Performance

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Contents

1 Portfolio Performance Evaluation

So far, we have following evaluation methods:

- Sharpe ratio: $SR = \frac{r^e}{\sigma}$
- Treynor ratio: $T = \frac{r^e}{\beta}$
- Jensen's alpha: $\alpha = r^e - \beta r_m^e$
- Infomation ratio: $IR = \frac{\alpha}{\sigma}$

However the sharpe ratio is hard interpret, so we may need M^2:

$$M^2 = (S - S_m)\sigma_m = r_{p_\sigma}^e - r_m^e$$

with interpreation that the return difference of the portfolio to market with control σ fixed.

Similarly,

$$T^2 = (T - T_m) = r_{p_\beta}^e - r_m^e$$

describe difference between the portfolio and market share the same β.

plug in α, we have

$$T^3 = \frac{\alpha}{\beta}$$

As hedge fund can short, they prefer information ratio. Otherwise, i.e., short is not allowed, we should consider Treynor ratio.

1.1 Other performance measure

As variance can be good or bad, there are various alternative measures of the tradeoff between return and **downside risks**:

1.1.1 Sortino ratio

Suppose we have a most conservative goal for return, this is **Minimun Acceptable Return**(MAR).

Suppose is given by:

$$SOR = \frac{\mathrm{E}\left[r_t - MAR\right]}{\sqrt{\frac{\sum_{t=1}^{T}(r_t - MAR)^2 \chi_{\{r_t < MAR\}}}{T}}}$$

r_f is a default choice of MAR.

1.2 Market timing

Market timing is that we change the weight on market based on our expectation to market. If we may increase ω when market does well and decrease ω as market does badly, the plot of the return against market return look like figure 1

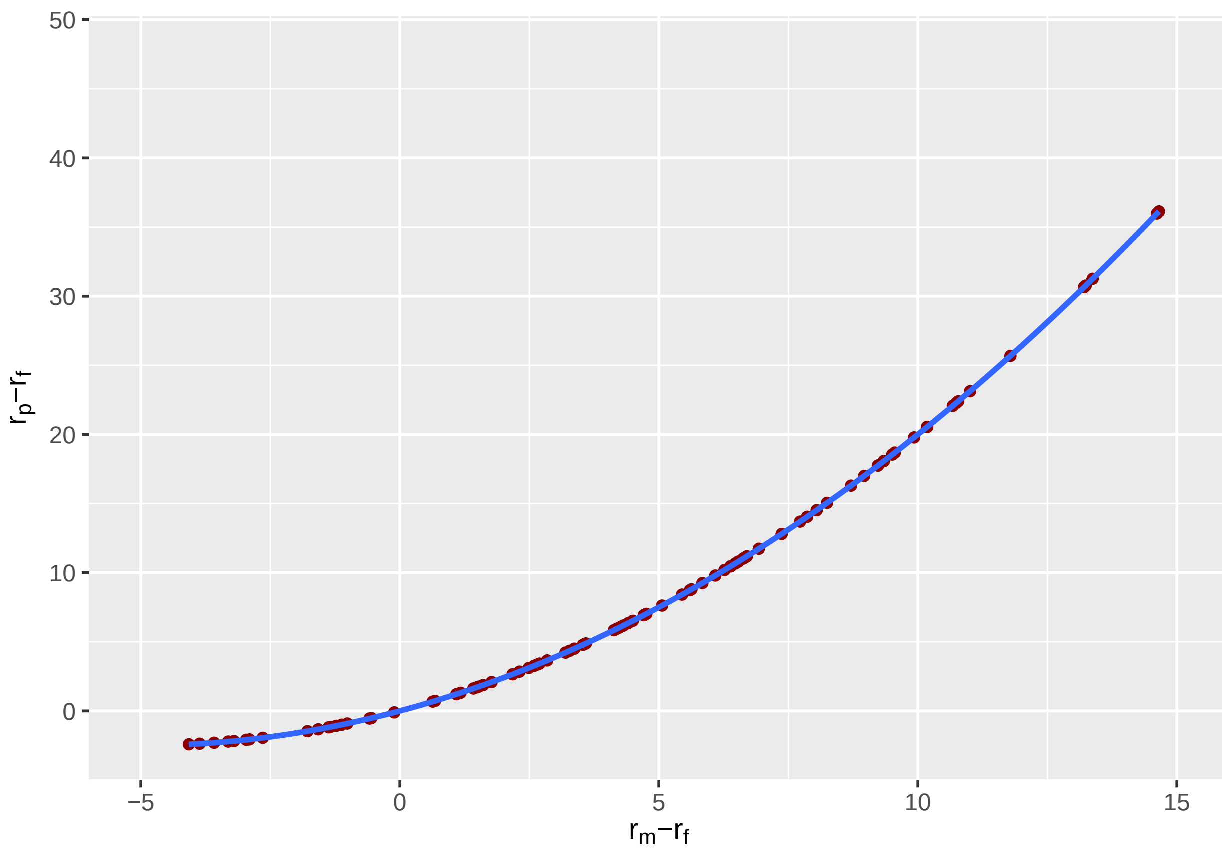

Figure 1: Market timing behavior

Thus we may estimate

$$r_i^e = \alpha + b r_m^e + c {r_m^e}^2 + e_i$$

to determine whether there is a quadratic term or estimate

$$r_i^e = \alpha + br_m^e + cr_m^e \chi_{r_m^e > 0} + e_i$$

to determine whether the slope is different with the sign, that is

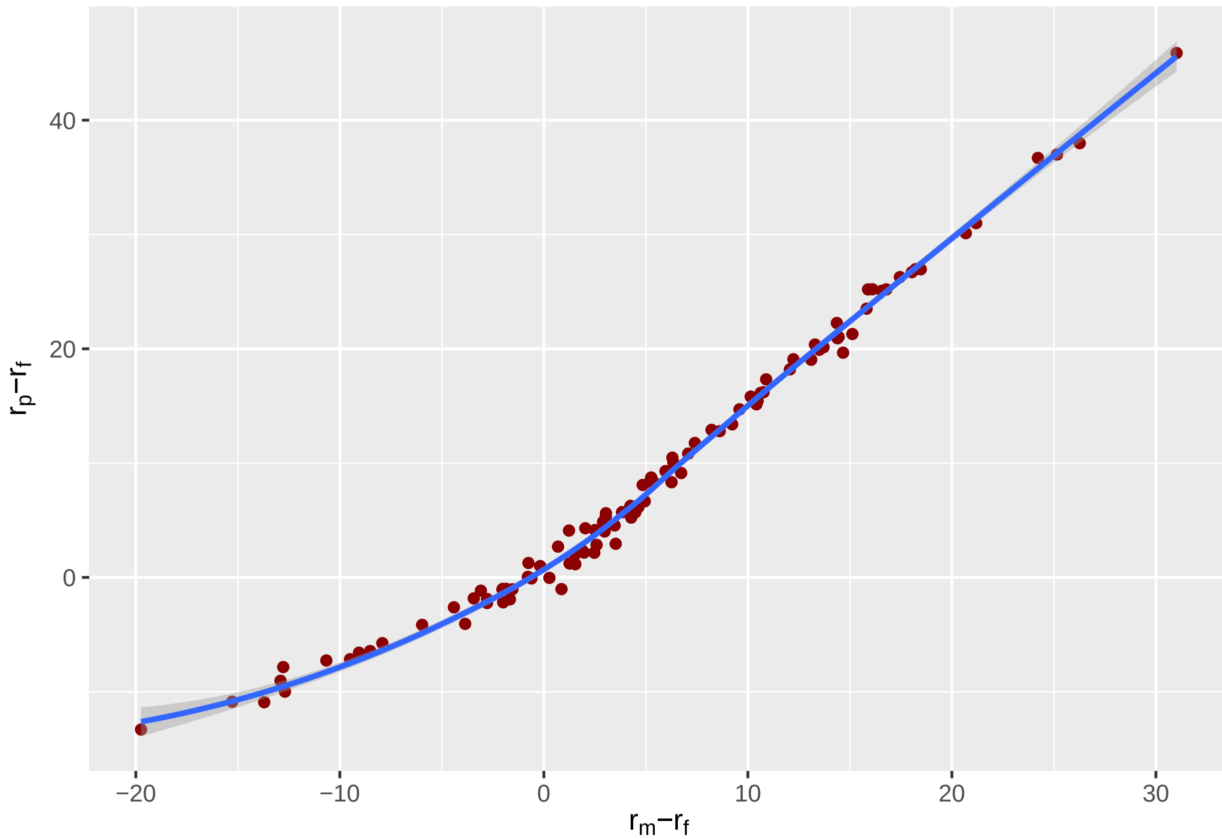

Figure 2: piecewise market timing behavior

Given initial wealth S_0, the value of perfect market timing is equivalent to holding an European call option on market with strike $(1 + r_f)\, S_0$.

Recall the BSM model $C\,(S_0, K, r, T, \sigma)$

$$C = S_0 N(d_1) - Ke^{-rT} N(d_2)$$

where $d_1 = \frac{\log(\frac{S}{K}) + (r + \frac{\sigma^2}{2})T}{\sigma\sqrt{T}}$ and $d_2 = d_1 - \sigma\sqrt{T}$.

- C is incresing in σ
- C is incresing in T
- C is incresing in r