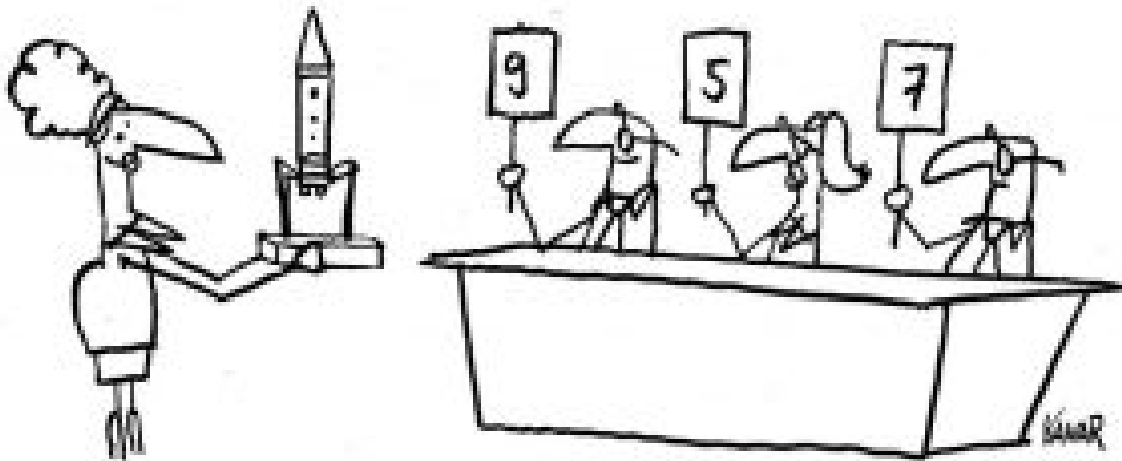
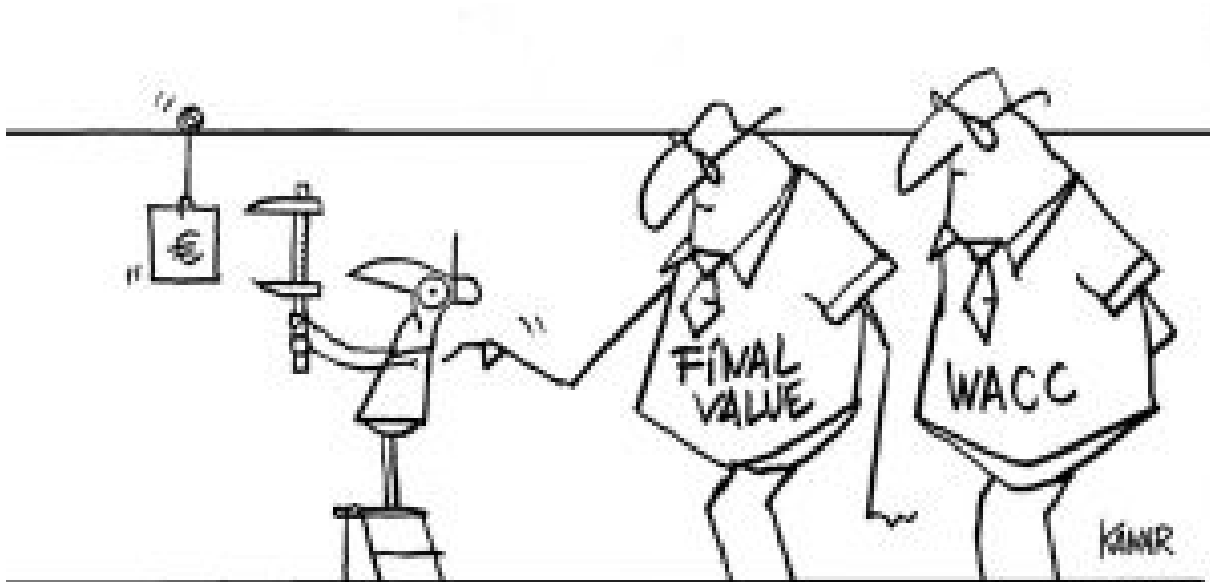


By Benoît Gailly, 17 January 2018

Valuating innovative business models: quantifying the unquantifiable



Valuation is a decision-making process aimed at **making smart bets** on the “least bad” way to “put a number” on a business model, taking into account what is known, what is believed and the remaining ambiguities and uncertainties. Numbers are a necessary evil.



The **net present value (NPV)** method is a very powerful but also very dangerous technique for valuing a business model based on its expected riskiness and potential cash flows. It can in particular be effectively used to compare multiple business models under similar cost of capital and terminal value assumptions.



Sensitivity analysis and scenario planning approaches can be used to **integrate known risks and potential uncertainties** and to reduce the scope of managerial ignorance, provided they are based on challenging business conversations regarding “what you need to believe” rather than black box models and/or blind number-crunching.

Bibliography

The valuation decision-making process: making smart bets

Keywords: ambiguity, IRR (internal rate of return), mathiness, sources of uncertainties, ROI (return on investment), uncertainty, valuation methods

- (Book) Blastland, M. & A. Dilnot (2007) [*The Tiger That Isn't. Seeing through a world of*](#)

[numbers](#)

- (Book) Christensen, C. M., Kaufman, S. P., & Shih, W. C. (2010). [Innovation killers: how financial tools destroy your capacity to do new things](#). Harvard Business Review Press.
- (Book) Goldfarb, B., & Kirsch, D. A. (2019). [Bubbles and Crashes: The Boom and Bust of Technological Innovation](#). Stanford University Press.
- (Books) Keen, S. (2011). [Debunking Economics: The Naked Emperor Dethroned?](#)-Revised, Expanded and Integrated Edition. Zed Books.
- (Book) Kindleberger, Charles Poor, and Robert O'Keefe. [Manias, panics, and crashes](#). Palgrave Macmillan, 2001.
- (Books) Knight, F. H. (2012). [Risk, uncertainty and profit](#). Courier Corporation.
- (Book) Mackay, C. (2002). [Extraordinary popular delusions and the madness of crowds](#). Barnes & Noble.
- (Video) David Rose, [How to pitch to a VC](#) (TED talk)
- (Article) Åstebro, T., & Elhedhli, S. (2006). The effectiveness of simple decision heuristics: Forecasting commercial success for early-stage ventures. *Management Science*, 52(3), 395-409.
- (Article) Berkovitch, E., & Israel, R. (2004). Why the NPV criterion does not maximize NPV. *The Review of Financial Studies*, 17(1), 239-255.
- (Article) Brun, E., Saetre, A.S., & Gjelsvik, M. (2009). Classification of ambiguity in new product development projects. *European Journal of Innovation Management*, 12(1), 62-85.
- (Article) Cassar, G. (2010). Are individuals entering self-employment overly optimistic? An empirical test of plans and projections on nascent entrepreneur expectations. *Strategic Management Journal*, 31(8), 822-840.
- (Article) Cooper, A. C., Woo, C. Y., & Dunkelberg, W. C. (1988). Entrepreneurs' perceived chances for success. *Journal of Business Venturing*, 3(2), 97-108.
- (Article) Chaney, P. K., Devinney, T. M., & Winer, R. S. (1991). The impact of new product introductions on the market value of firms. *Journal of Business*, 573-610.
- (Article) Cohen, L., Diether, K., & Malloy, C. (2013). Misvaluing innovation. *The Review of Financial Studies*, 26(3), 635-666.
- (Article) Denrell, J., & Fang, C. (2010). Predicting the next big thing: Success as a signal of poor judgment. *Management Science*, 56(10), 1653-1667.
- (Article) Fourcade, M. (2011). Cents and sensibility: economic valuation and the nature of "nature". *American Journal of Sociology*, 116(6), 1721-77.
- (Article) Ghosal, Vivek, and Prakash Loungani. "The differential impact of uncertainty on investment in small and large businesses." *Review of Economics and Statistics* 82.2 (2000): 338-343.
- (Article) Hering, T., Olbrich, M., & Steinrucke, M. (2006). Valuation of start-up internet companies. *International Journal of Technology Management*, 33(4), 406-419.
- (Article) O'Connor, G.C., & Rice, M.P. (2013). A comprehensive model of uncertainty associated with radical innovation. *Journal of Product Innovation Management*, 30(S1), 2-18.
- (Article) Segal, Gill, Ivan Shaliastovich, and Amir Yaron. "Good and bad uncertainty: Macroeconomic and financial market implications." *Journal of Financial Economics* 117.2 (2015): 369-397.
- (Article) Shepherd, D. A., & Zacharakis, A. (2002). Venture capitalists' expertise: A call for research into decision aids and cognitive feedback. *Journal of Business Venturing*, 17(1),

1-20.

- (Article) von Gelderen, M., Frese, M., & Thurik, R. (2000). Strategies, uncertainty and performance of small business startups. *Small Business Economics*, 15(3), 165-181.

Carefully using net present value (NPV) to value business models

Keywords: cost of capital, Discounted Cash Flow, Final Value, Net Present Value, opportunity cost, real options, risk premium, WACC

- (Book) Copeland, Thomas E., Tim Koller, and Jack Murrin. "[Valuation: measuring and managing the value of companies.](#)" (1991).
- (Video) [Startup Valuation made simple by Serious Funding: The VC Method](#)
- (Article) Adner, R., & Levinthal, D.A. (2004). What is not a real option: Considering boundaries for the application of real options to business strategy. *Academy of Management Review*, 29(1), 74-85.
- (Article) Gunther McGrath, R., & Nerkar, A. (2004). Real options reasoning and a new look at the R&D investment strategies of pharmaceutical firms. *Strategic Management Journal*, 25(1), 1-21.
- (Article) Hanafizadeh, P., & Latif, V. (2011). Robust net present value. *Mathematical and Computer Modelling*, 54(1), 233-242.
- (Article) Jacob, W.F., & Kwak, Y.H. (2003). In search of innovative techniques to evaluate pharmaceutical R&D projects. *Technovation*, 23(4), 291-296.
- (Article) Lint, O., & Pennings, E. (1998). R&D as an option on market introduction. *R&D Management*, 28(4), 279-287
- (Article) Loch, C. H., & Bode-Greuel, K. (2001). Evaluating growth options as sources of value for pharmaceutical research projects. *R&D Management*, 31(2), 231-248.
- (Article) Mitchell, G. R., & Hamilton, W. F. (2007). Managing R&D as a strategic option. *Research-Technology Management*, 50(2), 41-50.
- (Article) Newton, D. P., Paxson, D. A., & Widdicks, M. (2004). Real R&D options 1. *International Journal of Management Reviews*, 5(2), 113-130.
- (Article) Pakes, A. (1984). *Patents as options: Some estimates of the value of holding European patent stocks* (No. w1340). National Bureau of Economic Research.
- (Article) Robichek, Alexander A., and Stewart C. Myers. "Conceptual problems in the use of risk-adjusted discount rates." *The Journal of Finance* 21.4 (1966): 727-730.
- (Article) Romer, P (2015). Mathiness in the Theory of Economic Growth. *American Economic Review*, 105(5), 89-93.
- (Article) Ross, S.A. (1995). Uses, abuses, and alternatives to the net-present-value rule. *Financial Management*, 24(3), 96-102.
- (Article) Wonglimpiyarat, J. (2018). What is it about strategic implications of using financial models in the process of technology management?. *The Journal of High Technology Management Research*. <https://doi.org/10.1016/j.hitech.2018.12.001>

Integrating known risks and potential uncertainties:

Keywords: black swans, Monte-Carlo simulations, risk management, scenario planning, sensitivity analysis

- (Book) Arend, R.A. (2024) *Uncertainty in Strategic Decision Making: Analysis, Categorization, Causation and Resolution*. Palgrave Macmillan
- (Book) Gilovich, T., D. Griffin and D. Kahneman, [*Heuristics and Biases: The Psychology of Intuitive Judgment*](#), Cambridge University Press, 2002
- (Book) Razgaitis, R. (2003) [*Dealmaking using real options and Monte-Carlo Analysis*](#). John Wiley, Hoboken NJ
- (Book) Silver, N. (2012) [*The Signal and the Noise: Why So Many Predictions Fail—But Some Don't*](#). Penguin Press
- (Video) HBR: [The Six-Minute Guide to Making Better High-Stakes Decisions](#), Sarah Cliffe
- (Video) [Shell, Navigating an Uncertain Future](#)
- (Article) Angus, R. W., Packard, M. D., & Clark, B. B. (2022). Distinguishing unpredictability from uncertainty in entrepreneurial action theory. *Small Business Economics*, 1-23.
- (Article) Bodwell, W., & Chermack, T. J. (2010). Organizational ambidexterity: Integrating deliberate and emergent strategy with scenario planning. *Technological Forecasting and Social Change*, 77(2), 193-202.
- (Article) Boudreau, K. J., Guinan, E. C., Lakhani, K. R., & Riedl, C. (2016). Looking across and looking beyond the knowledge frontier: Intellectual distance, novelty, and resource allocation in science. *Management Science*, 62(10), 2765-2783.
- (Article) Bylund, P.L., & McCaffrey, M. (2017). A theory of entrepreneurship and institutional uncertainty, *Journal of Business Venturing*, 32(5), 461-475.
- (Article) Cornelius, P., Van de Putte, A., & Romani, M. (2005). Three decades of scenario planning in shell. *California Management Review*, 48(1), 92-109.
- (Article) Courtney, Hugh. "Decision-driven scenarios for assessing four levels of uncertainty." *Strategy & Leadership* 31.1 (2003): 14-22.
- (Article) Das, T. K., & Teng, B. S. (1999). Cognitive biases and strategic decision processes: An integrative perspective. *Journal of Management Studies*, 36(6), 757-778
- (Article) Denning, S. (2006). Effective storytelling: strategic business narrative techniques. *Strategy & Leadership*, 34(1), 42-48.
- (Article) Denrell, J., Fang, C., & Liu, C. (2014). Perspective—Chance explanations in the management sciences. *Organization Science*, 26(3), 923-940.
- (Article) Dow, J., & da Costa Werlang, S. R. (1992). Uncertainty aversion, risk aversion, and the optimal choice of portfolio. *Econometrica: Journal of the Econometric Society*, 197-204.
- (Article) Goodwin, P., & Wright, G. (2010). The limits of forecasting methods in anticipating rare events. *Technological forecasting and social change*, 77(3), 355-368.
- (Article) Hanafizadeh, Payam, Abolfazl Kazazi, and Azam Jalili Bolhasani. "Portfolio design for investment companies through scenario planning." *Management Decision* 49.4 (2011): 513-532.
- (Article) Jalonen, H. (2012). The uncertainty of innovation: a systematic review of the literature. *Journal of Management Research*, 4(1), 1.
- (Article) Jovanović, Petar. "Application of sensitivity analysis in investment project evaluation under uncertainty and risk." *International Journal of Project Management* 17.4 (1999): 217-222.
- (Article) Kenney, H.S., & Pelley, B. (2014). Stories that drive the future: how narratives can improve scenario planning. *Strategy & Leadership*, 42(5), 28-33.
- (Article) Keizer, J. A., Vos, J. P., & Halman, J. I. (2005). Risks in new product development: devising a reference tool. *R&D Management*, 35(3), 297-309.

- (Article) Kim, L. (1998). Crisis construction and organizational learning: Capability building in catching-up at Hyundai Motor. *Organization Science*, 9(4), 506-521.
- (Article) Kleinknecht, A., & Van Der Panne, G. (2012). Predicting new product sales: The post-launch performance of 215 innovators. *International Journal of Innovation Management*, 16(02), 1250011.
- (Article) Mendonça, S., e Cunha, M. P., Ruff, F., & Kaivo-oja, J. (2009). Venturing into the wilderness: Preparing for wild cards in the civil aircraft and asset-management industries. *Long Range Planning*, 42(1), 23-41..
- (Article) Postma, T. J., & Liebl, F. (2005). How to improve scenario analysis as a strategic management tool?. *Technological Forecasting and Social Change*, 72(2), 161-173.
- (Article) Ruff, Frank. "Corporate foresight: integrating the future business environment into innovation and strategy." *International Journal of Technology Management* 34.3-4 (2006): 278-295.
- (Article) Van Groenendaal, Willem JH. "Estimating NPV variability for deterministic models." *European Journal of Operational Research* 107.1 (1998): 202-213.
- (Article) Vecchiato, R. (2019). Scenario Planning, Cognition, and Strategic Investment Decisions in a Turbulent Environment. *Long Range Planning*. (in press) <https://doi.org/10.1016/j.lrp.2019.01.002>
- (Article) Vettorello, M., Eisenbart, B., & Ranscombe, C. (2021). The Innovation System Roadmap: A novel approach to instil futures-oriented reasoning in strategic decision making. *Creativity and Innovation Management*.
- (Article) Wiltbank, R., Read, S., Dew, N., & Sarasvathy, S. D. (2009). Prediction and control under uncertainty: Outcomes in angel investing. *Journal of Business Venturing*, 24(2), 116-133.
- (Article) Xu, Chonggang, and George Zdzislaw Gertner. "Uncertainty and sensitivity analysis for models with correlated parameters." *Reliability Engineering & System Safety* 93.10 (2008): 1563-1573.

(c) Prof. Benoit Gailly, Louvain School of Management