

Indian Institute of Technology, Kharagpur

Date _____ FN/AN Time: 3 hours Full Marks: 50 No of Students: 64
End Spring Semester 2023 Deptt: HSS Sub No: HS50026
5-Year Integrated M.Sc in Economics and Dual Degree Financial Engineering
Sub Name: Behavioural Finance
Answer all the questions.

Q1: How do you define representativeness? Explain the variants of representativeness and related biases with suitable examples. (7 Marks)

Q2: What is the technical description of overconfidence? Highlight the various forms and causes of overconfidence and investment mistakes occur due to overconfidence. (7 Marks)

Q3: Explain cognitive dissonance and self-attribution biases and their implications on investment decisions. How somebody can cope with cognitive dissonance bias? (7 Marks)

Q4: Market outcomes can be explained through behavioural biases. Justify this statement with proper arguments. (7 Marks)

Q5: Briefly explain the various emotional and social biases. How do you link investor mood with market mood? Highlight the measures used for measuring investor/ market sentiment.

(7 Marks)

Q6: Write a note on the influence of behavioural biases on various corporate financing decisions. (7 Marks)

Q7: Write short note on following items:

(8 Marks)

- (i) Standard life cycle theory vs. behavioural life cycle theory
- (ii) Dollar cost averaging
- (iii) Anchoring bias
- (iv) Availability bias



INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR
End-Spring Semester 2022-23

Date of Examination: 24/04/2023 Session (FN/AN): FN Duration: 3 Hours Full Marks 50

Subject No.: HS50018 Subject Name: FIXED INCOME SECURITIES

Department/Center/School: Humanities and Social Sciences

Specific charts, graph paper, log book etc., required: None

Special Instructions (if any): (i) Answer all the questions. (ii) Use of non-programmable calculator is permitted. Use of financial calculators is strictly prohibited. (iii) While answering all the necessary steps/calculations should be clearly shown. (iv) This question paper contains 3 printed pages.

1. The Glasgo Manufacturing Company forecasts a cash inflow of \$20 million in two months from the sale of one of its assets. It is considering investing the cash in a First National Bank CD for 90 days. First National Bank's jumbo CD pays a rate equal to the LIBOR. Currently such rates are yielding 6%. Glasgo is concerned that short-term interest rates could decrease in the next two months and would like to lock in a rate now. As an alternative to hedging its investment with Eurodollar futures, First National suggests that Glasgo hedge with a forward rate agreement (FRA). (i) Define the terms of the FRA that would effectively hedge Glasgo's future CD investment. (ii) Show in a table the payoffs that Glasgo and First National would pay or receive at the maturity of the FRA given the following LIBORs: 5.5%, 5.75%, 6%, 6.25%, and 6.5%. (iii) Show in a table Glasgo's cash flows from investing the \$20 million cash inflow plus or minus the FRA receipts or payments at possible LIBORs of 5.5%, 5.75%, 6%, 6.25%, and 6.5%. What is the hedged rate of return Glasgo would earn from its \$20 million investment? [2+3]

2. Suppose Commerce Bank sells XU Trust a two-year, \$15 million FRN paying the LIBOR plus 150 basis points. The note starts on 3/20 at 9% and is then reset the next seven quarters on dates 6/20, 9/20, and 12/20. Suppose a money center bank offers Commerce Bank a cap for \$200,000 with the following terms corresponding to its floating-rate liability: The cap consists of seven caplets coinciding with the reset dates on the note; Exercise rate on the caplets = 7%; Notional principal = \$15 million; Reference rate = LIBOR; Time period on the payoffs is .25; Payoff is paid on the payment date on the note; Cost of the cap is \$200,000 and is paid on 3/20.

(i) Show in a table Commerce Bank's quarterly interest payments, caplet cash flows, hedged interest cost, and hedged rate as a proportion of the \$15 million FRN loan (do not include cap cost) for each period given the following rates: LIBOR = 7.5% on 3/20/Y1, 8% on 6/20/Y1, 9% on 9/20/Y1, 8% on 12/20/Y1, 7% on 3/20/Y2, 6.5% on 6/20/Y2, 6% on 9/20/Y2, and 5.5% on 12/20/Y2.

(ii) To help defray part of the cost of the cap, suppose Commerce Bank decides to set up a collar by selling a floor to one of its customers with a floor rate of 6.5% for \$150,000 with the following terms: The floor consists of seven floorlets coinciding with the reset dates on the note; Exercise rate on the floorlets = 6.5%; Notional principal = \$15 million; Reference rate = LIBOR; Time period on the payoffs is .25; Payoff is paid on the payment date on the note; Cost of the floor is \$150,000 and is paid on 3/20. Evaluate Commerce Bank's hedged interest costs from

The convertible bond's underlying stock price follows a binomial process where in each period it has an equal chance it can either increase to equal u times its initial value or decrease to equal d times the initial value, where

- $u = 1.1$
- $d = 1/1.1 = .9091$
- $q =$ probability of stock increasing in one period $= 0.5$
- Current stock price is \$92

Further, suppose using regression analysis, we estimated the following relationship between the stock in and the one-period spot rate:

$$S_t = 0.16 - 0.001P_t^s \quad \dots(1)$$

Using the above information, (i) Calculate the value of the callable convertible bond using a binomial tree of stock prices. Assume a flat yield curve at 5% that is not expected to change. (ii) Calculate the value of the callable convertible bond using a binomial tree of stock prices with different interest rates derived from above equation (1). [4+6]

8. The Star Chemical Company wants to raise \$150M with a 5-year loan to finance an expansion of one of its production plants. Based on its moderate credit ratings, Star can borrow 5-year funds at a 10.5% fixed rate or at a floating rate equal to LIBOR + 75 BP. Given the choice of financing, Star prefers the fixed-rate loan. The Moon Development Company is also looking for 5-year funding to finance its proposed \$150M office park development. Given its high credit rating, suppose Moon can borrow the funds for 5 years at a fixed rate of 9.5% or at a floating rate equal to the LIBOR + 25 BP. Given the choice, Moon prefers a variable-rate loan. In summary, Star and Moon have the following fixed and floating rate loan alternatives:

Company	Fixed Rate	Floating Rate
Star Company	10.5%	LIBOR + 75 BP
Moon Company	9.5%	LIBOR + 25 BP

(i) Describe Moon's absolute advantage and each company's comparative advantage? (ii) What is the total possible interest rate reduction gain for both parties if both parties were to create synthetic positions with a swap? (iii) Explain how a swap bank could arrange a five-year, 9.5%/LIBOR a swap that would benefit both the Star and Moon companies. What is the total interest rate reduction gain and how is it split? [2.5+2.5+5]

General Equilibrium and Welfare Economics (HS50030)

End-Semester Examination (Spring 2022-23)

Full Marks: 50

Answer All Questions

1. Consider a Robinson Crusoe Economy, where a single good is produced by a firm and consumed by a representative household. Household owns the firm. Household maximizes utility, and Firm maximizes profit, and return the profit back to the household. Utility function of the household is, $u = u(c, l) = c^\alpha l^{1-\alpha}$; c is consumption, and l is leisure. Total endowment of time is, T that can be optimally allotted to labour supply (h), and leisure by the household. Price of consumption good is, p , and that of leisure is, w . Firm produces consumption good using the production function, $y = f(h) = Ah^\beta$ $0 < \beta < 1$. Here, A is the Total Factor Productivity (TFP)/Technology level. Government imposes a distortionary labour income tax at the rate $0 < \tau < 1$ and returns the revenue back to the household as transfer. Suppose, $\alpha = \beta = 0.5$, $A = 1$, $T = 24$, $\tau = 0.30$
- (27)

- Write down the resource constraint of the economy, and write down the Planner's problem. (2+2)
- Derive the Pareto Optimal allocation of the economy through Planner's solution. (3*2=6)
- Derive the individual solution/competitive equilibrium alongside the profit of the firm when the consumption good is a numeraire. (6*2=12)
- Intuitively explain the impact of tax on the economy. (2)
- Do you think that the competitive equilibrium of the given economy is Pareto Optimal? Comment on the First Welfare Theorem for the Economy. (2+1)

2. Consider a Robinson Crusoe Economy with fixed endowment of capital (\bar{K}) to the household. Economy produces a single good by a firm and consumed by a representative household. Household owns the firm. Household maximizes utility, and Firm maximizes profit, and the profit is paid back to the household. Utility

using the collar given the interest-rate scenario defined in part (i). Contrast Commerce Bank's cap hedge with its collar hedge. [2.5+2.5]

3. The MEJ Development Company is constructing a \$300 million office park development that it anticipates completing in two years. At the project's completion, the company plans to refinance its short-term construction and development loans by borrowing \$300 million through the private placement of 10-year bonds. The MEJ Company has a BBB quality rating and its option-free, fixed-rate bonds trade 200 basis points above comparable Treasury bonds and its floating-rate bonds trade at 150 basis points above the LIBOR. Currently, 10-year T-bonds are trading to yield 6%. With current rates considered relatively low, MEJ is expecting interest rates to increase and would like to lock in a rate on the 10-year fixed rate bond two years from now. The company is considering locking in its rate by entering a forward swap with Star Bank. Star is willing to provide MEJ a two-year forward swap agreement on a 10-year, 7.25% LIBOR swap.

- (i) Explain the forward swap position that MEJ would need to take in order to lock in the rate on its 10-year, fixed-rate bond to be issued two years from now.
- (ii) Given MEJ hedges with a swap position, explain how it would obtain a fixed rate for 10 years at the forward swap's expiration date by issuing its floating rate notes at LIBOR plus 150 bp. What is the fixed rate MEJ would have to pay on its position? [2+3]

4. Suppose a speculative hedge fund anticipating higher rates in several years purchased a two-year payer swaption on a three-year 6% LIBOR generic swap with semiannual payments and a notional principal of \$20 million for a price equal to 50 bp times the NP. (i) Explain what the fund would do at the swaption's expiration if the fixed rate on a three-year par value swap were at 7% and at 5%. What would be the fund's profits or losses at those rates? Use the YTM-approach in valuing the swap's position. (ii) Show graphically and in a table the values and profits/losses at expiration that the hedge fund would obtain from closing its payer swaption on a 6% LIBOR swap with a notional principal of \$20 million purchased at a price equal to 50 bp times the NP. Evaluate at fixed rates on three-year par value swap at expiration of 4%, 4.5%, 5%, 5.5%, 6%, 6.5%, 7%, 7.5%, and 8%. Use the YTM-approach in valuing the swap's position. [2+3]

5. Suppose a corporation issues a \$9 million, three-period, 5% coupon bond with a sinking fund obligation requiring the company to sink \$3 million in period 1 and \$3 million in period 2, with the company having the option to either buy the bonds in the market or call them at $CP = 100$ per \$100 face value. Assume that the current one-year spot rate $S_0 = 10\%$, upward and downward parameter $u = 1.1$, $d = 0.9091$, respectively and probability of spot rate increasing in one year $q = 0.5$. Using the binomial interest rate tree, calculate the value of the sinking fund bond. Note: Use the price constraint approach [5]

6. Elucidate any five bond portfolio strategies with numerical examples. [5]

7. The following details are available in case of ABC convertible bond:
 Three-year, 10% convertible bond; Face value = \$1000; CR = 10
 Assume the following:

The convertible bond is callable in year 1 and year 2 at a $CP = \$1100$ and no default risk.

function of the household is, $u = u(c, l) = c^\alpha l^{1-\alpha}$; c is consumption, and l is leisure. Total endowment of time is, T that can be optimally allotted to labour supply (h), and leisure by the household. Price of consumption good is, p , and that of leisure is, W . Firm produces consumption good using the production function, $y = Ah^\beta K^{1-\beta}$, $0 < \beta < 1$. Here, A is the Total Factor Productivity (TFP)/Technology level, and price of capital is, r . (23)

- Write down the relevant Lagrangian, and Derive the Marshallian demand function for consumption and leisure. (1+2+2)
- Write down the profit expression, and Derive the First Order Conditions for profit maximization of the firm. (1+2+2)
- Assuming consumption good as numeraire, derive the market clearing price for labor (W^*) and capital (r^*). (1+1)
- Derive, market clearing output (y^*), labor supply (h^*), leisure (l^*), and Profit of the firm (π^*). (1+1+1+1)
- Numerically calculate, W^*, r^*, y^*, h^*, l^* for $\alpha = \beta = 0.5$, $A = \bar{K} = 1$, $T = 24$, and write down the competitive equilibrium of the given economy. (5+2)

w
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y
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Attempt all questions:

Consider a two-bidder first price auction with asymmetric beliefs. Let the belief that Bidder 1 has about bidder 2's valuation i.e $X_1 \sim \text{Uniform}(0, \omega_1)$. Let the belief that Bidder 2 has about bidder 1's valuation i.e $X_2 \sim \text{Uniform}(0, \omega_2)$. Given this derive from scratch the optimal bidding functions β_1 and β_2 of the two bidders. (20 marks)

Question 2

Priyanshu and Adhiraj are bargaining over a piece of land worth Rs. $v > 0$. They engage in an infinite period sequential bargaining (Rubenstein Bargaining) where the players offer alternately. Priyanshu moves first. Their discount factors are given by δ_P and δ_A respectively. Also $\delta_j \in (0, 1) \forall j \in \{P, A\}$. What are their equilibrium payoffs. Who gets more and under what circumstances? (20 marks)

Question 3

Discuss how complete market failure can happen in presence of asymmetric information. (5 marks)

Question 4

Construct an example with 5 boys and 5 girls such that the greedy algorithm yields a stable match. (5 marks)