IP Valuation and Forming University Startups

Budapest, September 15 – 17, 2015

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AGENDA

1. **License v. startup strategy**
2. Introduction to valuing a startup
3. Running a DFEB

In order for universities and government research institutes (GRIs) to successfully commercialize their technology, they need technology buyers.

License v. spin-off strategy

There are two primary methods for commercializing university/GRI technology:

1. **License strategy:** License the technology to an existing business
2. **Startup strategy:** Create a startup company and contribute the technology to the startup in exchange for equity and royalty payments.

Licensing is preferred strategy in developed markets

In developed technology commercialization markets (like the United States), the licensing strategy is the dominant strategy when compared to startups.

But, startups are highly relevant.

Licensing and Startup Data for U.S. Universities, Hospitals, and Research Institutions					
	2009	**2010**	**2011**	**2012**	**2013**
Licensing Strategy					
Number of new licenses/options	5,328	5,362	6,051	6,372	6,554
Total licensing income	$2.3 billion	$2.4 billion	$2.5 billion	$2.6 billion	$2.8 billion
Startup Strategy					
Number of startups formed	596	651	671	705	818

Source: 2013 AUTM Annual Survey

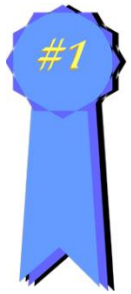
Mechanics of startup strategy

Mechanics of startup strategy

1. **Formation:** University establishes a company to develop and commercialize the technology
2. **Transfer patent rights:** University transfers its patent rights to the newly-formed company—typically in exchange for equity + a license with royalty payments.

Mechanics of startup strategy

3. **University compensation:** University can profit in three ways:



   1) **Capital gains [BEST OUTCOME]:**
      - Sell equity interest after startup achieves a liquidity event (e.g., sale of startup to a larger company or initial public offering)
   2) **Royalty payments:**
      - University may have required a royalty payment as part of its transfer of the patent rights to startup

Mechanics of startup strategy

3. **University compensation:** University can profit in three ways:
    3) **Dividend payments:**
        - Startup could make dividend payments to its shareholders (including university)
        - This is NOT a common occurrence

Likely economic benefit

Therefore, the likely economic benefit from a university forming a startup to commercialize a patent is:

1. The ***capital gains*** from selling the startup's stock; and
2. Any ***royalty payments*** to the university.

The ***net present value*** of the projected capital gains + royalty payments is the value of the startup strategy.

Pros of startup strategy

Pros of startup strategy

1. **May be the only viable strategy if business sector is not strong enough to provide serious technology buyers:**

Pros of startup strategy

1. **May be the only viable strategy if business sector is not strong enough to provide serious technology buyers:**
    - Business sector must have sufficient R&D capabilities to absorb the patented technology.
    - R&D capacity of business sector must be strong enough to do the needed development work to make patented-technology commercially useful.

Pros of startup strategy

2. **Even if business sector is strong enough, technology may not mesh with current business strategies:**
    - Revolutionary technology may require new companies that follow new business strategies (e.g., Google).
    - Rather than wait for the business sector to catch up to the technology, the university may create its own companies.

Pros of startup strategy

3. **Focused and motivated entrepreneur:**
    - By personally involving the inventor with the startup, the venture is ensured of a focused and motivated entrepreneur.
    - That focus and motivation can be lost when the technology is transferred to a larger company.

Negatives of spin-off strategy

Negatives of startup strategy

1. **Startups have a very high failure rate,** which leaves valuable technology trapped in a failed company.

2. Common reasons for failure:

2. Common reasons for failure:

- **Lack of start-up funding**

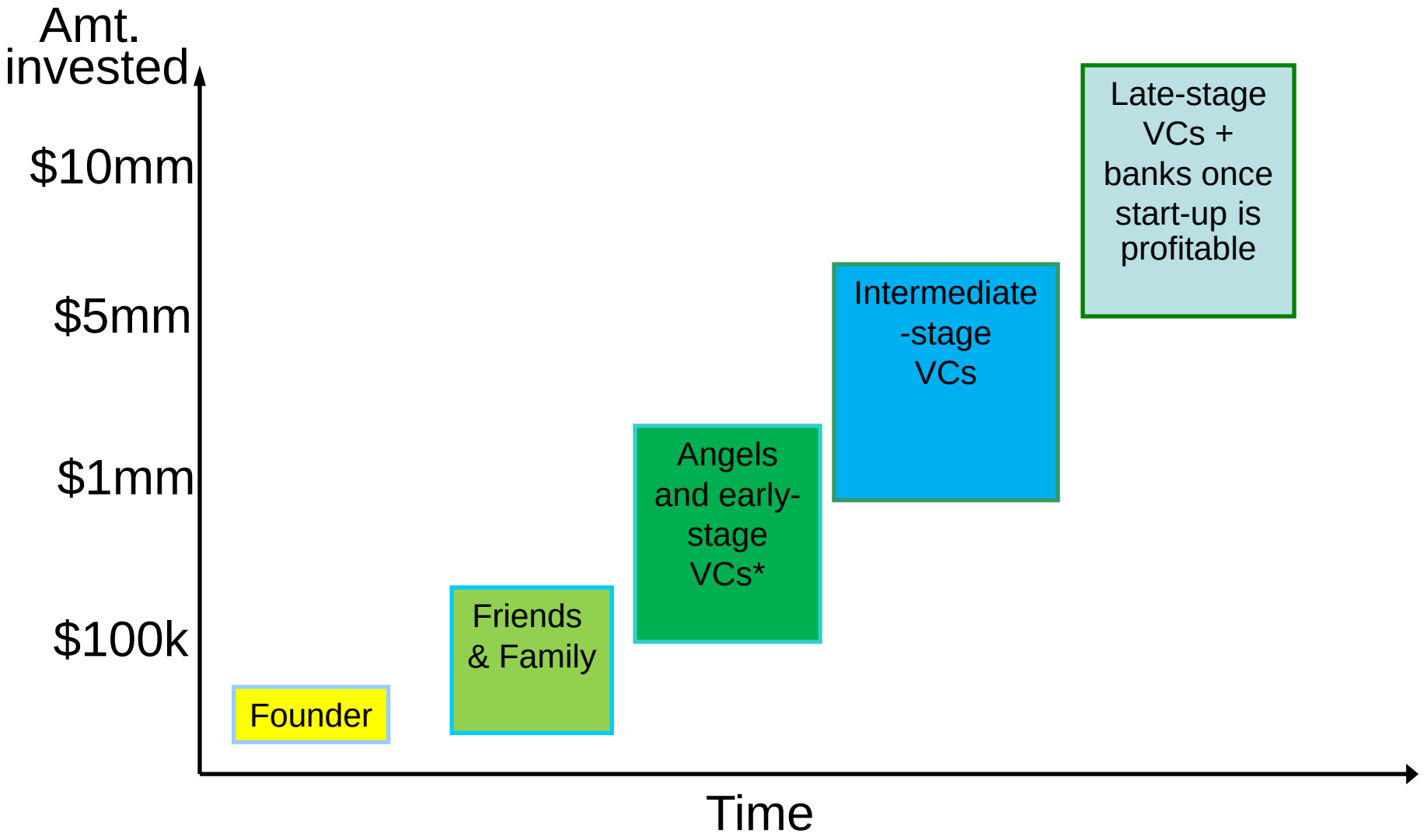
Start-ups are difficult to finance

Significant debt financing is seldom appropriate for start-ups

Traditional equity investors have struggled to navigate this extremely risky environment.

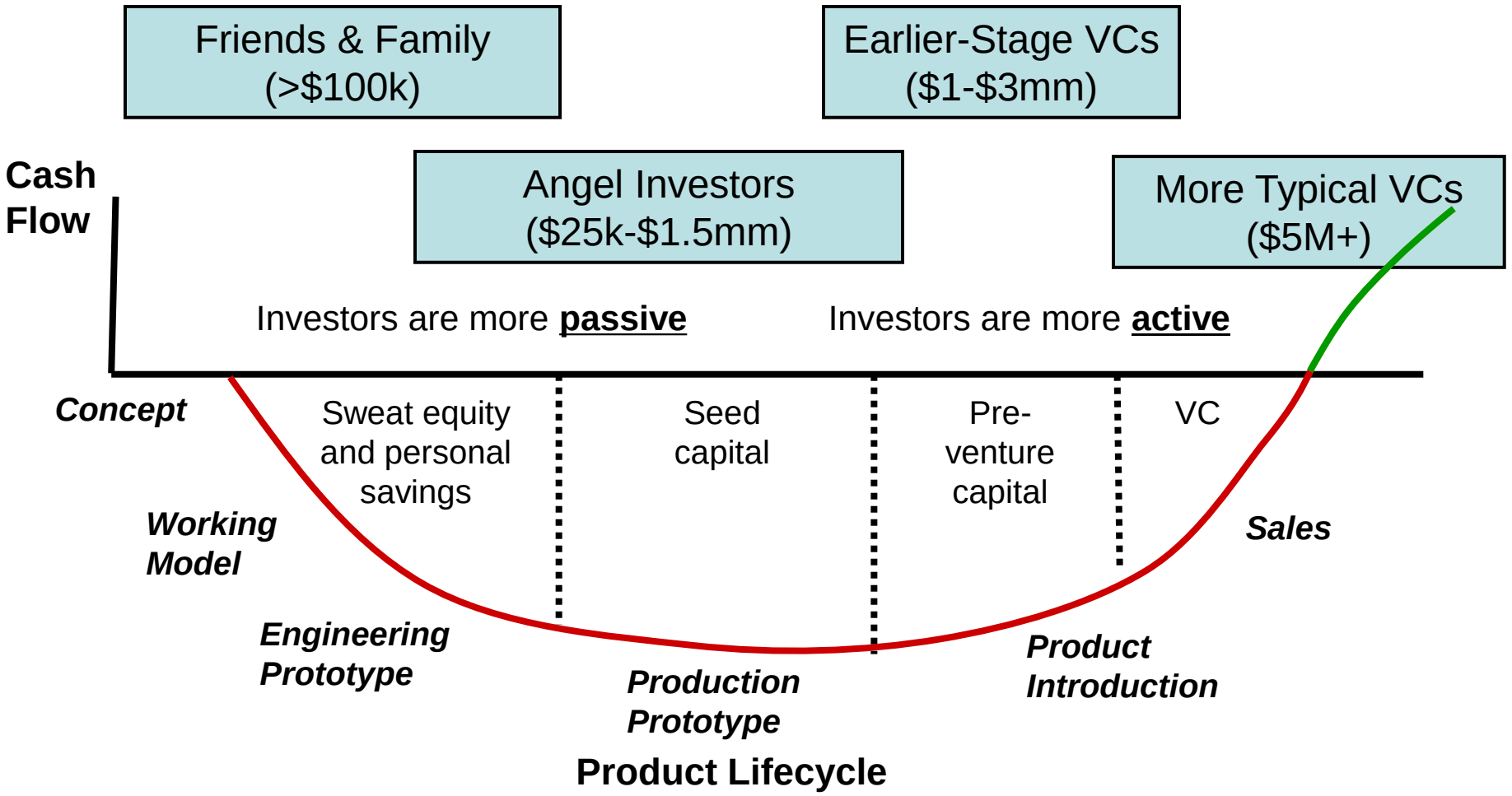
Fortunately, some investors—***angels*** and ***VC firms***—have learned to successfully operate in this environment.

Typical equity funding sequence for U.S. start-ups



*There are very few early-stage VCs

Equity funding sources as start-up passes through "Valley of Death"

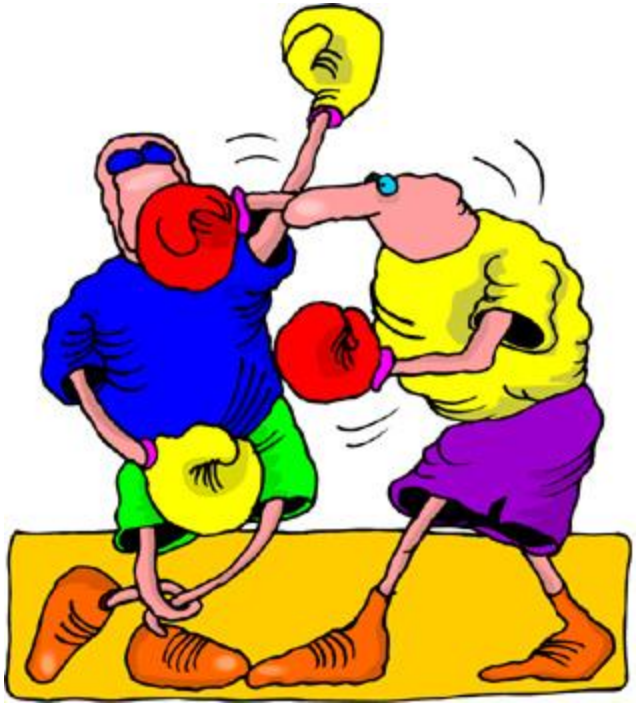


*This slide is adapted from a slide prepared by Michael Gurau, ClearVenture Partners, for a presentation on financing rapid-growth energy companies (Concord, NH, July 1, 2010)

Negatives of startup strategy

2. **Common reasons for failure:**
   - **Managerial incompetence**
     - Being a smart scientist does not mean you will be a smart business person.
     - Ability to develop and execute a business strategy is just as important (and probably more important) to business success than quality of the technology.
     - It is hard to find qualified managers to run startups.

3. Conflicts of interest:



3. Conflicts of interest:

- **At the university/GRI level:**
  Universities/GRIs may view spin-offs as financial saviors and then take inappropriate financial risks.

Example of inappropriate financial risk

Boston University and Seragen:

- During the 1980s and 1990s, Boston University invested close to $100 million in a biotechnology company called Seragen that was formed to commercialize a new cancer-curing drug developed by one of Boston University's professors.
- Boston University's president explained, "If we had just 5 percent of what eventually became Bell Telephone, we would be richer than Harvard today."
- Of course, Seragen did not become Bell Telephone, and eventually went bankrupt costing Boston University almost all of its investment in Seragen and much of the school's endowment.

See David Barboza, *Loving a Stock, Not Wisely but too Well*, N.Y. TIMES, Sept. 20, 1998, at Section 3, p.1.

3. **Conflicts of interest:**
   - **They also exist at the researcher level**

Does that mean startups should be avoided?

Absolutely not!

Startups are a valuable commercialization strategy

Startups are an imperfect, but very valuable method for technology commercialization.

- Startups are frequently the best method in countries with less-developed high-technology industries.
- As the country's high-technology industries develop, the need for startups should decline and the licensing method should increase.

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Reminder

The likely economic benefit from a university forming a startup to commercialize a patent is:

1. The ***capital gains*** from selling the startup's stock; and
2. Any ***royalty payments*** to the university.

The ***net present value*** of the projected capital gains + royalty payments is the value of the startup strategy.

What does this mean?

1. **Projected capital gains =**

Projected sale price of stock — Purchase price of stock → Discounted back to present value

Requires:

- Forecasting eventual sale price of stock
- Choosing a discount rate

What does this mean?

University obtains stock without any cash contribution and forecasts selling the stock for $10 million after 7 years. The net present value of the capital gains is substantially less than $10 million.

Year 0		**Year 7**
$0		$10,000,000
Purchase price (no cash contribution)		Anticipated future sale price
Net present value @	30%	**$1,593,663**
	40%	**$948,645**
	50%	**$585,277**
	60%	**$372,529**

What does this mean?

2. Projected royalty payments =

Projected royalty payments by period → Discounted back to present value

Requires:

- Forecasting royalty payments by period
- Choosing a discount rate

What does this mean?

University forecasts generating 7 years of running sales royalty from the license.

		1	2	3	4	5	6	7	Total
Forecasted Royalties									
Units sold		1,000	10,000	20,000	35,000	30,000	20,000	5,000	
Price per unit		$1,000	$800	$800	$750	$700	$600	$500	
Total sales		$1,000,000	$8,000,000	$16,000,000	$26,250,000	$21,000,000	$12,000,000	$2,500,000	
5% royalty		$50,000	$400,000	$800,000	$1,312,500	$1,050,000	$600,000	$125,000	$4,337,500
NPV @	**40%**	$35,714	$204,082	$291,545	$341,655	$195,231	$79,686	$11,858	**$1,159,771**
	50%	$33,333	$177,778	$237,037	$259,259	$138,272	$52,675	$7,316	**$905,670**
	60%	$31,250	$156,250	$195,313	$200,272	$100,136	$35,763	$4,657	**$723,639**

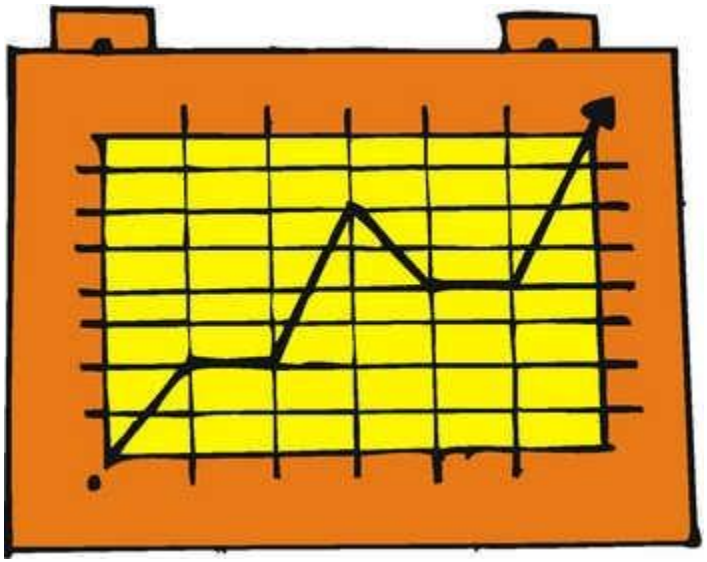
What does this mean?

University formed a startup to commercialize a patented technology. University received stock in the startup and also entered into a license agreement. The net present value of University's forecasted return from the investment is:

- Forecasted capital gains of $10 million in 7 years
  - @ 30% = $1.6 million
  - @ 40% = $0.9 million
  - @ 50% = $0.6 million
  - @ 60% = $0.4 million
- Forecasted total royalties
  - @ 40% = $1.2 million
  - @ 50% = $0.9 million
  - @ 60% = $0.7 million

Value range of investment = $1.1 million to $2.8 million

Let’s focus on capital gains

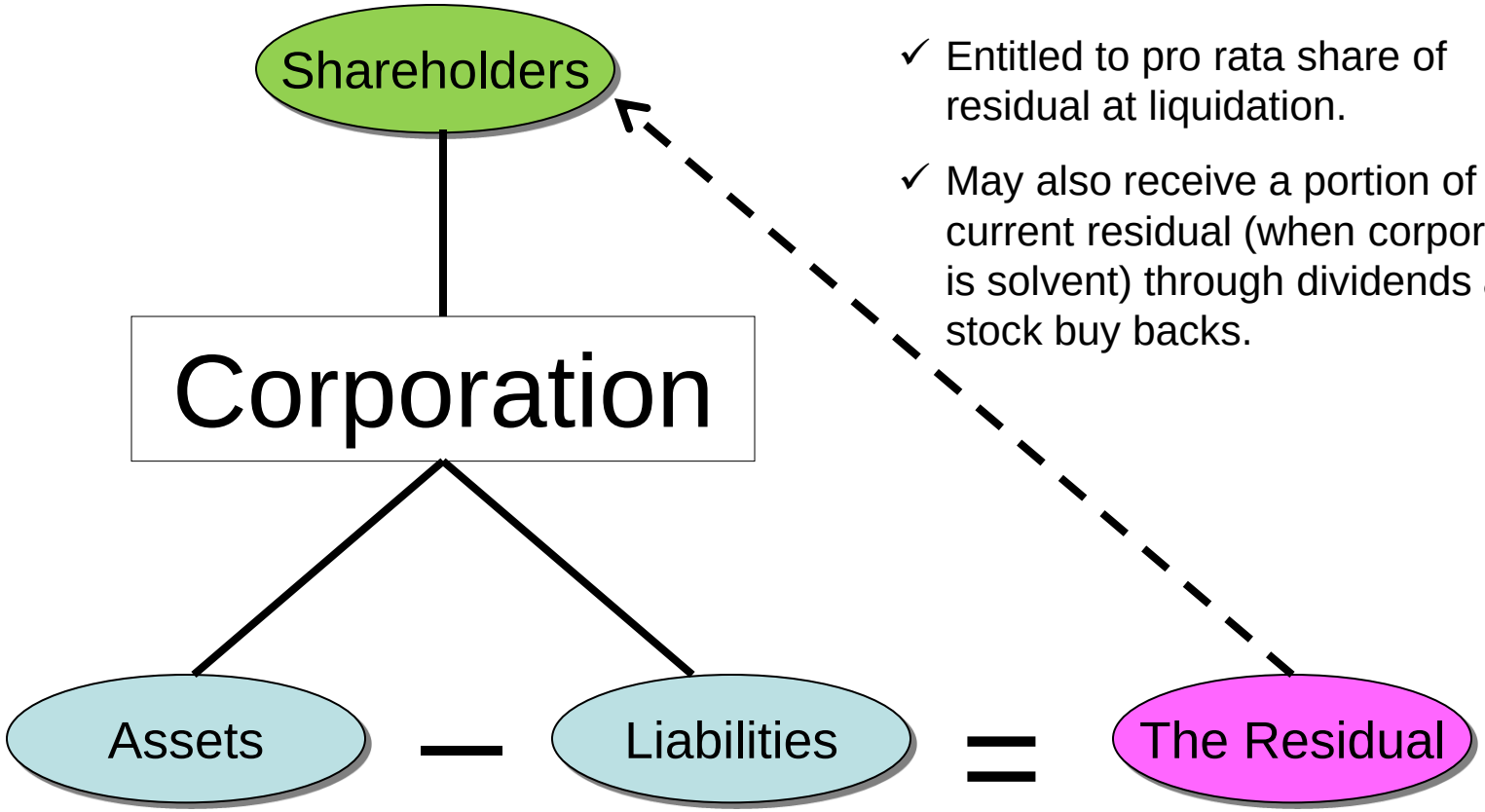


The “residual”

When valuing a company, the primary economic benefit stems from the rights it grants stockholder’s in the “residual.”

- Common stock represents a percentage ownership in a corporation.
- This percentage ownership entitles the stockholder to a number of rights. The most significant right is a ***residual claim on the corporation’s net assets***.

The “residual”



- ✓ Entitled to pro rata share of residual at liquidation.
- ✓ May also receive a portion of current residual (when corporation is solvent) through dividends and stock buy backs.

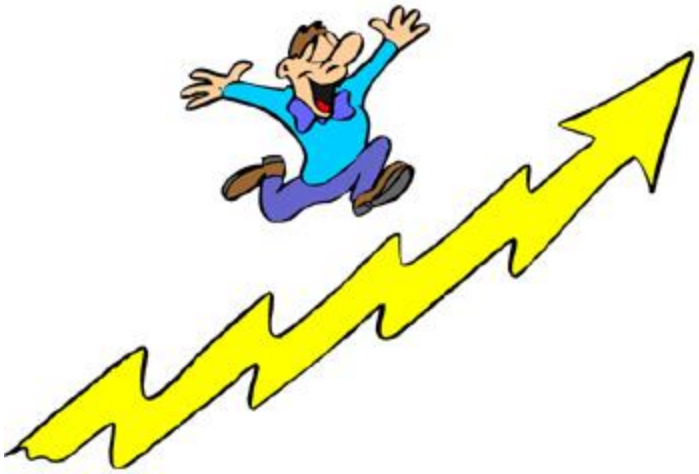
The “residual”

When valuing the future capital gains from forming startup, the valuation analysis seeks to:

1. Calculate the ***present value*** of the startup’s ***eventual residual***; and
2. Determine what percentage of that amount is owned by each stockholder.

To do this, we will run a ***Discounted Future Economic Benefits (DFEB)*** Analysis.

The residual comes from profits.



The residual comes from profits.

1. **Current residual =**
   Accumulated past profits

2. **Future residual =** Results from future profits

Current residual is shown on balance sheet

A balance sheet reports the company's assets, liabilities and shareholders' equity on a specified date (e.g., year end, quarter end or month end).

Balance sheets adhere to this formula:

Assets = Liabilities + Shareholders' Equity

- **Assets =** valuable resources the company owns.
- **Liabilities =** obligations the company has to creditors.
- **Shareholders' equity =** the company's net asset position, or the portion of the assets to which the company's shareholders have a claim.

Balance Sheet

	Last Day of Fiscal Year 1	Last Day of Fiscal Year 2
Assets		
Current assets:		
Cash and cash equivalents	$ 9,000,000	$ 8,000,000
Accounts receivable (less allowances for doubtful accounts)	700,000	2,000,000
Inventories	400,000	2,800,000
Prepaid expenses	250,000	100,000
Total current assets	10,350,000	12,900,000
Long-term investments	2,000,000	2,100,000
Fixed assets:		
Land	500,000	620,000
Buildings	1,800,000	2,200,000
Office equipment	200,000	240,000
Other assets	900,000	1,100,000
Total assets	$ 15,750,000	$ 19,160,000
Liabilities		
Current liabilities:		
Accounts payable	$ 5,000,000	$ 7,000,000
Customer deposits	750,000	500,000
Borrowings under bank line of credit	1,000,000	1,200,000
Current portion of long-term debt	250,000	400,000
Income taxes payable	100,000	125,000
Total current liabilities	7,100,000	9,225,000
Long-term debt, net of current portion	2,000,000	2,500,000
Other liabilities	300,000	400,000
Total liabilities	$ 9,400,000	$ 12,125,000
Shareholders' Equity		
Liabilities and shareholders' equity	$ 6,350,000	$ 7,035,000

Profits are shown on income statement

An income statement reports a company's revenues and expenses for a specified period of time (e.g., one year, one quarter, or one month).

Income statements adhere to this formula:

Profits = Revenues — Costs

Income statement (or profit & loss statement)

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues	$2,000,000	$3,000,000	$3,800,000	$4,300,000	$4,800,000
Cost of sales	$800,000	$1,200,000	$1,520,000	$1,720,000	$1,920,000
Gross profit	$1,200,000	$1,800,000	$2,280,000	$2,580,000	$2,880,000
SG&A expenses:					
Selling expenses	$360,000	$540,000	$684,000	$774,000	$864,000
R&D expenses	$100,000	$150,000	$190,000	$215,000	$240,000
G&A expenses	$240,000	$360,000	$456,000	$516,000	$576,000
Operating profits	$500,000	$750,000	$950,000	$1,075,000	$1,200,000
Other income (expenses)					
Net interest income (expense)	$100,000	$200,000	($200,000)	($250,000)	$150,000
Depreciation and amortization	($200,000)	($225,000)	($250,000)	($200,000)	($220,000)
Extraordinary income (loss)	—	—	$300,000	($100,000)	—
Pre-tax income	$400,000	$725,000	$800,000	$525,000	$1,130,000
Income taxes	$80,000	$145,000	$160,000	$105,000	$226,000
Net income	$320,000	$580,000	$640,000	$420,000	$904,000

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Reminder: basic arithmetic of DFEB calculation

$$PV = EB_0 + \frac{EB_1}{1 + r_1} + \frac{EB_2}{(1 + r_2)^2} + \frac{EB_3}{(1 + r_3)^3} + \ldots + \frac{EB_n}{(1 + r_n)^n}$$

Where:

PV	=	Present value
EB	=	Economic benefit
$EB_{1,2,3\ etc.}$	=	Economic benefit in the first, second, third periods (and so on) of the stream of benefits
EB_n	=	Economic benefit in the last period of the stream of benefits
$r_{1,2,3\ etc.}$	=	Discount rate in the first, second, third periods (and so on)

Adding up the present value of the future residual additions

	Future Year					
	1	**2**	**3**	**4**	**5**	**Total**
Projected free cash flow	$1.0 million	$1.5 million	$2.0 million	$1.5 million	$2.5 million	$8.5 million
Discount rate	25%	25%	25%	25%	25%	
Present value	$0.8 million	$1.0 million	$1.0 million	$0.6 million	$0.8 million	$4.2 million

Over the next five years, the firm projects that it will receive $8.5 million in free cash flow, but the present value of that cash flow stream is roughly half that amount at $4.2 million. The math behind the calculation is:

Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**PV**

$$\frac{\$1 \text{ million}}{1.25} + \frac{\$1.5 \text{ million}}{1.25^2} + \frac{\$2.0 \text{ million}}{1.25^3} + \frac{\$1.5 \text{ million}}{1.25^4} + \frac{\$2.5 \text{ million}}{1.25^5} = \$4.2 \text{ million}$$

Everything we learned earlier about projecting profits and discount rates applies …

with ***one significant addition***.

Terminal value

A DFEB analysis measures all the future net economic benefits projected to flow to the firm. Since corporations have a potentially infinite duration, such projections may extend infinitely into the future. Unfortunately, the further into the future the projections are made, the less reliable they become.

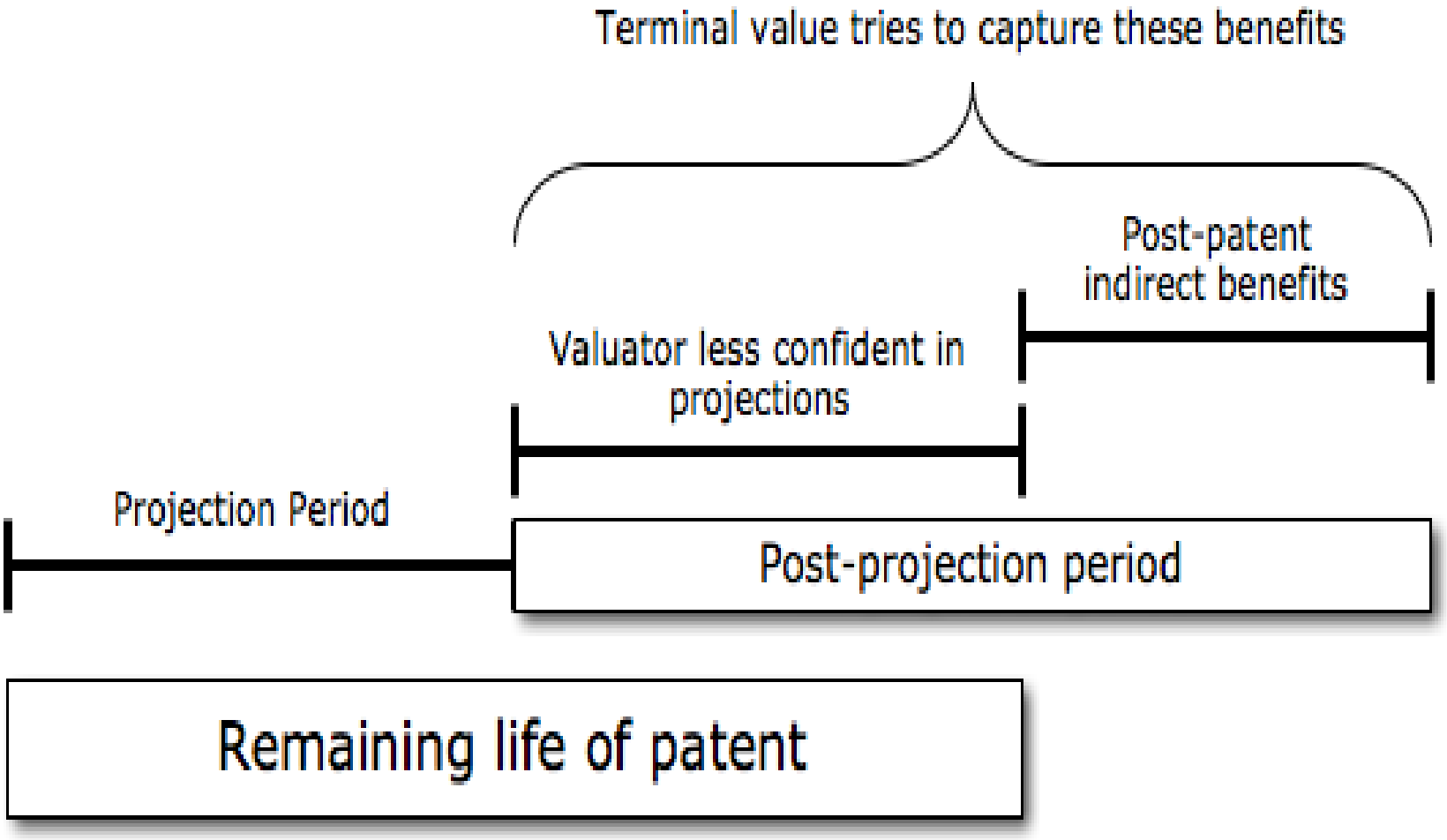
The valuator needs a mechanism to close the projections while still being able to capture future additions to the residual that may take place beyond the projection period. This closure process is referred to as “estimating the firm’s terminal value.”

Terminal value

The valuator will project (and discount) net economic benefits for those future periods for which she feels confident in her projections (e.g., for the next five years).

The valuator will then conclude the DFEB calculation with a terminal value. This terminal value ***approximates the residual additions from the end of the projection period until the eventual liquidation of the firm***.

Terminal value can also apply to patents



Terminal value

The formula for the DFEB analysis with a terminal value is:

$$PV = EB_0 + \frac{EB_1}{1 + r_1} + \frac{EB_2}{(1 + r_2)^2} + \frac{EB_3}{(1 + r_3)^3} + \cdots + \frac{EB_n}{(1 + r_n)^n} + \frac{\text{terminal value}_n}{(1 + r_n)^n}$$

Terminal value

Two of the most common methods of calculating terminal value in the context of valuing a firm are:

1. Stable growth rate method

2. Terminal multiple method

Stable growth method

This method takes the benefits from the final projection year and assumes they will grow at a constant rate going forward. The formula for the stable growth method is

$$terminal\ value = \frac{benefits\ from\ the\ final\ projection\ year\ x\ (1+stable\ growth\ rate)}{discount\ rate - stable\ growth\ rate}$$

Stable growth method

The stable growth method can be used when:

a. The asset's benefits are expected to continue in perpetuity, or for a very long period of time (e.g., 50 years); **and**

b. The valuator believes the benefits will grow at something approximating a stable growth rate.

Terminal multiple method

This method seeks to estimate the sales price of the asset at the end of the projection period.

The terminal multiple method uses a ratio analysis to do this.

Terminal multiple method

We do not have time for in-depth coverage of ratio analyses. For now, it is worth pointing out that asset sales are often priced based on a multiple of the asset's projected performance.

Terminal multiple method

A commonly used multiple is sales price-to-earnings.

If comparable assets are selling for 10x earnings, the valuator would apply that multiple to the final year of the projection period to estimate the sales price of the asset in that final year.

Terminal multiple method

P/E Ratio Example

Purchaser has the opportunity to buy a company (Target).

- Purchaser is confident in its profit projections for the next five years, but then feels less confident.
- In five years, Purchaser believes Target will be comparable to four publicly-traded companies. These companies sell similar products and have similar market sizes.
- Assume Purchaser is able to generate valuation ratios for the comparable portfolios using forward one-year operating profits.

Terminal multiple method

	Comparable Companies			
	A	B	C	D
Enterprise value of the companies	$400 million	$560 million	$280 million	$300 million
Forward 1-year operating profits	$40 million	$70 million	$40 million	$60 million
Sales price as a multiple of forward 1-year operating profits	10x	8x	7x	5x

Terminal multiple method

The comparable companies are valued between 5*x* and 10*x* forward 1-year operating profits.

- Purchaser examined the portfolios and believes Target is better than Company D, but not as good as Company A.
- Purchaser may therefore want to use a valuation ratio of 7*x* to 8*x* forward 1-year operating profits.
- Purchaser forecasts Target's forward 1-year operating profits at the end of the projection period to be $30 million.

Purchaser may want to use a terminal value in the range of $210 million to $240 million.

Terminal multiple method

The terminal multiple method is commonly used when valuing companies. There are often publicly traded companies—with publicly reported stock prices—that can be used to generate valuation ratios.

Many assets, however, lack such comparable data. For these asset classes, the terminal multiple method is not available.

Sample terminal value calculations

Sample Stable Growth Method Calculation

Assumptions for the calculation:

- Free cash flow for final projected period = $5 million
- Projected stable, long term growth rate = 6%
- Discount rate = 20%

$$\text{terminal value} = \frac{\text{final projected period of net economic benefits x } (1 + \text{stable, long term growth rate})}{(\text{discount rate} - \text{long term growth rate})} = \frac{\$5 \text{ million x } 1.06}{0.20} = \$26.5 \text{ million}$$

Sample Terminal Multiple Method Calculation

Assumptions for the calculation:

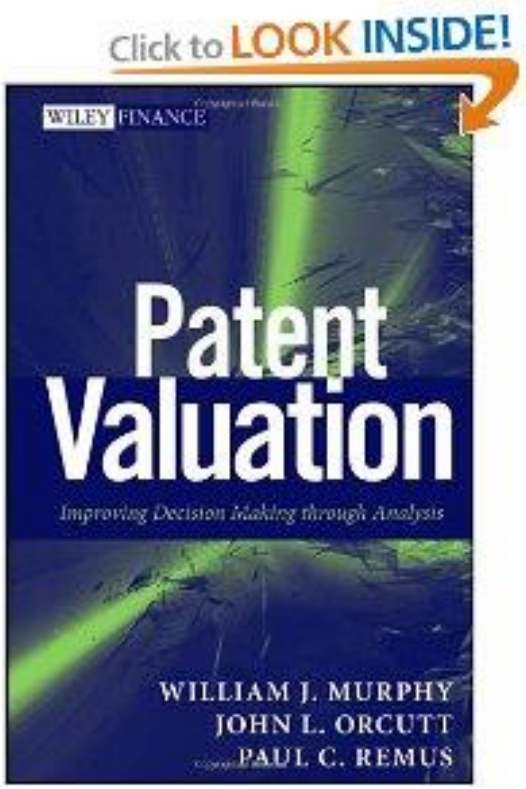
- Earnings for the final projected period = $5 million
- P/E ratio for a comparable set of companies (i.e., the company being valued will be like these comparable company by the final projected period) = 11x
- Terminal value = $55 million

Terminal value is a satisficing method

Developing the terminal value is itself a valuation analysis, although a relatively rudimentary one because of the high input uncertainty. Developing a terminal value is an example of a satisficing valuation method. As the projections extend further into the future and the uncertainty surrounding the inputs needed to develop those projections increases, a *good enough* valuation method is probably all that can reasonably be expected.

EXERCISE:
Let’s do a startup valuation!

John Orcutt is the author of . . .



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