

Capital Budgeting: Sequential Choices

(Welch, Chapter 13-3)

Ivo Welch

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1: ABC's New Factory

ABC has already invested \$20 million in opening its new flagship factory. Finishing it will only require another \$5 million. But demand has recently dropped, and expected revenues are only \$400 thousand per year. The appropriate cost of capital is 10%.

Should ABC finish its half-finished factory?

2: ABC's Gadget Factory

ABC produces 100,000 gadgets.

Each gadget costs \$1 to produce.

The market price of gadgets is \$1.80 each.

- ▶ Demand is perfectly elastic.

To produce another 100,000 gadgets requires running the machine at night.

- ▶ These extra 100,000 gadgets however cost not \$1 but \$2 to produce.

3: One-Year (Exposition)

You own the factory for exactly one year.

The gadget price process is:

- ▶ With 10% probability, the output price doubles after exactly one year.
- ▶ With 10% probability, the output price halves after exactly one year.
- ▶ With 80% probability, the output price stays the same.

4: Other Parameters

So, **the expected price is \$1.89.**

Shutting down the plant, doubling production, or reopening it costs nothing.

The cost of capital is a constant 0% per year—for illustration.

5: ABC's Plant Value?

What is the value of this plant?

Is it $\$1.89 \cdot 100,000$?

6: Solve It!

What is the value of this plant?

How do you go about solving this?

7: Is Calculation Difficult?

Is it difficult to do this calculation for 5 years?

30 years?

With more than one or two choices?

8: Switching Costs

As before, but assume that switching the plant costs \$20,000. What is the value of this plant now?

How do you go about solving this?

Shutdown Costs of Oil Wells in 2020

9: “Real Options”

Real Option == Strategic Option

As an owner of a real option, do you like volatility?

10: Other Real Options?

Leverage a product into future markets.

Find product spinoffs. The ability to learn about (how to do) future products.

Stop the project if conditions are bad.

Delay or mothball-restart the project if conditions are bad.

Accelerate the project if conditions are good.

Expand the project if conditions are good.

11: The Value of Unbuilt Land

What is the value of unbuilt land in the boonies?

12: The Value of R&D

What is the value of R&D?

13: Real Option Conclusion

A real option is the flexibility to change in the future, *depending* on the *then*-prevailing conditions.

Such flexibility adds value and is one reason why you cannot take the expected price and multiply it by the expected quantity of output.

14: CEO Use

- ▶ 52% of managers do sensitivity analysis (not scenario analysis).
- ▶ 27% work with real options.
- ▶ 14% do simulations.

NOTE:

- ▶ In the web appendix to Chapter 12 (posted in the companion), there are a lot more examples of real options and decision trees.