**Economics 70, Personal Finance:**
**Making Better Decisions and Building a Better Financial System**

**Final exam, Thursday December 1, 2022**

**Do all four questions and do not spend too much time on any one question. The last question allows you to choose four out of five topics to explain.**

**You may use a physical calculator but should not use a smartphone or any other tools or materials.**

**When answering numerical questions, be sure to show your working to make it possible to get partial credit for partially correct calculations.**

## 1. Rolling over a traditional IRA to a Roth IRA (25 points)

You have a traditional IRA with $50,000 from past contributions and capital income that you have earned in the account. This year you have unusually low income because you are between jobs, so you estimate that your tax rate is 15%. You expect that in retirement, your tax rate will be 25%. You plan to retire in 15 years, and at that time you plan to withdraw the money in the IRA and consume the proceeds. Over the next 15 years you expect to earn 6% per year on the assets in the IRA. You do not plan to make further contributions to the IRA during this 10-year period.

You learn that you have the right to convert your traditional IRA to a Roth IRA. If you do this, you pay tax on the total value of the traditional IRA today, but then invest your remaining funds free of taxation on future capital income and any future withdrawals.

a) If you keep your traditional IRA, how much can you consume in 15 years when you withdraw the funds? (State your answer to the nearest dollar.)

b) If you convert your traditional IRA to a Roth IRA, how much tax do you have to pay this year, and how much can you invest in the Roth IRA? (State your answers to the nearest dollar.)

c) If you convert your traditional IRA to a Roth IRA, how much can you consume in 15 years when you withdraw the funds? (State your answer to the nearest dollar.)

d) Comment on any difference between your answers in parts a) and c). Be sure to explain which features of this example are responsible for any difference.

e) Are there any other reasons besides a difference in income that might lead you to expect a different tax rate in 15 years than now?

## 2. Choosing too low an insurance deductible (25 points)

Sydnor's article "Overinsuring Modest Risks" reports data on people who select a low $500 deductible rather than a standard $1,000 deductible on an auto insurance policy. The data show that when they make a claim, the low-deductible purchasers save an average of $469.86 from having the low deductible.

a) Why is the average amount saved not exactly $500?

b) The data also show that on average, low-deductible purchasers only make claims 4.3% of the time, and they pay an extra $99.86 per year for having the low deductible. Sydnor uses these facts to show that the expected benefit of a low deductible is much less than the cost. Explain his calculation, stating the expected benefit and the cost and the difference between them. (You are being asked for three numbers. Each number should have the format $xx.xx, in other words to the nearest penny.)

To calculate the expected benefit, use the formula for expectation, aka mean, presented in section:

$$E[x] = \sum_{x} Prob(x) \cdot x$$

c) Does your calculation in part b) imply that auto insurance companies make high profits from selling low-deductible insurance policies? Why or why not?

d) How high would the claim probability have to be to make the expected benefit of a low-deductible policy equal to the cost? The relevant formula is the same as in part b). (Your answer format should be y.y%.)

e) Suppose that personal finance professors begin to persuade insurance buyers to avoid low-deductible policies unless they have an expected benefit at least equal to their cost. Suppose there are some risky drivers with high claim probabilities, and other safer drivers with low claim probabilities, and all drivers know their own claim probabilities. What do you expect will happen to the price of low-deductible insurance policies as the personal finance professors spread their message? What will happen to the break-even claim probability you calculated in part d)?

f) What name is used in finance to describe the underlying mechanism of part e)? What name is used to describe the change in the insurance market you describe in part e)?

g) Choosing a low-deductible insurance policy is sometimes a simple mistake resulting from misunderstanding, but some people may do it deliberately even though they understand that the expected benefit is substantially less than the cost. Explain why.

## 3. Investing in real estate (30 points)

You are offered an opportunity to participate in a fund that invests in multiple real estate properties in Phoenix, AZ. You can invest as much or as little money as you'd like. You don't know the Phoenix real estate market, but the brochure tells you the average return since the fund launched three years ago has been 10.9% per year after fees, with no negative returns. The brochure says this is achieved because land is safer than equities – which the brochure claims are just "money on paper".

Having taken Econ 70, you decide to investigate further. You find online data showing that an index of Phoenix real estate returns (including price appreciation and rent) has gained 12.9% per year over the last three years, and 6.1% per year over the last ten years. The same online data source tells you that an index of national real estate returns (averaging across many US cities) has gained 7.2% per year over the last three years, and 5.3% per year over the last ten years.

a) Using the information above, what seems to be the fee that the fund charges its investors? (You can assume that the fund is well diversified in Phoenix real estate so that its before-fee return is comparable to the Phoenix real estate index. You answer format should be x.x%.)

b) Your online research shows that Phoenix real estate has done well relative to most other US cities. Given this fact, state a reason why the real estate company's marketing department has chosen to offer a Phoenix fund to investors rather than a fund investing in some other US city. (Note: you are **not** being asked to explain why Phoenix real estate has done well. Hint: think about the parallel between the marketing of real estate funds and the marketing of mutual funds and ETFs.)

c) State a reason why you might prefer to use a ten-year historical average return rather than a three-year average historical return to estimate the return you will receive in the future if you invest in the fund.

d) State a reason why you might prefer to use a national average historical return rather than the Phoenix historical return to estimate the future return on Phoenix real estate.

e) Using your answers to parts a), c), and d) above, write down your estimate of the return that investors in the Phoenix fund will receive in the future, after fees. (Note: this should be different from just the average return to the index of Phoenix real estate. Your answer format should be x.x%. Show your working by listing all the components of the calculation to be sure of getting partial credit!)

f) Your online data source estimates the standard deviation of Phoenix real estate returns over the last ten years at 6.8% per year. The safe interest rate is 1.5%. Using your answer to part e), what do you estimate to be the Sharpe ratio, after fees, on the Phoenix fund you are being offered? (Your answer format should be 0.yy. Show your working to be sure of getting partial credit!)

g) Having done these calculations, you start talking to your relatives about the opportunity. Your uncle tells you that the fund must be a bad investment since anyone can go and buy a property in Phoenix and get the same return on average, without paying the fund managers. Thinking of diversification **and** some of the points we made about buying a home, why could your uncle be wrong?

h) The points above notwithstanding, your aunt reminds you that when you take out a mortgage on one property you have leverage, so you may be able to earn a higher expected return than the fund. Explain her reasoning.

i) Your cousin reviews your calculation in part f) and says that since your estimated Sharpe ratio is slightly lower than the Sharpe ratio of the S&P 500 stock index, there is no point in buying any of the fund when you can just invest in the S&P. Do you agree? Why or why not?

**4. Short explanations (20 points)**

**Choose four of the following five topics. For each one you choose, write a paragraph at most. Be sure to follow the instructions carefully to keep your answer relevant.**

a) The APR on a payday loan depends on how many days before your next paydate you take out the loan. Why? Explain verbally, or show a formula or numerical example.

b) Cryptocurrency exchanges have been compared to unregulated banks. Explain the comparison, with particular attention to the ways in which these institutions can fail.

c) A structured product with upside potential and a money-back guarantee may be sold as a "sure thing". Explain why this characterization is misleading, and specifically why the structured product can underperform a safe investment strategy.

d) Target date funds invest aggressively in equities when investors are young adults, and more cautiously as investors approach retirement. Explain the rationale for this change in asset allocation over the life cycle. In your answer, refer to time diversification, labor income, or both.

e) Closing costs for a home purchase are surprisingly high. Of the following, what fraction of mortgage principal do these costs typically represent: 0-1%, 1-2%, 2-5%, 5-7%, 7%-10%. What are some of the contributors to these costs?