Using R for Evaluating Trading Strategies

Patrick Burns
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http://www.burns-stat.com

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Summary

- R is a good thing
- Random portfolios are useful

Backtest Results

Emerging Market Fund

Wealth

1.00 1.10 1.20

1998 1999 2000 2001

11 12 8
Testing Investment Portfolios

- Test if result is better than a guess
- Computers exist
- Implies a random permutation test

A Permutation Test

- An amount of money in each asset (typically including a lot of zeros)
- Permute the amounts among the assets
- Takes at most 6 lines of R

There's a Problem

- Portfolios are not a haphazard collection of assets
- The permuted portfolios are not realistic
- In particular volatility is too large

Typical Constraints

- Non-negative weights (no short selling)
- Weights less than some limit
- Weights within some limit of benchmark weights
- Country constraints (linear)
- Industry constraints (linear)
- Liquidity constraints
Practical Constraints

- Limit turnover
- Limit number of assets traded
- Limit number of assets in portfolio
- Threshold constraints

Random Portfolios

- Sample from the set of portfolios that obey all constraints
- This is non-trivial
- Uses a genetic algorithm typically

So Why is R Still Important?

- Now have a whole pile of portfolios
- Want to step through time in backtests
- Want to graph results

A Valid “Permutation” Test

- Generate a random sample of portfolios that satisfy given constraints
- Compare actual result to distribution from random portfolios
Backtest Results

The Random Paths

Random Quantiles

Whole Period from Random Starts
10-day Non-overlapping p-values