30 PRICING AND VALUATION OF FORWARD

1. The no-arbitrage price of a futures contract with a spot rate of 990, a time to maturity of 2 years, and a risk-free-rate of 5% is closest to:
   (A) 1091
   (B) 1040
   (C) 792

2. If the one year spot rate is 5%, the two-year spot rate is 5.5%, and the three year spot rate is 6%, the fixed rate on a 3-year annual pay swap is closest to:
   (A) 1.99%
   (B) 5.65%.
   (C) 4.50%.

3. Consider a one-year currency swap with semiannual payments. The payments are in U.S. dollars and euros. The current exchange rate of the euro is $1.30 and interest rates are

	180 days	360 days
USD MRR	5.6%	6.0%
MRR	4.8%	5.4%

   What is the fixed rate in euros?
   (A) 2.659%.
   (B) 5.318%.
   (C) 5.245%.

4. The value of the S&P 500 Index is 1,260. The continuously compounded risk-free rate is 5.4% and the continuous dividend yield is 3.5%. Calculate the no-arbitrage price of a 160-day forward contract on the index.
   (A) $562.91.
   (B) $1,310.13.
   (C) $1,270.54.

5. Consider a 9-month forward contract on a 10-year 7% Treasury note just issued at par. The effective annual risk-free rate is 5% over the near term and the first coupon is to be paid in 182 days. The 40 price of the forward is closest to:
   (A) 1,037.27.
   (B) 965.84.
   (C) 1,001.84.

The Isle of Nefer is a developing country with its stock and futures markets enjoying record trading volumes due to the influx of foreign funds. You are looking to invest in the stock and futures markets in the Isle of Nefer. The representative stock market index, Nefer Industrial Index (NII), is currently priced at 8,765 and the one year NII future contract is currently trading at 8,920.

You have experience in using forward contracts but not futures. You discuss the possibility of investing in the Isle of Nefer using futures contract with your supervisor, Peter Filler, and he makes the following comments.

Comment 1:	"A futures contract will have positive value after marking to market if the future price is up on that day."
Comment 2:	"Given a quoted clean bond price of the CTD, when looking at a bond future the full price of the bond must be used which equals the clean price of the bond plus accrued interest. The futures price can then be calculated as: QFP = {(full price) x $(1 + R_f)^T + AI_T$ — FVC)(1 / CF) Where AI_T = accrued interest at futures maturity, R_f = risk-free rate, FVC = future value of coupon and CF = conversion factor

Peter Filler also suggests that you invest in Treasury bond futures. Exhibit 1 contains the relevant information.

Exhibit 1

Price of underlying deliverable 16 year 5% Treasury bond (just paid coupon)	$1,030
Expiration of Treasury bond futures contract	0.7 year
Conversion factor	1.08
Risk free rate	3.0 percent

6. Comment 1 is best described as:
   (A) correct.
   (B) incorrect as the value of the futures contract should be negative after marking to market.
   (C) incorrect as the value of the futures contract should be zero after marking to market.

7. Comment 2 is best described as:
   (A) correct.
   (B) incorrect as the full price should be the clean price less the current accrued interest.
   (C) incorrect as the accrued interest at expiration should be deducted from the future value of full bond price in arriving at the quoted futures price.

8. Using Exhibit 1, the quoted price of the Treasury bond futures contract should
   (A) $941.
   (B) $975.
   (C) $1,100.

9. The price of a forward contract:
   (A) must be equal to the market price at contract termination.
   (B) is the settlement price for the underlying asset.
   (C) is equal to the value of the contract in equilibrium.

10. Which of the following is equivalent to a pay-fixed swap with a tenor of two years with semi-annual swap payments and a fixed rate of 6% (exchanged for MRR)? The notional principal is $100,000,000.
   (A) A strip of two forward rate agreements, which obligates the party to pay a fixed rate of 6% and receive six-month MRR on a notional principal of $100,000,000.
   (B) A forward rate agreement, which obligates the party to pay a fixed rate of 6% and receive six-month MRR on a notional principal of $100,000,000.
   (C) A strip of three forward rate agreements, which obligates the party to pay a fixed rate of 6% and receive six-month MRR on a notional principal of $100,000,000.

Elodie Brodeur works in the finance department of a large fashion house in France. The international catwalk season will start in two months' time and Brodeur has worked out that the company will need a 3-month loan of €4m in two months' time. The company's lenders are typically retail banks offering loans at MRR plus 40 basis points. Brodeur is concerned that interest rates may rise during the next two months and wants to use a FRA to lock-in the borrowing cost. Brodeur has collected the rate information shown in Exhibit 1.

Exhibit 1: Current MRR Rates

60 day MRR	2.0%
90 day MRR	2.4%
150 day MRR	2.6%
210 day MRR	2.9%

One month after the initiation of the FRA the MRR rates are shows in Exhibit 2.

Exhibit 2: MRR Rates One Month Later

30 day MRR	1.8%
90 day MRR	2.5%
120 day MRR	2.8%
180 day MRR	3.0%

At the expiration of the FRA, 90-day MRR is 3.4%.

11. Which of the following comments relating to Brodeur's use of a forward rate agreement is least accurate?
    (A) A short FRA can be used to lock into a fixed rate of borrowing commencing in two months' time and expiring in five months' time.
    (B) The use of a FRA to hedge interest rate risk would lock Brodeur into paying a fixed rate plus 40 basis points for her borrowing.
    (C) The use of a FRA to hedge interest rate risk on her future loan will mean that she no longer benefits if interest rates fall.

12. Using the data in Exhibit 1, which of the following is closest to the forward price of the FRA?
    (A) 2.4%.
    (B) 2.8%.
    (C) 3.0%.

13. For this question only, assume that the forward price of the FRA was 2.9%. Which of the following is the closest to the value accrued on the FRA from Brodeur's perspective one month after initiation of the contract?
    (A) +€2,300.
    (B) +€2,200.
    (C) –€2,265.

14. Assuming the forward price of the FRA was 2.9%, which of the following is closest to the value of the FRA at expiration?
    (A) €4,958.
    (B) €5,000.
    (C) €19,831.

15. 90 days ago the exchange rate was USD 0.83 per CDN and the term structure was:

	180 days	360 days
USD MRR	5.2%	5.6%
CDN MRR	4.8%	5.4%

A 1 year, semi-annual settlement, fixed for fixed swap was initiated with 5.30% fixed for CDN and 5.52% fixed for USD on a principal of USD 1 million.
Current exchange rate is USD 0.84 per CDN and the yield curve is:

	90 days	270 days
USD MRR	5.2%	5.6%
Disc Factor	0.98717	0.95969
CDN MRR	4.8%	5.4%

Disc factor	0.98814	0.96108

What is the value of the swap to the USD interest payer?

(A) -$3,472.

(B) $10,126.

(C) $11,500.

16. At contract initiation, the value of a forward contract:

(A) depends on the market price of the underlying asset.

(B) is typically zero regardless of the price of the underlying asset.

(C) is set to 100 by convention.

17. The fixed-rate on a semiannual 2-year interest rate swap is closest to the:

(A) coupon rate on a 2-year par bond with the same credit risk as the reference rate.

(B) current 180-day T-bill rate.

(C) coupon rate on a 2-year par bond with the same credit risk as the fixed-rate payer.

18. What is the difference between spot and futures prices? Spot prices are always:

(A) equal to the futures price at futures expiration.

(B) delivered to meet the futures obligation at expiration.

(C) lower than futures prices.

19. The current U.S. dollar ($) to Canadian dollar (C$) exchange rate is 0.7. In a $1 million currency swap, the party that is entering the swap to hedge existing exposure to C$-denominated fixed-rate liability will:

(A) receive floating in C$.

(B) pay floating in C$.

(C) pay C$1,428,571 at the beginning of the swap.

20. A $10 million 2-year semi-annual-pay MRR-based interest-rate swap was initiated 180 days ago when swap fixed rate was 3.8%. The fixed rate on the swap is now 3.4% and the term structure is as follows:

Days	MRR	Discount Factor
180	3.00%	0.98522
360	3.20%	0.96899
540	3.40%	0.95148

720	4.00%	0.92593

Value of the swap to the payer is closest to:

(A) -$58,114.

(B) -$29,229.

(C) -$45,633.

21. The price of a 3 x 5 forward rate agreement (FRA) is the:

(A) 3-month implied forward rate 5 months from today.

(B) 2-month implied forward rate 3 months from today.

(C) 2-month implied forward rate 5 months from today.

22. The price of an interest rate swap is the:

(A) cost to purchase a swap.

(B) fixed rate of interest.

(C) market value of the swap.

23. Consider a fixed-rate semiannual-pay equity swap where the equity payments are the total return on a $1 million portfolio and the following information:

- 180-day MRR is 5.2%
- 360-day MRR is 5.5%
- Dividend yield on the portfolio = 1.2%

What is the fixed rate on the swap?

(A) 5.4197%.

(B) 5.4234%.

(C) 5.1387%.

24. A swap is equivalent to a series of:

(A) FRAs priced at market rates.

(B) off-market FRAs.

(C) interest rate calls.

25. A U.S. firm (U.S.) and a foreign firm (F) engage in a 3-year, annual pay currency swap; The USD fixed rate at initiation was 5% while FC fixed rate was 4%. At the beginning of the swap, $2 million was paid by the U.S. firm and the exchange rate was 2 FC units per $1. At the end of the swap period the exchange rate was 1.75 FC units per $1. At the end of year 1, firm:

(A) U.S. pays firm F 160,000 FC units.

(B) F pays firm U.S. $200,000.

(C) U.S. pays firm F $200,000.

26. During the life of a forward contract, the value of the contract is best described as:
    (A) the difference between the future value of the spot price and the expected future price of the underlying asset.
    (B) the present value of the expected future price of the underlying asset.
    (C) the difference between the spot price and the present value of the forward price of the underlying asset.

27. An equity portfolio manager who has a positive long-term outlook for equities, but expects equity prices to decline over the next three months, would most appropriately enter into:
    (A) an equity swap as the equity return payer.
    (B) a short straddle with an equity index as the underlying.
    (C) an equity swap as the equity return receiver.

28. Calculate the price (expressed as an annualized rate) of a 1x4 forward rate agreement (FRA) if the current 30-day rate is 5% and the 120-day rate is 7%.
    (A) 7.63%.
    (B) 7.47%.
    (C) 6.86%.

29 In an equity return swap for MRR, if the return on the underlying equity portfolio is negative for a payment period, period, the equity return payer will:
    (A) receive a net payment greater than the loss of value on the equity portfolio.
    (B) make a net payment greater than the loss of value on the equity portfolio.
    (C) receive a net payment less than the loss of value on the equity portfolio.

30. At the inception of a market-rate plain vanilla swap, the value of the swap to the fixed-rate payer is:
    (A) zero.
    (B) either positive or negative.
    (C) positive.

31. The floating-rate payer in a simple interest-rate swap has a position that is equivalent to:
    (A) a series of long forward rate agreements(FRAs).
    (B) a series of short FRAs.
    (C) issuing a floating-rate bound and series of long FRAs.

32. The value of a futures contract between the times when the account is marked-to-market is:

(A) the same as the contract price.

(B) equal to the difference between the price of a newly issued contract and the settle price at the most recent mark-to-market period.

(C) never less than the value of a forward contract entered into on the same date.

33. The fixed-rate payer in an interest-rate swap has a position equivalent to a series of:

(A) long interest-puts and short interest-rate calls.

(B) long interest-rate puts and calls.

(C) short interest-rate puts and long interest-rate calls.

34. To initiate an arbitrage trade if the futures contract is underpriced, the trader should:

(A) short the asset, invest at the risk-free rate, and buy the futures.

(B) borrow at the risk-free rate, buy the asset, and sell the futures.

(C) borrow at the risk-free rate, short the asset, and sell the futures.

35. 30 days ago, J. Klein took a short position in a $10 million (3X6) forward rate agreement (FRA) based of MRR and priced at 5%. The current MRR curve is:

- 30-day = 4.8%
- 60-day = 5.0%
- 90-day = 5.1%
- 120-day = 5.2%
- 150-day = 5.4%

The current value of the FRA, to the short, is closest to:

(A) -$15,154.

(B) -$15,280.

(C) -$15,495.

36. Writing a series of interest-rate puts and buying a series of interest-rate calls, all at the same exercise rate, is equivalent to:

(A) being the floating-rate payer in an interest rate swap.

(B) a short position in a series of forward rate agreements.

(C) being the fixed-rate payer in an interest rate swap.

37. A company has chosen to use a 6 x 9 FRA expiring in 6 months to mitigate the risk of paying a floating coupon on the bond issue. The current term structure for MRR is as follows:

Term	Interest Rate
180 days	5.65%
270 days	5.95%

What is the price of this forward rate agreement (FRA)?

(A) 6.37%

(B) 3.19%

(C) $6.37

38. The contract price of a forward contract is:

(A) always the present value of the expected future spot price.

(B) the price that makes the contract a zero-value investment at initiation.

(C) determined at the settlement date.

39. Consider a 1-year semiannual equity swap based on an index at 985 and a fixed rate of 4.4%. 90 days after the initiation of the swap, the index is at 982 and MRR is 4.6% for 90 days and 4.8% for 270 days. The value of the swap to the equity payer, based on a $2 million notional value is closest to:

(A) $22,564

(B) $22,314

(C) –$22,564

40. Consider a fixed-for-fixed 1-year $100,000 semiannual currency swap with rates of 5.0% in USD and 4.8% in CHF, originated when the exchange rate is $0.34. After the first settlement, the exchange rate is $0.35 and the term structure is:

	90 days	180 days
MRR	5.2%	5.6%
Swiss	4.8%	5.4%

What is the value of the swap to the USD payer?

(A) $2,814.

(B) –$2,719.

(C) $2,937

41. The fixed-rate receiver in a plain vanilla interest rate swap has a position equivalent to a series of:

(A) long interest-rate puts and short interest-rate calls.

(B) short interest-puts and long interest-rate calls.

(C) long interest-rate puts.

42. Calculate the price of a 200-day forward contract on an 8%, semi-annual, U.S. Treasury bond with a spot price of $1,310. Next coupon payment will be made in 150 days. The annual risk-free rate is 5%.

(A) $1,270.79.

(B) $1,305.22.

(C) $1,333.50.

43. An index is currently 876, the risk-free rate (R_f) is 7%, and the dividend yield on the index portfolio is 1.8%. Assuming that these are continuously compounded yields, the price of an

18-month index future is closest to:

(A) 945.2.

(B) 943.0.

(C) 947.1.

44. A plain vanilla interest-rate swap to the fixed-rate payer is equivalent to issuing a fixed-rate bond and:

(A) selling a series of interest rate puts.

(B) buying a floating-rate bond.

(C) selling a series of interest rate calls.

45. For a 1-year quarterly-pay swap, an equivalent position with short puts and long calls would involve:

(A) three put-call combinations expiring on the first three settlement dates of the swap.

(B) put-call combinations expiring on each of the four settlement dates.

(C) three put-call combinations on the last three settlement dates of the swap.

46. Consider a 1-year, $5 million semiannual-pay fixed-rate equity swap initiated when the equity index is 750 and swap fixed rate is 3.7%. Equity index was at 760 at first settlement. It is now 270 days since inception of the swap and the index is at 767, 90-day MRR is 3.4% (DF = 0.99157) and 270-day MRR is 3.7% (DF = 0.9730). What is the value of the swap to the fixed-rate payer?

(A) -$3,520.

(B) $3,478.

(C) -$2,726.

47. The price and value of a plain vanilla interest-rate swap are:

(A) equal in equilibrium.

(B) only equal at the inception of a swap contract.

(C) never equal.

48. The theoretical price of a forward contract:

(A) is the no-arbitrage price.

(B) equals the long's expectation of the future price of the underlying asset.

(C) is always greater than the current price of the underlying asset.

49. Which of the following is equivalent to a pay-floating USD receive-fixed EUR currency swap position?

(A) A short position in a EUR bond coupled with a long position in a USD-denominated floating rate note.

(B) A short position in a EUR bond coupled with the issuance of a USD-denominated

floating rate note.

(C) A long position in a EUR bond coupled with the issuance of a USD-denominated floating rate note.

50. At expiration, the value of a forward contract is:

(A) always greater than or equal to zero.

(B) the difference between the contract price and the market value of the underlying asset.

(C) equal to the market price of the underlying asset.

51. Calculate the no-arbitrage forward price for a 90-day forward on a stock that is currently priced at $50.00 and is expected to pay a dividend of $0.50 in 30 days and a $0.60 in 75 days. The annual risk free rate is 5% and the yield curve is flat.

(A) $49.49.

(B) $48.51.

(C) $50.31.

52. What is the value of a 6.00% 1 x 4(30 days x 120 days) forward rate agreement (FRA) with a principal amount of $2,000,000. 10 days after initiation if the MRR curve at that time reflects the following:

110-day MRR = 6.15% and 20-day MRR = 6.04%?

(A) $767.40.

(B) $700.00

(C) $745.76.

Abel Smith works in the Treasury Department of OTS Ltd. OTS is an international construction firm, based in the United States. OTS hopes to raise €100 million through the issuance of a €100 million one-year fixed rate bond but is concerned about the currency risk exposure.

TNA Bank proposed a one year EUR-USD currency swap with semi-annual settlements to OTS to mitigate the exchange rate risk. The notional principal would be €100 million. The bank provides the following information:

Exhibit 1: MRR Spot Rate (annualized)

Days	$ MRR	PV Factors	Days	MRR	PV Factors
180	0.70%	0.9965	180	1.50%	0.9926
360	1.00%	0.9901	360	2.00%	0.9804

Using the information in Exhibit 1, the bank calculates that the currency swap's fixed rates are 0.85% on the USD and 1.75% on the euro.

The term structure of MRR and MRR spot rates three months after the swap initiation is shown in Exhibit 2:

Exhibit 2: MRR Spot Rate (annualized)

Days	$ MRR	PV Factors	Days	MRR	PV Factors
90	0.85%	0.9979	90	1.30%	0.9968
270	1.20%	0.9911	270	2.30%	0.9830

Exhibit 3: Exchange Rates

Time	Exchange Rate	Time	Exchange Rate
Swap initiation	€1: USD1.43	1st settlement date	€1: USD1.55
90 days after swap initiation	€1: USD1.48	2nd settlement date	€1: USD1.55

OTS has an investment portfolio with similar weighting as the S&P500. Smith believes that the U.S. equity market could suffer further declines and OTS could hedge the equity risk using an equity swap. Smith obtained the outlook of the U.S. equity market in Exhibit 4.

Exhibit 4: Performance of S&P500 for the Next Three Quarters

Time	S&P Index Level
Swap initiation	1,190
1st quarter	1,000
2nd quarter	980
3rd quarter	1,050
4th quarter	1,130

Smith is proposing for OTS to be the party paying the equity return on a USD500 million one-year equity swap. OTS will be receiving fixed rate of 1% on a semi-annual basis.

Smith makes two comments:

Comment 1:	A fixed-rate payer in an equity swap would not have to pay more than the fixed rate each period.
Comment 2:	Compared to an interest rate swap, the first payment in an equity swap will not be known at initiation.

53. Has the bank correctly calculated the fixed rates on the currency swap?

(A) Both fixed rates are incorrectly calculated.

(B) One of the two fixed rates is incorrectly calculated.

(C) Both fixed rates are correctly calculated.

54. If OTS decides on a fixed for fixed currency swap, what is the market value of the swap to OTS three months after swap initiation?

(A) The value of the euro payments is €97.68m and converting the euro value to USD using €1: USD1.55, the swap has a positive to OTS.

(B) The value of the euro payments is €100.27m and converting the euro value to USD using €1: USD1.48, the swap has a positive to OTS.

(C) The value of the euro payments is €101.8m and converting the euro value to USD using €1: USD1.43, the swap has a positive to OTS.

55. Using the information in Exhibit 2, what is the market value of the equity swap to OTS three months after swap initiation?

(A) +USD80.35 million.

(B) +USD85.33 million.

(C) +USD88.76 million.

56. How many of Smith's comments are correct?

(A) Neither comment is correct.

(B) One comment is correct.

(C) Both comments are correct.

57. Which of the following is equivalent to a plain vanilla receive-fixed interest rate swap?

(A) A short position in a bond coupled with a long position in a floating rate note.

(B) A short position in a bond coupled with the issuance of a floating rate note.

(C) A long position in a bond coupled with the issuance of a floating rate note.

58. An index is currently 965 and the continuously compounded dividend yield on the index is 2.3%. What is the no-arbitrage price on a one-year index forward contract if the continuously compounded risk-free rate is 5%.

(A) 991.4.

(B) 991.1.

(C) 987.2.

59. A stock is currently priced at $110 and will pay a $2 dividend in 85 days and is expected to pay a $2.20 dividend in 176 days. The no arbitrage price of a six-month (182-day) forward contract when the effective annual interest rate is 8% is closest to:

(A) $110.20.

(B) $110.00.

(C) $110.06.

60. In which type of swap contract is notional principal most likely to be exchanged at initiation?
    (A) Interest rate swap.
    (B) Currency swap.
    (C) Equity swap.

61. Consider a fixed-rate semiannual-pay equity swap where the equity payments are the total return on a $1 million portfolio and the following information:
    - 180-day MRR is 4.2%
    - 360-day MRR is 4.5%
    - Div. yield on the portfolio = 1.2%

    What is the fixed rate on the swap?
    (A) 4.3232%.
    (B) 4.5143%.
    (C) 4.4477%.

62. Over the life of a swap, the price of the swap:
    (A) is approximately equal to the market value of the swap.
    (B) does not change.
    (C) fluctuates with changes in the yield curve.

63. Which of the following best describes the price of a forward contract? The forward price is:
    (A) always expressed in dollars.
    (B) always equal to the market price at contract termination.
    (C) the price that makes the values of the long and short positions zero at contract initiation.

64. The price of a forward contract:
    (A) depends on forward interest rates.
    (B) changes over the term of the contract.
    (C) is determined at contract initiation.

65. How will the price of the one-year stock index future perform over the next 12 months?
    (A) The futures price will converge to the future spot index price, with the basis reducing to zero.
    (B) The value will move approximately in line with the spot index price, with a fairly constant basis.
    (C) The futures price will move approximately in line with the spot index price, though its actual level at the end of the year will depend more on supply and demand than on the spot price.