

Taxes and Business Strategy (15.518)
Sloan School of Management
Massachusetts Institute of Technology
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Problem Set 1

Show all computations for questions requiring a numerical answer.

1. Should you make an investment or repay your student loan early? Suppose it is June 1997, you are 28 years old, and you anticipate graduating with \$40,000 of student loans. Following a grace period that runs until December 31, 1997, interest will begin to accrue on your loan at the rate of 8% per year. For simplicity, assume the loan calls for repayments in six equal, annual installments, beginning on January 1, 1998 and ending on January 1, 2003. There is no penalty for early repayment. Note the date of the first payment on this loan occurs before any interest has accrued. Verify that each payment will be \$8,012.

By December of 1997 you can spare a \$1,000 net cash outflow to either invest or pay down your student loan. Following graduation, you take a several month vacation to ___ (insert destination of your choice). Since you only worked a few months in 1997 your income is low enough that you can make a fully deductible contribution to an IRA for 1997, if you so desire.* Your income after 1997 will be too high to make a deductible contribution. You anticipate cashing out of any investment you make to use towards the last payment of your student loan. You can earn an 8% pre-tax return in a mutual fund. Your marginal tax rate is 25% in 1997, increasing to 40% thereafter. You have no existing IRA investments and do not expect to make any in the future.

You have four choices:

- a. repay early \$1,000 of your student loan,
- b. invest in the mutual fund outside an IRA,
- c. invest in the mutual fund via a deductible IRA contribution, or
- d. invest in the mutual fund via non-deductible IRA contribution.

If you invest outside the IRA, assume that all of the returns are ordinary income. Early withdrawals (before age 59 and a half) from an IRA are subject to a 10% penalty. The penalty does not apply to any portion of the distribution that represents a withdrawal of nondeductible contributions.

- A. Compute the after-tax effect on your wealth after the last payment of your student loan for each of the four alternatives. Which maximizes your after-tax wealth?
- B. Redo part (a) assuming you can earn a 15% pretax return in the mutual fund.
- C. Same as part (b), but suppose that after three years you decide to change careers and pursue your dream of being a professional poet. Accordingly, your marginal tax rate is 40% from 1998-2000, after which it permanently drops to 25%.

* IRAs (Individual Retirement Accounts) are a tax-deferred savings plan for workers that allow annual contributions of up to \$2,000 (\$3,000 after 12/31/01). For taxpayers meeting certain income requirements, the contribution is tax deductible. Taxpayers who do not meet the requirements can make non-deductible contributions. All dividends, interest and capital gains accumulate on a tax-deferred basis so both deductible and non-deductible contributions are advantageous. Withdrawals are taxable as ordinary income.

2. Fully taxable bonds yield 9.5% per year before tax, tax-exempt bonds yield 7%, and the pretax return on single premium deferred annuities (SPDAs) is 9%.
- A. What are the after-tax rates of return per period (for holding periods of 3, 5, 10, and 20 years) for an investment in (1) tax-exempt bonds; (2) taxable bonds; (3) SPDAs cashed out after age 59.5 (no excise tax); and (4) SPDAs cashed out before age 59.5 requiring a 10% nondeductible excise tax (in addition to the normal tax) on the accumulated interest, for an investor facing; (I) a 15% ordinary tax rate each period; and (II) a 28% ordinary tax rate each period?

Holding Period	Tax-Exempt Bonds	Taxable Bonds	SPDAs (no penalty)	SPDAs (with penalty)
3 Years				
15% taxpayer				
28% taxpayer				
5 Years				
15% taxpayer				
28% taxpayer				
10 Years				
15% taxpayer				
28% taxpayer				
20 Years				
15% taxpayer				
28% taxpayer				

- B. Based on your analysis in part (A), how do the optimal investment strategies change as a function of tax rates, lengths of investment horizon, and age?
- C. Age at 34.5, you deposited \$50,000 into an SPDA yielding 8.5%. Ten years later, to finance the purchase of your second home, you require a mortgage exceeding the cash-out value of your SPDA. As an alternative to liquidating your SPDA, you can borrow funds at an annual interest rate of 11%, tax deductible, for fifteen years. Your current tax rate is 28%, and you expect it to remain at that level. How much better or worse off will you be at age 59.5 if you invade your SPDA today (and incur the 10% excise tax) to reduce the size of the required mortgage.
- D. How does your answer to (C) change if the interest expense incurred on the debt used to finance the expenditure is not tax-deductible (for example, you purchased a flashy new BMW)?

3. An investor with a tax rate on ordinary income (and deductions) of 40% and a tax rate on capital gain income (ignore long/short) of 20% has an after-tax discount rate (for present value computation purposes) of 6%. The investor owns \$1,000,000 worth of Microsoft stock that she purchased two years ago for \$300,000. Assume that Microsoft pays no dividends. She would like to diversify her portfolio.

A. Assume she sells all the Microsoft stock today and reinvests the after-tax proceeds in a Growth Fund that she expects to increase in value by 20% each year. There is no taxable income from the Growth Fund until the investment is sold, and then any gain is a capital gain. Assume she keeps the Growth Fund investment for three years and then sells it at the end of the third year.

Required: What is the net present value of the investor's after-tax cash flows relating to this investment? Assume that any cash flows for taxes occur at the same time as the related pre-tax cash flows.

B. Suppose that selling short "against the box" is still allowed for federal income tax purposes. (The practice was disallowed as part of the Taxpayer Relief Act of 1997.) Assume that the investor borrows \$1,000,000 worth of Microsoft stock from her broker and sells it short today. (There is no tax on the short sale.) She then invests the proceeds from the short sale in a Growth Fund that she expects to increase in value by 20% each year. There is no taxable income from the Growth Fund until the investment is sold, and then any gain is a capital gain. Assume she keeps the Growth Fund investment for three years and then sells it at the end of the third year. Assume further that at the end of the three year period she sells her Microsoft stock (it is still worth \$1,000,000) and uses the proceeds to close out the short sale (i.e., she buys more Microsoft stock and gives it to her broker to replace the original stock she borrowed.)

Required: What is the net present value of the investor's after-tax cash flows relating to this investment? Assume that any cash flows for taxes occur at the same time as the related pre-tax cash flows.

C. If the cash flows in part **a** differ from those in part **b**, explain why. (Short answer—one or two sentences.)

D. Recompute part **b** assuming that during the term of the short sale the broker charges the investor a **tax-deductible** fee **each year** equal to 3% (i.e., 300 basis points) of \$1,000,000. Assume the fee is paid at the end of the year.