Midterm Review

Ec 70 Section 8

Roadmap

Question 1 of Midterm Exam 2022

Question 1 of Practice Midterm Exam

Question 4 of Practice Midterm Exam

Question 6 of Practice Midterm Exam

Question 1 of Midterm Exam 2022

Diversification with Mutual Funds

During the AI boom of the late 2020s, many new AI companies are taken public and start trading on the stock exchange. You consider investing in one, but do not have any special information about any particular company's prospects. Your research suggests that each AI company has an expected return of 8% with a standard deviation of 60companies have the same correlation with one another. You compare AI stock investments with a safe money market fund that pays 2%.

The Sharpe ratio or risk-reward ratio for a risky asset is defined as the difference between the expected return on the risky asset and the safe return, divided by the standard deviation of the return on the risky asset.

Diversification with Mutual Funds

a) What is the Sharpe ratio for a single AI stock? (Answer format: 0.xx.)

Diversification with Mutual Funds

You discover a mutual fund that buys a highly diversified portfolio of AI stocks. The fund has a standard deviation of return of 15

b) What is the expected return on the fund? (Answer format: xx%.)

Diversification with Mutual Funds

c) What is the Sharpe ratio of the fund? (Answer format: 0.xx.)

Diversification with Mutual Funds

For the purpose of this question, you can assume that the fund holds so many stocks that the variance of the fund's return equals the variance of an individual stock's return times the correlation of the individual stock returns with one another. (This is a formula stated in words!)

d) What is the correlation of the individual AI stock returns with one another? (Answer format: 0.xx.)

Diversification with Mutual Funds

In the early 2030s, the AI boom slows and the individual AI stocks become less volatile as they mature. Your research suggests that each AI stock now has a lower standard deviation of 40%. However the mutual fund now has a higher standard deviation of 20%, despite the fact that each stock it holds is safer.

e) What must the correlation of individual AI stock returns now be to reconcile these facts? (Answer format: 0.xx.)

Diversification with Mutual Funds

f) Comment briefly on what economic factors in the 2030s might have led the correlation of individual AI stock returns to change in the way you described in part e)

Diversification with Mutual Funds

g) It is sometimes argued that high-risk investing is justified if you want a high return, and are willing to take risk, but cannot do it using leverage. Given the assumptions made in this question, can this argument be used to justify buying a single AI stock rather than the mutual fund? Why or why not?

Diversification with Mutual Funds

h) If you can invest in other asset classes besides AI stocks, do you expect to be able to increase your Sharpe ratio above the level that is available from the AI mutual fund? Why or why not?

Question 1 of Practice Midterm Exam

Short Calculations

a) A high-yield bond fund has a stated yield which is 2% higher than the yield on a US Treasury bond fund of the same maturity. You estimate that the high-yield fund contains bonds issued by companies which have a 2.5% probability of default, and that in the event of default bondholders will recover 50% of the value of their bonds. Given these estimates, what is the expected excess return on the high-yield bond fund over the Treasury bond fund?

Short Calculations

b) Suppose a very large number of stocks are available, each of which has variance of return V and correlation ρ with each other stock. A mutual fund can reduce its variance to ρV by holding a diversified portfolio of all these stocks. If each stock in the market has a standard deviation of 40%, and a correlation of 0.2 with every other stock, what is the standard deviation of the diversified mutual fund?

Question 4 of Practice Midterm Exam

Bayes' Law

Bayes' Law says that if there are two events A and B, then:

$$Pr(A|B) = Pr(B|A) \times \frac{Pr(A)}{Pr(B)}$$

Bayes' Law

a) What name is used for probabilities like $Pr(A|B)$ and $Pr(B|A)$? What name is used for probabilities like $Pr(A)$ and $Pr(B)$?

Bayes' Law

b) Give an example where A and B can each take two possible values. (If you like, you can repeat the example used in class where A is sick or healthy, and B is a positive or negative test result.) Illustrate your example with a table of numerical values.

Bayes' Law

c) Base rate neglect is a generally mistaken way of thinking that gives a different expression for $Pr(A|B)$. What is that expression?

Bayes' Law

d) There is one special case where base rate neglect is consistent with Bayes' Law and therefore is not mistaken. What is that special case?

Bayes' Law

e) Give an example of base rate neglect in personal finance. You can state your example in words without giving a table of numerical values. Extra credit: If possible, show how a business can exploit people with the type of base rate neglect that you describe.

Question 6 of Practice Midterm Exam

Returns and Luck

You are evaluating a new asset class, Kryptocurrencies (not necessarily the same as real- world cryptocurrencies!) In recent years Kryptocurrencies have performed well, delivering an average real return of 10% per year, but they are also extremely volatile with a standard deviation of 25% per year. A rule of

thumb is that if the ratio of the K-year mean to the K-year standard deviation of an asset is greater than two, then the probability that the true mean is zero is less than 5How many years long does the Kryptocurrency track record have to be to give you this degree of confidence that the high observed return to Kryptocurrencies is not just the result of luck?