Class / Week #3: Valuation in M&A

Example of recapture of depreciation in asset purchase

Historical cost = $5m

Depreciated acq. cost = $1m

Sales price today = $10m

taxed at cap. gains { capital gain { $10m, $5m

taxed @ ordinary income corp. tax rate { depreciation { $1m

Merger Valuation

Mergers & Acquisitions Valuation

APV

$$\text{Max Price} = \underbrace{\sum_{i=1}^{\infty} \frac{CF_i}{(1+r)^i}}_{\text{Independent Firm Value}} + PV(\text{Synergy})$$

$$V_{Target} = V_{Target\ stand\text{-}alone} + Syn_{Fin} + Syn_{Rev.\ Enh.}$$

$$Syn_{Fin} = \sum_i \frac{CF_i}{(1+r_{Fin})^i}$$

$$Syn_{Rev.\ Enh.} = \sum_i \frac{CF_i^*}{(1+r_{rev.\ enh.})^i}$$

$$r_{Fin} \neq r_{rev.\ enh.}$$

Different synergies are evaluated separate (note the different discount rates)

Valuing Cost Savings & Asset Reduction

Cost Synergies (Ex. 11.3, Ch. 11 Bruner)

	Year		0	1	2	3	4	5
1	Pre-Tax Cost Savings, Constant US$			$ 50	$ 100	$ 100	$ 100	$ 100
2	Expected Inflation Rate			2%	2%	2%	2%	2%
3	Growth Rate FCF (nominal), perpetuity	2%						
4	Discount Rate	6%						
5	Ongoing Investment/Savings (year 3+)	5%						
6	Pre-Tax Cost Savings, Current US$ COST SAVINGS			$ 51	$ 104	$ 106	$ 108	$ 110
7	Tax Expense (@ .40)			(20)	(42)	(42)	(43)	(44)
8	After-Tax Cost Savings			31	62	64	65	66
9	**Less:** Investment to Realize Savings		$ (1,000)			(5)	(5)	(6)
10	**Plus:** Disinvestment Associated with the Savings			20	20	10	-	-
11	Subtotal ASSET REDUCTION		(1,000)	51	82	68	60	61
12	Continuation Value							1,548
13	FCF		$ (1,000)	$ 51	$ 82	$ 68	$ 60	$ 1,609
14	**NPV Cost Savings**		$428					
15	IRR Synergy Investment		15%					

Irregular CFs have multiple IRRs.

Irregular CF: Increase from year #0 to year #2; Decrease #2 to year #4; Increase in year #5

Can calculate with MIRR function = MIRR(CF, 0.06, 0.06) i.e. @ re-investment rate of 6%

Note: discount @ cost of debt

$PV_5 = 1{,}548 = \text{Continuation Value}_5$

$$= \frac{CF_5 * (1+g^*)}{r - g^*} = \frac{CF_6}{r - g^*}$$

Calculation of
the continuation value
for the cost savings synergies

real CF ⟶ real discount rates

//

$$\frac{\text{nom. CF}}{(1+\pi)}$$

↳ inflation

$$(\text{real } r + \#1) = \frac{(\#1 + \text{nom. } r)}{(\#1 + \pi)}$$

nom. CF ⟶ nominal discount rates

Valuing Revenue Enhancements

Revenue Enhancements

			0	1	2	3	4	5
	Year							
1	Revenue Enhancements, **Constant Dollars**			$ 100	$ 200	$ 200	$ 200	$ 200
2	Expected Inflation Rate			2%	2%	2%	2%	2%
3	Growth Rate FCF (nominal), in perpetuity	3%						
4	Discount Rate	15%						
5	Ongoing Investment/Revenue (year 1+)	5%						
6	Operating Cost/Revenues	45%						
7	**PV** Revenue Enhancements			$ 102	$ 208	$ 212	$ 216	$ 221
8	Operating Costs Earmark			(46)	(94)	(96)	(97)	(99)
9	Tax Expense (@ .40)			(22)	(46)	(47)	(48)	(49)
10	After-Tax Cost Savings			34	69	70	71	73
11	Less: Investment Necessary		$ (400)	(5)	(10)	(11)	(11)	(11)
12	Plus: Disinvestment for Revenue			10	5	-	-	-
13	Subtotal		(400)	39	63	59	61	62
14	Terminal Value							531
15	Free Cash Flow		$ (400)	$ 39	$ 63	$ 59	$ 61	$ 593
16	**Net Present Value of Cost Savings**		**$50**					
17	**IRR Synergy Investment**		**18%**					

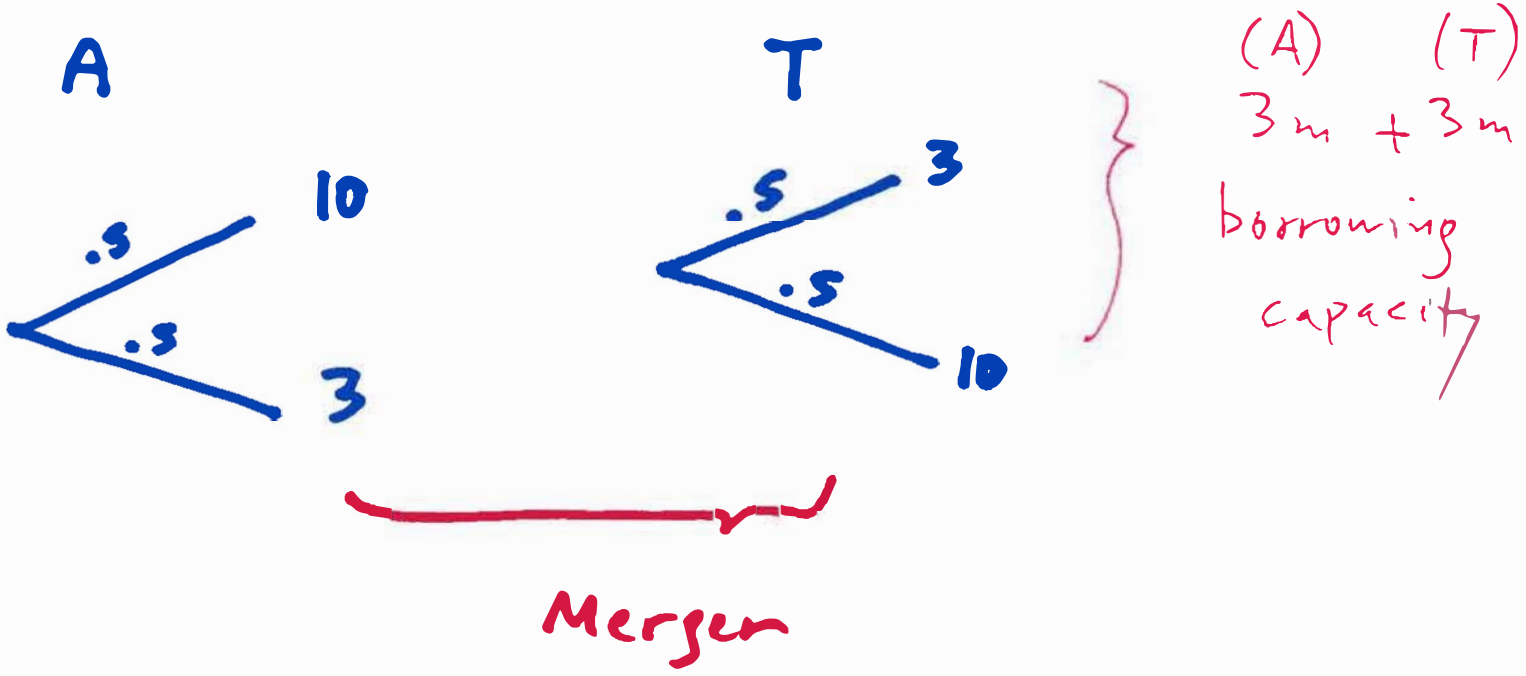
Note that revenue enhancements are riskier than cost synergies

MIRR(CF, 0.15, 0.15)

We use again Modified IRR (or MIRR)
Note the assumption of re-investment rate of 15%

Note: discount @ cost of equity (i.e., riskier investment)

Example of Co-Insurance



Merger Co-insurance Example (AD 25)

Ex. Based on Ch. 30, Damodaran, p. 829 (Second Edition)

Two companies merge

	Lube & Auto	Gianni Cosmetics	Combined
Firm Value	$100	$150	$250
Debt Face Value	$80	$50	$130
Debt Maturity	10	10	10
St. Dev. Firm Value	40.0%	50.0%	0.154 $^{0.5}$
Share of assets in survivor	0.4	0.6	
Correlation b/n CFs	0.4		

due to coinsurance, asset volatility goes down.

Black-Scholes Option Pricing

Option Pricing Calculator		
S	250	*Current Asset Value*
X	130	*Exercise (Strike) Price*
T	10.00	*Time to Maturity (Years)*
r_f	10.00%	*Riskless Interest Rate (%)*
σ	39.24%	*Volatility (% p.a.)*
d_1	1.9533	
d_2	0.7124	
$N(d_1)$	0.9746	
$N(d_2)$	0.7619	
C_E	207.215	*European Call Value ($)*
P_E	5.039	*European Put Value ($)*

N.B.: option-pricing C. Harvey

Option Price Values

obtain from Black-Scholes formula with: $X=80, S=100, T=10, \sigma=40\%, r_f=10\%$

Equity Value in Firm	$75.9	$134.5	$207.6
Debt Value in Firm	$24.1	$15.5	$42.4

12.75%

Debt Yield $= \left(\frac{80}{24.1}\right)^{.10} - 1 \quad \left(\frac{50}{15.5}\right)^{.1} - 1 \quad \left(\frac{130}{42.4}\right)^{.1} - 1 = 10.52\%$

Calculating Variance of Combined Firm (Co-Insurance Example)

$$\sigma^2_{\text{Newco}} = \left[w_A^2 \sigma_A^2 + w_T^2 \sigma_T^2 + 2 w_A w_T \underbrace{\frac{\text{cov}(r_A, r_T)}{\rho_{AT} \; \sigma_A \; \sigma_T}} \right]$$

Variance

We discussed the financial synergies $-1 \leq \dfrac{\text{cov}(r_A, r_T)}{\sigma_A \; \sigma_T} \leq 1$

$$\rho_{AT} = \frac{\text{cov}(r_A, r_T)}{\sigma_{r_A} \; \sigma_{r_T}}$$

Calculating r_D (YTM) For the co-insurance example

$$\$42.78_m = \frac{\$130_m}{(1+r_D)^{10}} \quad \text{(FV}_{10}\text{)}$$

$$\$42.78_m \equiv PV_0$$

$$\Rightarrow \quad \frac{\#130_m}{\#42.78_m} = (1+r_D)^{10}$$

Financial Synergy Calculation

Equity (levered) beta

asset beta (unlevered beta)

Newco

$$\beta_E = \boxed{\beta_A} + \frac{D}{E}(1-T)(\beta_A - \beta_D)$$

asset risk

financial risk

(Hamada formula)

In reverse,

→ usually assumed $\emptyset$

$$\boxed{\beta_A} = \frac{\beta_E + \beta_D \frac{D}{E}(1-T)}{1 + \frac{D}{E}(1-T)}$$

Valuing Financial Synergies

$$\beta_A = \frac{\beta_E + (1-T)\frac{D}{E}\beta_D}{1+(1-T)\frac{D}{E}}$$

		Buyer (Before)	Target (Before)	Buyer+Target (Before)	Newco	Value Impact
1	WACC before M&A	10.2%	11.2%	10.7%		
2	Newco WACC after M&A				10.1%	
3	Total Capital Buyer+Target, before M&A	$ 6,000	$ 6,000		$ 12,000	
4	Dollar Cost of Capital	$ 612	$ 674	$ 1,286	$ 1,209	$77
5	**Implied PV Financial Synergies**					**$760**
	Newco's Cost of Capital After M&A					
6	Cost of Equity =	**12.0%**	**15.5%**		**12.6%**	
7	Beta buyer, before M&A	1.00				
8	Beta target, before M&A		1.50			
9	Unlevered Beta $\beta_A = \beta_E \Big/ \left[1+(1-T)\frac{D}{E}\right]$	0.83	1.01		0.92	
10	Newco asset beta adj. because of covariance unanticipated by market				-0.10	
11	Market value weight buyer (%)	50%				
12	Market value weight target (%)		50%			
13	Beta Newco $\beta_E = \beta^*_A \left[1+(1-T^*)\frac{D^*}{E^*}\right]$				1.08	
14	Risk-Free Rate	0.05	0.05		0.05	
15	Equity market risk premium	0.07	0.07		0.07	
16	Cost of equity CAPM	12.0%	15.5%		12.6%	
17	Cost of Debt =	**4.8%**	**6.0%**		**5.4%**	
18	New rating Newco desired cap. structure	**AA**	**BBB**		**A**	
19	Debt maturity for desired cap. structure	7	7		7	
20	Current *pre-tax debt* yields, @ Newco rating & tenor	8.0%	10.0%		9.0%	
21	Marginal tax rate Newco	40.0%	40.0%		40.0%	
22	After-tax cost debt Newco	4.8%	6.0%		5.4%	
	Weights in desired capital structure Newco					
23	Targeted weight debt (%)	**25%**	**45%**		**35%**	
24	Targeted weight equity (%)	**75%**	**55%**		**65%**	

$= \frac{\$77}{10.1\%}$

assumed reduction in asset risk as a result of the acquisition

re-levered beta

assumed reduction of default risk

Unlevering of equity betas

$$\beta_A = \frac{\beta_E}{1 + (1-T)\frac{D}{E}}$$

$$\underbrace{WACC}_{r_A} = (1-T)\,r_D\,\frac{D}{E+D} + r_E\,\frac{E}{D+E}$$

after-tax cost of debt

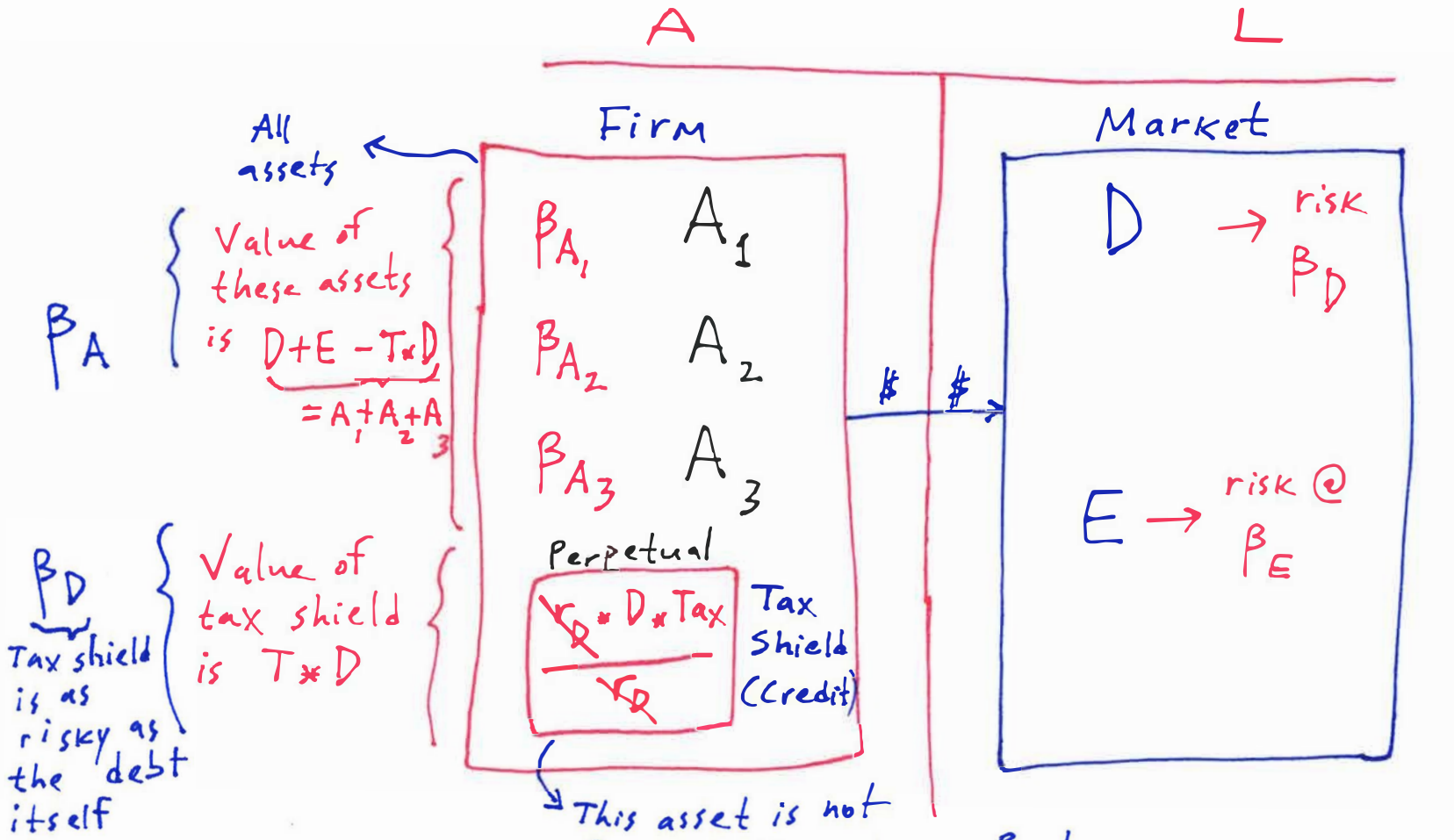
CAPM: $r_E = r_F + \beta_E * MRP$

MRP $= r_M - r_F$ = 8.63% − 0.98%

$r_D = r_F + \beta_D * MRP$

$r_A = r_F + \beta_A * MRP$

Optional: Levering & unlevering betas (Deriving the Hamada Formula)



No loss of ### from firm to markets: ⇒

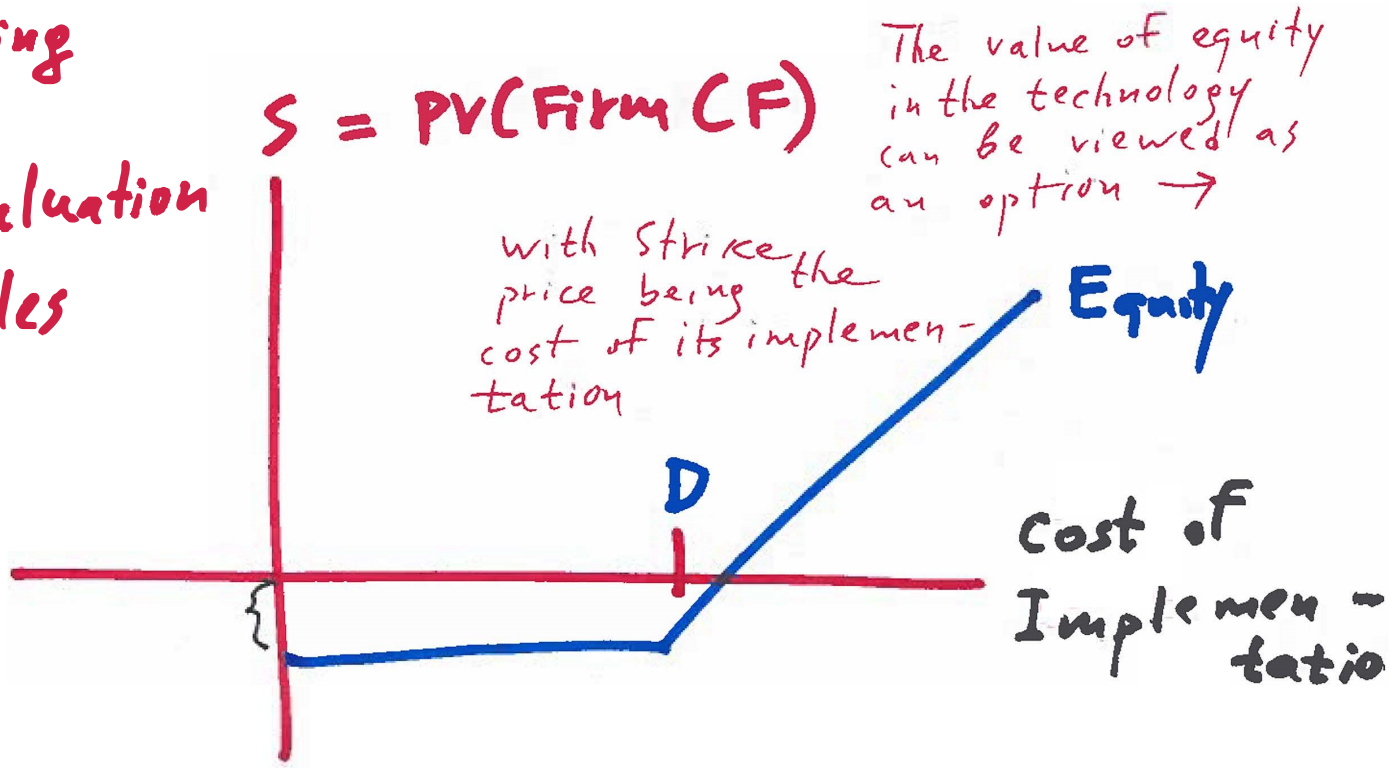
$$\beta_A * \frac{D+E-D*T}{D+E} + \beta_D * \frac{D*T}{D+E} = \beta_D \frac{D}{D+E} + \beta_E \frac{E}{D+E}$$

⇒ with some algebra:

$$\beta_A = \frac{\beta_E + (1-T)\frac{D}{E}\beta_D}{1+(1-T)\frac{D}{E}}; \text{ in reverse, } \beta_E = \beta_A + \frac{D}{E}(1-T)(\beta_A - \beta_D)$$

Value of Enabling Technology

(Real Option Valuation via Black-Scholes calculator)



Asking Price

$120m < $100m (assets in place) + technology value

↓

$ 29.6m

Valuing Real Option Synergies: B-S Eq

$$C = \left[N(d_1) \times S\right] - \left[N(d_2) \times PV(X)\right]$$

$$d_1 = \frac{\log[S/PV(X)]}{\sigma\sqrt{t}} + \frac{\sigma\sqrt{t}}{2}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Also value of the European call option

CF of technology if implemented

Exhibit 11.6, Bruner: Valuation of a new technology

Value of technology

Call value (C)	$29.6
Call delta (hedge ratio)	0.736
Using put-call parity	
Put value (P)	$227.9
Delta	-0.264
S underlying asset price (US$ million)	$50.00
X exercise price (US$ million)	$500.00
r_F risk-free rate	7.0%
St. Dev. (volatility, σ)	80.0%
T years to expiration	10.0
Cumulative Standard Normal Function	
d_1 from Black-Scholes	0.631
N(d1)	0.736
d_2 from Black Scholes	(1.898)
N(d2)	0.029

cost of implementation

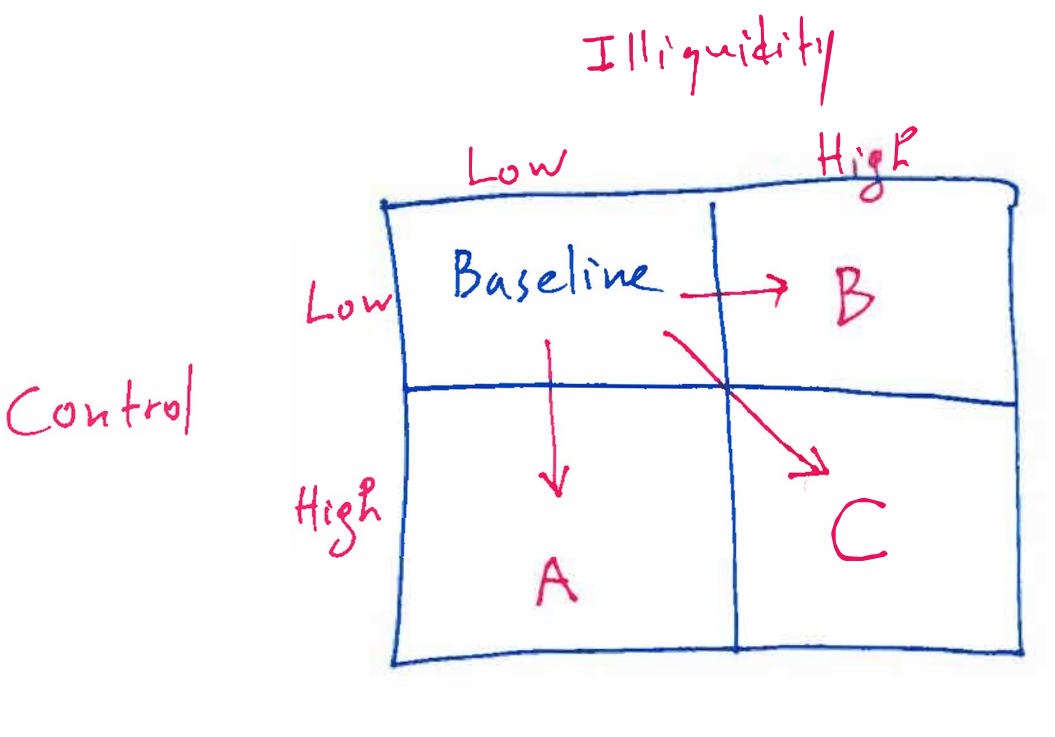
very risky cash flows

Constant yield, continuous dividend model	
Call value (C)	$28.1
Call delta (hedge ratio)	0.731
Using put-call parity	
Put value (P)	$228.5
Delta	(0.269)
S underlying asset price (US$ million)	$50.0
X exercise price (US$ million)	$500.0
r_F risk-free rate	7.0%
St. Dev. (volatility, σ)	80.0%
T years to expiration	10.0
Dividend yield	0.43%
Cumulative Standard Normal Function	
d_1 from Black-Scholes	0.614
N(d1)	0.731
d_2 from Black Scholes	(1.915)
N(d2)	0.028

Price is lower if implemented technology immediately "throws off" 3 million $

Why would a technology producing only $50m but costing $500m be worth $29.6 million?? → chance of CF being higher!

Liquidity & Control



Value of Control & Liquidity

Valuing Control & Liquidity: Ch. 15

Three acquisitions: **DCF=$100m** **SH. OUT= 100m** **P = 1$** SECTION II

	Multiplicative model for control and liquidity			
	Assumptions			
	% discount for illiquidity	**30%**		
	% premium for control	**40%**		
	Size of control block	**51%**		
	Base Case VE: marketable & no control asymmetry	**$ 100**		
	Shares outstanding (#)	**100**		
		Case A	**Case B**	**Case C**
	Illiquidity?	***no***	*yes*	*yes*
	Control Asymmetry?	*yes*	***no***	*yes*
1	**Base Case V_E: liquid & no control asymmetry**	$ 100.0	$ 100.0	$ 100.0
2	**Illiquidity Adjustment**	*0%*	*-30%*	*-30%*
3	**Illiquidity-Adjusted VE**	$ 100.0	$ 70.0	$ 70.0
4	**%Premium for control**	*40%*	*0%*	*40%*
5	**Control Block Size**	*51%*	*0%*	*51%*
6	**Control Block Value**	$ 71.4	$ -	$ 50.0
7	**Minority Block Value**	$ 28.6	$ 70.0	$ 20.0
8	**Adjusted V_E: control asymmetry & illiquidity**	**$ 100.0**	**$ 70.0**	**$ 70.0**
9	**Control block price/share**	$ 1.40	$ -	$ 0.98
10	**Minority block price/share**	$ 0.58	$ 0.70	$ 0.41

Baseline Scenario → no control issues, no illiquidity

Valuation of Private Companies: Cost of Capital

$$\beta_A^{PRIV} = \text{Total Beta} = \frac{\beta_A^{Public}}{\rho(r_A, r_M)}$$

$$\frac{\sigma_{r_A}}{\sigma_{r_M}} = \frac{\left[\dfrac{cov(r_A, r_M)}{\sigma_{r_M}^2}\right]}{\dfrac{cov(r_A, r_M)}{\sigma_{r_A}\,\sigma_{r_M}}} \Leftarrow$$

A Note on Special Purpose Acquisition Companies (SPACs)

- SPAC is a "blank-check" company formed with the intention of acquiring or merging with another company.

- The SPAC needs to complete an acquisition within two years or the capital raised must be returned to investors, as such it mostly represents a vote of confidence in the sponsor or investor behind the SPAC and in their ability to find future deals that would generate a high ROI.

- In a typical SPAC structure, the sponsor raises initial capital by issuing units consisting of 1 share and ½ or ⅓ of a warrant.

- The shares are generally priced at $10 and the warrants are typically struck 15% out of the money ($11.50) with a 5-year term and an $18 forced exercise.

- It comes with an embedded put option: Because the acquisition target is unknown at the time of the IPO, potential value creation is completely dependent on the ability of the sponsor to identify a target (typical private) company and negotiate the purchase. The SPAC purchase represents the de facto IPO for the acquired firm. However, in exchange for not knowing ahead of time the specific company that will be acquired, SPAC investors receive two benefits.

    - First, the right to evaluate the pending purchase and elect to hold or redeem the initial investment at cost (plus accrued interest) two days before the vote.

    - Second, warrants. The decisions are separate. A SPAC investor may choose to retain both the shares and warrants, or redeem the shares and hold the warrants, or sell both.

- The SPAC sponsor is typically compensated with a promote equal to 20% of pro forma equity and warrants. In a US SPAC, the sponsor's promote is not contingent upon meeting any financial targets. However, the sponsors of some recent SPACs have put their equity promote into an earn-out that is only received if the company achieves certain performance objectives, further aligning the financial incentives of the SPAC sponsor and shareholders.

- European SPACs are structured slightly differently. First, since they lack a redemption feature, they are truly "blank check" firms. The European SPAC investor owns the shares regardless of whether the investor likes the acquisition or not. Second, the sponsor does not receive a 20% promote up front. Instead, the sponsor only earns a promote if the company achieves certain return targets.

- Once the IPO is complete, and the SPAC sponsor - now with millions in fresh funds in the bank - finds a suitable target, he or she negotiates a non-binding term sheet. Depending on the size of the transaction, the sponsor may wall cross potential new outside investors to

raise a PIPE (private investment in public equity). The transaction is then announced to the public and an 8-K is filed.

- The SPAC investor base is highly fluid and as Goldman writes, many SPACs experience nearly a full rotation in their shareholder base during the time between the announcement of the deal and closing of the acquisition (transition from merger arbitrage traders and hedge funds to longer-term fundamental investors).

- The sponsor will then file a proxy with the SEC, conduct a pre-merger roadshow, receive redemption notices (if any), and hold a shareholder vote. Redemption notices are due 2 days prior to the shareholder vote, and shareholders will typically determine whether or not to redeem based on where shares are trading at the time redemption notices are due. If the vote passes, the SPAC merges with the target company and will often undergo a ticker change to reflect the name of the target business.

- On the other hand, if the vote fails, the sponsor will resume searching for a suitable target. After 24 months from the capital raise the SPAC will be closed and the capital returned to investors if a merger has not been completed.

- Benefits of SPACs:
    - First, in the traditional IPO process, issuers are prohibited from including any forward-looking guidance in their Form S-1 registration.
        - As a result, prospective investors are required to evaluate the merits of an issue based on backward-looking results and their own expectations.
        - In contrast, the SPAC due diligence process allows a target company to present forecasts and enhances the ability of a SPAC to acquire early-stage companies or those with complicated business models. This can be useful in businesses like sports betting, cannabis, electric vehicles, or other nascent industries that lack meaningful comparisons in the traditional IPO market. Of course, it is a given that the target company will present the most optimistic projections to potential investors, which is why removing the investor diligence aspect of the process is usually a sign of complacent groupthink whereby the investor base is willing to believe anything the target company presents similar to how i) rating agencies assessed all pre-crisis debt as stellar even if it was generally garbage and ii) investors are willing to engage in groupthink when someone else does their "diligence" job for them.

    - Second, in a traditional IPO, the amount of new capital raised is limited, typically to 20%-25% of the value of a company. But in a SPAC transaction, no limit exists on potential proceeds. A SPAC may acquire a majority or minority interest in the target firm and the concurrent PIPE capital raise may be any size.

Make-up Quiz #3 (Week #3) for FIN 5372

Question #1 (1 pts)
You are presented with a cost synergy of $10 million, starting a year after the merger. The cost of debt is 7%, the cost of asset capital is 10% and the cost of equity capital is 15%. If the cost savings are perpetual and starting next year, what is the present value of the cost synergy?

$r_D = 7\%$
$r_A = 10\%$
$r_E = 15\%$

A. **$142.86 million = $10 million / 0.07**
B. $100 million = $10 million / 0.10
C. $ 93.75 million = $10 million / [(7%+10%+15%)/3]
D. $ 66.67 million = $10 million / 0.15

$PV_0 = \frac{\$10\text{ m}}{r_D} = \frac{\$10\text{ m}}{7\%}$

Question #2 (1 pts)
Please use the Excel file *"Topic #3 (Real Option Synergies Valuation) (Ch11).xlsx"* – posted on Canvas – to solve this question. A company possesses a growth opportunity (a patent) with the following parameters: (1) present value of the expected cash flows form the new technology is $300 million; (2) in order to implement it the company must invest $400 million; (3) the patent protection is for 10 years; and (4) the uncertainty about the returns from the project is 40%. If the risk-free rate is 2%, what is the value of this growth opportunity?

A. $300 million
B. $239.4 million
C. $134.9 million
D. $120 million

L&A:
FV = 80
PV = -24.10
PMT = 0
N = 10
I/Y = 12.75%.

Question #3 (1 pts)
Please use Excel file *"Topic #3 (Co-Insurance Example).xlsx"* – posted on Canvas – to solve this question. In the *Gianni Cosmetics* and *Lube & Auto* merger, what will be the yield associated with debt of combined firm if correlation of cash flows of Gianni & Lube is 1?

(YTM)

A. 10.5%
B. 11.75%
C. 12.71%
D. 14.3%

Combined
FV = 130
PV = -39.3
PMT = 0
N = 10
I/Y = ? 12.71%.

Question #4 (0.5 pts)
Please use Excel file *"Topic #3 (Liquidity and Control) (Ch15).xlsx"* to solve this question.
In the class example of a public company going through a leveraged buyout to become private (i.e., Case C), what will be the price of the minority shares if the illiquidity discount is 10% and the control premium is 90%? Please assume that the control block size is 51%.

A. 41 cents per share
B. 15 cents per share
C. 10 cents per share
D. 6 cents per share

Question #5 (0.5 pts)
Cost synergies are riskier than revenue enhancement synergies.

A. True
B. False