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Problem 1 (Pricing Annuities)

In this exercise, you will learn how to calculate the price of a bond that promises to pay \$100 dollars every year for the next T years starting from the current period (where T is some arbitrary number of payment periods after the current year, possibly very large like 10, 20, or 100...). This type of payment is in general referred to as an annuity*.

Assuming that the market nominal interest rate remains constant for the next T years, and it is equal to 10%, we know that the price of this bond is the present value of the underlying promised payments, so

$$P = \$100 + \frac{\$100}{1.1} + \frac{\$100}{1.1^2} + \frac{\$100}{1.1^3} + \dots + \frac{\$100}{1.1^T} .$$

- a. Multiply both sides of the above expression by $\frac{1}{1.1}$ and subtract both the left-hand side and the right-hand side of the new equation from the original equation. Using the obtained this way expression, calculate P by canceling terms and simplifying terms.

Your answer:

(HINT: After you subtract one from the other, you should be left with the first term “\$100” and the last term $\frac{\$100}{1.1^{T+1}}$, no other terms should appear in your expression.)

- b. Make the observation that the term $\frac{\$100}{1.1^{T+1}}$ is arbitrarily small when T is very large (e.g. on a computer or calculator compute $\frac{\$100}{1.1^{100}}$). Given that, answer what should be the price of this bond if T is infinite (the bond promises an indefinite stream of such payments)?

Your answer:

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(HINT: T can not appear in your answer.)

*The term **annuity** is used in finance theory to refer to any stream of fixed payments over a specified period of time (possibly infinite). An annuity is for example a retirement insurance contract that promises annual payments to the beneficiary until she or he dies. Insurance companies, in order to calculate their potential claims, go through such calculations on a regular basis – using present value concept and tables of death probability conditional on age, gender etc...

Problem 2 (Balance Sheet)

Consider the following simplified balance sheet for a bank

Assets	Liabilities
Reserves \$10,000	Deposits \$70,000
Loans \$66, 000	Net worth (equity) \$6,000

a. If the requires reserve ratio is 10%, how much in excess reserves does the bank hold?

Your answer:

b. What is the maximum amount by which the bank can expand its loans?

Your answer:

c. If the bank makes the loans in (b), show the *immediate* impact on this bank's balance sheet

Your answer:

Assets	Liabilities
Reserves	Deposits
Loans	Net worth (equity)

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- d. Assuming the person that will get this loan will deposit all the money in a demand deposit account at some bank (Virtual Mutual), modify the initial balance sheet of Virtual Mutual below to show the *immediate* impact of this operation:

Initial balance sheet of Virtual Mutual

Assets	Liabilities
Reserves \$10,000	Deposits \$50,000
Loans \$50, 000	Net worth (equity) \$10,000

Your answer:

Assets	Liabilities
Reserves	Deposits
Loans	Net worth (equity)

Problem 3 (Balance Sheet)

What is wrong with the following balance sheet?

Assets	Liabilities
Reserves \$5,000	Deposits \$50,000
Loans \$50, 000	Net worth (equity) \$15,000

Your answer:

Write down a corrected version below

Your answer:

Assets	Liabilities
Reserves	Deposits
Loans	Net worth (equity)

Problem 4 (M1 versus M0)

From the following information calculate M0 and M1

Cash holdings of the public: \$100 billion
 Cash in the vaults of the banks: \$50 billion
 Demand deposits: \$100 billion

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Saving accounts: \$50 billion

Your answer:

Problem 5 (Assets versus Liabilities)

Briefly explain whether you agree or disagree with the following statement: *“Assets are things of value that people own. Liabilities are debts. Therefore, a bank will always consider a checking account deposit to be an asset and a car loan to be a liability.”*

Your answer:

Problem 6 (M1 versus M2)

Which of the following is considered part of M1 money supply? Circle the correct answer, and explain briefly if you circle *no*.

1. A \$10 bill you carry in your wallet

Circle the answer: yes no

2. A \$100 travelers' check you bought but did not use

Circle the answer: yes no

3. A \$100 in bank's vault (Be careful! This is the tricky one!)

Circle the answer: yes no

4. The \$325.43 balance in your checking account

Circle the answer: yes no

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5. A share of GM stock worth \$400

Circle the answer: yes no

Using the following data calculate the stock of high powered money M0 (stock of bills and coins in circulation – i.e. stock of bills and coins outside the Fed), M1 and M2:

1. (Bank) reserves 50
2. Cash in the hands of the public 400
3. Demand deposits 400
4. Retail MMMF balances 400
5. Other checkable deposits 880
6. Savings-type account balances 1,300
7. Small time deposits 950
8. Travelers Checks 10

Stock of high powered money =

M1 =

M2 =

Problem 7 (Classical Model)

Using the classical model with capital accumulation and no government, answer whether each of the following statements is true or false. Briefly explain.

1. "A permanent increase in labor supply will cause an increase in real GDP, but will not lead to a faster economic growth in the long-run."

Circle the answer: yes no

2. "A permanent increase in the nation's saving rate will cause an increase in real GDP, but not a faster economic growth in the long-run."

Circle the answer: yes no

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3. "With constant labor supply, work hours and technology, as long as planned investment spending continues to be bigger than depreciation, real GDP will continue to grow year after year."

Circle the answer: yes no

4. "All else equal, a permanent increase in an economy's saving rate (and planned investment) may accelerate economic growth for a couple of years."

Circle the answer: yes no

Problem 8 (Balance Sheet)

Suppose a bank has the following entries on its balance sheet: \$20 million in property and building; \$200 million in government bonds; \$300 million in loans; \$5 million cash in vault; \$95 million in accounts with the Federal Reserve; \$550 million in demand deposit liabilities. There are no other entries on the balance sheet except for the net worth.

a. What is this bank's net worth?

Your answer:

b. What is the maximum value of the bank's loans that could be "written off" due to bankruptcies before the bank would become insolvent? (Hint: I haven't talked about it, you want to read the "Using the Theory Box" in the textbook, page 307).

Your answer: