**Cost**

Consider a firm which has the production technology

If the price of are , then the cost of using as inputs would be

The firm, we assume, behave optimally which means it minimizes the cost of production:

s.t.

where and technology is given. The firm only chooses If the solution is

then the total cost, or cost of production, or (simply) cost is

In that case,

Example: Suppose that the production technology is Cobb-Douglas:

Let us solve the cost minimization:

s.t.

An easy way to solve this problem is to observe that

Therefore, the cost is

To minimize this expression with respect to , differentiate with respect to to see

Conclude

So the cost is

assuming . The marginal cost is the derivative of :

In general, the geometry of the cost function and the technology are related as follows:



**Theorem:** MC is increasing/constant/decreasing if and only if the technology exhibits decreasing/constant/increasing returns to scale.

This is relevant as the marginal cost is actually the supply curve in competitive markets. In particular, the profit maximization problem can be stated as

where is the total cost. This is equivalent to

where To maximize the first expression, we solve

In other words, if the competitive firm maximizes its profit, then

However, the supply curve is “how much the firm would produce to maximize its profit at any given price”. Therefore, is the supply curve.

Example: Suppose that Then the profit maximization rule tells us

So the relation tells us how much output would maximize profit at any given price.

So we have seen thus far that technology is pivotal to income distribution and the determination of value. Next week we will see that technology also determines the economic growth.