Cheatsheet - Finance - ADM2350

www.examreviews.ca

CHAPTER 4 - TIME VALUE OF MONEY PART 1

Single Payment - Principle Only, One Lump Sum

Ask Yourself - Are you asked to calculate the value NOW or at some Point in the FUTURE?

1) NOW - Use PV Formula

$PV = \frac{FV}{(1+r)^n}$ PV Factor = $\frac{1}{(1+r)^n}$

Calculator:
|FV| = Enter this as a negative
|N| = Enter number of years (n)
|I/Y| = Enter interest rate (r) as a percentage not a decimal
|CPT| -> |PV|

2) At some point in the FUTURE:

$FV = PV*(1+r)^n$

FV Factor = $(1+r)^n$

Calculator:
|PV| = Enter this as a negative
|N| = Enter number of years (n)
|I/Y| = Enter interest (r) rate as a percentage not a decimal
|CPT| -> |FV|

OTHER FORMULAS:

$n = \frac{\ln(FV/PV)}{\ln(1+r)}$

$r = (FV/PV)^{(1/n)} - 1$

$FV = PV*[1+ (APR/m)]^{(m*n)}$

VARIABLES:
FV = FVN = Future Value
PV = Present Value
r = Interest Rate
INT = $ of interest = PV*r
n = t = # of years/periods
m = # of compounding periods per year
f = # of payments per year
ln = "LN" function on calculator
R = Real Rate
h = Inflation rate

SIMPLE INTEREST - **Interest paid only on the priciple** (not on interest)

$PV = \frac{FV}{(1+n*r)}$ $FV = PV + (n)*(PV)*(r)$

Inom = APR = Quoted Rate = compound period rate * # of periods per year
EFF% = EAR = Effective Annual Rate = $I = r = [1+(APR/m)]^m - 1$
Iper = EPR = Effective period Rate = $r = [1 + (APR/m)]^{(m/f)} - 1$ or $EPR = [1 + EAR]^{(1/f)} - 1$
EAR (Continuous Compounding) = $e^{APR} - 1$

FISHER EFFECT:
Takes into account inflation
Exact: $(1 + R) = (1+I_{nom})*(1+h)$
Approximation: $R = r + h$

CHAPTER 6 - INTEREST RATES AND BONDS

BOND PRICE = PV of Stream of Payments + PV of Face value

$P = C\left[\frac{1 - \frac{1}{(1+r_d)^n}}{r_d}\right] + \frac{F}{(1+r_d)^n}$

Calculator:
|FV| = F = Face value of bond (default = 1000)
|N| = Enter # of years (n)
|I/Y| = Interest rate (r_d) as a %
|PMT| = C = Payment each (n)
|CPT| -> |PV|

OTHER BONDS:
Zero Coupon Bonds - No coupons are paid
Bond Price = $P = \frac{F}{(1+r_d)^n}$
Perpetual Bond - Coupons continue forever
Bond Price = $P = C/r_d$

NOTES:
1) If coupon rate = YTM, P=F
Bond is selling at par
2) If coupon rate >YTM, P>F
Bond is selling at a premium
3) If coupon rate < YTM, P<F
Bond is selling at a discount

Current Yield = C / P
Capital Gains Yield = r_d - Current Yield = $(P_1 - P_0)/P_0$

COUPON FREQUENCY:
Annual Coupons:
n = t = # of years to maturity
r_d = YTM given
C = PMT = F*coupon rate

Semi- Annual Coupons:
n = t = # years*2
r_d = YTM / 2
C = PMT = (F*coupon rate)/2

*When solving for YTM with semi annual coupons, you must multiply your answer from above by 2. (This applies to answer given by calculator as well)

VARIABLES:
P = Price of Bond (PV)
C = Coupon per period
r_d = market rate (YTM) or real rate
n = t = # of periods
F = Face value, normally $1000
YTC = Yield to Call
C_p = Call price at time (t)

OTHER FORMULAS:

$YTM = r_d = \frac{C + \left[\frac{F - P}{N}\right]}{\frac{F + P}{2}}$ $YTC = r_d = \frac{C + \left[\frac{C_p - P}{N}\right]}{\frac{P + C_p}{2}}$

-> If YTM>YTC: Bond will be called
-> If YTM<TYC: Bond wont be called

CHAPTER 7 - RISK, RETURN, SML

Expected Return (**asset**)
$= E(R) = \hat{r} = SUM(p_i*r_i)$

Variance = $SUM[\ p_i*(r_i - \hat{r})^2\ ]$
Standard Deviation = SQRT(variance)

Total Risk = Systematic risk + Unsystematic Risk
Beta and SD are measures of risk
-Beta measures systematic risk,
-SD measures total risk
If B=1, asset has same risk as market
If B>1, asset has more risk than market

Portfolio B = $SUM(p_i*B_i) = SUM(w_i*B_i)$

Expected Return (**portfolio**) = r_p
$= w_x*E(x) + w_y*E(y)$

Variance = $\sigma^2 = [w_x\sigma_x]^2 + [w_y\sigma_y]^2 + 2*(w_x\sigma_x)*(w_y\sigma_y)*COR(x,y)$
Standard Deviation = $\sigma = SQRT(\sigma^2)$

Risk-Reward Ratio = $(r_i - r_f)/(\sigma - 0)$

Security Market Line:
$RP_M = r_M - r_f$ = risk premium
$r_i = r_f + B_i*[r_M - r_f] = r_f + B_i*RP_M$
where $B_i = COR(i,M)*SD_i/SD_M$

CHAPTER 4 - TIME VALUE OF MONEY PART 2

Multiple Payments - Payments made each Period - Annuities and Perpetuities

Ask Yourself - Are you asked to calculate the value NOW or at some Point in the FUTURE?

NOW

Are Payments made at the beginning or end of each period?

BEGINNING

Option #1 - Annuity Due
Even Cash flows each (n)

$PV = C\left[\frac{1 - \frac{1}{(1+r)^n}}{r}\right] * (1+r)$

Calculator:
|FV| = 0
|N| = Enter # of years (n)
|I/Y| = Interest rate (r) as a %
|PMT| = Cashflow (C) each (n) (enter as a negative #)
|CPT| -> |PV|

Option #2 - Perpetuity Due
-Even Cashflows forever

$PV = (C/r) * (1+r)$

Calculator:
|FV| = 0
|N| = Enter 100,000,000
|I/Y| = Interest rate (r) as a %
|PMT| = Cashflow (C) each (n) (enter as a negative #)
|CPT| -> |PV|

Option #3 - Uneven
Cash Flows each (n)

$PV = C_0 + \frac{C_1}{(1+r)^1} + ... + \frac{C_n}{(1+r)^n}$

Calculator:
Push |CF| button
|CFo| = C_0 |C01| = C_1 |F01| = 1
|C02| = C_2 |F02| = 1 .....
(Enter all your cash flows)
Push |NPV| button
|I| = interest rate (r) as a %
Down arrow, then |CPT|

VERY IMPORTANT - Your Calculator must be in BGN mode. Push |2nd| |BGN| then |2nd| |SET| then |2nd| |Quit|

END

Option #1 - Annuity
Even Cash flows each (n)

$PV = C\left[\frac{1 - \frac{1}{(1+r)^n}}{r}\right]$

Calculator:
See

Option #2 - Perpetuity
-Even Cashflows forever

$PV = (C/r)$

Calculator:
See

Option #3 - Uneven
Cash Flows each (n)

$PV = \frac{C_1}{(1+r)^1} + ... + \frac{C_n}{(1+r)^n}$

Calculator:
Push |CF| button
|CFo| = 0
|C01| = C_1 |F01| = 1
|C02| = C_2 |F02| = 1 .....
(Enter all your cash flows)
Push |NPV| button
|I| = interest rate (r) as a %
Down arrow, then |CPT|

FUTURE

Are Payments made at the beginning or end of each period?

BEGINNING

Option #1 - Annuity Due
Even Cash flows each (n).

$FV = C\left[\frac{[(1+r)^n - 1]}{r}\right] * (1+r)$

Calculator:
|PV| = 0
|N| = Enter # of years (n)
|I/Y| = Interest rate (r) as a %
|PMT| = Payment each (n) (enter as a negative #)
|CPT| -> |FV|

Option #2 - Uneven
Cash Flows each (n)

$FV = C_1*(1+r)^n + C_2*(1+r)^{n-1} +...+C_n(1+r)$

VERY IMPORTANT - Your Calculator must be in BGN mode. Push |2nd| |BGN| then |2nd| |SET| then |2nd| |Quit|

OTHER FORMULAS:

$n = \frac{\ln[\ C / (C - r*PV)\ ]}{\ln[1+r]}$

OR

$n = \frac{\ln[\ (C + r*FV) / C\ ]}{\ln[1+r]}$

*To solve for (r) you must use trial and error or the financial calculator

Calculator:
|PV| = Enter as a postive #
|FV| = Enter as a negative #
|CPT| -> |I/Y|
|N| = Enter # of periods (n)
|PMT| = Payment each (n) (enter as a negative #)

END

Option #1 - Annuity
Even Cash flows each (n).

$FV = C\left[\frac{[(1+r)^n - 1]}{r}\right]$

Calculator:
|PV| = 0
|N| = Enter # of years (n)
|I/Y| = Interest rate (r) as a %
|PMT| = Payment each (n) (enter as a negative #)
|CPT| -> |FV|

Option #2 - Uneven
Cash Flows each (n)

$FV = C_1*(1+r)^n + C_2*(1+r)^{n-1} +...+C_n$

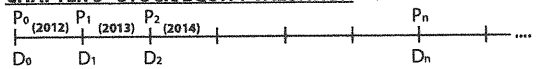
VARIABLES:
PV = Present value of cash flows
n=t = # of time periods
r = interest rate or required return
C = PMT = cashflow per period
FV = Future value
ln [] = the LN function on calculator
g = growth rate

PV of a Growing Perpetuity
$PV = C / (r-g)$

PV of a Growing Annuity
$PV = \frac{C}{(r-g)} * \left[1 - \left[\frac{(1+g)}{(1+r)}\right]^n\right]$

VARIABLES:
E(R) = r_p = Expected/Portfolio Return
pi = probability of outcome
B = Beta
$r_i = \hat{r}$ = Return on Asset
r_f = Risk free rate (T-bills, gov bonds)
SD_i = Standard deviation of portfolio
SD_M = Standard deviation of market
r_M = Market Return
COR = Correlation
w_i = weight of asset in portfolio

CHAPTER 8 - STOCK/EQUITY VALUATION (DRAW A TIMELINE)



DIVIDEND DISCOUNT MODEL:
Determining the value of a stock is very similar to calculating the PV of an annuity. Think of the dividends as the cashflows each period.

1) No Growth in Dividends, Constant dividend forever:
$P_0 = D/r$ Calculator: |N| = 1000000, |I/Y| = r, |FV| = 0, |PMT| = D, |CPT| |PV|

2) Constant Growth in Dividends (Gordon's):
$P_n = \frac{D_n*(1+g)}{(r-g)}$ (Horizon Value) $r = (D_1/P_0)+ g$ $D_n = D_0*(1+g)^n$ Calculator: |N| = 1000000, |I/Y| = (r-g), |FV| = 0, |PMT| = $D_n*(1+g)$, |CPT| |PV|

3) Uneven Dividends or Abnormal Growth followed by constant growth:
$P_0 = \frac{D_1}{(1+r)^1} + ... + \frac{P_n + D_n}{(1+r)^n}$ Calculator: Push |CF| button |CFo| = 0, |C01| = D_1 ,|F01| = 1.... |C0n| = ($P_n + D_n$), |F0n| = 1 (Enter all cash flows), Push |NPV| button, |I| = interest rate (r) as a %, Down arrow, then |CPT|

VARIABLES:
P_0 = Price of Stock today
P_n = Price of Stock at time (n)
D_n = Dividend at time (n)
r = Required Rate of Return
n = t = # of periods
g = Growth rate
$P_{PS} = V_{PS}$ =Price of preferred shares
D_{PS} = Annual dividend preferred
r_{PS} = Rate of Return prefereed

g = Capital Gains Yield = $\frac{P_1 - P_0}{P_0}$

Dividend Yield = D_1 / P_0
Total Return = r =
Capital Gains Yield +
Dividend Yield
r = holding period return
$= \frac{P_1 - P_0 + D_1}{P_0}$

$P_{PS} = D_{PS}/r_{PS}$

CHAPTER 9 - COST OF CAPITAL

Weighted Average Cost of Capital -> Indication of how the market views the risk of a firms assets, helps a firm determine their required return for capital budgeting

WACC = $(D/V)*r_d*(1-T) + (P/V)*r_p + (E/V)*r_e = (w_d)*r_d*(1-T) + (w_p)*r_p + (w_e)*r_e$

D = Market Value of Debt = # of Bonds outstanding*Current MARKET Price of the Bond
P = Market value of preferred shares = # of preferred shares issued* MARKET Price per share
E = Market value of Equity = # of common shares issued* MARKET Price per share
V = Value of the Firm = D + P + E
r_d = Cost of debt, to calculate this you must find the YTM on the bonds that the firm has issued. Use bond pricing formula in chapter 6. (ignore flotation costs)
r_p = Cost of preferred = D_p/P_p, where D_p = annual dividend and P_p = the price of preferred share today.
Cost of preferred (with flotation costs) = $D_p/\{P_p * (1- F)\}$, where F = flotation cost
r_e = Cost of equity, 3 options: 1) Use Gordons growth model = $r_e = (D_1/P_0)+ g$
Gordons growth model (with flotation) = $r_e = D_1/[P_0*(1-F)] + g$ -> F = flotation
2) Use SML = $r_e = r_f + B_A*[r_M-r_f]$
3) Use Bond Yield plus premium = $r_e = r_d$ + Bond risk premium
If you have all the info to calculate all options, take the average of the three r_e from formulas above.
T = Tax Rate

Converting D/E Ratio to (D/V) and (E/V):
(D/V) = Weight of Debt = w_d = (D/E Ratio) / (1 + D/E Ratio)
(E/V) = Weight of Equity = w_e = 1 / (1 + D/E Ratio)

OTHER FORMULAS
g = growth = Retention Ratio * ROE
Retention Ratio = 1 - Payout Ratio

CHAPTER 10 - NPV, IRR, PAYBACK PERIOD, PROFITABILITY INDEX

NPV - Net Present Value
1) Equal Cash flows forever:
NPV = (CF/r) - I
Calculator:
Push |CF| button |CFo| = -I
|C01| = CF |F01| = 1000000
Push |NPV| button
|I| = interest rate (r) as a %
Down arrow, then |CPT|

2) Equal Cash flows until (n)
$NPV = CF\left[\frac{1 - \frac{1}{(1+r)^n}}{r}\right] - I$
Calculator:
Push |CF| button |CFo| = -I
|C01| = CF |F01| = n
Push |NPV| button
|I| = interest rate (r) as a %
Down arrow, then |CPT|

3) Unequal Cash flows until (n)
$NPV = \frac{CF_1}{(1+r)^1} + ... + \frac{CF_n}{(1+r)^n} - I$
Calculator:
Push |CF| button |CFo| = -I
|C01| = CF_1 |F01| = 1
|C02| = CF_2 |F02| = 1 .....
(Enter all your cash flows)
Push |NPV| button
|I| = interest rate (r) as a %
Down arrow, then |CPT|

VARIABLES:
CF = Cash Flow
r = required rate of return
n = # of time periods
I = initial investment

IRR - Internal Rate of Return
IRR is the rate "r" that will make NPV = 0. You can do this by trial and error, but it is much easier to use the calculator:

Calculator:
Push |CF| button |CFo| = -I
|C01| = CF_1 |F01| = 1
|C02| = CF_2 |F02| = 1 .....
(Enter all your cash flows)
Push |IRR| then |CPT|

For irregular cash flows there can be multiple IRR's.

PI - Profitability Index
$PI = \frac{NPV + |I|}{|I|}$

PAYBACK PERIOD (PP)
Determine number of periods it takes to return your initial investment. Example:
I = 500, CF each period =200

t	Beg	CF	End
1	-500	200	-300
2	-300	200	-100
3	-100	200	100

PP= 2+(100/200) = 2.5 years

DISCOUNTED PAYBACK PERIOD (DPP)

Same as above except you must first calculate the PV of each cash flow:
PV of CF = $\frac{CF_n}{(1+r)^n}$

EAA - Equivalent Annual Annuity
Use when comparing mutually exclusive projects of differing lengths that repeat forever.
$EAA = \frac{NPV}{\left[\frac{1 - \frac{1}{(1+r)^n}}{r}\right]}$

DECISION CRITERIA
(Non Repeating Projects)
NPV - Proceed with a project when NPV>0
IRR - Proceed with a project if IRR > r (WACC)
PI - Proceed with project if PI >1
PP - Proceed with project if PP is lower than project time limit
DPP - Proceed with project if DPP is lower than required DPP
(Non Repeating Projects - Mutually Exclusive)
Choose project with the highest NPV (NPV>0), Highest IRR (IRR>WACC), Lowest PP, Lowest DPP, Highest PI (PI>1). **NPV is the BEST criteria.**
(Repeating Projects)
EAA -> proceed if EAA>0
(Repeating Project - Mutually Exclusive)
Choose project with highest EAA (EAA>0)

CHAPTER 11 - CAPITAL INVESTMENT, CCA

You will proceed with the project/investment if NPV > 0 NPV = (1) + (2) + (3) +(4) - (5) (see below)

(1) PV of After Tax Net Revenue: 1) Even net revenue each year: $(R - C)(1-T)\left[\frac{1 - \frac{1}{(1+r)^n}}{r}\right]$
Calculator:
|FV| = 0, |N| = Enter # of periods (n)
|I/Y| = Interest rate (r) as a %
|PMT| = (R-C)*(1-T), |CPT| -> |PV|

Uneven net revenue each year: $\left[\frac{(R_1-C_1)}{(1+r)^1} + ... + \frac{(R_n-C_n)}{(1+r)^n}\right] * (1-T)$

Calculator:
Push |CF| button |CFo| = 0, |C01| = (R_1-C_1),|F01| = 1, |C02| = (R_2-C_2) |F02| = 1 ... |CFn| = (R_n-C_n), |F0n| = 1 (Enter all your cash flows),
Push |NPV| button, |I| = interest rate (r) as a %, Down arrow, then |CPT| **Multiply answer by (1-T)

(2) PV of CCA Tax Shield: 2 Parts: PV Tax Shield from Asset - PV Tax Shield after Salage
$= \left[\frac{I*d*T}{d+r}\right] * \left[\frac{1+0.5r}{1+r}\right] - \left[\frac{S*d*T}{d+r}\right] * \left[\frac{1}{(1+r)^n}\right]$

PV_n tax Shield after Salvage: $\frac{(UCC_n - S_n)*d*T}{d+r}$
(Only used for cashflow method)

(3) PV of Salvage: $\frac{S}{(1+r)^n}$ Calculator: |FV| = S |N| = n, |I/Y| = r, |CPT| -> |PV|

(4) PV change NWC: 1) $\frac{\text{Change NWC}}{(1+r)^n}$ Calculator: |FV| = Change NWC |N| = n, |I/Y| = r, |CPT| -> |PV|
(2 Options)
2) $\frac{NWC_1}{(1+r)^1} + ... + \frac{NWC_n}{(1+r)^n}$ Calculator: Push |CF| button, |CFo| = 0, |C01| = NWC_1, |F01| = 1, (Enter all your cash flows) Push |NPV| button, |I| = interest rate (r) as a % Down arrow, then |CPT|

(5) Initial Investment = Cost of equipment
+ Other costs (installation, shipping)
+ Opportunity Cost (use of land)
- MV of old equipment sold + NWC at n =0

VARIABLES:
R = Revenue
C = Cost
T = Tax rate
r = cost of capital
n = # of periods
NWC = net working capital
d = CCA Rate
S = salvage value
UCC = unused CCA
CCA = Capital cost allowance
I = Initial Investment
D = depretiation

OTHER FORMULAS
Depretiation Tax Shield = D*T
Straight Line Depretiation = (Initial cost - salvage) / # years