Exam #1 (80 Points Total) Answer Key

1. A pharmaceutical company comes out with a new pill that prevents baldness. When asked why the drug costs so much, the company spokesman replies that the company needs to recoup the $10 billion it spent on research and development.

   (a) (5 points) Do you believe the spokesman's explanation? Yes No (Circle one and explain briefly.)

   (b) (5 points)

   If you said "Yes" above: Do you think the company would have charged less for the drug if it had discovered it after spending only $5 million instead of $10 billion? Yes No (Circle one and explain briefly.)

   If you said "No" above: What alternative explanation might help explain why the drug company charges so much for its pill?

   You should not believe the spokesman's explanation because the R&D expenditure is a sunk cost. If it spent twice as much or half as much to discover the drug, it should still charge the same price, because that's the price that maximizes profit. And that's the alternative explanation for why the drug company charges such a high price: that's the price that maximizes profit.

2. (5 points) Explain (as if to a non-economist) the phrases "fish are capital," "trees are capital," and/or "oil is capital," or otherwise explain the importance of the interest rate at the Bank of America in management decisions regarding natural resources such as fish, trees, and oil.

   To maximize your present value you need to compare the return you'll get from "investing in the fish" (or the trees, or the oil) with the return you'll get from investing in the bank. Investing in the bank means catching the fish, cutting down the trees, or selling the oil and putting the proceeds in the bank. Investing in the fish means letting the fish grow and reproduce so there will be more fish next year; investing in the trees means letting the trees grow so there will be more lumber next year; investing in the oil means keeping the oil in the hopes that the price will go up next year.

3. Although many services are provided on a fee-up-front basis (for example, you pay before you enter the movie theater), some services are provided on the "honor system". Parking meters are one example: instead of paying someone when you park your car, you are "on your honor" to put money in the meter. (Some cities also do this with their public transportation systems.) Of course, it isn't just a matter of honor: there are also enforcement officers ("meter maids") who show up from time to time and penalize rule-breakers. So:

(a) (5 points) If you "risk it" by putting nothing in the meter, there's an 80% chance that you'll get away with it (so your cost will be \$0) and a 20% chance that you'll get a \$20 ticket. What is the expected cost of taking this risky option?

The expected cost is $(.80)(0) + (.20)(\$20) = \$4$.

(b) (5 points) If the "safe option" is to put \$3 in the meter, can you say for sure whether a risk-neutral individual will risk it or to play it safe? (Circle one: Risk it Play it safe Can't say for sure) Can you say for sure what a risk-averse individual will do? (Circle one: Risk it Play it safe Can't say for sure) What about a risk-loving individual? (Circle one: Risk it Play it safe Can't say for sure) (*Hint:* Recall that risk-averse individuals avoid fair bets, that risk-loving individuals accept fair bets, and that risk-neutral individuals are indifferent towards fair bets.)

Since the safe option has a lower expected cost (\$3 instead of \$4), a risk-neutral individual will choose to play it safe. Since risk-averse individuals don't take fair bets, they will also play it safe. But we can't say for sure about risk-loving individuals because it depends on how much they like risk.

(c) (5 points) Imagine that the City of Seattle wants to save money by cutting in half the number of enforcement officers (so that the chance of getting a ticket is only 10%). Can you suggest a way to do this without drastically increasing the attractiveness of cheating?

The city could double the amount of the ticket from \$20 to \$40. This would mean that the expected value of risking it is still \$4: $(.90)(0) + (.10)(\$40) = \$4$.

4. Assume that you've just bought a new carpet. The good news is that the carpet will last forever. The bad news is that you need to steam-clean it at the end of every year (i.e., one year from today, two years from today, etc.). What you need to decide is whether to buy a steam-cleaner or just rent one every year. *You can use the bank to save or borrow money at a 5% interest rate.*

(a) (5 points) Will the amount you paid for the carpet affect your decision regarding renting versus buying? Yes No (Circle one and explain briefly.)

No, this is a sunk cost.

(b) (5 points) One year from today (i.e., when you first need to clean the carpet), you'll be able to buy a steam-cleaner for \$500; like the carpet, the steam-cleaner will last forever. Calculate the present value of this cost.

Use the present value of a lump sum formula to get a present value of $\frac{\$500}{1.05} \approx \$476.19$.

(c) (5 points) The alternative to buying is renting a steam-cleaner, which will cost you $20 at the end of every year forever. Calculate the present value of this cost. Is it cheaper to rent or buy? Rent Buy (Circle one; you do *not* need to explain.)

Use the present value of a perpetuity formula to get a present value of $\frac{\$20}{.05} = \$400$.

(d) (5 points) Imagine that your friend Jack calls to tell you that steam-cleaners are on sale (today only!) for $450: "You'd have to be a moron to pay $20 every year forever when you can just pay $450 today and be done with it!" Write a brief response explaining (as if to a non-economist) why you do or do not agree.

"Jack, I disagree with you. Instead of paying $450 today to buy a steam-cleaner, I'd rather put that $450 in the bank and 'live off the interest'. At the end of every year I'd have $22.50 in interest, which would pay for the annual rental of a steam-cleaner *and* leave me with $2.50 left over for wild parties." (Alternately, you could put $50 towards a wild party today and put the remaining $400 in the bank; the interest payments would then be $20 per year, exactly enough to rent a steam-cleaner.)

5. You win a $100 lump sum payment in the lottery! You decide to put your money in a 40-year Certificate of Deposit (CD) paying 6% annually. The inflation rate is 4%.

(a) (5 points) How much money will be in your bank account at the end of 40 years?

Plug $100 and 6% into the future value formula to get about $1028.57.

(b) (5 points) Assume that after 40 years you'll have 10 times more money (i.e., $1000). Does this mean you'll be able to buy 10 times more stuff? Circle (Yes No) and *briefly* explain.

No: inflation means that you'll have 10 times more money, but not 10 times more purchasing power.

(c) (5 points) Assume that "It's It" ice cream bars cost $1 today, and that their price increases at the rate of inflation. How much will an It's It bar cost in 40 years? How many will you be able to buy with the money you'll have in 40 years? (Note: If you didn't get an answer to question 5a, use $1000 for the amount of money you'll have in 40 years.)

Plug $1 and 4% into the future value formula to get a price of about $4.80. With $1028.57, you'll be able to buy about 214 ice cream bars.

(d) (5 points) Calculate the real interest rate using *both* the "rule of thumb" and the true formula.

The rule of thumb says that the real interest rate is approximately $6-4=2\%$. The true formula gives us $r = \frac{1+n}{1+i} - 1 = \frac{1.06}{1.04} - 1 \approx .019$, i.e., about 1.9%.

(e) (5 points) Assume that the real interest rate is 1.92%. Use this interest rate to calculate the future value of your \$100 lump sum if you let it gain interest for 40 years. How does your answer compare with your answer from question 5c?

Plug \$100 and 1.92% into the future value formula to get a future value of about \$214. This equals the answer from question 5c.