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Computational Investing, Part I

152: The Fundamental Law: Buffet, Simons & Coin flipping

Find out how modern electronic markets work, why stock prices change in the ways they do, and how computation can help our understanding of them. Learn to build algorithms and visualizations to inform investing practice.

Recommended Readings

- ◎ *Grinold & Kahn chapters 5 & 6*
- ◎ *Balch's blog:*
 - <http://augmentedtrader.wordpress.com>
 - *Article about Fundamental Law*
 - *Article about coin flipping*

Observation

- ◎ Jim Simons (rentec) and Warren Buffet (BRK) offer about the same performance.
- ◎ Buffet's portfolio contains few equities:
 - 54% in just 3 stocks (2010)
- ◎ Simons trades actively (100Ks/day?)

Question:

- Can a single theory relate the performance of these two titans?
- Yes, the “Fundamental Law of Active Portfolio Management”

First, Some Preliminaries. Recall:

$$r_p(t) = \underbrace{\beta_p \cdot r_m(t)}_{\text{return due to market}} + \underbrace{\alpha_p(t)}_{\text{residual return}}$$

And

$$r_p(t) = \overset{\text{std dev}}{\beta_p \cdot r_m(t)} + \overset{\text{std dev}}{\alpha_p(t)}$$

market risk residual risk

Information Ratio (IR)

$$IR = \frac{\text{mean}(\alpha_p(t))}{\text{Stddev}(\alpha_p(t))}$$

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← Reward
← Risk

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$$\text{Sharpe Ratio} = \frac{\text{mean}(\text{return})}{\text{Stdddev}(\text{return})}$$

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↖ Reward
 ↖ Risk

Information Coefficient (IC, Skill)

- IC
- Correlation of forecast to actual return
- Remember biased coin?

Breadth (BR)

- BR
- Number of opportunities to execute.
- Number of coin flip bets

The Fundamental Law

$$IR = IC \cdot \sqrt{BR}$$

$$IR = \frac{\text{mean}(\alpha_p(t))}{\text{stddev}(\alpha_p(t))}$$

↖ Reward
↖ Risk

$$\text{Sharpe Ratio} = \frac{\text{mean}(\text{return})}{\text{stddev}(\text{return})}$$

↖ Reward
↖ Risk

The Fundamental Law

$$\text{IR} = IC \cdot \sqrt{BR}$$

↑
performance

$$IR = \frac{\text{mean}(\alpha_p(t))}{\text{stddev}(\alpha_p(t))}$$

↖ Reward
↖ Risk

$$\text{Sharpe Ratio} = \frac{\text{mean}(\text{return})}{\text{stddev}(\text{return})}$$

↖ Reward
↖ Risk

The Fundamental Law

$$\text{IR} = \text{IC} \cdot \sqrt{\text{BR}}$$

Handwritten annotations in red:

- SKILL** with a bracket above **IC**
- performance** with an arrow pointing to **IR**

The Fundamental Law

$$\text{IR} = \overset{\text{Skill}}{\text{I}} \cdot \sqrt{\text{BR}}$$

performance opportunity

Next: An Example