Intangible Assets Valuation

Dr. Daniel Sava
Dr. Brian More

Mathys & Squire Consulting

WIPO
WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

Work through academic specific examples

Dr. Brian More

Case study 1 – Software valuation (copyright)

Scientific software for selling to pharma and chemical industry companies

Accounts for cost of development

IP copyright – not patented; no open-source code used

The software comprises 5 modules developed in collaboration between the biotechnology department and the computing department

Use the cost to reproduce at today's prices

Financial Data Verified by Accounts

Year	2018	2019	2020	2021	2022	2023
	Inception	Coding	Elaboration	Transition	Transition	Delpoyment
Systems Architect	25,000	5,000	54,000	10,000	5,400	14,000
Sprint Manager	2,000	35,000	46,300	0	0	0
Designer	36,700	10,000	23,670	2,600	0	3,000
Coder	0	176,320	83,250	20,000	12,300	4,320
Penetration testing	0	0	28,900	32,800	25,890	6,000
Overheads	12,740	45,264	47,224	13,080	8,718	5,464
Capital expenditure	28,500			4,630		
Consultancy	20,000	20,000	20,000	20,000	20,000	20,000
Totals	**124,940**	**291,584**	**303,344**	**103,110**	**72,308**	**52,784**
Total Historic Cost	**948,070**					

Accounting year end the 30th of June

Input Parameters for Valuation

Adjustments

Inflation rate	5% pa
Obsolescence	10% pa
Profit	10%
Opportunity cost	10%
Discount rate	15%
Valuation date	30/08/2023

Tax

Corporation Tax	25%
Tax Amortization period	15 years
Annuity	5.8473
TAB factor	0.10797943

Step by Step Calculations

Multiply the annual costs by the profit and opportunity cost to enhance the value = 120%

Totals	124,940	291,584	303,344	103,110	72,308	32,784
Profit + Opportunity	149,928	349,901	364,013	123,732	86,770	39,341

Multiply the new costs by the inflation factor
Number of days from the accounting period end to the valuation date = 61 days
Enhancement factor = 0.167 to increase the costs from June to August
For 2023 multiply by (1 + 0.05) ^ 0.167 = 1.008
For 2022 multiply by (1 + 0.05) ^ 1.167 = 1.059
Then continue back to 2018

Totals	124,940	291,584	303,344	103,110	72,308	32,784
Profit + Opportunity	149,928	349,901	364,013	123,732	86,770	39,341
Inflation Factor	5.167	4.167	3.167	2.167	1.167	0.167
Inflated costs	192,916	428,786	424,838	137,531	91,853	39,663

Step by Step Calculations

Divide the new costs by the obsolescence factor
Number of days from the accounting period end to the valuation date = 61 days
Enhancement factor = 0.167 to increase the costs from June to August
For 2023 divide by (1 + 0.10) ^ 0.167 = 1.016
For 2022 divide by (1 + 0.10) ^ 1.167 = 1.118
Then continue back to 2018

Totals	124,940	291,584	303,344	103,110	72,308	32,784
Profit + Opportunity	149,928	349,901	364,013	123,732	86,770	39,341
Inflation Factor	5.167	4.167	3.167	2.167	1.167	0.167
Inflated costs	192,916	428,786	424,838	137,531	91,853	39,663
Obsolescence	117,894	288,242	314,147	111,867	82,185	39,036

Reproduction cost then equals the sum of the bottom line = **€ 953,371**

Accounting for tax and tax amortization benefit (TAB)

Reproduction cost then equals	**= € 953,371**
Corporation tax	**= 25%**
Tax deducted	**= € 238 343**
After tax reproduction cost	**= € 715,028**
Tax amortization benefit	**= € 77,208**
Fair Market Value of Software	**= € 792,236**

Commentary on Calculations

The inflation rate is taken at 5% per annum, more accurately you would apply the inflation rate at the known yearly rate.

Obsolescence is taken at 10% per annum, this varies dependent upon the complexity of the algorithms.

The fair market value is very sensitive to the obsolescence
For an obsolescence of 20% the fair value becomes **€539,752**

Case study 2 – Teaching material (copyright)

Teaching material – new way of teaching medical students – saves Medical universities cost;

Your university medical school has developed a blended teaching software package along with online real time assessment for medical students. The software is a gamification of traditional lecture theatre training with cost savings as shown on the next slide:

Medical School Cost Savings 2023-2028

- Lecture theatre time saved = 200 hours per annum
- Marking and assessment time saved = 500 hours per annum
- Blended cost of teaching staff = $ 250 per hour (includes overheads)
- Blended cost of marking staff = $ 50 per hour (includes overheads)
- Total cost saving = $ (200 x 250) + $ (500 x 50) = $ 75,000 per annum

Input Parameters for Valuation

Adjustments

Growth rate	5% pa
Terminal growth rate	1%
Discount rate	20%
Valuation date	29/08/2023
Financial year end	31/12/2023
First cash flow	31/12/2023

Tax

Corporation Tax	25%
Tax Amortization period	25 years
Annuity	4.947587
TAB factor	0.0520511

Step by Step Calculations

Year	2023	2024	2025	2026	2027	2028	Terminal
Saved costs	75,000	78,750	82,688	86,822	91,163	95,721	96,678
Taxes	18,750	19,688	20,672	21,705	22,791	23,930	24,170
After tax saved costs	56,250	59,063	62,016	65,116	68,372	71,791	72,509
Partial Period Adjustment	0.34	1	1	1	1	1	
	19,125	59,063	62,016	65,116	68,372	71,791	
Terminal Value						381,625	
	19,125	59,063	62,016	65,116	68,372	453,416	
Years for discounting	0.34	1.34	2.34	3.34	4.34	5.34	
Discount factor	0.94	0.78	0.65	0.54	0.45	0.38	
Present Value of saved costs	**17,975**	**46,260**	**40,478**	**35,418**	**30,991**	**171,265**	
Net Present Value	**342,388**						
TAB	**17,822**						
Fair Value	**360,209**						

Commentary on Calculations

The discount rate is taken at 20%, this is high for a public university where the cost of capital is debt only, this figure is more like a small private university value.

For sensitivity calculations take the discount rate to 10%, then recalculate.

Result

Net Present Value			**485,246**
TAB			**48,525**
Fair Value			**533,771**

A 48% increase in the expected lifetime value

Licensing Considerations

The total value of the NPV of the cost savings using the gamified teaching material = $360,000.

The licensing university would expect 25% of this as a royalty = $90,000

Or $9,000 per annum over 10 years.

Case study 3 – Valuation of technology (patents + know how)

Case study 3ISR report – quite clean + different types of claims

There are a few strong competitors

The team is very experienced and can deliver scale-up; done so with previous technology

No projections, not easy to get the costs of development as was done alongside other things.

Case study 3 – Valuation methods

What method would you choose?

Relief from Royalty – easiest to obtain data for

DCF/Greenfield can also work – more data required about EBIT, changes in working capital, investment requirements, depreciation & amortisation.

Case study 3 – Revenue modelling

Carbon market – a few established players

https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage

Around – 125Mt per year by 2030 (125 million tonnes)

For our example – the technology aims for 1**Mt** by 2033 – Fisher Pry to model the diffusion of the technology.

Price per tonne – PwC – forecasts future carbon offset prices (graph) – assume a $60

https://www.pwc.co.uk/services/sustainability-climate-change/insights/bullish-sentiment-expected-over-next-decade-for-carbon-markets-globally-latest-trends-and-developments-in-2022.html#:~:text=The%20EU%20and%20UK%20ETS,2026%2D30%20for%20both%20schemes

Case study 3 – Revenue modelling

Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Time	0	1	2	3	4	5	6	7	8	9	10
Penetration	3.23%	7.24%	15.45%	29.94%	50.00%	70.06%	84.55%	92.76%	96.77%	98.59%	99.39%
Removal Capacity	32	72	154	299	500	701	846	928	968	986	994
Target removal capacity	1,000										
Shape parameter	0.85										
Timeto50%	4										

Revenue in thousands)

Penetration	3.23%	7.24%	15.45%	29.94%	50.00%	70.06%	84.55%	92.76%	96.77%	98.59%	99.39%
Carbon removal capacity (kilotonnes)	**32.00**	**72.00**	**154.00**	**299.00**	**500.00**	**701.00**	**846.00**	**928.00**	**968.00**	**986.00**	**994.00**
Revenue	$1,920	$4,320	$9,240	$17,940	$30,000	$42,060	$50,760	$55,680	$58,080	$59,160	$59,640

Case study 3 – Royalty rate

Year	Licensor	Licensee	IP right	Territory	Base	Royalty	Restrictions
15/04/2021	Euacentrix LLC	Boon Industries Inc.	IP covering proprietary technology – Proprietary formula (ClO_2 + water) & make use Proprietary Equipment	Worldwide	Net Sales	5%	Exclusive; For all application and uses
19/11/2020	Digital Research Solutions Inc.	JANGIT Enterprises Inc.	Patent (US 10572726 (digital media document summarizer) + associated know-how	Worldwide	Net Sales	6%	Exclusive, Solely for field of Summarization, Consolidation and educational software
04/12/2019	Tortec Forschungsinstitut gmbh	Tortec Titan+	Exploit the technology (List of 8 patents (Ukraine, Russia) + technologies, patents, designs, processes, formulas, know-how, technical data, etc.) to produce TORtec products.	Worldwide	Net Income	10%	Exclusive, Perpetual, Irrevocable
21/04/2015	SG Blocks Inc	Red Cardinal Holdings	Proprietary method and technology for construction of buildings	Worldwide	Net Sales	10%	Non-exclusive USA, EU Exclusive – The world – (USA+EU)
01/08/2011	Temple University	Save the world air, inc.	Patent rights (Patent portfolio – Method for Reduction of Crude oil viscosity – USA, Brazil, Canada, UK, China, Indonesia, Mexico, Nigeria, Norway, Russia, Arab Emirates- granted only in UK and Nigeria) and technical information for making, selling, using, importing Licensed product	Worldwide	Net Sales	7% for (first $20m sales, sliding scale to 4% for >$100m	Exclusive
12/07/2010	CEFCO Global Clean Energy, llc/CEFCO LLC	Peerless, LLC	CEFCO Process (Patent US20080250715+ know-how) in the field of “air quality control systems for post-combustion gases, including air filtration, air emissions control, carbon emission and capture and air pollutants recovery, and the production of end-products, including chemicals, fertilizers, fuels, and metals and minerals, from the products of such filtration, control, capture or recovery process.”	USA	Gross Revenue Sales	5%	Exclusive, 10 years
09/12/2014	Rice University	Tubz, LLC	Patent family (USA, Europe, Israel, South Korea) - Graphene-CNT Hybrid Material and Use as a Supercapacitor Electrode	Worldwide	Adjusted Gross Sales	3% +other payments	Exclusive, Field of use (consumer electronics (including without limitation mobile electronics, mobile telephones/smartphones, tablets, and wearable electronics), nano electronic technologies, electric vehicles, energy storage, and medical devices.)

Case study 3 – Royalty rate

What royalty rate should we use for this valuation?

Which do you think is the closest comparable?

In my view – 5th agreement is the closest – start from 5% - consider geography, exclusivity, any other existing licences.

How would you adjust if you discover there is already a contract that gives a companies a free non-exclusive world-wide licence?

3.25% - 3.75%

Case study 3 – Discount rate and risk adjustment

What are the risks for this technology to reach the market?

What are the risks associated with the IP?

How can we account for the risk in the IP valuation?

Either high VC discount rate; or Rate of return of startup (20%) + risk adjustment of revenues (10% success rate)

Case study 3 – Other parameters

Tax rate – 25% - usually a good assumption if no information

Terminal growth rate - -7% - the patent expires in 2043

Tax amortisation period – Remaining patent lifetime

Valuation data

End of financial year

Case study 3 – Revenues & Inputs

Revenues & Inputs

		Royalty Rate	3.5%	Succes factor	10%
Target Capacity for removal (kilotonnes)	**1,000**	Terminal growth rate	-7%		
Price per kilotonne	$60	Tax rate	25%		
Discount rate	20%	Financial Year End	31/12/2023		
Tax amortisation period	19	Valuation Date	29/08/2023		
Annuity	4.8434957	First cashflow	31/12/2023		
TAB factor	0.0680682				

	2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	Terminal
Penetration	3.23%	7.24%	15.45%	29.94%	50.00%	70.06%	84.55%	92.76%	96.77%	98.59%	99.39%	
Carbon removal capacity (kilotonnes)	**32.00**	**72.00**	**154.00**	**299.00**	**500.00**	**701.00**	**846.00**	**928.00**	**968.00**	**986.00**	**994.00**	**924.00**
Revenue	$1,920	$4,320	$9,240	$17,940	$30,000	$42,060	$50,760	$55,680	$58,080	$59,160	$59,640	$55,440

Case study 3 – Fair value

Net Present Value

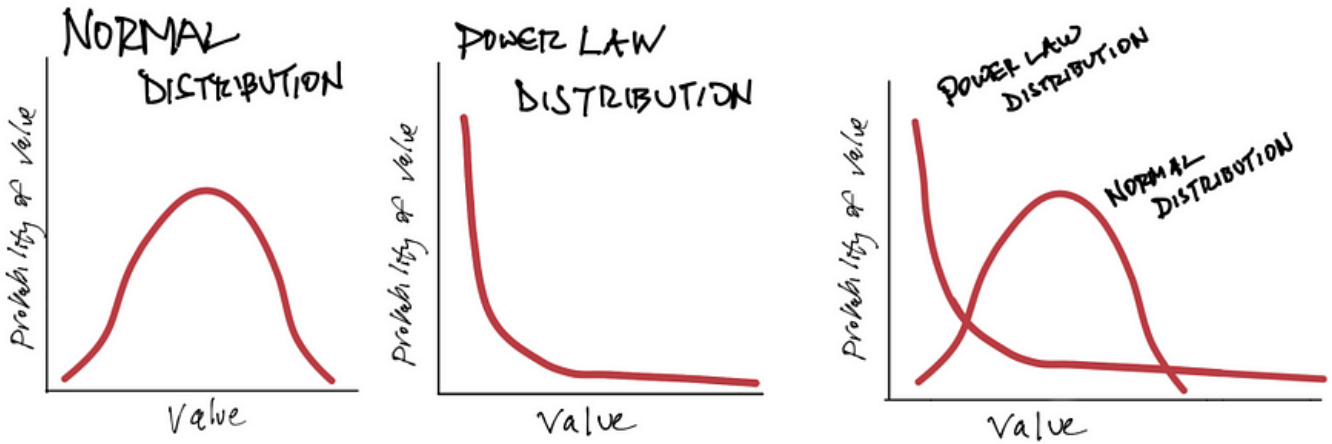
Revenues	$1,920	$4,320	$9,240	$17,940	$30,000	$42,060	$50,760	$55,680	$58,080	$59,160	$59,640	$55,440
risk adjusted revenues	$192	$432	$924	$1,794	$3,000	$4,206	$5,076	$5,568	$5,808	$5,916	$5,964	$5,544
Pre tax royalties	$7	$15	$32	$63	$105	$147	$178	$195	$203	$207	$209	$194
Taxes	-$2	-$4	-$8	-$16	-$26	-$37	-$44	-$49	-$51	-$52	-$52	-$49
After tax saved costs	$5	$11	$24	$47	$79	$110	$133	$146	$152	$155	$157	$146
Partial period adjustment	0.34	1	1	1	1	1	1	1	1	1	1	1
	$2	$11	$24	$47	$79	$110	$133	$146	$152	$155	$157	$146
Terminal value												$539
	$2	$11	$24	$47	$79	$110	$133	$146	$152	$155	$157	$685
Years for discounting	0.34	1.34	2.34	3.34	4.34	5.34	6.34	7.34	8.34	9.34	10.34	11.34
Discount factor	94%	78%	65%	54%	45%	38%	31%	26%	22%	18%	15%	13%
Present value of saved costs	$2	$9	$16	$26	$36	$42	$42	$38	$33	$28	$24	$87
Net present value	**$382**											
Tax amortization benefit	$26											
Fair value	**$408**											

Case study 3 – Sensitivity Analysis

Royalty rate \ Discount rate	15.0%	17.5%	20.0%	22.5%	25.0%
2.5%	$430	$351	$291	$245	$209
3.0%	$516	$421	$349	$294	$251
3.5%	$602	$491	$408	$343	$293
4.0%	$688	$561	$466	$392	$334
4.5%	$774	$631	$524	$441	$376

Success rate \ Discount rate	15.0%	17.5%	20.0%	22.5%	25.0%
7.5%	$451	$368	$306	$257	$219
10.0%	$602	$491	$408	$343	$293
12.5%	$752	$614	$510	$429	$366
15.0%	$903	$737	$611	$515	$439
17.5%	$1,053	$859	$713	$601	$512

Spinouts and VC funding



Source: https://dougshapiro.medium.com/power-laws-in-culture-27ab6461c693

Venture capital works on a Power Law model

VCs – each investment is made with the potential of returning 10-20x (the whole fund or more)

Most of the investments will fail

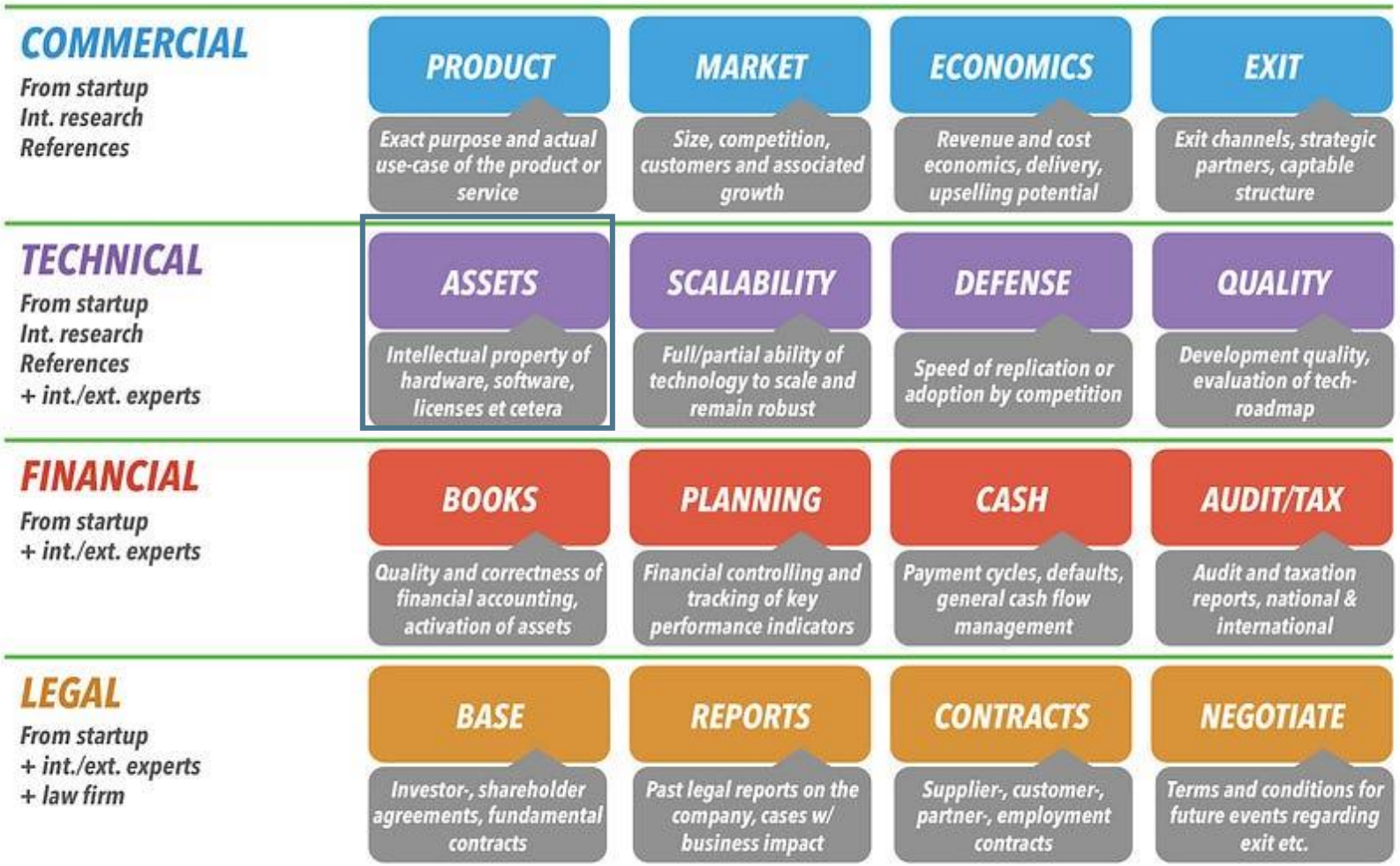
A few will return the invested capital or a bit more

Outliers will return most of the fund

“A healthy intellectual property position may not guarantee a start-up technology company is going to be successful, but it is going to find it a whole lot harder to succeed if it does not have one. And crucially, it is not just the ownership of intellectual property that is important, it is the understanding that intellectual property is a key.”

Joff Wild

Spinouts and VC funding – due diligence



Spinouts and VC funding – valuation approaches

Early stages- VCs value company/not IP individually

- IP is included in the company value (main driver of value)

Pre & Post money valuation

The Art

- How much money one needs to raise? – VCs usually want 20-30% equity
- Interest from other investors (FOMO) – more leverage
- "*We laugh at [venture] firms that use spreadsheets for seed and Series A deals for valuations. There's just not enough data*." says Mendelson, co-author of the book, Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist.

Early stage – lack of historical financial data

Premoney valuation = Postmoney valuation – Invested Capital

Premoney valuation - €4m | 80%
Postmoney valuation - €5m |100%
Invested capital - €1m | 20%

Spinouts and VC funding – valuation approaches

3 semi-quantitative method (high degree of subjectivity) – Payne Scorecard, Berkus method, and Risk factor summation method.

- Example of Payne Scorecard

2 quantitative methods – VC method; First Chicago method.

- VC method

Spinouts and VC funding – Payne scorecard

COMPARISON FACTOR	WEIGHT IN VALUATION
Strength of entrepreneur & Team	0-30%
Size of the opportunity	0-25%
Product/Technology	0-15%
Competitive environment	0-10%
Marketing/Sales/Partnerships	0-10%
Need for additional investment	0-5%
Other factors	0-5%

Develop for seed companies in the range of $1m - $2.5m – Premoney valuation.

Decide on comparison factor for potential company

Compare the factors with a benchmark company for which the Premoney valuation is known

Add factors and multiply with benchmark pre-money valuation

Source: William Payne, The Definitive Guide to Raising Money from Angels; Antonella Puca, Early Stage Valuation: A Fair Value Perspective

Spinouts and VC funding – Payne scorecard

COMPARISON FACTOR	TARGET COMPANY	BENCHMARK	COMPARISON	FACTOR
Strength of entrepreneur & Team	30%	25%	120%	0.36
Size of the opportunity	25%	25%	100%	0.25
Product/Technology	15%	20%	75%	0.1125
Competitive environment	10%	10%	100%	0.1
Marketing/Sales/Partnerships	10%	12.5%	80%	0.08
Need for additional investment	5%	5%	100%	0.05
Other factors (great traction)	5%	2.5%	200%	0.1

Total factor – 1.0525; Benchmark Premoney valuation - $2m

Target Premoney valuation - $ 2.105m

Spinouts and VC funding – VC method

Estimating – Postmoney valuation & ownership % - as a function of desired risk adjusted return & capital to invest

Postmoney valuation = Valuation at exit/(1+Target Return)$^{\text{Time to exit}}$

Example

€1m to invest; Required return 40%

Value at exit - €30m; Time to exit – 6 years

Target Total value to paid in capital (TVPI or Investment multiple) - (1+Target Return)$^{\text{Time to exit}}$ – 7.53

Postmoney valuation - €30m/7.53 – approx. €4m

Thank you for your attention!

DSava@mathys-squire.com
BMore@mathys-squire.com

Photo credits: