

Kenmerk : Vellekoop/InvTh/Tentamen0506
Datum : 15 oktober 2008

Course : **Final Examination Introduction to Investment Theory**
Code : 151560
Date : Nov 9, 2005

All answers must be motivated.
You may use an electronic calculator.
Lots of success !

1. On Nov 3, 2005 16:00 hrs, the official Centrebet Bookmaker betting odds for the Eredivisie Game FC Twente - Willem II were

FC Twente wins	payoff 1.75 euro per euro bet
Willem II wins	payoff 4.10 euro per euro bet
Draw (nobody wins)	payoff 3.50 euro per euro bet

This means that if you bet 1 euro on 'FC Twente wins' that you will receive nothing if Willem II wins or if no team wins, but that you will receive your euro back with 75 eurocents extra if FC Twente wins.

- Define a three-dimensional state price model for the bets and calculate the riskfree rate of return r_f in this model.
 - Explain why the riskfree rate is negative.
 - Calculate the riskneutral probability that FC Twente will win the game.
 - Somebody defines a new contract which is called 'FC Twente Light'. You receive 5 euro if FC Twente wins, you receive nothing if Willem II wins, but you get your money (i.e. the price of the contract) back in case of a draw. Find the correct price for such a contract.
 - Suppose you are a huge FC Twente fan¹ and that you believe that the probability that FC Twente wins is 70%. You have 100 euro in your pocket and decide to bet a percentage on FC Twente². Assume you have a logarithmic utility function. Find out how much money you should bet on FC Twente to optimize the expected utility of the amount of money you own after the game.
2. A bank offers the following rates to its customers. The bank makes no distinction in rates between borrowing and lending.
- short rate for six months is 2.2000% annually,
 - swaprate of 3.1920% annually, for a swap with two payment dates (six months from now and 12 months from now), where you pay the floating short rates of the previous period and receive the fixed swap rate.
- Find the discount rates $d_{0,1}$ and $d_{0,2}$ for the coming six and twelve month periods.³

¹It's hard, I know, but try !

²i.e. not on FC Twente Light, but on the original FC Twente contract.

³If you cannot find them, use $d_{0,1} = 0.98961$ and $d_{0,2} = 0.96971$ in the following questions

- b. If you need to invest 1 million dollar six months from now and want to receive it back with interest six months later, you might want to strike a Forward Rate Agreement Deal with a bank. What would be a reasonable deal rate for the FRA based on the information given above ?
- c. Let A be a bond with maturity 12 months from now and a face value of 100.000 dollars. The annual coupon payment is 5% but it will pay semi-annually so there will be coupon payments in exactly six months and at maturity. Calculate the price and quasi-modified duration (expressed in years) of this bond.⁴
- d. What will the new price of this bond be if today a parallel shift in the spot rate curve occurs which lowers all spot rates with 80 basis points ?
3. Consider two assets X and Y which have the same mean and the same variance σ^2 , and correlation coefficient $\rho < 1$. You want to create a portfolio, consisting of assets X and Y only, which has minimal variance (since the mean is already determined, of course).
- a. Find this portfolio with minimal variance, and show that your answer does not depend on the value of ρ .
- b. Find the variance of your minimal variance portfolio, and show that this does depend on the value of ρ . Discuss the case $\rho = -1$.
4. You are a fund manager in a large investment bank and your boss is worried about a certain large portfolio which contains several different Dutch stocks. He has heard that there are different ways to analyze portfolios: mean-variance analysis, Markowitz Models and CAPM, but he does not know the details about any of these. He therefore asks you to write a memo (maximal length: 3 quarters of a page) on this issue, in which you explain how the performance of a portfolio can be measured in an objective way.

Write this memo.

Points:

1	a : 3	2	a : 4	3	a : 3	4	: 4	free	: 4
	b : 2		b : 3		b : 2				
	c : 2		c : 3						
	d : 3		d : 3						
	e : 4								

Total: 40 points

⁴If you cannot find the answer, use the price 101.800 and a quasi-modified duration of 0.9800 years in the following questions.