Econ 134 - Financial Economics

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Problem Set # 3

You will be graded on all three problems for serious effort. In addition, you will also be graded on the correctness of some of your answers for an additional 30 points; this time, I don't tell you in advance for which. *Make sure to box all your answer to receive credit.* Maximal total score: 110 points.

1. (20) XYZ company (silly names are for textbooks!) is currently restructuring. As a result, the market expects zero dividends for the following three years; from year 4 on, when the restructuring is expected to have been successfully completed, constant dividends of \$ 8 per share are expected forever. Assume that

- the applicable discount rate for holding XYZ stock (XYZ's "required rate of return", as we will call it) is 16%;

- the market price for XYZ stock is and will be "fair", that is: equal to the present value of dividends, and that the future evolves exactly according to expectations;

- XYZ stock is tradeded "ex-dividend", i.e. the right to year t's dividend belongs to the owner of the share at the end of year t-1.

i) What is an XYZ share worth in year 3?

ii) What will the price of an XYZ stock be in years 0 through 4.

2. (35) *I made up the following question five and a half years ago, in exactly the wording below. Interestingly, Coca-Cola's stock is now around \$40.90, its market capitalization \$97 billion, quite a bit below where they were then.*

Coca-Cola's share price on December 31, 1996 was \$52.63 . The total market value of its common stock was \$131 billion. Coca-Cola has been the best-performing company among the 30 companies comprising the Dow Jones over the last 10 years; an investor who put \$100 into Coca-Cola stock on 12-31-1986 and reinvested dividends saw the value of his investment increase to \$1,337 by 12-31-96. Dividends paid in 1996 were \$1.25 billion. Could it be that Coca-Cola's stock is somewhat overpriced?

Let's apply the Differential Growth model to this question (cf. pages 115-116 in CF, which are pages 76-77 in our customized version).

First, it is helpful to normalize current (= 1996) dividends equal to 100. The key, of course, is to make the right assumptions about the future growth of earnings and dividends, and on the required rate of return on Coca-Cola stock. For the latter, it does not seem unreasonable to assume that Coca-Cola stock is of average riskiness, hence setting the required rate of return to 12% p.a. seems plausible.

On the growth front, things are much more iffy. Over the last 10 years, Coca-Cola's net income grew at a (compound) average rate of 14% p.a. ; let's assume that dividends will grow at that rate over the next 20 years, and that thereafter, they will grow only at the long-term average for the U.S. economy which of 6% (everything here is in nominal terms).

i) Based on these data, dividends in year 1 (1997) are 114; how large are they in years 10, 20, 21 (=2017). Sketch a timeline representing the expected dividend stream in years 1 through 30; it should have a kink between years 20 and 21, similar to that of figure 5.3 in CF, p. 111.

ii) Dividends from year 1 to 20 represent a growing annuity; determine their PV.

iii) Dividends after year 20 represent a delayed growing perpetuity; determine their PV.

iv) Add ii) and iii) and divide by 100; this gives a "Differential Growth Factor" by which 1996 dividends are to be multiplied to determine the PV.

v) Based on your answer to iv) and the above figure for 1996 dividends, compute the "fair price" (PV) of Coca-Cola stock, and compare with the total market value.

vi) Under these assumptions, Coca-Cola stock is greatly overvalued. One possibility for this is that "dividends" have not been properly measured. In fact, Coca-Cola has purchased stock from its shareholders in 1996 worth $1.400 billion; since these are also cash payments to its shareholders, they should arguably be included in the computation above. Thus, define "gross dividends" as dividends + stock repurchases = $2.657 billion.

Using these "gross dividends" in part v) instead, recompute the "fair price" of Coca-Cola stock; the new figure should correspond much more closely to the Coca-Cola's actual valuation.

vii) However, the assumption of another 20 years of exceptional growth seems very optimistic. Thus, recompute the "fair price" of Coca-Cola stock based on gross dividends, but assuming that the period of exceptional growth of 14% lasts only for another 10 years, to be followed by an average growth of 6% p.a. forever. This has a rather dramatic impact on the result!

viii) A final bit of info: Coca-Cola is proud to have supplied almost 2 ounces of the 64 ounces of

liquid intake that an average member of the world population needs each day; does this throw any light on the reasonableness of the growth assumptions made above?

3. (25) Methusalem is a Victorian rentier who lives foreover. His only income is the coupon stream of the perpetuities he owns, 20,000 £ p.a. forever. Methusalem wants to enjoy a consumption stream that grows steadily at the rate of 2%. The market interest rate is and will be 4% forever. Assume that Methusalem will receive his first payment exactly 1 year from now, and will pay for his annual consumption at the end of each year.

i) How much can Methusalem afford to consume in the first year, if he wants to ensure that his annual consumption grows at the rate of 2% p.a. forever? Illustrate Methusalem's income and consumption streams in a time line.

ii) How long will Methusalem be a net saver if he adopts this consumption plan (i.e. how long will his annual consumption be less than his annual income) (*Hint: you may use the doubling rule*)

iii) Suppose that Methusalem is willing to save even more today to enjoy higher consumption growth in the future. Which perpetual growth rates can he achieve by saving sufficiently hard initially? Which are out of his reach?