Portfolio Construction

投资组合的构建

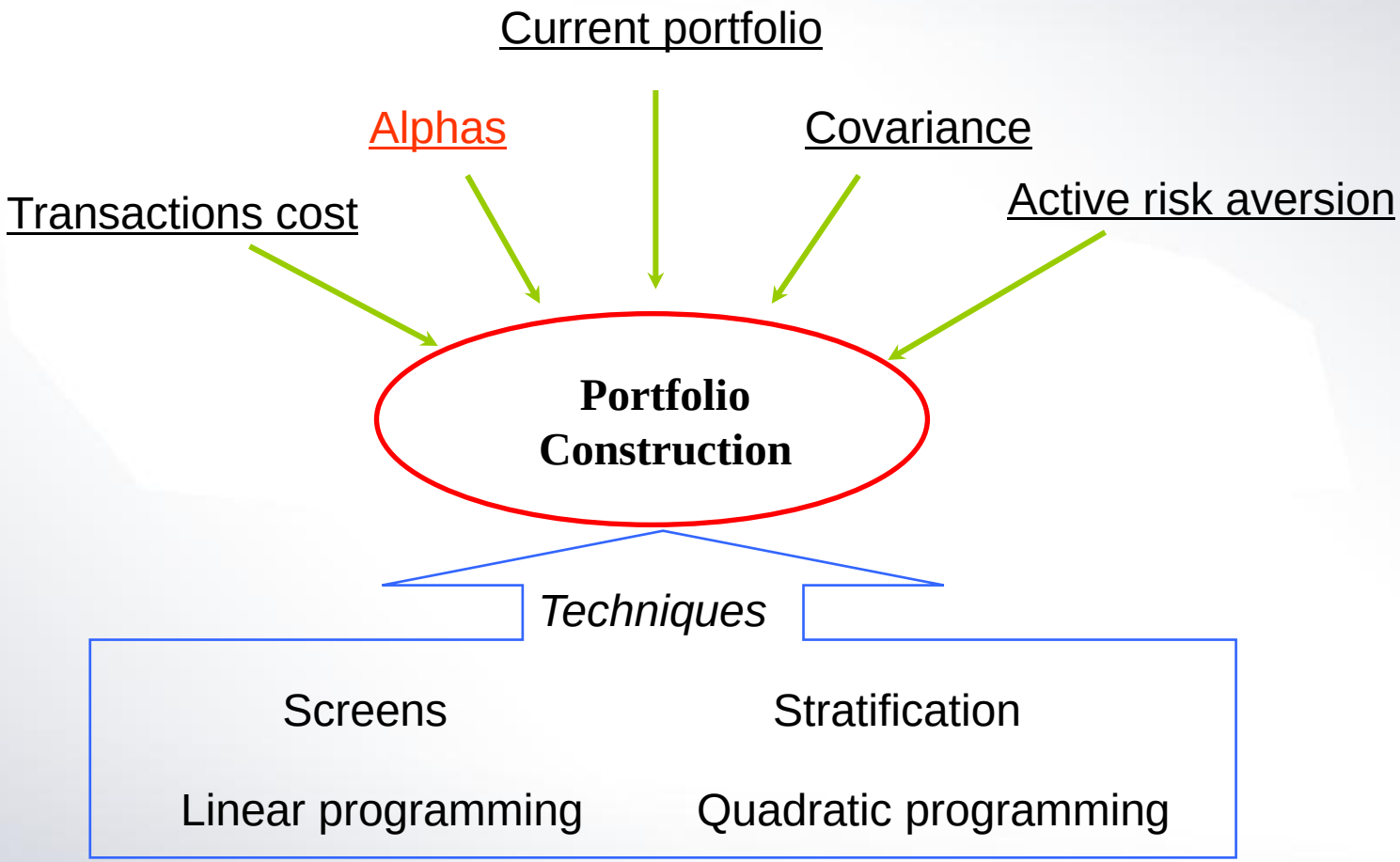
Portfolio Construction (组合构建)

Equity Portfolio Management Strategies

Passive management (被动型管理) is a long-term buy-and-hold strategy and attempts to design a portfolio to replicate the performance of a specific index.

Active management (主动型管理) is an attempt by the manager to outperform, on a risk-adjusted basis, a passive benchmark portfolio.

Inputs to Portfolio Construction Process



Inputs to Portfolio Construction Process

- **Portfolio Utility**:

$$\text{(portfolio alpha)} - \text{(risk aversion)} \times \text{(active risk)}^2 - \text{(transactions costs)}$$

$$\text{risk aversion} = \frac{\text{information ratio}}{2 \times \text{active risk}}$$

For example, assuming that the information ratio is 0.8 and the desired level of active risk is 10%, then the implied level of risk aversion is 0.04. Being able to quantify risk aversion allows the manager to understand a client's utility in a mean-variance framework. Utility can be measured as: excess return – (risk aversion × variance).

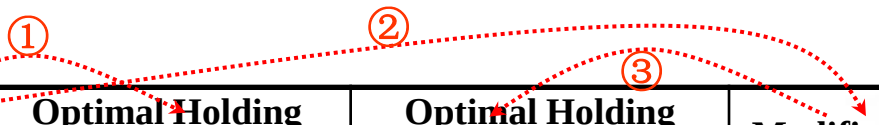
Refining Alphas

- For alphas, the expression is

$$\alpha_i = E(R_i) - \{R_F + \beta_i[E(R_M) - R_F]\}$$

The term $R_F + \beta_i[E(R_M) - R_F]$ measures the return on stock i forecast by the model, and α_i measures the share of additional return.

- **One Example**

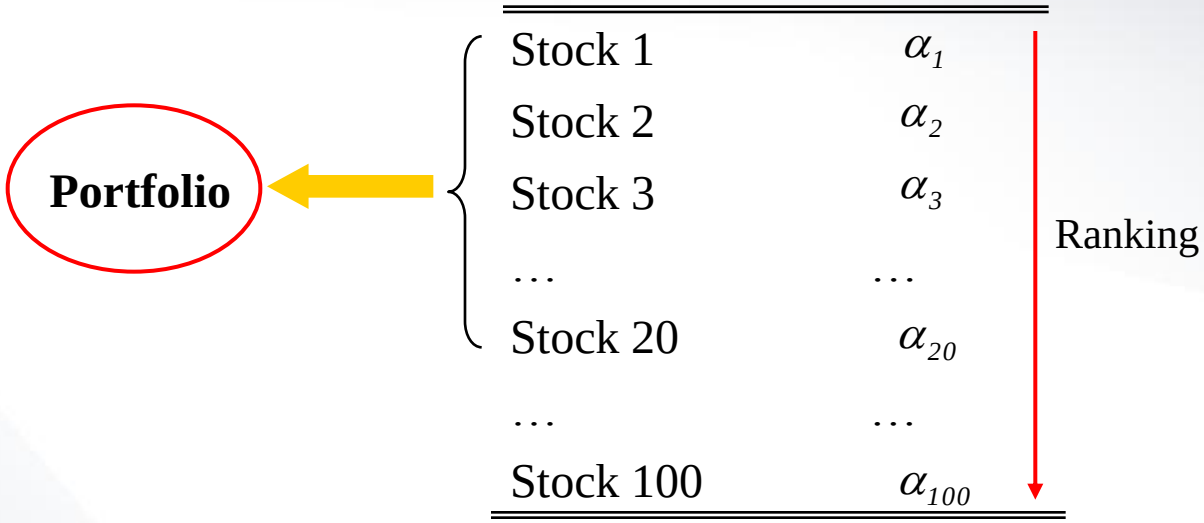


Stock	Alpha	Optimal Holding (unconstrained)	Optimal Holding (constrained)	Modified Alpha
American Express	–3. 44%	–0. 54%	0. 00%	–1. 14%
AT&T	1. 38%	6. 39%	6. 18%	0. 30%
Coca-Cola	–2. 93%	–2. 22%	0. 00%	–0. 78%
Disney	1. 77%	5. 79%	5. 85%	0. 60%
……				
3M	3. 98%	17. 95%	15%	0. 91%
Total		100%	100%	

Constraints: disallow short sales and percentage of one stock less than 15%

Techniques for Portfolio Construction

1. Screens (筛选)



➢ ***Strength***

① Are easy to implement and understand.

② Enhance alphas by concentrating the portfolio in the high-alpha stocks.

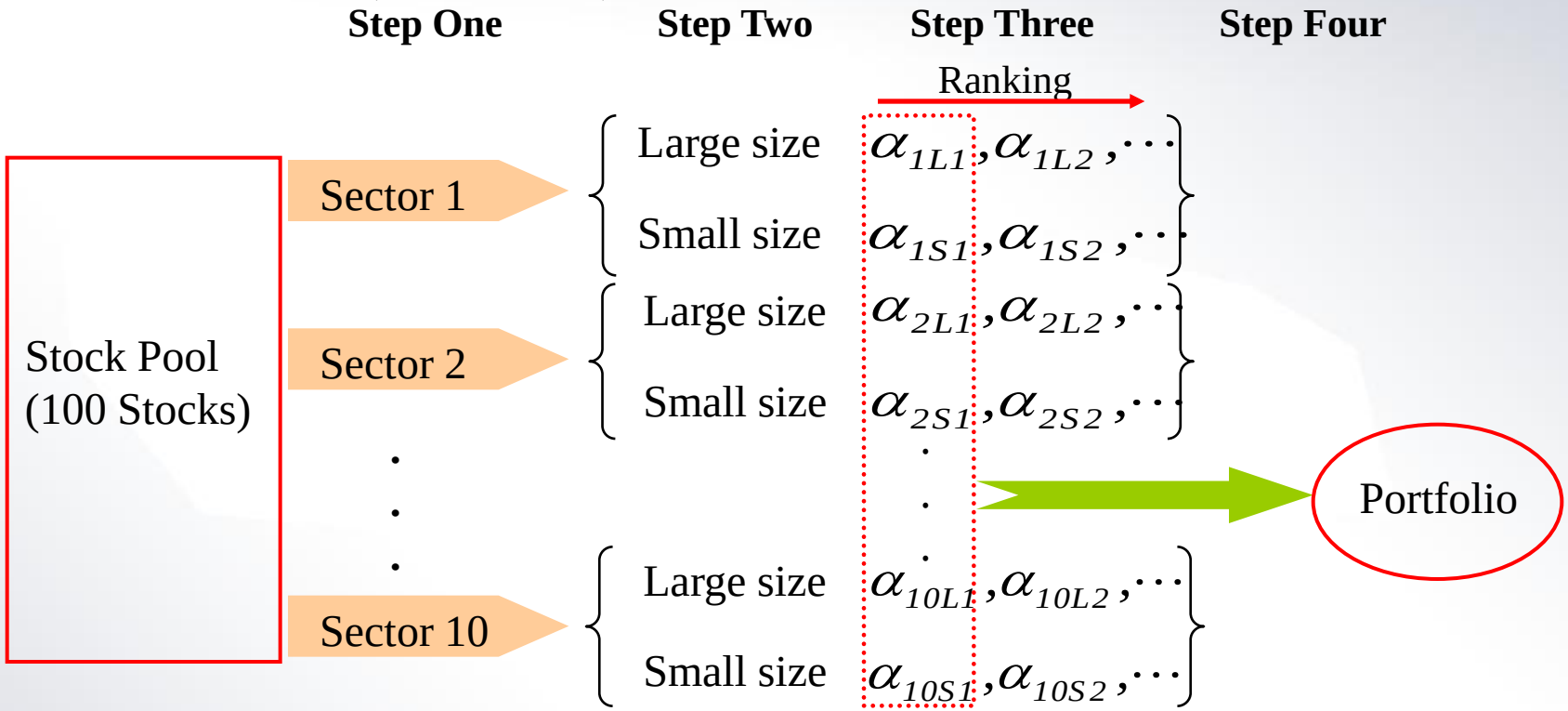
➢ ***Weakness***

① Ignore all information in the alphas apart from the rankings.

② Do not protect against biases in the alphas. If all the utility stocks happen to be low in the alpha rankings, the portfolio will not include any utility stocks.

Techniques for Portfolio Construction

2. Stratification (分层选取法)



- ***Strength***: The stratification scheme has the same benefits as screening. It is somewhat transparent and easy to code.
- ***Weakness***: Stratification retains some of the shortcomings of a screen. It does not consider slightly over-weighting one category and underweighting another.

Techniques for Portfolio Construction

3. Linear Programming (线性规划)

- The linear programming uses a type of stratification based on characteristic such as industry, size, volatility and beta.
- *Strength*: The linear program takes all the information about alpha into account and controls risk by keeping the characteristics of the portfolio close to the characteristics of the benchmark.
- *Weakness*: the result can be very different from the benchmark with respect to the number of assets and some risk characteristics.

4. Quadratic Programming (二次规划)

- The quadratic program explicitly considers each of the three elements: alpha, risk, and transactions costs. (Max: $\alpha_P - \lambda_A \cdot \sigma_p^2 - TC$)
- *Strength*: Since a quadratic program includes a linear program as a special case, it can include all the constraints and limitations one finds in a linear program. This should be the best of all worlds
- *Weakness*: The quadratic program requires a great many more inputs than the other portfolio construction techniques.

Example

1. The most measurable of the inputs into the portfolio construction process is the:

   A. position alphas.

   B. transactions costs.

   C. current portfolio.

   D. active risk aversion.

C The current portfolio is the only input that is directly observable.

Example

2. Which of the following is correct with respect to adjusting the optimal portfolio for portfolio constraints?

A. No reliable method exists.

B. By refining the alphas and then optimizing, it is possible to include constraints of both the investor and the manager.

C. By refining the alphas and then optimizing, it is possible to include constraints of the investor, but not the manager

D. By optimizing and then refining the alphas, it is possible to include constraints of both the investor and the manager.

B The approach of first refining alphas and then optimizing can replace even the most sophisticated portfolio construction process. With this technique both the investor and manager constraints are considered.

Example

3. A manager has forecasts of stocks A, B, and C, but not of stocks D and E. Stocks A, B, and D are in the benchmark portfolio. Stocks C and E are not in the benchmark portfolio. Which of the following are correct concerning specific weights the manager should assign in tracking the benchmark portfolio?

A. $w_C = 0$

B. $w_D = 0$

C. $w_C = (w_A + w_B)/2$

D. $we_C = w_D = w_E$

A The manager should assign a tracking portfolio weight equal to zero for stocks for which there is a forecast but that are not in the benchmark. A weight should be assigned to Stock D, and it should be a function of the alphas of the other assets.

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