BUSI 722

Session 3: Backtesting & QMJ Variables

Kerry Back

The Backtesting Process

Standardizing Returns

- In most situations, it is uncommon to standardize the dependent variable.
- But if we want to pick stocks, we don't need to forecast returns. We just need to forecast ranks.
- So we could rank returns and compute z-scores of ranks each month to form our target variable.

Why Not Cross-Validation?

- With cross-sectional data, we randomly split into train and test sets, or use k-fold cross-validation.
- With time series, **random splits use future data to predict the past**.
- Stock returns exhibit regime changes, trending volatility, and evolving factor premia.
- A model trained on 2020 data and tested on 2015 data would have an unfair advantage.
- We must **always train on the past and test on the future**.

Walk-Forward Validation

Simple train/test split:

- Train on data through date T. Test on data after T.
- Example: train through 2015, test 2016–2025.
- Problem: model is static — never updated with new information.

Walk-forward (rolling window) validation:

1. Train on months 1 through T. Predict month $T + 1$.
2. Train on months 1 through $T + 1$. Predict month $T + 2$.
3. Continue, always training on all available past data.

Each prediction is genuinely **out of sample** — the model has never seen the data it is predicting.

The Backtesting Loop

Each period, repeat the following steps:

1. **Validate:** choose model and hyperparameters using past data only.
2. **Train:** fit the model on the training window.
3. **Predict:** generate predictions for next period's returns.
4. **Form portfolio:** sort or weight stocks based on predictions.

Then advance one period:

- Calculate the portfolio return over the period.
- Add the new data to the training set.
- Return to step 1 and repeat.

Evaluating the Backtest

- Sort stocks into deciles each month based on predicted values.
- Compute the average return of each decile each month.
- We now have return series for 10 portfolios, all constructed out of sample.
- Evaluate: mean return, standard deviation, Sharpe ratio, cumulative performance.
- The spread between the top and bottom deciles measures the **predictive power** of the model.

Quality Minus Junk Variables

Create Quality Minus Junk Variables

- See Session 1 / Quality Minus Junk for link to paper
- See Session 1 / Workflow for procedure to follow
- Important: create all growth rates of ratios or other fundamental variables before merging with returns

https://learn-investments.rice-business.org/capm/
sml-industries