



Module 4

Alternative Approaches to Valuation and Investment

Examples of Real Options in Practice
(Is that an option in your project?)

Presenter: Sean Pinder



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Examples of real options

We will consider three common types of real options:

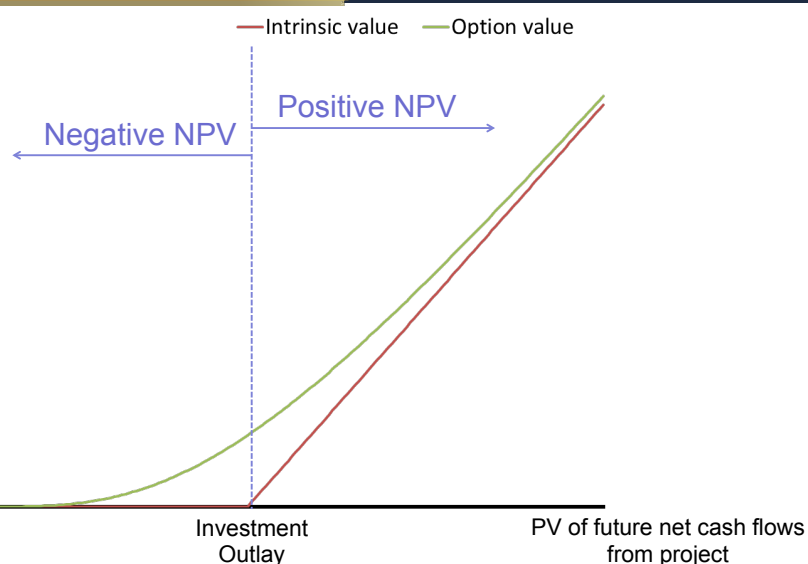
1. Option to Invest (Delay Investment)
2. Option to Expand
3. Option to Abandon Operations.

The Option to Invest (Delay Investment)

Key Features

- A call option
- Exercise price is equal to the up-front investment required when you decide to go ahead with the project
- The value of the underlying asset is the present value of the net cash flows from operating the project
- Option premium (price) is what was necessary to spend to establish the option
- Volatility is reflected in the forecast variability of the future cash flows from the project
- Term to expiry is the period of time you have the right to exercise the option.

The Option to Invest (Delay Investment)



The Option to Invest (Delay Investment)

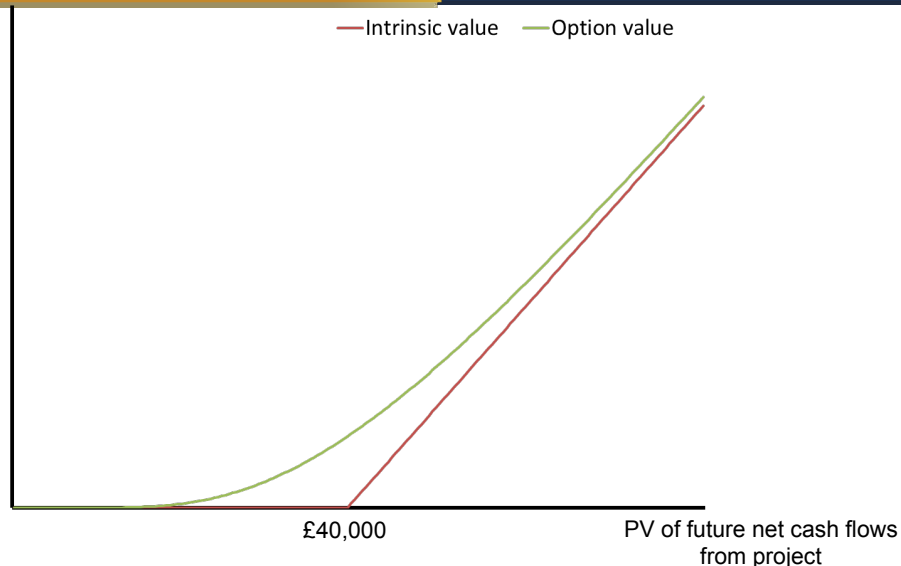
Let's return to our initial idea about developing a pastizzi manufacturing business.



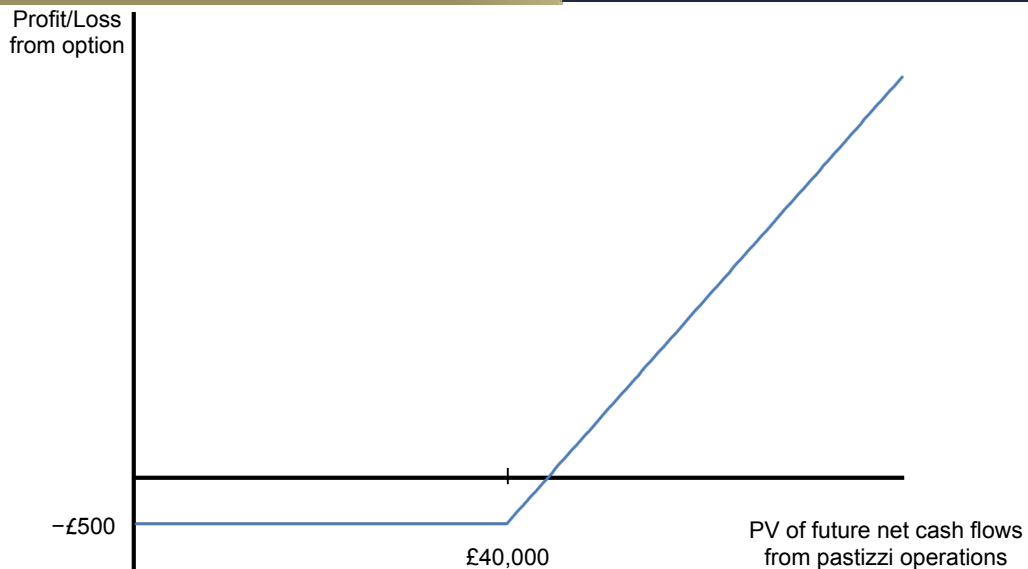
You decide against ever opening the business in your own home but if you want to open a pastizzi-selling business in a factory – you will need to have purchased the relevant permits – for £500 – well in advance of the time that you make a decision about the project.

If you choose to go ahead you will need to spend £40,000 up-front.

The Option to Invest: Our example



The Option to Invest: Our example

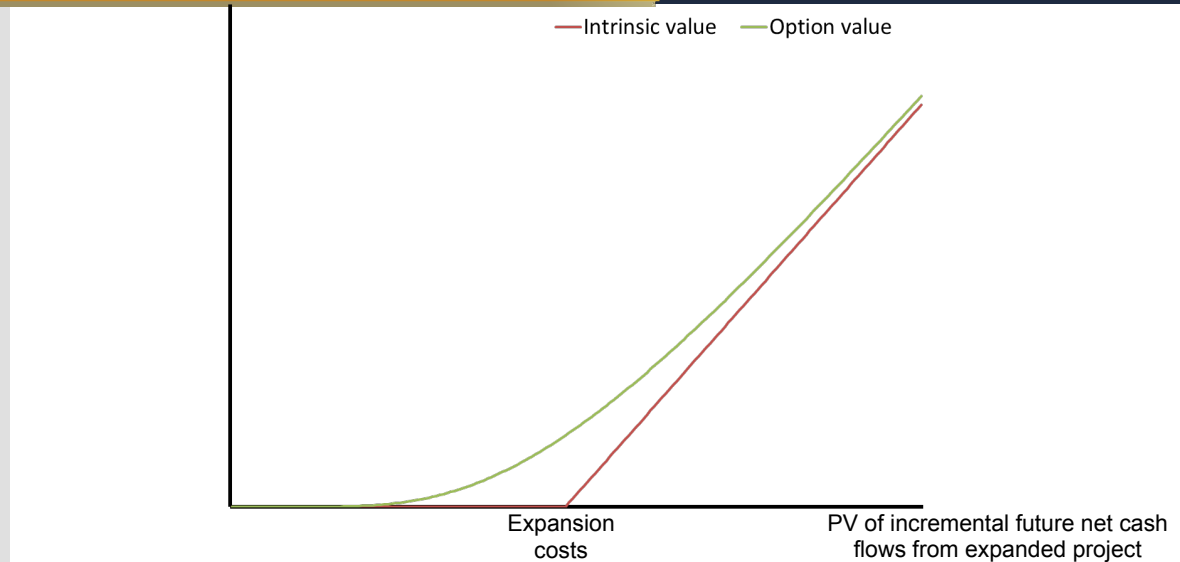


The Option to Expand

Key Features

- A call option
- Exercise price is equal to the costs of expansion
- The value of the underlying asset is the present value of the **incremental** net cash flows from expanded operations
- Option premium (price) is what was necessary to spend to establish the option
- Volatility is reflected in the forecast variability of the future **incremental** cash flows from the expanded operations
- Term to expiry is the period of time you have the right to exercise the option.

The Option to Expand



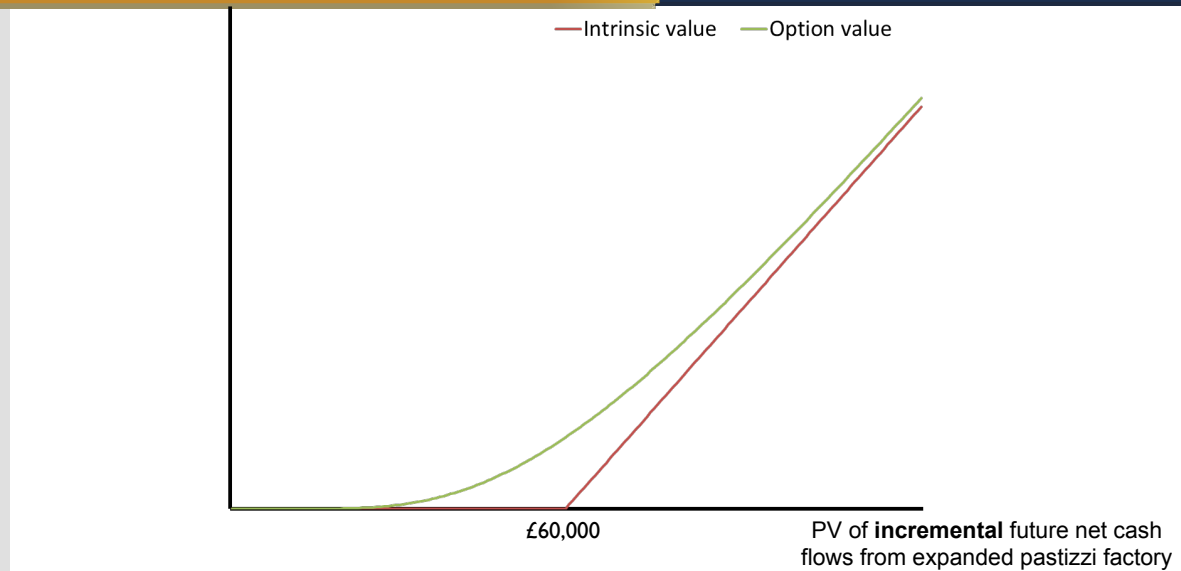
The Option to Expand

You have a choice of two locations for your pastizzi factory:

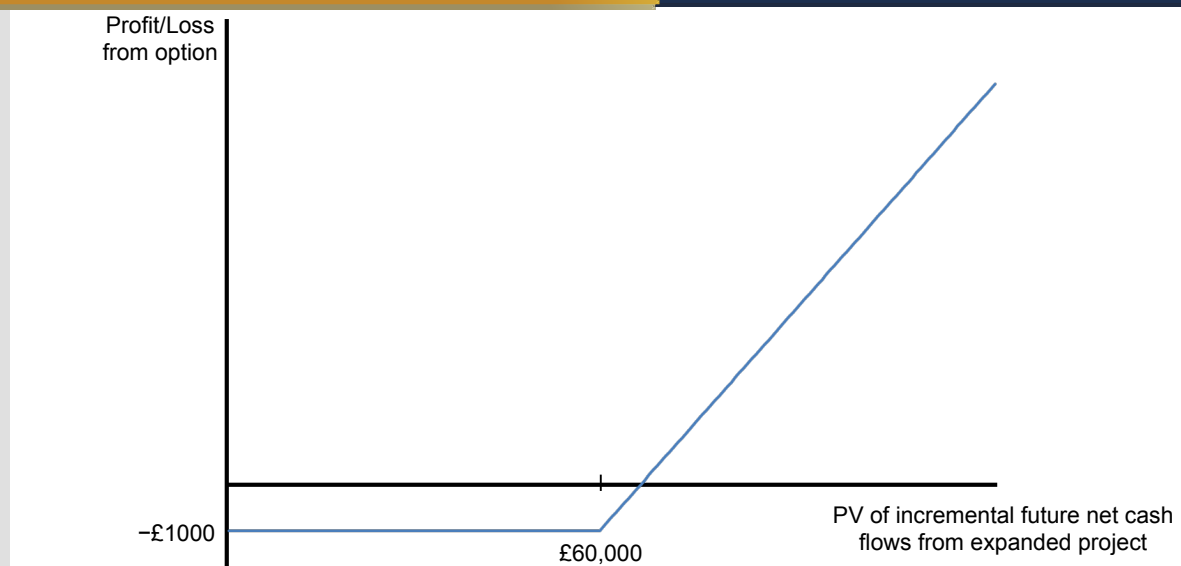
1. Factory A – with space to meet all current projected levels of demand.
2. Factory B – a larger factory which could facilitate increased production activity if required. It would also cost an additional £1,000 up-front over and above the cost of factory A. To rejig your factory to increase production would cost £60,000.



The Option to Expand



The Option to Expand



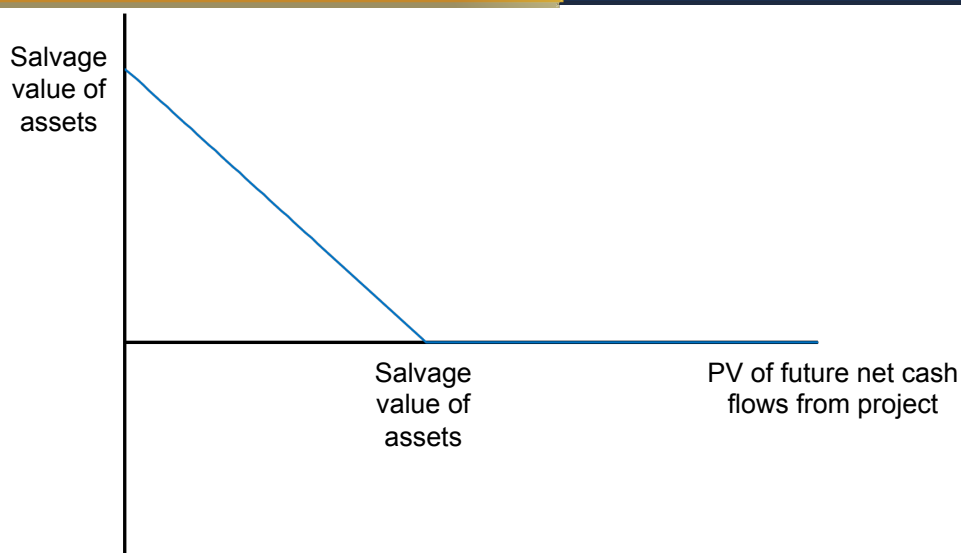


The Option to Abandon Operations

Key Features

- A put option
- Exercise price is equal to the salvage value of the assets that can be sold upon abandonment
- The value of the underlying asset is the present value of the net cash flows from continued operations
- Option premium (price) is what was necessary to spend to establish the option
- Volatility is reflected in the forecast variability of the future cash flows from the project
- Term to expiry is the period of time you have the right to exercise the option.

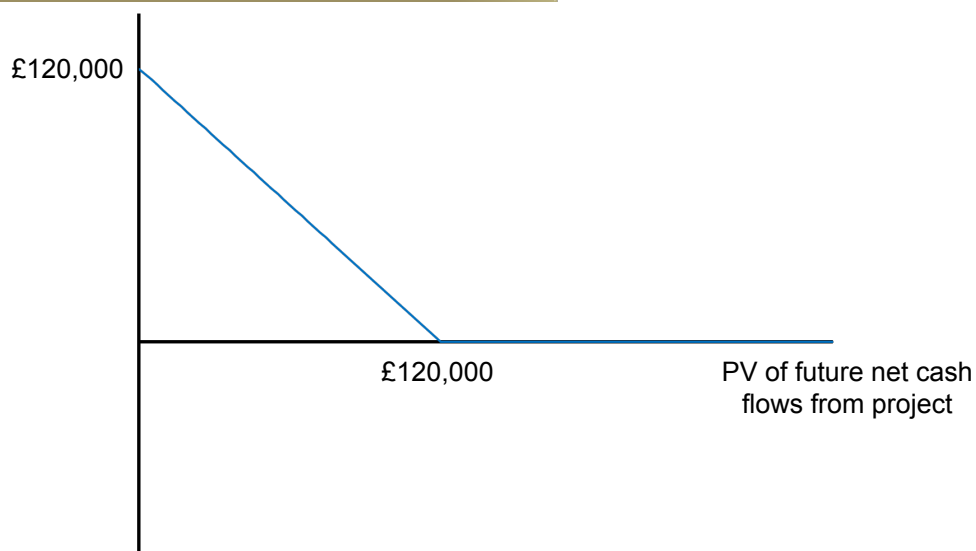
The Option to Abandon



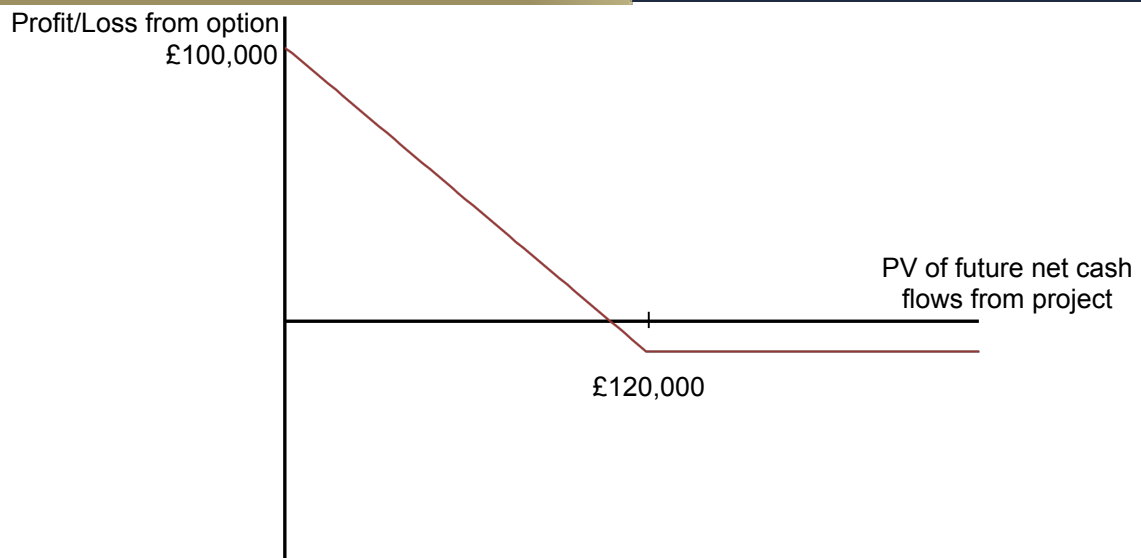
The Option to Abandon Operations: Example

- The local government is very keen to promote employment in the area and they either require you to sign a binding contract agreeing to operate your business in the area for a full 5 year period – which matches the useful life of your equipment.
- Alternatively, you can pay an additional £20,000 up front – which would give you the right to cease operations and sell off your equipment at any time.
- The salvage value of your assets at the moment is £120,000.

The Option to Abandon



The Option to Abandon



Early exercise?

Recall that when dealing with financial options – it doesn't make sense to exercise American style options early **unless**...

- Call Options – the underlying asset is about to pay a significant dividend.
- Put Options – the option is **deep-in-the-money** such that there is little likelihood that you will regret receiving the exercise price early.



Early exercise?

Similarly, we can explain the rational early exercise of real options.

For example:

- Option to invest – we may exercise to avoid missing out on cash flows from project (analogous to dividends from share).
- Option to abandon – we may exercise when the PV of cash flows from continued operations is far below the salvage value of assets.

Summary

We have considered three common types of real options:

1. Option to Invest (Delay Investment)
2. Option to Expand
3. Option to Abandon Operations.

Identified the reason why real options might be exercised early – and linked those reasons to the similar rationale for exercising financial options early.

How can we approximate the value of real options?



Source list

All diagrams (Slides 4, 6, 7, 9, 11, 12, 14, 16, 17) and examples produced by Sean Pinder.
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Slide 5:

Pastizzi (<https://flic.kr/p/8CxFwS>) by Charles Haynes
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