

Faculty of Economics and Management

Department of Economics



Diploma Thesis

**Economic Analysis of Coffee Commodity in the Global
Market**

Written by Bc. Anna Háková

Supervisor: Ing. Petr Procházka, MSc, Ph.D.

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Department of Economics
Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Háková Anna

Economics and Management

Thesis title

Economic Analysis of Coffee Commodity in the Global Market

Objectives of thesis

Evaluate global coffee commodity market. Particularly, recommend what positions (short vs. long) should be taken in the mid-term and long-term future. Determine and evaluate main factors affecting price and quantity of coffee beans in the global market. Evaluate impact of recent financial and economic crisis upon commodities in general and coffee in particular.

Methodology

Literature review will be conducted using methods of synthesis, induction, deduction, and extraction. Analytical section will be done using methods of both qualitative (descriptive) as well as quantitative analysis such as fundamental, psychological, and technical analysis.

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3/2013 finalization

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Keywords

commodity, coffee beans, world market, export, import, technical analysis, fundamental analysis

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The Diploma Thesis Supervisor

Procházka Petr, Ing., MSc, Ph.D.

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prof. Ing. Miroslav Svatoš, CSc.

Head of the Department

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Ing. Martin Pelikán, Ph.D.

Dean

Declaration

I declare that I have worked on my diploma thesis titled “Economic Analysis of Coffee Commodity in the Global Market” by myself and I have used only the sources mentioned at the end of the thesis.

In Prague

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Signature

Acknowledgement

I would like to thank to Ing. Petr Procházka, MSc, Ph.D. for his useful advice and support during my work on this Thesis.

Ekonomická analýza komodity kávy na globálním trhu

**Economic Analysis of Coffee Commodity in the Global
Market**

Souhrn

Tato diplomová práce poskytuje ekonomickou analýzu kávy jako komodity a její roli na světovém trhu. Je zaměřena na komoditu samotnou, ale také na principy obchodování na komoditních trzích. Zahrnuje analýzu hlavních faktorů ovlivňujících nabídku a poptávku po kávě, monitoruje historické cenové trendy kávy, za použití technických nástrojů analyzuje nedávný vývoj ceny a doporučuje obchodní taktiky pro investory. Určuje hlavní aktéry a hlavní řídicí síly na trhu s kávou a zabývá se krizí v kávovém průmyslu.

Teoretické pozadí, založené na výzkumu literatury, poskytuje komplexní přehled pro analyzovaný problém. Kávový průmysl a i komoditní trhy jsou podrobně prozkoumány.

V praktické části je použita fundamentální a technická analýza k identifikaci hlavních prvků, pohybů a procesů na trhu s kávou. Jsou definovány síly, které ovlivňují kvantitu nabídky a poptávky po této komoditě. Jsou použity různé obchodní strategie, které odhadují trendy v ceně kávy a na základě nabytých informací jsou vytvořena doporučení.

Klíčová slova

Komodita, kávové boby, světový trh, export, import, technická analýza, fundamentální analýza

Summary

This diploma thesis provides economic analysis of coffee as a commodity and its role in the global market. It is focused on the commodity itself, and also on the principles of trading in commodity exchanges. It includes analysis of the main factors affecting supply and demand of coffee, it monitors historical trends of price of coffee, by using technical tools it analyses recent development in price and recommends trading tactics for investors. It determines the main actors and main driving forces in the coffee market and it deals with the crisis in the coffee industry.

The theoretical background, based on literature research, provides a complex overview for the analysed problem. The coffee industry and commodity markets are examined in detail.

In the practical part fundamental and technical analysis are used to identify main elements, movements and processes on the coffee market. The forces influencing quantity of coffee supplied and demanded are defined. Different types of trading strategies for price trend estimation are used and based on the all information gained the recommendation are made.

Key words

Commodity, coffee beans, world market, export, import, technical analysis, fundamental analysis

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1. INTRODUCTION

Coffee is a crop of global importance, both from the point of view of the consumer as well as from the perspective of the producer. Coffee drinkers appreciate its flavour and stimulating effects. For producers and processors of coffee, it is a source of income and livelihood. For a large group of traders on commodity exchange, coffee is an essence of daily trading, it is their main interest, because coffee is one of the most traded commodities in the world.

Coffee has become a factor that converges society on many levels. In the USA or the European Union coffee is available anywhere on the streets, at work, at home. The importance of drinking coffee for humans is supported by the continuous world researches of benefits or harmfulness of this drink.

This diploma thesis is dedicated right to this crop and its position and role on the global market. It is focused on history and life cycle of coffee as a plant that is processed and in the form of coffee beans traded on commodity exchanges. Different factors that influence the coffee life cycle and the way of coffee from producer to consumer are examined. The main exporters and importers as well as main producers and consumers are introduced. The work deals with factors that affect the size of supply and demand, and especially the price of coffee in the world. The work says who the main actors and main driving forces in the coffee market are. Whether the coffee market is prone to various types of crisis and how consumers of coffee behave in the time of crisis. The work also points out problems connected with coffee production.

A considerable part of the thesis is created from the view of potential investor on coffee exchange market, when the price development and famous trends are monitored. The topic of commodity exchange markets is discussed in details. The history, various subjects on the market, various tools and many different terms commonly used in the market are introduced.

At the end the thesis is focused on the potential new growing market. For the future growth of the coffee trade it is absolutely crucial for investors to find new fields for sales.

2. OBJECTIVE OF THE THESIS AND METHODOLOGY

At the beginning of the thesis it is important to define its objectives and methodology.

2.1. Objectives

The main objective of this thesis is to evaluate the global coffee commodity market from many perspectives. The aim is firstly to form a complex background for later economic studies, to introduce coffee as a commodity and to bring all aspects connected with coffee industry together for better understanding later analysis. The same complex background should be provided also for commodity exchange trading principles and for exchange in general.

Based on fundamental and technical analysis the thesis should identify the main factors affecting the coffee market as a whole. What the determinants of coffee price are. The main influences on quantity supplied and demanded should be introduced. The aim is also to recommend types of positions that should be taken for the mid-term and long-term trading future as well as to mention possible tactics that are connected with daily trading of coffee that could be used by investor.

Another aim of the thesis is to clarify the impacts of recent crisis on commodity and especially on coffee market and suggest and examine new potential market for coffee industry.

2.2. Methodology

The work is divided into two main parts that are divided again into sub-parts. The two main chapters are theoretical background and the case study itself.

The theoretical background is a research based on available information resources that are adequate to the topic. The literature used consists of books, articles and internet resources. The author's arrangement of work from the basic to more complicated problems sets the complex information base and introduction for later analysis in case study itself. The thesis provides comprehensive view on coffee as well as on the commodity exchange markets. For the literature review, the main methods used are synthesis, deduction, induction and extraction. The analysis in the case study part is based on the synthesis of information from the literature research.

For the case study, fundamental and technical analysis are used. Fundamental analysis deals with the current situation in the world and its influence on the supply and demand in the global coffee market. It defines basic relationship between supply and demand and factors influencing the size of supply and size of demand. The data series for analysis mainly taken from the International Coffee Organization are analysed qualitatively and also quantitatively in the technical analysis. Technical analysis explains historical development of price. Also the typical possible behaviour of investor on the coffee market is approached by the use of technical indicators in combination with charts. These charts are taken from the internet financial portal Investing.com monitoring the real prices of commodities. The commonly used technical tools are described and different strategies connected with these tools are introduced to identify the changes in price trend and to identify the price trends themselves. These trends are examined and explained.

Software Eviews is used to calculate seasonality of the coffee price. Software IBM SPSS is used for correlation, to determine whether there is a relationship between price and other variable. The regression analysis is applied for prognosis of import and also simple comparative analysis is used in many cases in the whole thesis.

The impacts of coffee crisis and recent economic and financial crisis are analysed and evaluate. Recommendation concerning the future investments in coffee are made.

3. THEORETICAL BACKGROUND I. – COFFEE IN GENERAL

Many people start their day with a cup of delicious coffee. It is a daily routine, without which they cannot imagine their later functioning. Often the morning cup of coffee is not the only one during a day. However, many consumers have no idea what process the coffee must pass through before it appears in their favourite café or in their favourite cup.

What an ordinary layman consumer knows about coffee? The first thing is that coffee is usually a hot drink of the fruit of the coffee plant. It also refers to powder which can be used for the manufacture of beverages. This is obtained by milling the roasted seeds of the coffee plant. Coffee acts as a stimulant due to the caffeine that it contains. It can be therefore said that coffee is a type of legal drug. And that is maybe why coffee has so many fans. Then consumer has definitely noticed the coffee division into two basic types – Robusta and Arabica. That coffee is relatively expensive goods. And that the biggest producer seems to be Brazil. But there are many other aspects of coffee as a product. In this thesis, coffee is going to be presented as a complex part of commodity market with a complicated life cycle.

3.1. WHERE DOES COFFEE ORIGINATE FROM?

First records about coffee are from the year 1000, when Persian physician and philosopher Avicenna of Bukhara (regarded as a father of early modern medicine and clinical pharmacology) described the medical properties of this plant, he called it bunchum. Then during the 15th and 16th century coffee spreads over the Muslims world. In 1600 coffee was brought to southern India and then to Holland. In 1645 the first coffeehouse was opened in Venice, in 1650 in England. In 1658, the Dutch began to cultivate coffee in Ceylon. Later on coffee is conquering North America. After the Turkish ambassador had visited the court of Louis XIV in 1669, coffee started to be popular in Paris. In that time coffee could already be found also in Germany. During the 17th century coffee was seen as something inflammatory and King Charles II. closed all coffee houses in London. Similar attempts could be seen in France. But at the end of the century, Paris opened the first café named Café de

Procope. Few years later, New York opened its first coffee house. During the 18th century coffee beans started to be planted in gardens of Amsterdam and Paris. Because France had many colonies, beans were spread also over them. The plant moved from French Guiana to Brazil. Englishmen brought seeds to Jamaica. In 1873 the first successful national brand of packaged roast ground coffee Ariosa was put on the U.S. market by John Arbuckle.

In 1882 The New York Coffee Exchange commenced business. At the very beginning of the last century, the first modern espresso machine was invented. Also decaffeinated version of coffee is introduced. In 1911 U.S. created its first National Coffee Association followed by creation of The Colombian Coffee Federation. In 1938 Nestlé Company invented the first instant coffee Nescafé. During the last century the U.S.A. became the biggest consumer of coffee in the world. In the 1962 the International Coffee Agreement was signed for a five-year period with aim to maintain quotas for exporting countries and to keep coffee prices high and stable in the market (mainly by using export quotas to steer the price). In 1971 the first shop of the famous chain Starbucks Corp. was opened in Seattle. In the seventies, society has started to take care about Fair Trade coffee production. In the nineties organic coffee production becomes the fastest growing segment of the specialty coffee industry. In years 2001-2003 the world coffee prices fall to their lowest real levels ever. [1]

3.2. FROM BEAN TO CUP

Coffee is one of the most valuable items of the international trade. It is also one of the most valuable non-alcoholic beverages in the world. Millions of families depend on growing coffee and hundreds of millions people are regular coffee drinkers.

But there would be no cup of coffee without the coffee plant. First, the coffee plant must be planted in tropical regions. Then coffee beans or “cherries” must be harvested, picked and then processed. They are dried and milled before they are ready to leave the producing country. They are exported, roasted and then grinded, blended and distributed to be finally brewed. This seemingly simple process has been

pretty similar for many centuries. But the process of making a drink from coffee seeds has changed dramatically over the past century – it was influenced by the technological innovation.

3.2.1. Coffee as a plant (Genus: *Coffea*, Family: *Rubiaceae*)

Coffee plant grows from three to five years before it starts to procreate, so it takes a long time to get coffee beans on the market. Many growers have been exiting business because coffee needs special conditions for growth. The plants grow in tropical areas, where they get enough moisture and rain, and the average temperature is around 21 degrees Celsius. Its average height is around three meters, so it is possible to pick cherries by hand. After 15 years, plants are replaced by new ones due to their reduced fecundity. For 0,5kg of processed coffee 2000 cherries are needed, i.e. 4000 coffee beans. Coffee is kept and transported in 60 kg bags, representing a yield from about 66 plants. Damages of yield occur quite often because every single plant is prone to sudden drought, wind, frost or heavy rain. Due to this, it is very hard for farmers estimate oncoming production.

There are more than twenty species within the genus *Coffea*, but only two are drunk as coffee. *Coffea arabica* in other words Arabica and *Coffea canephora* which is called Robusta. The difference is mainly in its aroma but also in taste, caffeine content, disease resistance and optimum cultivation conditions. Arabica has mild aroma and it is more popular type of coffee. It grows in East African regions and Central and South American countries. Robusta has stronger aroma and two times more of caffeine than Arabica and it grows in hotter and wetter lowland forests of West Africa and Southeast Asian countries.

It should be noted that there exists also another variety of coffee called Liberica or Liberian coffee, but it is grown only in West Africa and Malaysia. Because of its very specific taste, the demand for this coffee is very small. And therefore this thesis is not focused on it more. [1] [2]

3.2.2. Farming

The farming differs. Traditional farms plant from 400 to 1000 trees per acre. Large scale farms with technology plant from 1500 to 4000 trees per acre. Firstly farmers choose beans from highly productive plants. Beans are planted and raised in

nurseries for the first year and after they are moved to outdoors plantation where they grow until they are fruiting plant. Coffee plants have to be protected against diseases and pests. In organic cultivation systems and small-scale production it means going around with a machete and applying mulch and compost around the plants. With is very time consuming and labour intensive method.

In Brazil, the harvesting is done mainly in the spring, while in Central America and East Africa it is done from September to the end of the year. In areas of the equator, like in Colombia, it is usually harvested throughout the year thanks to a stable climate. Harvesting takes about 6 to 8 weeks.

3.2.3. Processing

Firstly the coffee cherries have to be picked from the plant. There are two methods how to do it. One is, that all the cherries - immature, overripe, dry and ripe are taken off the tree by hand or machine. It is less costly method. But machines damage coffee plants and they also collect cherries of bad quality. It makes the process of sorting and selecting harder. The second one is that only ripe berries are hand-selectively picked from the plant. It is quite labour intensive technique. Better care means better taste of coffee.

After one of these methods coffee cherries have to expose beans that they have inside. There are also two processes to choose how to do that. It mostly depends on the water availability in the coffee producing region. These two methods are then called dry (natural) or wet (washed). Sometimes both methods could be combined. The way of processing plays an important role in the resulting flavour and price of coffee. After the dry process, coffee has a full-bodied and mild aroma. The dry process is mostly used when the quality of coffee beans is poor. It is used for Robusta preparation. Whole coffee bean is dried and then sold for processing.

After the wet process coffee gets a fine body and lively acidity with strong aroma, which is more appreciated in the market. Majority of Arabica beans are wet processed. When the beans are in water, they are fermented and pulp is removed before drying. In the factory, beans are sorted according to size and quality. These graded coffee beans are then packed (60kg bags) and sold to traders, who roast them. Some bags may wait in warehouses for few months but also for one or two years in

effort to regulate the flow into the market, but they tend to lose quality if they are stored too long.

The unique aroma of coffee is created within a roasting process. Roasting usually takes place in the consumer country, since roasted coffee has only a limited durability. More roasted coffee, lower character and quality it has. The resulting taste is influenced by temperature, air supply and the roasting time. Lightly roasted beans are suitable for coffee served with milk. In contrast, espresso is from beans that are roasted for longer time. There must be also grinding of roasted beans, which should be done just before drinking, because aroma can disappear quickly.

Here comes a question about creation of decaffeinated coffee and instant coffee. Decaffeination runs at the stage of green bean and it is achieved by using of different chemicals that destroy the caffeine such as chloroform, benzene or methylene chloride. Or without chemicals using carbon dioxide process or a complex water process. Instant coffee is produced after the roasting process when coffee beans are undergoing process of dehydration.

As it was mentioned before, in the world can be found large harvesting companies but also small-scale traditional family production. These small farmers collectively produce more than half of the global coffee supply. And unfortunately they are often facing poor living conditions. That also includes the fact that for processing and storage of coffee beans special facilities are needed which small farmers cannot afford. This puts them into even worse situation, as they are pushed away from the market by larger producers. This also led to creation of an organized social movement of “fair trading”. [1] [2]

3.3. PRODUCERS AND EXPORTERS

The difference between producers and exporters is crucial for reading from data sheets. Production means everything produced, export is just what is send abroad the productive country. So it means that most productive country does not have to be necessarily the most exporting one. Most producers are from developing countries. Exporting of coffee often accounts for majority of their foreign exchange earnings.

3.3.1. Main areas of world coffee production

Main areas could be found especially in the area between the Tropic of Cancer and Tropic of Capricorn. They can be divided geographically into Latin America, South and Central Africa and South Asia.

Latin America contributes to the world production and also to exports by the largest part. It has also the best natural conditions for growing Arabica, which has very high quality. Brazil, Colombia, Mexico, Honduras and Peru are the biggest producers. There can be found also smaller coffee producing countries like Nicaragua, Guatemala, Costa Rica, Cuba, El Salvador, Dominican Republic, Haiti, Jamaica or Panama. They do not produce much but their coffee is of the highest quality.

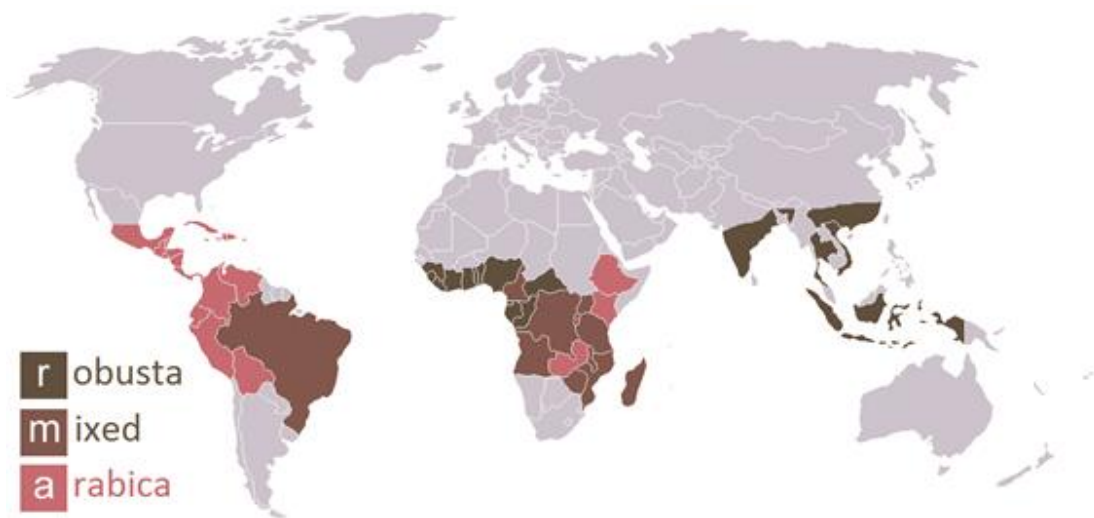
Africa is the area with the smallest share of coffee world production producing mainly Robusta type. Also Arabica can be found in these areas, but it does not have such a high quality as the one in Latin America, because of natural conditions. Ethiopia is the leading country in production and export there. Coffee exports have a significant impact on Ethiopia's economy stability. For many people at a risk from poverty rate coffee production is one way to make their living. As said before, other big exporters are in Uganda and Côte d'Ivoire. Other countries have only small share of the world's coffee production. Just in Madagascar the top quality Robusta type could be found.

Almost one-quarter of the world's coffee production comes from the Asian continent. Vietnam is behind Brazil the second world's largest producer and exporter of coffee. Thanks to government investment and the World Bank loans, Vietnam got in this second place in world coffee production. The sudden penetration of Vietnam to the international market and the abolition of quotas (issued by the ICO) caused the saturation of the market. In Vietnam Robusta is grown mainly. Coffee production is the largest economic flow for the country. Vietnam is a low-cost producer. The production costs are nearly halved in comparison with Brazil and thus Vietnam has become quite quickly a real competitor in the market. Almost all production is sent out of the country because local people are more used to drink tea instead. The third world's largest exporter is Indonesia. It is due to its volcanic natural conditions that are suitable for growing coffee. Same applies for islands like Java and Sumatra.

China is consuming mainly tea so its minor production is exported also. India as one of the major producers of coffee is also successful exporter having the 6th rank in the world's production list. Arabica with a really good quality can be found in the Philippines. [1] [2] [3]

The picture 3.3.1. 1 illustrates areas of coffee bean production in the world. Term mixed refers to locations where both types of coffee are produced.

Picture 3.3.1. 1 Map of coffee bean production



Source of picture: *Coffee Beans*, available at: <http://www.coffeebeans.ie/about-coffee-page34052.html>

3.3.2. The deeper look on the top 5 world exporters

Brazil has been the largest exporting producer already for many years. The 80 percent of its export is made by type Arabica. This could be observed from the following table 3.3. 1. Right behind Brazil, with its exported production, is Vietnam with type Robusta. The third is Indonesia, which is often exchanging this third leading position in the coffee production with Colombia. The closest to them is Ethiopia but including this country, the production anywhere else does not exceed 10 millions bags over year. Other important successful exporters are India, Honduras, Peru, Mexico, Uganda, Guatemala and Côte d'Ivoire. [3]

Table 3.3. 1 Exporting countries: Total coffee bean production (000 bags)

Country	Type of Coffee	2008	2009	2010	2011	2012	2013
Brazil	Arabica/Robusta	45 992	39 470	48 095	43 484	50 826	49 152
Vietnam	Robusta/Arabica	18 438	17 825	19 467	22 289	22 030	27 500
Indonesia	Robusta/Arabica	9 612	11 380	9 129	7 287	12 730	11 667
Colombia	Arabica	8 664	8 098	8 523	7 653	10 371	10 900
Ethiopia	Arabica	4 949	6 931	7 500	6 798	6 366	6 600
WORLD TOTAL	-----	128 636	122 953	132 983	132 304	145 116	145 775

Source of data series: ICO

(1 bag = 60 kg)

The table 3.3. 1 is also showing the world total exported production. In last measured year 2013 it was 145 775 000 bags of coffee. It has increasing tendencies last five years. World coffee exports amounted to 8.54 million bags in December 2013, compared with 9.07 million bags in December 2012. In the twelve months ending December 2013, exports of Arabica totalled 68.24 million bags compared to 67.32 million bags of previous year; whereas Robusta exports amounted to 40.61 million bags compared to 43.50 million bags of previous year. [4]

The global production is highly weather dependent. So if there are any mechanisms of international trade, they are used to smooth any inconvenient peaks or declines in production and thus coffee prices and to balance supply and demand.

3.4. IMPORTERS AND CONSUMERS

By the word consumers in the coffee world is understood mainly the USA and the European Union. The main importers are the same the USA and European Union headed by Germany. The USA but also Germany import coffee from Brazil or Vietnam. Italy is the third biggest importer in the world and the second in the European Union, followed there by France. Japan the fourth world major importer is also having coffee mainly from Vietnam. Data for this could be found in the table 3.4. 1. It could be said that the world imports have also increasing tendencies looking at longer time period. It is estimated that 1.6 billion cups of coffee are drunk worldwide every day. [5] Daily cups per capita also differ in countries. For example the Finns are with their 3.37 cups per day per person the biggest drinkers in Europe.

Germany has only 1.89 cups per day per person. But Germany is much populous state. [6]

Consumption has grown by an average of around 1.2% a year since the early 1980s. [7]

Table 3.4. 1 Imports of all forms of coffee from all sources (May to October 2013) in bags

Country	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13
European Union	6 128 573	6 098 467	6 383 094	5 302 587	6 044 684	6 296 721
USA	2 750 008	2 375 692	2 568 604	2 314 778	1 981 469	2 058 645
Germany	1 793 284	1 687 261	1 906 199	1 624 243	1 656 220	1 756 316
Italy	815 830	734 646	862 015	475 206	807 703	822 496
Japan	897 401	760 503	726 223	812 120	585 114	671 212
France	562 109	539 808	604 051	449 089	513 359	613 073
WORDL TOTAL	10 200 785	9 624 729	10 128 730	8 772 695	9 015 693	9 412 324

Source of data series: ICO

(1 bag = 60 kg)

Brazil is not just the main actor on the producer's side but it also has a huge influence on consumer's side. Table 3.3. 2 shows Brazil's share on the world domestic consumption of coffee beans. Brazil is the biggest consumer from the domestic consumers but due to amount of coffee demanded also important country in the world scale.

Table 3.4. 2 Domestic consumption: Brazil vs. world total in years 2011 - 2013 (000 bags)

	2010/11	2011/12	2012/13
Brazil	19 130	19 720	20 330
WORLD TOTAL	41 873	42 745	43 694

Source of data series: ICO

(1 bag = 60 kg)

Consumers could be divided also by the age group. Children and young people should not drink coffee. People usually begin to drink coffee around the age of 15 or 16. Then the trend slightly increases, because often with higher age, the higher amount of coffee person consumes. The greatest consumers belong among group of people in the age 28 to 55. People who are over 55 years drink coffee significantly less, due to cardiac problems and other diseases associated with high blood pressure.

Interesting phenomenon is that young drinkers are more likely to drink milk-based coffees like Cappuccino or Latté. The largest soluble coffee drinkers are the inhabitants of Scandinavia. In Germany people like filtered coffee and Italians consume strong espresso. So it could be observed that each age group and each country also prefers different sorts of products.

3.5. TRADE

Coffee is one of the most valuable primary products in the world economy. It is traded commodity on major futures and commodity exchanges. The main actors on international trade have been for many years Brazil, Colombia and the USA. Nowadays Vietnam is really progressive in it also. Brazil is still controlling majority of global coffee production. Coffee has been one of its most traded agricultural commodity with solid base on international markets. Fortunately for any traders, coffee is an addictive stimulant and consumers would pay almost whatever. Consumers start to care more about the quality and origin of their drink. On the market there is wide range of coffee drinks available. Anyone can choose according to his or her taste preferences. But also whether it is more pleasant to have coffee at home or in café or in the street or wherever. Consumer does not have to rely only on one place, but there are many possibilities and ways to drink any type of coffee, which makes coffee very interesting commodity. It could be cold or hot, with milk or without caffeine, with brown or white sugar, with cream or with cacao, nuts and liqueur, strong or mild. Ice creams, cakes and other dessert are made or at least have taste of coffee. That means that a wide range of coffee product could be found on the market, so almost every person could be potential client.

Just small amount of exported product is processed in the countries of its origin. That means that other value must be added during the other processes that follow. The market is dominated mostly by large multinational companies which produce in large-scale. Limited range of coffee brands is sold through supermarket chains and for new small brands it is quite difficult to enter this market. In the past these small brands were usually considered to have inferior quality coffee, but it is not the case anymore. Small brands are now more fashionable and people expect something unique from their assortment.

3.6. TRANSPORT

Coffee is exported to all over the world with the help of automobiles, aircraft, or of the ship. Shipping is typical way to transport huge amounts of commodities. Coffee can be transport in form of “break bulk”, stowed in the bags in the ship’s tonnage. But bags do not protect coffee from bad weather that can occur during loading and discharging. They can be torn easily. Coffee can get contaminated.

Coffee can be containerized cargo (in bags or in bulk). That is much safer method to transport. It is faster, more efficient and easier. Weather conditions do not matter. But there is a need of lifting equipment and not all of ports have it. Although transporting coffee in containers is big improvement, it has problems. Containers are not fully exploited, that means loosing of money because there are charges per container not by the weight of cargo. Coffee needs a special ventilation process, which is not included in all types of containers, that is why the break bulk transportation is sometimes preferred. When importing coffee, the quality have to be controlled and the inspection takes place after the transport on a ship. [8]

3.7. QUALITY CONTROL

Quality control requires qualified staff which makes the control costly and problematic. In some cases, it is done by the government of the producing country or by coffee authorities. There are penalties for lower than average quality. It is a passive control because it just encourages producers to have just minimal or average quality coffee not the best quality coffee. So there are also premiums offered for better than average quality. Important is that: “...*different producing countries have differing quality control systems and attach differing values to certain aspects of quality.*” [11] International Organization for Standardization defines many standards for example for exporters, sampling, water content, foreign matter and defects, for storage and transportation, for the caffeine content, etc. These ISO standards for coffee can be found in more details in the standards catalogue of the organization by technical committees under the code ISO/TC 34/SC 15. [9]

3.8. INTERNATIONAL COFFEE ORGANIZATION (ICO)

Recently consumers have shown growing interest in various certificates. There exist many organizations that are focused on coffee. For example Rainforest Alliance Certified™ that seeks to preserve biodiversity in production areas. Its main attention is given to sustainability. It is an ecological association. Another is Speciality Coffee Association of Europe (SCAE). Due to this associations coffee cups carry the label of excellence. To get it, they must meet criteria regarding growing and the collection of coffee beans. The main and the most important organization is ICO. Many data series used in this thesis are coming from the sites of International Coffee Organization. It is: “...*the main intergovernmental organization for coffee, bringing together exporting and importing Governments to tackle the challenges facing the world coffee sector through international cooperation. Its Member Governments represent 94% of world coffee production and over 75% of world consumption.*

The ICO’s mission is to strengthen the global coffee sector and promote its sustainable expansion in a market-based environment for the betterment of all participants in the coffee sector. “[10]

The ICO publishes daily ICO indicator prices, which represent the four main types of coffee available in the international market (Colombian mild Arabica, other mild Arabica, Brazilian and other natural Arabica, and Robusta) (source: the coffee guide). It was established in 1963 in London.

3.9. LABOUR CONDITIONS

They are closely connected with the size of production and depend on whether it is a small farm or a large plantation. Small farms employ their own family’s labour and they cultivate less area than huge farms. Family farmers usually bring in a cash income of 500-1,000 USD a year for their coffee. [11] In large farms it is different. Workers have to meet a 100-pound quota in order to get the minimum wage that is less than 3 USD per day, which is really hard and more than half of workers do not get this minimum wage. Because of this situation, also children have to help their families to meet the daily quota and to earn money. They are not officially employed and thus there is no way to protect them by law. Families live in the really poor

conditions with very limited water source, weak health care and without sufficient education. Unfortunately the owners of big farms take advantage of poor enforcement of human rights in their country.

3.10. FAIRTRADE

The World Fair Trade Organization was created to enable smallholder producers of coffee and other commodities to improve their trading conditions, to give them a chance to participate independently in trade with fair conditions and prices. In the hard time when big international companies ruin small businessmen and prices of coffee are really unstable, small producers have sometimes problems to cover their production costs. This can cause serious social and economic problems. The help is achieved by setting a minimum price that includes all costs of necessities for environmentally friendly production of coffee but also health care and education costs that farmers have to pay from their earnings. The price of coffee is announced each year and throughout this year remains unchanged. Fair traded coffee (and other products) could be recognized for typical symbol of Fairtrade placed on package. Product gets an international certification mark for meeting the standards set by the World Fair Trade Organization. Coffee has the main importance in Fair Trade. It could be said that Fair trade coffee market is already oversaturated. Disadvantage of the Fairtrade coffee is its high price. The term Fairtrade is often associated with organic production, but organic production is not required within the Fairtrade, but farmers should be encouraged to behave environmentally friendly. [12]

4. THEORETICAL BACKGROUND II. – COFFEE ON THE COMMODITY MARKET

Previous chapters provided basic overview of the world of coffee. But coffee is a commodity traded on markets, therefore it is necessary to introduce also the commodity markets themselves and their trading principles to get comprehensive view for the analysis of the importance of coffee for the global market.

4.1. HISTORY OF COMMODITY TRADING

The beginning of exchange trading is closely connected with the development of market trading. There was many important market centres in Europe. In the 12th and 13th century in Italian port cities. In the middle of 15th century in the Belgian city Bruges. In the 16th century there was open the first special building for exchange market in Antwerp. Until then, only securities and coins were traded. From 17th century also England, France and Germany started to participate in this trading. There was also the first appear of real goods as subjects of trade. One of the first exchange markets of goods was the grain exchange founded in Amsterdam in 1617. Merchants were trading initially only the actual goods that were readily available. Delivery started to develop in the late 19th century. In 18th century there was also very important association of English traders and Russian Baltic ports called The Baltic Mercantile and Shipping Exchange.

The first organized commodity market was created in 1848 in the USA. It was Chicago Board of Trade (CBOT). It was the only official place where farmers and traders got together. In the same century Chicago started to be a major trading spot. But the city as such did not have sufficient storage capacity, no rules to evaluate quality and quantity of commodities. Because farmers and traders had to deal with different problems there had been a gradual creation of rules and the first real exchange market was established. The city was connected to the rest of the country with railways and telegraph. So delivery of commodities was ensured to all parts of the country. Chicago Board of Trade has been until now the world's largest commodity exchange.

Futures contracts (described in more details in the next chapters), as they are known today, occurred later. They were created to facilitate trading between farmers and traders. Farmers had money to grow their crops and traders had certainty that they will receive these crops. Before the futures contracts system there was no special method. Commodity was delivered and paid right on the spot. That means cash payment. In order to stabilize wheat prices, Americans have invented their own on-arrival contracts. Prices were already agreed at the time of delivery and contracts already signed many months in advance.

There are also records about the commodity trade from the ancient China 6000 years ago. There are also notes about trading in Egypt, Arabia, Greece and Roman Empire. But the first truly preserved documents are from the 17th century from Japan where commodity trading was used as an instrument to ensure the harvest of rice. Japanese also invented a unique representation of changing prices levels - so called “candlesticks“ chart – a graph that is used even today.

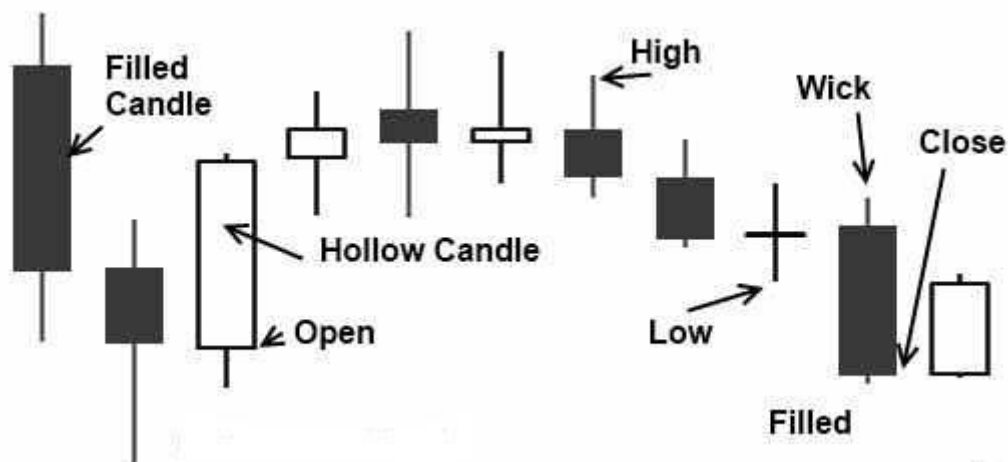
In Europe the evolution of commodity markets was highly influenced by the Industrial Revolution. Because of new machines there was ability to process all kinds of materials much faster. This has also increased for example the demand for the production of raw cotton from the United States. Further development occurred after an introduction of the first telegraph system between England and America. That meant exchanging more details on the supply of cotton through a new transatlantic cable. [13] [14] [15]

4.2. CANDLESTICK CHART

The candlestick chart (picture 4.2. 1) is composed from the body and the wick (upper and lower shadow). The area between the open and the close is the real body, the area above and below the real body are shadows. Traditionally, candlesticks have not been in different colours. If the close is less than the open, there is filled candlestick body and if the close is higher than the open, there is a hollow candlestick body. Nowadays different colours are used to show movements on the chart, for example green for increase and red for decrease. Open stands for opening price, the price at which the market opened in a given time interval. Close stands for

closing price, the price at which the market closed for the day. High is the highest price that was reached in the given time interval. Low is the lowest price that was reached in the given time interval. [16]

Picture 4.2. 1 Candlestick chart



Source of picture: *Liberated Stock Trader*, available at: <http://www.liberatedstocktrader.com/stock-charts/>

4.3. WHAT IS A COMMODITY?

Commodities are basically raw materials (in majority natural resources) which can be found in different forms in ordinary life and daily routine of every human being. They are homogenous, movable materials. Commodity supplies from different suppliers are interchangeable. Examples of commodities: gold, silver, platinum, copper, crude oil, natural gas, wheat, corn, orange juice, sugar, coffee, cocoa, soybeans but also foreign currencies, financial instruments, etc., - all of them traded since early stages of human existence.

Universally recognized classification of commodities is as follows: Energy, Industrial Metals, Precious Metals, Agriculture and Livestock.

Subject of this thesis is coffee and coffee is an agricultural commodity. Agricultural commodities, in other words “soft commodities”, are obtained from agricultural crops or animals (corn, beef). Some of them are direct products of earth other are derived (high-fructose corn syrup). Supply of these agricultural commodities such as coffee, is depending on size, cultivation and fertility of areas

where coffee is planted, it also depends on the weather and the diseases and pests. These facts cause the high volatility in prices. [17]

Current problem is that commodities are not so attractive. Many people take them as something that is out of fashion because big part of them is related to agriculture. Nowadays society does not consider agriculture as attractive field and potential investors choose rather another direction for their investments. But at the same time human and animals must eat something. Likewise, most of what humans commonly use is made from agricultural products. This sector, including commodities, is very important and it has huge perspectives for the future.

4.4. COMMODITY TRADING

The place where buyers and sellers of commodities negotiate prices is called commodity exchange and it is one of the most widespread markets in the world. The subjects that enter the market could be single persons or big companies (financial funds). Commodities are sold and bought usually in form of futures contracts (sold in future based on conditions agreed today) and prices are derived based on supply and demand for the commodity. All the specific terms mentioned above will be deeply explained later on in following chapters. [2] [18]

The trading of commodity derivative, in other words so called futures trading, has some specifics even though it might seem similar to trading of shares. Commodities futures (in advance specified amounts of commodity) are traded with strictly set dates of delivery, because it is the case when real raw materials are traded. These materials always have suppliers who are obliged to deliver them in specific time to the buyer of futures. And futures contract commits a buyer for the future to take the agreed amount of the asset (material) that is the basis for a futures contract. For example there could be bought futures contract for 1000 pounds of coffee (1 pound = 453.59 g) that will be supplied September of the next year. This is possible, because it takes time till the coffee is produced. This is a similar case for any commodity. Each commodity must be mined or produced or transported or it could be processed in any way and it takes time, but the deal of trade could be made. This brings advantages to the both sides – buyers and sellers, because it means that

producers of coffee have sales of their product guaranteed and buyers could buy coffee now for lower prices than they would buy next year, so they earn money. This principle is already many years old and it has roots in ancient Japan.

This all can take place in commodity exchange. Mechanism based on supply and demand gives a space for speculation. Each participant has the opportunity to speculate (to guess or to derive from different type of analysis) whether the price of the commodity will go up or down in the future and so he/she can buy it or sell it to earn money (unfortunately due to wrong decision he/she can lose money also). For this procedure it is very important to know the date of delivery of the chosen commodity that is set by the futures contract. As a speculator we do not want to physically take the amount of commodity, because for example in case of 1000 pounds of coffee we would need to store it somewhere, that costs us money, and perhaps we do not have facilities for processing coffee so it would lay fallow. And not only that, we would have to pay the full price of the coffee defined in the contract (the reason why the full price of contract is not paid all in the first purchase will be mentioned later in chapter). It follows that the most traded contracts are those just before the delivery date, because each speculator deprives them not willing to receive a “hill” of real coffee (or any other amount of other commodity) which he would have to deal with. For speculators it is the best to focus on the futures contracts that are dedicated on long term future.

One big advantage of commodities against the stocks is that for purchase of futures contract is needed to pay only a small deposit (margin) of the total price of the commodity, so even a small movement in the price - up or down - means a large gain or loss. This effect is called leverage and it occurs just in the commodity market. When buyer sells his/her commodity, the whole low buying margin is again paid back to him/her. It makes the market of commodities be very attractive for investors. They do not have to be super rich to gain a huge amount of money. But of course nothing is 100% certain, the more the profit. In case of shares the margin is around 50% of the price of the share. [2] [18]

For identification of commodities in the commodity market English abbreviations are used. The first letter of the commodity followed by the name of the month

specifically created to avoid confusion. Price quotations for each commodity are different and therefore it is necessary to study them.

Coffee futures ticker symbol: KC (C)

Trades: March - H, May - K, July - N, September - U, December - Z [2] [19]

There exists another way to invest money - so called spread. It is the difference between the terms of delivery of the commodity. For example, buying a September contract for coffee and selling one of April. Profit is the difference between these prices. It means buying when the spread is small and waiting till the spread increases to get profit. This method is less risky than futures trading in itself. [20]

In case of investing into commodities in general (not just in one). It is possible to put money into whole commodity indices. Commodity index is a set of different commodity futures contracts. Indices vary in composition and also in the weight of each commodity represented in the index. By investing into indices, person has well diversified portfolio because he/she trades the entire index. Main important indices are Dow Jones UBS CI, S&P GSCI and NASDAQ Commodity Index.

4.5. SUBJECTS ON THE MARKET

Many different types of subjects could be found in the market. The main are commodity sellers, small speculators, large speculators, commercials, brokers. There is also commission. Its interest is supervision and regulation of the market and this organ is different in every state where commodity exchange can be found. It supervises the exchange, brokerage companies and all entities associated with trading. Commercials are commodity sellers, who supply commodity and those who need the commodity to produce something else (they use it like input to produce output). They are also called hedgers. They trade the commodity because they want to mitigate effect of unexpected prices of commodities in the future. This form of protection is called hedging. Hedge is for example investing into two different goods with negative correlations. It means that when the one is at a loss, another one is profitable. After that there are investors, so called small and large speculators or non-commercials who observe development of the market of their commodity and they

try to earn money (make a profit) without coming into contact with the real material, so basically via selling and buying contracts. Their capital is necessary in the market for its smooth function. Small speculators are those who trade with small quantities of contracts. Large speculators are banks and funds with high capital available for use and they usually trade with hundreds of contracts. These investors are source of liquidity for hedgers in the market. Lower number of investors means higher volatility of the price of commodities; this also leads to difficulties for hedgers. The division into these tree branches – large speculators, commercials and small speculators is based on old Commitments of Traders report (COT). COT publishes weekly reports on the status positions of individual types of entities trading in commodity markets. This report can be also used as a good indicator, because based on it different behaviour and tactics of large companies could be observed and can be then used for our tactics. Recently in July 2010 new more detailed division of these subjects on the market was introduced. There are dealers or so called intermediary. They represent sell side of the companies (banks, dealers). The rest three subjects are on the buy side and they are asset managers with institutional investors, leveraged funds that speculate on the market and other reportable that does the hedging. [21] Brokers are neutral subjects between sellers and buyers. They manage money (needed for contract) that sellers and buyers give to him or put to the broker agency. Broker agency than trades with the clearing bank, which is the ultimate purchaser and vendor of contracts. Clearing bank (Bank that allows access to the commodity exchange, sets limits for trading, manage the client's account for transactions, monitors the development of positions and alerts client of potential risks of development. It provides an overview of the regular daily position. [22]) brings together buyers and sellers who do not know each other. [2] [18]

4.6. COMMODITY VS. SHARE

As it was mentioned before there is a difference between commodity and share trading. Futures contract has a date of expiration. The maximum length of contract is 24 months. Speculators have to discontinue ownership of it before the date agreed in contract comes otherwise they have to accept the delivery of commodity. Commodities are products. In case of shares of a company there is no date of expiration. Investor can possess them for many years. Investor does not have to sell

them, because he gets dividends paid from it. Shares are parts of company not products. If the company performs badly or goes bankrupt, investor loses all his money. Shares can have value of zero, commodities cannot, they still have some value and investor can get even to the negative position because he guarantees by his invested money – he can get under the amount of money invested. Due to small changes in the unit price of a contract there may be a huge gain or huge loss. The size of loss can be much bigger than the original investment.

What does commodity futures contract exactly includes? It includes the quantity of the product, unit price, the value of the whole contract, date of delivery and consent to the terms of payment. Each commodity is traded in different units. And their price is set by supply and demand mechanism. When there is a shortage in supply of some commodity, and same demand for it, the price goes up. If there is a surplus in reserves of some commodity, and same demand, the price goes down. When there are same reserves but higher demand, there is higher price and with same reserves available and lower demand, there is also lower price. There are also important terms connected with the futures contract. There is FND (first notice day) and LTD (last trading day). FND is announcements concerning the new ownership of the contract for the purchase of commodity, it is important to sell the contract near in the future, otherwise investor has to take full responsibility for the contract. LTD is the very last day when there is still the possibility to sell the contract to someone else and avoid the obligation to take commodity physically into personal possession. For speculators it is thus important to sell before FND comes.

In times of crisis, prices of basic goods and food are rising – it means many commodities' prices are rising, because people need them. Share prices, real estate and bonds are falling, because they are not necessary for living. [18]

4.7. DIVISION OF THE COMMODITY EXCHANGE SPACE

As mentioned earlier, commodities are traded on commodity exchanges, where each trader contact his/her broker and commands him to buy or sell commodity contract, broker passes the command to the so called pit arena, where his merchant executes this command. This is the case of traditional way of trading. Nowadays

many exchanges switched to electronic trading where all these processes run on commodity exchanges' servers. This possibility brought many advantages to the trading and among the biggest could be mentioned that trading with commodities as well as all the information connected is available to everyone in the world who has Internet access.

The most important commodity exchanges could be found in the U.S.A.:

- Chicago Mercantile Exchange (CME)
- Chicago Board of Trade (CBOT) established in 1848
- New York Mercantile Exchange (NYMEX) established in 1870
(CME, CBOT, NYMEX are all parts of the CME group)
- New York Board of Trade (NYBOT) - it was renamed into Intercontinental Exchange (ICE)

The key ones in Europe are:

- European Exchange AG (EUREX) in Germany
- London International Financial Futures Exchange (LIFFE) in the UK

The main in Asia is:

- Tokyo Commodity Exchange (TOCOM) in Japan.

For this thesis focused on coffee trading it is important to mention main commodity exchanges that concerns coffee:

- Bolsa de Mercadorias & Futuros (BM&F) in Brazil
- Tokyo Grain Exchange (TGE)
- London International Financial Futures and Options Exchange (LIFFE)
(NYSE Euronext)
- Intercontinental Exchange (ICE) - ICE Futures U.S.
- New York Mercantile Exchange (NYMEX) [23]

In New York market there is trading with coffee Arabica and its price is expressed in cents per pound. The size of one contract is 37.500 pounds. In London, there is traded Robusta and the price is expressed in dollars per ton. The size of one contract is 10 tons. [24]

There exist also small commodity exchanges - regional or specialized. The disadvantage of them is low trading volume, which has an impact on the liquidity and the cost of the trade. It means that for small investor, who is beginner, it is better to invest money on bigger exchanges. [18]

4.8. LONG VERSUS SHORT POSITION

On the futures market there is possibility to speculate in two ways thus earn money by trading with a short and a long position. When speculator trades with the long position, he purchases commodity contract and expects its price to rise. That means appreciation of the futures contract. The principle is simple: buy low, sell high. When speculator trades with the short position, he sells commodity contract (without necessity to own one) and expects its price to decrease. He can then buy it back and thereby earn money. Important is to buy the contract of the same commodity and same date of delivery before the FND, otherwise the speculator has to deliver the real commodity to buyer of it. The principle is sell high, buy low. It could be observed that in the commodity exchange there is possibility to make money whether the price moves up or down. [18]

4.9. BULL AND BEAR TRENDS, TICK

This term refers to the price trend. Trend of commodity prices gives us important information on which the strategy of investing could be established. The best is to follow the trend. When there is a long-term rise in price it is called the bull trend (upward trend), when it comes to long-term declines it is called bear trend (downward trend). The smallest movement of commodities is called a tick. When there are many peaks and troughs without any significant upward slope or downward slope, it is a horizontal (sideways) trend.

Commodity market shows cyclical behavior. It is because of the different seasons of the year or week and due to human behavior. Similarly, the products have their own life cycles.

There are apparently 18-year growth trends in commodities' market. [2] [18]

4.10. OPTIONS

The option is another trading instrument. It is also derivative as well as futures. It is a contract between the seller and the buyer, which gives to buyer the right (not the obligation) to sell or buy from the seller particular asset at a specified price (the strike price) at any time up to the expiry date of the contract. For such a right to have this option the purchaser pays a specified price to the seller. It is called the option premium. There exist two types of options. Call option it is the right of the buyer to buy the underlying assets (of commodity) in future. Put option is the right of owner to sell the underlying assets in future. [2] [25]

4.11. PRICE

Coffee is not a homogenous product so there is no single price for coffee as such. Prices that are changing from day to day are determined by supply and demand. Price is mostly set according to the coffee quality, its origin and availability. That means that not all coffee is the same. [26]

There are many other factors that influence price of coffee. For example behaving of speculators on the market, changes in the exchange rates of currencies, value added to the product on the way from producer to consumer. Price of dollar, the main currency in which coffee is traded. Rising of production costs which have to cover expenses on fertilizers, labour and transport. Development of other commodities. The political and economic situation in the world (war, terrorism...) and especially conditions of the large economies like the USA, the European Union, China or India can affect price of coffee. [18]

Export and import of coffee depends largely on shipping. Today there is still a limited number of ships and those who are available use more and more expensive

fuel. It is due to the fact that crude oil is getting expensive and became scarce resource. Crude oil is disappearing from the natural deposits and finding new deposits has to be more financed, all this can also cause a rise in the price of coffee. Likewise, the price of water. In many countries there is still a lack of water and even developed countries will have to be more modest in their water consumption in future.

The price and supply of sugar, which is complementary commodity to the coffee, are also important factors. Many people cannot imagine having their morning coffee without spoon of sugar. But problem is that there are no new plantations of sugar cane based. So in case of sugar supply is decreasing but demand is growing, driving the prices up. Also milk is an important commodity, which may affect the coffee market or at least the price of coffee consumer buys in his favorite café.

Despite the fact, that there exist many influences, the average price of coffee can be calculated.

4.12. COFFEE COMPANIES

There are four major corporations in the coffee world that use cheaper Robusta type.

- Kraft (In Europe it is Mondelez International), that owns labels as Jacobs, Maxwell House and Carte Noire.
- Nestlé with labels Nescafé, Nespresso and Dolce Gusto
- Procter & Gamble with labels Folgers and Millstone.
- Sara Lee with Caboclo, Café do Ponto and Douwe Egberts.

These companies purchases more than 50% of all Robusta coffee beans. It is because this type of coffee is suitable for mass production. [27]

It is possible instead of investing into coffee invest to stock of companies producing, processing or manufacturing coffee. When coffee price decreases, the stock of company increases. Companies do well. They can raise their profit with

same costs of production and higher revenues because of buying commodity for lower prices, this increases the value of stock. When coffee price increases and these companies have huge amounts of coffee in their inventories, they again do well. But there is one disadvantage connected with investing into stocks. A stock may fall to zero, commodity cannot. [2]

4.13. PSYCHOLOGICAL ANALYSIS – ANOTHER TOOL FOR INVESTORS

It is important to mention one tool suitable for investing that will not be part of this thesis, because it requires a large and time-tested experiences. Psychological analysis is based on studies of psychology of investors. The subject of psychological analysis is to predict behaviour of people, in this case of participants of commodity markets. Disadvantage is the analysis difficulty and the length of prediction, it could be done just for short term future. When someone is capable analyser, he/she can make a profit on the behaviour of the other investors. The most important is to determine whether the market is controlled by the responsible tactics of investors or by their emotions. Whether participants of the market behave rationally or irrationally. Media with their actions contributes fast and a lot for hysteria and euphoria on the market.

- The main theory is the **theory of the crowd**. Firstly defined by Gustave Le Bon. It assumes that people behave like a throng or **herd** often very irrationally with strong emotions that can lead to hysteria, panic or euphoria. Individuals make decisions according to people in their surroundings and not according to their own beliefs or they can act as a group without planned direction. The psychological analysis and the crowd theory is closely related to the term **speculative bubbles**. It describes a huge optimism on the market caused by certain events or emotions. Traders that are part of the crowd perceive even small stimulus as positive, it is then reflected in the market prices and they start to deviate from the real prices. It is basically artificially stimulated growth that cannot last forever and after the bubbles bursts the prices fall very dramatically. [28]

- There is **fear of possible losses (the disposition effect)**, when individuals prefer to have lower revenues and to maintain losses. It is when investors tend to sell their assets with growing value, but at the same time they keep assets that have lower value in their portfolio. Investors do not want to admit their losses that often leads to greater losses.
- **Effect of concentration** is when investors rely just on small irrelevant information available and they ignore situation as the whole. It happens when losing investors want to believe in positive future shift in prices based on even insignificant information.
- **Over optimism** when investors tend to have exaggerated optimism for outcome of planned actions. They tend to overestimate the likelihood of positive events and underestimate the likelihood of negative events.
- **Ostrich effect** when new and less experienced investors have a dismissive attitude in adverse events. They accept favourable but deny unfavourable situations.
- **The effect of overconfidence** occurs when successful investors have a tendency to have excessive confidence (which is far away from real accuracy) based on previous gains.
- **Theory of regret** means that investors regret that they missed a possible transaction when the price of commodity was at its peak and they have loses in form of opportunity costs. Their mistake in judgment leads to keeping their sometimes senseless positions until the better situation occurs and they replace loses. It often leads to worse outcome than under normal circumstances. [29]

In practice the combination of fundamental, technical and psychological analysis is used. All methods are relatively close to each other and sometimes the combination of them is necessary for the right conclusions.

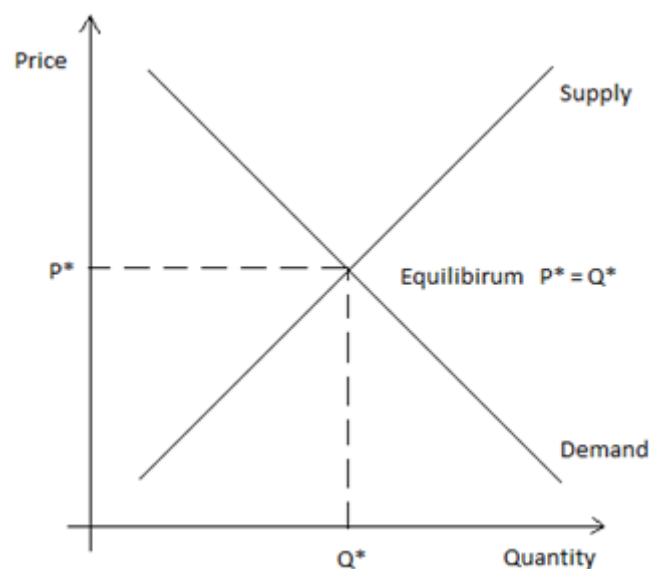
5. CASE STUDY

One of the good methods for investors to get more detailed information about the commodity is to apply the fundamental analysis. This analysis is also part of this thesis. Fundamental analysis is studying of fundamentals. It means the interaction of supply and demand. The price of the coffee commodity depends on the demand and supply of coffee, in other words on price is derived by the interaction between customers and suppliers. This principle is the same within an every market in the world. If there are no customers for the product, there should not be also any suppliers, because they do not have people to sell their product to and they cannot earn any money. Fundamental analysis is also based on the macroeconomic situation in the country and in the world and it is necessary to look also at the political, economic and social changes. Very beneficial is studying of historical development of the commodity, because history repeats.

5.1. SUPPLY AND DEMAND, PRICE

The price of coffee is set by interaction of supply and demand for coffee.

Chart 5.1. 1 Equilibrium of supply and demand



Source: Author's own illustration

The market demand for commodity represents basically consumers' behaviour. Market value of some commodity as well as any other product is represented by its value for the customers. (In case of agricultural commodity the demand illustrates mainly the interests for already finished products.) Customers want to buy at the lowest price possible as much of the product as they can. Suppliers want to sell at the highest price possible a sell as much as they can, because they want to make profit or at least cover the production costs. But both these conditions coming from buyers and suppliers cannot be satisfied, so they have to agree on the acceptable price for acceptable quantity (acceptable for both sides but often not a fair price) which lies at the equilibrium (chart 5.1. 1) where supply meets demand or the point of market clearing price. If there are low prices it is a signal that there is possibly too much of commodity supplied in the market relative to demand. Profit for producers and sellers can be achieved just when consumers show higher demand.

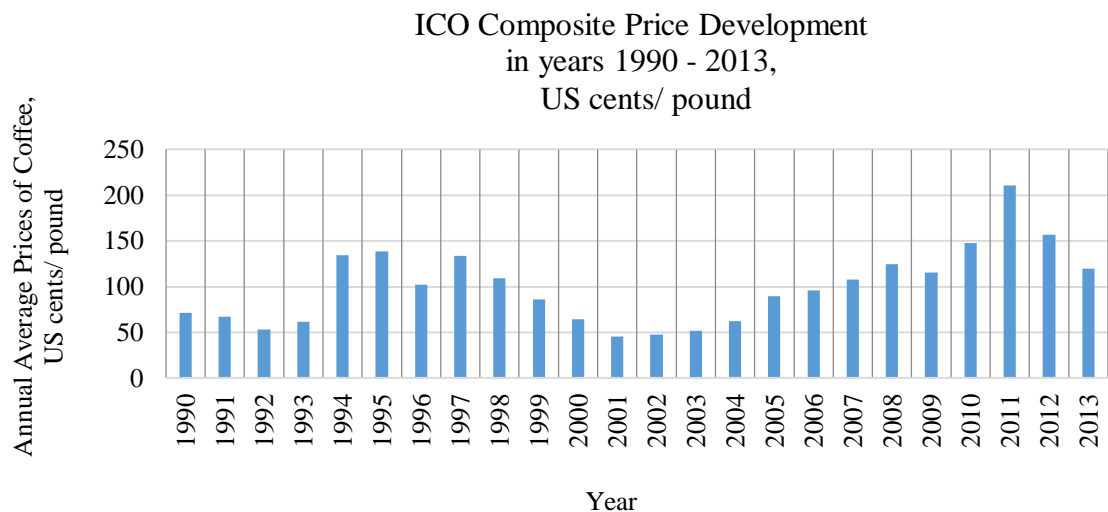
There are other factors than level of production that affect demand such as handling, packaging, location of harvested area, quality control, financing of the commodity. And there are also in this case of coffee much more important factors that affect supply such as the competition in the market, technology development and the price of inputs or weather conditions. And last not least there are diseases and pests that attack coffee plants. The final price is derived based on all these circumstances and other external factors (value of currency, etc.)

Long-term declining commodity market causes reduction in capacity, it creates an imbalance between supply and demand. Smoothing of this situation is not a matter of months or year, but it means a time horizon spanning several years. As with other commodities, this rule applies also with coffee. In trading, it is necessary to take the time needed to provide the new production.

Falling coffee prices are forcing production to be reduced. This leads to a reduction in the supply and then to the price increase. Price will be driven up again until increased profits attracts other producers on the market, they will increase the supply and prices will fall again. And so over and over again. Even assuming constant demand for coffee unless their capacity is somehow renewed, the imbalance between demand and supply is occurring.

Demand for coffee is quite stable and inelastic. It does not react to changes of price much, because people drink it anyway. (Good example of it could be Starbucks Corp. chain or Costa Coffee, where cup of coffee has really high price, but customers buy it anyway.). One reason also could be that there is no equivalent substitute for coffee in the world. In the long term investment coffee is for investors undoubtedly an interesting commodity. Actually the consumption of coffee is still increasing and production seems to be insufficient. In other words it means that demand is still increasing, while the supply side is often affected by something that prevents its growing like weather condition or high costs of cultivation. Response to it in prices could be very steep.

Chart 5.1. 2 ICO Composite price development



Source of data: ICO, author's own illustration

(1 pound = 453.59 g)

On the chart 5.1. 2 average changes of ICO composite price of coffee can be observed. The ICO composite price indicator contains proportionally all prices of all types of coffee such as Colombian mild Arabica, other mild Arabica, Brazilian Natural Arabica and Robusta. It could be seen that in the years 2001 - 2003 there was a big crisis in coffee market. The prices were at lowest levels for 100 years. They did not even cover production costs and so there was a huge liquidation of coffee plants and growers were leaving to other branches of agriculture or they started to cultivate other crops like coca. In the chart there can be observed also other periods of high

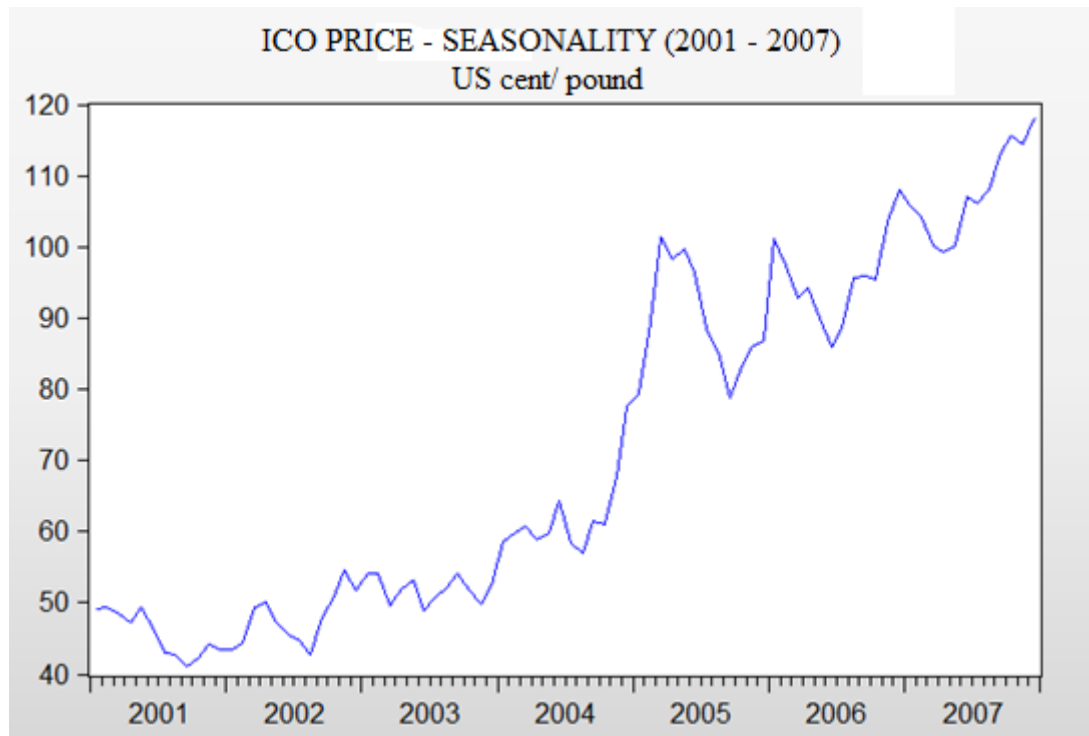
price volatility. After the bad years the growing price was determined by continuous condition: demand exceeding supply. In the time of the world crisis in 2008, no exceptional behaviour of prices was reported. In the year 2011 the turnover happened. Between 2011 and 2013 there was a decline in coffee prices due to supply excess over the demand. For the next year, the situation may change because of the opposite situation – lower supply of coffee. (This topic is closely examined in chapter about current weather situation and coffee price in case study of this thesis.)

In the next chapters the significant increase in supply and creation of surplus in years 2001 - 2003 in the coffee market is justified by charts and data series of production of the two biggest producers in the world. It can be assumed that when the price of coffee is decreasing, consuming countries are buying more and they put something also into their inventories, so they have reserves for their later consumption. It also takes some time in the market before the oversupply, based on the high production, occurs. It takes time to see how consumers react to high amounts of commodity in the market.

5.1.1. Seasonality of price

This sub-chapter is dedicated to seasonality of coffee price and its deviations. The period from 2001 until 2007 was chosen, because it shows almost the linear trend and it was assumed as suitable for this calculation. Later development of price is non-linear but for demonstration of deviations during year, the time series of 2001 to 2007 serves well. For calculation the program Econometric Views was used. The chart 5.1.1. 1 shows the chart of data series that were used as input of the calculation.

Chart 5.1.1. 1 Eight year seasonality of coffee price for years 2001 – 2007



Source of data: ICO, author's own illustration in program EViews

(1 pound = 453.59 g)

Although it was assumed that for calculation the linear model would be appropriate, the parabolic regression model was used because it better described the behaviour of given time series. January values lie on the estimated parabola and deviations of each month are deviations from the parabola. For the seasonality calculation 11 dummy variables were used. The Ordinary Least Squares Method was applied for the model estimation.

Table 5.1.1. 1 Output from Econometric Views program

Output from EViews
12 seasons of 8 years
(2001 - 2007)

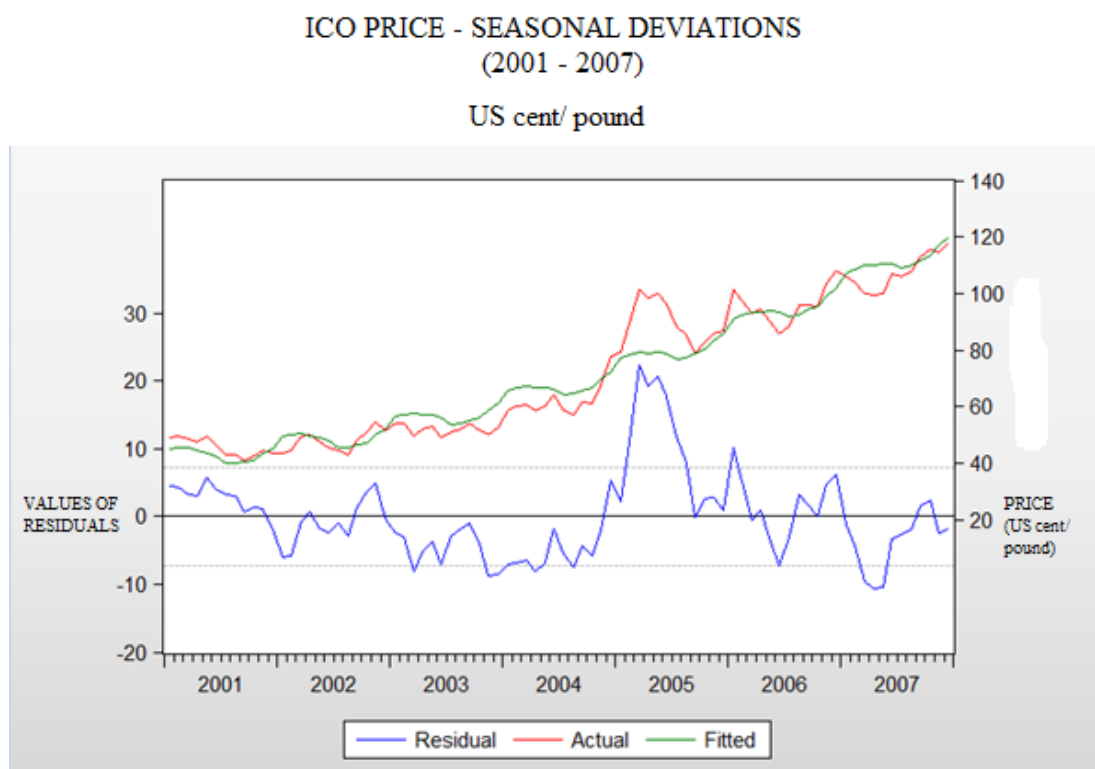
Dependent Variable: PRICE
 Method: Least Squares
 Date: 03/26/14 Time: 17:22
 Sample: 2001M01 2007M12
 Included observations: 84

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.51166	3.484619	12.77375	0.0000
TREND(2000M12)	0.280566	0.131477	2.133959	0.0364
TREND(2000M12) ²	0.007894	0.001498	5.270428	0.0000
SEAS(2)	0.107356	3.857245	0.027832	0.9779
SEAS(3)	-0.193933	3.857729	-0.050271	0.9600
SEAS(4)	-1.501011	3.858500	-0.389014	0.6984
SEAS(5)	-2.453878	3.859536	-0.635796	0.5270
SEAS(6)	-4.106820	3.860824	-1.063716	0.2911
SEAS(7)	-7.095550	3.862357	-1.837103	0.0704
SEAS(8)	-7.570069	3.864134	-1.959059	0.0541
SEAS(9)	-7.288948	3.866162	-1.885319	0.0635
SEAS(10)	-7.296473	3.868454	-1.886147	0.0634
SEAS(11)	-5.355501	3.871031	-1.383482	0.1709
SEAS(12)	-3.826032	3.873920	-0.987638	0.3267
R-squared	0.926048	Mean dependent var	71.45440	
Adjusted R-squared	0.912313	S.D. dependent var	24.36834	
S.E. of regression	7.215930	Akaike info criterion	6.941471	
Sum squared resid	3644.875	Schwarz criterion	7.346607	
Log likelihood	-277.5418	Hannan-Quinn criter.	7.104332	
F-statistic	67.42720	Durbin-Watson stat	0.322960	
Prob(F-statistic)	0.000000			

Source of the figure: author's own illustration in program EViews

The table 5.1.1. 1 shows the output of the calculation in EViews. SEAS(n) stands for different season in year and for different x in the parabolic equation. The resulting formula is then: $y = 0,007894x^2 + 0.280566x + 44.51166$. (The statistical insignificance of the coefficients on column named Prob. should not matter because there is factual significance.) Calculated deviations are shown in the chart 5.1.1. 2. The red curve represents actual (given) time series. The green curve represents the estimated parabolic trend model for different values of x ranging from 1 for 2001M01 observation to 84 for 2007M12 observation and including seasonal (monthly) constants (SEAS(2) for February, SEAS(3) for March and etc. to SEAS (12) for December). The blue curve is the difference between red and green curve.

Chart 5.1.1. 2 ICO price of coffee – Seasonal deviations



Source of the chart: author's own illustration in program EViews

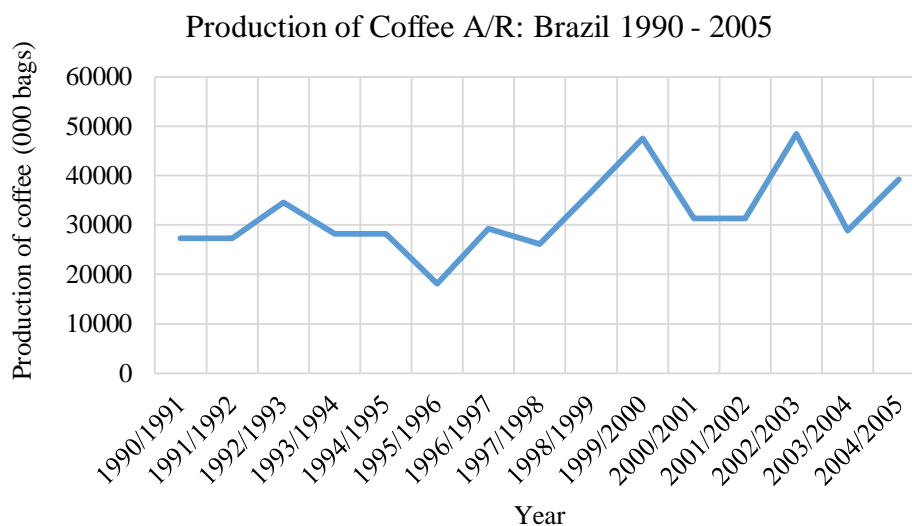
There could be observed quite strong seasonality. The most expensive coffee is the one of January, February and March. The cheapest is from July till November. It can be assumed that major consumers of coffee, the EU and the USA, drink coffee mainly during winter season when months are colder rather than in hot summer. With higher demand, prices grow.

5.2. PRODUCTION OF BRAZIL AND VIETNAM - CONTRIBUTION TO THE COFFEE CRISIS

In the previous chapters the problem of coffee crisis was introduced. So what was the real cause of this coffee crisis? The chart 5.2. 1 shows production of coffee in Brazil during 15 years. Brazil's production is very uncertain, because of the unstable weather. Arabica, its major type of produced coffee, needs very specific conditions for growing, due to this, it is much better valued than Robusta. The production goes up and down over a single year. Starting at years 1997/1998 Brazil was able to increase production in new areas with lower risk of frost and the production started

to grow. The increase in production was much bigger than before. Obviously Brazil contributed to the saturation of coffee market.

Chart 5.2. 1 Production of coffee Arabica / Robusta in Brazil in years 1990 – 2005

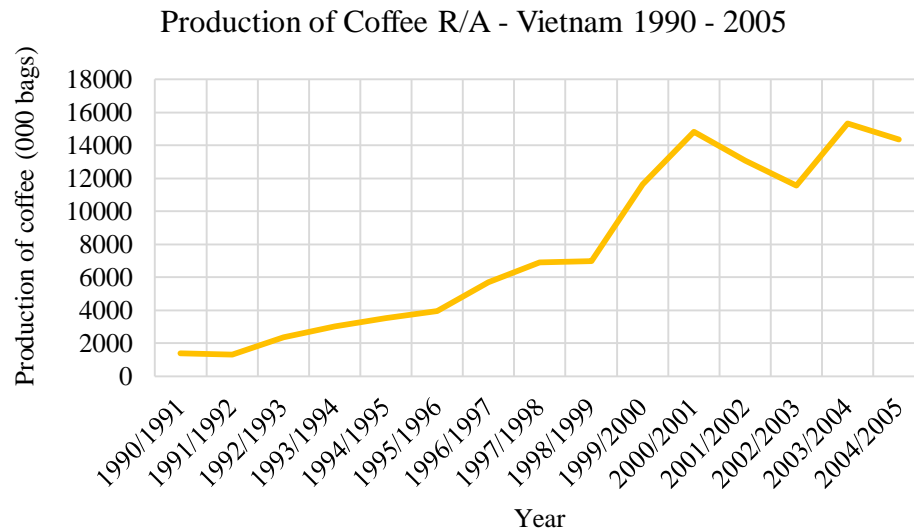


Source of data: ICO, author's own illustration

(1 bag = 60 kg)

The chart 5.2. 2 shows coffee production of Vietnam in years 1990 – 2005. Vietnam is producing mainly coffee type Robusta. The run of production is definitely not so dramatic. There are no big ups and downs. Basically it can be said that the production of coffee in Vietnam has an increasing tendency. The country has much stable weather and Robusta has easier cultivation than Arabica. In the time starting 1998/1999 till 2000/2001 Vietnam raised its production more than two times and from years 1990 – 2001 almost ten times. It could not remain without response. Vietnam outperformed its competitors and became one of the leaders. It is already obvious that saturation of the market had to come afterwards. Interesting is that Vietnam as a developing country prefers to enter an already running market with focus on exports of coffee rather than to satisfy his own internal market and to try to achieve an economic self-sufficiency.

Chart 5.2. 2 Production of coffee Robusta / Arabica in Vietnam in years 1990 – 2005



Source of data: ICO, author's own illustration

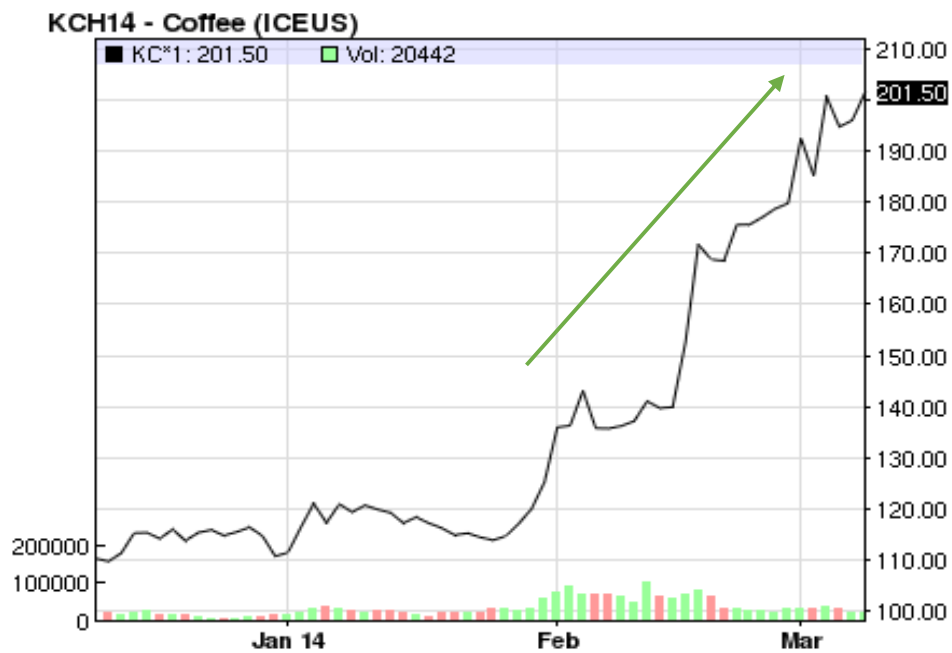
(1 bag = 60 kg)

5.3. VALUE OF DOLLAR VS. COFFEE

Based on information from literature background it is already known that the USD should have impact on price of coffee, because coffee (and other commodities) is traded in dollar and dollar is still the most important currency in the world.

There could be observed strong inverse relationship among price of commodity and price of dollar. When the price of dollar goes up, the price of commodity goes down. When dollar strengthens against other currencies, the prices of commodities weaken and conversely. When dollar declines there is more dollar needed to buy commodities. With lower value of dollar, other buyers from other countries have more buying power than buyers in dollar countries. They can buy more because the commodity is cheaper for them. Because they raise the demand, prices go up again. This phenomenon can be observed from the following charts (5.3. 1 and 5.3. 2). Arrows indicate the most significant changes that happened in the same period of time.

Chart 5.3. 1 Commodity futures price quote for coffee (3 months in years 2013 - 2014, US cents/ pound)



Source of the chart: NASDAQ

(1 pound = 453.59 g)

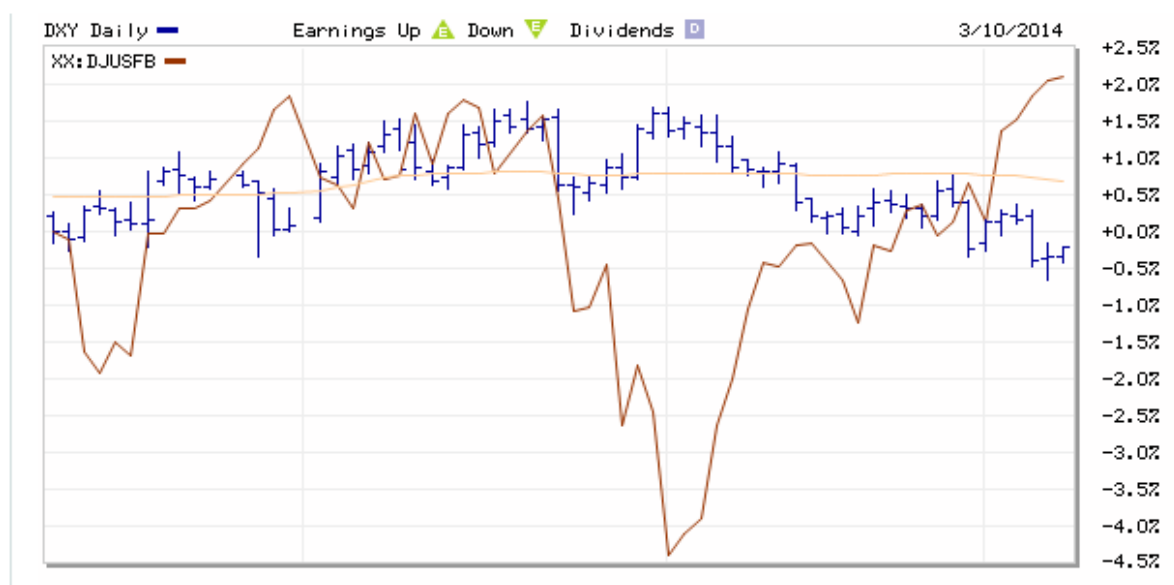
Chart 5.3. 2 Development of the price of the dollar against the euro (3 months in years 2013 - 2014)



Source of the chart: Yahoo! Finance

In the chart 5.3. 3 the blue represent the dollar index, which is the value of dollar against a basket of other major currencies, and the brown line represents Dow Jones U.S. Food and Beverage Index. As the dollar moves higher, the other index moves down. The development of changes is shown again for 3 months. Dow Jones Food and Beverage Index includes, among others, also soft drinks manufacturers, bottlers and distributors, and coffee belongs in this case under the group of soft drinks. (Other companies include in this index work with commodities such as fruit juice, tea, livestock, crops, etc.) [30]

Chart 5.3. 3 Dollar Index vs. Dow Jones Food and Beverage Index (10th March 2014)



Source of the chart: MarketWatch

The picture illustrates the facts mentioned above, i.e. that commodities have negative relationship with the USD.

5.4. WEATHER AND COFFEE PRICE

At the beginning of the year 2014 Brazil, the first biggest producer of coffee in the world, went through very bad weather conditions. Historic drought caused production of Arabica (especially with delivery in March) to drop enormously and pushed prices up to their absolute peaks in decade. Because the world coffee shortage could occur. A key region for coffee production Minas Gerais was consistently under the dry weather during. Its expected production was expected to

be around 60 million bags but forecasts said that it will decline to 50.2 million bags maximum. Dry conditions are forcing many cities to switch to system of water rations and some districts are receiving water only every three days that makes cultivation of coffee (and other agricultural commodities) much more expensive and harder. Due to global climate changes it can be expected that more extreme weather conditions become routine in the close future and production of coffee will be at risk. The drought in Brazil had also influence on sugar cane and thus on price of sugar of which is the Brazil the biggest producer in the world. Consumers of coffee with sugar will have to dig deeper into their wallets. [31] [32] [33]

The (1-year long) chart 5.4. 1 shows the huge growth in price of US coffee C that could be observed mainly during the first months (January, February) of 2014.

Chart 5.4. 1 US Coffee C price growth in the beginning of the year 2014



Source of the chart: Investing.com

5.5. CORRELATION (CRUDE OIL, WORLD GDP, EURO VS. ICO PRICE OF COFFEE)

The aim of the analysis is to determine the correlation strength of the relationship between variables. For correlation it was used IBM SPSS Statistic Data Editor (sig. 2-tailed, number of observation = 16). The analysis was done for years 1997 – 2012.

The “ ρ ” sign stands for the value of Pearson’s correlation.

- In the first case it was assumed that price of coffee should be influenced by price of crude oil. Crude oil is crucial for shipping (or other transport that needs fuel) and its prices have to be included into the price of coffee. Higher price of fuel should mean higher price of coffee.

Variable x_1 : ICO Price (US cent/ pound)

Variable y_1 : Crude Oil (US dollars/ barrel)

$$\rho = 0.656$$

Closer number to 1 means stronger relationship between variables. The result of correlation 0.656 (65.6%) is confirming the strong relationship between price of coffee and price of crude oil. It means that changes in one variable affect the other variable (non-directional relationship). The correlation is positive (there is not negative sign). It means that when the price of crude oil goes up, than the price of coffee goes up also and when the price of crude oil goes down, the price of coffee goes down also.

(Source of ICO prices data: ICO, source of crude oil prices data: ChartsBin)

- The second case is correlation of ICO price with the world GDP. By author of the thesis it was assumed that price of coffee goes up as the world GDP goes up. With growing GDP people should be able to buy more coffee. The demand increases and it should lead to higher prices of coffee. Customers should be willing to drink coffee despite high prices.

Variable x_1 : ICO Price (US cent/pound)

Variable y_2 : World GDP

$$\rho = - 0.068$$

This number is around 0 and it means weak relationship between variables. The result of correlation – 0.068 (6.8%) is confirming the very weak relationship between price of coffee and the world GDP. It means that changes in one variable does not almost affect the other variable (non-directional relationship). The correlation is negative (there is negative sign). It could be explained as follows: when the world GDP goes up, than the price of coffee goes down also and when the world GDP goes down, the price of coffee goes up, but these influences are really small so they are considered insignificant.

(Source of ICO prices data: ICO, source of world GDP data: Index Mundi)

- Previous chapter showed negative influence among value of the US dollar and value of commodities. This last correlation was applied for the case of coffee price and the Euro value to US dollar. The assumption is that any rise in value of the Euro to the US dollar may positively influence price of commodity. Because from the previous chapter it is known the opposite case. The Euro was chosen as another major world currency next to dollar.

Variable x_1 : ICO Price (US cent/pound)

Variable y_3 : Euro to US dollar

$$\rho = 0,685$$

The result of correlation 0.685 (68.5%) is again confirming the strong relationship between price of coffee and value of the Euro to US dollar. Changes in one variable affect the other variable (non-directional relationship). The correlation is positive. It means that when the value of the Euro against US dollar goes up, than the price of coffee goes up also and when the value of the Euro against US dollar goes down, the price of coffee goes down also.

(Source of ICO prices data: ICO; source of rate euro against US dollar: Investing.com)

5.6. MOVING AVERAGES

Moving averages are used to model the trend component of time series. It is based on the assumption that short sections of times series can be expressed in form of one curve with different features.

5.6.1. The Simple Moving Average

The Simple Moving Average (SMA or just MA) is one of the basic tools that could be used for recognition of right time to enter or to exit the market of commodity. It is reliable and quite strong strategy which smooth out the data. The SMA is based on counting with average closing prices of the chosen interval of trading days. Using following formula:

$$\text{SMA} = (\mathbf{P}_1 + \dots + \mathbf{P}_n) / \mathbf{n}$$

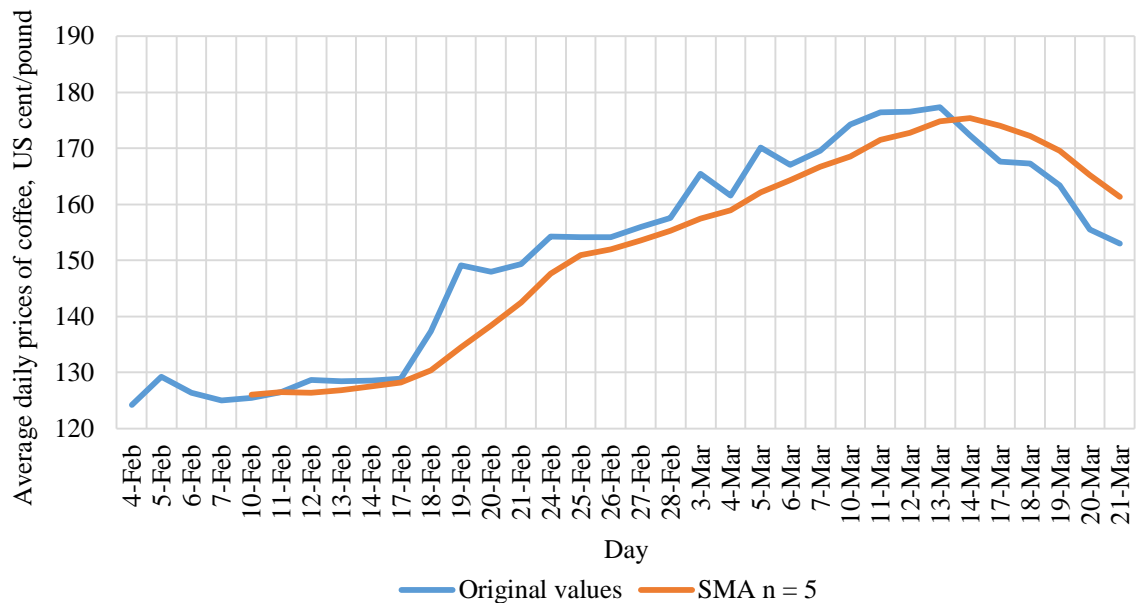
Where **P** is closing price, **n** represents the number of days (stated period, chosen by investor) on which the simple moving average is counted.

The total sum of closing prices of the trading days from the stated period are divided by the number of days in the stated period.

In every new day of trading a new moving average has to be created. The value of the SMA is ranging above and below the original prices fluctuation. [34]

In the next chart 5.6.1. 1 the SMA for average daily prices of coffee could be seen. The stated period here is 5 days. The blue line represents original data series of prices. The orange line represents the SMA.

Chart 5.6.1. 1 SMA - Average daily prices of coffee



Source of data: ICO, author's own interpretation and calculation

(1 pound = 453.59 g)

Whenever the blue line of original data series (original values) of price crosses orange average line, it is a signal for an action on the market. If the price crosses the SMA from the bottom, it is a signal to buy coffee, to enter a long position. If it crosses the SMA from the above it is the signal to sell the commodity or to take a short position. In this case, there is just one significant crossing from the bottom (11th February) and it means to take a long position. The investor could keep his long position for more than one month, because the price was still growing and also the SMA did not cross it again. On 13th of March the original blue price line crossed the orange line from above and it was a signal to sell – to enter a short position.

Moving averages are calculated from the data of the past days, so they are always behind (in delay) the real data. They are trend following indicators. When prices are in trend, moving averages work well, when prices are not in trend, moving averages can give false signals. [35] [36]

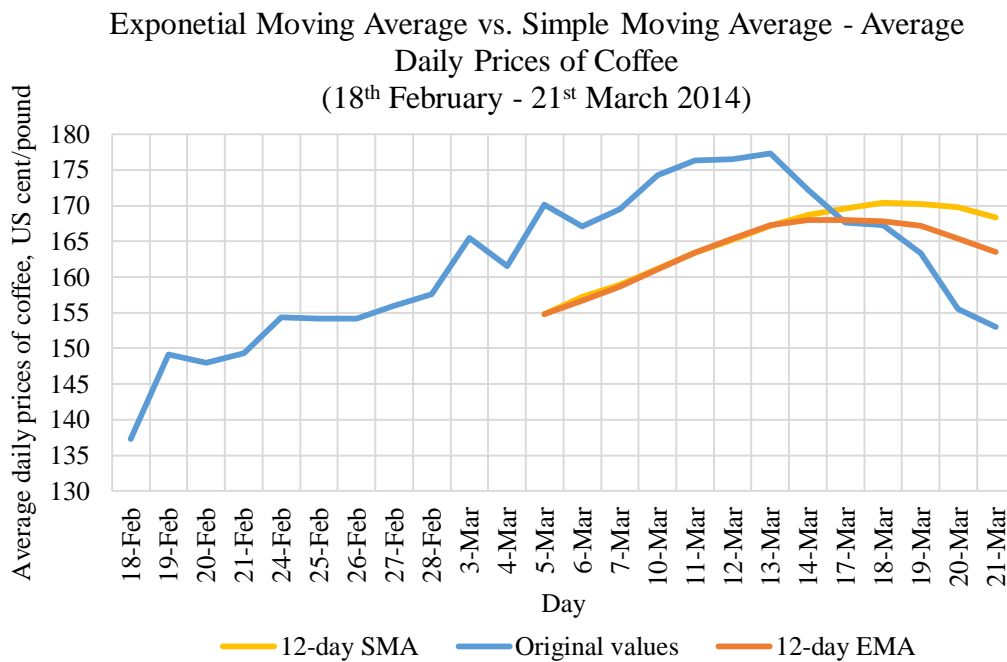
5.6.2. The Exponential Moving Average

The Exponential Moving Average (EMA) is another of the basic tools next to SMA that is used by investors. The EMA is used to reduce delay of SMA. The EMA put more weight on data that are more recent, and less weight on older data. It causes faster reaction on actual changes in prices. The formula is:

$$\text{EMA} = \mathbf{P} * \mathbf{K} + [(\text{EMA}_{n-1} * (\mathbf{1} - \mathbf{K}))]$$

Where **P** is the closing price used to calculate average, **n** is the length of the reference period (in month, weeks, days) and **K** refers to smoothing factor and is equal to $2 / (\mathbf{n} + \mathbf{1})$. [37]

Chart 5.6.2. 1 EMA vs. SMA – Average daily prices of coffee



Source of data: ICO, author’s own interpretation and calculation

(1 pound = 453.59 g)

On the chart 5.6.2. 1 the EMA of average daily prices of coffee and the SMA of the same values are displayed. There is used 12-day short term average that is often used (as well as 26-day average) when working with EMA. There is same number of periods used for determination of SMA for better comparison. Using EMA has advantage in form of more accurate information because it response faster to changes

in prices. In this case, the graph of prices crossing EMA signals to enter the short position lately than in case of the crossing of SMA. The EMA really closely copies the blue line of prices and shows the real time when it was strongly obvious that the price is going down – the latest time for selling.

5.7. COFFEE COMMODITY AS SUBJECT OF TRADING ON COMMODITY MARKET

This chapter is devoted to technical analysis of coffee price trends in the market with a help of the global financial portal investing.com where real time quotes and technical charts of commodity futures are available. All prices of US coffee C are in the US cents per pound. All charts show daily coffee closing prices.

5.7.1. SMA (5, 10, 20)

Chart 5.7.1. 1 US Coffee C Price - SMA (n = 5, 10, 20)



Source of the chart: Investing.com

As it was noted earlier, SMA applies equal weight to all prices in the calculation. Here comes another method “the crossing of simple moving averages” that is used to determine the signal to action – to enter position. In the chart 5.7.1. 1 that represents price movements from the 8th November 2013 until the 18th March 2014, the crossings of simple moving averages of 5-day (blue), 10-day (orange) and 20-day (pink) periods were used. When the SMA with shorter period crosses the SMA with longer period upwards, it is a signal for long position. If the shorter SMA crosses the longer SMA downward, it is a signal to sell. In this case, whenever the blue line crosses the orange or the pink line (e.g. in February 2013) or the second possibility occurs whenever the orange line crosses the pink line (e.g. in February 2013), it is time to buy. The selling signal occurs for example at the end of the chart in March 2014 when blue line crosses the orange line from above. The buying signal is here generated also when all lines are gradually sorted from top to bottom, and the upper one is the SMA with the shortest period. It could be observed from February 2014.

5.7.2. SMA (10, 30, 60)

Chart 5.7.2. 1 US Coffee C Price - SMA (n = 10, 30, 60)



Source of the chart: *Investing.com*

In the chart 5.7.2. 1 that represents price movements from the 21st March 2013 until the 17th March 2014, the crossings of simple moving averages of 10-day (blue), 30-day (orange) and 60-day (pink) periods were used. The whole examined period is longer (almost 1 year) and therefore there were used also longer periods of the SMA than before. The principle of signal recognition is the same as in the previous case. In this case, whenever the blue line crosses the orange or the pink line from the bottom it is a signal to buy (e.g. in December 2013) or whenever the orange line crosses the pink line (e.g. in January 2014) it is the signal to buy also. The signal to sell comes when the shorter SMA line crosses the longer SMA line from above (e.g. in April 2013). The second buying signal here occurs from February 2014.

5.7.3. The Moving Average Convergence Divergence (MACD)

The MACD indicator is based on the moving averages. It is the suitable indicator for volatile markets. It is calculated by formula: **MACD = 12-day EMA – 26-day EMA**

The time for buying or selling is again signaled by crossover of the MACD indicator over **a signal line** which is defined as: **9-day EMA** of the MACD line.

Chart 5.7.3. 1 US Coffee C Price - MACD



Source of the chart: *Investing.com*

The signal for entering long position is generated when the MACD line rises above the signal line and the bullish trend is expected in future. The signal for short position is generated when the MACD falls below the signal line and the bearish trend is expected to occur. Convergence happens when the moving averages move towards each other. Divergence happens when the moving averages move away from each other. The 12-day EMA is faster and responsible for most of MACD movements. The 26-day EMA is slower and less reactive to price changes. There is also a centreline that is expressed by zero. When the black histogram shows values above zero it means that MACD line is above the EMA. When there are negative values of histogram, it means that MACD line is under the EMA. In short the black bars shows differences between MACD and EMA. Investors can watch the movements around the centreline, when values of histogram are getting closer to zero, there is high probability of crossovers occurrence. [32]

The chart 5.7.3. 1 shows MACD line with EMA line and also black graph of histogram from November 2013 till March 2014. When the green line of MACD crosses the red line of EMA from below, it is time to buy because there is going to be a bullish trend. When the MACD line crosses the signal line from above it is time to enter the short position. In the chart high fluctuations above and below occur until the February 2014, after this month there is a significant bullish trend that lasts almost till the end of examined period, than is replaced by bearish trend.

5.7.4. Relative Strength Index (RSI)

Relative Strength Index is the moment technical indicator that measures the speed and change of price movements. It is defined by following formula:

$$\mathbf{RSI = 100 - (100 / 1 + RS)}$$

Where **RS** is average gain divided by average loss for 14 periods.

RSI ranges from 0 to 100. When value are lower than 30, it indicates oversold market and values greater than 70 indicate overbought market. [38]

Chart 5.7.4. 1 US Coffee C Price - RSI



Source of the chart: Investing.com

The chart 5.7.4. 1 shows RSI of US Coffee C Price during a half of a year from 18th September 2013 to 18th March 2014. RSI is expressed as black line, with 14-day period. (There is also green line of moving average of 9-day period.) At the beginning the black line was kept between number 40 and 50, the huge drop occurred on November 2013 when RSI fell under 30 and even under 20. It means that the market was oversold and there was a right moment to open the long position because the bullish trend occurred right afterwards. The RSI line went through the mean values of 50 up until it reached number 70 (February 2014) which is the border signaling the overbought market. It was the right time to closed long positions. The line changed its direction again and there occurred bearish trend.

5.7.5. Bollinger Bands (BB)

It is a trend indicator using statistics and comprising one moving average and the two curves representing the upper and lower limits. For determination of market borders the standard deviation (of 95% probability) is used. It means that from 95% the market should move in the borders set by upper and lower limit.

An essential part is the **middle Bollinger band** which is **equal** to the **SMA**. The **lower Bollinger band** is **equal** to **SMA – 2 standard deviations** and **upper Bollinger band** is **equal** to **SMA + 2 standard deviations**.

When the markets are without bull or bear trends (there are just sideways trends), the Bollinger bands are narrowing, when there are large trends movements, the two curves are widening from each other. The advantage of Bollinger bands is that it determines the periods of high and low volatility and extremes. The disadvantages is that using only Bollinger bands alone often gives many false signals. For better results it is good to use this indicator in combination with other indicators such as MACD or RSI. [39]

The chart 5.7.5. 1 shows Bollinger bands trend indicator applied on the US Coffee C Price movements from September 2013 until March 2014. Two black curves are upper and lower Bollinger bands and blue Bollinger band in the middle is SMA. At the beginning of October 2013 there was a clear sideways trend and Bollinger bands were getting closer to each other and closer to the candlestick chart. The similar situation of sideways trends was happening until the February 2014 when the upper BB was intersected by the price chart market tensions were released and bullish trend appeared. Bollinger bands got further from each other. It was the right time to enter the long position.

Chart 5.7.5. 1 US Coffee C Price – Bollinger Bands



Source of the chart: Investing.com

5.7.6. Stochastic Oscillator

Stochastic oscillator captures the current price movements in relation to the price movements in the past. Distance from the past are defined by the period. The values of the current market price are compared with extreme values observed in the recent period. Stochastic oscillator ranges from 0 to 100. When the indicator falls below the value of 20 points, the market is oversold. When the indicator goes above the 80 points, the market is overbought. It consists of **two curves**, the first is **%K** and the second is **%D**. **%D** is simple moving average of **%K** values. The mostly used period for **%K** is 14 (days, weeks, years, etc.). **%D** is more important line, which shows major signals.

The corresponding formulas follow:

$$\%K = (\text{Current Close Price} - \text{Lowest Low Price}) / (\text{Highest High Price} - \text{Lowest Low Price}) * 100$$

$$\%D = \text{3-day SMA of \%K values}$$

Where Lowest Low Price is the lowest low price for the period of 14, Highest High Price is the highest high price for period of 14. %K is multiplied by 100 to move the decimal point by two places.

There is also possible to apply the crossover strategy. When the %K crosses the %D to above it is time to open a long position. When the %K crosses the %D from above it is the right time to go for short position. [40]

The chart 5.7.6. 1 show US Coffee C price development in the time from 13th September 2013 to 17th March 2014. The stochastic oscillator is located below the chart of the price. The black line is %K and the green line is %D. It is clear that at the end of October 2013 and November 2013 the oscillator fell under the value of 20 points. The market was oversold. The significantly overbought market, crossing 80 points border, occurred on February 2014. There are many crossovers in the graph, but the most significant one for long position is on February 2014, when the black line crosses the green line from the bottom.

Chart 5.7.6. 1 US Coffee C Price – Stochastic Oscillator



Source of the chart: Investing.com

5.7.7. The Dow Theory

The Dow Theory set the basis for today's modern technical analysis. It defines three basic types of price movements. They are:

- Primary long-term movement (Primary trend)
- Secondary middle-term movement (Secondary trend)
- Tertiary short-term movement (Tertiary trend, Minor trend)

The primary long-term movement is the main movement of the curve. It represents the primary market development which lasts at least one year (or 3 years). Under this it is possible to identify Bullish trend and Bearish trend.

- **The primary upward trend** has three phases.

- The Accumulation Phase, which is the start of the upward trend. It comes at the end of a downtrend. It is hard to spot.
- The Public Participation Phase, which is the long lasting part with the largest price movements. In this phase, many traders take long positions, because the new upward primary trend already confirms itself.
- The Excess Phase, which is the last stage of upward trend. The last time to enter the market in form of long position and end up with possible gains. In this phase, traders have to be careful and watch signs of weakness in the trend, because it can signalize coming primary downtrend.
- **The primary downward trend** has also three phases.
 - The Distribution Phase, which is the first phase of bear market. The time when traders sell their positions into overbought market. It is the opposite of the accumulation phase. The buyers still occur in this trend, because they hope that the price will go up again. It happens because it is too difficult to spot this phase.
 - The Public Participation Phase, which is the similar to the phase in primary upward trend but it moves downward. The selling is increasing. Many traders take short positions.
 - The Panic Phase, which is the last phase of primary downward market. Traders sell in large amounts and in short time period. The market and the economy is weak. Investors are in panic. When everything reach the worst situation, the new primary upward trend occurs again. [41]

Secondary middle-term movement are the corrections of long-term trend movements. It lasts several weeks or several months. Generally the movement of secondary trend ranges between $1/3$ and $2/3$ of primary trend. It is also more volatile than primary trend.

Tertiary short-term movement are short-term deviations from the primary and secondary movements, which last only few days or weeks. Tertiary trend usually goes against the direction of the secondary trend. These small movements has no significant meaning for long-term outcome. [42]

Chart 5.7.7. 1 US Coffee C Price – Dow Theory application



Source of the chart: Investing.com

The chart 5.7.7. 1 illustrates the application of the Dow Theory on the movements of US Coffee C Price during the period starting 17th of May 2012 and ending 17th March 2014. The red arrow shows the primary long-term movement – the bearish trend. The green arrow shows bullish trend as secondary reaction against the primary bearish trend. The blue arrows show examples of the tertiary trends.

5.7.8. Support and Resistance

Support and resistance is popular tool of technical analysis to identify, when the trend stop or when it changes its direction. The price is given by the interaction of supply and demand. The resistance occurs in the time when the supply is

concentrated. The support occurs in the time when the demand is concentrated. Support is the price below which no one wants to sell. It is a particular “floor”, the lower limit that the majority of traders is willing to accept as a minimum. Resistance is particular “ceiling”, the highest price that the majority of traders is willing to accept and pay as a maximum. They are such places on the charts, where price is stagnating at a certain level and reluctant to continue above or below. The more the price is stagnant, the stronger is the barrier. In the end the price breaks these barriers and continues to rise or fall again. Prices can fall at the support that can hold and price will go back up, or the support will be violated, and price will drop through the support and continue lower, to the next support. The similar situation occurs with the resistance. Prices can rise at the resistance that can hold and price will go back down, or the resistance will be violated, and price will rise through the resistance. [18] [43]

The chart 5.7.8. 1 shows US Coffee C Prices from August 2013 until March 2014. The green arrows indicate periods of the support, the red arrows indicate periods of the resistance. The price bounced off the resistance level and decreased in both cases. The price also bounced off the support level and increased in all cases.

Chart 5.7.8. 1 US Coffee C Price – Support and Resistance



Source of the chart: *Investing.com*

5.8. WHAT POSITION SHOULD BE TAKEN IN MID-TERM AND LONG-TERM FUTURE?

Each commodity has a different market developments. A potential investor into coffee should be interested in the rapacity and speed of the coffee market. Very important is the rate of change in the market or in other word its volatility. It could be observed well from the chart because it is the area where the chart ranges over a given period. Coffee market is very volatile. This extreme volatility means dramatic price changes during the months or weeks but mainly during a single day. The prospects for future harvest changes due to unpredictable weather events. Higher prices encourage coffee production to grow, lower prices result in decrease of production. The price depends on quality of raw coffee, on the cost of production, on the shipment, on the inventory, on different seasonal factors, on the speculation on the coffee futures markets, on completion in the market, on the supply and demand,

etc. The price is therefore subject of many uncertainties and investments concerning coffee are very risky.

5.8.1. Mid-term future

The term mid-term future could be in this case period of 3 months. From the previous chapter about current weather situation in major producing countries it can be assumed that coffee is going to be a scarce commodity this year (2014). Production will not be as it was expected, because huge part of harvest was damaged by drought and it takes a long time to produce another crop. Prices already shot up enormously in February 2014. It was a reaction to new information about the bad weather that was released. There has been some negative movements in price during March 2014 but it should be just temporal trend. Good strategy for next months should be careful observation of the coffee market and to take into account the typical price volatility of coffee. But it can be assumed that due to scarcity of coffee on the supply side, the prices will definitely grow. There will be significant bullish trend and investors should open a long position.

5.8.2. Long-term future

The long-term future could refer to the period of 1 year. Till the end of this year 2014, the growing tendencies in coffee prices could be assumed, because the supply is going to be very insufficient. Even for the longer future, growing world demand could be assumed as it was mentioned many times in this thesis. Again the future will give many possibilities for opening long position. But investors should be very cautious. There is another problem in the coffee market. It is the fact, that few large companies (Kraft, Nestlé, Procter & Gamble and Sara Lee) occupies the large part of coffee market. The market is from its majority in their hands. It creates enormous pressure on coffee growers in developing countries. They are in very weak position and the side of large companies can dictate low prices. The main interest of these big subjects is to generate profit. There is a risk that customers will not buy more and more expensive coffee, in this case companies can keep the costs of processing of coffee same but they have to push producers to cut their prices. So determine clearly whether the long position or short position should be entered is very problematic.

5.9. IMPACT OF FINANCIAL AND ECONOMIC CRISIS UPON COMMODITIES

The most recent global crisis began 6 years ago in the September 2008. It was caused by the collapse of the U.S. mortgage market, when the market got full of delinquent mortgages which were provided for high interest rates to customers with poor credit history. It led to the failure of major mortgage providing companies. The stocks of the companies dropped, because people were afraid that their problems could affect financial sector and whole economy. Their fears were justified. Gradually it grew and expanded into the world financial and economic crisis, because U.S. financial markets are closely linked with other financial markets over the world. The world crisis in 2008 slowed down all industries especially those in developed countries. Stocks of many companies fell but what happened with the commodity markets?

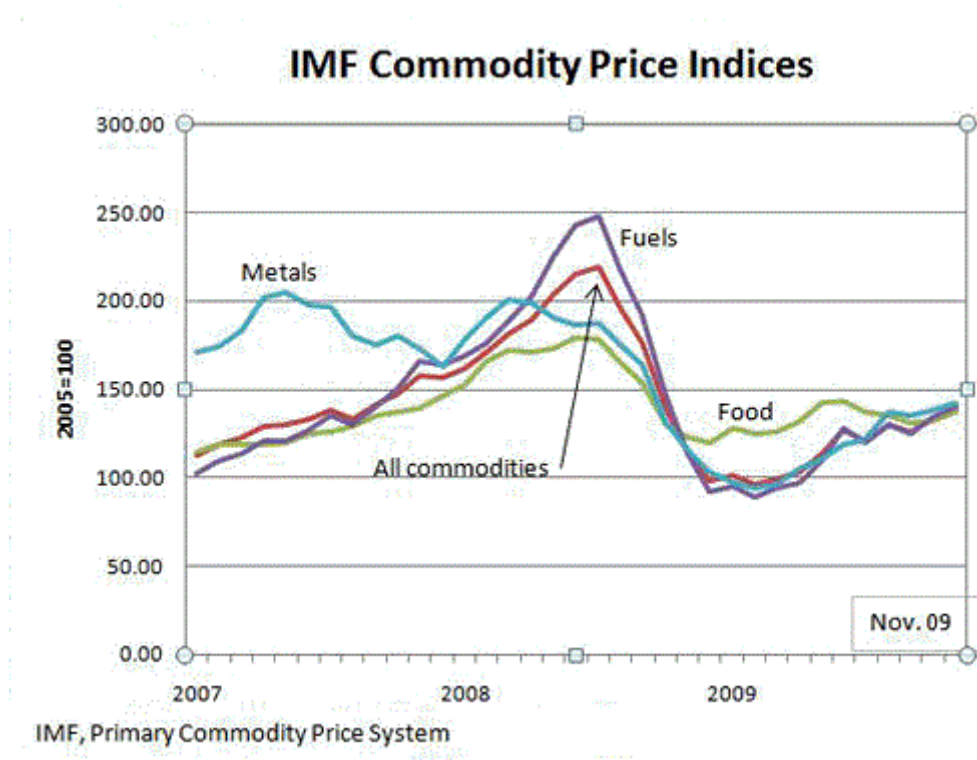
The development of price of commodity highly depends on type of commodity. Whether the commodity is metal, fuel or food. In the time of crisis (or war) food products often show better performance than non-food. Food and beverage companies rather reduced prices of their products than to reduce the amount of products or to lose company's share on the market. In case of coffee industry, the crisis did not have big impact. Coffee represents just a small portion of customer's spending. When people want to save money on coffee, they do not go to café, but they rather go home and make the instant (or other) version, which is much cheaper (also because it is made from cheaper type Robusta). This exactly happened in time of the crisis. In some countries where coffee is produced, prices of coffee dropped, because devaluation of dollar made their currencies much valuable and they could buy more coffee for less money and thus domestic coffee consumption was stimulated. On the other hand devaluation of dollar means lower profits from coffee sold for the primary producers and farmers. This could be a big problem for economics that highly depend on coffee production and its export. Generally impacts of the crisis differ with different country. [44]

Generally the coffee industry could be perceived as neutral sector when it comes to crisis. It is mainly due to the fact that coffee is not the basic goods such as wheat,

corn or rice and people can live more or less without it, because they do not have to drink it every day.

The chart 5.9. 1 shows Commodity Price Indices of the International Monetary Fund in years of the world crisis from 2007 till November 2009. The index of all commodities was growing until the half of a year 2008. It dropped dramatically when the crisis in the world was already evident. It is important to mention that prior to the fall in prices, the food crisis was recorded in the world. The reasons were increasing prices of food as well as fuel. But the subdued global economic activity has reduced demand for commodities and thus their prices fell. There was a decrease in demand for energy and energy prices fell as well as the price of crude oil and other fuels. Metals dropped a lot also. Only food commodities kept the price more stabilized in comparison to other commodities. There was still high demand for food and it will be forever, because people have to eat in any situation.

Chart 5.9. 1 IMF Commodity Price Indices in the time of the world crisis



Source of the chart: The World Bank, available at: <http://data.worldbank.org/indicator/FP.CPI.TOTL>

5.10. CHINA AS A POTENTIAL MARKET FOR COFFEE

For the future of coffee trading it is important to find new markets in the world. It concerns mainly big developing or already highly developed economies, which are open to western customs and drinking coffee as a daily routine is undoubtedly one of these customs. New potential customers could be found for example in growing economy like China. Next chapter will be focused on these two countries.

The one of the greatest economic successful stories of all time can be observed in China. China is the country with the largest population on the planet. It is potentially the largest market in the world, bigger than the U.S. and the EU together. China is the largest creditor in the world. It is basically the world's biggest bank. The Chinese society is made up of peasants, workers as well as entrepreneurs. A lot of the population is young. China has a vital class of merchants for the majority of its existence. Its people are hardworking and very productive, so we can watch fast development in China's industrial production. This country consumers more of everything than ever before. It has to import a lot because it has a lack of almost every basic commodity it needs. The Chinese save a lot but they are also investing. Many of them are abroad, where they are successfully living their lives and with their colleagues in the country they are creating the second biggest economy in the world by the GDP (in current year 2014). [45] This all makes China to appear like a good place for coffee market. However, it has many problems such as a low standard of living, poorly developed internal market, lack of drinking water, etc. Instead of satisfaction of the domestic market, many products are exported.

Another complication comes with China's cuisine. It is still very conventional, based on long traditions and many rituals. Typical Chinese people are faithful consumers of their typical drink – a tea. So the trade with coffee is still at its begging.

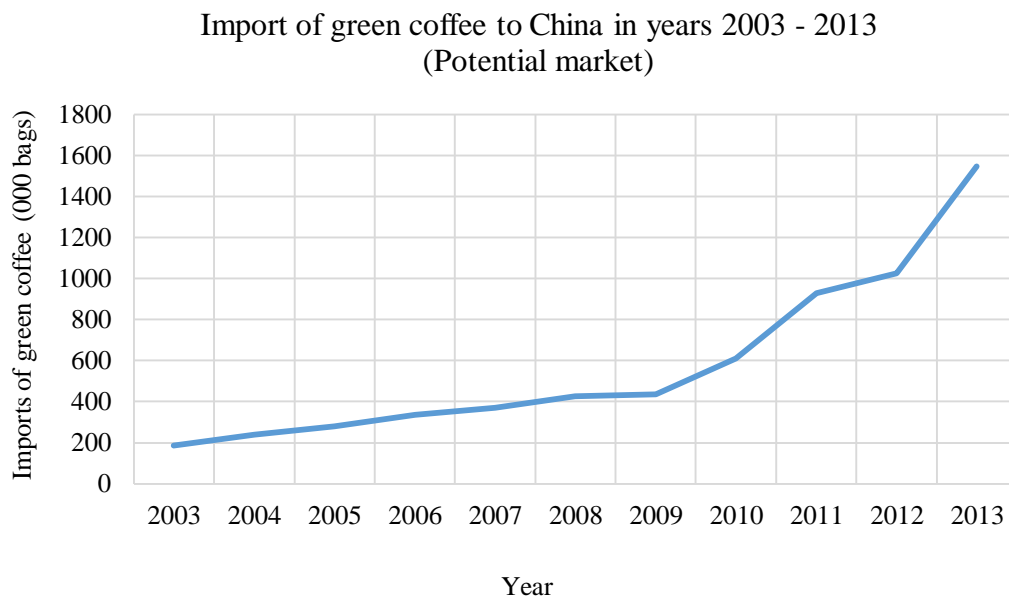
As positive can be perceived that many peasants are moving to cities and they are changing lifestyle. It can be therefore expected an increase in the consumption of various "modern" products of the Western world.

Coffee in China is becoming fashionable and chic mainly among the young people of the middle class in big cities. This drink is widely sold in the most famous brands of fast foods. There has been also small increase in selling of coffee

machines. But most businesses that are focused on food service offer still only just tea or water. The estimated consumption of coffee per capita was 4 cups per year in 2013. [3] [46]

The best way to improve coffee industry there is via franchising or a joint-venture. It does not cost much and it can be spread over quite easily. This easy access to the country rise also brands awareness. It should be done in big cities like Shanghai, which is the main economic centre and the most populated China's city, because there is a real potential for new customers.

Chart 5.10. 1 Imports of green coffee to China in years 2003 – 2013



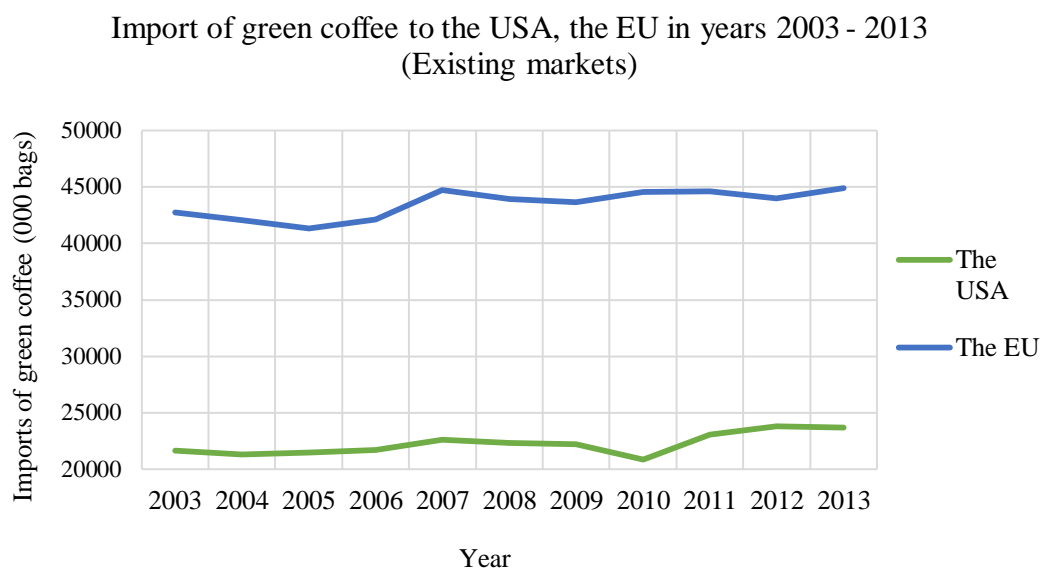
Source of data series: Index Mundi, author's own illustration

(1 bag = 60 kg)

The chart 5.10. 1 shows imports of green coffee to China in years 2003 to 2013. There could be observed slightly increasing tendency from year 2003 till 2009. After year 2009 there is a relatively rapid growth in imports. It can be assumed, that import has been growing due to higher demand. This chart can be easily compared to imports of green coffee in already existing markets like the EU or the USA (chart 5.10. 2). The chart with existing markets shows imports in the same period like in the case of China. It is evident, that imports are growing. It confirms the theory of slightly increasing demand in the world of coffee, but there is definitely no hysteria.

Comparing to China, the USA and the EU imports of coffee are rather stagnating. The situation in existing markets is expected to be more less the same in the next years.

Chart 5.10. 2 Import of green coffee to the USA, the EU in years 2003 - 2013



Source of data series: Index Mundi, author's own illustration

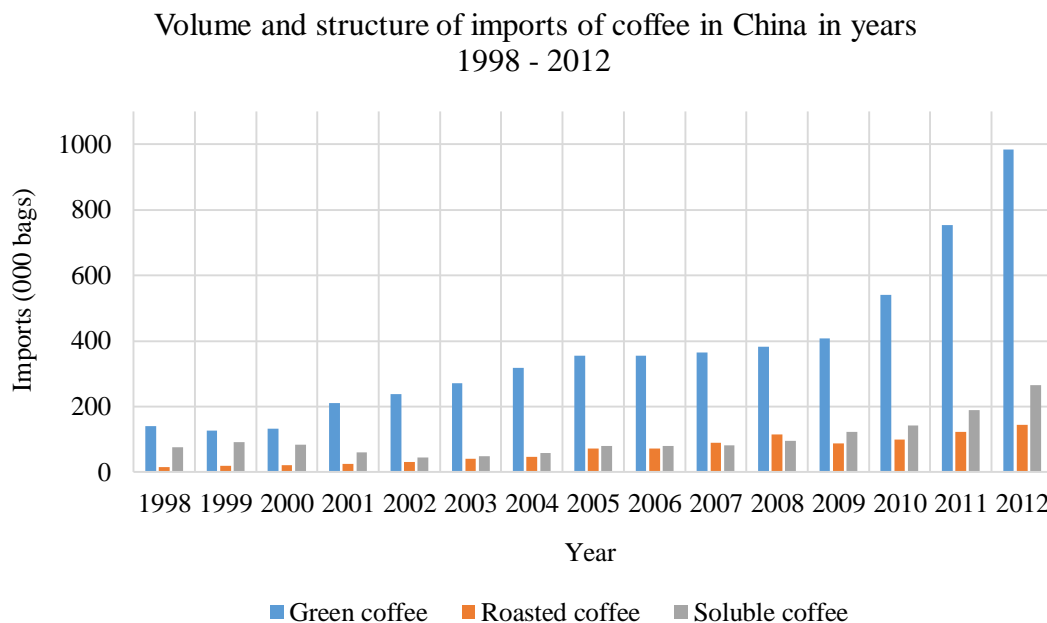
(1 bag = 60 kg)

Based on well-known fact about the current growth of the Chinese population and based on previous information, China seems to be really interesting for coffee for the future.

For better and deeper illustration the chart 5.10. 3 shows volume and structure of import of coffee to China in years 1998 – 2012. It can be seen that coffee in China is becoming increasingly more important. The more dynamic growth occurred after year 1999 when famous café chain Starbucks Corp. entered China's market. Starbucks is considered as the creator of demand for coffee in this country. [47] The green coffee is used for later processing (roasting) so it is bought by coffee making companies. The other case is already roasted coffee. It could be used for making drink at home but it must be firstly grinded or it is bought by café and prepared for customers by same method. The most interesting is soluble coffee. Increase in imports of soluble coffee means that Chinese are getting used to prepare a cup of

coffee at home by themselves. This fact opens new possibilities for new specialized coffee markets.

Chart 5.10. 3 Volume and structure of imports of coffee in China in years 1998 - 2012

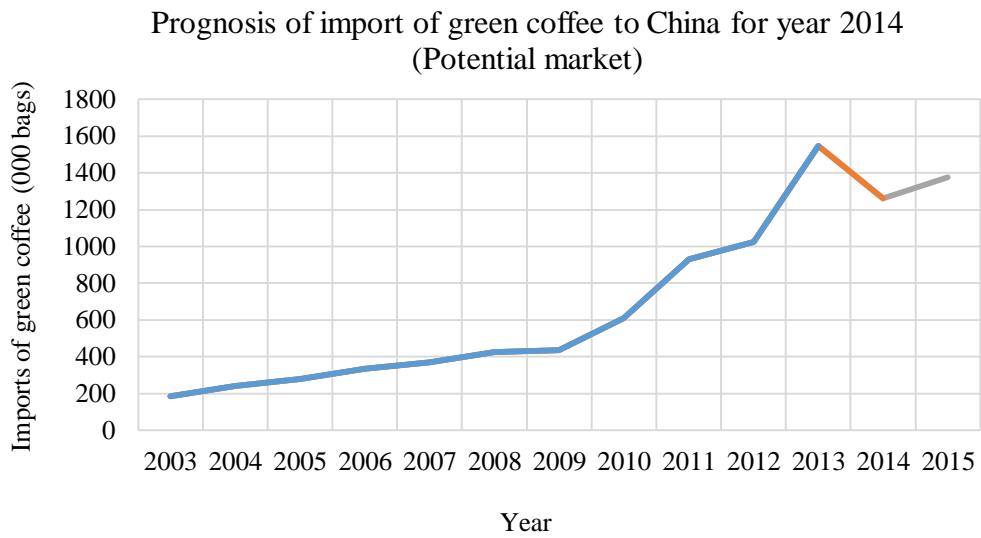


Source of data series: ICO, available at: <http://dev.ico.org/documents/cy2012-13/icc-111-8e-study-china.pdf>, author's own illustration

(1 bag = 60 kg)

Based on data series used for the chart 5.10. 1 it is possible to do little prognosis of the future import of coffee to China. Of course based on the growing demand for coffee in China and the assumption that there will not be any enormous natural or other disaster in next two years in producing countries or crisis in the world economy. In the chart 5.10. 1 the linear trend line was added, with function $y = 113.68x - 102.09$. This function served to do prognosis for 2 periods, for year 2014 and for 2015. The new chart 5.10. 4 was created.

Chart 5.10. 4 Prognosis of import of green coffee to China for year 2014



Source of data series: Index Mundi, author's own illustration, own computation

(1 bag = 60 kg)

The prognosis shows declining and then again growing trend. Based on linear regression model the new trend is firstly deflected down and then it again returns and continues in the previous growing trend.

6. CONCLUSION

Coffee is a part of social life of humans all over the world. The countries, where coffee drinking was not common, are experiencing its slower or faster expansion. Coffee is therefore irreplaceable commodity of the global importance. The main fact is that its consumption is still growing along with slowly growing demand but the supply is to some extent limited mainly by bad weather conditions and unfortunately the weather cannot be influenced in any way.

One of the objectives of this thesis was to evaluate global coffee commodity market. For the evaluation of this market as a whole, at first it was important to divide this topic into the two smaller parts, because coffee itself can be described and studied from wide range of views as well as the trading in commodity markets. These topics are really extensive, and the introduction of them was crucial to get a closer idea of their connection. The combination of information on the coffee and on the trading in commodity markets provided a solid base for the evaluation of global coffee commodity market. In the literature research, the chapters were devoted to the history and the real origin of coffee plant. The way from producers to consumers was described. The main world producers, consumers, exporters and importers of coffee were mentioned. The difficulties connected with cultivation, transporting, quality control and labour conditions were emphasized. The principles of commodity trading were explained in chapters about subjects on the market, division of the market space, different price movements and possible derivatives.

By the analysis in case study it was found that the demand for coffee is quite stable and inelastic, because customers tends to buy coffee almost for any price due to the fact that there is no other drink with same features that could replace it. From time to time it happens that there is over supply in the coffee market but most of the time, there is slightly higher demand than supply. Any natural disaster or bad weather makes the supply even smaller and it causes imbalance on the market and new coffee production takes long time. In that time prices grow. Bad weather has been a major factor but not the only factor that is influencing the price of coffee. Based on correlation calculated in the thesis, it can be assumed that price of crude oil that is used mainly for transportation can cause increase in final price of coffee. The

same could be assumed about the strong world currencies other than the US dollar, which has negative relation with the price of coffee.

In the recent history the coffee market experienced huge crisis, when prices were at their minimum. The main reason was exceptional over supply caused by the over production in two main producing countries – Brazil and mainly Vietnam. Vietnam entered the market quite quickly and multiplied its production of the cheaper variant of coffee. Other producers could only deal with the consequences of the crisis such as for example the enormous decrease in prices below the costs of production. In these days of 2014, it is possible to watch the opposite situation - a lack of coffee on the market. It was caused by the extreme weather events right in Brazil. A large part of the estimated harvest was destroyed, the quantity supplied will not be sufficient and there can be expected large increase in the price of coffee until the next year. Based on the analysis, the author recommends investors to enter the long position because now it is the right time. They should not wait until the summer because the result of the seasonality analysis showed that prices are highest during the cold seasons, because people tend to buy rather hot drinks.

In the analysis of recent coffee price trends many technical indicators were used. The SMA and the EMA were calculated and interpreted by the author. Other indicators were created and studied with the help of the internet financial portal Investing.com. In comparison with the EMA, the SMA did not provide the precise information about the signal. EMA's advantage was more accurate information because it responded faster to changes in prices. It showed the right signal only when the decrease in price was really obvious. There was used another technique connected with the SMA – combination of more SMAs together. The first case were used SMAs (5, 10, 20) in a shorter period and in the second case SMAs (10, 30, 60) in a longer period. This is more precise method than using just one SMA alone. Another technical indicator used was the MACD that is 26-day EMA subtracted from 12-day EMA. The MACD is in this case very reliable and practical indicator also due to the usage of the histogram. All these indicators mentioned before revealed February 2014 as the best time to enter the long position on the coffee market. The RSI was used to find the time when the market was overbought and oversold. The overbought market was signalized again at the end of February 2014. The Stochastic Oscillator showed the same as the RSI.

When the impact of the recent financial and economic crisis in 2008 was evaluated, it was found that the coffee industry is generally a neural sector. During the global crisis, people tended to save their money for coffee by preparing coffee at home and not buying it in café. And when it comes to commodities, the food and beverage industry is doing much better than industries connected with other commodities.

It was stated at the beginning that coffee consumption is still growing. It happens mainly due to occurrence of new areas for sales like in China. It was confirmed that this country, with fast growing economy, with its massive population and continuously increasing import of coffee, means definitely the future for the coffee trading.

Coffee market includes a wide range of subjects and for the most accurate analysis it requires to combine several methods - fundamental, technical and also psychological analysis. In technical analysis it is advisable to combine multiple technical indicators and tools to raise the chance of profit.

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