Scribe Notes: 4/23 Lecture

Review of last class:

R Script: Two possible asset allocations/portfolios

1. SPY 50% stocks, VNQ 50% RE

2. Commodities, TLT (gov't bonds)

Goal: Want to test redistribution/volatility of return on the portfolio's

R SCRIPT: Diversification.R, Portfolio.R

DBC: commodities, trading funds(oil etc)

ETF: Ex- change traded fund, can buy and sell shares on open market

LQD: Long term corporate bonds

VNQ: Real Estate

class studies performance of portfolio's using R

ONE DAY AT A TIME: For loop, bootstrap resampling- Monte Carlo Simulation

Output of Histogram: distribution of possible returns for one year

Lecture

Steps of For Loop

a. Can I do this for one day?

b. Today's performance sets the stage for tomorrow's grading.

How? Bootstrap Resampling

- Pretend that the past is broadly indicative of the statistical character of what we expect from the future
- Fake complicated mathematical structures that would otherwise be difficult to simulate
- Go to past, simulate one whole day of metrics of portfolio
- Do this 250 times, and link these 250 days to predict future days' trading
  1. Compute returns
  2. Loop an entire trading year
  3. Change weights of stocks to (.5,0,0,0,.5)
  4. Do simulation 100 times
  5. Difference in histograms of both portfoilio's

     VNQ/SPY: high expected return (gain 10%), but huge spread-risky (3 times as high as second portfolio)

     DBC/TLT: lower expected return, less spread-less risky

DBC/TLT

1. Change weights to (0,.5,0,.5,0)
2. Run again to see returns (same as before)

Benefits of Diversification:

For stocks and Real estate, they are highly correlated.

a. Bad day, really bad while good days are really good which produces very large swing (risk)

Commodities and bonds are negatively correlated with each other

a. Risks cancel each other out, never get really bad days

What's important is the diversification of assets- this simulation allows us to see that.

Risk Premium: extra amount of return that investors expect to be compensated for when they take a risk

Inverse relationship between expected return and risk premium.

Capstone Homework:

Kelly's Rule: If you have a log utility function "whatever edge you have, the amount you want to be is in direct proportion to the edge you have."- seems aggressive

Problem 2 on past homework:

a. R script: currentwealth =1000, rounds=10000, frac=0.1

With this betting strategy, you are guaranteed to go broke.

Inputting more rounds, there is a less change of going broke.

Question: How can it be that when I have a bet with a small edge, and you're only betting 10% of your wealth?

Answer: Losing streaks,

Is 10% of my wealth too much? We will try 0.5% of my wealth.

= .5% of wealth, make more money and lower risk.

Counterintuitive: Accepting lower expected return on any given betting term, you (probably) will earn more return in the long-run.

Question: What percent of my wealth should I bet? (optimal fraction of my wealth should I bet)

Kelly criterion:

Win→ (w + fw) where w equals current wealth and f equals fraction of wealth bet, with probability p

Lose→ (w – fw) with probability 1- p

$E(u(k)) = p \log (w + fw)$

$U(x) = \log (x) + (1 - p) \log(w - fw)$

Derivative of log of $f(x) = f'(x)/f(x)$

$d/df\ E(u(k)) = P * w/(w + fw) + (1 - P) * (-w/w-fw)$

$= p (1/1 + f) + (1 - p) *(-1/1 - f) = 0$

F $= p - (1-p) = 2p-1$ therefore, optimal wealth optimization is 4%

In R Script, Frac= .4 and run histogram

Kelly rule is known as an extremely aggressive betting strategy. Many people use fractional Kelly strategies- if Kelly says bet half of wealth, I'll bet a fourth of my wealth-→ because strategy works, just large fractions are more risky (aggressive)

Professor Scott's story about losing half of wealth