$$NPV'_0 - NPV_0 = \$86$$

This value represents the value of the flexibility.

3.1.2 ROA approach[5]

First of all, let start to define an option. Option is an agreement that gives the holder the right to buy or sell an Asset for a certain price (established now!), at (or by) a certain future time. The owner of a "call" option that gives the owner the right, not the obligation, to make the investment in another period of time, and pay now an exercise price. The underlying asset of the real option, in this case, is the good (oil, gas, fishering…), and the exercise price is represented by the amount of the initial investment.

The ROA has been introduced in literature as an approach that can be able to overtake the limits of the NPV since it evaluates an opportunity of investment like an option that, if it has been exercised, it determines the start of the production/investment. When an enterprise has a possibility to make a decision like this, it does mean that it is the owner of a "call" option that gives the owner the right, not the obligation, to make the investment in another period of time, and pay now an exercise price. The underlying asset of the real option, in this case, is the good (semi-conductors, in our example), and the exercise price is represented by the amount of the initial investment. If the firm decides to invest it means the firm exercises the option and this decision is "irreversible": even if the investment can be sold to another enterprise, it does not possible to re-purchase the option or the money that the firm paid for its exercise. The exercise of the option is optimal when it is "deep in the money", because it guarantees that the value of the returns is greater than the cost of investment. As a consequence, the evaluation of the opportunity of the investment can be done with methods similar to the financial option models.

In our example[6], we use a binomial approach in order to build a risk-free portfolio, with a long position on the opportunity of investment and a short position on "*n*" semi-conductors. The opportunity of the investment plays the rule of the financial option and the semi-conductors are the underlying asset, where "n" represents the delta of the option, that is, the value of the option when change the value of the underlying asset.

The discounted values of the investment in time 1, of the two stages (up and down) are, respectively:

$$PV_1^{up} = \sum_{s=0}^{\infty} \frac{150}{(1+0.1)^s} = 1{,}650$$

$$PV_1^{down} = \sum_{s=0}^{\infty} \frac{50}{(1+0.1)^s} = 550$$

The exercise of the option (that is, to invest) gives to the owner the right to obtain the discounted value of the cash flows of the project and the cost of investment is the exercise price of the option.

[5] For a more analytical dissertation about option and investment under uncertainty, see Dixit & Pindyck (1994).

[6] Note that we are using as a reference a "European option", where the exercise of the option can be done only at the delivery time. It can be extend the model also to the case of a "American options", that is, contracts that provide the right to exercise the option in every time before the delivery.