

Question 1: Bonds (9 marks)

Digging Deep Construction issued \$10 million in bonds 2 years ago with the following characteristics:

- 10 years to maturity
- Quarterly frequency coupons with a coupon rate of 8% APR with quarterly compounding
- Face value of \$1000

- i. If you purchased one bond at the time of issuance (2 years ago) and sold the bond today when the yield to maturity was 9% and the final coupon for year 2 was just received, what was your annualized total return? (5marks)

$$P_2 = \frac{20}{0.0225} \left[1 - \frac{1}{(1.0225)^{32}} \right] + \frac{1000}{(1.0225)^{32}} \quad \text{Coupon} = \frac{(1000)(0.08)}{4} = 20$$
$$= 943.4058 \quad (2) \quad (1)$$

$$(2) \quad \text{Total return} = \left(1 + \frac{20 \times 8}{1000} + \frac{943.4058 - 1000}{1000} \right)^{1/2} - 1$$
$$= 5.04\%$$

- ii. In two years (i.e. when the bond has 6 years to maturity), assuming the yield to maturity remains 9%, will the duration of the bond be higher or lower? *No calculation is necessary, in your answer define duration and explain why duration would be higher or lower in two years.*

(4) Duration is a measure of a bond's effective maturity and reflects the interest rate risk of a bond. A longer duration indicates higher interest rate risk.

As duration increases with maturity, ~~the~~ in two years (holding all other factors constant) the bond will have a lower or shorter duration.

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Question 2: Equity Valuation (7 marks)

Dextros Inc., a purveyor of high quality sugar, just paid a dividend of \$2.50 based on earnings of \$4.00 per share (i.e. $EPS_0 = \$4.00$ and $D_0 = \$2.50$). Dextros is expected to maintain the same dividend payout ratio for the next 5 years after which the payout ratio will decrease to 40% and remain at that level indefinitely. Earnings are expected to grow at a rate of 7% for the next 6 years and at a rate of 0.5% in perpetuity thereafter. The cost of capital for Dextros is 10%.

- i. What is the value of one share of Dextros Inc. today ($t=0$)? You do not need to solve for the actual value, just provide the formula for the calculation. *8 marks*

	0	1	2	3	4	5	6	7	∞
EPS		4.00							
Div		2.50							
Payout		0.625	→ 0.625				0.40	0.40	→
g			→ 7%				7%	0.5%	→

(2)

Growing annuity $D_1 \rightarrow D_5$ Growing Perp. $D_7 \rightarrow \infty$

$$P_0 = \frac{D_1}{r-g_1} \left[1 - \frac{(1+g_1)^5}{(1+r)^5} \right] + \frac{D_6}{(1+r)^6} + \frac{D_7}{r-g_2} \frac{1}{(1+r)^6}$$

$$= \frac{2.50(1.07)}{0.10 - 0.07} \left[1 - \frac{(1.07)^5}{(1.10)^5} \right] + \frac{(4.00)(1.07)^6(0.40)}{(1.10)^6} + \frac{(4.00)(1.07)^6(0.005)(0.40)}{0.10 - 0.005} \frac{1}{(1.10)^6}$$

(2)
(1)
(3)

- ii. In ten years, what will be the NPVGO? Based on this value, would investors prefer that Dextros increase or decrease its dividend payout ratio? Explain why. *6 marks*

$$P_{10} = \frac{D_{11}}{r - g_2} = \frac{(4)(1.07)^6(1.005)^5(0.40)}{0.10 - 0.005} = \$25.9137 \quad (2)$$

$$\begin{aligned} \text{NPVGO} &= P_{10} - \frac{\text{EPS}_{11}}{r} \\ &= 25.9137 - \frac{(4)(1.07)^6(1.005)^5}{0.10} \quad (2) \\ &= -35.6313 \end{aligned}$$

As the NPVGO is negative investors would prefer that the payout ratio be increased so that a lower proportion of earnings is directed at a growth opportunity with a negative NPV.

(2)

Question 3: Equity Valuation 2 (7 marks)

Referring to the financial statements provided at the back of the exam (which can be removed), determine the value of one share of Down Under Labs via discounting of the free cash flows to the firm. Assume the following:

- Today is the end of the 2003 fiscal year (i.e. the 2004 revenue and expenses will be realized one year from today)
- The free cash flows to the firm in 2006 will be realized in perpetuity thereafter.
- The required rate of return for Down Under Labs is 8% EAR.
- Corporate tax rate is 20%.
- Down Under Labs will not make any plant, property or equipment purchases in the foreseeable future (i.e. capital expenditures are zero in each year).

	2004	2005	2006
NWC : AR	6025	12050	12653
Inv	12996	10481	8453
AP	(6922)	(13,844)	(14,536)
Cash	0	0	0
	12099	8687	6570
ΔNPV	-901	-3412	-2117

FCFF

Net Income	1,769	6,701	8,282
+ depreciation	10,476	8446	6812
+ interest	609(.8)	572(.8)	686(.8)
- Cap Exp	0	0	0
- ΔNWC	(901)	(-3412)	(2117)
	13,633.2	19,016.6	17,759.8

$$\text{PV FCFF} = \frac{13633.2}{1.08} + \frac{19016.6}{1.08^2} + \frac{17,759.8}{\frac{0.08}{1.08^2}}$$

②

$$= 219,254.0775$$

$$P_0 = \frac{219,254.0775 - 21,911}{50,000}$$

①

$$= 3.95$$

Question 4: Risk and Reward (9 marks)

The table below summarizes the expected return to three assets across three possible scenarios and the likelihood that each of the scenarios will be realized.

State of Economy	Probability	Asset A	Asset B	Asset C
Boom	50%	9%	22%	4%
Normal	20%	-6%	-3%	4%
Recession	30%	9%	2%	4%

What is the standard deviation of a portfolio constructed with equal weights of all three assets given that asset B has an expected return of 11% and a standard deviation of 7.97%?

$$E[R_A] = (.5)(0.09) + (.2)(-0.06) + (.3)(0.09) = 0.060 \quad (1)$$

$$\sigma_A = \sqrt{(.5)(0.09 - 0.06)^2 + (.2)(-0.06 - 0.06)^2 + (.3)(0.09 - 0.06)^2} = 0.060 \quad (2)$$

$$\begin{aligned} \text{Covariance}(R_A, R_B) &= (.5)(0.09 - 0.06)(0.22 - 0.11) + \\ & (.2)(-0.06 - 0.06)(-0.03 - 0.11) + \\ & (.3)(0.09 - 0.06)(0.02 - 0.11) = 0.0042 \quad (3) \end{aligned}$$

$$\sigma_T = \sqrt{(.5)^2(0.06)^2 + (.5)^2(0.0797)^2 + (2)(.5)(.5)(0.0042)} = 0.06773 \quad (2)$$

$$\sigma_P = (.66)(0.06773) = 0.04471 \quad (1)$$