
Algorithm 1 End-to-End Quantitative Strategy Backtest

Input: Start/End Date T_{start}, T_{end} , Stock Pool Definition P , Factor Data F , Return Data D_{ret} , Industry Tolerance ϵ , Fee Rate γ

Output: Daily Net Returns R_{net} , Performance Metrics M

// Phase 1: Data Preparation & Alpha Generation

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1:  $D_{status} \leftarrow \text{LoadAndFilterStatus}(P)$ 
2:  $S_{all} \leftarrow \emptyset$ 
3: for year  $y \in \text{Years}(T_{start}, T_{end})$  do
4:   if Cache exists for  $y$  then
5:      $S_y \leftarrow \text{LoadCache}(y)$ 
6:   else
7:      $D_{merged} \leftarrow \text{Merge}(D_{status}[y], F[y])$ 
8:      $S_y \leftarrow \text{CalculateFactorScore}(D_{merged})$ 
9:     SaveCache( $S_y$ )                                     ▷ Apply alpha formula
10:    end if
11:     $S_{all} \leftarrow S_{all} \cup S_y$ 
12:  end for
13:   $D_{full} \leftarrow \text{Merge}(S_{all}, D_{ret})$ 
// Phase 2: Portfolio Construction & Execution (Daily Loop)
14: Initialize Weights  $W_{t=0} \leftarrow \mathbf{0}$ 
15: for day  $t \in [T_{start}, T_{end}]$  do
16:   Step 2.1: Screening & Initial Weighting
17:    $Univ_t \leftarrow \{i \in D_{full}[t] \mid \text{Tradable}_i \wedge \text{NotST}_i \wedge \text{NotIPO}_i\}$ 
18:    $Sel_t \leftarrow \{i \in Univ_t \mid Score_{i,t} \geq 1\}$ 
19:    $w_{i,t} \leftarrow 1/|Sel_t|$  for  $i \in Sel_t$ , else 0                                ▷ Equal weight
20:   Step 2.2: Industry Neutralization (Iterative)
21:   repeat
22:      $R_{curr} \leftarrow \text{CalcIndustryWeights}(W_t)$ 
23:      $R_{tgt} \leftarrow \text{CalcMarketIndustryWeights}(D_{full}[t])$ 
24:     for industry  $k$  do
25:       if  $|R_{curr}[k] - R_{tgt}[k]| > \epsilon$  then
26:          $\alpha \leftarrow (R_{tgt}[k] \pm \epsilon) / R_{curr}[k]$ 
27:          $w_{i,t} \leftarrow w_{i,t} \cdot \alpha$   $\forall i \in \text{Industry}_k$ 
28:       end if
29:     end for
30:     Normalize remaining weights
31:   until Converged or MaxIterations reached
32:   Step 2.3: Untradable Adjustment (Vectorized Logic)
33:    $S_{susp} \leftarrow \{i \mid \text{Suspended}_{i,t}\}$ 
34:   if  $t > 0$  then
35:      $w_{i,t} \leftarrow w_{i,t-1}$   $\forall i \in S_{susp}$                                          ▷ Inherit weight
36:      $W_{locked} \leftarrow \sum_{i \in S_{susp}} w_{i,t}$ 
37:      $w_{j,t} \leftarrow w_{j,t} \cdot (1 - W_{locked})$   $\forall j \notin S_{susp}$                       ▷ Scale tradable
38:   end if
39:   Step 2.4: Performance Calculation
40:    $R_{gross,t} \leftarrow \sum_i w_{i,t} \cdot r_{i,t}$ 
41:    $Turnover_t \leftarrow \frac{1}{2} \sum_i |w_{i,t} - w_{i,t-1}|$                                      ▷ Exact turnover cost
42:    $R_{net,t} \leftarrow R_{gross,t} - Turnover_t \cdot \gamma$ 
43: end for
// Phase 3: Analysis
44:  $M \leftarrow \text{CalculateMetrics}(R_{net})$                                               ▷ Annual Ret, IR, MDD, etc.
45: return  $M$ 
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