Exam FM

Questions

1. A man has two annuities-immediate with the same interest rate and the same level payments. The first is a 30-year annuity and the second one is a 15-year deferred 15-year annuity. The present value of the first is 4 times the present value of the second. Find the interest rate.

   A) 7.3%  B) 7.4%  C) 7.5%  D) 7.6%  E) 7.7%

2. A 10-year 1000 par bond has 6% semi-annual coupons. The bond is sold at a premium of 35. What is the bond's nominal annual yield convertible semi-annually?

   A) 5.48%  B) 5.54%  C) 5.62%  D) 5.71%  E) 5.79%

3. A company has liabilities of 2000 and 5000 due at the end of years one and three respectively. The investments available to the company are two zero coupon bonds. The first is a one-year 1000 par value bond with an annual effective rate of 5.6%. The second is a three-year 1000 par bond. If the cost of exactly matching liabilities is 6068.36, what in the annual effective yield on the second bond?

   A) 5.2%  B) 5.5%  C) 5.8%  D) 6.0%  E) 6.2%

4. An investment pays 2000 at the end of year one, 4000 at the end of year 3 and 6000 at the end of year 5. It was purchased to yield an annual rate of 6.2%. Find the Macaulay duration of this investment.

   A) 3.28  B) 3.44  C) 3.49  D) 3.53  E) 3.56

5. A 10-year 1000 par bond with 6.5% semi-annual coupons is priced to yield at an annual rate of \( j \) convertible semi-annually. The amount of premium amortized in period 7 is 2.346, and the amount amortized in period 12 is 2.706. Find \( j \).

   A) 5.8%  B) 6.0%  C) 6.2%  D) 6.4%  E) 6.6%
6. Money is deposited in a bank. For the first 4 years interest accumulates at an annual nominal rate of 6% convertible monthly. For the next 6 years it accumulates at a force of interest of 5%. For the 10-year period what is the equivalent nominal discount rate convertible quarterly?

A) 4.9% B) 5.2% C) 5.4% D) 5.7% E) 5.9%

7. A man planning to work for the next 30 years sets up a retirement account by making monthly end of the month payments into a fund. The first payment is 100 and each subsequent payment is 1 more than the previous one. The fund earns at a nominal rate of 7.2% convertible monthly. At the end of the 30 years he plans to make end of month withdrawals of 2000 per month. If interest rates stay the same, how many payments will he expect to receive?

A) 292 B) 302 C) 312 D) 322 E) 332

8. For a given yield curve the implied forward rates are \( i_{0.1} = 0.030 \) and \( i_{1.2} = 0.032 \). The spot rate \( i_3 = 0.04 \). Find \( i_{2,3} \).

A) 0.0542 B) 0.0547 C) 0.0553 D) 0.0561 E) 0.0582

9. Consider the following account summary:

<table>
<thead>
<tr>
<th>Date</th>
<th>Before Activity</th>
<th>Deposits</th>
<th>Withdrawals</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1</td>
<td>10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 1</td>
<td>10,500</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>September 1</td>
<td>12,800</td>
<td></td>
<td>2600</td>
</tr>
<tr>
<td>December 31</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the time weighted yield is 5.466%, what is the dollar weighted yield?

A) 6.58% B) 6.62% C) 6.65% D) 6.71% E) 6.74%

10. A man buys a home for 200,000 and takes out a 30-year mortgage with monthly payments. The interest rate is 5.4% convertible monthly. At the end of 15 years he decides to add 500 a month to each subsequent payment. Assuming there are no penalties, how many more payments, including the final partial payment, are there?

A) 102 B) 108 C) 111 D) 115 E) 120
11. A woman buys a 10-year 1000 par bond with 7.0% semi-annual coupons. The coupon payments are deposited into an account that pays 6.6% convertible semi-annually. After the 10th deposit the bank drops its rate to 5.8% convertible semi-annually. At the end of the 10 years period what is her annual yield for this investment?

A) 6.5%  B) 6.7%  C) 6.9%  D) 7.1%  E) 7.3%

12. A man has a 30-year loan with level annual end of year payments. The principal repaid in the 10th payment is 408.12, and the principal in the 20th payment is 766.10. What is the principal repaid in the 15th payment?

A) 540.33  B) 544.02  C) 548.65  D) 552.25  E) 559.16

13. Tom has a 10-year increasing annuity-immediate that pays 100 for the first year and increases by 100 each year thereafter. Jerry has a 10-year decreasing annuity-immediate that pays X the first year and decreases by X/10 each year thereafter. Each has an annual interest rate of 6.5%, and they have the same present value. Find X.

A) 821  B) 828  C) 835  D) 842  E) 849

14. Sally and Linus each make annual end of year deposits into a savings accounts that have the same annual interest rate. Sally’s annual deposits are 100. Linus deposits 100 per year for the first 10 years and 200 per year thereafter. At the end of 20 years Linus has accumulated 4/3 the amount that Sally has. What is their common, nonzero, interest rate?

A) 6.0%  B) 6.5%  C) 6.9%  D) 7.2%  E) 7.5%

15. You are given the following yield curve:

<table>
<thead>
<tr>
<th>Year</th>
<th>Spot Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.5%</td>
</tr>
<tr>
<td>2</td>
<td>4.0%</td>
</tr>
<tr>
<td>3</td>
<td>3.8%</td>
</tr>
<tr>
<td>4</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

A 3-year 1000 par bond has a 5% annual coupon rate. Use the yield curve to find the price of the bond.

A) 1033  B) 1038  C) 1042  D) 1046  E) 1051
16. A 3-year 1000 par bond with 5.8% annual coupons is priced to yield 6.4%. What is the Macaulay duration for the bond?

A) 2.795   B) 2.801   C) 2.837   D) 2.862   E) 2.890

17. A man invests 1000 at the beginning of each year into a fund that pays an annual interest of 5.6%. The annual interest payments are deposited into a fund that that pays 6.2% annually. What is his total accumulation at the end of 10 years?

A) 13,261   B) 13,585   C) 13,730   D) 14,020   E) 14,318

18. A perpetuity immediate pays 100 a year for the first 10 years. Starting with year 11, each payment is 3% more than the previous one. The annual yield is 4.5%. Find the present value of this perpetuity.

A) 5213   B) 5324   C) 5375   D) 5431   E) 5486

19. Lucy deposits 1000 into an account and makes an additional deposit of 2000 two years later. The account accumulates at a constant force of interest. At the end of 4 years the accumulation is 3431.75. Find the force of interest.

A) 0.035   B) 0.040   C) 0.045   D) 0.050   E) 0.055

20. A man buys a house for 150,000 with a mortgage rate of 5.8% convertible monthly. At the time of purchase he owns a 10,000 20-year zero coupon bond that earns 4% annually. The bond matures in 15 years. He would like to use the proceeds from the bond to make a payment larger than the usual fixed rate payment and pay off the balance of the mortgage after the 180th payment. How much should his monthly payments be?

A) 1145   B) 1173   C) 1197   D) 1214   E) 1242

21. The current price of a stock that pays no dividends is 40. The continuously compounded risk free rate is 4%. Investor A buys a six month 41-strike put for 3.48. Investor B enters into a six month short forward contract to sell that stock for the forward price 40.81. At what stock price do the two investors have the same profit in six months?

A) 40.81   B) 41   C) 44.29   D) 44.36   E) They do not have the same profit at any stock price.
22. An investor buys a 30-strike put and a 30-strike call on a stock. Both options have the same expiration date. Which of the following is the most likely reason for taking this position?

A) To profit from an expected increase in the stock price.
B) To profit from an expected decrease in the stock price.
C) To profit from high volatility in the stock price.
D) To profit from low volatility in the stock.
E) To create a synthetic forward sale.

23. You buy a 35-strike put and write a 45-strike call on a stock. The options have the same expiration date. Which of the following can be the graph of your profit?

A)  

B)  

C)  

D)  

E) None of these

24. The current price of a stock is 40. The price of a 35-strike call is 6.13 and the price of a 45 strike call is 0.97. Consider buying $n$ 35-strike calls and selling $m$ 45-strike calls. What ratio $n/m$ gives you a zero premium for this position?

A) .158    B) .172    C) .567    D) 5.814    E) 6.320
25. You write a 35-strike put and a 45-strike call on a stock. The options both expire in three months. The price of the put is 0.44 and the price of the call is 0.97. The continuous risk free rate is 4%. What is your maximum profit?

A) 0.53  B) 0.535  C) 1.41  D) 1.424  E) There is no maximum

26. Which of the following are true?

I. Future and forward prices at expiration for otherwise identical contracts must be the same, since futures are standardized forwards.

II. When the interest rate is positively correlated with the futures price, the futures price will exceed the forward price for an otherwise identical contract.

III. All forward and futures contracts will require a maintenance margin account which is marked to market on a regular basis.

A) I only  B) II only  C) III only  D) I and III  E) II and III

27. The price of an S&P 500 Index futures contract is 1520. An investor enters a short forward position. When the position is closed the futures price is 1540. If there is no settlement requirement, what is the dollar gain or loss?

A) $20 gain  B) $20 loss  C) $5000 gain  D) $5000 loss  E) None of these

28. A stock has current price \( S_0 = 35 \). The annual continuous interest rate is \( r = .04 \) and the continuous dividend yield is \( \delta = .02 \). You observe a one year prepaid forward price of 34.20. Which of the following is true?

A) No arbitrage is possible.

B) You can create an arbitrage by buying one prepaid forward and selling one share of the stock short

C) You can create an arbitrage by selling the prepaid forward and buying one share of the stock.

D) You can create an arbitrage by buying the prepaid forward and selling \( e^{-0.02} \) shares of the stock short

E) You can create an arbitrage by selling the prepaid forward and buying \( e^{-0.02} \) shares of the stock.
29. The zero-coupon bond prices for the next 3 quarters are

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero-coupon bond price</td>
<td>.985</td>
<td>.971</td>
<td>.954</td>
</tr>
</tbody>
</table>

The guaranteed rate on a four quarter interest rate swap is 1.74%. Find the zero coupon bond rate for the fourth quarter.

A) .929  B) .933  C) .935  D) .937  E) .939

30. Zero coupon bond yields and oil forward prices for the next three years are

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Forward Price</td>
<td>60</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>Zero-coupon bond yield</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
</tr>
</tbody>
</table>

What is the level swap payment for a three year oil price swap?

A) 61.90  B) 62.13  C) 62.27  D) 62.38  E) 62.43