

## Schweser Printable Answers - Session Asset Valuation: Fixed Income Investments: Valuation Concepts

Test ID#: 1361230

[Back to Test Review](#)
[Hide Questions](#)
[Print this Page](#)

### Question 1 - #9238

Harold Adams, CFA, is a financial analyst for Hyde Brothers, a large investment bank based in New York City, which currently has several large mutual funds under management. Adams reports directly to the Chief Investment Officer. One of Hyde Brother's mutual funds has underperformed the market over the past twelve months. Adams has been asked by the CIO to review two of this fund's fixed income holdings, and to recommend whether he believes that they continue to meet Hyde Brothers' investment criteria. Specifically, Adams must determine whether to buy, sell or hold securities issued by Butler, Inc. and the Greeno Company.

Adams begins by reviewing the financial ratios for Butler, Inc., (Table 1 below) and select operating data for The Greeno Company (Table 2 below). Table 3 contains Median Rating Criteria from a rating agency used by Hyde Brothers. Use the information in these tables to answer the following two questions on Butler, Inc., and then four questions on The Greeno Company.

Table 1 Selected Data on Butler, Inc.			
Ratios	2002 (Projected)	2001	2000
EBIT interest Coverage Ratio	19.5	17.2	13.7
EBITDA interest coverage	10.0	9.0	8.0
Funds from Operations/TD	48.0	48.0	55.0
Free Operating Cash Flow/TD	NA	NA	NA
Pretax Return on Capital	26.0	24.1	18.5
Operating Income/Sales	36.0	36.5	37.8
LTD/Capitalization	29.0	28.9	31.8
TD/Capitalization	45.0	58.0	60.2

Table 2 Selected Data on The Greeno Company	
Operating Data	2002 (Projected) (in \$ millions)
Earnings after tax	25.0
Interest expense	5.0
Current assets	9.0
Current Liabilities	2.0
Long-term debt	50.0
Equity	180.0
Tax Rate	40%

Table 3 Rating Agency Select Median Rating Criteria						
Ratios	AAA	AA	A	BBB	BB	B
EBIT interest Coverage Ratio	12.9	9.2	7.2	4.1	2.5	1.2
EBITDA interest coverage	18.7	14.0	10.0	6.3	3.9	2.3
Funds from Operations/TD	89.7	67.0	49.5	32.3	20.1	10.5
Free Operating Cash Flow/TD	40.5	21.6	17.4	6.3	1.0	(4.0)
Pretax Return on Capital	30.6	25.1	19.6	15.4	12.6	9.2
Operating Income/Sales	30.9	25.2	17.9	15.8	14.4	11.2
LTD/Capitalization	21.4	29.3	33.3	40.8	55.3	68.8
TD/Capitalization	31.8	37.0	39.2	46.4	58.5	71.4

Current Ratio	5.0	4.0	4.0			
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## Part 1)

Butler's 2001 earnings before interest and taxes (EBIT) interest coverage ratio is *closest* to:

- A) AAA.
- B) AA.
- C) A.
- D) BBB.

Your answer: A was incorrect. The correct answer was A) AAA.

With a 2000 EBIT interest coverage of 17.2, Butler would be rated an AAA credit risk, as the median standard in Table 2 for AAA is 12.9.

## Part 2)

Butler's bonds are currently rated and priced as BBB credits. After reviewing the data, Adams would *most likely* make which of the following recommendations?

- A) Sell the bonds pending an upgrade.
- B) Buy the bonds pending a downgrade.
- C) Sell the bonds pending a possible downgrade.
- D) Buy the bonds pending an upgrade.

Your answer: A was incorrect. The correct answer was D) Buy the bonds pending an upgrade.

All but total debt to capitalization ratio indicate an A rated instrument. Bond values increase as credits are upgraded, thus the investor should buy now in anticipation of the upgrade.

## Part 3)

The current ratio for the Greeno Company is:

- A) 2.50.
- B) 4.50.
- C) 9.00.
- D) Cannot be determined.

Your answer: A was incorrect. The correct answer was B) 4.50.

Current ratio = current assets/current liabilities =  $9 \div 2 = 4.5$ .

## Part 4)

The long-term debt to total capitalization ratio for Greeno Company is:

- A) 27.8%.
- B) 3.60 times.
- C) 21.7%.
- D) 4.60 times.

Your answer: A was incorrect. The correct answer was C) 21.7%.

The ratio is  $50 \div (50 + 180) = 21.7\%$ .

## Part 5)

The interest coverage ratio for Greeno is *closest* to:

- A) 6.6 times.
- B) 4.0 times.
- C) 11.0 times.

D) 9.3 times.

Your answer: A was incorrect. The correct answer was D) 9.3 times.

$EBT = \text{net income} \div (1 - t) = 25 \div 0.6 = 41.67$   
 $EBIT = \text{interest expense} + EBT = 5.0 + 41.67 = \$46.67$  million  
 $\text{Interest coverage} = EBIT \div \text{interest} = 46.67 \div 5 = 9.33$  times.

Part 6)

Assume that Greeno's bonds are currently rated A by all the major rating agencies. On the basis of only the information provided in this series of questions, Adams should advise clients to:

- A) sell Greeno bonds in anticipation of a rating downgrade.
- B) hold Greeno bonds because they are fairly valued at their current levels.
- C) buy Greeno bonds in anticipation of a rating upgrade.
- D) neither buy nor sell. Purchase or sale determination cannot be made given the information provided.

Your answer: A was incorrect. The correct answer was C) buy Greeno bonds in anticipation of a rating upgrade.

Based on the rating table, the Greeno bonds should be rated AA and not A. Hence, buy the bonds in anticipation of an upgrade.

#### Question 2 - #9240

Robin Alberts, CFA, is the head of research for Worth Brothers, a large investment company based in New York. Next week, a group of analysts who have just completed the Worth Brothers' management training program will begin rotating throughout the various departments and trading desks at the firm. The trainees will be split into small groups, and each group will spend four weeks in each area to learn the basic operations of each department through "hands on" experience. Also, in that time period, each department head is expected to fully evaluate each candidate in order to determine their future placement within the firm.

Alberts decides that she should begin every rotation in the research department by giving each candidate a brief review exam to test their knowledge of the general principles of credit analysis. She asks each candidate to analyze the following three scenarios and to answer two questions on each scenario.

Scenario One				
	Firm A	Firm B	Firm C	Firm D
Payout Ratio	75%	--	--	--
Required Rate of Return	12%	12%	12%	12%
Return on Equity	20%	15%	30%	14%
Price/Book Value Ratio	--	3.00	0.70	3.50

Scenario Two Cost of Capital Measures for Brown, Inc.	
Risk-Free Rate	5%
Expected Return on the Market	12%
Beta	1.5
Tax Rate	40%
Cost of Debt	10%
Proportion of the Firm Financed with Debt	20%
Proportion of the Firm Financed with Equity	80%

Scenario Three The Donner Company as of December 31, 2003 (in \$ millions)			
Cash	38	Current Liabilities	52
Accounts Receivable	120	Long-term Bonds	123
Inventory	57	Common Stock	75
Property, Plant & Equip.	218	Retained Earnings	183

Total Assets	433	Total Liabilities & Equity	433
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	2001	2002	2003
Operating Profit (EBIT)	42	38	43
Interest Expense	16	17	20
Relevant Industry Ratios:			
Long-term Debt-to-equity Ratio: 0.52			
Current Ratio: 3.20			
Interest Coverage Ratio: 2.10			

Part 1)

Using the information in scenario one which of the following items would *increase* firm A's price/book value (PBV)?

- A) Decrease ROE.
- B) Decrease income.
- C) Increase the required rate of return.
- D) A larger spread between ROE and the required rate of return.

Your answer: A was incorrect. The correct answer was D)

A larger spread between ROE and the required rate of return.

To increase the price/book value (PBV) do one of the following:

- Increase return on equity (ROE).
- Decrease the required rate of return (r).
- Increase the spread between ROE and r.

Part 2)

Using the information from scenario one which of the following items would *decrease* firm A's price/book value (PBV)?

- A) Increase the spread between ROE and the required rate of return.
- B) Increase return on equity (ROE).
- C) Increase the required rate of return.
- D) Decrease the riskiness of the firm.

Your answer: A was incorrect. The correct answer was C)

Increase the required rate of return.

To decrease the price/book value (PBV) do one of the following:

- Decrease return on equity (ROE).
- Increase the required rate of return (r).
- Decrease the spread between ROE and r.

Part 3)

Using the information in scenario two, what is the cost of equity capital of Brown, Inc.?

- A) 10.5%.
- B) 15.5%.
- C) 12.0%.
- D) 13.6%.

Your answer: A was incorrect. The correct answer was B)

15.5%.

Use the CAPM to compute the cost of equity capital as follows:

$$K_{\text{equity}} = 5\% + 1.5(12\% - 5\%) = 15.5\%.$$

Part 4)

Using the information in scenario two, what is the weighted-average cost of capital (WACC) of Brown, Inc.?

- A) 13.60%.
- B) 9.86%.
- C) 13.20%.
- D) 14.40%.

Your answer: A was incorrect. The correct answer was A)

13.60%.

The weighted-average cost of capital (WACC) = (proportion of firm financed with equity)(cost of equity) + (proportion of firm financed with debt)(cost of debt)(1 - tax rate) =  $(0.8)(15.5\%) + (0.2)(10\%)(1 - 0.4) = 13.6\%$ .

Part 5)

Using the information in scenario three, what should Mansted observe about Donner's solvency and debt capitalization?

- A) Donner's solvency ratio is better but its debt capitalization is worse than the industry average.
- B) Donner's solvency ratio is worse but its debt capitalization is better than the industry average.
- C) Both Donner's solvency ratio and its debt capitalization are worse than the industry average.
- D) Both Donner's solvency and debt capitalization ratios are better than the industry average.

Your answer: A was incorrect. The correct answer was D)

Both Donner's solvency and debt capitalization ratios are better than the industry average.

Donner's current ratio of  $(38 + 120 + 57) / 52 = 4.13$  is higher (better) than the industry average of 3.2. Donner's long-term debt-to-equity ratio of  $123 / (75 + 183) = 0.48$  is lower (better) than the industry average of 0.52.

Part 6)

Using the information in scenario three, what should Mansted observe about Donner's ability to make its interest payments? Donner's interest coverage ratio is:

- A) declining (worsening) over time and is below the industry average.
- B) rising (improving) over time and is above the industry average.
- C) rising (improving) over time but is below the industry average.
- D) declining (worsening) over time but is still above the industry average.

Your answer: A was incorrect. The correct answer was D)

declining (worsening) over time but is still above the industry average.

Donner's interest coverage ratio  $(42 / 16 = 2.625$  in 2001,  $38 / 17 = 2.235$  in 2002, and 2.150 in 2003) is declining from year to year but is still above the industry average of 2.10.

#### Question 3 - #9262

Brad Taylor is a portfolio manager for a small firm that caters to high net worth individuals. He invests substantial amounts of his clients' assets in fixed incomes securities, while his partner deals primarily with his clients' equity investments. Taylor's particular areas of analytical expertise include corporate bonds, asset-backed securities (ABS), and foreign government bonds. Being in a small firm, Taylor is involved in every aspect of managing the fixed income portion of the portfolio, from the initial identification of a potential investment, to the analysis, and on to the purchase decision. In addition, he also performs an ongoing analysis of assets currently held in the portfolio.

As the size of the portfolio has grown over the past two years, Taylor has become increasingly aware of the fact that he needs to acquire additional support staff in order to adequately perform his fiduciary duties. He has recently hired a new trading assistant, Donald Johnson, whose prior position was at a firm that invested exclusively in equity securities.

Johnson has not had much experience in the analysis of fixed income securities and realizes that there are some significant differences between the credit analyses of equities versus that of fixed income securities. He is trying to understand how to evaluate the credit quality of fixed income securities in the specific sectors of corporate bonds, asset-backed securities, and foreign government bonds. Taylor suggests that to begin, Johnson should review one of Taylor's old fixed income textbooks, to become more familiar with the concepts. Johnson needs to be able to identify which key ratios are used in fixed income analysis, how to calculate them, and the how to interpret them. He is familiar with basic mechanics of a cash flow analysis of an equity investment, but needs to understand why and how cash flow from operations can affect the value of a fixed income security. In addition, Taylor expects Johnson to quickly have a strong working knowledge of each of the following areas: corporate bonds and the measurement of their capitalization and solvency; asset-backed securities and the factors that will determine an issue's rating; and foreign government bonds and the economic and political risks that can affect their performance.

Part 1)

Johnson is not sure what is meant by a short-term solvency ratio. Which of the following ratios is a measure of short-term solvency?

- A) Total debt to capitalization ratio.
- B) EBIT interest coverage ratio.
- C) Current ratio.
- D) Funds from operations to total debt ratio.

Your answer: A was incorrect. The correct answer was C) Current ratio.

The current ratio is defined as current assets divided by current liabilities. It is a measure of the adequacy of liquid assets for meeting short-term obligations as they come due.

The total debt to capitalization ratio is equal to the sum of current liabilities and long-term debt divided by the sum of long-term debt and shareholders' equity. It includes longer term assets and liabilities that are not as liquid.

The EBIT interest coverage ratio is earnings before interest and taxes divided by the annual interest expense. It is not a suitable measure of short-term solvency.

The funds from operations/total debt ratio measures the amount of funds from operations relative to total debt.

Part 2)

Johnson has read about the importance of coverage ratios in order to evaluate the credit risk of a corporate bond. Which of the following statements is *most correct*?

Coverage ratios are used to:

- A) test the adequacy of cash flows generated through earnings for purposes of meeting debt and lease obligations.
- B) determine the capital adequacy of long-term assets to meet long-term debt obligations.
- C) judge the capital adequacy of liquid assets for meeting short-term obligations as they come due.
- D) determine the extent to which a corporation is trading on its equity, and the resulting financial leverage.

Your answer: A was incorrect. The correct answer was A) test the adequacy of cash flows generated through earnings for purposes of meeting debt and lease obligations.

Examples of coverage ratios are: EBIT interest coverage ratio, EBITDA interest coverage ratio, funds from operations to total debt ratio, and free operating cash flow to total debt ratio.

Part 3)

Johnson asks Taylor to define a discretionary cash flow. Which of the following is the *most correct*?

A discretionary cash flow:

- A) results from profits.
- B) may be spent at the company's discretion.
- C) remains available after a company services its debt.
- D) remains available to a company after it funds its operating requirements and capital expenditures.

Your answer: A was incorrect. The correct answer was D) remains available to a company after it funds its operating requirements and capital expenditures.

Discretionary cash flow can be defined as cash flow that is available to a firm after it has funded its basic operating requirements and can be calculated as:

$$\text{discretionary cash flow} = \text{cash flow from operations} - \text{nondiscretionary capital expenditures}$$

Nondiscretionary capital expenditures are those required to maintain the productive capacity of the firm's existing fixed assets and the company's competitive position in its industry.

Part 4)

Johnson turns his attention to asset-backed securities (ABS). Which of the following is the *least important* factor considered by rating agencies in assigning a credit rating to ABS?

- A) Quality of the seller/servicer.
- B) Credit quality of the collateral.
- C) Covenants of the lending agreement.
- D) Cash flow stress and payment structure.

Your answer: A was incorrect. The correct answer was C) Covenants of the lending agreement.

Lending agreement covenants are not a major factor considered by rating agencies.

The role of the servicer is critical in an asset-backed security transaction. Therefore, rating agencies look at the ability of a servicer to perform all the activities that a servicer will be responsible for.

The rating companies will look at the underlying borrower's ability to pay and the borrower's equity in the asset.

The payment structure of an asset-backed security transaction can be either a passthrough or pay through structure. This has important implications for the distribution of the cash flows to the different tranches of the security.

Part 5)

Taylor explains to Johnson that there are major differences between asset-backed securities (ABS) and corporate bonds in terms of credit risk. Which of the following is a major difference?

ABS have:

- A) complete predictability of cash flows and no operational risk.
- B) the same predictability of cash flows but a lower operational risk.
- C) a greater predictability of cash flows due to the absence of operational risk.
- D) a smaller predictability of cash flows due to the higher operational risk.

Your answer: A was incorrect. The correct answer was C) a greater predictability of cash flows due to the absence of operational risk.

In an ABS transaction the role of the servicer is to simply collect the cash flows. There is no active management with respect to the collateral and so very little operational risk associated with cash flows. Conversely, corporate management includes tremendous operational risk.

Part 6)

Taylor tries to explain the subtleties of *foreign sovereign debt* to Johnson. Which of the following is **NOT** a factor used in assessing the credit quality of a national government's local currency debt?

- A) Income and economic structure.
- B) Balance of payments and external balance sheet structure.
- C) Fiscal policy and budgetary flexibility.
- D) Monetary policy and inflation pressures.

Your answer: A was incorrect. The correct answer was B) Balance of payments and external balance sheet structure.

In assessing the credit quality of local currency debt, only domestic government policies that emphasize fostering or impeding timely debt service are considered. Only for foreign currency debt will credit analysis focus on the interaction of domestic and foreign government policies as measured by a country's balance of payments and the structure of its external balance sheet.

#### Question 4 - #9686

Patrick Wall is a new associate at a large international financial institution. Wall has recently completed graduate school with a Master's degree in finance, and is also currently a CFA Level 1 candidate. His previous work experience includes three years as a credit analyst at a small retail bank. Wall's new position is as the assistant to the firm's fixed income portfolio manager. His boss, Charles Johnson, is responsible for getting Wall familiar with the basics of fixed income investing. Johnson asks Wall to evaluate the bonds shown in Table 1. The bonds are otherwise identical except for the call feature present in one of the bonds. The callable bond is callable at par and exercisable on the coupon dates only.

Table 1 Bond Descriptions		
	Non-Callable	Callable Bond
Price	\$100.83	\$98.79
Time to Maturity (years)	5	5
Time to First Call Date	--	0
Annual Coupon	\$6.25	\$6.25
Interest Payment	Semi-annual	Semi-annual
Yield to Maturity	6.0547%	6.5366%
Price Value per Basis Point	428.0360	--

Wall is told to evaluate the bonds with respect to duration and convexity when interest rates declined by 50 basis at all maturities over the next six months.

Johnson supplies Wall with the requisite interest rate tree shown in Figure 1. Johnson explains to Wall that the prices of the bonds in Table 1 were computed using this interest rate lattice. Johnson instructs Wall to try and replicate the information in Table 1 and use his analysis to derive an investment decision for his portfolio.

										15.44%
									14.10%	
								12.69%		12.46%
						11.85%			11.38%	
				9.75%			10.25%			10.05%
			8.95%		9.57%			8.28%		8.11%
		7.35%	7.91%	7.23%	7.88%	7.74%		7.42%		6.54%
	6.62%		6.40%		6.37%		6.69%		5.99%	
6.05%		5.95%		5.85%		6.25%		5.40%		5.28%
	5.36%		5.17%		5.15%		5.05%		4.83%	
		4.81%		4.73%		5.05%		4.36%		4.26%
			4.18%		4.16%		4.08%		3.90%	
				3.82%		3.37%		3.52%		3.44%
					3.30%		2.84%		3.15%	
								2.54%		2.77%
									2.24%	
Years	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	

#### Part 1)

Wall is having a few problems computing the bond prices using the interest rate tree. He would like to compute the value of the non-callable bond at node A given the relevant part of the tree. Using the referenced portions of the tree, what is the value of the non-callable bond at node A?

Relevant part of interest rate tree:

	8.95%
7.91%	
	7.23%

Corresponding part of non-callable bond tree:



A ==>

to:

- A) \$90.56.  
B) \$94.01.  
C) \$96.05.  
D) \$97.02.

answer was B) \$94.01.

e A is computed as follows:

$$\text{on}/2] + 0.5 \times [\text{Bond Value}_{\text{down}} + \text{Coupon}/2] / (1 + \text{Interest Rate}/2)$$

$$.25/2] + 0.5 \times [\$96.83 + \$6.25/2]\}/(1 + 7.91\%/2) = \$94.01$$

f the call option. Using the given information what is the value of the

- A) \$0.00.  
B) \$1.21.  
C) \$2.04.  
D) \$3.13.

answer was C) \$2.04.

ce between the value of the callable and the non-callable bond.

.04

relationship between the embedded option and the callable bond. How does the value of the bond change if interest rate volatility increases? The value:

- A) decreases.  
B) remains the same.  
C) may increase or decrease.  
D) increases.

answer was D) increases.

ty of the underlying asset increases. This is due to the asymmetric payoff of

The bond changes when interest rate volatility increases. How will an increase in interest rate volatility affect the bond's price? The value:

- A) increases.  
B) remains the same.  
C) may increase or decrease.  
D) decreases.

answer was D) decreases.

if the interest rate volatility increases because the value of the embedded call

option increases. Since the value of the callable bond is the difference between the value of the non-callable bond and the value of the embedded call option, its value has to decrease.

Part 5)

Wall now turns his attention to the value of the embedded call option. How does the value of the embedded call option react to an increase in interest rates? The value of the embedded call:

- A) increases.
- B) remains the same.
- C) decreases.
- D) may increase or decrease.

Your answer: A was incorrect. The correct answer was C) decreases.

Since the underlying asset to the option (the bond) decreases in value the option must decrease in value also.

Part 6)

Wall believes he understands the relationship between interest rates and straight bonds but is unclear how callable bonds change as interest rates increase. How do prices of callable bonds react to an increase in interest rates? The price:

- A) increases.
- B) decreases.
- C) remains the same.
- D) may increase or decrease.

Your answer: A was incorrect. The correct answer was B) decreases.

Since the bond has a fixed coupon it becomes relatively less attractive to investors when interest rates increase. Its cash flows are now discounted at a higher discount rate which reduces the value of the bond.

#### Question 5 - #9616

James Wallace, CFA, is a fixed income fund manager at a large investment firm. Each year, the firm recruits a group of new college graduates in the spring to enter in the firm's management training program. The program is a rigorous six-month course that exposes every candidate to each of the different departments within the firm. After successfully completing the six-month training period, candidates then receive offers for employment in one of the departments within the investment firm. Recently, Wallace was selected by his boss to teach the fixed income portion of the firm's training program. He will be able to hold several two-hour sessions with the new hires over a two-week time period, during which he is expected to instruct the trainee's on all aspects of fixed income analysis. These sessions serve as preparation for the trainees to be able to complete a month long rotation on the fixed income trading desk.

His first few sessions will cover the core concepts of fixed income investing. Wallace believes that in order to fully grasp the more complicated concepts of fixed income analysis, the new hires must first begin by having a complete knowledge of the term structure and the volatility of interest rates. The new hires each have different educational backgrounds and varying amounts of work experience, so Wallace decides to begin with the most very basic concepts. He wants to start by teaching the various theories of the term structure of interest rates, and the implications of each theory for the shape of the Treasury yield curve. To evaluate the trainees' understanding of the subjects at hand, he creates a series of questions.

The following interest rate scenario is used to derive examples on the different theories used to explain the shape of the term structure and for all computational problems in Wallace's lectures.

Table 1 LIBOR Forward Rates and Implied Spot Rates		
Period	LIBOR Forward Rates	Implied Spot Rates
0 x 6	5.0000%	5.0000%
6 x 12	5.5000%	5.2498%
12 x 18	6.0000%	5.4996%
18 x 24	6.5000%	5.7492%
24 x 30	6.7500%	5.9490%
30 x 36	7.0000%	6.1238%

James uses a rounded day count of 0.5 years for each semi-annual period.

Part 1)

Following Wallace's first lecture he asks the trainees which of the following explains an upward sloping yield curve according to the (unbiased) pure expectations theory of the term structure of interest rates?

- A) The market expects short-term rates to rise through the relevant future.
- B) There is a risk premium associated with more distant maturities.
- C) There is greater demand for long-term securities than for short-term securities.
- D) There is greater demand for short-term securities than for long-term securities.

Your answer: A was incorrect. The correct answer was A) The market expects short-term rates to rise through the relevant future.

Under this theory, forward rates exclusively represent expected future spot rates. Thus the entire term structure at a given time reflects the market's expectations of future short term spot rates.

Part 2)

Wallace now poses a similar question regarding the liquidity preference theory. Which of the following could explain an upward sloping yield curve according to the liquidity preference theory of the term structure of interest rates?

- A) The market expects short-term rates to rise through the relevant future.
- B) There is greater demand for long-term securities than for short-term securities.
- C) There is a risk premium associated with more distant maturities.
- D) There is greater demand for short-term securities than for long-term securities.

Your answer: A was incorrect. The correct answer was C) There is a risk premium associated with more distant maturities.

According to the liquidity preference theory, the pure expectations theory applies but is modified for a risk or term premium. The longer the maturity, the greater the risk of price fluctuation to the investor.

Short-term rates to rise through the relevant future could explain an upward sloping yield curve according to the pure expectations theory. Greater demand for long-term securities than for short-term securities would drive the yields on long-term securities down and would result in an inverted (downward sloping) yield curve. Greater demand for short-term securities than for long-term securities could explain an upward sloping yield curve according to the market segmentation theory. The market segmentation theory implies that the rate of interest for a particular maturity is determined solely by demand and supply for that maturity, with no reference to conditions for other maturities.

Part 3)

Wallace explains to the class that the relationship between forward rates and the swap fixed rate is one of no arbitrage. Using the information in Table 1, he asks the class to compute the swap fixed rate for a one-year plain vanilla interest rate swap. Which of the following is the *closest* to the correct answer?

- A) 5.00%.
- B) 4.85%.
- C) 5.25%.
- D) 5.50%.

Your answer: A was incorrect. The correct answer was C) 5.25%.

The swap fixed rate is computed as follows:

$$\text{Swap Fixed Rate} = \frac{f_{0,1} \times df_1 + f_{1,2} \times df_2}{\sum_{i=1}^2 df_i}$$

Where  $f_{i,j}$  is the forward rate from  $i$  to  $j$  which dictates the cash flow for payment  $j$  and  $df_i$  is the discount factor

associated with the payment in time  $i$ .

$df_i = 1/(1+S_i)^i$ , where  $S_i$  is the implied  $i$ -period spot rate.

For example,  $df_2 = 1/[(1+f_{0,1})(1+f_{1,2})] = 1/(1+S_2)^2 \rightarrow$  note: spot rates are given

$df_1 = 1/(1+0.05/2) = 0.9756$ , and  $df_2 = 1/(1+0.052498/2)^2 = 0.9495$

So,

Swap Rate =  $2 \times [(0.05/2)(0.9756) + (0.055/2)(0.9495)] / (0.9756 + 0.9495) = 5.2465\%$

Part 4)

Wallace finally asks the class about the market segmentation theory of the term structure of interest rates. Specifically, Wallace asks which of the following could explain an upward sloping yield curve according to the market segmentation theory?

- A) There is a risk premium associated with more distant maturities.
- B) The market expects short-term rates to rise through the relevant future.
- C) There is greater demand for short-term securities than for long-term securities.
- D) There is greater demand for long-term securities than for short-term securities.

Your answer: A was incorrect. The correct answer was C) There is greater demand for short-term securities than for long-term securities.

This could explain an upward sloping yield curve according to the market segmentation theory. The market segmentation theory implies that the rate of interest for a particular maturity is determined solely by demand and supply for that maturity, with no reference to conditions for other maturities.

A risk premium associated with more distant maturities could explain an upward sloping yield curve according to the liquidity preference theory. The market expecting short-term rates to rise through the relevant future could explain an upward sloping yield curve according to the pure expectations theory. Greater demand for long-term securities than for short-term securities would drive the yields on long-term securities down and would result in an inverted (downward sloping) yield curve.

Part 5)

Wallace presents the relationships between spot and forward rates according to the pure expectations theory. Which of the following is *closest* to the one-year implied forward rate one year from now?

- A) 6.58%.
- B) 6.48%.
- C) 6.25%.
- D) 5.75%.

Your answer: A was incorrect. The correct answer was C) 6.25%.

The implied forward rate is determined as follows:

$$(1 + S_{0,12}) \times (1 + f_{12,24}) = (1 + S_{0,24})^2$$

Where  $f_{12,24}$  is the implied 12-month forward rate in 12 months, and  $S_{0,12}$  and  $S_{0,24}$  are the implied 1-year and 2-year spot rates today.

$$\text{So, } f_{12,24} = [(1 + S_{0,24})^2 / (1 + S_{0,12})] - 1$$

$$\text{Implied Forward Rate} = f_{12,24} = [(1 + 0.057492)^2 / (1 + 0.052498)] - 1 = 6.2510\%$$

Part 6)

Wallace completes his first lecture by tying the relationship between Treasury prices and the shape of the term structure. He is particularly interested in the implications of a steepening yield curve. Which of the following must be **TRUE** for a steepening yield curve?

- A) The price of short-term Treasury securities increases relative to the price of long-term Treasury securities.
- B) The price of short-term Treasury securities increases.
- C) The price of long-term Treasury securities increases.
- D) The price of long-term Treasury securities increases relative to the price of short-term Treasury securities.

Your answer: A was incorrect. The correct answer was A) The price of short-term Treasury securities increases relative to the price of long-term Treasury securities.

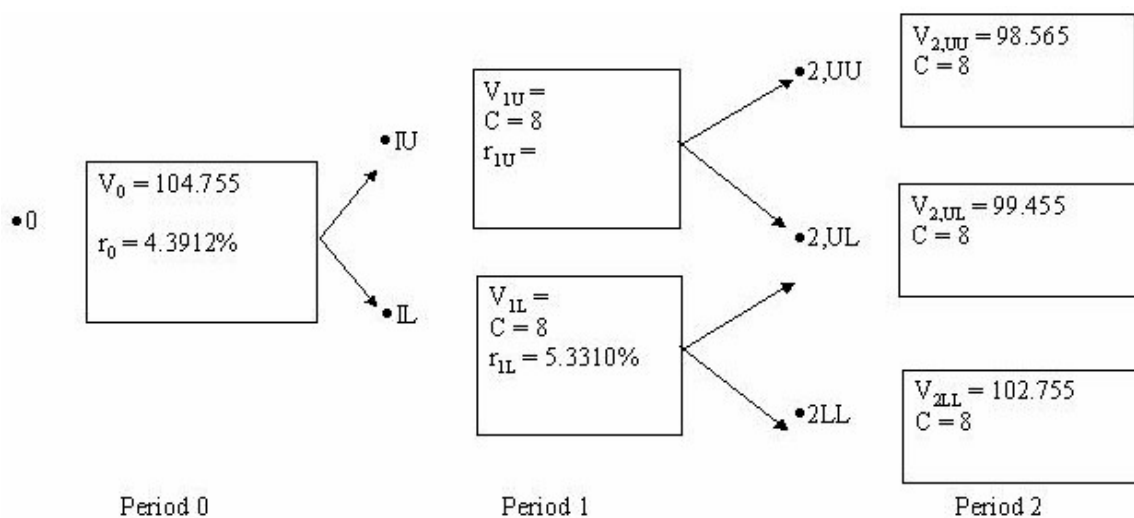
For a steepening of the yield curve to occur, in every case, the short-term yield has to decrease relative to the long-term yield. Therefore, the price of short-term Treasury securities increases relative to the price of long-term securities.

#### Question 6 - #9675

Dawn Adams, CFA, along with her recently hired staff, have responsibilities that require them to be familiar with backward induction methodology as it is used with a binomial valuation model. Adams, however, is concerned that some of her staff, particularly those not enrolled in the CFA program, are a little weak in this area. To assess their understanding of the binomial model and its uses, Adams presented her staff with the first two years of the binomial interest rate tree for an 8 percent annually compounded bond (shown below). The forward rates and the corresponding values shown in this tree are based on an assumed interest rate volatility of 20 percent.

#### 2-Period Binomial Interest Rate Tree for an 8% Annually Compounded Bond

(Assumption: 20% Volatility)



A member of Adams' staff has been asked to respond to the following:

Part 1)

Compute  $V_{1L}$ , the value of the bond at node 1L.

- A) \$95.99.
- B) \$99.01.
- C) \$103.58.
- D) \$101.05.

Your answer: A was incorrect. The correct answer was C) \$103.58.

$$V_{1L} = \frac{1}{2}[(V_{2LU} + C)/(1 + r_{1L}) + (V_{2LL} + C)/(1 + r_{1L})]$$

$$V_{1L} = \frac{1}{2}[(99.455 + 8)/(1 + 0.05331) + (102.755 + 8)/(1 + 0.05331)] = \$103.583$$

Part 2)

What is the value of  $r_{1U}$ , the one-year forward rate at the upper node at period 1?

- A) 10.946%.
- B) 7.953%.
- C) 11.935%.
- D) 6.511%.

Your answer: A was incorrect. The correct answer was B) 7.953%.

$$r_{1U} = (5.331)e^{2(.2)} = 7.9529\%$$

Part 3)

Compute  $V_{1U}$ , the value of the bond at node 1U.

- A) \$99.01.
- B) \$99.13.
- C) \$91.72.
- D) \$101.11.

Your answer: A was incorrect. The correct answer was B) \$99.13.

$$V_{1U} = \frac{1}{2}[(V_{2,UU} + C)/(1 + r_{1U}) + (V_{2,UL} + C)/(1 + r_{1U})]$$

From the previous question the value for  $r_{1U}$  was determined to be 7.9529%. Using this value for the forward rate:

$$V_{1L} = \frac{1}{2}[(98.565 + 8)/(1 + 0.079529) + (99.455 + 8)/(1 + 0.079529)] = \$99.127$$

Part 4)

Compute  $V_0$ , the value of the bond at node 0.

- A) \$99.07.
- B) \$104.76.
- C) \$101.35.
- D) \$105.70.

Your answer: A was incorrect. The correct answer was B) \$104.76.

$$V_0 = \frac{1}{2}[(V_{1U} + C)/(1 + r_0) + (V_{1L} + C)/(1 + r_0)]$$

From the previous question the value for  $V_{1U}$  was determined to be \$99.127

$$V_0 = \frac{1}{2}[(99.127 + 8)/(1 + 0.043912) + (103.583 + 8)/(1 + 0.043912)] = \$104.755$$

Part 5)

Assume that the bond is puttable in one year at par (\$100) and that the put will be exercised if the computed value is less than par. What is the value of the puttable bond?

- A) \$95.38.
- B) \$105.17.
- C) \$107.56.
- D) \$103.04.

Your answer: A was incorrect. The correct answer was B) \$105.17.

The relevant value to be discounted using a binomial model and backward induction methodology for a puttable bond is the value that will be received if the put option is exercised or the computed value, whichever is greater.

In this case, the relevant value at node 1U is the exercise price (\$100.000) since it is greater than the computed value of \$99.127. At node 1L, the computed value of \$103.583 must be used.

Therefore, the value of the puttable bond is:

$$V_0 = \frac{1}{2}[(100.00 + 8)/(1 + 0.043912) + (103.583 + 8)/(1 + 0.043912)] = \$105.17314$$

Part 6)

Assume that the bond is puttable in one year at par (\$100) and that the put will be exercised if the computed value is less than par. What is the value of the put option?

- A) \$1.86.
- B) \$1.08.
- C) \$3.70.
- D) \$0.42.

Your answer: A was incorrect. The correct answer was D) \$0.42.

$$V_{\text{puttable}} = V_{\text{straight}} + V_{\text{put}}$$

Rearranging, the value of the put can be stated as:

$$V_{\text{put}} = V_{\text{puttable}} - V_{\text{straight}}$$

$V_{\text{puttable}}$  was computed to be \$105.173 in the previous question, and  $V_{\text{straight}}$  was determined to be \$104.755 in the question prior to that. So the value of the embedded put option for the bond under analysis is:

$$\$105.173 - \$104.755 = \$0.418$$

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