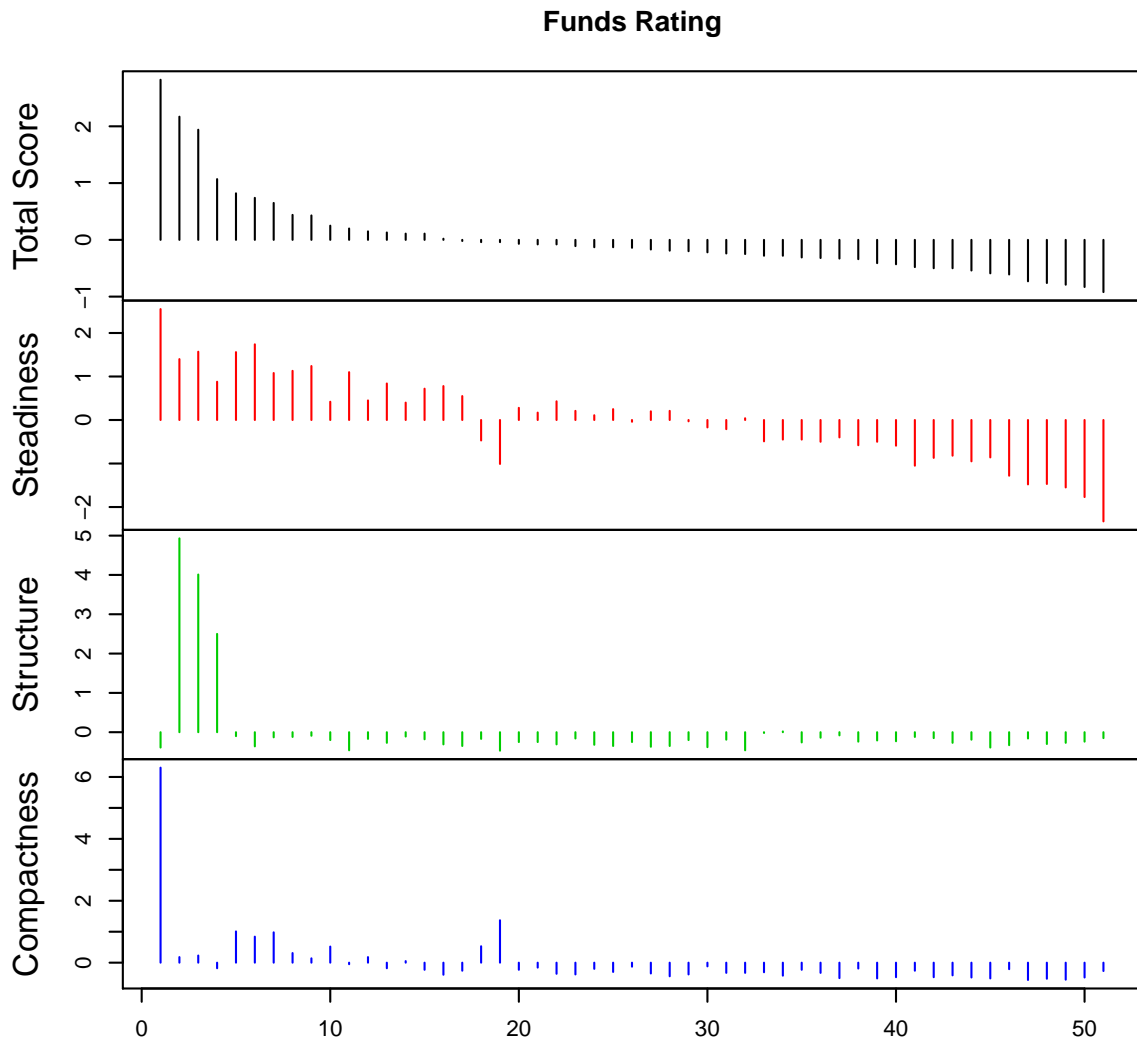
Figure 4: The sorted total scores for all 51 funds. Note the scores are normalised to mean zero and variance one. From top to bottom the total score, the steadiness ratio, the structure ratio, and the compactness ratio. ∎

We have monitored all 51 funds from our peer group. The resulting ratios for the *steadiness*, the *structure* and the *compactness* have been normalized to mean zero and variance one. The means are used as *total scores*. Figure 4 shows the measures in the order of the total scores. Note, *steadiness* is highly correlated to the *total scores*. The reason for this is that steadiness expresses an overall view of high stability. From the structure view we find that only three funds out of the 51 rely on a unique design and managment strategy that have mastered all structural changes and breaks over time even in turbulent market phases. Concerning compactness of the power spectrum we found that 25.5% of the funds show positive values. So structure can be considered to be the strongest individual measure in the proposed rating and ranking process.
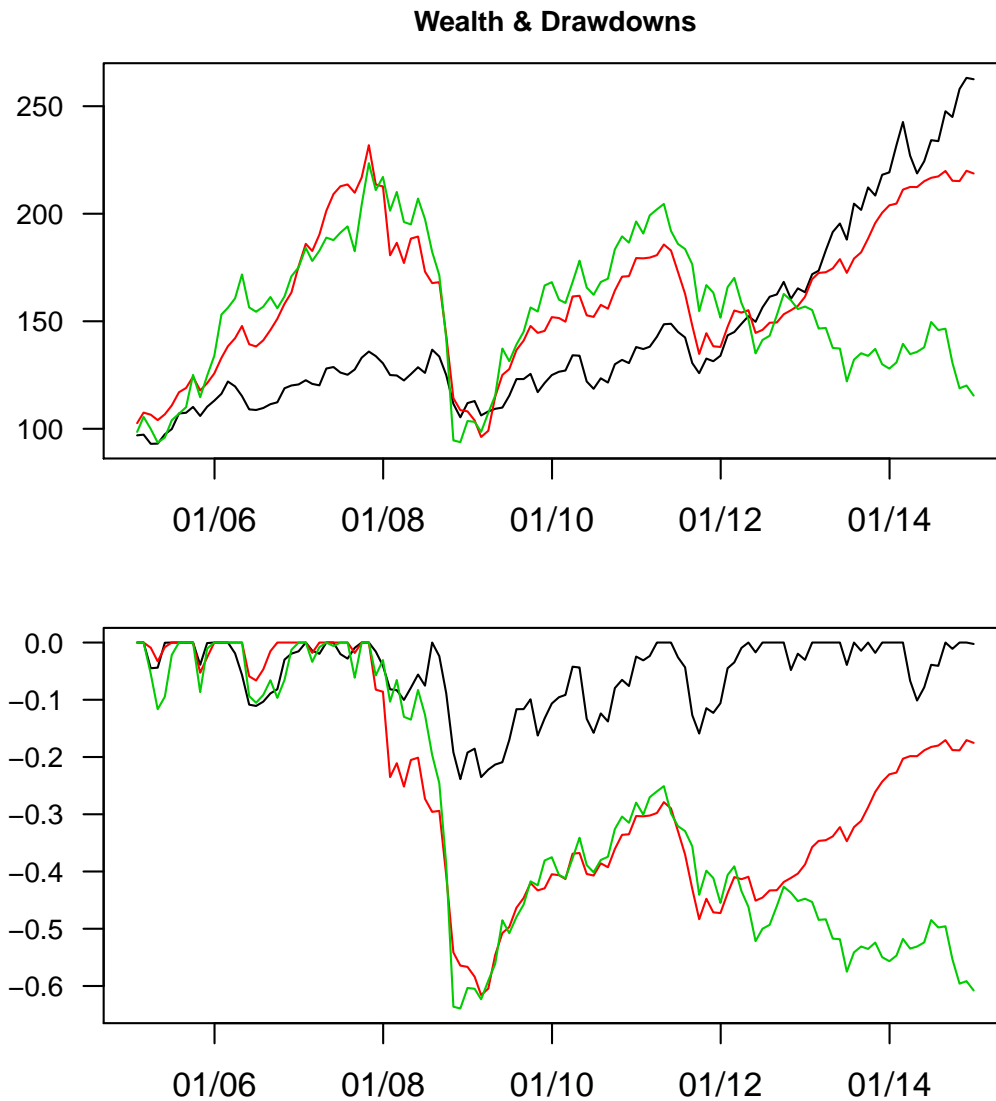
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Wealth & Drawdowns

Figure 5: The wealth (upper chart) and the drawdowns (lower chart) for equal weights portfolios composed from the five highest (black curve), the five lowest (green curve), and the five middle (red curve) ranked funds. ■

The ranking of the funds can be done easily just by ordering the ratings. From the ranking list we have created equal weighted portfolios composed from the five highest, the five lowest, and the five middle ranked funds. Comparing these three portfolios should result in a clear separation concerning performance and risk. This is impressively demonstrated. What we observe in figure 5 is a clear classification for performance and risk. But it is also worth to note that the mid ranked portfolios are as weak as the low rated portfolios when we compare the maximum drawdowns.

We like to investigate how stable are our high and low ranked portfolios. For this we perform a control monitoring. The results are shown in figure 6 for the portfolio of the five highest ranked funds and in figure 7 for the portfolio of the five lowest ranked funds.
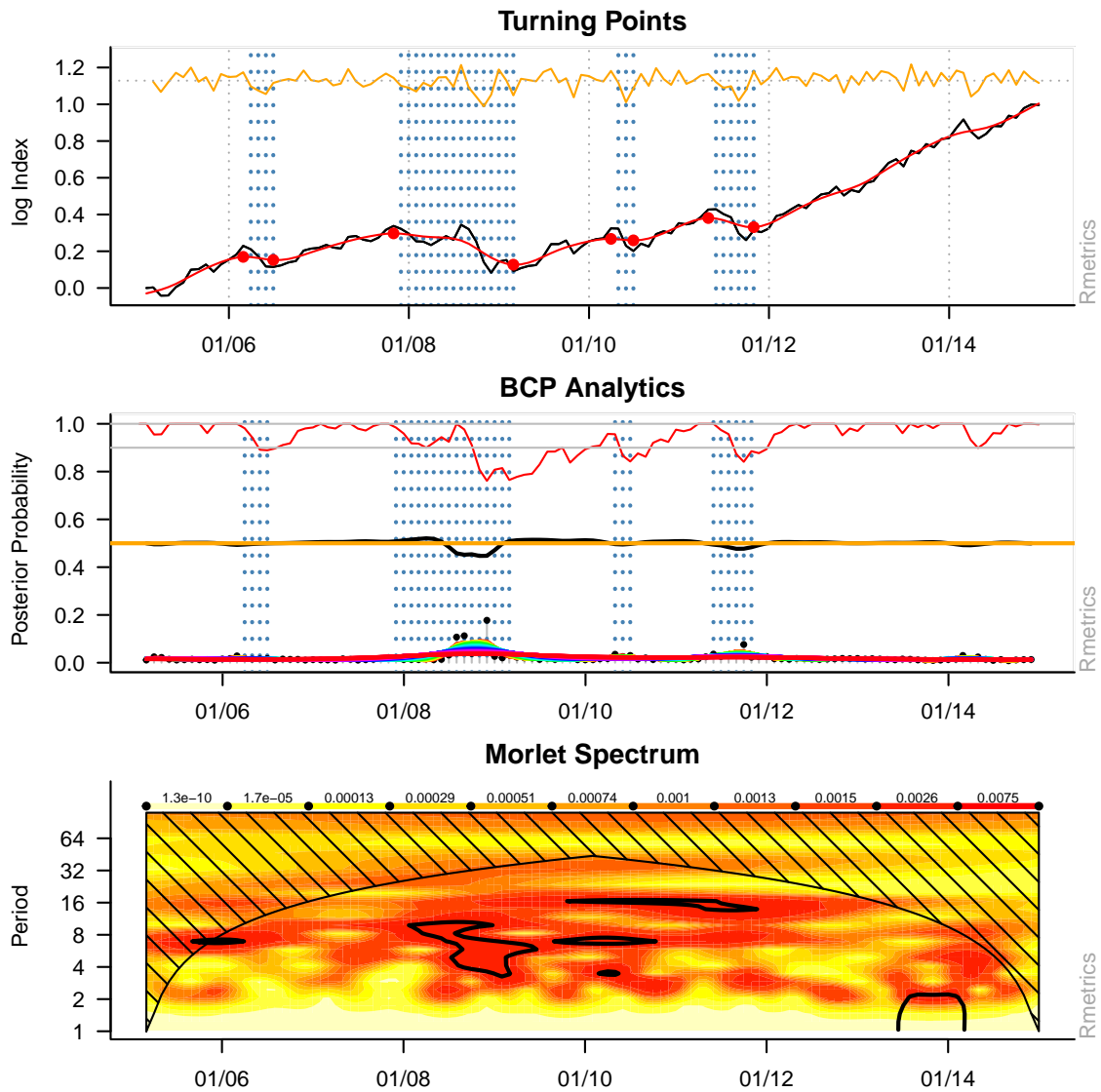
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Turning Points

BCP Analytics

Morlet Spectrum

Figure 6: The charts monitor the equal weighted portfolio composed from the five highest rated funds. ∎

The portfolio composed from high rated funds shows a steady wealth, no structural breaks expressed by a narrow rainbow band, and a very homogenous power spectrum with a large number of isolated islands and low quantile level for the variability.

In contrast, the portfolio composed from low rated funds shows for the *steadiness* of the logarithmic wealth a lower return with a higher tracking error. For the *structure* we get aware of a widened rainbow band about the years 2008/2009 and with an pronounced twiggling indicator. The Morlet wavelet shows a distinctive isolated island that dominates the power spectrum. The associated quantile level is a factor of three larger compared with the value form the high rated portfolio. Putting all together this means an essential improvement for the stability of the high rated portfolio.
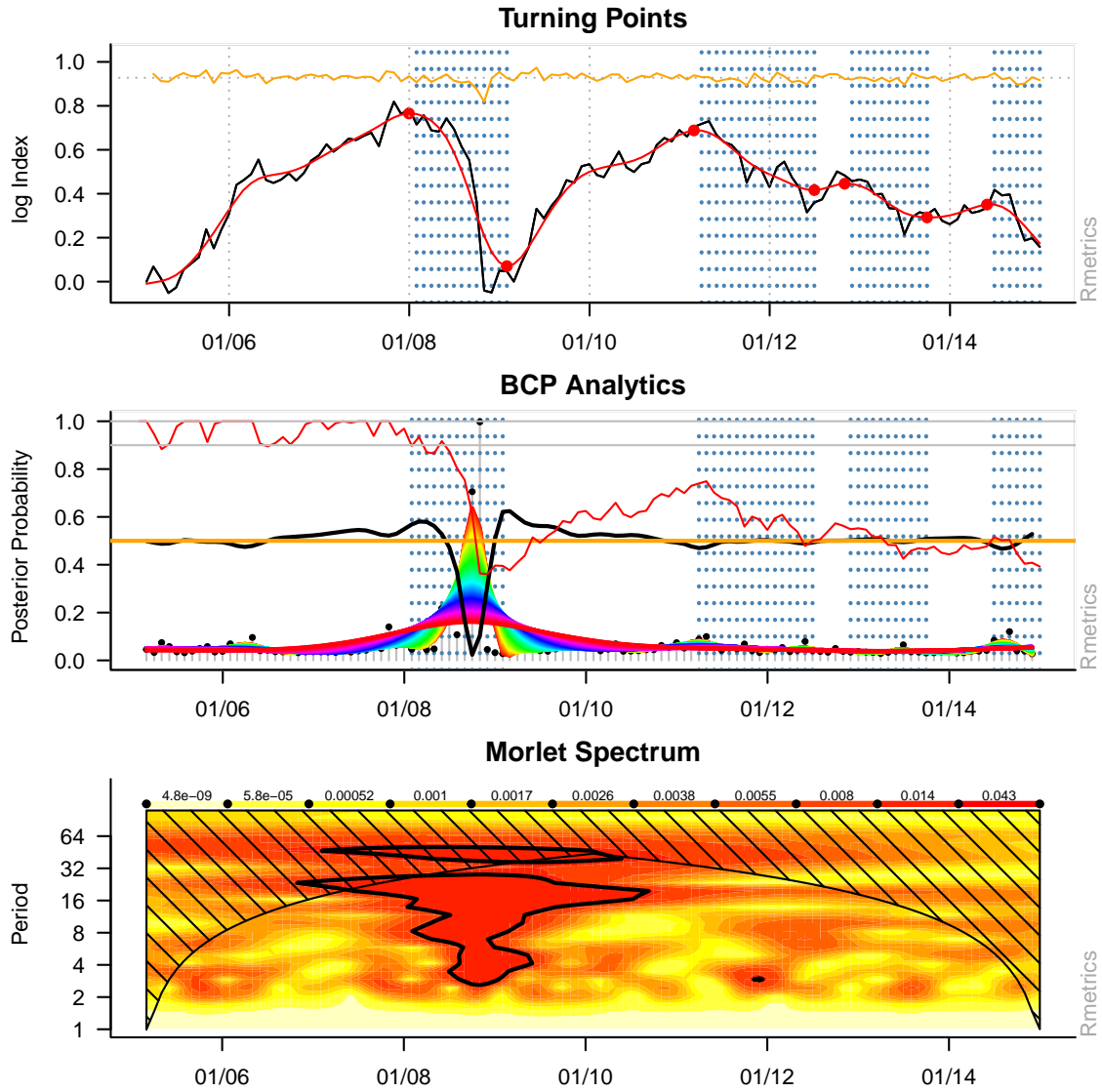
Figure 7: The charts monitor the equal weighted portfolio composed from the five lowest rated funds. ■

3 Summary

In this case study we have demonstrated how to apply the conceptually new stability rating approach to measure and to valuate the stability of funds. However one should be careful in the interpretation of the results. Of course, stability is one of the most important drivers for well performing and low risk funds, but it cannot account for any component of possible vulnerabilities. Our approach is in many aspects complementary to fund ratings provided by leading rating agencies.

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