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Economics, Finance, and Interest Theory

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SOCIETY OF ACTUARIES

Thursday, May 25, 2000

CASUALTY ACTUARIAL SOCIETY

DIRECTIONS

1. DO NOT BREAK THE SEAL OF THE BOOKLET UNTIL THE SUPERVISOR TELLS YOU TO DO SO.

2. This test consists of 55 multiple-choice test questions. You will have a total of 240 minutes in which to answer them and record your answers on the answer sheet. NO ADDITIONAL TIME WILL BE ALLOWED FOR CODING YOUR ANSWER SHEET. Failure to stop writing or coding your answer sheet after time is called will result in the disqualification of your answer sheet and possible further disciplinary action.

3. There are five answer choices for each question, lettered (A) through (E). Answer choices for some questions have been rounded. For each question, choose the best answer. On your answer sheet, find the row of circles with the same number as the question. Then find the circle in that row with the same letter as your answer. Use a soft lead pencil and blacken the circle completely. INDICATE ALL YOUR ANSWERS ON THE ANSWER SHEET. No credit will be given for anything written in the booklet.

   Example

   Calculate the value of x in the equation x + 6 = –3 .

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ Ⓔ

   (A)   –9
   (B)   –3
   (C)   –2
   (D)   3
   (E)   9

4. Answer sheets are mechanically scored. BE SURE THAT EACH MARK IS BLACK AND COMPLETELY FILLS ONLY THE INTENDED ANSWER CIRCLE. Make no stray marks on the answer sheet. Choose only one answer for each question. If you change an answer, erase your first mark completely and mark your new choice.

5. Use the blank portions of booklet pages for your scratch work. You are not permitted to use extra scratch paper.

6. Do not spend too much time on any question. If a question seems too difficult, go on to the next question. You may return to unanswered questions if you finish before time is called.

7. Your score will be based on the number of questions that you answer correctly, with each question having equal weight. There will be no deduction for wrong answers. It is therefore to your advantage to answer every question.

8. After time is called, the supervisor will collect the booklet and your answer sheet separately. DO NOT ENCLOSE THE ANSWER SHEET IN THE BOOKLET. All booklets and answer sheets must be returned. THE QUESTIONS ARE CONFIDENTIAL AND MAY NOT BE TAKEN FROM THE EXAMINATION ROOM.

1. Joe deposits 10 today and another 30 in five years into a fund paying simple interest of 11% per year.

Tina will make the same two deposits, but the 10 will be deposited n years from today and the 30 will be deposited $2n$ years from today. Tina's deposits earn an annual effective rate of 9.15% .

At the end of 10 years, the accumulated amount of Tina's deposits equals the accumulated amount of Joe's deposits.

Calculate n .

(A)   2.0

(B)   2.3

(C)   2.6

(D)   2.9

(E)   3.2

2. A tax cut of 100 billion is proposed. The savings rate is a constant 6% of income.

Calculate how much additional spending would be generated (in billions).

(A)   94

(B)   100

(C)   106

(D)   1567

(E)   1667

3. The demand for books purchased from Internet booksellers is perfectly elastic.

The Federal government institutes a sales tax on books purchased in this manner.

Which of the following will result?

(A) The equilibrium quantity and equilibrium price will both decline. The sellers and the buyers will each pay a portion of the tax.

(B) The equilibrium quantity will decline, while the equilibrium price will rise. The sellers pay the tax.

(C) The equilibrium quantity will decline, while the equilibrium price will not be affected. The sellers pay the tax.

(D) The equilibrium quantity will not be affected, while the equilibrium price will rise. The buyers pay the tax.

(E) The equilibrium quantity will decline, while the equilibrium price will rise. The buyers pay the tax.

4.   The Capital Asset Pricing Model is assumed to hold.

A share of a firm's stock is expected to have a value of 40 one year from now.

No dividends are paid and the beta coefficient is less than 1.0 .

The market conditions are such that the rate of return on the market is 13% and

the risk-free asset rate of return is 5%.

Which of the following is/are true?

   I.   The current price of the stock is at least 35.40 .

   II.   If beta increases, the current price of the stock increases.

   III.   If the risk-free asset rate of return increases, the current price

          of the stock decreases.

   (A)   II only

   (B)   I and II only

   (C)   I and III only

   (D)   II and III only

   (E)   I, II, and III

5. One of the fundamental national accounting relationships is

$$GDP = C + I + G + (X - M)$$

where each term has the following definition, along with its 1999 value:

GDP	= gross domestic product	
C	= personal consumption	= 47
I	= private investment	= 11
G	= government spending	= 13
X	= exports	= 7
M	= imports	= 10

Over the next 5 years, the following nominal growth rates are expected:

C	4.0% per year, compounded semi-annually
I	−3.0% per year, compounded quarterly
G	0.5% per month
X	6.5% per year
M	6.5% per year

It can be assumed that due to the daily activity of an economy, *GDP* is changing at a continuous rate.

What is the continuous rate of growth for *GDP* over the 5 year period?

(A)   3.23%

(B)   3.30%

(C)   3.35%

(D)   3.70%

(E)   4.11%

6. Which of the following statements are true about new issues of seasoned equity?

    I.   As a percentage of gross proceeds, issue costs tend to be lower for bonds than for seasoned equity.

    II.   The announcement of new issues of seasoned equity generally results in a decline in the stock price.

    III.   It is generally believed that managers will be more likely to provide new issues of common stock when they think the stock is overvalued than when they think the stock is undervalued.

(A)   I only

(B)   II only

(C)   I and III only

(D)   II and III only

(E)   I, II, and III

7.   Consider a two-good graph that traces the consumption of goods X and Y in response to

changes in income. Good X is measured on the horizontal axis and good Y on the

vertical axis. Assume that the graph approaches the horizontal axis as income increases.

Which of the following statements MUST be true?

(A)   Consumption of X does not depend on income.

(B)   Consumption of Y does not depend on income.

(C)   X is an inferior good.

(D)   Y is a Giffen good.

(E)   Y is an inferior good.

8.   GDP and National Income can be measured by adding up either the value of output

produced or the levels of income earned.

Which of the following is true concerning the accounting for GDP and National Income?

(A)   The output method essentially sums the units of all products sold multiplied

by the prices for those products.

(B)   The income approach includes interest on government debt.

(C)   The output method includes an imputed value of rental services for owner-

occupied housing.

(D)   The output method includes investments by individuals in stocks or bonds.

(E)   The income method includes gross wages paid minus income taxes.

9. A senior executive is offered a buyout package by his company that will pay him a monthly benefit for the next 20 years. Monthly benefits will remain constant within each of the 20 years.

At the end of each 12-month period, the monthly benefits will be adjusted upwards to reflect the percentage increase in the CPI .

You are given:

 (i)   The first monthly benefit is R and will be paid one month from today.

(ii)   The CPI increases 3.2% per year forever.

At an annual effective interest rate of 6%, the buyout package has a value of 100,000 .

Calculate R .

(A)   517

(B)   538

(C)   540

(D)   548

(E)   563

10. A bank customer borrows X at an annual effective rate of 12.5% and makes level

payments at the end of each year for n years.

    (i)   The interest portion of the final payment is 153.86 .

    (ii)   The total principal repaid as of time $(n - 1)$ is 6009.12 .

    (iii)   The principal repaid in the first payment is Y .

Calculate Y .

    (A)   470

    (B)   480

    (C)   490

    (D)   500

    (E)   510

11. Which of the following statements about weighted-average cost of capital (WACC) is true?

    (A)   The WACC provides a good evaluation measure for a specific capital budgeting project that is safer than other projects of the firm.

    (B)   One purpose of the WACC is to adjust the cost of equity by the appropriate tax rate.

    (C)   The WACC provides the correct discount rate only for projects with business risks that are similar to those of the average existing assets of the firm.

    (D)   Only before-tax costs should be considered.

    (E)   If a company issues additional debt, the increased leverage causes the WACC to rise.

12. A company is subject to the following revenue (R) and marginal cost (MC) functions where Q is output quantity:

$$R = 10 + 10Q - Q^2$$

$$MC = 0.5Q + 5$$

What is the optimal output quantity for this company, assuming the company has no fixed expenses?

(A)   2

(B)   3

(C)   5

(D)   7

(E)   10

13.   Many governments in Europe tightly regulate when retail shops can be open for business.

In this type of regulated environment, which of the following statements would be true?

(A)   The operating costs of retail shops would be lower without the

given restrictions on opening hours.

(B)   Most people seeking part-time employment would oppose lifting

restrictions on opening hours.

(C)   Consumers tend to favor the abolition of restrictions on opening

hours for retail shops.

(D)   An individual retailer likely would find its profits decline if it could

evade the restriction undetected.

(E)   Large retail chain stores tend to lobby in favor of keeping the

opening hour restrictions.

14. A perpetuity paying 1 at the beginning of each 6-month period has a present value of 20 .

A second perpetuity pays X at the beginning of every 2 years.

Assuming the same annual effective interest rate, the two present values are equal.

Determine X .

(A)　3.5

(B)　3.6

(C)　3.7

(D)　3.8

(E)　3.9

15. You are given the following cash flows for two mutually exclusive projects:

Time	Project X	Project Y
0	−74,054	−74,054
1	+25,000	0
2	+25,000	0
3	+25,000	0
4	+25,000	+121,600

If the required rate of return is 10%, which project would be chosen and why?

(A) Project X because it has a lower profitability index.

(B) Project X because it has a shorter payback period.

(C) Either project because they have the same IRR and

   same discounted payback period.

(D) Project Y because it has a higher cash flow.

(E) Project Y because it has a higher NPV .

16. On January 1, 1997, an investment account is worth 100,000 . On April 1, 1997, the

value has increased to 103,000 and 8,000 is withdrawn. On January 1, 1999, the account

is worth 103,992 .

Assuming a dollar weighted method for 1997 and a time weighted method for 1998, the

annual effective interest rate was equal to x for both 1997 and 1998 .

Calculate x .

(A)   6.00%

(B)   6.25%

(C)   6.50%

(D)   6.75%

(E)   7.00%

17. Suppose that the central bank pursues a policy of interest rate stabilization. The fiscal authority increases taxes while holding spending fixed.

In an IS-LM model, the most likely effect on interest rates (r), the money supply (M), real output (Y) and investment (I) is

(A) r, I, and M remain constant, while Y decreases.

(B) r and I remain constant, while M and Y decrease.

(C) M remains constant, while r increases, I decreases, and Y decreases.

(D) M remains constant, while r decreases, I increases, and Y decreases.

(E) r remains constant, while I, M, and Y decrease.

18. A company faces a demand curve given by $P = 1000 - 50Q$. The total cost for the company is $TC = 340Q + 5Q^2$.

Compute the increase in price created by a movement from a competitive to a monopolistic equilibrium.

(A)   0

(B)   50

(C)   100

(D)   250

(E)   285

19. On January 1, you buy 1000 shares of a mutual fund at a price of 1.25 per share.

The share prices at various times of the year are as follows:

Time	Share price
3 months later	1.50
6 months later	1.75
9 months later	1.60
12 months later	1.90

During the year, you will make one deposit of 1200 and one withdrawal of 800 .

Which of the following situations would give the minimum fund balance at the end of the year?

(A)   Withdrawal at 3 months, deposit at 6 months

(B)   Withdrawal at 3 months, deposit at 9 months

(C)   Withdrawal at 6 months, deposit at 9 months

(D)   Withdrawal at 9 months, deposit at 3 months

(E)   Withdrawal at 9 months, deposit at 6 months

20. It has been suggested that companies often overstate earnings in bad years and understate them in good years because they want investors to believe that the cash flows are less variable than they actually are.

Which of the following, if true, would cast the most doubt on the sensibility of this strategy?

(A)   Investors are risk-averse.

(B)   Earnings follow a random walk.

(C)   The strong efficient market hypothesis holds.

(D)   Investors rely on historically observed betas.

(E)   Corporate tax rates increase with earnings.

21. Colleen has the following information about a company:

Interest on all debt	=	17
Profit margin	=	10%
Sales	=	650
Debt-equity ratio	=	60%
Long term debt	=	150
Inventory turnover	=	7
Value of leases	=	30

What is the company's return on equity?

(A)   8%

(B)   10%

(C)   12%

(D)   14%

(E)   16%

22.   Consider the indifference curve map for two products X and Y . Assume that neither

product has a negative marginal utility. X is measured on the horizontal axis.

Which of the following statements is FALSE?

(A)   Horizontal indifference curves mean that utility is independent of Y .

(B)   If basket 1 is preferred to basket 2, and basket 3 has the same utility as

basket 2, then baskets 1 and 3 cannot be on the same indifference curve.

(C)   A consumer's optimum may be found at a point other than where his budget

line is tangent to an indifference curve.

(D)   Indifference curves will not intersect even if one of the products has zero

marginal utility.

(E)   Along any ray from the origin, indifference curves farther from the origin imply

higher levels of utility as long as at least one of the products adds to utility.

23. Assume the following conditions hold in an economy:

(i)   In the short run, wage and price adjustments do not occur.

(ii)   Investment depends on the real interest rate.

(iii)   Consumption depends on the real interest rate and real income.

(iv)   The real interest rate is fixed.

(v)   The marginal propensity to consume is less than one.

If planned aggregate demand exceeds actual output, what is the economic

adjustment process?

(A)   There will be no change in inventories. Planned aggregate demand will
decline until planned aggregate demand equals actual output.

(B)   An unplanned increase in inventories will induce producers to decrease the
quantity of output. During the adjustment, planned aggregate demand will
also decline.

(C)   An unplanned decline in inventories will induce producers to increase the
quantity of output, while lower than expected levels of income will cause
consumption to decline.

(D)   There will be no change in inventories. Producers will increase the quantity
of output, while both investment and consumption decrease.

(E)   An unplanned decline in inventories will induce producers to increase the quantity
of output. During the adjustment, planned aggregate demand will also increase.

24. A small business takes out a loan of 12,000 at a nominal rate of 12%, compounded

quarterly, to help finance its start-up costs. Payments of 750 are made at the end of

every 6 months for as long as is necessary to pay back the loan.

Three months before the 9th payment is due, the company refinances the loan at a

nominal rate of 9%, compounded monthly. Under the refinanced loan, payments of R

are to be made monthly, with the first monthly payment to be made at the same time

that the 9th payment under the old loan was to be made. A total of 30 monthly

payments will completely pay off the loan.

Determine R.

(A) 448

(B) 452

(C) 456

(D) 461

(E) 465

25. You are given the following information about Stock P and Stock Q:

Variance of Stock P = 100.0

Variance of Stock Q = 225.0

Covariance between Stock P and Stock Q = 53.2

At the end of 1999, you are holding 4 million in Stock P. You are considering a strategy of shifting 1 million into Stock Q and keeping 3 million in Stock P.

What percentage of risk, as measured by standard deviation, can be reduced by this strategy?

(A)   0.5%

(B)   5.0%

(C)   7.4%

(D)   9.7%

(E)   10.4%

26.   Betty borrows 19,800 from Bank X . Betty repays the loan by making 36 equal payments

of principal at the end of each month. She also pays interest on the unpaid balance each

month at a nominal rate of 12%, compounded monthly.

Immediately after the 16th payment is made, Bank X sells the rights to future payments to

Bank Y . Bank Y wishes to yield a nominal rate of 14%, compounded semi-annually, on

its investment.

What price does Bank X receive?

(A)   9,792

(B)   10,823

(C)   10,857

(D)   11,671

(E)   11,709

27. In the mid-1980s, fiscal deficits in Brazil were largely financed by printing money.

Assume that prices in Brazil are not fixed, that Brazil trades with the rest of the

world, and that the Brazilian economy is small relative to the rest of the world.

Determine the long run impact on the Brazilian economy if this policy is continued

indefinitely.

(A)   Real national income will rise, while both nominal and real interest rates will

remain stable.

(B)   The price level and the nominal interest rate will both rise.

(C)   The price level, the nominal interest rate, and the real interest rate will all rise.

(D)   The price level and real national income will both rise.

(E)   Nominal national income will stabilize while nominal interest rates rise.

28. The demand for computer printers is given by the following expression, where P represents price and Q_D represents quantity demanded:

$$Q_D = 1000 - 5P$$

The supply of computer printers is given by the following expression, where P represents price and Q_S represents quantity supplied:

$$Q_S = 100 + 4P$$

Determine the consumer surplus in the market for computer printers.

(A)   9,000

(B)   25,000

(C)   30,000

(D)   31,250

(E)   55,000

29. A firm has proposed the following restructuring for one of its 1000 par value bonds.

The bond presently has 10 years remaining until maturity. The coupon rate on the existing bond is 6.75% per annum paid semiannually. The current nominal semiannual yield on the bond is 7.40% .

The company proposes suspending coupon payments for four years with the suspended coupon payments being repaid, with accrued interest, when the bond comes due. Accrued interest is calculated using a nominal semiannual rate of 7.40% .

Calculate the market value of the restructured bond.

(A) 755

(B) 805

(C) 855

(D) 905

(E) 955

30. An individual purchases two goods, milk and bread. Both are normal goods for this individual. Assume that the price of milk decreases, while the price of bread remains the same.

With respect to bread, how do the income and substitution effects operate in this situation, and what is the overall effect on quantity of bread purchased by this individual?

(A) The income effect will increase the quantity; the substitution effect will increase the quantity. Overall, quantity purchased will increase.

(B) The income effect will decrease the quantity; the substitution effect will increase the quantity. Overall, the effect on quantity purchased is unknown.

(C) The income effect will increase the quantity; the substitution effect will decrease the quantity. Overall, the effect on quantity purchased is unknown.

(D) The income effect will decrease the quantity; the substitution effect will decrease the quantity. Overall, the quantity purchased will decrease.

(E) The income effect will increase the quantity; there is no substitution effect since the price of bread remained the same. Overall, the quantity purchased will increase.

31. The price of a share of stock issued by a certain company is 30 on January 1, 2000.

The price assumes annual dividends, with the first dividend due on December 31, 2000.

The first dividend will be 1.65, with future dividends expected to grow at a rate of 3% per year forever.

Which of the following statements are true, assuming the market capitalization rate remains the same in future years?

    I.   If an investor requires an annual effective return of at least 9% on all its asset purchases, it will consider purchasing the common stock of this company on January 1, 2000.

    II.   If an investor buys 100 shares of stock on January 1, 2000, and later sells all 100 shares on January 1, 2003, the investor will expect a capital gain of 278.18.

    III.   On July 1, 2000, the price of the stock will be 1.5% greater than the price on January 1, 2000.

(A)   II only

(B)   III only

(C)   I and II only

(D)   I and III only

(E)   II and III only

32. Assume that the return on a portfolio of utility stocks depends on the following

macroeconomic factors:

Macroeconomic Factor	Factor Risk	Expected Return for Exposure to Factor
Yield spread	1.35	10.75
Interest rate fluctuations	−1.75	3.30
GNP growth	0.15	5.50
Unanticipated inflation	−0.20	3.20
Market	0.55	11.00

The risk-free rate = 5.00% .

Use the Arbitrage Pricing Theory to determine the estimate of the expected return on a

portfolio of utility stocks.

(A)   10.0%

(B)   14.5%

(C)   15.0%

(D)   19.5%

(E)   20.0%

33. A company is introducing a new product that they think will have a 10-year life cycle, with sales increasing steadily for 5 years, after which sales will decline steadily.

The company feels that the product will be so successful that they will make sales every day of the year. As a result, they model future sales by assuming net cashflows are received continuously over the 10-year horizon at the following rates:

$$100t \qquad 0 \le t \le 5$$

$$100(10 - t) \qquad 5 < t \le 10$$

The company requires an effective annual rate of return on any investment of 12.75% .

What is the maximum amount of money the company should spend today to invest in this new product?

(A) 1252

(B) 1331

(C) 1414

(D) 1606

(E) 1880

34.   In the early 1980s, the government deficit increased. Simultaneously, the government

pursued an increasingly restrictive monetary policy.

Using an IS-LM model, determine the impact of these policies on the interest

rate (r) and real output (Y).

(A)   Both r and Y will increase.

(B) Y will decrease, while r increases.

(C) r will decrease, while Y increases.

(D) Y will increase, but the effect on r cannot be determined.

(E) r will increase, but the effect on Y cannot be determined.

35.   Assume that the market structure for sewing machines is a dominant firm oligopoly; that is, there is one large supplier of sewing machines and a large number of small suppliers. Demand for sewing machines is downward sloping. Suppose that the marginal cost of producing sewing machines for the dominant firm rises, while the supply curve for the small firms remains constant.

Determine the effect on the price of sewing machines and the share of sewing machines sold by the dominant firm.

(A)   The price of sewing machines will remain constant, while the market share of the dominant firm will decline.

(B)   The price of sewing machines will rise, while the market share of the dominant firm will decline.

(C)   The price of sewing machines will rise, while the market share of the dominant firm will remain constant.

(D)   The price of sewing machines will rise, while the effect on the market share of the dominant firm cannot be determined.

(E)   The price of sewing machines will remain constant, while the effect on the market share of the dominant firm cannot be determined.

36. Which of the following statements about normal and inferior goods are true?

    I.   If the price of a normal good declines, the quantity demanded will increase

             only if the substitution effect is greater than the income effect.

    II.   Less of an inferior good is consumed by an individual if her income goes up.

    III.   A Giffen good is an inferior good.

    (A)   I only

    (B)   II only

    (C)   I and III only

    (D)   II and III only

    (E)   I, II, and III

37. A customer is offered an investment where interest is calculated according to

the following force of interest:

$$\delta_t = \begin{cases} 0.02t & 0 \le t \le 3 \\ 0.045 & 3 < t \end{cases}$$

The customer invests 1000 at time $t = 0$.

What nominal rate of interest, compounded quarterly, is earned over the first

four-year period?

(A) 3.4%

(B) 3.7%

(C) 4.0%

(D) 4.2%

(E) 4.5%

38. On December 31, 2000, a company makes the following projections for the year 2001:

Earnings before interest and tax (EBIT)	600
Net interest	150
Debt ratio	0.5
Market-to-book ratio	1.0

Also assume the following:

Risk-free rate	5%
Rate of return on the company's debt	6%
The company's weighted average cost of capital	9%
Corporate tax rate	40%
All cash flows occur at the end of the year.	

Calculate the certainty equivalent of the company's year 2001 earnings available for equity returns.

(A)   204

(B)   248

(C)   253

(D)   257

(E)   260

39.   Sally lends 10,000 to Tim. Tim agrees to pay back the loan over 5 years with monthly payments payable at the end of each month.

Sally can reinvest the monthly payments from Tim in a savings account paying interest at 6%, compounded monthly. The yield rate earned on Sally's investment over the five-year period turned out to be 7.45%, compounded semi-annually.

What nominal rate of interest, compounded monthly, did Sally charge Tim on the loan?

(A)   8.53%

(B)   8.59%

(C)   8.68%

(D)   8.80%

(E)   9.16%

40. On July 1, 2000, a pharmaceutical company is deciding whether to invest 3,000,000 in

the development of a new drug. The company estimates that the probability of success is

5%, in which case it can obtain a patent and sell the drug as a monopolist beginning in

year 2005 . The marginal cost of production would be a constant 10 per prescription,

and the quantity demanded (in millions of prescriptions per year) would be $q = 100p^{-1.5}$,

where p is price. After the end of the year 2020, the patent would expire and there would

be no future profits. The company's cost of capital is 10% and applies to all stages of the

project. Assume that all cash flows for year z occur on July 1, z .

What is the project's net present value?

(A) $-1,374,000$

(B) $-561,000$

(C) $252,000$

(D) $1,157,000$

(E) $1,761,000$

41. A community council (elected by the citizens of the community) is considering the purchase of a system to alert citizens about severe weather. The system involves the installation of several sirens at various locations in the community; the sirens make a loud noise that can be heard by all citizens when activated.

Determine the most efficient method of providing the severe weather alert system in the community.

(A) The council should supply the system itself, taxing each citizen an appropriate amount. The council should appropriate enough resources so that the marginal benefit of the system equals its marginal cost.

(B) The council should hire a private firm, and give this firm monopoly rights in supplying the system. A private firm will supply the appropriate number of sirens so that the marginal benefit of the system equals its marginal cost.

(C) The council should supply the system itself, funding it through the voluntary contributions of its citizens. Private citizens will contribute an appropriate amount of resources to fund the system so that the marginal benefit of the system equals its marginal cost.

(D) The council should not be involved in the decision. A private firm will supply the appropriate number of sirens so that the marginal benefit of the system equals its marginal cost.

(E) The council should supply the system itself, taxing each citizen an appropriate amount. The council should appropriate enough resources so that the marginal benefit of the system equals its total cost.

42. Which of the following are true?

    I.   The value of flexibility in manufacturing and service processes can

           be modeled using option pricing theory.

    II.   The stock of a bankrupt company can be viewed as a put option.

    III.   As the stock price rises, the value of a put option falls.

    (A)   III only

    (B)   I and II only

    (C)   I and III only

    (D)   II and III only

    (E)   I, II, and III

43. A 1000 par value 5-year bond with 8.0% semiannual coupons was bought to yield 7.5% convertible semiannually.

Determine the amount of premium amortized in the 6th coupon payment.

(A)   2.00

(B)   2.08

(C)   2.15

(D)   2.25

(E)   2.34

44. Suppose that a technological improvement in the banking system leads to an increase

in the growth rate of the velocity of money from 4% to 5% per year. Assume that the

growth rate of output is constant at 2% and that the growth rate of the money supply

is constant at 3% .

According to the quantity theory of money, what will happen to the rate of inflation in

this economy?

(A)   It will rise from 5% per year to 6% per year.

(B)   It will rise from 3% per year to 4% per year.

(C)   It will fall from 1% per year to 0% per year.

(D)   It will fall from 4% per year to 3% per year.

(E)   It will stay constant at 1% per year.

45. You are considering starting your own business. Your estimated sales revenue is

120,000 per year, office rent and expenses are 20,000 per year, wages and salaries for

your employees amount to 40,000 . You expect to tie up 100,000 of your own money

in starting the business. The expected market rate of return in the coming year is 5% .

The annual salary in your current job is 50,000 . You need to quit your current job to

start your own firm.

If you start this business, what is your expected economic profit at the end of the

first year?

(A)   0

(B)   5,000

(C)   10,000

(D)   55,000

(E)   60,000

46. Which of the following are true?

    I.   No party to a bankruptcy, except the lawyers, ever benefits from prolonging bankruptcy proceedings.

    II.   In general, within an industry, the most profitable firms borrow the least.

    III.   The "pecking order theory" says that firms will tend to issue debt, if they need external finance at all.

(A)   III only

(B)   I and II only

(C)   I and III only

(D)   II and III only

(E)   I, II, and III

47.   Jim began saving money for his retirement by making monthly deposits of 200 into

a fund earning 6% interest compounded monthly. The first deposit occurred on

January 1, 1985 .

Jim became unemployed and missed making deposits 60 through 72 . He then

continued making monthly deposits of 200 .

How much did Jim accumulate in his fund on December 31, 1999 ?

(A)   53,572

(B)   53,715

(C)   53,840

(D)   53,966

(E)   54,184

48.   A corporation buys a new machine for 2000 . It has an expected useful life of 10 years, and a salvage value of 400 .

The machine is depreciated using the sinking fund method and an annual effective rate of i . Depreciation is taken at the end of each year for the 10-year period.

The present value of the depreciation charges over the 10-year period is 1000 at the annual effective rate i .

Calculate i .

(A)   8.4%

(B)   8.8%

(C)   9.2%

(D)   9.6%

(E)   10.0%

49.   Countries X and Y trade with each other and can each produce two goods, grain (G)

and hogs (H). Both countries consume some of each good. Given currently available

resources, Country X's production possibilities are given by the equation

$100 = 5G + 10H$. Country Y's production possibilities are given by the equation

$200 = 10G + 2H$.

Determine which goods each country will produce and the flow of trade between the two

countries in general equilibrium.

(A)   Country Y will produce both goods, while Country X will produce grain (but no

hogs). Country Y will export both grain and hogs to Country X.

(B)   Country Y and Country X will both produce both goods. Country Y will export

grain to Country X, and Country X will export hogs to Country Y.

(C)   Country Y will produce grain (and no hogs) and Country X will produce hogs

(and no grain). Country Y will export grain to Country X and Country X will

export hogs to Country Y.

(D)   Country X will produce both goods, while Country Y will produce grain (but no

hogs). Country X will export hogs to Country Y.

(E)   Country Y will produce hogs (and no grain) and Country X will produce grain

(and no hogs). Country Y will export hogs to Country X and Country X will

export grain to Country Y.

50. In the beginning of 1999, a company invested 10 million in a project that is expected to

earn 2 million at the beginning of each year beginning in year 2001 . Immediately after

the investment is made, the company learns that 100 of its most experienced workers plan

to retire by the end of 2000 . Without these workers' skills, the project can earn nothing

until 2005 .

Assume that the risk-free rate is zero and the company's beta is greater than 0 .

Based on the discounted payback rule, which of the following actions would be

recommended?

(A)   Abandon the project.

(B)   Continue the project and do nothing, forgoing the 4 years of profits.

(C)   Invest 2 million immediately to hire and train new employees, preserving the

earnings in 2003 and 2004 .

(D)   Give *w* to each of the potential retirees at the beginning of 2004 if they delay

retirement until then.

    i) $\sqrt{\dfrac{w}{10}}$ employees are expected to accept this offer.

    ii)   The cash flows in years 2001-2004 would be 2 million times the percent

of the potential retirees who accept this offer.

(E)   No recommendation can be made without knowing the discount rate.

51. Seth deposits X in an account today in order to fund his retirement. He would like to receive payments of 50 per year, in real terms, at the end of each year for a total of 12 years, with the first payment occurring seven years from now.

The inflation rate will be 0.0% for the next six years and 1.2% per annum thereafter. The annual effective rate of return is 6.3% .

Calculate X .

(A) 303

(B) 306

(C) 316

(D) 327

(E) 329

52. You are given the following information:

    (i)   Price of call option with strike price of 45 = 7.62;

    (ii)   Price of put option with strike price of 45 = 1.96;

    (iii) Annualized continuously compounded risk-free rate of return = 6.0%; and

    (iv) $N(d_1) = 0.742$, $N(d_2) = 0.665$.

Using the Black-Scholes formula and put-call parity, calculate the time to maturity on the options.

    (A)   3 months

    (B)   6 months

    (C)   1 year

    (D)   1.5 years

    (E)   2.5 years

53. Which of the following economic phenomena characterizes the end of an expansion and

the beginning of a recession?

(A)   Declining levels of business inventories

(B)   An increase in productivity growth

(C)   Low interest rates and low levels of investment

(D)   A decline in profit margins

(E)   An increase in the growth rate of investment expenditures

54. A company's quick ratio is equal to 0.60 and its cash ratio is 0.08 .

Calculate the ratio of the company's receivables to its current liabilities.

(A)   0.08

(B)   0.13

(C)   0.34

(D)   0.52

(E)   0.68

55. Which of the following will cause an increase in the money supply?

    I.   A decrease in market interest rates

    II.   A decrease in bank reserve requirements

    III.   A decrease in the supply of government bonds due to central

        bank purchases in the open market

(A)   II only

(B)   I and II only

(C)   I and III only

(D)   II and III only

(E)   I, II, and III

Course 2 May 2000
Answer Key

1.	B	21.	E	41.	A
2.	D	22.	A	42.	C
3.	C	23.	E	43.	B
4.	C	24.	D	44.	A
5.	B	25.	B	45.	B
6.	E	26.	C	46.	D
7.	E	27.	B	47.	C
8.	C	28.	B	48.	*
9.	D	29.	E	49.	E
10.	B	30.	C	50.	D
11.	C	31.	A	51.	B
12.	A	32.	D	52.	A
13.	C, E	33.	C	53.	D
14.	C	34.	E	54.	D
15.	E	35.	B	55.	D
16.	B	36.	D		
17.	B	37.	A		
18.	D	38.	B		
19.	A	39.	D		
20.	C	40.	C		

On 13, both C and E were considered acceptable, though E was not as good as C.

*All answers were scored correct on 48 because it tested material that may not have been on the syllabus.

1. Answer: B

   Joe's accumulative value = $10[1 + 0.11(10)] + 30[1 + 0.11(5)] = 67.5$

   Tina's accumulative value = $10(1.0915)^{10-n} + 30(1.0915)^{10-2n} = 10(1.0915)^{10} \cdot v^n + 30(1.0915)^{10} \cdot v^{2n} = 24v^n + 72v^{2n}$.

   $72v^{2n} + 24v^n - 67.5 =$

   $v^n = \dfrac{-24 \pm \sqrt{576 + 19,440}}{144} = 0.8158$

   $n \cdot \ln[1/1.0915] = \ln(0.8158) \therefore n = 2.33$.

2. Answer: D

   At first, 100 billion $\times$ 0.94 is spent, which equals 94 billion. But then this 94 billion spent generates another $94 \times 0.94 = 88.36$ and so forth. If this process continues, the total amount spent will be $0.94(100) + (0.94)^2 (100) + (0.94)^3 (100) + \ldots = 94(1 + 0.94 + 0.94^2 + \ldots)$.

   This is a geometric series $94\left(\dfrac{1}{1 - 0.94}\right) = 1566.67$.

3. Answer: C

   The sales tax will shift the supply curve upward by the amount of the tax.
   With perfectly elastic demand, the demand for books is flat. Hence, the impact of the supply shift is to decrease the equilibrium quantity, but leave the gross sale price unaffected. Sellers receive the same price for books, but must remit the tax to the Federal government. Hence, sellers bear the entire burden of the tax.

4. Answer: C

   CAPM states that $E[R_i] - r = beta_i \times (E[R^M] - r)$ where $E[R_i]$ = expected return of stock i, r = risk-free asset rate of return, and $E[R^M]$ = expected return on the market

   (II) As beta increases, the expected return increases - resulting in a lower current stock price. (II) is false

   (III) As r increases, the expected return increases since beta < 1. This results in a lower current stock price. (III) is true

   (I) Assume beta = 1, plug into formula and the expected return is 13%. Current price would be 40/1.13 = 35.40. From (I), we know a lower beta results in higher stock price, so (I) is true

5. Answer: B

(i) $GDP_0 = 47 + 11 + 13 + (7 - 10) = 68$

(ii) $GDP_5 = 47(1.02)^{10} + 11(1 - 0.0075)^{20} + 13(1.005)^{60} - 3(1.065)^5$
    $= 57.2927 + 9.4624 + 17.5351 - 4.11026 = 80.179966$

$\therefore 68\,e^{\delta 5} = 80.17966$ ←under continuous interest, accumulation function is $a(t) = e^{\delta t}$

(p. 24 Kellison)

$$\Rightarrow \delta = \frac{\ln\left(\dfrac{80.17966}{68}\right)}{5} = 0.0329532 = 3.30\%.$$

6. Answer: E

I. True, see chart on p. 394.

II. True, see p. 392

III. True, due to indication of information.

7. Answer: E

The graph approaches the horizontal axis at higher income levels. That means less Y and more X is consumed as income rises. This points toward Y being an inferior good.

8. Answer: C

The output method includes an imputation for the rental services of owner-occupied housing as part of the personal consumption expenditures component of GDP .

9. Answer: D

R	R		R	(1.032)R	(1.032)R	(1.032)R	$(1.032)^2$R	$(1.032)^{19}$R	$(1.032)^{19}$R

$$\begin{array}{cccccccccc} 0 & 1 & 2 & & 12 & 13 & 14 & & 24 & 25 & & 239 & 240 \end{array}$$
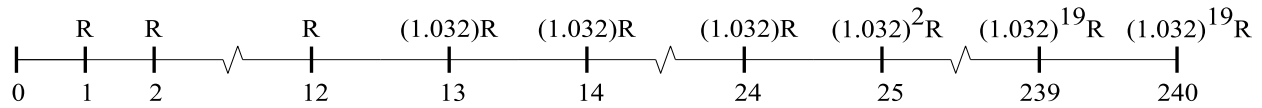
100,000 at time 0 . i = 0.06 .

(i)   Equivalent rate per month $j = (1.06)^{1/12} - 1 = 0.0048675$

(ii)   Equivalent annual payment made at end of each year

End of year

$$\begin{array}{cc} R \cdot S_{\overline{12}|j} & 1 \\ (1.032)R\ S_{\overline{12}|j} & 2 \\ (1.032)^2\ R\ S_{\overline{12}|j} & 3 \\ \vdots & \vdots \\ (1.032)^{19}\ R\ S_{\overline{12}|j} & 20 \end{array}$$

Thus, at time 0:

$$100{,}000 = R\ S_{\overline{12}|j}\ (1.06)^{-1} + (1.032)\ R\ S_{\overline{12}|j}\ (1.06)^{-2} + \cdots + (1.032)19\ R \cdot S_{\overline{12}|j}\ (1.06)^{-20}$$

geometric series (equation 4.39 p. 114 Kellison)

$$\left.\begin{array}{l} a = \dfrac{RS_{\overline{12}|j}}{1.06} \\[2mm] r = \dfrac{1.032}{1.06} \\[2mm] n = 20 \end{array}\right\} = a\left(\dfrac{1-r^n}{1-r}\right) = \dfrac{RS_{\overline{12}|j}}{1.06}\left[\dfrac{1-\left(\dfrac{1.032}{1.06}\right)^{20}}{1-\left(\dfrac{1.032}{1.06}\right)}\right] = R(11.628804)[15.694351]$$

$$\therefore R = \dfrac{100{,}000}{182.5064} = \$547.93 .$$

10. Answer: B

$X = Pa_{\overline{n}|0.125}$

$153.86 = P(1 - V)$

$1384.74 = P$

$6009.12 = (a_{\overline{n}|} - v)P$

$+1230.88$

$\underline{7240}$

$1384.74 = a_{\overline{n}|}$

$5.2284 = a_{\overline{n}|0.125}$

$n = 9$

$Y = 1384.74v^9 = 479.73$

11. Answer: C

   (A)   False: WACC is a good measure for projects with the same risk profile as other projects of the firm, not for safer or riskier projects.
   (B)   False: Debt is adjusted by the appropriate tax rate, not equity.
   (C)   True.
   (D)   False: WACC formula includes corporate taxes.
   (E)   False: The WACC stays the same even if debt is increased.

12. Answer: A

   $MR = MC$
   $MR = 10 - 2Q = 0.5Q + 5$
   $Q = 2$

13. Answer: C

   Consumers frequently pay the price of restrictive business practices. In the case of government regulated opening hours, they have to put up with, among other things, long lines at cash registers during peak hours, little opportunity to shop with the whole family, and fewer opportunities to comparison shop to avoid high prices and low quality products.

14. Answer: C

   $$\ddot{a}^2\,_{\infty} = 20 = \frac{2}{d^{(2)}} \Rightarrow d^{(2)} = 0.10$$

   $$d = 1 - \left(1 - \frac{0.10}{2}\right)^2 = 0.0975$$

   $$v = 1 - d = 0.9025$$

   $$X[1 + v^2 + v^4 + v^6 + \dots] = 20$$
   $$X\frac{1}{1-v^2} = 20$$
   $$X = 20(1 - v^2) = 3.71 \Rightarrow 3.70 .$$

15. Answer: E

$NPV_X = -74{,}054 + 25{,}000 \ (PV1FA_{10,4}) = 5192.64$.

$NPV_Y = -74{,}054 + 121{,}600 \ (PV1F_{10,4}) = 9000.44$.

$P/I_X = \dfrac{79{,}264.64}{74{,}054} = 1.07, \ \ P/I_Y = \dfrac{83{,}054.44}{74{,}054} = 1.12$.

NPV is best indicator if life same and same costs.

16. Answer: B

$y = 100{,}000 - 8000 + I$

$y - 92{,}000 = I$

$x = (y - 92{,}000)/(100{,}000 - 8000(3/4)) = (y - 92{,}000)/94{,}000$

$103{,}992/y - 1 = x$

$(103992 - y)y = (y - 92{,}000)/94{,}000$

$x = 1.0625$

17. Answer: B

An increase in the tax rate with no change in spending shifts the IS curve to the left, decreasing interest rates, output, but increasing investment. The central bank shifts the LM curve to the left by decreasing the money supply, thus stabilizing the interest rate and investment. Output falls.

18. Answer: D

1. Competitive Eq: $P = MC$: $1000 - 50Q = 340 + 10Q \rightarrow Q^* = 11, P^* = 450$.

2. Monopolistic Eq: $MC = MR$: $1000 - 100Q = 340 + 10Q \rightarrow Q^{**} = 6, P^{**} = 700$
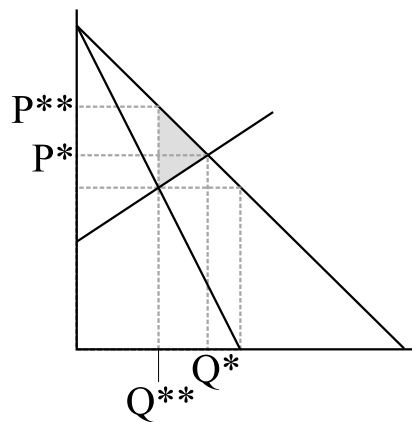
19. Answer: A

The first thing a student must realize is when is the worst time to make your deposit and withdrawal in general:

(i) deposit – just before unit value falls $\Rightarrow$ (this eliminates answers B, C, D) 6 months.

(ii) Withdrawal – just before unit value rises – either 3 months or 9 months

Thus, student must choose between A and E . Doing the calculations:

Withdrawal at 3 months:

Fund at time 0 = $1250 (1000 units $\times$ 1.25)

withdrawal at time 3 = 800/1.5 = 533.33 units $\Rightarrow$ fund = 466.67 units $\times$ 1.5 = 700

deposit at 6 = 1200/1.75 = 685.71 units $\Rightarrow$ fund = 1152.38 $\times$ 1.75 = 2016.67

fund at 12 = 1152.38 $\times$ 1.90 = 2189.52 $\leftarrow$ lower so answer is A .

20. Answer: C

If all (not just published) info is incorporated in the stock price, it is impossible to fool investors by manipulating the published financial statements.

21. Answer: E

$$\text{Debt burden} = \frac{\text{EBIT} - \text{tax} - \text{interest}}{\text{EBIT} - \text{tax}} = \frac{\text{EBIT} - \text{tax} - 17}{\text{EBIT} - \text{tax}} = 0.7385$$

EBIT – tax = 65

$$\text{Debt-equity ratio} = \frac{\text{LT debt} + \text{value of leases}}{\text{Equity}} = \frac{150 + 30}{\text{Equity}} = 0.6$$

Equity = 300

$$\text{ROE} = \frac{\text{EBIT} - \text{tax} - \text{interest}}{\text{equity}} = \frac{65 - 17}{300} = 16\%$$

Note: Inventory turnover is extraneous information.

22. Answer: A

Horizontal indifference curves imply that utility only depends on Y .

23. Answer: E

With fixed prices and wages, in the simple Keynesian model, excess demand for goods will induce an increase in production. As income rises, so does consumption, thus raising planned aggregate demand. Since MPC < 1, the adjustment process is stable.

24. Answer: D
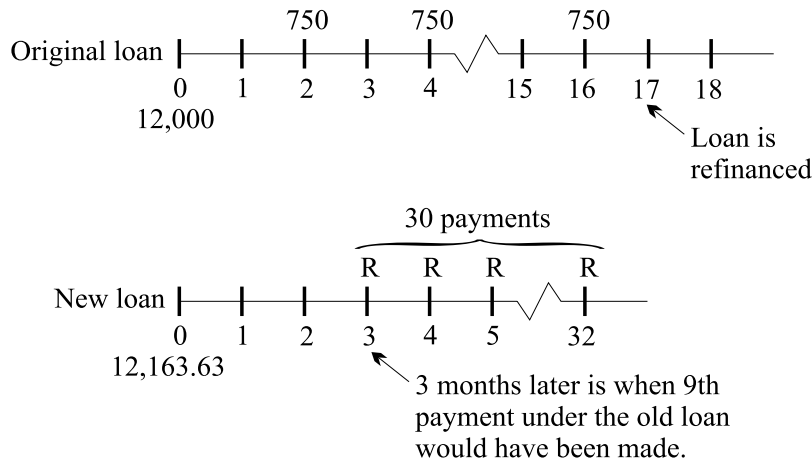
Original loan:

(i)   Equivalent semi-annual rate $= \dfrac{i^{(2)}}{2} = (1.03)^2 - 1 = 0.0609$.

(ii)   Outstanding balance at time 17 (4.25 years) using retrospective method (equation (6.2) p. 168 Kellison) $= 12{,}000 \, (1.03)^{17} - 750 \, s_{\overline{8}|\,0.0609} \, (1.03) = 19{,}834.17 - 7447.12(1.03)$
           $= 19{,}834.17 - 7670.54 = 12{,}163.63$.

New loan:

(See graphic above)

$12{,}163.63 = R \cdot a_{\overline{30}|\,0.0075} \, (1.0075)^{-2} \Rightarrow R = \dfrac{12{,}163.63}{26.377926} = \$461.13$.

25. Answer: B

Portfolio of 100% Stock P:

Variance = 100

Standard deviation = 10

Portfolio of 75% Stock P and 25% Stock Q:

Variance $= P^2 \, \sigma_p^2 + Q^2 \, \sigma_q^2 + 2 \, PQ \, \sigma_{PQ} = (0.75)^2 \, (100) + (0.25)^2 \, (225) + 2(0.75)(0.25)(53.2)$
$= 56.25 + 14.06 + 19.95 = 90.26$.

Standard deviation = 9.50

$\therefore$ Percentage of Risk Reduced $= (10 - 9.5)/10 = 5.0\%$.

26. Answer: C

(i)   Monthly principal repayment R = 19,800/36 = 550

Price after 16 payments = present value of remaining 20 payments of principal and interest at

monthly i = $(i^{12})/12 = (1.07)^{1/6} - 1 = 0.0113403 = 550 a_{\overline{20}|\,0.0113403} + 5.5 (Da)_{\overline{20}|\,0.0113403}$

((4.33) p. 112) = 10,857.27 .

27. Answer: B

The long run impact of an expansion in the money supply is an increase in the price level.
Sustaining a policy of financing deficits by printing money leads to inflation and a rise in the
nominal interest rate.

28. Answer: B

Equilibrium price is $100 and equilibrium quantity is 500 . Consumer surplus is obtained by
integrating the difference between the price the consumer is willing to pay and the equilibrium
price (the expression $200 - 0.2Q^d - 100$) over the quantity interval [0, 500] .

29. Answer: E

If suspended coupons have interest accrued, there is no difference between this arrangement and
the old terms of the issue, from a time value point of view or
$PV_0 = 33.75 (PV1FA_{3.7,20}) + 1000(PVIF_{3.7,20}) = 954.64$ or
$PV_0 = 33.75 (PV1FA_{3.7,12})(PV1F_{3.7,8}) + (33.75(FV1FA_{3.7,8})(FV1F_{3.7,12}) + 1000)PV1F_{3.7,20}$.

30. Answer: C

Since the price of one of the goods decreased, the income effect is positive and leads to an increase in the quantity of bread purchased (since bread is a normal good). The relative price of bread increased since the price of milk decreased, so the individual will purchase more milk and less bread. The substitution effect decreases the quantity of bread purchased. Overall, the impact on the quantity depends on the relative sizes of the income and substitution effects.

31. Answer: A

I. Price $= 30 = 1.65/(r - 0.03)$; $r = 8.5\% < 9\% \Rightarrow$ False

II. Capital gain $= \left[\dfrac{1.65(1.03)^3}{0.055} - 30\right] \cdot 100 = 278.18$

$$\Downarrow$$
$$\text{True}$$

III. Price will increase by $(1.085)^{1/2} - 1$, or $4.16\% \neq 1.5\%$.

$$\Downarrow$$
$$\text{False}$$

32. Answer: D

| | Expected Risk Premium | | |
Factor	Factor Risk b_i	= (Expected Return $- r_f$)	$b_i \times$ Expected Risk Premium
Yield spread	1.35	5.75	7.76
Interest rate	-1.75	-1.70	2.98
GNP	0.15	0.50	0.08
Inflation	-0.20	-1.80	0.36
Market	0.55	6.00	3.30
			14.48

Expected return = risk free rate + expected risk premium = 5% + 14.48 = 19.48 .

33. Answer: C

Present value $= 100\ (\overline{I}\overline{a})_{\overline{5}|i} + 100v^5\ (\overline{D}\overline{a})_{\overline{5}|i}$

where $i = 0.1275$, $\delta = \ln(1 + i) = 0.1200$, $\overline{a}_{\overline{5}|} = \dfrac{1 - v^5}{\delta} = \dfrac{1 - (1.1275)^{-5}}{0.12} = 3.7599669$

$= 100\left[\dfrac{\overline{a}_{\overline{5}|}}{\delta} - \dfrac{5v^5}{\delta}\right]$ eq. 4.44 p. 120) $+ 100\ v^5\left[\dfrac{5 - \overline{a}_{\overline{5}|}}{\delta}\right]$ (modification of eq. 4.33 p. 112) $= 100(14.137351) = 1,413.735 = 1414$.

34. Answer: E

An increase in the deficit will shift the IS curve to the right, thus increasing r and y . Tight monetary policy shifts the LM curve to the left, thus increasing r and decreasing y . Hence, the impact of these simultaneous shifts is to increase r, but to either increase or decrease y depending on which shift dominates.

35. Answer: B

In a dominant firm oligopoly, the intersection of the dominant firm's MC and MR determines the quantity that the dominant firm will sell and the price at which these units are sold. The small firms take this price as given. If the MC curve for the dominant firm rises, the dominant firm raises its price and lowers its quantity; the small firms take this new price as given, raising the quantity that they sell. The total quantity sold, however, falls since demand is downward sloping.

36. Answer: D

I.   The quantity demanded for a normal good always increases as its price goes down. So I is false.

II and III are true by definition.

37. Answer: A

$$AV = 1000 \; e^{\int_0^3 0.02t\,dt} \; e^{\int_3^4 0.045\,dt} = 1000 \left(e^{\left[\frac{0.02t^2}{2}\right]_0^3} \right) \left(e^{0.045t\big|_3^4} \right) = 1000 \; (e^{0.09})(e^{0.18-0.135})$$

$= 1000 \; e^{0.135} = 1144.54$.

$1000(1 + j)^{16} = 1144.54$

$j = 0.0084732$

$4j = 3.39\%$

38. Answer: B

Earnings available for the equity returns: $(1 - 0.4) \cdot (600 - 150) = 270$. Now:

$r_E \cdot E/(D+E) + r_D (1 - T_c) (D/(D+E)) = r_{WACC}$ or (since $D/(D+E) = 0.5$)

$0.5\ r_E + 0.06\ (1 - 0.4) \cdot 0.5 = 0.09$

$r_E = 0.144$

Thus, CEQ $= \dfrac{270(1+r_f)}{(1+r_E)} = \dfrac{270 \cdot (1.05)}{1.144} \doteq 248$.

39. Answer: D

(i) Monthly payment $R = 10{,}000/a_{\overline{60}|i}$

(ii) R is reinvested at $i = 0.005 \Rightarrow$ accumulated value $= R \cdot S_{\overline{60}|0.005} = R(69.77027)$

(iii) Overall yield is $i = 0.0745/2 = 0.03725 \Rightarrow 10{,}000(1.03725)^{10} = 14{,}415.657$

Thus, we have $R = \dfrac{14{,}415.657}{69.77027} = 206.62$ and from (i): $10{,}000 = 206.62\ a_{\overline{60}|i} \Rightarrow$ using

calculator,

this solves for $i = 0.007333767$

$\therefore i^{(12)} = 12i = 8.80\%$.

40. Answer: C

Marginal cost and price elasticity of demand are constant, so monopoly price is $p = \dfrac{MC}{1 - \left| \dfrac{1}{\varepsilon} \right|} = 30$.

$P = $ price, $MC = $ marginal cost $= 10$, $\varepsilon = $ price elasticity of demand $= 1.5$

Or likewise: $q = 100p^{-1.5}$

$\qquad\qquad dq = -150p^{-2.5}\ dp \qquad R = qp$

$\qquad\qquad dp/dq = p^{2.5}/{-150} \qquad MR = dR/dq = p + q\ dp/dq$

$\qquad\qquad\qquad\qquad\qquad MR = p + q\ (p^{2.5}/{-150}) = p + (100/p^{1.5})(p^{2.5}/{-150})$

$\qquad\qquad\qquad\qquad\qquad MR = p + (-2/3)p = (1/3)p$

$\qquad\qquad\qquad\qquad\qquad$ Set $MR = MC$; $(1/3)p = 10$; $p = 30$

$q = 100p^{-1.5} = 0.608581$.

Expected profit each year $= $ (prob. of success) $* q * (p - MC) * (1{,}000{,}000$ of prescriptions)

$= 0.5 * 0.608581 * (30 - 10) * 1{,}000{,}000 = 608{,}581$.

NPV $= 608{,}581 \cdot v^4 \cdot a_{\overline{16}|0.10} - 3{,}000{,}000 = 252{,}073$

(Note: there are 16 payments; first payment in 2005, last payment in 2020 .)

41. Answer: A

The warning system is a pure public good (nonrival and non-excludable). Hence, private firms will not supply an appropriate amount of the good. Because of the free-rider problem, voluntary contributions will also not yield the efficient outcome. Only through taxation and public provision can the efficient amount of the good be provided. The efficient amount is the amount at which the marginal benefit of the good equals its marginal cost.

42. Answer: C

I.　True: Option Pricing Theory has many uses and is versatile; helping evaluate the risk of decisions involving options. Some examples in manufacturing and servicing include options on raw materials, the option to abandon a project, and the option to vary the product mix as demand changes. (Ch. 21)

II.　False: The stock of a company is in effect a call option on the assets of the firm. (p. 592)

III.　True: $P = C - S + PV(x)$. As S rises, P falls.

43. Answer: B

$g = 0.08/2 = 0.04$

$i = 0.075/2 = 0.0375$　　　$v = 0.963855$

Adjustment to Bv in the 6th payment $= 1000 \cdot (g - i) \, v^{11-6} = 2.078$

44. Answer: A

The quantity theory of money equation is $\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$. The growth rate of money is constant at 3 and the growth rate of Y is constant at 2. Hence, when the growth rate of velocity is 4%, inflation is 5%; when the growth rate of velocity is 5%, inflation is 6%.

45. Answer: B

Accounting profit $= 120,000 - 40,000 - 20,000 = 60,000$

Opportunity costs $= 50,000(\text{salary}) + 5,000(\text{lost investment income})$
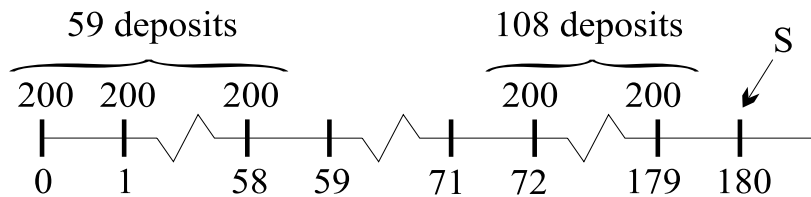
Economic benefit $= 60,000 - 55,000 = 5,000$

46. Answer: D

False – shareholders and junior creditors want prolonged proceedings in hopes that a stroke of luck will rescue their investment.

True.

True.

47. Answer: C

$$S = 200 S_{\overline{59}|.005}(1.005)^{122} + 200\, S_{\overline{108}|0.005}\,(1.005) = \$53{,}839.83\,.$$

48. Answer: A

$$\text{PV of depreciation charges} = \sum_{t=1}^{10} \frac{2000-400}{s_{\overline{10}|i}}(1+i)^{t-1} V^t_i = \sum_{t=1}^{10} \frac{1600}{s_{\overline{10}|i}} \frac{1}{(1+i)}\,(1+i)^t\, V^t$$

$$= \frac{1600}{\ddot{s}_{\overline{10}|i}} \sum_{t=1}^{10}(1) = \frac{16{,}000}{\ddot{s}_{\overline{10}|i}} = 1000$$

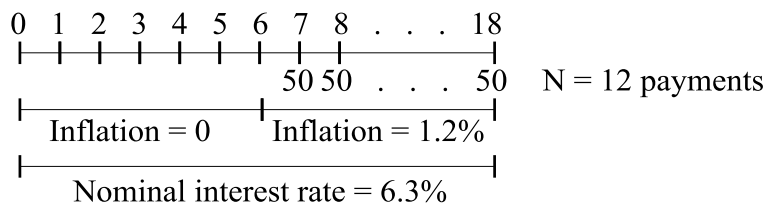$$\ddot{s}_{\overline{10}|i} = 16$$

$$i = 8.39\%\,.$$

49. Answer: E

Country X has a comparative advantage in the production of grain, while Country Y has a comparative advantage in the production of hogs. Hence, Country X should specialize in grain, and export this to Country Y . Country Y should specialize in hogs, and export hogs to Country X .

50. Answer: D

Optimal bonus is one that equates marginal revenue (benefit) and marginal cost. Cost of bonus
= w*√(w/10), revenue from bonus = 4*2,000,000*(w/100) . MC = MB implies w = 80,000/3
= 26,667 and (√(w/10))/100 = 51.64 workers expected to stay. Net benefit to the company
= revenue – cost = 2,754,000 (undiscounted). Better than any other option and, since positive
cash flows precede the negative ones, any positive discount rate (which is implied by the
question) preserves the ranking.

51. Answer: B

```
0  1  2  3  4  5  6  7  8  .  .  .    18
├──┼──┼──┼──┼──┼──┼──┼──┼──────────┤
                  50 50  .  .  .  50    N = 12 payments
├──────────────┼──────────────────┤
   Inflation = 0      Inflation = 1.2%
├──────────────────────────────────┤
       Nominal interest rate = 6.3%
```

$i_{real} = \dfrac{1 + i_{nominal}}{1 + i_{inflation}} - 1 = \dfrac{1.063}{1.012} - 1 = 0.0504$ or 5.04% .

$PV_0 = 50 \, (PVIFA_{5.04,12})\{PVIF_{6.3,6}\} = 306$.

52. Answer: A

$r_f = 0.6$ $N(d_1) = 0.742$
$X = 45$ $N(d_2) = 0.665$
$C = 7.62$
$P = 1.95$

Black-Scholes:
$$C = S \cdot N(d_1) - PV(X) \cdot N(d_2)$$
$$7.62 = S(0.742) - PV(X) \cdot (0.665)$$
$$S = \frac{7.62 + PV(X) \cdot (0.665)}{0.742}$$
$$S = 10.269542 + 0.8962264 \cdot PV(X)$$

Put-Call Parity:
$$C + PV(X) = P + S$$
$$7.62 + PV(X) = 1.96 + S$$
$$S = 5.66 + PV(X)$$
$$10.269542 + 0.896224 \cdot PV(X) = 5.66 + PV(X)$$
$$PV(X) = 44.33$$
$$44.33 = 45e^{-(0.06)T}$$
$$T = 0.250 \text{ years or 3 months}$$

53. Answer: D

The onset of a recession is characterized by increases in business inventories, high interest rates, slowdowns in productivity growth, declining profit margins and declines in investment growth.

54. Answer: D

$$\text{Quick Ratio} = \frac{\text{cash } + \text{ short term } + \text{ receivables}}{\text{current liabilities}} = 0.60$$

$$\text{Cash Ratio} = \frac{\text{cash } + \text{ short term}}{\text{current liabilities}} = 0.08$$

$$\frac{\text{Receivables}}{\text{Current liabilities}} = 0.60 - 0.08 = 0.52 \text{ .}$$

55. Answer: D

I. is false. A decrease in interest rates causes a decrease in the money supply.

II. is true. Decrease in reserve requirement enables bank to make more loans, which increases money supply.

III is true. The Central Bank creates bank reserves when it purchases government bonds in the open market and this increases the money supply.