12th Aug

Wednesday, August 12, 2020 1:02 PM

1 Row = Each day
-> Stock doesn't trade every day;
-> Entries copied

Portfolio Optimisation

- $1000 to invest
- Buy lots of a single stock

Sharpe Ratio

In-sample Optimisation

Set of data, find best parameters for data through historical data

Find best portfolio for that period

GOOD (returns)
Good returns (price increase over time)
Percentage change
Relative growth of portfolio

1. Take portfolio value (everyday)
2. Take log of value (relative changes of the logarithm will be corresponding with the relative changes)
3. Take number, take log, increasing by log 2 (in terms of log)
4. More accurate representation of percentage change
5. Hence log returns of portfolio value

ONLY LOG FINAL VALUE

RISK

1. Find log of portfolio, find SD

Balance
Sharpe: Average return (log) / Daily S.D * (365)^1/2
--> Relative return
--> Variabliilty of day to day changes
--> Find a maximum of Sharpe ratio

--> Construct a portfolio before doing any optimization

For multiple stocks:
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Choose some combination and find the Sharpe ratio

Short selling --> Buying negative amounts of stocks

If stocks go up, go buy
If go down, sell (having a negative quantity)
Shorts
-> Borrow stocks
-> Take unit
-> Sells
-> Return units to lender
-> At end of period, buy back
-> Worth if stock price goes down

Shorting
-> Borrow $1 (small fee to borrow)
-> Down to $0.5
-> Reurn lender of $1

(some values are missing due to it not existing)

BUY AND HOLD
1993 - 1998
Combination of 3 stocks, apply static weights, see how much change

- What are the best collection of three stocks
- Best collection of weights
- Go investigate optimization routines
- Generate lots of portfolios

- Optimisation routines
    - Blackbox, no parameters, input is three numbers, output is one number, find best inputs.
- Newton's method

Dynamic:

- Adjust holdings to each stock to particular proportions
- "exactly 50% of total wealth in each" (constant proportion)
- Changes inputs and outputs of everyday
- Positive proportions

Machine learning:

- Examine historical performance
    - Increases and decreases, adjust weights accordingly
        - Proportion of wealth to be invested is CONSTANT* Relative_change
- Take input of neural network as recent performance, use neural network to find best weights
    - Ensure inputs are in the right form
- More involved; ML is function of inputs

TASK

Find the best possible method for profit for a period of time for a particular measure of performance

- **Best triple + weights which maximize Sharpe ratio**
- **List table of best performing strategies**

- **Graphically**

Risk

Value-at-risk (VAR):

- Measure of lower quantile of period performance
- Callculate daily log returns
- Find worst possible case (95% VAR, lower 2.5% of quantile)
- Sort from worst to best, what is the 2.5%
- Provides a figure of lower 5%
- (ABS?)

Expected shortfall:

- Averaging losses of lower quantile
- Take daily performances, take worst 5%, average.

Efficent frontiier

- Take tangent

- From portfolio, invest 100% of wealth
- Treating savings account as an additional option (interest rate)

Out of sample tests:
Optimise over one period, try again for different period
Relative to other strategies

Most strategies overfit; to counter balance, look for trading volume sectors, profit /loss, (not available)

Regularisation parameters, training set, verification set,

Value at risk
5th percentile worst
(only shows quantile, not worst possible case)

Expected shortfall: (aveage value at risk)
Return against |VAR|