Purchasing Coffee As A Commodi Essay, Research Paper

Introduction

Coffee is a refreshment beverage that is produced in many places throughout the world. Coffee is the second most important traded (legal) commodity in the world next to oil (Trouble Brewing 1). Coffee is considered a commodity, that is widely traded on several worldwide exchanges, most notably the New York Board of Trade (NYBOT). A future market for coffee exists in order for buyers to reduce risk as well as for speculators to attempt to gain a profit. The objective of this report is to research the background, the fundamental analysis, and technical analysis of coffee to create forecasts and recommendations for the acquisition of $500,000 of coffee.

Background

In general, coffee can grow in the region around the equator due to its tropical climate. This region includes Central America, Northern South America, Africa, the Middle East, India, and Indonesia. Latin America and the Caribbean produce most of the world s coffee. Over two thirds of the world coffee production is exported from Latin America and the Caribbean (Trouble Brewing 1). The United States and Europe consume most of the world s coffee production. Together, the United States and Europe consume two out of every three bags of coffee produced in the world (Trouble Brewing 1).

There are many varieties of coffee trees, but only three are used commercially: Arabica, Liberica, and Robusta. Arabica makes up about 75% of world supply, opposed to Liberica and Robusta, which are commonly used in instant coffee due to their harsh flavor (Coffee Production 1). Arabica coffee is broken into three categories: Brazilian Mild, Columbian Mild, and Other Mild. Since Arabica coffee makes up almost all of the world supply of coffee and Brazil is the leading supplier of coffee worldwide, we will focus only on Brazilian Mild Arabican coffee.

Arabica coffee trees are very sensitive to sudden changes in temperature. For example, a frost will typically kill them (Coffee Production 1). Arabica trees grow best deep in the ground, in a climate of 65-75 degrees Fahrenheit, with a high annual rainfall of 60 inches, and at an altitude of 2000 to 6500 ft. (The Cultivation of Coffee 1). After they are first planted, Arabica trees mature in three to four years and can continue to produce fruits for twenty to thirty years (Coffee Facts & Figures 2). A typical Arabica coffee bean takes nine months from its flowering stage to become a ripe, pick able cherry. Typically, one tree yields about two pounds of beans per year, which means that a great deal of labor is required for every cup of coffee (The Cultivation of Coffee 2).

Steps in Coffee Production

Harvesting

It takes about three to four years for a coffee tree to begin to produce fruit. The fruit of the coffee tree is called the cherry, which turns bright red when ripe. The ripening process takes eight months (The Cultivation of Coffee 1). Coffee beans are the seeds of the cherries. Each cherry only yields about two beans.

Most coffee crops are picked by one of two ways: manually or by machine. If the cherries are picked by hand, each tree will require several visits because the tree s fruit ripens at different times. This process contributes to the high cost of coffee (Coffee Production 1). With mechanical harvesting, a machine shakes the coffee tree so that all of the berries fall to the ground, regardless of ripeness. This damages the trees and also requires that the ripe and unripe berries to later be sorted.

Processing

Once the coffee beans are picked, they have to be processed immediately which can be done by one of two ways: the dry method or the wet method. The dry method is the most traditional method of processing coffee as well as the easiest and cheapest. With the dry method, berries are left out to dry in the sun, raked several times per day, and covered at night to keep out moisture. The cherries are raked until their moisture content falls to 11 percent, which can take from seven to ten days (10 Steps to Coffee 2). When they are dry enough, the beans can be heard rattling and are then moved into storage (10 Steps to Coffee 2).

The wet method is more expensive that the dry method and is usually reserved for the best hand picked varieties of coffee (Extracting the Coffee Beans 2). The biggest difference between the two methods is that with the wet method, the cherries are not air dried before the pulp is removed (10 Steps to Coffee 3). Instead, the pulp is removed from the bean twelve to twenty four hours after harvesting (10 Steps to Coffee 3).

Making the Grade

Next, the coffee is ready to be graded. There are many factors that are taken into consideration in the grading of coffee. The altitude, region, care given to cultivation, type of harvesting, and attention given to processing are all important in determining the quality of the beans (Coffee Facts 2). The beans are sorted according to size and weight by machine and then also may be hand sorted to remove any imperfect beans (Coffee Facts 2). Finally, a small portion of beans from each batch is roasted and tasted by a professional (Coffee Facts 2).

Fundamental Analysis

Fundamental analysis is one of two ways to forecast a price and it is done through understanding the underlying factors that affect price, including supply and demand. Through this understanding, it is possible to quantify qualitative information to forecast price. Factors that affect supply are weather, inventory levels, technology, disease, harvest times, and production levels. Factors that affect demand include the economy, substitutes, perceived quality, and consumer preference. Through the examination of these factors, a price will be forecasted for April of 2001 by estimating a change in the supply or demand to use in a model to predict price.

Weather is a crucial factor in coffee production. Coffee trees must get the right amount of water and sunshine. Almost all coffee is grown around the equator because of the required high temperatures. Droughts and floods are the top causes of weather phenomena that affect coffee production. In Figure A1.1 it is possible to see the affect weather has on coffee. In 1994, a record crop was planted that would have yielded 102 million bags of coffee. However, a drought in Brazil and Columbia damaged almost 20% of the crop. Only 92.5 million bags were produced in 1994, a loss of more than 10% of the total world estimated production. In fact, it was a 1% decrease from the previous year s production level. Another year that the weather had a great impact on coffee was in 1996. Columbia experienced significant rainfall that year and only 88 million bags were produced, a 9% decrease from the previous year s production. There has been some drought in this years blooming stage in Brazil, but enough to only decrease supply by roughly 2%

Stock levels also have a major affect on supply. Both 1996 and 1997 illustrate the affect stock levels have on supply in extremely different ways. In 1996 production of coffee decreased 9.17%. However, warehouse stocks remained consistent with previous years stock. Normally, if the stock level remains the same or increases, it would lead to lower prices. The difference in 1996 was that coffee was being stored, not sold despite a decrease in production. This change in stock level was motivated by the coffee growers, who were trying to hold more stock to create a supply shortage, thus increasing the price. The strategy was successful, but it only led to the decrease in demand for coffee, which will be discussed later.

In 1997, just the opposite happened. After the 1996 mistake of storing too much coffee, a great deal of the coffee that was stored was lost to rot and bad quality. Many of the beans produced in 1996 and 1997 had quality defects that made the coffee bean bitter. Therefore, despite a 14% increase in coffee production, the total stock of coffee dropped nearly 31% from the quality problems. This has kept warehouse numbers down for the past few years, but two record crops in 1999 and 2000 helped get warehouse levels back up. If stock levels continue to increase at the current pace, this would add about 4% more stock in May.

Technology has greatly increased yield results. Traditionally coffee was dried and sorted by hand, causing more of the supply to rot or become defective. Since the early 1990 s, automation has taken place in many coffee-producing countries. Beans are dried and sorted by machines, reducing the amount of time that the coffee takes to get to the market. Technology has also increased the amount of berries that each tree produces through genetically altered coffee trees. Technology has continued to increase yields each year, so our estimate is for a 3% increase in supply due to technological advances.

Disease is another factor that can affect supply. Tracheomycosis is the disease coffee is most prone to. There has been no big breakouts in the past ten years, but it is estimated that 3-4% is lost every year to diseases. Other diseases include Koleroga and Nematodes. There have been no known breakouts this year, but as in the past disease will claim at least 2% of the crop.

Harvest time has a small effect on supply. Since most coffee is grown around the equator, the harvest period ranges within two months of each other, from region to region. These times are from May and September. This may seem like it would have an effect on coffee purchases during May, right before harvest begins, but it is actually the opposite. Since it takes a couple of months to dry the beans, the shipping season for coffee usually does not start until mid November and the previous year s production does not get done before next year around March. This is why the previous year s production has more impact on the prices for the next year. In Figure A1.2, you can see that the first four months of each year are less volatile than the remaining months. The big price increases usually happen during the beginning of harvest season in June, July, and August. This occurs because buyers start to scramble to buy coffee based on the progression of the harvest, making it more difficult to purchase in the following months.

An example of this would be in early 1994. There was enough production from 1993 to buy in early 1994 at reasonable prices, despite worries about crop yield because of a drought in early 1994. Prices did increase, but they were not as volatile as in June and July. The same coffee could have been bought in April for 87.14lb. would have cost 211.81lb. in July. This is to show that the big price increases usually do not occur until harvest season of that season begins. We do not feel that there will be any significant decrease because of the harvest time in relation to the time we are to buy the coffee.

The production level, or the amount of budding trees, is the last significant factor on the supply of coffee. With technology increasing the amount of yield per tree, many coffee farmers have been able to increase capital to invest in new trees. It takes about four years for a tree to produce cherries, so the amount of coffee trees budding has increased significantly the past four years. Many new trees were planted in the mid 1990 s when coffee growers began increasing their yields and gaining more money. These new trees had a significant impact on production levels in 1999 and 2000. A projection level of harvests from new trees is around 3-4%, so we are assuming a 3% increase in new harvests.

After the supply factors were used to understand past data affecting supply, demand must be done in the same way. By exploring how each factor will affect demand, we can estimate the fluctuation in demand to use in a model to predict price. Our group found that obtaining actual numbers for demand was impossible, so there were no concrete numbers to compare for demand. The best way to approach the demand was to look at all the factors and try to equate a number to show how much demand would have changed. The numbers in Figure A2.2 under estimated demand are only in theory, and are not actual.

The theory behind these numbers is the first factor that affects demand for coffee, economics. Coffee is not considered a necessity like corn, wheat, milk and others. Coffee is a luxury item that has an elasticity of .2 when compared to price. What this means is that for every 1% that price changes, demand for coffee will change by .2%. This is very significant because as supply goes down, price goes up, so demand will in return go down. This helps to level demand with supply, and shows that supply has more of an impact on price than does demand. Figure A2.2 demonstrates that a very big increase or decrease in price has a significant effect on demand, while a small change in price will only have a small effect on demand. In 1994 price increased by 215%, causing demand to decrease by 43%. Even though price in 2000 is back down close to where it was in 1991, you can see that demand is as strong as previous years. This is true because the changes in price have since dropped in much smaller amounts, meaning that demand increased in those smaller amounts. So it is our belief that demand has not caught up to the supply or price in the past three years, even though prices have decreased. Other factors would have kept the demand numbers much higher than the numbers depicted from the elasticity model. When we first determined our model without this factor, we had an overall price decrease of 4.5%.

Another factor that has influenced demand over the past ten years is market preference. It is estimated that 75% of Americans drink coffee, with 54% drinking at least one cup per day. There is very little room for growth in the American market. Most other markets in South America and Asia are at the similar point. In these countries, the consumption is lower due to poor economic conditions. It has been found that in these countries the wealthy sector drinks roughly at the same percentage as Americans. This demonstrates that markets are near or already at their max capacity for coffee consumption. The only factor that would increase coffee drinkers in these countries would be if the wealth of the nation increased. The only wealthy markets that are increasing coffee consumption are in Europe. Coffee is slowly replacing tea in Europe, which will be discussed in substitutes. The estimated increase in demand because of the European market is a 5% increase.

Substitutes for coffee can tap into the coffee market and decrease demand. The accepted substitutes for coffee are tea, soft drinks, chocolate, and alcohol. Tea, soft drinks, and chocolate all have caffeine in them, the same drug that has made coffee popular. Tea was the popular drink around the world until Americans began boycotting it before the American Revolutionary War. After this coffee became the preferred drink in the Americas and is now catching on in Europe despite the popularity tea has enjoyed. Coffee consumption has been increasing in Europe because of the Americanization of foreign countries. Many countries see American culture as a way of life, so many have begun adapting to coffee instead of tea. It is estimated that coffee has increased nearly 15% in European countries in the 1990 s, so even though tea is a substitute, coffee is winning this battle in demand.

Soft drinks on the other hand have had an opposite affect on coffee consumption. While the number of coffee drinkers has increased in the U.S., the number of heavy coffee consumers has decreased. This has been mostly due to the busy life style of Americans, where convenience is a priority. Also, soft drinks are very similar in price. The average cup of coffee costs $.10, and the average can of pop costs only $.16. Chocolate, though a substitute is usually not in a drink form, so it has little to no effect on coffee demand. Alcohol as a substitute comes into play because in Islamic countries, alcohol consumption is forbidden. Coffee has served for hundreds of years as an acceptable substitute to alcohol in these nations. This is why Islamic nations drink much stronger coffee than do Americans and Europeans, because they want more caffeine as a substitute drug to alcohol. Our group feels that while the number of coffee drinkers has increased, the overall amount of cups of coffee has decreased in large part because of the availability of soft drinks. Therefore, we are predicting a 2% decrease in demand.

The last factor that affects demand is the quality of the bean. While we are looking at the overall coffee supply and demand, each type of coffee and country has its own flavor and quality of coffee. Since we are buying Arabica coffee, this will come into play. Arabica coffee is considered to be the better flavor coffee over Robusta or Liberica because it is much smoother. So when we are looking at demand for coffee, we must include a 2-3% increase in demand, because demand for the coffee that we are going to buy is more popular than other coffee.

Table 1

Supply %Change Demand %Change

weather -2% substitutes -2%

inventory levels 4% perceived quality 3%

technology 3% consumer preference 5%

disease -2% price change/ elasticity \*1%

harvest times 0% net change 7%

production levels 4%

Net Change 7% (\*based on a 4% decrease in price)

Since we believe the price of coffee is mainly affected by supply, we took the total 7% for supply and .2, or the elasticity of demand, times the 7% increase in demand, for an overall demand increase of 1.4% to come up with a 5.6% increase in supply. This would result in a 4.6% decrease in price for April. The January price of $67.85 cents/lb. at a 4.6% decrease would give us an April price of $64.05 cents/lb. With a 7% increase in supply, we estimate a supply of 114.7 million bags, similar to the 115.1 million bags estimated by the USDA. The R squared for predicting the current years price with current years supply is 0.55. This means that our group is 55% confident that price will move with our predicted supply. This is illustrated in Figure A3.1

While we feel comfortable with these figures, it is also required to look at last year s production when trying to predict the price for an April purchase. If you look at Figure A3.2, you can see that price is most dependent on the previous years production and the current inventory level. The regression model gives us a 0.8 R squared. This is because in April, before the next years harvest, a buyer is still buying from the previous years crop. A look at the year 2000 s production plus 2001 beginning inventory shows that supply increased by 5.68%. Using this information we would have:

Table 2

Supply % Change Demand % Change

5.68% 7%

This gives us a change of 4.28% in price based on 5.68 (7\*.2). Using this year s price on January 25 of $67.85 cents/lb and decreasing this by the 4.28%, we come up with a price of $64.95 cents/lb.

Now these two prices bring us to our biggest dilemma, which one to use. As previously mentioned, prices in April seem to be based off of last year s price, but it is still affected by what the predicted harvest of that year will bring. So for simplicity sake, we decided to take the average of the two prices for the fundamental price. The average price is $65.50 cents/lb, so the fundamental price analysis for coffee has predicted a price of $65.50 cents/lb for April 25th.

Technical Analysis

The first step in the technical analysis was to graph the cash price data from the past ten years in order help identify which forecasting model to use by looking at the pattern of the data. The graph can be seen in Figure A4.1. The graph shows no noticeable trend. A TSN analysis was done next to confirm whether or not there was a trend. The results from the TSN analysis can be seen in Table A4.2. Since the results of the TSN analysis show over twenty percent noise, a less complex forecasting model should be used since a large portion of the variation cannot be explained.

However, we were not comfortable with the results of the analysis since a large percentage was a trend. We then performed a TSN analysis for the past three years to see if it would give us different results. However, the analysis still gave us a large percentage of noise. This narrowed down the forecasting method possibilities to a simple moving average, a weighted moving average, or the na ve method.

The results from the averages and na ve method are in Table A4.3. The na ve method is best since it produced the lowest overall error. The two-month weighted moving average error was very close to the na ve error. However, the two month weighted moving average was almost a na ve forecast since the weights of .9 (w1) and .1(w2) produced the best results. To confirm that the na ve model would be best, we also analyzed data from only the past three years using the average based models and the na ve method. The na ve method still proved to be the best model.

We believe that the na ve model was the best method because of the uncertainty of the variation, the nature of the market for the commodity, and the time frame. The variation of the coffee supply and price depend on the weather, disease, natural disasters, and government regulations. Therefore, a trend pattern is not likely. The prices in the cash market for coffee have been relatively stable in recent years due to the consistency of the market conditions. Lastly, since we only are forecasting four months in advance, the price is less likely to dramatically fluctuate month to month, which makes the na ve model best. Using the na ve method, our forecasted price for April 25th is $64.39 cents/lb.

Recommendations

The first concern with our recommendation of when to buy coffee centers on which price to use, the fundamental price or the technical price. Our group decided to average out the fundamental and the technical price. The technical we know will have some error because it is na ve and the April price is the forecasted January price. The fundamental on the other hand has better accuracy according to the trend analysis and R squared value, but with demand numbers only estimated, these numbers can be somewhat risky. The forecasted price that our group came up with is equal to 64.95 cents/lb on April 25th. By using this forecasted price, three different options can be looked at to determine when we want to buy the coffee and if a futures contracts will be necessary. All three options are illustrated on Figure A5, so not all values will be addressed in the report

Option number one dealt with buying in the cash market on January 25th at 67.85 cents/lb. In order to do option one, we needed to convert our figures because our price was in cents/lb and buying options in the cash market are only sold in 60 kilograms bags. The conversion mark for lbs to kilograms is 2.2, so we first divided the $500,000 allotted to buy coffee by the price per pound to get a total number of pounds that will be bought. The second step was to take the total pounds and divide those by the 2.2 to come up with how many kilograms $500,000 can buy. This number was then divided by 60, because this is the amount of kilograms that the bags are sold in and came up with a total of 5,583 60Kg bags that we are going to purchase. With these numbers we were then able to find the total price for option number one by taking the $500,000 spent and multiplying it by the 2% holding cost per month times three months and came up with a total cost of $530,000 dollars to purchase 5,583 bags of coffee.

Option two deals with buying the cash product on April 25th. Since our group has predicted a price drop in the cash market for coffee, this has a lower price than option one. With our forecasted price of .6495 cents/lb, it would cost $478,629.54 to purchase 5,583 bags of coffee using option number two.

The third option is to buy in the cash market on April 25th and to buy a May Futures contract on January 25th and sell it back on April 25th. This is referred to as long hedging. By having the cash price drop 2.90 cents/lb using the Jan. 25th price minus our forecasted April 25th price, we would save $21,370.68. If we bought a futures contract on Jan. 25th for 70.55 cents/lb and assumed that it would be worth our forecasted cash price of 64.95 cents/lb on April 25th, then you would lose $41,267.52 on the futures contract. The total loss through hedging would be $19,896.84 plus a $2,500 commission for the purchase and selling of the futures contract and you have a total cost of $522,396.84 to purchase the 5,583 60Kg bags of coffee.

As you can see, option number two would be the recommended option, as it is nearly $44,000 cheaper than the next best option, option number three. In order for option number three to be better, coffee would have to rise to $.702 cents/lb, which was found by using breakeven analysis. Based on the standard deviation of .29 cents/lb from the past three years of cash price data, the probability of coffee rising to $.702 appears to be great in April. However, we are very confident with our forecast and are going to stay with option number two. We strongly believe that the price of coffee will fall, not rise.