



Lecture

Financing of Innovation

Risks: real and perceived

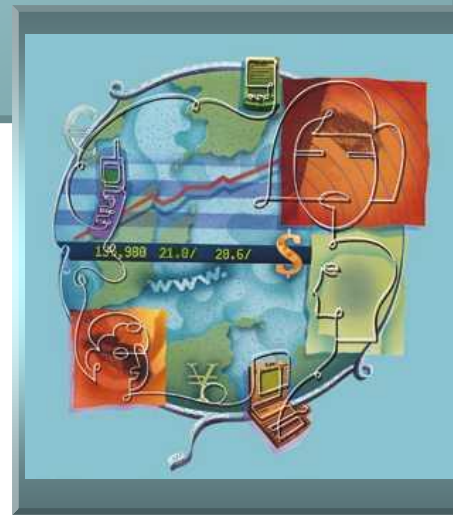
Dr. Mehdi Mili

Associate Professor of Finance

Dep. Of Econ & Finance,

University of Bahrain

milimehdi@gmail.com





Sources of Innovation financing

Financial success is the major goal of business. In order to achieve this goal, businesses must:

- have realistic financial plans
- monitor and review costs
- gain support of bankers, investors and venture capitalists.

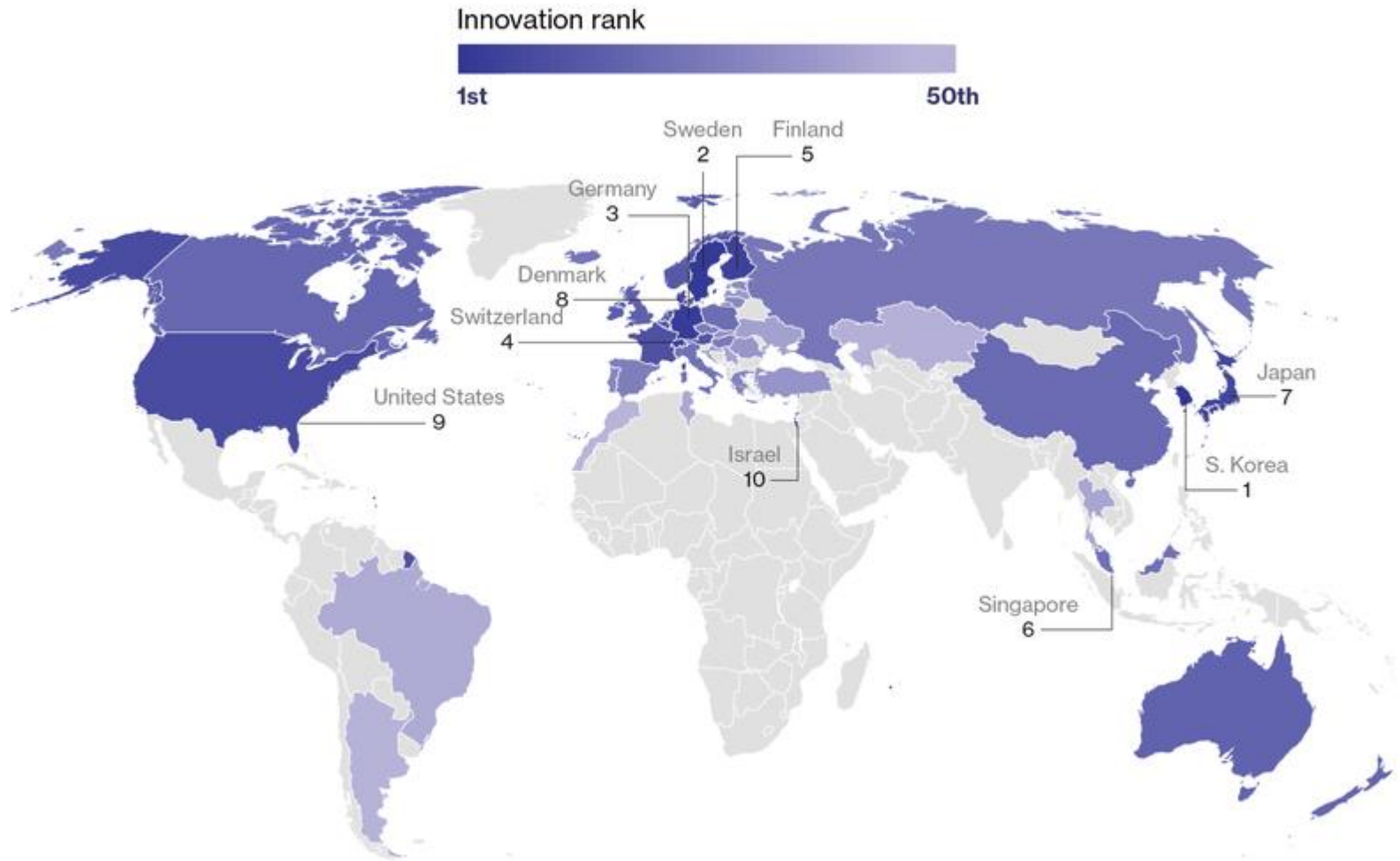
Some important sources of funding for innovation activities include:
your own funds

- government grants
- family and friends
- debt
- equity
- business angels
- venture capital
- crowd funding.



Fifty Most Innovative Economies

South Korea, Sweden and Germany top the list; Israel moved into top 10 for the first time



SOURCE(S): Bloomberg, International Labour Organization, International Monetary Fund, World Bank, Organization for Economic Co-operation and Development, World Intellectual Property Organization, United Nations Educational, Scientific, and Cultural Organization



- The generally accepted method of evaluation of investment, is based on discounted cash flows (DCF).
- The method is successfully used for investment projects with low level of uncertainty and duration from several months up to few years.
- In many cases it is not suited to long-term NPD and R&D projects, as it penalizes projects with high risk and potentially valuable projects can be rejected or terminated.



Weakness of DCF methods

- Do not take into account the typical nature of the NPD and R&D projects that can be divided into stages separated by gates, deciding about project continuation or termination.
- Financial models assume that the decision about the project realization is done at its very beginning and is irreversible. However, investments into NPD or R&D projects are incremental and the evaluators at the gates decides about the project fate on the basis of changing situation.



Two kinds of risks

- **specific risk**
- **market risk**



Specific risk

- Specific for the partial situation
- At least partly under your control (e.g. risk of a fire or risk of project failure)
- Can be diversified - we can use insurance to share fire risk and maintain the diversified project portfolio to protect against the risk of project failure
- Therefore the market does not pay any premium for specific risks
- Specific risk can be often characterized by its probability.
- Better management of specific risk can help us to achieve the competitive advantage.



Market risk

- Is not under your control
- Cannot be diversified. The pharmaceutical company, as a part of health care sector, can do little to diversify the market risk.
- Traditionally, market risk increases the capital expenses and therefore decreases the project value.
- However, the situation is different with options: here the higher market risk, expressed as volatility, increases the option value, which can be quantified using the Black-Scholes algorithm, well known from financial options.

Volatility

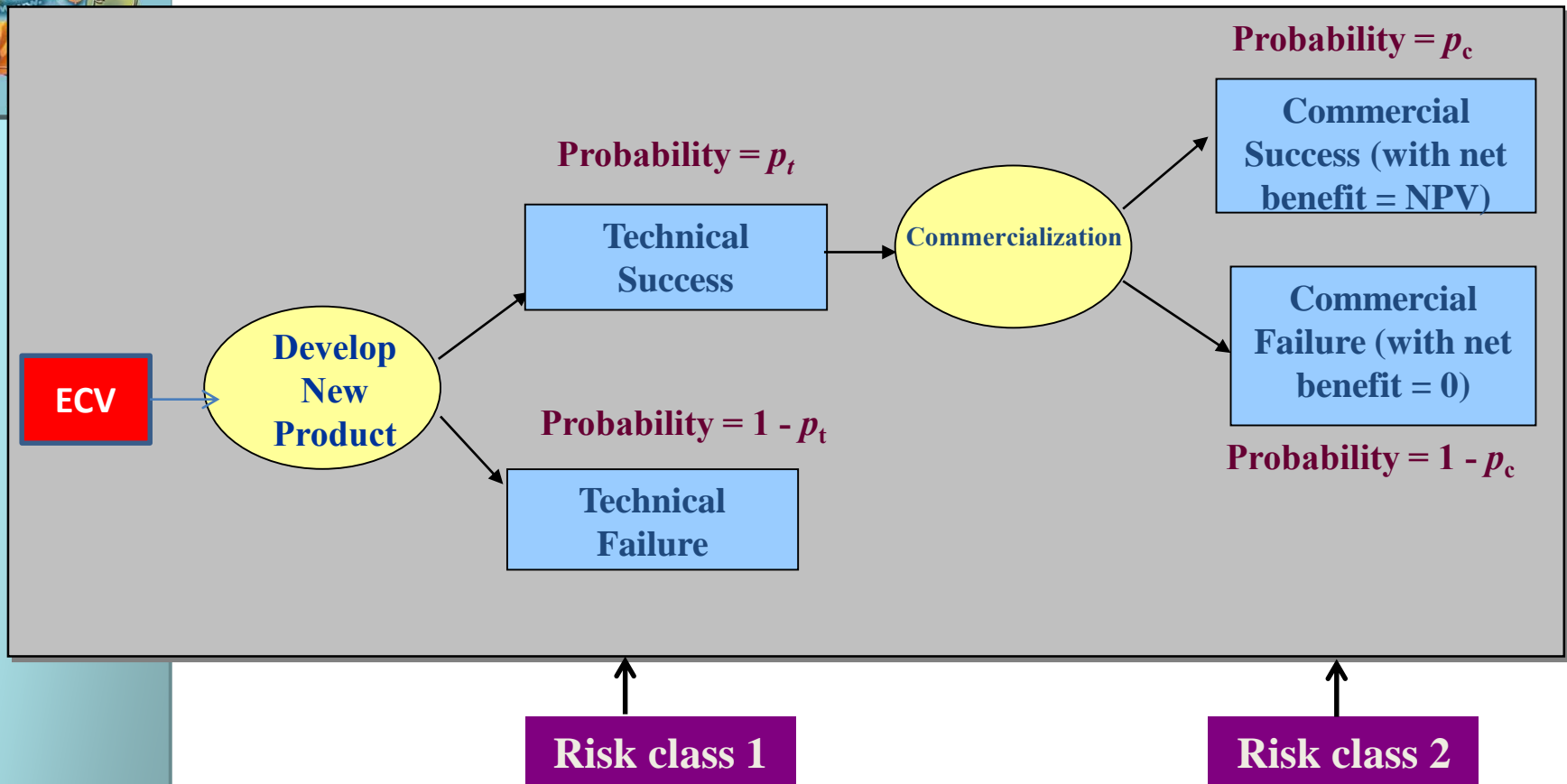
- Quantifies the rate of change of market value of the ***underlying asset***, i.e. the asset to its ownership we are entitled by buying the option (technology, database of customers ...).
- Is usually specific for the industry and can be estimated on the basis of information available from e.g. stock market, industry statistics, etc.
- The higher the volatility, the more advantageous is to hold the respective option.
- The higher volatility means the higher potential of both the increase and decrease of the related asset price. As the option holder we can fully exploit the increase, while in the case of decrease we do not realize the option and the maximum loss is limited by the option cost.



Project Expected Commercial Value (ECV)

- Takes into consideration all three important characteristics of each phase – its cost, duration and probability of success
- The project is modeled by the probability tree.
- The stage duration, together with the discount rate, is reflected in the net present value calculation.
- Illustration: project with only two stages – development and commercialization

Expected Commercial Value (ECV)



ECV is the expected NPV of the project, calculated by using the probabilities of the various alternatives.

$$ECV = [(NPV * p_c - C) * p_t] - D$$

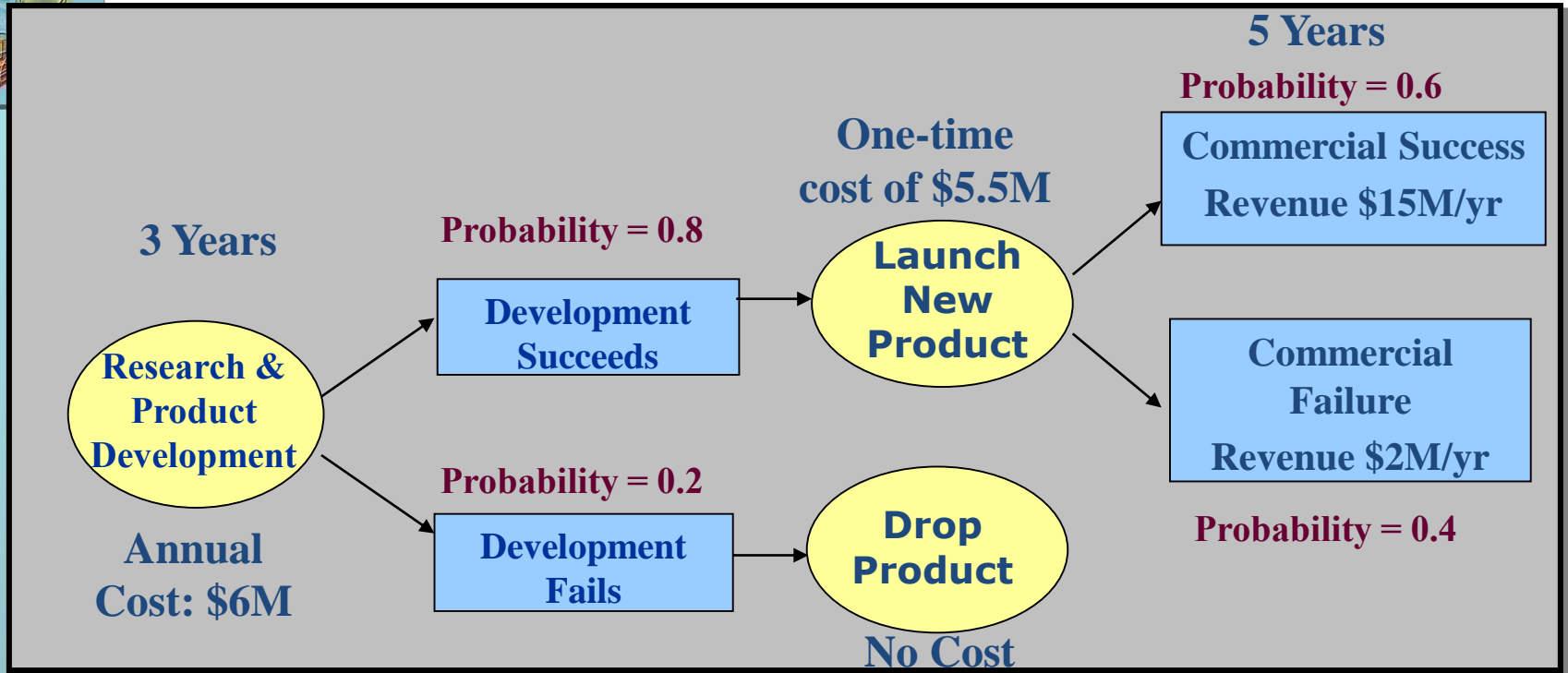
according to [Cooper 2001]



ECV Example

- The design of a new product is expected of \$6m
- There is a .8 probability that the product will be technically feasible
- If feasible, the product can be launched in year 4 with an estimated cost of \$5.5M
- If launched, the product will be a commercial success with probability 0.6, earning gross revenues of \$15M.
- If it is a commercial failure, then the revenue is only \$2M.

ECV Example

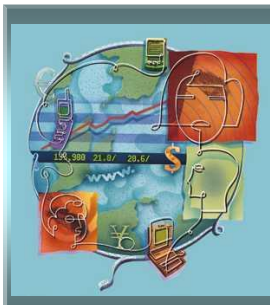


Year	What's Happening	Commercial Success	Commercial Failure
1	Technical development		
2	Product sales	\$15	\$2

ECV Example

Example calculation:

$$\text{ECV} = .8[(.6)(15) + (.4)(2) - 5.50] + .2(0) = 3.44$$





Criticisms of ECV Analysis

- Using expectation does not capture worst case risk
- The possibility of changing decisions in the future changes the risk characteristics of the project.
- Consequently, the use of the same discount rate may be inappropriate.
- However, it's not clear what other discount rate should be used.

Example of Expected Commercial Value



As an example of how ECV can be used, Entwhistle Electric is considering an investment in a tiny battery for cell phone applications. There is some risk that the battery cannot be developed in the necessary size. Facts pertaining to the project are:

Project net present value	\$8,000,000
Probability of commercial success	90%
Commercialization cost	\$1,500,000
Probability of technical success	75%
Product development cost	\$3,500,000

Entwhistle's financial analyst derives the following ECV for the project from the preceding information:

$$(((\$8,000,000 \text{ Project NPV} \times 90\% \text{ probability of commercial success}) - \$1,500,000 \text{ commercialization cost}) \times (75\% \text{ probability of technical success})) - \$3,500,000 \text{ product development cost}$$

Expected commercial value = \$775,000



Conclusion

- Illustration of the often neglected side of the new product development and R&D projects.
- The researchers, engineers, designers must work together with investors to determine before the project launch and in the gates how efficiently the capital invested into the effort is used.
- It is not an easy task; however, we hope that we succeeded to persuade the auditorium that this important task cannot be avoided.

References

- [Boer 2003] BOER F.P. *Risk-adjusted Valuation of R&D Projects*, online, <http://www.tigerscientific.com>
- [Cooper 2001] COOPER R.G., EDGET S.J., KLEINSCHMIDT E.J. *Portfolio Management for New Products*, Basic Books, 2001, ISBN 0-7382-0514-1
- [Cooper 2005] COOPER R.G. *Product Leadership*, Basic Books, 2005, ISBN 0-465-01433-X
- [Vacek 2006] Vacek J. “Structuring the new product development processes”, in *AEDS 2006 Proceedings*, pp. xx, University of West Bohemia, Pilsen, 2006, ISBN

