Current draft: February 14, 2018

Real Options 2.

Another important example of a real option is the option to wait to invest. This is especially important when an investment is irreversible. Waiting reduces possible regret. Consider a very simplified example to make the point. A firm has developed a new technology (an example might be a digital recording device like TiVo). It can build a new factory which will begin production in one year for $2 billion. Once the factory is built, it is so specific to the new technology that it can not be redeployed (of course it could be abandoned). There are 2 possible characterizations of consumer demand that will become evident in one year. In the "Up-" state, the project would generate a 30-year annuity throwing off $400 million per year. In the "Down-" state the project would generate a 30-year annuity throwing off $160 million per year. To focus attention on the real options, let's assume that this is an all equity firm, and its cost of equity is 10%. So WACC is 10%.

First, let's consider this project's NPV.

Step 1: Value of $1 annuity for 30 years at 10%: $\frac{1}{0.1} - \frac{1}{0.1}/(1.1)^{30}$ which is 9.4269.

Step 2: Expected Value of Future cash flows (starting in 1 year):
$.5 \cdot 3,770.77 + .5 \cdot 1,508.31$ which is $2,639.54.

Step 3: The present value of that expected value: $\frac{2,639.54}{1.1}$, which is $2,399.58.

Step 4: Project's NPV: $2,399.58 - 2,000$ (thousand dollars). Which is $399.58 million.

So the NPV rule tell us to accept this project. Notice that if the down state occurred we would not abandon the project since at that point the factory is in place and running at a profit.

But notice that this problem has a specific instance in which valuable information becomes available in the future. So let's consider what would happen if we wait to invest. If we wait, we may lose a bit of market share, in the Up-state the annuity would be 380 million starting in 2 years. In the Down-state the annuity would be 140 million starting in 2 years. Suppose we wait, and in one year, the Down state occurs. In this state the NPV is negative (in terms of today's value this is -$727.46 million). So we would not invest if we observed that this was the state of nature. The present value of the new factory in the up-state is $1,142.34 million today. So the present value of the expected future cash flows if we wait to invest is $571.17.

This means that we increase the value of the firm by waiting to invest by $171.6 million.