Midterm 1

EQUITY VALUATION

Preferred Shares (PS)

$$\boxed{P = \frac{D}{k} \Longleftrightarrow k = \frac{D}{P}}$$

DDM model over n periods — CS

$$\boxed{P_0 = \frac{D_1}{(1+k_c)^1} + \frac{D_2}{(1+k_c)^2} + \dots + \frac{D_n + P_n}{(1+k_c)^n}}$$

DDM with constant growth

$$P_0 = \frac{D_0(1+g)}{(1+k_c)} + \frac{D_0(1+g)^2}{(1+k_c)^2} + \dots + \frac{D_0(1+g)^\infty}{(1+k_c)^\infty}$$

$$= \frac{D_0(1+g)}{k_c - g} = \boxed{\frac{D_1}{k_c - g}} \Longleftrightarrow k_c = \frac{D_1}{P_0} + g$$

DDM with no growth

$$\boxed{P_0 = \frac{EPS_1}{k_c} + PVGO \text{ (if any)}}$$

$\boxed{g = b \times ROE}$, b = retention ratio = plowback = 1 − payout ratio

$ROE = NPM \times TR \times LR$

DuPont MODEL $\Rightarrow \frac{NI}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Equity}$

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approx: $RF = \text{Real rate} + \pi^e$

exact: $RF = (1 + \text{Real rate})(1 + \pi^e) - 1$

$$\boxed{CY = \frac{C}{P_0}}$$

Effective Period Rate

$$\boxed{k = \left(1 + \frac{QR}{m}\right)^{\frac{m}{f}} - 1}$$

Present Values

$$PV_0 = \frac{FV_n}{(1+k)^n}$$

PVIFA

$$PVA_0 = \frac{PMT}{k}\left[1 - \frac{1}{(1+k)^n}\right]$$

$$PVP_0 = \frac{PMT}{k}$$

$$PVGA_0 = \frac{PMT_1}{k-g}\left[1 - \left(\frac{1+g}{1+k}\right)^n\right]$$

$$PVGP_0 = \frac{PMT_1}{k-g}$$

$$\boxed{k = e^{QR} - 1}$$

$$\boxed{n = \frac{\ln(FV_n / PV_0)}{\ln(1+k)}}$$

Future Values

$FV_n = PV_0(1+k)^n$ — FVIFA

$$FVA_n = PMT\left[\frac{(1+k)^n - 1}{k}\right]$$

$$P_{T\text{-Bill}} = \frac{F}{1 + \left(k \cdot \frac{n}{365}\right)} \quad (n = \text{days})$$

$$k = \frac{F - P}{P}\left(\frac{365}{n}\right)$$

Zero Coupon Bond

$$\boxed{P_{ZCB} = \frac{F}{(1+k)^n} \Longleftrightarrow YTM = k = \left[\frac{F}{P}\right]^{\frac{1}{n}} - 1}$$

CCA

Beg UCC | CCA | End UCC | CCATS

recapture $\Rightarrow$ SP > BV

terminal loss $\Rightarrow$ SP < BV

Amortization

Mortgage — Bond

Period | BB | PMT | Int | PR | EB

Required Rate of Return = Dividend Yield + Capital Gain

(k = D/P + g)

BOND VALUATION

$$P_{Bond} = \frac{C}{(1+k)} + \frac{C}{(1+k)^2} + \dots + \frac{C}{(1+k)^n} + \frac{F}{(1+k)^n}$$

$$P_B = \frac{C}{k_b}\left[1 - \frac{1}{(1+k)^n}\right] + \frac{F}{(1+k)^n}$$

Bond with a call premium

$$P_{CB} = \frac{C}{k}\left[1 - \frac{1}{(1+k)^c}\right] + \frac{CP}{(1+k)^c}$$

CP ← Call Premium; c = time until call

$$HPR = \frac{CI - CO}{CO}$$

CI = coupons + FV; CO = PV

$K = RF + RP$

Midterm 2

CAPITAL BUDGETING

$$CF_0 = C_0 + \Delta NWC + OC$$

$$CF_t = CFBT(1-T) + \underbrace{CCA_t(T)}_{\text{TAX SHIELD}}$$

$$NPV = \overbrace{\left[PV(OCF) + PV(CCATS) + PV(ECF) \right]}^{\text{CASH INFLOWS}} - \overbrace{\left[CF_0 \right]}^{\text{CASH OUTFLOWS}}$$

$$NPV = CFBT(1-T)\underbrace{\left[\frac{1-\frac{1}{(1+k)^n}}{k}\right]}_{\text{PVIFA}} + \frac{C_0(d)(T)}{d+k}\left[\frac{1+0.5k}{1+k}\right] - \frac{SV_n(d)(T)}{d+k}\left[\frac{1}{(1+k)^n}\right] + \left[SV + \Delta NWC_n - \underbrace{(0.5)T(SV_n - C_0)}_{\text{capital gain/ capital loss}} - \underbrace{T(SV_n - UCC_n)}_{\text{CCA recapture/ terminal loss}}\right]\left[\frac{1}{(1+k)^n}\right]$$

$$-\left(C_0 + \Delta NWC_0 + OC\right)$$

d = applicable CCA Rate

For Replacement Decisions — Sensitivity Analysis

ΔC_0 ΔSV_n $-\Delta CF_0$

Midterm 2

Comm 308 : Midterm II

Cash Flow Estimation & Capital Budgeting

Payback: Find T such that: $CF_1 + CF_2 + \dots + CF_T = CF_0$

Discounted Payback: Find T such that: $\frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_T}{(1+k)^T} = CF_0$

} Time Period

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} - CF_0$$

⊕ Accept
⊖ Reject

Initial Cash Outlay

$$CF_0 = C_0 + \Delta NWC + OC$$

$$PI = \frac{PV(\text{Cash inflows})}{PV(\text{Cash outflows})}$$

Simple → Annual After Tax CFs: $CFBT(1-T) + CCA_t(T)$

$$EANPV = \frac{\text{Project NPV}}{\underbrace{\left[\frac{1-\frac{1}{(1+k)^n}}{k}\right]}_{PVIFA}}$$

$$NPV = PV(OCF) + PV(CCATS) + PV(ECF) - CF_0$$

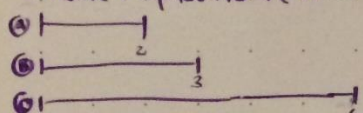
$$PV(OCF) = CFBT(1-T)(PVIFA)$$

$$PV(CCATS) = \left[\frac{(C_0)(d)(T)}{d+k} \cdot \frac{1+0.5k}{1+k}\right] - \left[\frac{(SV_n)(d)(T)}{d+k} \cdot \frac{1}{(1+k)^n}\right]$$

Replacement Decisions: $C_0 \rightarrow \Delta C_0$, $SV_n \rightarrow \Delta SV_n$

PV(Annual After-Tax Cash Flows) expanded

Chain Replication (Time Adjusted)



IRR: discount rate that makes NPV=0

Estimation: $\underbrace{\sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t}}_{\text{PV of future CF}} = \underbrace{CF_0}_{\text{Initial cash outlay}}$

$$PV(ECF) = \frac{SV_n + \Delta NWC}{(1+k)^n}$$

Replacement Decisions: $SV_n \rightarrow \Delta SV_n$

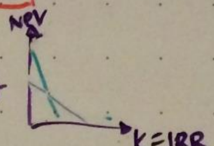
Discount rate for projects = WACC

Compare Projects:

	0	1	2	3	IRR	NPV
Proj 1						
Proj 2						
Increm.						

Crossover rate = rate at which $NPV_A = NPV_B$

or IRR of incremental project



Risk, Return, Portfolio Theory, Asset Pricing

Total return = Income Yield + Capital Gain

$$\frac{CF_t + P_1 - P_0}{P_0} = \frac{CF_t}{P_0} + \frac{P_1 - P_0}{P_0}$$

$$\text{Geometric mean} = \left[\prod_{i=1}^{n}(1+r_i)\right]^{\frac{1}{n}} - 1$$

$$ER = \sum_{i=1}^{n}(r_i \times Prob_i)$$

Ex post (past) $\sigma = \sqrt{\frac{\sum_{i=1}^{n}(r_i - \bar{r})^2}{n-1}}$

Ex ante (future) $= \sqrt{\sum_{i=1}^{n}(Prob_i)(r_i - ER)^2}$

$$ER_p = \sum_{i=1}^{n}(w_i \times ER_i)$$

⟹ Two Security Portfolio

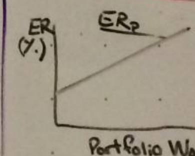
$$ER_p = ER_B + w(ER_A - ER_B)$$

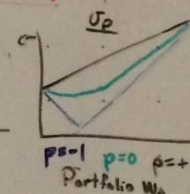
$$\sigma_p = \sqrt{(w_A)^2(\sigma_A)^2 + (w_B)^2(\sigma_B)^2 + 2(w_A)(w_B)(COV_{AB})}$$

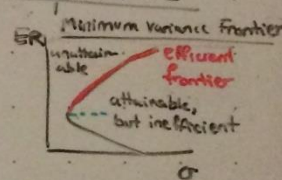
$$COV_{AB} = \sum_{i=1}^{n} Prob_i(r_{A,i} - \bar{r}_A)(r_{B,i} - \bar{r}_B) = \rho_{AB}\sigma_A\sigma_B$$

$$\rho_{AB} = \frac{COV_{AB}}{\sigma_A \cdot \sigma_B}$$

Two Security Portfolios







Total risk = systematic risk + Non-systematic risk

(market) ⇓ compensated → required rate of return

(unique) ⇓ can be diversified away ⟹ NOT compensated

Midterm 2

$$ER_p = W \cdot ER_A + (1-W)RF$$
$$= W \cdot ER_A + RF - W\,RF$$
$$\boxed{ER_p = RF + W(ER_A - RF)}$$
$$\boxed{W = \frac{(ER_p - RF)}{(ER_A - RF)}}$$

$$\boxed{\beta_i = \frac{COV_{i,M}}{\sigma_M^2} \quad \frac{\rho_{i,m} \cdot \sigma_i \cancel{\sigma_M}}{\sigma_M \cancel{\sigma_M}}}$$
$$\boxed{\beta_p = W_1\beta_1 + W_2\beta_2 + \dots W_n\beta_n}$$

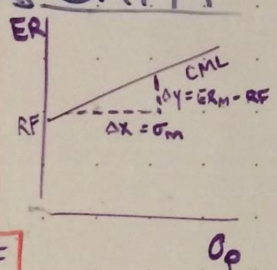
$$\sigma_p = \sqrt{W_A^2\sigma_A^2 + \cancel{W_{RF}^2}\,\underset{\downarrow\,0}{\sigma_{RF}^2} + \cancel{2W_AW_{RF}\cdot\rho_{A,RF}\,\sigma_A\,\sigma_{RF}}}$$

$$\boxed{\sigma_p = \sqrt{W_A^2\sigma_A^2}} \iff W_A = \frac{\sigma_p}{\sigma_A}, \quad \sigma_p < \sigma_A$$
given $\rho < +1$

Therefore, $\boxed{ER_p = RF + \left[\frac{ER_A - RF}{\sigma_A}\right]\sigma_p}$

Capital Market Line (CML) → CAPM

$$\boxed{ER_p = RF + \underbrace{\left[\frac{ER_M - RF}{\sigma_M}\right]}_{\text{Slope of CML}}\sigma_p}$$



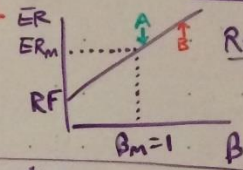
$$\boxed{\text{Sharpe Ratio} = \frac{ER_p - RF}{\sigma_p}}$$

- risk adjusted performance metric

When portfolio = market portfolio, Sharpe Ratio = Ex post slope of CML

Security Market Line

$$k_i = RF + \underbrace{(ER_M - RF)\beta_i}_{\text{Risk premium}}$$



A is undervalued
B is overvalued

$P = \frac{D}{k}$ [Fixed] $\quad \uparrow P = \frac{D}{k\downarrow} \quad \downarrow P = \frac{D}{k\uparrow}$

$$\boxed{\alpha_i = \underbrace{(R_i - RF)}_{\text{individual stock performance}} - \underbrace{\beta_i(R_m - RF)}_{\text{risk premium}}}$$

COST OF CAPITAL

Market Value Firm: $\boxed{V = D + P + S = \frac{ROI \cdot IC}{k_a}}$
(Total Enterprise Value = TEV)

$$\boxed{k_a = WACC = \frac{ROI \cdot IC}{V} = \frac{K_eS + k_d(1-T)D}{V} = k_e\left(\frac{S}{V}\right) + k_p\left(\frac{P}{V}\right) + k_i\left(\frac{D}{V}\right)}$$

Cost of Common Equity

$\boxed{S = P_0 \cdot n}$

$\boxed{P_0 = \frac{D_1}{k_e - g}} \iff \boxed{k_e = \frac{D_1}{P_0} + g}$

Cost of Preferred Equity

$\boxed{P = P_0 \cdot n}$

$\boxed{P_0 = \frac{D_p}{k_p}} \iff \boxed{k_p = \frac{D_p}{P_0}}$

Cost of Debt

$\boxed{D = B \cdot n}$

$$\boxed{B = \frac{I}{k_b}\left[1 - \frac{1}{(1+k_b)^n}\right] + \frac{F}{(1+k_b)^n}}$$

Net Proceeds: After Flotation Costs $(SP - f)$

$\boxed{k_{ne} = \frac{D_1}{NP} + g}$ $\boxed{k_{ne} = k_e \times \frac{P_0}{NP}}$ $\boxed{k_p = \frac{D_p}{NP}}$

$$\boxed{NP = \frac{I(1-T)}{k_i}\left[1 - \frac{1}{(1+k_i)^n}\right] + \frac{F}{(1+k_i)^n}}$$

$\boxed{\text{General: } \frac{\text{Investor's Req. Return}}{1-f}}$

$$\boxed{k_i = \frac{k_d(1-T)}{1-f_d}}$$

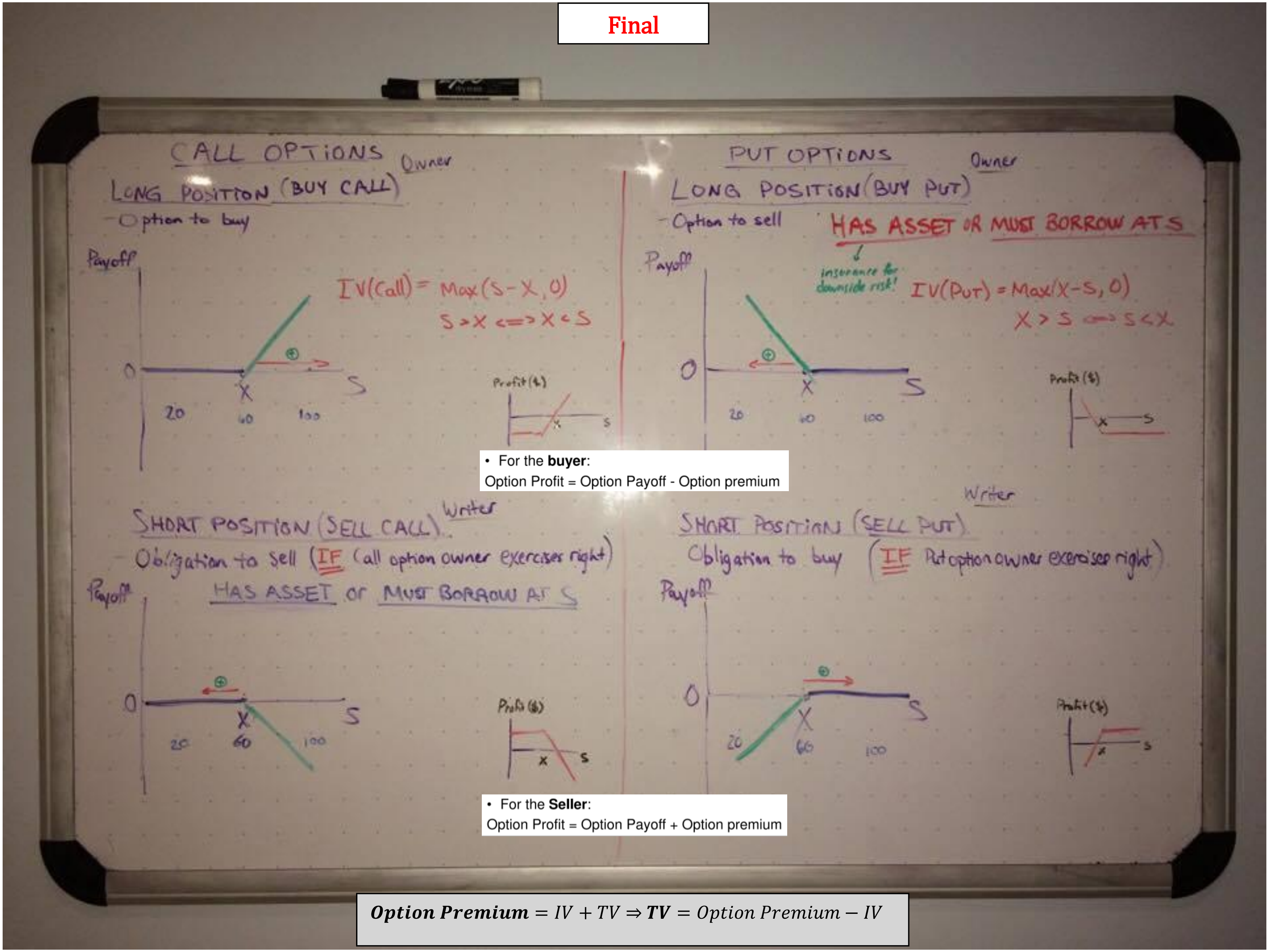
$$\boxed{k_e = \frac{D_1}{P_0} + g = \frac{\overbrace{EPS_1(1-b)}^{D_1}}{P_0} + \underbrace{(b \times ROE)}_{g}} \iff \boxed{P_0 = \frac{EPS_1(1-b)}{k_e - (b \times ROE)}}$$

OR

$$\boxed{k_e = RF + \underset{(ER_M - RF)(\beta_e)}{(MRP \times \beta_e)}}$$

$$\boxed{P_0 = \boxed{PVEO} + \boxed{PVGO} = \boxed{\frac{ROE_1 \times BVPS}{k_e}} + \frac{Inv}{1+k_e}\left[\frac{ROE_2 - k_e}{k_e}\right]}$$

Final



- For the **buyer**:

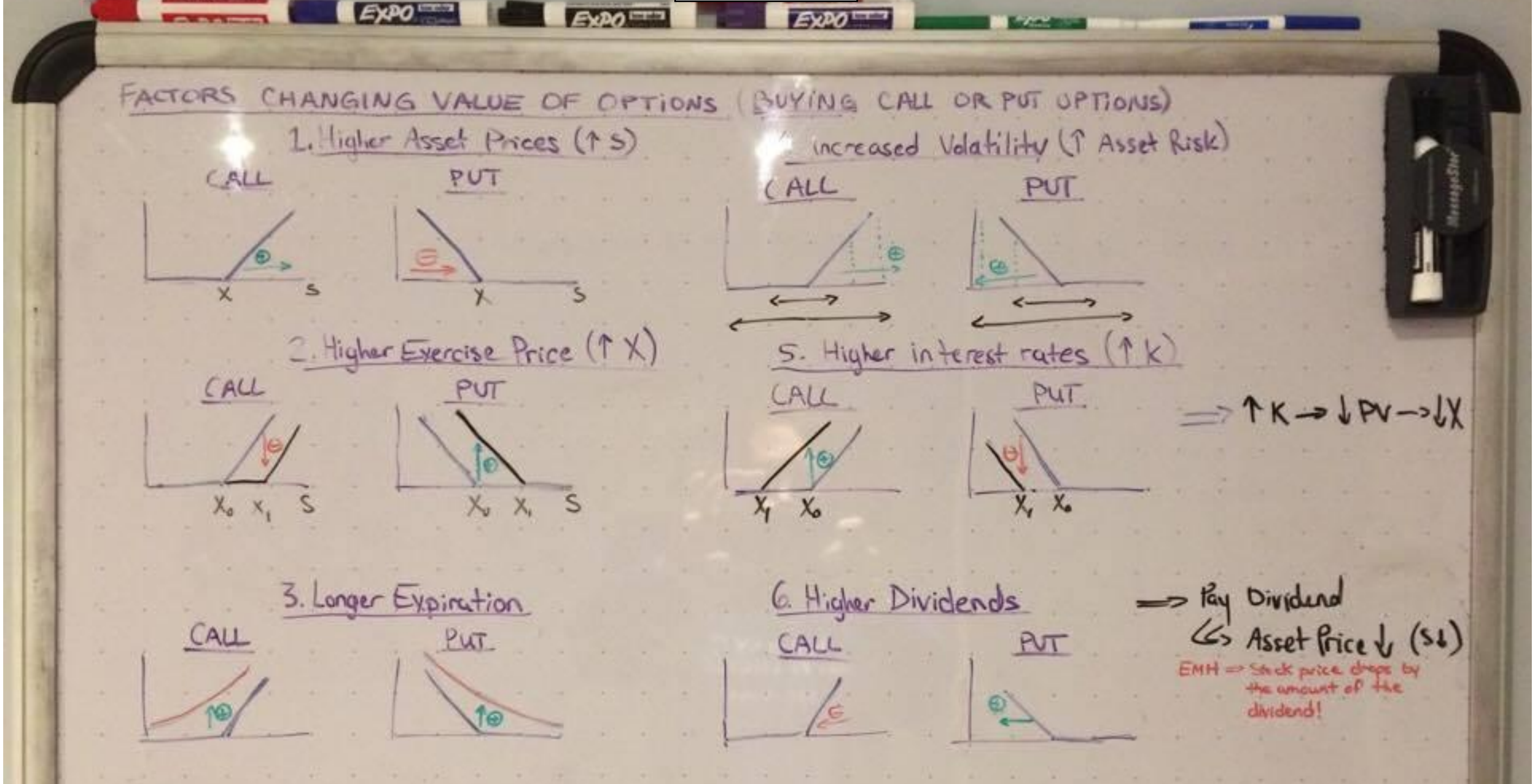
Option Profit = Option Payoff - Option premium

- For the **Seller**:

Option Profit = Option Payoff + Option premium

$$\boldsymbol{Option\ Premium} = IV + TV \Rightarrow \boldsymbol{TV} = Option\ Premium - IV$$

Final



	Call Prices	Put Prices
Higher asset price (S)	↑	↓
Higher exercise price (X)	↓	↑
Longer expiration	↑	↑
Increased volatility	↑	↑
Higher interest rates	↑	↓
Higher dividends	↓	↑