commerce undergraduate society

COMM 298

MIDTERM REVIEW SESSION

by: Josh Lax

Overview

I. Introduction

II. Summaries of the 4 lectures

III. Formula Sheet

IV. Sample Questions

V. Q&A

VI. Feedback Form

Introduction

- **Tutor**
  - Josh Lax
  - 3rd year Finance & Real Estate student
  - Grade in COMM 298 – 96%
- **Review Session**
  - Content:

    1. Course Materials
    2. Sample Questions
    3. Past Exams

  - Timeline:

    ~3 hours in total

    First part: lecture summaries, formulas
    5- minute break
    Second part: sample questions
    5-minute break: challenge question
    Third part: sample questions, Q&A, feedback form

Lecture Summaries

Intro to Finance

Why do people borrow? Why do people invest? – lack of capital or lack of projects.
Lender/creditor = person who invests, borrower/debtor = person who borrows
Debt ratings and covenants, seniority, callable debt, convertible debt
Common shares, dual shares, preferred shares, voting rights → Absolute Priority Rule of financing
Primary vs secondary Market → Money market vs capital market
Management *supposed* to maximize equity value, but don't always do so (agency problem)
Financial Management Decisions:

- Capital budgeting
  - What long-term investments or projects should the business take on?
- Capital structure
  - How should we pay for our assets? Should we use debt or equity?
- Working capital management
  - How do we manage the day-to-day finances of the firm?

Financial Intermediaries: Banks, investment banks, brokers, dealers
Financial Institutions: Mutual funds, hedge funds, private equity, venture capital

Time Value of Money

Simple vs. compounded interest
Future versus & Present Value of an investment
"r" as a return, discount rate, cost of capital etc.
Effective Annual Rate, APR [percent, periods]
CANADAS BANK ACT = require short term interest rates to be quoted as APR
CRIMINAL CODE = limits interest rates to 60% per year
Loans (payday, interest-only, pure discount, equal payments, equal principal, amortization table)
Converting from and to EAR, APR, Effective period rates
Annuities, Present and Future Value of them (Annuities Due)
Contract interest rate versus **Personal interest rate**

Bonds

Face/Par Value usually = $1,000
Coupon rate in terms of APR
Bond prices and market interest rates are inversely related.
Perpetual Bonds = Constant year end payments, never mature
Sensitivity analysis -> (New – old) / old
Bonds with different maturities have different sensitivities to rate changes (interest rate risk)
Calculating Coupon Payments using rate and payout frequency

YTM = the **one** discount rate to price bond, quoted in APR terms
YTM assumes: hold the bond until maturity, reinvest coupons at YTM.

YTM < CR	P > F	a **premium**
YTM = CR	P = F	**par**
YTM > CR	P < F	a **discount**

YTM as "solver" of finding the one "r" to price bond
Current Yield = Annual Coupon / Current Price, good to use if have to trial and error for YTM
Bond prices quoted as a percent of a $1,000 face value. If price = $1,045.90, it's quoted as 104.59
Quotes also provide coupon rate, maturity date, and YTM information.

Default (or credit) risk: risk that a bond issuer will be unable to make promised payments of coupons or principal. Investors expect to be compensated through a higher yield. (Risk **averse**)

Default premium: YTM on risky bond - YTM of risk-free bond w/ similar maturity and coupon.

Realized rate of return (ROR): the annual rate of return that an investor actually earned during the time period that they owned an asset. Find HPR, and then find EAR of it to end with ROR

Bond yields affected by: The real rate of interest, Premium for expected future inflation, Interest rate risk premium, Default risk premium, & Liquidity premium

The **term structure** is a plot of yields on risk-free gov.t bonds of different maturities. (yield curve)

Risk-free bond yields represent: The real rate of interest, Premium for expected future inflation, & An interest rate risk premium

Nominal returns: returns in dollar terms**, Real returns**: returns in terms of purchasing power.
- Investors should be concerned about the real investment rate of return, but **Money Illusion** exists

Inflation = % increase in price of goods, Investors **should** care about purchasing power not price

Discounting nominal cash flows by nominal % = discounting real cash flows by real interest rate!

Stocks

Residual cash flows of a firm = **earnings**, board and management decide how much of earnings to distribute to shareholders. Dividends are the portion of earnings paid to shareholders.
Shareholders elect a board of directors (1 share = 1 vote), whose job is to hire management.
Preferred shares pay a fixed periodic dividend (perpetuity), and have priority over common shares.

Common Stock price = present value of all expected future dividends -> D1/1+r + D2/(1+r)^2 …
If zero growth in dividends, then just perpetuity. If Dividends grow, P(0) = [D1 / (r – g)]

Expected rate of return, r, is a market rate, driven by alternative returns on similar-risk securities and is NOT determined by the expected dividends and growth of the firm.

The price of the stock, P0, varies and is related to expected dividends and growth prospects, given the market rate of return, r.
Cum-dividend stock price = ex dividend + not issued yet dividend

Discounting: $PV = FV(1+r)^{-n}$

Compounding: $FV = PV(1+r)^{n}$

Present Value of an n-payment annuity of \$A $= A\left[\frac{1-(1+r)^{-n}}{r}\right]$

Future Value of an n-payment annuity of \$A $= A\left[\frac{(1+r)^{n}-1}{r}\right]$

Present Value of a perpetuity of \$A = $\frac{A}{r}$

Converting APR to effective annual rate: $r_{annual} = \left[1+\frac{i}{m}\right]^{m} - 1$

Converting APR to effective periodic rate: $r_{periodic} = \left[1+\frac{i}{m}\right]^{\frac{m}{k}} - 1$

Effective rate with continuous compounding: $r_{periodic} = e^{in} - 1$

Bond valuation: $P = I\left[\frac{1-(1+r)^{-n}}{r}\right] + F(1+r)^{-n}$

Realized Rate of Return: $ROR = \left[\frac{(selling\ price + FVRC)}{purchase\ price}\right]^{\frac{1}{n}} - 1$

Fisher Equation: $1 + real\ rate = \frac{1 + nominal\ rate}{1 + inflation\ rate}$

Constant Dividend Growth: $P_0 = \frac{DIV_1}{r-g}$ and so $r = \frac{DIV_1}{P_0} + g$

Sample Questions

Question 1.

You take out a $5,000 loan which calls for **simple interest** of 5% per year. Repayment of principal and all accumulated interest is to be made at the end of year 5.

a) How much is your payment to settle the loan at the end of year 5?

*Total interest accrued = .05 * 5000 * 5 = $1250*
Payment = interest + principal → ***Payment = $6250***

b) How much would your payment be if instead the interest was compounded annually?

*Future Value = 5000 * (1+.05)^5 =* ***Payment = $6381.4***

Question 2.

Joe is going to attend a four-year university 10 years from today. The annual tuition will be $30,000 paid at the end of each year. Joe's parents want to make one deposit **today** into their savings account which will **exactly** pay for the four years of tuition in Joe's future. Their savings account generates an 8% EAR.

a) How much do Joe's parents need to have **10 years from now** in their account to pay for Joe's tuition, assuming they withdraw and pay the $30,000 tuition at the end of each of the 4 years of his degree?

PV(10) = 30,000 [(1 - (1+.08)^-4) / .08]* → ***PV(10) = $99,363.81***

b) What amount must Joe's parent deposit **today** to achieve that balance in 10 years?

99,363.81 = PV(1+.08)^10* → ***PV = $46,024.67***

c) If the savings account only generated a 6% annual return, by what **percent** would the amount Joe's parents need to deposit **today** increase?

PV(10) = 30,000 [(1 - (1+.06)^-4) / .06]* → *PV(10) = $103,953.17*

103,953.17 = PV(1+.06)^10* → *PV = $58,046.91*

(58,046.91 - 46,024.67) / $46,024.67 = ***increase by 26.12%***

Question 3.

Suppose in the future you want to buy a $1,000,000 house. Your down-payment will be 20%, and you will take on a 30-year equal payment mortgage for the remaining balance at a 4% APR, compounded semi-annually. Today, you deposit $100,000 in a savings account with a 10% EAR.

a) How long will it take for you to be able to make the down-payment?

*200,000 = 100,000 * (1+.1)^n → 2 =1.1^n → ln(2) = n*(ln(1.1))* → ***n = 7.27 years***
*** (note you can estimate with Rule of 72 as we are waiting for investment to double)

b) What will be your **monthly** mortgage payment for the following 30 years?

Effective Monthly Rate of bank financing → r = [(1 + .04/2) ^ 2/12] – 1 → r = .0033
*PV of annuity to solve for c → 800,000 = c * [(1 – (1+.0033)^-360) / .0033] →*
c = $3804.15

c) Assuming you pay off the house after the 30 years, and then immediately sell it for $1,200,000 what will be your Holding Period Return

holding period return → (1,200,000-1,000,000)/1,000,000 = ***20%***

Question 4.

Today is your birthday! As a gift, your parents have decided to offer you two different financial opportunities. If you choose gift A, your parents will give you a one-time sum of $100. If you choose gift B, your parents will give you $8 at the **beginning** of every year, **forever**. Assume that you would place your funds into a high-yield savings account that generates a 7.5% **APR** compounded **quarterly**.

a) Under these assumptions, which gift would you choose?

First find the EAR → EAR = [(1 + .075/4) ^ 4] – 1 → EAR = .0771
PV of Perpetuity = D / r BUT it is at beginning of year so must compound by one year
*PV of Perpetuity Due = (8 / .0771) * 1.0771 → PV Gift B = $111.76 →* ***Choose Gift B***

b) What APR (compounded quarterly) would make you indifferent in choosing a gift?

Find when PV of Perpetuity Due = $100
*8 / EAR * (1+ EAR) = 100 → 8 + 8*EAR = 100*EAR → 8 = 92*EAR → EAR = .0870*
*.0870 = [(1 + APR/4) ^ 4] – 1 → 1.087^.25 = 1 + APR/4 → … **APR = 8.43%***

5-Minute Break

Here's a challenge question to work on

Your time travel machine works! You go back to January 1st, 2000, 8 years before the housing market crash. You take out a mortgage on a $5 million office building downtown. Initially paying 15% down, you agree to a 35-year term, at 10% APR compounded semi-annually. You pay **equal monthly** payments at **the end** of each month.

a) On January 1st, 2008, a pension fund offers you $10 million for your office! Assuming you agree and pay off the remaining balance of your mortgage, what will be the **remaining amount** of proceeds from sale?

Find Effective Monthly Interest Rate → [(1 + .1/2) ^ 2/12] – 1 → r = .008164846
Find monthly payments → 4,250,000 = c[(1 - (1.0082)^-420) / .0082] c = $35,879.83*
Outstanding Loan at sale → 35,879.83[(1 - (1.0082^-324)) / .0082] = $4,079,159.78*
Proceeds remaining after sale → 10,000,000 – 4,079,159.78 ***= $5,920,840.22***

More Sample Questions

Question 5.

The government of Canada decides to issue zero-coupon bonds with a 5-year maturity with a face value of $1,000. Currently the YTM is 4%.

a) How much would it cost to buy this bond today?

Simply 1000 / (1.04)^5 → ***Price today = $821.93***

Question 6.

The government of Canada again issues bonds with a face value of $1,000, but this time with a 8% **annual** coupon, one-year maturity, and YTM of 6%.

a) What is the price of this bond today?

Price = (FV + Coupon)/(1+YTM) → *1080/1.06 =* → ***Price = $1,018.87***
****(CR>YTM, so price is at a premium)*

Question 7.

A risk-free bond is issued with $1,000 face value, 10-year maturity, 4% **annual** coupon, 6% YTM

a) What is the current price of the bond?

PV = 40[(1 – (1.06)^-10) / .06] + 1000/(1.06)^10* → ***Price = $852.80***

b) Assume you buy and hold the bond for the full 10 years, and invested the coupons in an account which earned 5% APR compounded **quarterly**. What would be your Realized Rate of Return for the 10-year hold?

Start with finding EAR of savings account → *= [1 + .05/4] ^4 = .0509*
Future value of reinvested coupons → *40*[((1.0509)^10) -1) / .0509]) = $505.34*
ROR = [((1000 + 505.34)/852.80) ^ (1/10)] – 1 → ***ROR = 5.847%***

c) What is the bond's price today if the coupons are paid **semi-annually**?

Recall YTM is quoted in APR terms. If coupons aren't annual, discount rate = YTM/k
PV = 20[(1 – (1.03)^-20) / .03] + 1000/(1.03)^20* → ***Price = $851.22***

Question 8.

Instead of issuing more equity, Tesla decides to issue a one-year, zero-coupon bonds at $940. At the same time, the Government of Canada issues a one-year zero-coupon bond at $960.

a) What are the YTM of these two bonds?

940 = 1000/(1+YTM) → ***6.38%*** *&* *960 = 1000/(1+YTM)* → ***4.17%***

b) What is the Default Premium in this case?

Recall Default Premium = YTM of risky – YTM of risk free → ***2.21%***

Question 9.

ABC announces today that they will issue a fixed annual dividend of $1.75 forever starting one year from now. The stock now trades at $10 / share.

a) What are ABC investors required rate of return?

10 = 1.75 / r → ***r = 17.5%***

b) Assuming the same required rate of return in a), what would the share price today be if the annual dividend grew by 5% each year?

Price = 1.75 / (.175 - .05) → ***Price = $14***

c) Assuming the dividend grows like in part b), and you buy a share today, how much will you sell it for in 5 years?

*Price today =$14, Price in 5 years = [1.75* ((1.05)^5)*] / .175-.05 → P(5) = **$17.87**
***(Notice how the share price grew at the same rate as the dividend)*

Question 10.

You bought XYZ stock on January 1st, 2018 for $100. On December 31st, 2018, XYZ issued a dividend of $10 per share. On December 31st, 2019, XYZ issued a dividend of $12 per share. On January 1st, 2020, XYZ announces that their dividends will now grow by a fixed rate of 3%.

a) If investors require a 10% rate of return, what is the new share price on Jan 1st, 2020?

Price(2020) = Dividend at end of 2020 / r – g → *12.36 / (.1-.03)* → ***Price(2020) = $176.57***

b) Annual inflation = 3%, what was your **Real** annual rate of return? (excluding dividends)

First find annual return → *(1+r)^2 = (176.57/100)* → *r = .3288*
1 + real = (1.3288) / (1.03) → ***Real annual rate = 29%***

Q&A

Please fill out the survey on the FB page!