IQIC - Quantitative Tools

#7: Avoiding Backtesting Mistakes

When Backtests Lie

Why historical results can fool you

- **A backtest is a simulation, not reality**. It uses past data and simplified assumptions.
- **You control every choice**, universe, signal, period, rules, so it's easy to accidentally (or intentionally) bias results.
- **Good-looking backtests often fail live**. Sometimes markets change, costs are underestimated, or the strategy was overfitted.
- **The goal is not a perfect backtest**, it's an honest one that you can trust enough to risk real capital.

What a Backtest Is	What It Is Not
A historical simulation	A guarantee of future returns
Based on assumptions	Free of real-world frictions
A research tool	A finished product

Using the Future to Predict the Past

Look-ahead bias

- **Definition:** Using information that was not available at the time of the trade.
- **Example:** Using today's closing price to decide a trade at today's open.
- **Why it happens:** Easy to accidentally include future data in calculations or timing.
- **How to avoid:** Lag all signals by at least one day; trade at next open or close.

Example:

Correct:

- Jan 31 close: Calculate signal using Jan 31 data
- Feb 1 open: Execute trade

Wrong:

- Jan 31 close: Calculate signal AND trade at Jan 31 close (impossible)

Only the Survivors Remain

Survivorship bias

- **Definition:** Using only assets that exist today, ignoring those that disappeared.
- **Example:** Backtesting on today's S&P 500 companies, which excludes companies that went bankrupt or were delisted.
- **Why it matters:** Survivors tend to be winners, so results look better than reality.
- **How to avoid:** Use a point-in-time universe that includes delisted stocks.

Example:

- Today's S&P 500 → only winners
- Historical S&P 500 → includes losers that later delisted

When Your Strategy Fits the Past Too We

Overfitting

- **Definition:** Tuning rules so much that they fit past noise, not real patterns.
- **Example:** Testing many parameter combinations and picking the one with the highest backtest return.
- **Why it's dangerous:** The strategy looks great historically but fails live because the pattern was random.
- **How to avoid:** Keep rules simple; use out-of-sample testing; limit parameter tweaking.

In-Sample Performance	Out-of-Sample Performance
Excellent (e.g., +80%)	Poor (e.g., -5%)

Testing too many strategies

Data snooping

- **Definition:** Testing many strategies and only reporting the best one.
- **Example:** Trying 100 signals, finding one with a great backtest, and ignoring the 99 failures.
- **Why it's misleading:** The best result may be due to chance, not skill.
- **How to avoid:** Pre-register your hypothesis; adjust for multiple testing; report all tests.

Strategy Tested	Backtest Return
Momentum	+5%
Value	+3%
Random 1	+12%
Random 2	-2%
Random 3	+15% ← cherry-picked

Making Your Backtest Credible

A checklist for honesty

- **Use point-in-time data**: avoids survivorship and look-ahead bias.
- **Lag signals and trade after**: no same-bar execution.
- **Keep rules simple**: fewer parameters, less overfitting.
- **Test out-of-sample**: if it only works in-sample, discard.
- **Include costs**: realistic transaction costs and slippage.
- **Report all tests**: don’t hide failures.
- **Sanity check**: does the strategy make economic sense?

Additional Resources

Where to go next

- **"The 7 Deadly Sins of Backtesting": StarQube**
  A 10-minute read covering survivorship bias, look-ahead bias, overfitting, costs, and other mistakes from this set.
- **Backtesting Slides: Portfolio Optimization Book**
  Rigorous academic slide deck (88 pages) with the same "Seven Sins" framework and deeper backtesting methodology.
- **Papers With Backtest Wiki: Advanced Backtesting**
  Hub for exploring backtesting techniques and strategies; good starting point for further research after this course.