FINANCE, ACTUARIAL STUDIES

AND STATISTICS

All students must hand in an assignment of their own. Ensure you also complete and attach a cover sheet with your assignment. You must complete the assignment using a spreadsheet. Excel-based assignments should be submitted using wattle and should have the answer and workings set out in a way, which is easy to follow. For an excel spreadsheet submission make sure you add a worksheet to your excel file which has all the answers summarised on a single worksheet and workings must be shown on separate worksheets.

The Scenario

You are a financial planner who is investigating the options for a 55 year old man who wishes to have enough money to retire by the time he is 70. This man is very lucky. He has just won the lottery and received a prize of $300,000 after tax. He has approached you to understand his financial situation and make an informed decision regarding his investment options for his financial future. His current financial arrangements are as follows:

- He decides to purchase a new home at a price of $500,000. According to the home loan that he would like to apply for, the initial principal he has to pay upfront is 20% of the property price. The remaining loan will be paid via 10 years' monthly repayments. The repayments are currently at the level of $X at the end of each month, which is enough to have the property paid off exactly in 10 years at the current interest rate of 4% p.a. effective.
- His salary is currently $180,000 p.a., which is taxed at a rate of 33% before being paid to him. This is currently being paid on a monthly basis at the same time as the home loan repayment is due (i.e. at the end of each month).
- Currently each month, $X of the net salary is going towards the home loan, $2,500 is being used in expenses and any additional amount is being invested in a bank account earning 3% p.a. compounded monthly. These payments are being made on the same day the net salary is received. Interest income in the bank account is taxed at a rate of 20% immediately on the interest income earned each month.
- His current bank account balance (before receiving the lottery winnings and paying the initial principle) is assumed to be zero.
- He expects his salary to increase at a rate of 4% p.a. going forward. This increase is processed on a yearly basis, with the next increase to occur after 12 further salary payments at the current rate.
- He expects his expenses to increase by 0.5% each month, including next month (i.e. the expense at the end of the 1st month will be (2500×1.005)).
- He intends to live in his new home when he is retired and live off the proceeds of his bank account in retirement.
- Initially, the man wants to deposit the remaining lottery winnings (after he pays the initial principle for the new home) in his bank account.

a) Calculate the monthly level payments the man has to repay for the home loan (e.g. find X). You are allowed to simply solve X by setting up the equation of value in excel, instead of using "Goal seek". (2 marks)

b) Calculate the expected amount the man will have in his bank account at age 70 under the basis above. Assume all interest rates remain constant. (10 marks)

The first thing you notice about this man's financial affairs is that it would be more beneficial for him to pay off the home loan as quickly as possible (using the remaining lottery winnings), rather than depositing the remaining lottery winnings in his bank account.

c) Use one sentence to briefly explain why this is the case. (1 Marks)

This would involve closing the bank account down immediately and making a lump sum contribution (from the lottery winnings) to the home loan, and then continuing the $X per month repayments until the loan is paid off. In this situation, the loan will be paid off less than 10 years. Again, any additional amount of net salary not used is credited to the bank account (which starts from a balance of zero).

d) Calculate how much more the man will have at age 70 if he takes this approach. (6 Marks)

You inform the client that there might exist better investment options in the market rather than earning interest income in the bank account. However, the client mentions to you he is extremely risk averse and does not want to invest in anything where the cash-flows aren't known in advance. Based on this you decide to only recommend fixed interest securities, with the intention of investigating the impact of investing the remaining lottery winnings (after he pays the initial principle for the new home) in these securities.

Two options which you are considering are as follows:

Bond A – A coupon bond redeemable at par in 5 equal annual installments, the first being in 11 years' time. Coupons of 6% per annum are payable half yearly in arrears. The coupons are payable on the nominal amount outstanding at the time of coupon payment. For example, if the nominal amount of this bond is $100, the coupons payable during year 12 after the first redemption payment of $20 (100/5) are based on the nominal amount outstanding at that time of $80 (100-20). This bond has a **net** yield of 8% p.a. effective.

Bond B – Pays half yearly coupons of 5% p.a. Redemption is at par on any coupon date between 12 and 15 years from now at the decision of the issuer. This bond has a minimum **net** yield of 8.5% p.a. effective.

The client is also subject to a tax of 20% on coupons and 30% on capital gains, payable immediately it is incurred.

e) Assuming the man invests in either Bond A or Bond B (but not both at the same time); calculate the nominal amount of each bond which can be purchased using the remaining lottery winnings, after the initial principle is paid.

(7 marks)

Should the client decide to invest in one of the bonds above, you decide to recommend that the home loan continue to be paid off with the $X per month for 10 years. The client invests coupons and redemption payment in the bank account immediately when they are received.

f) For both bond purchase options, calculate how much money the man will have in the bank account at age 70. Assume that Bond B is redeemed at the most advantageous date for the issuer.

(13 marks)

g) Which of the four alternatives (part(b), part(d), two in part(f)) discussed above should the man choose such that he has the largest bank balance at the age of 70?

(1 marks)

END OF ASSIGNMENT