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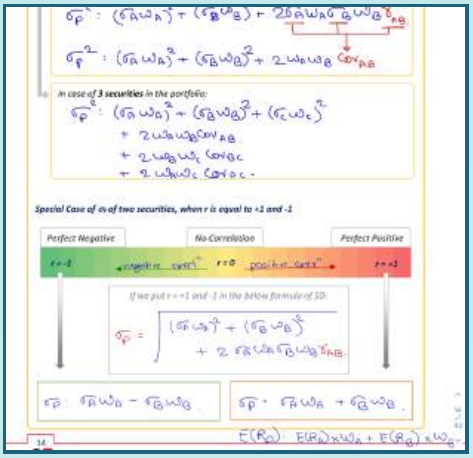

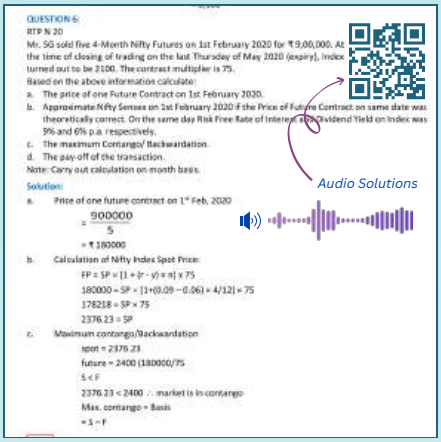

UNIQUE STRUCTURED CONCEPT NOTES

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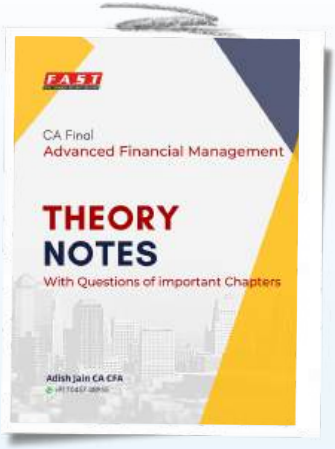

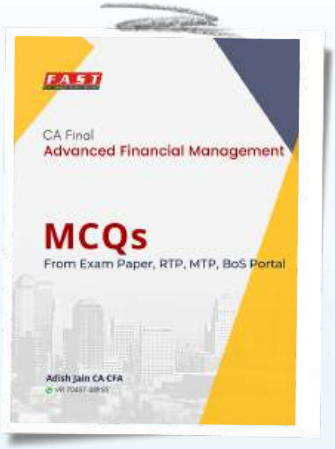

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OutNotes vs. ICAI Chapters

No.	ICAI Chapter Name	OutNotes Chapter Name
1	Financial Policy & Corporate Strategy	Financial Policy & Corporate Strategy, Risk Management and Security Analysis
2	Risk Management	
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Equity & Business Valuation

A. Dividend based Valuation Models

QUESTION 1:

N 20 | N 11 | SM

A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, what is the price of the share today?

Solution:

EPS = 137.80 × 15% = 20.67

DPS = 20.67 × (1-0.60) = 8.268

g = 0.15 × 0.060 = 9%

Price of share (P_0) $= \frac{D_1}{Ke - g}$

$= \frac{8.268}{0.18 - 0.09} = 91.87$

QUESTION 2:

SM | M 21 | M 05

A company's beta is 1.40. The market return is 14%. The risk free rate is 10% (i) What is the expected return based on CAPM (ii) If the risk premium on the market goes up by 2.5% points, what would be the revised expected return on this stock?

Solution:

Expected Return $= R_f + \beta (R_m + R_f)$

$= 10 + 1.40 (14 - 10)$

$= 15.6\%$

Revised risk premium $= (14\% - 10\%) + 2.5\%$

$= 6.5\%$

Revised expected return $= 10 + 1.40 (6.5)$

$= 19.1\%$

QUESTION 3:

N 21

Following are the details of X Ltd. and Y Ltd.:

Particulars	X Ltd.	Y Ltd.
Dividend per Share	₹ 4	₹ 4
Growth Rate	10%	10%
Beta	0.9	1.2
Current Market Price per Share	₹ 150	₹ 70

Other Information:

Risk Free Rate of Return 7%

Market Rate of Return 14%

a. Calculate the price of shares of both the companies.
b. Write the comment on the valuation on the basis of price calculated and current market price.
c. As an investor what course of action should be followed?

Solution:

a) Calculation of Prices of shares of both companies:

	X Ltd.	Y Ltd.
Beta	0.9	1.20
Cost of Equity using CAPM	= 7% + 0.9 [14% - 7%] = 13.30%	= 7% + 1.20 [14% - 7%] = 15.40%
Growth Rate	10%	10%
Price of Share	$= \frac{4.00}{0.133 - 0.10}$ = ₹ 121.21	$= \frac{4.00}{0.154 - 0.10}$ = ₹ 74.07

b) and c) Comment on valuation and course of action:

Company	CMP	Value	Valuation	Action of the Investor
X Ltd.	₹ 150.00	₹ 121.21	Overvalued	Sell
Y Ltd.	₹ 70.00	₹ 74.07	Undervalued	Buy

QUESTION 4:
M 15

The following information is collected from the annual reports of BB Ltd:

Profit before tax	₹ 2.50 crore
Tax rate	40 percent
Retention ratio	40 percent
Number of Outstanding shares	50,00,000
Equity capitalization rate	12 percent
Rate of return on investment	15 percent

What should be the market price per share according to Gordon's model of dividend policy?

Solution:

	PBT	2,50,00,000
Less:	Tax @ 40%	(1,00,00,000)
	EAES	1,50,00,000
÷	No. of shares	50,00,000
	EPS	3

Calculation of DPS = $3 \times 0.60 = 1.80$
Calculation of growth = $0.40 \times 0.15 = 6\%$

Price of share (P_0) $= \frac{D_1}{Ke-g}$

$= \frac{1.80}{0.12-0.06} = 30$

QUESTION 5:

N 18 | N 13 | M 11 | M 05 | SM | RTP

Shares of Voyage Ltd. are being quoted at a price-earnings ratio of 8 times. The company retains ₹ 5 per share which is 50% of its Earning Per Share.

You are required to determine:

1. the cost of equity to the company if the market expects a growth rate of 15% p.a.
2. the indicative market price with the same cost of capital and if the anticipated growth rate is 16% p.a.
3. the market price per share if the company's cost of capital is 20% p.a. and the anticipated growth rate is 18% p.a.

Solution:

1. Retained Earnings ₹ 5 per share

   Retention ratio 50%

   EPS $\frac{₹ 5}{50\%} = ₹ 10$

   DPS ₹ 5

   PF Ratio 8 times

   Market Price ₹ 10 × 8 times = ₹ 80

   Computation of cost of equity $= \frac{D_1}{P_0} + g$

   $= \frac{5}{80} + 0.15$

   = 21.25%

2. Market Price $= \frac{D_1}{ke-g} = \frac{5}{0.2125-0.16}$

   = ₹ 95.24

3. Market Price $= \frac{D_1}{ke-g} = \frac{5}{0.20-0.18}$

   = ₹ 250

QUESTION 6:

MTP N 23 | M 18 | N 14 | N 10 | N 08

The risk-free rate of return R_f is 9 percent. The expected rate of return on the market portfolio R_m is 13 percent. The expected rate of growth for the dividend of Platinum Ltd. is 7 percent. The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of Platinum Ltd. equity stock is 1.2.

a. What is the equilibrium price of the equity stock of Platinum Ltd.?

b. How would the equilibrium price change when:

- The inflation premium increases by 2 percent?
- The expected growth rate increases by 3 percent?

- The beta of Platinum Ltd. equity rises to 1.3?

Solution:

a. Calculation of cost of equity by using CAPM

$= R_f + \beta (R_m - R_f)$

$= 9 + 1.2 (13 - 9)$

$= 13.8\%$

Calculation of equilibrium price

$= \frac{D_1}{Ke - g}$

$= \frac{2(1+0.07)}{0.138 - 0.07}$

= ₹ 31.47

b. Revised price after the change:

$R_f = 11\%$

$R_m = 15\%$

Growth = 10%

Beta = 1.3

Calculation of K_e by using CAPM

$= R_f + \beta (R_m + R_f)$

$= 11 + 1.3 (15 - 11)$

= 16.2%

Equilibrium price after the change:

$= \frac{D_1}{Ke - g}$

$= \frac{2\ (1 + 0.1)}{0.162 - 0.10}$

= 35.48

QUESTION 7:

M 13 | SM | RTP

X Limited just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years He also expects the market price of this share to be ₹ 360.00 after three years

You are required to determine:

a. The maximum amount Mr. B should pay for shares, if he requires a rate of return of 13% per annum.

b. The maximum price Mr. B will be willing to pay for share, if he is off the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.

c. The price of share at the end of FO years If 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Calculate rupee amount up to two decimal points.

	Year - 1	Year – 2	Year – 3
FVIF @ 9%	1.090	1.188	1.295

FVIF @ 13%	1.130	1.277	1.443
PVIF @ 13%	0.885	0.783	0.693

Solution:

a) Calculation of Dividends

Year0	1	2	3	4
Growth	9%	9%	9%	9%
Dividend 14	15.26	16.63	18.13	19.76

The maximum amount Mr. B should pay for share

Year	CF's	PVAF@13%	PV
1	15.26	0.885	13.51
2	16.63	0.783	13.02
3	18.13 + 360 = 378.13	0.693	262.04
Max Amount			288.57

b. Gordon's formula

If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$= \frac{D_1}{Ke - g}$$

$$= \frac{15.26}{0.13 - 0.09}$$

= ₹ 381.5

c. Max price paid of the end of 3 year

$$P_3 = \frac{D_3 \times (1 + g)}{k_e - g}$$

$$= \frac{18.13 \times 1.09}{0.13 - 0.09}$$

= ₹ 494.04

QUESTION 8:

M 21

NM Ltd. (NML) is aspiring to enter the capital market in a three years' time. The Board wants to attain the target price of ₹ 70 for its shares at the end of three years The present value of its shares is ₹ 52.03. The dividend is expected to grow at a rate of 15% for the next three years NML uses dividend growth model for its projections.

The required rate of return is 15%.

You are required to calculate the amount of dividend to be declared by the board in the base year so as to achieve the target price.

Period (t)	1	2	3
PVIF (15%, t)	0.8696	0.7561	0.6575

Solution:

value of Share = PV of Dividend for 3 years + PV of Target price after 3 years

Let Base Dividend is D_0, then

₹ 52.03 = [D_0 (1 + g) × PVIF $_{(15\%,1)}$ + D_0 (1 + g)^2 × PVIF $_{(15\%, 2)}$ + D_0 (1 + g)^3 × PVIF $_{(15\%, 3}$] + 70.00 × 0.6575

₹ 52.03 = [D_0 (1.15) × 0.8696 + D_0 (1.15)^2 × 0.7561 + D_0 (1.15)^3 × 0.6575] + 70.00 × 0.6575

D_0 = 2

Thus, Company should declare a dividend of ₹ 2 in base year.

QUESTION 9:

MTP M 15

SRK Ltd. is a listed company and it has just announced annual dividend for the year ending 2013-14. Earnings Per Share (EPS) and Dividend Per Share (DPS) for 5 years is as follows:

₹	2013-14	2012-13	2011-12	2010-11	2009-10
EPS	14	13.6	13.1	12.7	12.2
DPS	8.2	8.1	7.9	7.8	7.7

In the opinion of MD of SRK Ltd., if current dividend policy is maintained annual growth in Earnings and Dividends will be no better than the annual growth in earnings over the past years

Since the Board of SRK Ltd. is reluctant to take debt to finance growth it is considering changing its dividend policy by retaining 50% of its earnings for investment in various projects having a post-tax rate of return of 15%. The beta of SRK Ltd. is 1.5, market risk premium is 4% and Risk Free Rate of Return is 6%.

You are required to calculate expected market price of share, if

a. SRK Ltd. does not announce a change in its Dividend Policy.

b. SRK Ltd. does announce a change in its Dividend Policy by retaining 50% of its earnings.

Note: Growth Rate can be assumed to be remain stable.

Solution:

a) Calculation of cost of equity using CAPM

K_e = Rf + β (R_m – R_f)

= 6 + 1.5 (4)

= 12%

Average Growth Rate $\left(\frac{14.00}{12.20}\right)^{1/4}$ = – 1 = 3.5%

Calculation of MP by Gordon's formula

$P_0 = \frac{D_1}{Ke-g}$

$= \frac{8.2\times1.035}{0.12-0.035}$

= 99.85

b) Dividend Payout Ratio: = 50%

RR = 1 – 0.5 = 50%

ROE = 15%

Calculation of growth rate

= RR × ROE

$= 0.50 \times 0.15$

$= 7.5\%$

$D_1 = 14 \times 1.075 \times 50\%$

$= 7.525\%$

$$P_0 = \frac{D_1}{Ke-g}$$

$$= \frac{7.525}{0.12-0.075}$$

$= 167.22$

QUESTION 10:

M 12 | RTP N 18

In December. 2011 AB Co.'s share was sold for ₹ 146 per share. A long term earnings growth rate of 7.5% is anticipated. AB Co. is expected to pay dividend of ₹ 3.36 per share.

a. What rate of return an investor can expect to earn assuming that dividends are expected to grow along with earnings at 7.5% per year in perpetuity?

b. It is expected that AB co. will earn about 10% on book Equity and shall retain 60% of earnings. In this case, whether, there would be any change in growth rate and cost of Equity?

Solution:

(a) $$K_e = \frac{D_1}{P_0} + g$$

$$= \frac{3.36}{146} + 0.075$$

$= 9.80\ \%$

(b) Revised growth = RR × ROE

$= 60\% \times 0.10$

$= 6\%$

- Existing D_1 = ₹ 3.36
- Existing RR

$g = RR \times ROE$

$7.5\% = RR \times 0.10$

$RR = 75\%$

- Existing Payout Ratio = 1 – 0.75 = 25%
- Existing $EPS_1 = \frac{3.36}{25\%}$ = ₹ 13.44
- Revised $EPS_1 = \frac{13.44}{1.075} \times 1.06 = 13.25$
- Revised $D_1 = 13.25 \times (1 - 0.60)$

$= 5.3$

- Ke $= \frac{D_1}{P_0} + g$

$= \frac{5.3}{146} + 0.06 = 9.63\%$

Self-note: In this question, we will have to particularly remember the flow of removing the old growth of and adding the new growth at EPS Level. It is not done in any other question.

QUESTION 11:

N 18

A Company has an EPS of ₹ 2.50 for the last year and DPS of ₹ 1. The Earnings is expected to grow at 2% a year in long run. Currently it is trading at 7 times its Earnings. If the required rate of return is 14%, compute the following:

a. An estimate of the P/E Ratio using Gordon Growth Model,

b. The Long-Term Growth Rate implied by the Current P/E Ratio.

Solution:

(a) $P_0 = \frac{D_1}{Ke-g}$

$= \frac{1 \times 1.02}{0.14 - 0.02}$

$= 8.5$

PE Ratio $= \frac{MP}{EPS} = \frac{8.5}{2.50} = 3.4$ times

(b) PE Ratio (Current) = 7 times

Price per share = ₹ 2.50 x 7 times

= ₹ 17.50

We know that

$P_0 = \frac{D_1}{Ke-g}$

17.50 = ₹ 1(1+g)/ (0.14 – g)

g = 7.84%

QUESTION 12:

N 22 | M 21 | M 19 | N 12 | N 09 | RTP

Following Financial data are available for PQR Ltd. for the year 2008:

	(₹ in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (₹ 10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnovers ratio	1.1

Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%
Dividend payout ratio	16.67%
Current market price of Share	₹ 14
Required rate of return of investors	15%

You are required to:

a. Draw income statement for the year
b. Calculate its sustainable growth rate of earnings
c. Calculate the fair price of the Company's share using dividend discount model, and
d. What is your opinion on investment in the company's share at current price?

Solution:

(a) Assets T/O Ratio $= \frac{\text{Sales}}{\text{Total Assets}}$

$1.1 = \frac{T/O}{600}$

Sales $= 660$

Since, operation margin is 10%

Therefore, Operating cost is 90%

Income statement

		(₹ Lakhs)
	Sales	660
Less:	Operating cost (660 × 90%)	(594)
	EBIT	66
Less:	Interest (125 + 50) × 8%	(14)
	EBT	52
Less:	Tax @ 40%	(20.8)
	EAT	31.2
Less:	Dividend @ 16.67%	(5.20)
	Retained Earnings	26

(b) ROE $= \frac{EAES}{Eq.SHF} = \frac{31.2}{100+300} = 7.8\%$

Sustainable growth rate = RR × ROE

= (1 – 0.1667)

= 0.8333 × 0.078

= 6.5%

(c) Using Gordon's formula

$D_1 = \frac{5.2 \text{ Lakhs}}{10 \text{ lakhs}} = ₹ 0.52$

$$P_0 = \frac{D_1}{Ke-g}$$

$$= \frac{0.52(1.065)}{0.15-0.065} = 6.51$$

(d) Current MP = 14, the share is overvalued. Hence investor should not invest in the company.

Self-note: Suggested Answer has assumed the given dividend as D_0.

QUESTION 13:

N 20

AB Industries has Equity Capital of 12 Lakhs, total Debt of 8 Lakhs, and annual sales of 30 Lakhs. Two mutually exclusive proposals are under consideration for the next year. The details of the proposals are as under:

Particulars	Proposal 1	Proposal 2
Target Assets to Sales Ratio	0.65	0.62
Target Net Profit Margin (%)	4	5
Target Debt Equity Ratio (DER)	2:3	4:1
Target Retention Ratio (of earnings) (%)	75	-
Annual Dividend (₹ In Lakhs)	-	0.3
New Equity Raised (₹ In Lakhs)	-	1

You are required to calculate sustainable growth rate for both the proposals.

Solution:

Self-note: Solution given below is not as per suggested answers because the answer over there is logically incorrect. Remember that start point under Proposal 1 is Sales whereas the same under proposal 2 is Equity Capital.

Sustainable growth rate for proposal 1:

Total Sales = 30 Lakhs

$$\text{Asset to sales Ratio} = \frac{\text{Asset}}{\text{Sales}}$$

$$0.65 = \frac{\text{Assets}}{30 \text{ Lakhs}}$$

Assets = 19.5 Lakhs

Net profit margin = 30 lakhs × 4%
= 1.2 lakhs

Target Debt to Equity = 2:3

Total capital = Total assets = 19.5 Lakhs

$$\text{Equity portion in total capital} = 19.5 \text{ Lakhs} \times \frac{3}{2+3}$$

= 11.7 Lakhs

$$\text{Return on Equity (ROE)} = \frac{\text{PAT or EAES}}{\text{ESHF}}$$

$$= \frac{1.2}{11.7} = 10.26\%$$

Sustainable Growth Rate = RR × ROE
= 0.75 × 10.26%
= 7.695%
~ 7.70%

Sustainable growth rate for proposal 2:

Total Equity = ₹ 12,00,000 + 1,00,000
= 13,00,000

$$\text{Debt equity Ratio} = \frac{\text{Debt}}{\text{Equity}}$$

$$4 = \frac{\text{Debt}}{13,00,000}$$

Debt = 52,00,000

Total capital = 13,00,000 + 52,00,000
= 65,00,000

Total Assets = 65,00,000

$$\text{Assets to Sales} = \frac{\text{Asset}}{\text{sales}}$$

$$0.62 = \frac{65,00,000}{\text{Sales}}$$

Sales = 104.84 lakhs

Net profit = 104.84 lakhs × 5%
= 5.242 lakhs

$$\text{Calculation of ROE} = \frac{\text{PAT or EAES}}{\text{ESHF}}$$

$$= \frac{5.242 \text{ lakhs}}{13 \text{ lakhs}}$$

= 40.32%

$$\text{Payout Ratio} = \frac{0.3}{5.242}$$

= 5.72%

Retention Ratio = 100% – 5.72%
= 94.28%

Sustainable growth rate = RR × ROE
= 94.28% × 40.32%
= 38.01%

QUESTION 14:
N 04 | RTP

Mr. A is contemplating purchase of 1,000 equity shares of a Company. His expectation of return is 10% before tax by way of dividend with an annual growth of 5%. The company's last dividend was ₹ 2 per share. Even as he is contemplating, Mr. A suddenly finds, due to a Budget announcement Dividends have been exempted from Tax in the hands of the recipients. But the imposition of Dividend Distribution Tax on the Company is likely to lead to a fall in dividend of 20 paise per share. A's Marginal tax rate is 30%.

Required:

Calculate what should be Mr. A's estimates of the price per share before and after the Budget announcement?

Solution:

Post Tax K_e = Pre-Tax $K_e \times (1\text{-}t)$
= $10\% \times (1 - 0.3)$
= 7%

Value of a share based on expected dividend: $P_0 = \frac{D_0 (1 + g)}{k_e - g}$

Price estimate before budget announcement: $P_0 = \frac{2 \times (1 + 0.05)}{(0.10 - 0.05)}$ = Rs 42.00

Price estimate after budget announcement: $P_0 = \frac{1.80 \times (1 + 0.05)}{(0.07 - 0.05)}$ = Rs 94.50

QUESTION 15:
MTP M 16

A company had paid a dividend of ₹2.50 per share last year and its required rate of return for equity investors is 20%. What will be the market price of the share at the end of the year, if

a. there is no growth in dividend?
b. dividend grows at constant rate of 5% per annum in perpetuity?
c. constant dividend for first five years and then grows at constant rate of 5% per annum in perpetuity?
d. constant dividend for first five years and then, share is sold at the price of ₹ 20?

Solution:

(a) $P_0 = \frac{D_1}{Ke} = \frac{2.50}{0.20}$ = ₹ 12.50

(b) $P_0 = \frac{D_1}{Ke\text{-}g}$
$= \frac{2.50 \times 1.05}{0.20\text{-}0.05}$
= 17.5

(c) Calculation of P_0:

Year	CF'S	PVAF @ 20%	DCF
D_{1-5}	2.5	2.991	7.48

Meet Adish

Chartered Accountant (CA) &
Chartered Financial Analyst (CFA)

Ex-Morgan Staley & ICICI Securities with
2+ years work-ex in Equity Research

Teaches CA Final-AFM, CMA, CFA
and Financial Modelling

Taught 10000+ students across courses

His 2 core mantra for students:
- Conceptual Clarity
- Comprehensive Coverage

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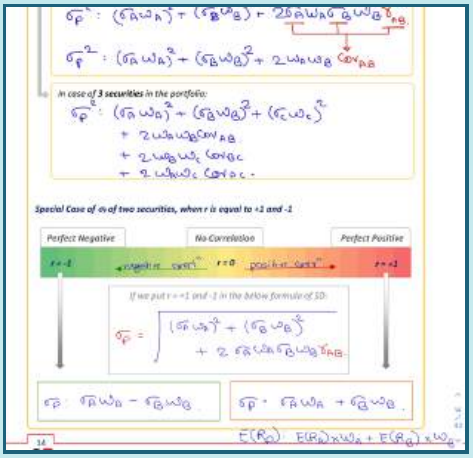

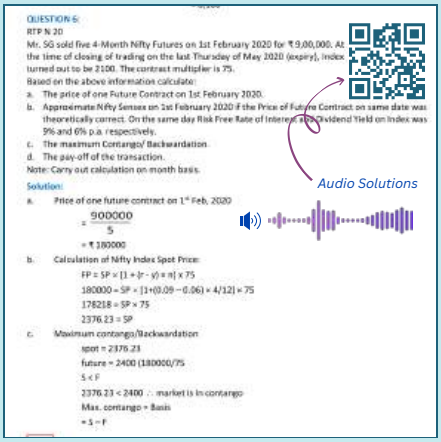

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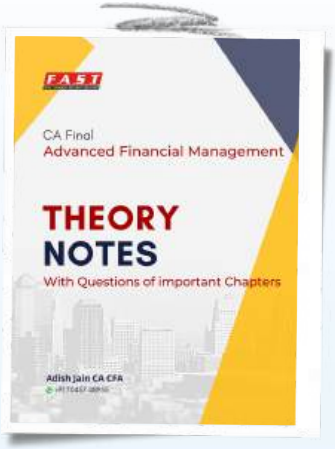

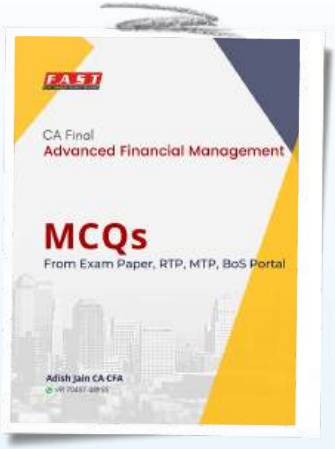

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Table of Content

Derivatives & Interest Rate Risk Management

A. Basics of Derivatives

B. Forward and Futures Contract

QUESTION 1:

RTP N 12

Suppose that there is a future contract on a share presently trading at Rs. 1000. The life of future contract is 90 days and during this time the company will pay dividends of Rs. 7.50 in 30 days, Rs. 8.50 in 60 days and Rs. 9.00 in 90 days

Assuming that the Compounded Continuously Risk-Free Rate of Interest (CCRRI) is 12% p.a. You are required to find out:

a) Fair Value of the contract if no arbitrage opportunity exists.

b) Value of cost of carry

[Given $e^{-0.01} = 0.9905$, $e^{-0.02} = 0.9802$, $e^{-0.03} = 0.97045$ and $e^{0.03} = 1.03045$]

Solution:

Logical Solution:

a) Calculation of fair value of contract, if no Arbitrage opportunity exists

FP = $(S_0 - PV(I)) \times e^{rt}$

= $(1000 - 24.49) \times e^{0.12 \times 90/360}$

= 975.51×1.03045

= 1005.21

Calculation of Income

Dividend	Day	PV (I)	
7.50	30	$7.50/e^{0.12 \times 30/360}$	= 7.43
8.50	60	$8.50/e^{0.12 \times 60/360}$	= 8.33
9	90	$9/e^{0.12 \times 90/360}$	= 8.73
			24.49

b) Value of cost of carry = Forward – Spot

= 1005.21 – 1000

= 5.21

Solution by ICAI:

a) Fair Value of Future Contract = ₹ 1000 e0.12X90/360 – Dividend Proceeds

= ₹ 1000 × 1.03045 – ₹ 24.49

= ₹ 1005.96

b) Since Value of Future Contract = Spot Price + Cost to Carry

₹ 1005.96 = ₹ 1000 + Cost to Carry

Cost to Carry = ₹ 5.96

QUESTION 2:

M 12 | RTP M 12

On 31-8-2011, the value of stock index was ₹2,200. The risk-free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend paid p.a.
January	3%
February	4%
March	3%
April	3%
May	4%
June	3%
July	3%
August	4%
September	3%
October	3%
November	4%
December	3%

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: $e^{0.01583} = 1.01593$

Solution:

The date given is as on 31/8/2011 therefore the relevant months are September, October, November and December

$FP = S_0 \times e^{(r-y) \times t}$

$= 2200 \times e^{(0.08 - 0.0325) \times 4/12}$

$= 2200 \times 1.01593 = 2235.05$

Calculation of average dividend yield

$$\text{Dividend yield} = \frac{3+3+4+3}{4} = 3.25\%$$

QUESTION 3:

RTP N 09 | RTP M 11

The following information about copper scrap is given:

Spot Price	: $ 10,000
Future Price	: $ 10,800 for a one-year contract
Interest rate	: 12%
PV (storage cost)	: $ 500 per year

What is the PV (convenience yield) of copper scrap?

Solution:

The formula to be used is the when the question is silent

FP $= (S_0 + PV(S) - PV(CY)) \times (1 + r \times n)$

$10800 = (10000 + 500 - PV(CY)) \times (1 + 0.12 \times \frac{12}{12})$

$10800 = (10500 - PV(CY)) \times 1.12$

$PV(CY) = 857.14$

Conclusion: PV of convenience yield is $857.14

QUESTION 4:

N 11 | N 08 | RTP

The 6-months forward price of a security is ₹ 208.18. The borrowing rate is 8% per annum payable with monthly rests. What should be the spot price?

Solution:

$$FP = S_0 \times \left(1 + \frac{r}{k}\right)^{nk}$$

$$208.18 = S_0 \times \left(1 + \frac{0.08}{12}\right)^{\frac{6}{12} \times 12}$$

$$208.18 = S_0 \times 1.0407$$

$$200.04 = S_0$$

$$S_0 = 200.04$$

QUESTION 5:

N 19

A future contract is available on R Ltd that pays an annual dividend of ₹4 and whose stock is currently priced at 125. Each future contract calls for delivery of 1,000 shares to stock in one year, daily marking to market. The corporate treasury bill rate is 8%.

Required:

a. Given the above information, what should the price of one future contract be?

b. If the company stock price decreases by 6%, what will be the price of one futures contract?

c. As a result of the company stock price decrease, will an investor that has a long position in one futures contract of R Ltd. realizes a gain or loss. What will be the amount of his gain or loss?

(Ignore margin and taxation, if any)

Solution:

(i) Price of one future contract: $= ([S_0 \times (1 + r \times n)] - I) \times$ Contract size

$= ([125 \times (1 + .08 \times 12/12)] - 4) \times 1000$

$= 1,31,000$

(ii) New Share price: $= 125 - 6\% = 117.5$

New price of one future contract $= [117.5 \times (1 + .08 \times 12/12) - 4] \times 1000$

$= 1,22,900$

(iii) Loss on long position = 1,22,900 – 1,31,000

= 8,100

Self-note: If the language of the question is not clear about timing of Income, then it is assumed to be on expiry of the contract.

QUESTION 6:

RTP N 20

Mr. SG sold five 4-Month Nifty Futures on 1st February 2020 for ₹ 9,00,000. At the time of losing of trading on the last Thursday of May 2020 (expiry), Index turned out to be 2100. The contract multiplier is 75.

Based on the above information calculate:

a. The price of one Future Contract on 1st February 2020.

b. Approximate Nifty Sensex on 1st February 2020 if the Price of Future Contract on same date was theoretically correct. On the same day Risk Free Rate of Interest and Dividend Yield on Index was 9% and 6% p.a. respectively.

c. The maximum Contango/ Backwardation.

d. The pay-off of the transaction.

Note: Carry out calculation on month basis.

Solution:

a. Price of one future contract on 1st Feb, 2020

$= \frac{900000}{5}$

= ₹ 180000

b. Calculation of Nifty Index Spot Price:

FP = SP × [1 + (r - y) × n] x 75

1,80,000 = SP × [1+(0.09 – 0.06) × 4/12] × 75

2,376.24 = SP

c. Maximum contango/Backwardation

spot = 2376.24

future = 2400 (180000/75)

S (2376.24) < F (2400)

∴ market is in contango

Max. contango = Basis

= S – F

= 2376.24 – 2400 = - 23.76

d. Pay-off of the transaction

In Feb: Sell - Inflow	9,00,000	
In May: Buy - Outflow	-7,87,500	(5 × 2100 × 75)
Gain	1,12,500	

Note: Remember 75 multiplies in second past of the question

QUESTION 7:
RTP M 15

Mr. X, is a Senior Portfolio Manager at ABC Asset Management Company. He expects to purchase a portfolio of shares in 90 days. However, he is worried about the expected price increase in shares in coming day and to hedge against this potential price increase he decides to take a position on a 90-day forward contract on the Index. The index is currently trading at 2290. Assuming that the continuously compounded dividend yield is 1.75% and risk free rate of interest is 4.16%, you are required to determine:

a. Calculate the justified forward price on this contract.

b. What position in forward should the portfolio manager take to hedge against potential price increase?

c. Suppose after 28 days of the purchase of the contract the index value stands at 2450 then determine gain/ loss on the above position.

d. If at expiration of 90 days the Index Value is 2470 then what will be gain on position.

Note: Take 365 days in a year and value of $e^{0.005942}$ = 1.005960, $e^{0.001849}$ = 1.001851.

Solution:

(a) $FP = S_0 \times e^{(r - y) \times t}$

$= 2290 \times e^{(0.0416 - 0.0175) \times 90/365}$

$= 2290 \times 1.005960$

$= 2303.65$

Justified forward price is ₹2303.65

(b) Since, he is willing to buy the portfolio in the spot market after 90 days, therefore to hedge against loss, he should take a long position in forward today.

(c) *Logical Solution:*

$FFP = S_0 \times e^{(r - y) \times t}$

Index forward price after 28th days $= 2450 \times e^{(0.0416 - 0.0175) \times 62/365}$

$= 2450 \times e^{0.004094}$

$= 2450 \times 1.00410$

$= 2460.05$

Self-note: Since the value of e^{rt} given in the question are not matching, we will calculate the value of e^{rt} as:

Calculation of $e^{0.00409}$

$$E^x = 1 + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!}$$

$$= 1 + \frac{0.00409}{1} + \frac{0.00409^2}{2 \times 1} + \frac{0.00409^3}{3 \times 2 \times 1}$$

$= 1.00410$

Gain on long position $= 2460.05 - 2303.65$

$= 156.39$

Solution by ICAI:

Gain/loss on Long Position after 28 days $= 2450 - 2290 \times e^{28/365(0.0416 - 0.0175)}$

$= 2450 - 2290 \times e^{0.001849}$

$= 2450 - 2290 \times 1.001851$

$= 155.76$

(d) Gain on long position at 90th day = 2470 – 2303.65

= ₹166.35

QUESTION 8:

N 09 | M 04 | MTP N 14 | RTP

The following data relate to Anand Ltd.'s share price:

Current price per share ₹ 1,800

6 months future's price/share ₹ 1,950

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

a. to calculate the theoretical minimum price of a 6-months forward purchase; and

b. to explain arbitrate opportunity.

Solution:

Calculation of FFP $= S_0 \times (1 + r \times n)$

$= 1800 \times (1 + 0.12 \times 6/12)$

$= 1908$

Calculation of arbitrage profit:

Since AFP (₹ 1950) > FFP (₹ 1908)

∴ Futures are overvalued.

∴ Cash and Carry arbitrage will be followed

Particulars	Today		At the end of 6m	
	Action	Amount	Action	Amount
Future	Sell	–	Settle	1950
Spot	Buy	(1800)		
Borrowing	Borrow	1800	Repay	(1908) *
Profit		0		42

* 1800 x (1+ 0.12 × 6/12) = 1908

QUESTION 9:

M 09 | RTP

The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three months futures contract is selling for ₹ 312. Develop an arbitrage strategy and show what your risk-less profit will be 3 months hence assuming that X Ltd. will not pay any dividend in the next three months.

What will be the strategy if actual futures price is ₹ 290 today?

Solution:

S_0 = ₹300

Calculation of Fair Future Price:

FFP $= S_0 \times (1 + \frac{r}{k})^{nk}$

$= 300 \times (1 + \frac{0.096}{12})^{3/12 \times 12}$

$= 307.26$

If Actual Future Price (AFP) is ₹312:

Since AFP (₹312) > FFP (307.26)

∴ Futures are overvalued.

∴ Cash and Carry arbitrage will be followed

Particulars	Today		At the end of 3m	
	Action	Amount	Action	Amount
Future	Sell	–	Settle	312
Spot	Buy	(300)		
Borrowing	Borrow	300	Repay	(307.26) *
Profit		0		4.74

* 300 x $(1+ 0.008)^3$ = 307.26

If Actual Future Price (AFP) is ₹290:

AFP (₹290) < FFP (₹307.26)

∴ Futures are undervalued

∴ Reverse cash and carry arbitrage will be followed

Particulars	Today		At the end of 3m	
	Action	Amount	Action	Amount
Future	Buy	–	Settle	(290)
Spot	Sell	300		
Investment	Invest	(300)	Redeem	307.26
Profit		0		17.26

QUESTION 10:

N 19

The NSE-50 Index futures are traded with rupee value being ₹100 per index point. On 15th September, the index closed at 1195, and December futures (last trading day December 15) were trading at 1225. The historical dividend yield on the index has been 3% per annum and the borrowing rate was 9.5% per annum.

a. Determine whether on September 15, the December futures were underpriced or overpriced?

b. What arbitrage transaction is possible to gain out this mispricing?

c. Calculate the gains and losses if the index on 15th December closes at (a) 1260 (b) 1175.

Assume 365 days in a year for your calculations.

Solution:

i) FP = $S_0 \times [1+ (r - y) \times n]$

$= 119500 \times [1 + (0.095 – 0.03) \times 91/365]$

= 1,21,436.55

Since AFP (₹ 1225 × 100) > FFP (₹ 121437)

Therefore, Futures are overpriced.

ii) Since futures is overpriced

∴ we will conduct cash and carry arbitrage by Selling futures, buying spot and borrowing on 15th sept and settling these positions on 15th Dec.

iii) Calculation of Gain loss

Particulars	On 15th Sept		On 15th Dec		
	Action	Amount	Action	126000	117500
Future	Sell	–	Settle	- 3500.00	5000.00
Spot	Buy	- 119500	Sell	1,26,000.00	1,17,500.00
Borrow	Borrow	119500	Repay	1,22,330.35*	1,22,330.35*
Dividend			Received	893.79#	893.79#
Profit		0		1063.44	1063.44

* $S_0 \times 1 + r \times n = 119500 \times [1 + 0.095 \times 91/365] = 122330.35$

$119500 \times 3\% \times 91 / 365 = 893.79$

QUESTION 11:

J 21

Mr. A is holding 1000 shares of face value of ₹ 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have no intention to sell.

On 1st January 2020, M/S. XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

(i) Shares to be borrowed for 3 months from 01-01-2020 to 31-03-2020,

(ii) Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and

(iii) Bank Guarantee will be provided as collateral for the value as on 01-01-2020.

Other Information:

a) Cost of Bank Guarantee is 8% per annum,

b) On 29-02-2020 M/s. ABC Ltd., declared dividend of 25%,

c) Closing price of M/S. ABC Ltd.'s share quoted in Stock Exchange on various dates are as follows:

Date	Share Price	
	Scenario — 1 Bullish	Scenario — 2 Bearish
01-01-2020	1000	1000
31-01-2020	1020	980
29-02-2020	1040	960
31-03-2020	1050	940

You are required to find out:

a. Earnings of Mr. A through Stock Lending Scheme in both the scenarios.

b. Total Earnings of Mr. A during 01-01-2020 to 31-03-2020 in both the scenarios.

c. What is the Profit or loss to M/S. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios?

Solution:

(a) Earnings of Mr. A through Stock Lending Scheme:

Particulars	Scenario A		Scenario B	
	Price	Lending fees	Price	Lending fees
31/1/2020	1020	(1020×1000×1%) = 10200	980	9800
29/2/2020	1040	10400	960	9600
31/3/2020	1050	10500	940	9400
		31100		28800

(b) Total Earnings of Mr. A during 01-01-2020 to 31-03-2020:

Particulars	Scenario 1	Scenario 2
Dividend Received	(₹100 × 1000 shares × 25%) = 25000	25000
Lending Charges	31100	28800
Total Earnings	56100	53800

(c) Profit or loss to M/S. XYZ

	Scenario 1	Scenario 2
P/(L) on short sales	(1000 – 1050) x 1000 = (50000)	(1000 – 940) x 1000 = 60000
Lending charges	(31100)	(28800)
Bank Guarantee	(20000)*	(20000)
	(1,01,100)	11,800

*₹1000 × 1000 shares × 8% × 3/12

Self-note: Suggested answers did not include dividends paid by XYZ in part 'c' of the solution.

Assumption: M/s XYZ Ltd. has borrowed all the1000 shares from Mr. A

QUESTION 12:

N 08 | RTP

Calculate the price of 3 months PQR futures, if PQR (FV ₹ 10) quotes ₹ 220 on NSE and the three months future price quotes at ₹ 230 and the one month borrowing rate is given as 15 percent and the expected annual dividend is 25 percent per annum payable before expiry. Also examine arbitrage opportunities. What if 3 months PQR Futures quotes at ₹210 today.

Solution:

Calculation of Fair Future Price

$FFP = S_0 \times (1+r)^n - I$

$$FFP = 220 \times \left(1+\frac{0.15}{12}\right)^3 - 2.50$$

FFP = 225.85

When AFP (₹230) > FFP (225.85), we will follow cash and carry arbitrage

Particulars	Today		At the end of 3M	
	Action	Amount	Action	Amount
Futures	Sell	–	Settle	230
Spot	Buy	220	-	-
Borrowings	Borrow	(220)	Repay	(228.35)*
Dividend			Received	2.5
Profit		0		4.15

* $220 \times \left[1+\left(\frac{0.15}{12}\right)\right]^3$

If 3M FP quotes at ₹210 then, AFP (₹210) < FFP (₹225.85) we will follow reverse cash and carry arbitrage

Particulars	Today		At the end of 3M	
	Action	Amount	Action	Amount
Futures	Buy	–	Settle	(210)
Spot	Sell	220		
Investments	Invest	(220)	Redeem	228.35*
Dividends			Pay	(2.5)
Profit		0		15.85

QUESTION 13:

RTP N 13

Suppose current price of an index is ₹ 13,800 and yield on index is 4.8% (p.a.). A 6- month future contract on index is trading at ₹ 14,340.

Assuming that Risk Free Rate of Interest is 12%, show how Mr. X (an arbitrageur) can earn an abnormal rate of return irrespective of outcome after 6 months. You can assume that after 6 months index closes at ₹ 10,200 and ₹ 15,600 and 50% of stock included in index shall pay divided in next 6 months.

Also calculate implied risk-free rate

Solution:

The fair price of the index future contract can be calculated as follows:

FP = 13,800 × [1 + (0.12 × 6/12)] – (13,800 × 4.8% × 50%)

= ₹ 14,296.80

Since presently 6-month index future is trading at ₹ 14,340, hence it is overpriced.

Therefore, Mr. X should follow cash and carry arbitrage:

1) He should take long position in a portfolio replicating index.

2) He should take short position in index futures.

He can earn an abnormal return as follows:

Step 1: Take position as per point 1 & 2 above today:

Total amount invested: 13,800

Step 2: Square off above portfolio after 6m and inflow will be:

	If price turns out to be:	
	10,200	15,600
Profit on sale of long spot index	10,200	15,600
Profit on short futures position	4,140.0	- 1,260.0
Dividend Received #	331.2	331.2
Total Profit	14,671.2	14,671.2

(13,800 × 4.8% × 50%) = 331.2

Step 3: Implied risk-free rate $= \frac{\text{Profit on investment}}{\text{Amount of Investment}} \times \frac{12}{6} \times 100$

$= \frac{14,671.2 - 13,800}{13,800} \times \frac{12}{6} \times 100$

$= 12.63\%$

Since the above implied risk-free rate (12.63%) is more than given risk free rate (12%), Mr. A has earned an abnormal return

QUESTION 14:

M 23 | RTP N 20 | M 19

Mr. V is a commodity trader and specialized himself in trading of rice. He has 24,000 Kg. of rice which he is planning to sell after 3 months from now. The following details are available as on date:

Spot price	1 Kg.	70
3 month's future is trading at	1 Kg.	68
Expected Lower price after 3 months	1 Kg.	64

Contract size 500 Kg/contract

You are required to advise to Mr. V:

1. Interpret the position of trader in the cash market.
2. How to mitigate the risk of fall in price.
3. How to use the futures market.
4. What will be the effective realized price for his sales if, after 3 months, spot price is ₹ 69/ Kg. and the 3 months future contract price is:
   a. ₹ 72/Kg
   b. ₹ 67/Kg

Solution:

(a) Rice trader is having long position in cash market

(b) The risk of fall in price can be mitigated by hedging this position by taking a position in derivatives market.

(c) Since, Mr. V has a long position in the cash market, therefore he should take a short position in future market to mitigate the risk

(d) No. of contracts to short $= \frac{24,000 \text{ kgs}}{500 \text{ kgs}} = 48$ contracts

Calculation of effective price realized:

Particulars	If price = ₹ 72/Kg	If price = ₹ 67/Kg
Sale proceeds from spot market	₹ 16,56,000 (69 × 24,000)	₹ 16,56,000 (69 × 24,000)
Gain/Loss or short future's position	(₹ 96,000) ((68 - 72) × 48 × 500)	₹ 24,000 ((67 - 68) × 48 × 500)
Total realization / inflow quantity ÷ Quantity	15,60,000 24,000	16,80,000 24,000
Effective realized price per kg	₹ 65/kg	₹ 70/kg

QUESTION 15:

M 21 | M 17 | N 13 | RTP

A trader is having in its portfolio shares worth ₹85 lakhs at current price and cash ₹15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%. Determine:

(i) Current portfolio beta

(ii) Portfolio beta after 3 months if the trader on current date goes for long position on ₹100 lakhs Nifty futures.

Solution:

(i) Current portfolio Beta $= \left[\frac{\beta_X \times MV_X + \beta_Y \times MV_Y}{\text{Total Value of Portfolio}}\right]$

$= \frac{85 \text{ lakhs} \times 1.6 + 15 \times 0}{100}$

= 1.36 times

(ii) Calculation of portfolio Beta after 3m

Value of index after 3m:

$\beta_P = \frac{\Delta \text{ in portfolio return}}{\Delta \text{ in market return (index)}}$

$1.6 = \frac{-3.2}{\Delta \text{ in market return (index)}}$

Δ in market return (index) = - 2% i.e., market fell by 2%

Value of Nifty Futures after 3 months = 100 – 2% = 98

Loss on long nifty futures = 100 – 98 = 2 lacs i.e., mark to market

Portfolio value after 3m:

	Value	
Share	85 - 3.2%	= 82.28
Cash	15 - 2	= 13.00
		= 95.28

% Change in portfolio value $= \frac{100 - 95.28}{100}$ = 4.72%

Portfolio Beta after 3m = 4.72%/2% = 2.36 times

Meet Adish

Chartered Accountant (CA) &
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His 2 core mantra for students:
- Conceptual Clarity
- Comprehensive Coverage