

# Frictionless economy and its implementation in real world

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## Abstract

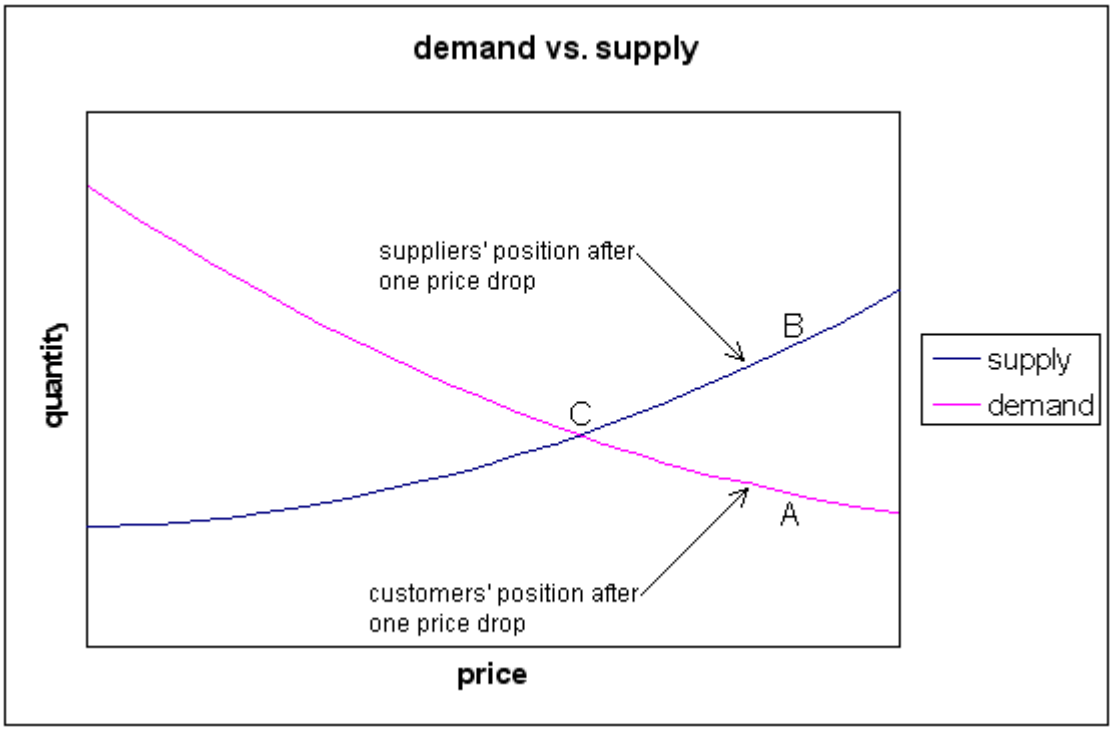
Frictionless economy is the new concept emerged from late 90s[1]. Its core idea is to remove the time both suppliers and customers spend on the trial and error on the price. So the markets always perform on the equilibriums. So markets can work in the perfect efficiency. But due to the various reasons, frictionless economy is rarely seen in the real world. The most common reason is lack of information. In last decade, the rise of internet and wide uses of IT technologies within businesses made the collection of information to be easier. Such trend renews people's interesting on the frictionless economy. In this paper, we examine how exactly frictionless economy works and various reasons to prevent it to happen. We also suggest several solutions allow people to implement the frictionless economy in the real world if the only reason prevent them to have it is lack of information.


**Keywords:** frictionless economy, equilibrium, perfect efficiency, online surveys, single item auction, selling data analysis, local equilibrium and global equilibrium.


## 1. Introduction

In classical supply and demand theorem, when amount of supply and demand does not match with each other, then both suppliers and customers need to make adjustments, so market can reach equilibrium. Such adjustments usually take time. In real market, such time can range from few weeks to one year. The Figure 1 shows typical adjustments in a market. At beginning, customers are at point A. The suppliers are at point B. So there is an oversupply in the market. So suppliers need to cut the price. So there will be more customers to buy the products. In the real market, one price drop usually does not solve the oversupply. So instead reaching equilibrium point C, both suppliers and customers should only move to some point in right of C. It may need suppliers to make several price drops before market reach equilibrium.

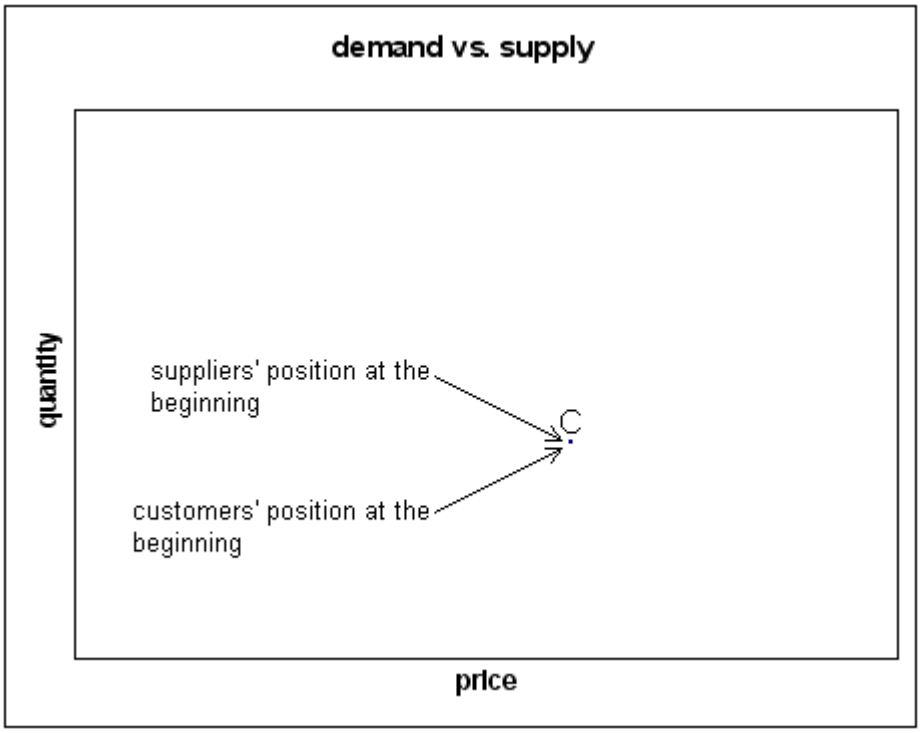
**Figure 1**




**2. How frictionless economy works**

Beside time spent by both suppliers and customers on trial and error, there are costs[2] associated with such adjustments, for example, customers pay higher prices on products than the ones they should pay. In the other hand, suppliers may sell products on a lower price than one they should sell. So letting both supplier and customers to take time to make adjustments before reaching equilibrium is not efficient way of running market. In order to let market run efficiently, it is good to remove time for such adjustments. For example, the night before a company release a product, it invites all potential customers to participate an online survey. From that survey, the company is able to get a supply and demand graph which contains the equilibrium point. Equilibrium point is the most important information on that graph. How both suppliers and customers reach that equilibrium point is less important. So company keep the equilibrium point while remove all other part of graph. See Figure 2.

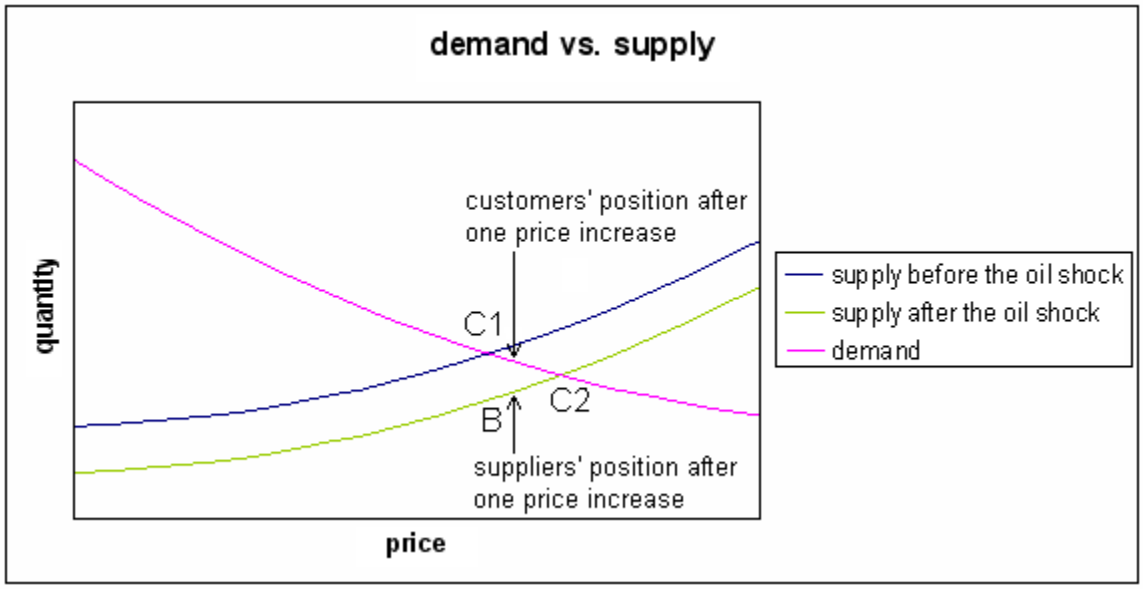
**Figure 2**




The above graph look unrealistic simple, but it shows what really matters to market. In the next day, the company just uses the price in the equilibrium to sell the products. All products will be sold out and no customer is unable to purchase the product.

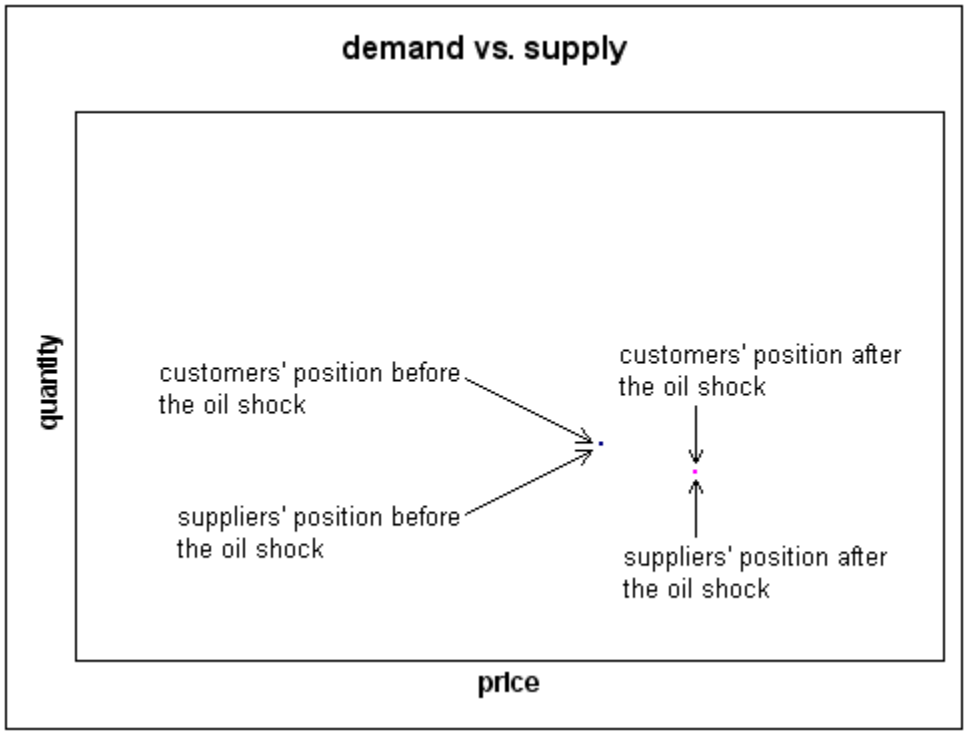
In classical supply and demand theorem, when there is a shift in either supply or demand curve, then both suppliers and customers need to make adjustments, so market can reach new equilibrium. Such adjustments also take time. The Figure 3 shows typical adjustments in a market for this situation. At beginning, the market is in the equilibrium point C1. If there is a shift in the supply curve due to the reason such as “oil shock”, then immediately after the shift, customers are still in C1 but suppliers fall to point B. So there is a shortage occur in the market. So suppliers take this advantage and increase the price. In the real market, suppliers usually take the trial and error approach when they are increasing the price since there is always a risk for overshooting the price. So they are likely to raise the price step by step. For first price increase, instead reaching new equilibrium point C2, both suppliers and customers should only move to some point before C2. It may need suppliers to increase price several times before market reach new equilibrium.

**Figure 3**




So letting both suppliers and customers to take time to make adjustments before reaching new equilibrium is not efficient way to handle curve shift. In order to let market running efficiently, it is good to remove time for such adjustment. For example, immediately after the shift, suppliers invite all potential customers to participate an online survey. From that survey, the company is able to get a new supply and demand graph which contains the new equilibrium point. New equilibrium point is the most important information on that graph. How both suppliers and customers reach that new equilibrium point is less important. So company keep the equilibrium point while remove all other part of graph. See Figure 4 (note, the old equilibrium point is still marked in order to show what will happen to the frictionless market before and after the "oil shock".)

**Figure 4**




Again the above graph looks unrealistic simple. In the next day, the suppliers just use the price in the new equilibrium point to sell the products. All products will be sold out and no customer is unable to purchase the product.

### 3. The reasons that prevent the frictionless market to happen

In the real world, it is very rare for a market to become frictionless. There are several reasons that prevent the frictionless market to happen.

### 2.1 Unable to find all information needed[3]

This is the most common reason that prevents market to become frictionless. Suppliers usually do not share the information on how many product they want to sell for a particular price. Thus no one can generate an aggregated supply curve. For the customer, they are thousands times more than suppliers. So it will be more difficult to generate an aggregated

demand curve. Since there is no way to generate an aggregated supply curve the demand curve. So it is impossible to determine the equilibrium point.

### 2.2 Lack capacities to reach the equilibrium position

Sometimes, a company may underestimate the popularity of a product. They do not make enough products for initial shipment. And initial shipment was sold out very quickly. When they try to make the second shipment, it takes time to wait the component suppliers to supply the components they need. The waiting time can range from weeks to months. During this time, the price will be the same as the one for the initial shipment.

### 2.3 The distance between buyer and seller[4]

In some cases, the seller simply can not sell their products and services to buyer. For example, every year, United States allows nurses in other country to work in their hospitals. Between the hospitals of United States and the nurses of a foreign country, there is supply and demand curve. There is an equilibrium point on the curve. The problem is that US government imposes the quota on the number of nurses that foreign country can enter US. So that foreign country simply can not provide enough nurses who match to the number specified at the equilibrium due to this restriction.

## 3. How to implement frictionless economy in the real world

Due to above reasons, it is very rare for a market to become frictionless. If the reasons for a market not to reach equilibrium are No 2 or 3, the solutions are usually not easy. But if the reason for a market not to reach equilibrium is just No 1, then the solutions can be easy. These solutions do not let a market to be absolutely frictionless, but they will let the market to be very closer to frictionless. There are three possible solutions to let a market to be closer to frictionless if only reason No 1 prevents it to happen.

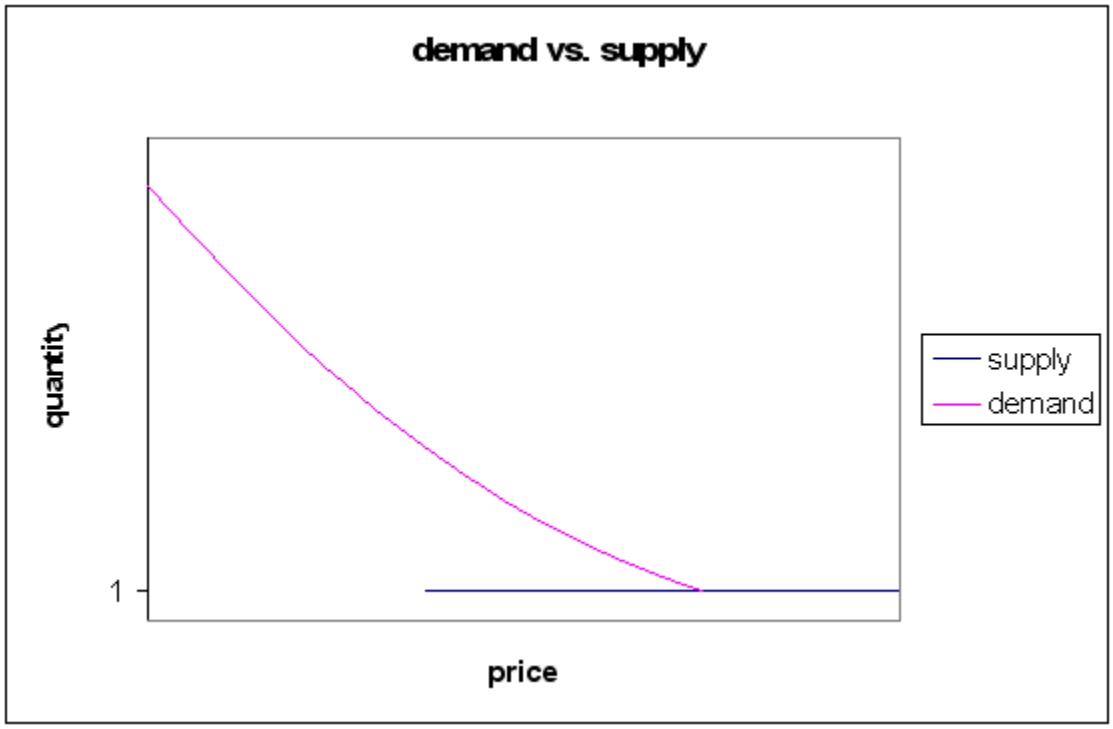
### 3.1 Uses surveys to determine equilibrium price

Many companies usually use surveys to determine equilibrium price for their products. These surveys can be done before release of product or during the middle of product release. The surveys can be done either online or offline. The surveys usually contains the questions such as if the price of this product is X, how many items do you want to buy or if the price of this product is X, will you buy this product. If a person's answers to these questions are greater than 0 or yes, he or she will be asked same questions again with a higher price of X. The questions are repeated until the person gives answer 0 or no. Then company who makes this survey summarize the demand of people for each price level for this product, then convert the result into the percentage, that is, what percentage of people want to buy this product for each price level. Then based on the population of the market they want to release the product and the percentage of people want to buy this product for each price level, they can construct the demand curve for their product which shows the number of people want to buy this product for each price level by multiplying population with percentage. Since they have supply curve in their hand, then they should be able to construct the supply and demand graph for their product and determine the equilibrium price.

### 3.2 Let bidders to show the highest prices during the single item auction[5]

For the single item auction, the supplier, who is the owner of item, usually has a minimum price for his or her item. The owner can sell the item for any price equal or greater than the minimum price. For demanders, they keep bidding on the item until some one come out a price which only that person want to pay. So the typical supply and demand graph for the single item auction can be:

**Figure 5**




From the graph, you can see that equilibrium price can fall anywhere above the minimum price which supplier wants for his or her item. So from the view point of supplier, the equilibrium price does not have any specialty. But from the view point of demanders, the equilibrium price must be the highest price they can afford. So in order to determine the equilibrium price in the single item auction, just letting bidders to show the highest price they want to pay. The highest price among these highest prices should be very closer to the equilibrium price. In real market, some bidders may change mind and decide to increase his or her highest price to overtake the current highest price. But after two or three rounds, then there usually no one decide to increase his or her highest price to overtake the current highest price. The market reaches equilibrium very fast, so the market is frictionless.

### 3.3 Collects sales data

For the small shops in the city, doing an online survey to determine the equilibrium price of a product is too costly for them. A good practical way to determine the equilibrium price for a product is to collect the selling data on that product for consecutive days after the product is put on the shelf. The number of days should not be long since we want to know the

equilibrium price fast and sell the product at the equilibrium price. The maximum length should be about 5 days. Each day, the price of product has a small increment or decrement over the yesterday's price. The rule to do decide whether it is an increment or decrement is simple. If the number of purchases of yesterday is great or equal to the number of purchases of the day before yesterday, then it is an increment. Otherwise, it is a decrement. The amount of increment or decrement can be varied and does not have to be same. When deciding the amount of decrement of increment, there are two things need to consider. First, the amount has to be small. Second, the resultant price should not repeat the price of a previous day. The store then records the selling volume for that particular price. After collecting these data, then store can construct a demand curve for this product by interpolate them. The linear fit is the easiest and safest approach. The easiest linear fit method is Ordinary Least Square. For example, the followings are the selling data of a store collected for product A within 5 days of period.

| Day | Price | Purchase |
|---|---|---|
| 1 | 15 | 39 |
| 2 | 15.25 | 39 |
| 3 | 15.5 | 36 |
| 4 | 15.4 | 37 |
| 5 | 15.45 | 38 |

To apply Ordinary Least Square, we set up the following three matrices.

$$X := \begin{pmatrix} 1 & 15 \\ 1 & 15.25 \\ 1 & 15.5 \\ 1 & 15.4 \\ 1 & 15.45 \end{pmatrix} \qquad c := \begin{pmatrix} c_0 \\ c_1 \end{pmatrix} \qquad y := \begin{pmatrix} 39 \\ 39 \\ 36 \\ 37 \\ 38 \end{pmatrix}$$

The second column of matrix X is the prices of 5 days. The matrix c is the unknown coefficients we need to solve in order to get the linear function we need for linear fit. The

matrix y is the numbers of purchases of 5 days. Then we set up the equation is Xc=y which is:

$$\begin{pmatrix} 1 & 15 \\ 1 & 15.25 \\ 1 & 15.5 \\ 1 & 15.4 \\ 1 & 15.45 \end{pmatrix} \cdot \begin{pmatrix} c_0 \\ c_1 \end{pmatrix} = \begin{pmatrix} 39 \\ 39 \\ 36 \\ 37 \\ 38 \end{pmatrix}$$

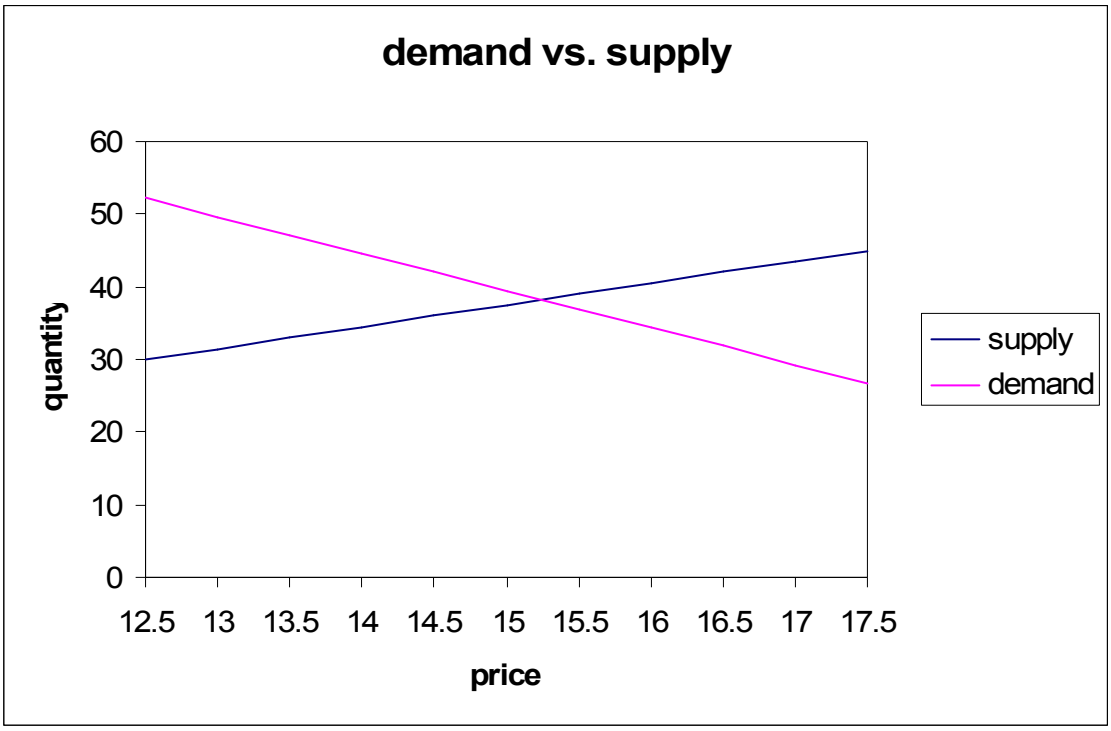
Then we multiply both sides by $X^T$, we get $X^TXc=X^Ty$. The result equation is

$$\begin{pmatrix} 5 & 76.6 \\ 76.6 & 1.174 \times 10^3 \end{pmatrix} \cdot \begin{pmatrix} c_0 \\ c_1 \end{pmatrix} = \begin{pmatrix} 189 \\ 2.895 \times 10^3 \end{pmatrix}$$

Solve the above equation, we get $c_0$=115.81 and $c_1$=-5.092. So the linear function is y=115.81-5.092x which represents the demand curve.

To construct the supply curve, we also use the easiest approach which is the other linear function. First, the store needs to determine the minimum price they can sell the product A and how many items they want to supply for this price. Second, the store needs to determine the maximum price they can sell the product A and how many items they want to supply for this price. The linear function we construct should contain two points which are (minprice, minsupply) and (maxprice, maxsupply). Constructing these two points from these two points are straightforward. For example, the store can sell the product A at the minimum price of 12.5. At this price, they want to supply 30 items. And the store can sell the product A at the maximum price of 17.5. At this price, they want to supply 45 items. So $c_0$ of the linear function we are going to construct should have a slope (45-30)/(17.5-12.5)=3 which is $c_0$. And $c_1$ should be 30-12.5*3=-7.5. So the linear equation represent the y=-7.5+3x. The Figure 6 displays both supply curve and demand curve.

**Figure 6**




To find the equilibrium price, we just need to solve the equation 115.81-5.092x=-7.5+3x. The x is 15.238. Or the equilibrium price is $15.238. To make the price we put on the shelf to be attractive, we choose $15.23. At this price, the store should supply -7.5+3*15.23=38.19 items or 38 items. In case that the equilibrium price do not fall between the minimum price or maximum price, it means that store made incorrect evaluations on minimum price, minimum supply amount, maximum price, or maximum supply demand. One of these values or more are just way off from what the selling data collected by store may suggest. So in this case, the store needs to revaluate these values, then find the linear equation of supply curve and equilibrium price again. The equilibrium price found by this store should be called **local equilibrium** which is the price in which demand of customers visiting this store is equal to supply of this store. If we find the enough local equilibriums, e.g., all stores of Unites States, then we find the average of these local equilibriums. Then result should be very close to the **global equilibrium** which is the price in which demand of customers in overall market is equal to supply of overall market. In most cases, the global equilibrium has little significance to the local stores. Because what they face are just local markets, so only local equilibriums

matter. The method I mentioned above can be implemented in inventory management software.

**Conclusion**

In generally speaking, frictionless market is not just a fictional concept. Lacking the information is the most common reason which prevents the market to reach frictionless. The By using some practical ways, such obstacle can be removed, then any market can become very closer to frictionless. As the markets approach frictionless, its efficiency increases greatly. Such markets can benefit both consumers and suppliers. In most case, the costs for markets to reach frictionless are usually minimal comparing to the benefits. With the aids of compute technologies, many required works can be done automatically. If all markets can behave in frictionless way, it will fundamentally change the landscape of business world.

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