

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

Department of Economics



Diploma Thesis

**ECONOMIC ANALYSIS OF GOLD COMMODITY
AND PHYSICAL GOLD IN THE CZECH REPUBLIC**

Author: Nikola Hablová

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

© 2014 CULS in Prague

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Department of Economics
Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Hablová Nikola

Economics and Management

Thesis title

Economic analysis of gold commodity and physical gold in the Czech Republic

Objectives of thesis

The objective of this thesis is to identify determinants of the gold price and predict future development of price of gold based on financial and economic analysis of the historical prices and given determinants. Also, physical gold is evaluated in terms of its purchasing price.

Methodology

Literature review and analytical section is conducted using synthesis, deduction, induction, secondary data analysis, comparison and regression analysis.

Schedule for processing

Data collection : to 30.6.2013

Theoretical part: to 31.11.2013

Practical part: to 28.2.2014

Submission of the thesis: to 15.3.2014

The proposed extent of the thesis

60-80 pages

Keywords

gold, precious metal commodities, US dollar, portfolio management, commodity exchange

Recommended information sources

CORTI, Ch. HOLLIDAY, R. Gold: Science and Applications, 1st edition CRC Press, Taylor and Francis Group, 2009, pp xii +416p. ISBN-10: 142-0-06523-8

DĚDIČ, J. Burza cenných papírů a komoditní burza. 1.vyd. Praha:PROSPEKTRUM, 1992a. 304 s. ISBN 80-85431-62-9

DĚDIČ, J. BARÁK, J., ZAGAR, T. Zákon o komoditních burzách: [komentář]. 1.vyd.Praha:SEVT, 1992b. 205 s. ISBN 80-7049-043-8

EICHENGREEN, B. Globalizing Capital: A History of the International Monetary System, 2nd edition, 2008, ISBN 978-0-691-13937-1

FABOZZI, F. a kol. The Handbook of Commodity investing. 1st ed. New Jersey: John Wiley & Sons, Inc., 2008. 1011 s. ISBN 978-0-470-11764-4

MALONEY, M. Guide to investing to the gold and silver. 1st ed. Business Plus; First Printing edition, 2008. s. ISBN-13: 978-0-446-51099-8

MCGUIRE, S. Hard Money: Taking Gold to a Higher Investment Level, ed. New Jersey: John Wiley & Sons, Inc., 2010, 256 p. ISBN 978-0-470-61253-8

MISHKIN, F. The economics of money, banking and financial markets. 7th ed. Boston: Addison- Wesley, 2004. xxxix, 679. ISBN 0-321-12235-6.

MURRAY, R. The Case for the 100 Percent Gold Dollar. Washington, DC: Libertarian Review Press, 1974, and Auburn, Ala: Mises Institute, 1991, 2005. © Mises Institute, 2005, ISBN 0-945466-34-X

The Diploma Thesis Supervisor Procházka Petr, Ing., MSc, Ph.D.

Last date for the submission

March 2014

prof. Ing. Miroslav Svatoš, CSc.

Head of the Department



prof. Ing. Jan Hron, DrSc., dr. h. c.

Dean

Prague October 31. 2013

Declaration

I declare that I have worked on my diploma thesis “Economic Analysis of Gold Commodity and Physical Gold in the Czech Republic” by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any third person.

In Prague

.....

Nikola Hablová

Acknowledgement

I would like to thank Ing. Petr Procházka, Msc. Ph.D. for his support, supervision and assistance during assessment of my diploma thesis.

Author: Nikola Hablová

**ECONOMIC ANALYSIS OF GOLD COMMODITY AND PHYSICAL
GOLD IN THE CZECH REPUBLIC**

**EKONOMICKÁ ANALÝZA KOMODITY ZLATA A FYZICKÉHO
ZLATA V ČESKÉ REPUBLICE**

Summary

This diploma thesis aims to do a full analysis of the precious metal gold. First chapters are dedicated by to reconstructing the historic role of gold, followed by basic characteristics of gold and description of various channels for investment in gold. The main body of theoretical section depicts the supply and demand for gold, including the key factors influencing both sides. The objective of this thesis is to identify some of the determinants of the gold price and predict future development of the price of gold based on a financial and economic analysis of the historical prices from the years 1979-2013. Then the reasons for changes in the price of gold will be explained. In addition, the correlations of the price of gold with four macroeconomic variables such as US Consumer Price Index (CPI), Dow Jones Average Index, exchange rate USD/GBP and the price of crude oil. Lastly, the price of gold is evaluated in terms of its real price (purchase price) as well as its nominal price in the Czech Republic. The whole work is finishing well by an evaluation of the observed results.

Key words

Gold, precious metal commodities, US dollar, portfolio management, commodity exchange, stock exchange, fiat currency, quantitative easing, real price, nominal price

Souhrn

Tato diplomová práce obsahuje ekonomickou analýzu drahého kovu zlata. Z počátku je zrekonstruována historická role zlata, kterou následuje popis základních charakteristik zlata a popis různých možností v investování do zlata. Základní téma teoretické části je poptávka po zlatě a nabídka zlata, zahrnující klíčové faktory, které ovlivňují obě strany. Dalším cílem této diplomové práce je identifikovat determinanty ceny zlata a předpovědět budoucí cenu zlata pomocí ekonomické analýzy historických cen z let 1979-2013. Poté budou vysvětleny důvody změny ceny zlata. Dále je popsána korelace ceny zlata se čtyřmi vybranými makroekonomickými ukazateli, kterými jsou americká inflace, GBP/USD směnný kurz, Dow Jones Average Industrial Index a cena ropy v dolarech. Nakonec je cena zlata vyhodnocena z pohledu ceny reálné (výkupní), a také z pohledu ceny nákupní či nominální na území České Republiky. Celá práce je zakončena vyhodnocením vypořizovaných výsledků.

Klíčová slova

zlato, vzácné kovy, americký dolar, portfolio management, komoditní směna, stock exchange, fiat měna, kvantitativní uvolňování, reálná cena, nominální cena

CONTENT

1. Introduction.....	- 11 -
2 Objectives and methodology.....	- 13 -
2.1 Objectives.....	- 13 -
2.2 Methodology	- 14 -
3 Theoretical Part	- 18 -
3.1 Introduction of Gold	- 18 -
3.1.1 Gold properties	- 18 -
3.1.2 Brief history of gold.....	- 19 -
3.1.3 Classical Gold Standard	- 20 -
3.1.4 Bretton Woods system	- 21 -
3.1.5 Dollar Standard and Fiat Currency	- 22 -
3.2 Supply of gold	- 24 -
3.3 Demand for gold.....	- 26 -
3.4 Price of gold 1970-2013.....	- 28 -
3.4.1 Price determinants.....	- 29 -
3.5 Gold as an investment.....	- 35 -
3.5.1 Physical holdings	- 36 -
3.5.2 Exchange traded funds	- 37 -
3.5.3 Gold accounts	- 37 -
3.5.4 Forward and Futures, Options, Swaps, Stocks and Bonds.....	- 37 -
3.6 Physical gold in the Czech Republic	- 39 -
3.6.1 VAT exemption	- 40 -
3.6.2 Gold coins in the Czech Republic.....	- 40 -
3.6.3 Gold bars in the Czech Republic	- 44 -
4 Practical Part	- 46 -

4.1 Economic and statistics verification of price of gold determinants	46 -
4.1.1 Price of gold vs. US Consumer Price Index (US CPI).....	46 -
4.1.2 Price of gold vs. GBP/USD exchange rate.....	47 -
4.1.3 Price of gold vs. Dow Jones Industrial Average (DJIA Index)	48 -
4.1.4 Price of gold vs. Price of crude oil.....	49 -
4.1.5 Declaring variables	51 -
4.1.6 Data set.....	52 -
4.1.7 Economic verification	54 -
4.1.8 Statistical verification	55 -
4.2 Prediction of Future price of gold	56 -
4.3 Analysis of gold market in the Czech Republic	59 -
4.3.1 Market price (nominal price), Premium.....	59 -
4.3.2 Purchase prices (real price)	61 -
5 Conclusion	67 -
6 Bibliography.....	68 -
6.1 Books sources and academic articles.....	68 -
6.2 Internet sources.....	69 -
7 Supplements and list of tables.....	73 -

1. Introduction

The issue of gold investment has recently been quite a thorny issue. Modern economies have debt problems and people talk about the crisis of democracy. The financial crisis influenced mood in the markets in the past years. Financial crisis has plagued us and still in some sectors plagues. The Eurozone and the euro as currency is very often controversial topic in recent years. Not just one country needed financial help from European Union in the times of financial crisis. All these factors contribute to the fact that investors are trying to find an alternative to conventional shares. Historically, in the times of uncertainty, people always turned to gold as a store of value. The development of the price of gold in last 15 years (except of the year 2012/2013) indicates to us that there is suspicion among investors. The price of gold in the years 2012 and 2013 slowly decreased and it should indicate that economies are recovering and investors again trust the financial markets. However, the debts of the countries are still higher, US Dollar is losing its purchasing power, Euro is also an unstable situation and war is not a word of the past. It is going to be interesting to watch how the price of gold will develop in following years and that is why one part of this thesis is devoted to predicting of future price of gold.

The aim of this work is to analyze gold as a real asset and familiarize the Czech investor with the possibilities that the gold investment offers. This work identifies strengths and weaknesses of investment in gold and then will be presenting various ways of gold investment that are strongly bound with the price of gold. The author formulated recommendations for investors to maximize the strengths and opportunities for gold investments and to limit their weaknesses and threats

The first chapter will acquaint the reader with the basic chemical and physical properties of gold and its history. One subchapter is devoted to the gold standard as well as will be present fundamental reasons why gold has such a high price.

Since the fall of the Bretton Woods system, the price of gold has recorded times of decline as well as times of growth, both of which were influenced by different factors. Another part is devoted to the price of gold, therefore the ceremony called „London Gold Fixing. “ In addition, the historic development of the price of gold in the years 1971 to 2013, together with the justification for some of the larger price fluctuations.

Thanks to its characteristics, gold is considered as the perfect wealth storage and, mainly in last ten years an investment asset. Therefore, this thesis will introduce different types of gold property and trade.

This diploma thesis should offer to the reader a different view on gold and show that despite the fact that the demand for jewelry is very essential, investment demand plays a crucial role as well. The practical part is divided into the two parts. First, part is about price determinants and its relationship with the price of gold. By choosing four different determinants it will be verified how these determinants are related to the price of gold and how they influence the price of gold. This chapter is followed by possible development of the price of gold in the future and considerations, whether the gold market is in a bubble or not.

The second part of the analytical section is devoted to physical gold in the Czech Republic. For small investors the gold market in the Czech Republic is relatively young. Approximately the year 2009, became a year of starting businesses with gold. Moreover, because the gold market is still a young market, it is very difficult to find analysis of purchase prices in the Czech Republic. This analysis should serve to smaller investors as a tool for finding the best purchase price in the Czech Republic. The whole work is finishing well by an evaluation of the observed results.

2 Objectives and methodology

2.1 Objectives

This diploma thesis aims to do a full analysis of the precious metal gold. First chapters are dedicated by reconstructing of historic role of gold, followed by basic characteristics of gold and description of various channels for investment in gold. The main body depicts the supply and demand for gold, including the key factors influencing both sides. Fundamental analysis and study of the various surveys and processed analyzes should help us in the selection of determinants, which has be affecting the price of gold. The analysis should detect the relationship between the price of gold and chosen price determinants. The objective of this thesis is to identify some of the determinants of the gold price and predict future development of the price of gold based on a financial and economic analysis of the historical prices from the years 1979-2013. In addition, the correlations of the price of gold with four stated to macroeconomic variables such as the Dow Jones Average Industrial Index, the USD/GBP exchange rate, US Consumer Price Index (CPI) and the price of crude oil are demonstrated bellow. Then will be explain the reasons for changes of price of gold. Other objective is predicting the price of gold development for next 5 years.

The second half of the practical part focuses on the physical gold in the Czech Republic and aims to do survey that will help us evaluate nominal prices as well as real prices (purchase prices) in the Czech Republic. The whole work is finishing well by an evaluation of the observed results. First, we evaluate nominal and real prices due to the weight of gold ingots. Then the analysis should uncover the premium that is hidden in the nominal or real price of gold. Then will be made survey that should response on the question, whether the purchase prices differ across the Czech Republic significantly due to its regions or not. The aim of this work is to analyze gold as a real asset and familiarize the Czech investor with the possibilities of gold investment offers.

2.2 Methodology

Quantitative and qualitative research was implemented. This part is an introduction to main methods, which were used in this thesis in order to understand the ongoing development of gold.

Literature review was conducted using methods of deduction, induction, extraction and synthesis. In other words, the author tried to understand the basic facts concerning the gold before analyzing its current state and predicting the future development. This helped the author to understand the difficult development of the gold and evaluate the role of gold in today's current economy. It also serve to reader get information about the basic facts, sketching the reason why gold works well as an investment and what are the reasons, that such a big number of investors consider gold as a favorable investment. Fundamental analysis show a broader understanding what is on the demand and what is on the supply side. It also explained and showed how the gold market changed over time.

The analytical part was constructed by using econometric analysis. Program GRETL was used as a tool to calculate correlation coefficient that measures the strength of linear association between two variables and regression analysis that try to estimate or predict the average value of one variable based on the fixed values of other variables (GUJARATI, 2004). In addition, this program helped to calculate statistical significance of gold price determinants and economic verification of proposed econometric model.

Specification of the Econometric Model

Lately used econometric model links an observable dependent variable Y to observable explanatory variables X_1, \dots, X_m , an unobservable variable U (the error term if the model is a linear regression), and parameters β_1, \dots, β_k , via function f :

$$Y = f(X_1, \dots, X_m, U, \beta_1, \dots, \beta_k). \quad (1)$$

For example, in this case of a linear regression model with intercept this function f is specified as:

$$f(X_1, \dots, X_m, U, \beta_1, \dots, \beta_k) = (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{k-1} X_{k-1} + \beta_k + U, m = k - 1. \quad (2)$$

(BIERENS, 2009)

Time Series Data

Time series is a sequence of data points, measured typically at successive time instants spaced at uniform time intervals. This model is based on Monthly prices (price on

the end of a month) of gold, crude oil, Dow Jones Industrial Average, exchange rate of USD/GBP and US CPI. (GUJARATI, 2004)

Estimation of the model

We quantify β_1 and β_2 . We obtain numerical estimates and this is done by statistical technique called regression analysis that try to estimate or predict the average value of one variable on the basis of the fixed values of other variables. (GUJARATI, 2004).

- Least Squared method

The least square methods lately just LSM is very popular technique in statistics due to several factors and the most common estimators can be cast within this frame. The mean of a distribution is the value that minimizes the sum of squared deviations of the outcome. The second, using squares makes this method mathematically very docile, because the Pythagorean Theorem indicates that, when the fault is independent of an estimated quantity, can be added the squared error and the squared estimated quantity. Third, the algorithms and the mathematical tools involved in LSM have been well studied for a relatively long time. The oldest use of OLS is linear regression analysis, which responses to the problem of finding a line or curve that best fits a set of data points. In the normal formulation, a set of N pairs of observations (Y_i, X_i) is used to determine a function relating the value of the dependent variable (Y) to the values of an independent variable (X). Just with one variable and a linear function, the prediction is given by the following equation:

$$\hat{Y} = a + bX + ut \quad (3)$$

This equation involves two free parameters which specify the intercept (a) and the slope (b) of the regression line. The least square method defines the estimate of these parameters as the values which minimize the sum of the squares (hence the name least squares) between the measurements and the model. (GREENE, 2002)

Hypothesis Testing

- Durbin Watson test

The Durbin-Watson test is a widely used method of testing for autocorrelation. The Durbin-Watson test has the null hypothesis that the autocorrelation of the disturbances is 0; it can be tested against the alternative that it is higher than zero, not equal to zero, or less

than zero respectively. To test for negative autocorrelation at significance α , the test statistic $(4 - d)$ is compared with lower and upper critical values ($d_{l,\alpha}$ and $d_{u,\alpha}$):

If $(4 - d) > d_{u,\alpha}$, there is no statistical evidence that the error terms are negatively autocorrelated.

If $(4 - d) < d_{l,\alpha}$, there is statistical evidence that the error terms are negatively autocorrelated.

If $d_{l,\alpha} < (4 - d) < d_{u,\alpha}$, the test is inconclusive. (DURBIN, WATSON, 1951)

- Ramsey's RESET test

The RESET test is a favorite means of diagnostic for validity of functional form. The assumption is that under the alternative, the model can be expressed by the regression $y = X * \beta + Z * \gamma$. Z is generated by taking powers either of the fitted response, the regressor variables or the first principal component of X . A standard F-Test is then applied to determine whether these variables have significant influence or not. The test statistic under H_0 follows an F distribution with parameter degrees of freedom. (BIERENS, 2009)

- Heteroscedasticity White test

White computes the White (1980) general test for heteroskedasticity in the error distribution by regressing the squared residuals on all distinct regressors, squares of regressors and cross products. The test statistic is distributed Chi-squared (p) under the null hypothesis of homoscedasticity and it is a special case of the Breusch-Pagan test for heteroskedasticity, which requires specification of an auxiliary variable list. (GOLDFELD S.M., QUANDT R.E., 1956)

- Breusch-Godfrey test for autocorrelation

Under H_0 the test statistic is asymptotically Chi-squared with degrees of freedom as given in parameter. If type is set to "F" the function returns back the F statistic which, under H_0 , follows an F distribution with degrees of freedom as given in parameters and the starting values for the lagged residuals in the supplementary regression are chosen to be zero. (GODFREY, 1978)

Forecasting

For forecasting were used program EXCEL and its function Trend line. Main idea of the method is a forecast that is calculated by inserting a time value into the regression equation. The regression equation is determined from the time-series data using the “least squares method”. Trend analysis uses a technique called least squares to fit a trend line to a set of time series data and then following by project the line into the future for a forecast. Trend analysis is a special case of regression analysis where the dependent variable is the variable to be forecasted and the independent variable is time. (GREENE, 2002)

While moving average model limits the forecast to one period in the future, trend analysis is a technique for making forecasts further than one period into the future. We used this method to forecast monthly price of gold in next 5 years. Trend line comes with its equation that can be in general express as $F = a + bt$, where: F is forecast, t is time value, a is y intercept and b is a slope of the line. It is needed to choose the trend that fits best. Visually, comparing the data pattern to the one of the 5 trends (linear, logarithmic, polynomial, power, exponential) we choose the linear function. (MIKULA, 2002)

Own survey of differences in purchase prices in the different regions in the Czech Republic.

The second part of the practical part was developed by using own surveying based on author's search of data internet, phone interview and personal visits of companies, that offer to buy or even sell gold in the Czech Republic. The absence of official list made the author to rely only on his own search of portals and companies. This chapter deals with simply comparing, averaging and evaluation of gathered prices of gold.

3 Theoretical Part

3.1 Introduction of Gold

The most important characteristics of gold are that it preserves wealth and provides liquidity to both institutions and individuals. Because of that, gold played important role as a central bank reserve asset since the late 19 century. The fact that gold is considered as homogenous and is characterized only by purity, it serves well as a comparable measure of currency in the world. In addition, as history tells us, there have been various agreements, known as gold standard, in nations which that valued their nation's currency in relation to their gold reserves. (FABOZZI, 2008)

3.1.1 Gold properties

First, we focus on the gold, its properties and some later used terms. Properties of gold are determined not only by way of its use, but also by way of affect that gold is trading. Gold (Aurum, symbol Au) is a chemical element with atomic number 79, with very good thermal and electrical conductivity. It is a precious metal of yellow color, which is well malleable and ductile, and whose density is 19.3 g/cm³. Weight of gold is usually determined in metric units or 1oz (1 troy ounce), 1oz is approximately 31.1 grams to other units include tola weight, which enjoys in India and the Middle East, there is a Chinese teal or Thai baht. The fineness of gold is determined in carats, pure gold (1000/1000) is marked as 24 karat. In the Earth's crust is gold occurs relatively rarely, total was not mined approximately 163,000 tons (WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013).

Gold is due to its properties like is decorativeness, durability and conductivity, used mainly in the manufacture of jewelry, medicine and engineering. Gold because of its durability and rarity served in the form of coins as currency. In the period of the gold standard worked gold as currency and serves gold as an investment or as a monetary reserve. In nature, gold is pure form of small granules, flakes or pebbles. We can found it in quartz veins in rocks and in alluvial rocks in the Valley Rivers. Part of gold is lost, sunk in ships or buried in the graves. Although gold mining continues and the end of mining, therefore there is no risk for the near future, demand grows increasingly. The average gold content per ton excavated from rocks in 2000 was about 2 g, while last year the average

yield only 1.2 g / t The cost of mining thus by each year increase. Number of discovered fields also decreases the cost of locating the contrary increase. Other gold deposits are hidden inside of earth or at the bottom of the seas and oceans. Available technology, however, does not allow obtaining gold from seawater and the question is whether humanity can find such technology in the coming years. (STRUŽ, STUDÝNKA, 2005)

3.1.2 Brief history of gold

History of gold began in Egypt and Nubia some more than 5000 years ago. These regions were the biggest producers of gold during the most of the history. Gold was one of the first humans' excavated metal and began very popular for its easy workability by artisans and for its aesthetic value. (BORDO, 1999)

In the Bible we find many stories associated with gold as well as gold figures in the Greek myths and legends, where the world of the gods reflect the life of real world with all the virtues and bad habits, therefore gold could not be missed. Just somebody knows that first gold fever occurred in the imperial of Russia. Another story is California Gold Rush. After the discovery of gold at Sutter's land gold madness swept throughout California and attracted thousands gold seekers from all over the world. The young state has become literally boiler of nations where lynch law was many times faster than lagging legislation. Just few gold miners actually get rich. The California Rush was transferred to distance Australia, which has so far appeared as a large penal camp. Australia is due to the influx of new residents civilized and lost its terrifying touch. (STRUŽ, STUDÝNKA, 2005)

Throughout history, civilizations have always been run by the formidable battle. It is an invisible battle, unrecognized by the most people who are affecting. Nevertheless, all of them feel the effects of the battle in their everyday lives. They feel it, for example, when they receive a bill for electricity and it is 0,50 dollars more than last month. The most often, this battle takes place between gold and silver on one side and currencies that supposedly represent the value of gold and silver on the other side. To understand how gold periodically assesses, we must first know the difference between currency and money. (EICHENGREEN, 2008)

Throughout the ages, the currency was many things, such as livestock, grains, spices, shells, beads and paper, but only two things were money, gold and silver. Cash is simply currency, medium of exchange, which can be used to buy something valuable, what we would call an asset. Cash unlike currencies have value in themselves. Money is always

the currencies that can be used to buy other things that have value. However, the currency is not always money, because the currency has no value in itself. 100-dollar banknote paper, which has a value, stored somewhere else - or at least it used to be before our money became currency. Maloney mentions in his book that the U.S. dollar is not backed up by anything but hot air, or what is commonly called a "good faith and credit of the United States". The result is uncovered currency. (MALONEY, 2008) The following chapter will include the history of our currency and the gold standard. To better understanding of following chapter is important to distinguish between domestic and international gold standard.

Domestic standard is standard independent on the other countries and can be distinguish into pure metal coin (where only gold is accepted) and mixed (where next to gold coins the papers notes are also printed). Domestic gold standard indicates fixed amount of gold in the coin, central banks can convert private gold into gold coins, which has to be accepted as money in all possible ways. On the other hand, next to domestic gold standard also exist international gold standard that can occur as gold bullion standard or gold exchange standard. First, case of international gold standard show us that there are no gold coins in circulation and is not used as reserves in central banks. The meaning of gold was that it could be bought at spot fixed price for foreign exchange. Gold exchange standard is characterized by distribution of coins minted from less valuable metals, for example silver. The leaders, though, could have a fixed exchange price by those that are on gold standard. (BORDO, 1999)

3.1.3 Classical Gold Standard

The classical Gold Standard was a system under which almost all the countries fixed the value of domestic currencies in term of a given amount of gold, or connected their currency to that of a country that did so. The currencies were convertible into gold at the fixed price and there was no limitation on the export or import of gold. Gold coins circulated as domestic currency beside coins of other metals, with the structure differencing by country. As all currencies were fixed in terms of gold, exchange rates between currencies were also fixed. Central banks had two predominant monetary policy functions under the classical gold standard and it was to protect the exchange rates and convertibility of fiat currency into gold. Also speeding up the extension process to a balance of payments imbalance, though this was often infringed. (BORDO, 1999)

The classical Gold Standard began in year 1870 to the outbreak of World War I in 1914. In the beginning of the 19th century, the turbulence caused by the wars of Napoleon had retreated, money consisted of copper coins, gold or silver or specie backed bank issue notes. Anyway, originally only the United Kingdom and some of its colonies were on a gold standard, later joined by Portugal in 1854. Other countries were usually using silver or a bimetallic standard what is use of silver and gold as specie backed. (FRIEDMAN, SCHWARTZ, 1963)

In the year 1871 Germany was just unified and benefited from war indemnity paid by France following by war of 1870 the Franco-Prussian war, which took steps, which shift economy towards a gold standard. Because of the strong position of the UK and the accession on the London's financial market, was easier to support other countries to turn to gold standard. By 1900, the most of the countries besides China and some Central American countries were on a gold standard. This lasted until the World War I began and disrupted the gold standard. Few tries to return to the classical gold standard were made during interwar period. For example the reestablishment between 1925 and 1930, when all countries had to stored national reserves in gold, dollars or pounds, moreover gold supply was not sufficient (high enough) for the increasing money in the circulation. That is why many countries used dollar and pound as reserves in the central banks. None of the gold standards exists after 1930's Great Depression that started in September 1929 in United States followed by Black Tuesday in the same year. Researches, later show that the most countries, which abolished the Gold standard system soon were able to recover faster from effects of Great Depression. (MELZER, 1991)

3.1.4 Bretton Woods system

The Bretton Woods system began in 1945 and took until the year 1971. In July 1944 was Bretton Woods system agreed in New Hampshire in the presence of the representatives from 44 countries. The major objectives were established and should avoid unstable exchange rate of the floating rate regime of the 1920s, which was seen as having obstructed external adjustment and the post-World War I adjustment of trade and finance. Other major objective aimed to avert the beggar-yours-neighbor policies that had characterized the later stages of the interwar gold exchange standard, during which countries used trade limitations and currency devaluations to reduce trade deficits in order to reduce domestic unemployment, put over that unemployment to another countries, and

increase trade surpluses. Third objective aimed to achieve symmetrical adjustment among those countries with balance of payments surpluses and balance of payments deficits. Fourth, the objective was to attain symmetric positions among national currencies in the international financial system. That is how International Monetary Fund (IMF) was found, it was a new institution, which should help achieve these objectives by promoting cooperation on international monetary items, keep sustain exchange rates, full employment, multilateral payments system, easing external disequilibrium and decreasing of exchange restrictions. Each member of the IMF was charged to establish a par value for its currency and it could be gold or the US dollar. IMF was charged also to maintain the market exchange rate of its currency in 1% of the declared par value. The Bretton Woods system featured fixed exchange rates unlike in the 1920s, which featured floating rates. (EICHENGREEN, 2008)

That which has been expected was different from what was emerged. Instead of currencies that are equal, the US dollar became center of the system and the US Treasury held 3/4 of global monetary gold stock. Throughout the 1950s and 1960s, particular European countries and Japan undervalued real exchange rates against the US dollar trying to support export growth. For the most of the 1950s and the 1960s the USA, supplies dollar liquidity around the world and ran balance of payments deficits. In the year 1968 interest in the pound brought a collapse of the Gold Pool agreement created in the 1961 by major countries (Germany, France, UK, USA, Belgium, Italy, Switzerland, Netherland) to designate stable price of gold at 35USD an ounce on the London Gold Fixing market the main center for gold trading. Members of the Gold Pool did not respect the laws and did not expect the controls in private transaction, central banks agreed as an arbitrage not to sell in the gold market. This year Federal Reserve removed 25% gold backing requirement against the issue of Federal Reserve notes. The Federal Reserve's elimination of the gold backing of the notes completed a transition, comprise some decades, to a fiat money standard. Until early 1973 the Bretton Woods system operate, but this period was marked as huge spread in US dollar global liquidity and several foreign exchange crises. (ABKEN, 1979)

3.1.5 Dollar Standard and Fiat Currency

In 1971 price of gold was on \$38 per ounce, after collapse of the Bretton Wood system on August 1971, the European Economic Community (EEC) agreed to maintain stable

exchange rates by regulating exchange rates volatility of 2.25%, because the EEC currencies floated as a group against other currencies such as the US Dollar. This deal was called "European snake in the tunnel". (MALONEY, 2008)

A fiat currency is a currency that is not convertible to anything else, for example to gold or silver. A fiat currency is also characterized by being legal tender by the government that issues it. Both of these conditions meet US Dollar, Japanese Yen or Euro. The problem with fiat currencies is that governments can easily print more notes wherever they think is appropriate. Theirs value is based on trust of people and when a government decides to print more notes, these fiat currencies are prone to quickly lose their values because there is nothing what is backing their value. If a government loses control and comes up to the state of hyperinflation which runs rampant, like as an example of Zimbabwe, country that has made all of their notes worthless through hyperinflation, then the value of fiat currency can quickly become worthless.(DAVE MANUEL, Definition of Fiat Currency, 2013)

3.1.5.1 Quantitative easing (QE1, QE2, QE3)

Quantitative easing is policy designed to inject money directly into the economy. When the global money supply increases in excess of the rate required by global growth, inflationary pressures mount: more money chasing fewer goods, services and assets. This is likely to cause inflation and currency debasement, leading to increased interest in hard assets like gold. To order normal monetary policy and lower interest rates the Federal Reserve System will buy short-term treasuries which ripe fast, turning into cash from the treasury. To order Quantitative easing, the Federal Reserve System (Fed) is buying longer-term securities. Moreover, they could sell these longer-term securities at any time; however, this would beat the purpose of Quantitative easing. As a result, these securities extend the Fed's balance sheet rapidly and represent a long-term period increase in the supply of money. This is in response to a sharp fall in demand as consumers and as businesses reduce their spending. In short, there is not enough money in the circulation. In late 2008 was introduce Quantitative easing (QE1), when the Fed injected 1.25 Trillion of US Dollars into the economy and in late 2010 (QE2), the Fed injected 600 Billion of UD Dollars by buying Treasury securities for that amount of US Dollars. In September 2012 took place third round of quantitative easing (QE3), the Fed decide to launch a 40 Billion

per month by introducing bond purchasing program of agency backed-mortgage securities. (BANK OF ENGLAND, Quantitative Easing-How it Works, 2013)

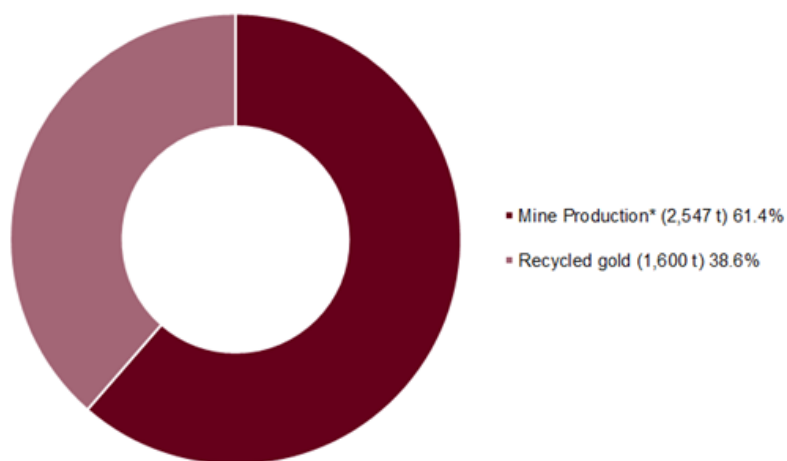
3.1.5.2 Operation Twist

Operation Twist is, that Fed sales short-term securities that they hold and then using the money from those short-securities sales to purchase longer-term securities. This should cause short-term interest rate increase and long-term interest rates decrease, but in more recent since the financial crisis, there has been high demand from fearing investors investing their money to buy short term treasuries, that short term rates have not risen distinctly because of the Fed's selling of short-term maturities. (LEARN BONDS, QE1, 2, and Operation Twist, 2012)

3.2 Supply of gold

Supply of gold consists either from mine production or central banks holdings or from metal recycling. There are two options how to extract gold out of a ground. First option is mining from open pits, you can get less than one gram of gold per ton of ore. The second way is more expensive, mining from underground what allows you to achieve levels of ten grams of gold per one tone. Gold in a form of bars is sent to the world after milling ore to get the metal follows cleaning and purification. (CORTI, HOLLIDAY, 2009)

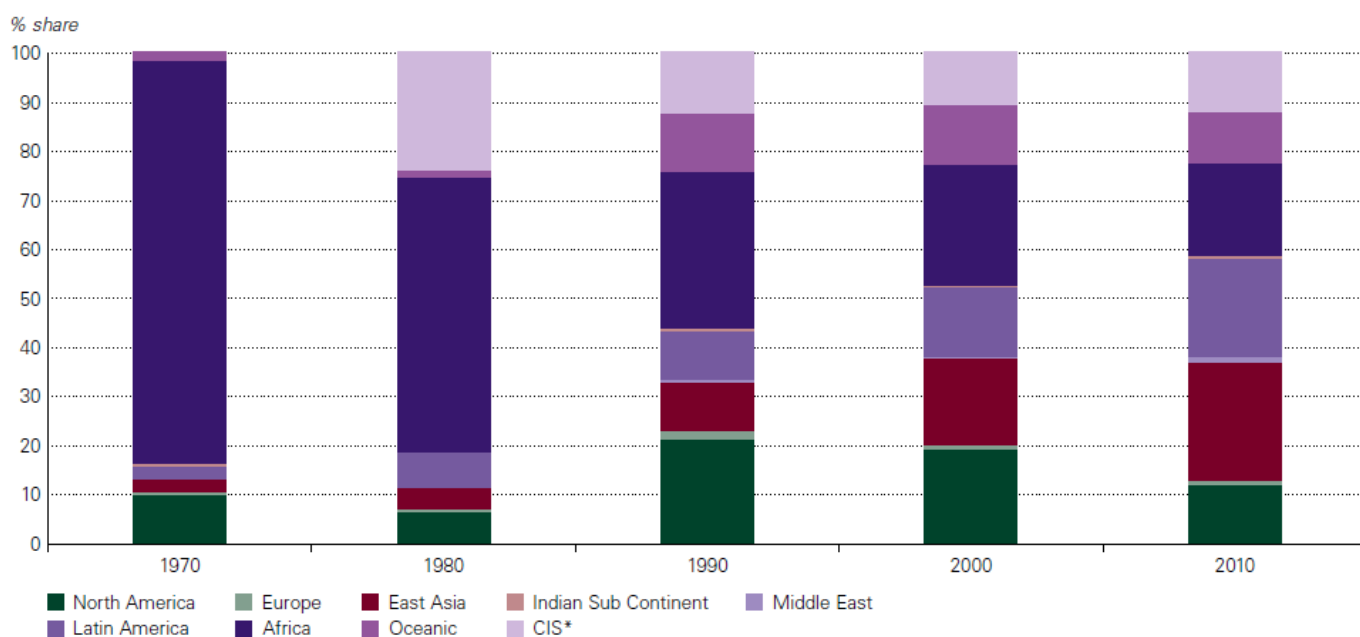
Chart 1. Gold supply flows, 5-year average (2008-2012)



Source: WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013

There is no relationship between supply of gold and its price, because almost all gold ever mined still exists above the ground, (just 20% is believed that lie on the sea bottom). Demand is supplied by gold, which already exist above the ground. For last 60 years more than 60% of all gold above the ground has been mined, mainly because gold price was determined by market powers that began in 1971 after the end of gold standard. The extracting gold from the ground is still more and more expensive, miners need to go much deeper and in the times of high market price of gold, miners extract low grade ore and in times of low market prices miners extract high-grade ore. The distribution of mining changes significantly. In 1970's when we not counting communists countries, South Africa was dominant by supplying almost 80% of the world market, but situation has been change and today no country supplies more than 14%. That differs from the other metals where supply concentration in some areas is much higher. (WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

Chart 2. Distribution of mine production by region



*CIS: Commonwealth of Independent States.

(Source: WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

The price of gold differs over the time. Depends on market sentiment if a secure strategy used by gold mining companies is forward selling, which consists of an agreement made by a miner with another party (usually a bank) to sell all or part of its future gold

production at an agreed price to be delivered at an agreed date in the future. By engaging in this practice, the mining company knows with certainty what the revenue on the forward sold production will be at the time of delivery. (CORTI, HOLLIDAY, 2009)

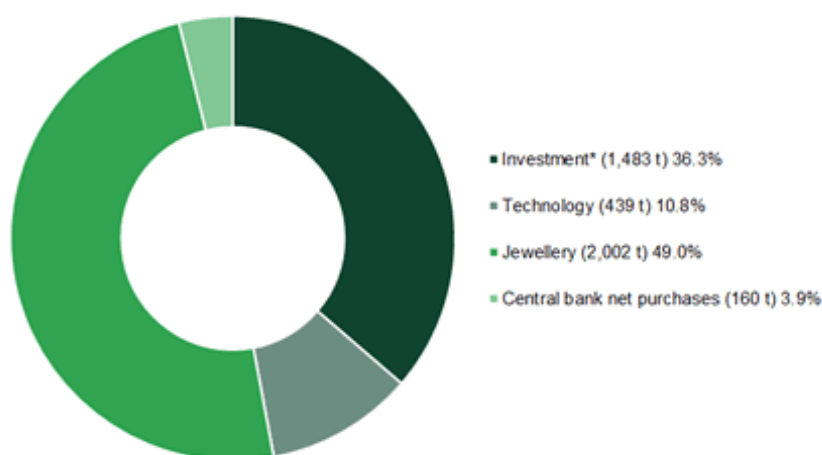
Since the end of 1980s for another 20years, the central banks had been acting as net sellers, because financial assets had been more useful in this period. Storage of gold is much more expensive than storage of financial assets and the most importantly, gold does not hold any interest. The Washington agreement of gold was signed in 1999 by participations of that contract, which were central banks. Central banks became then members of single currency - United Kingdom, Switzerland and Sweden. (MANDEL, 1999) The contract contained a commitment of selling less than 400 tons of gold per year up to 2004. The agreement aimed to stop shedding of gold, because gold was a trend at that period.

The unusual step in advance was when Bank of England intended to sell 58% of its gold reserves in auctions. Since 2009 the central banks became net buyer of gold after 20 years, in the times of crises, uncertainty of financial assets, gold seems to be a good option how to secure portfolio and invest.(WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

3.3 Demand for gold

Demand consists of investment, jewelry and industrial demand. There was a huge demand for last 30 years from Europe and North America to East Asia and India.

Chart 3. Gold demand flows, 5-year average (2008-2012)

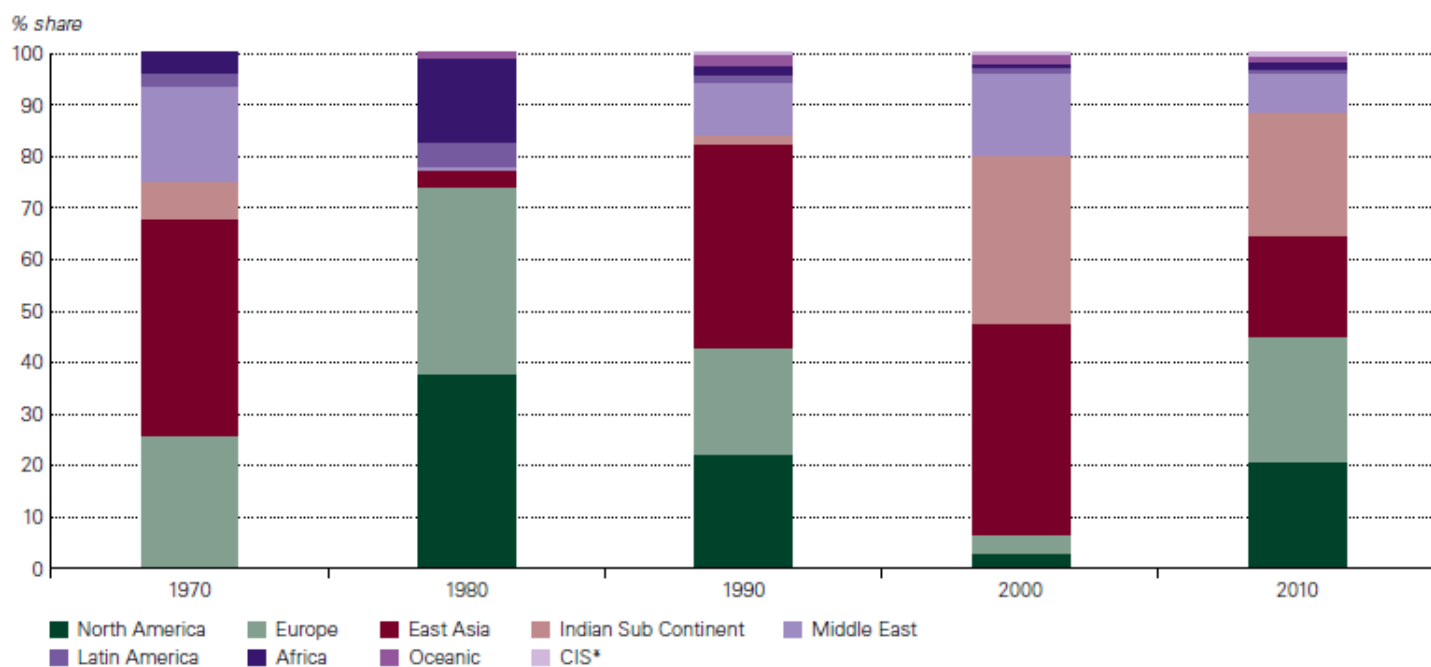


(Source: WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

As we can see on the Chart 3 investment demand consists of 1,483t in 5-years average (2008-2012), which makes 36.3% of the whole demand. Jewelry demand takes first place in demand flows with 49% of the whole demand and 10.8% of the whole demand is from technology side. (WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

Different case of demand is demand among mines. Mines (even if they do not have gold extracted yet) can sell forward for money that they use for start or go on with mining. Problem can occur, when mines do not mine gold they have promised and have to try find alternative solution by buying gold somewhere else to fulfill their obligations. (CORTI, HOLLIDAY, 2009)

Chart 4. Distribution of investment demand by region



*CIS: Commonwealth of Independent States.

(Source: WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

Investment demand is shown in Chart 4, we can see that European and North American do not figure from 1970 an from 2000, they were negative, because of an element supply, not demand. China is one of the fastest growing investment markets, in 2010 together with India the demand's 43%. The differences among the columns of the year 2000 and the year 2010 in Europe are caused by the financial crisis, made people invest to more secure assets. Also is needed to be mention that in time of recovering of

investment demand Exchange traded Funds (ETFs) for gold were established, which could also explain increasing investment demand.

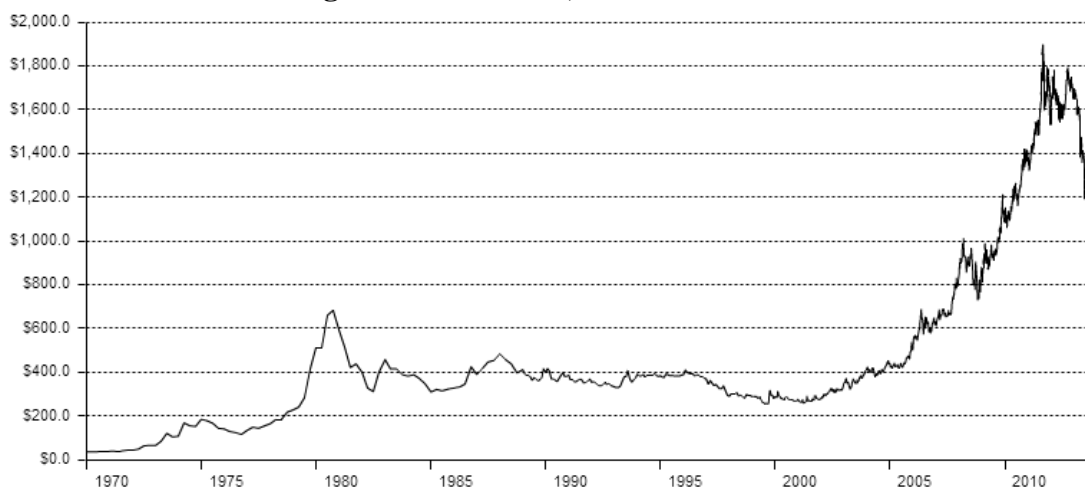
Industrial demand does not change in such a large range as an investment demand, but there are some changes what can be mentioned. First, the electronics demand has been increasing since 1970 and now covers seventy percent of the industrial demand. East Asia and India covers two thirds of the whole world demand for gold. China and Japan demand for electronics purpose lead in these rankings. We can ask why this west to east movement of the gold demand is. One important reason is opening of the east market to world trade and thus better access to gold. More over the reasons on the west countries for purchasing the gold differs from those on the east. (WORLD GOLD COUNCIL, The evolving structure of demand and supply, 2013)

3.4 Price of gold 1970-2013

How are precious metals measured and priced is already mentioned in previous chapters. In this chapter, we will focus on events that influenced the price of gold between the years 1970 and 2013.

After World War II to 1971, the world was on a quasi-gold standard. US Dollar were used as reserve currency while was convertible to gold. (ABKEN, 1979) In 1971 price was determine on \$38 per ounce and to 1980 increase to \$850 per ounce. On the Chart 5, we can see the prices of gold since 1970 to 2013. The period from 1971 to 1980 recalls bull market, then two decades from 1981 to 2000 are characterized as bear market and then another decade from 2001 to 2012 again as bull market. (MISHKIN, 2004)

Chart 5. Price of gold in US dollars, 1970 to 2013



(Source: World Gold Council, Price of gold, 2013)

The first period since 1970 to 1980 is characterized by increase in the gold price due to the massive inflation of US dollars because, which was not reflected in the price of gold because United States government willfully set the price of gold. The following decline and transition to the second period in 1981 w the gold price overreacted, as an investors gather up all gold related to investments and believed that the gold price would not decline again. (MISHKIN, 2004)

Recent factors that influence price of gold in 2013 (SNBCHF, 2014)

- 1) Price movements of other commodities
- 2) Global money supply and inflation
- 3) Trade and growth imbalances, the U.S. twin deficits and the “fear factor”
- 4) Central bank’s activities like money printing or gold purchases and sales
- 5) Real interest rates, in particular in the United States and “financial repression”

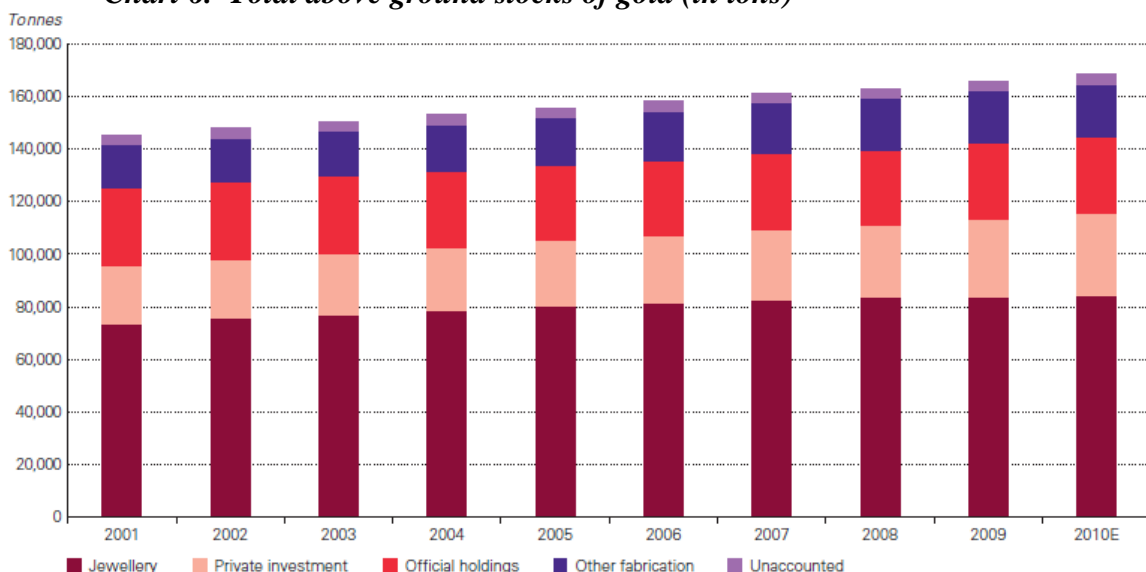
3.4.1 Price determinants

Variables that influence demand and supply of gold will affect price of gold. Every product has its supply and demand which are basis for the determination of price so the gold.

3.4.1.1 Supply determinants

At the beginning of this chapter is necessary to be mentioned, that the price of gold is not significantly influenced by gold supply. In previous chapters, the fact is that every year is mined just small proportion of what is already above the ground. According to World gold council and as we can see on the Chart 6, at the end of 2010 there were 168 350 tons mined. (MISHKIN, 2004)

Chart 6. Total above ground stocks of gold (in tons)



(Source: WORLD GOLD COUNCIL, Global gold market liquidity)

Average supply from mines from 2005 to 2010 was 2208 tones, average supply of recycled gold was 1324 tones and net official sector sales with 235 tones.(WORLD GOLD COUNCIL, Global gold market liquidity) From this results is obvious that the price of gold is much more determine by demand than by supply. The most of the mined gold still exists. Thereby, consumption does not play a big role in the pricing of gold, also gold for a year's hold its value. If you would go to the two companies and both of them would offer you gold brick, but one of them is thousand years old and the second is extract yesterday, you should pay the same amount of money for both of them.

Supply side determinants could be also governmental restrictions. One way how to deliver gold is for sure mining and that is the place where the government can hit by restrictions, for example in developed countries can force mining companies to take better care while process of mining in the context to be harmless to nature. The second way how to deliver gold is through bullion banks as a leased gold. Bullion banks figure, as intermediate wholesalers, but gold do not have to be moved physically when they are leasing or selling gold to somebody.

There is relationship between the amount of gold supplied in the time t and price of gold in the time $t-1$. Usually there is some lag between the price of gold and the reaction of mines. (WORLD GOLD COUNCIL, Short-run and long-run determinants of the price of gold, 2011)

3.4.1.2 Demand determinants

We can divide demand for gold into two groups. First is demand for use, demand for jewelry and industrial demand, the second is demand for investing purpose. The demand for use is influenced by increasing price. If the price of gold rises, people buy less jewelry; this demand is also influenced by seasonal fluctuations.

3.4.1.2.1 Jewelry

Gold is influenced by seasonal blips and when you buy a gold is good to consider it. It looks unlikely, because gold is not vegetable or fruit which depends on weather. Casey logically explain why the most of the observed years from the 1971 are characterized by decreasing price of gold from February to April, then May is characterized by increasing price of gold and in August price of gold again decrease and

when the price of gold again increase it continues till the end of the year. . (WORLD GOLD COUNCIL, Short-run and long-run determinants of the price of gold, 2006)

This cycle was describe by Doug Casey in the article on safeheaven.com and is hard to explain. Reasons of blips are caused by usage of gold as jewelry, decoration, electronics or metal reserves and on the end of the year is higher demand for an presents, for example, for the Christmas and that is one of the reasons why price of gold on the end of the year increase. Also in India there are two periods of weddings, firs one starts in November and December and the second one in March and May, that also influence demand for gold, because India is one of the biggest gold customer with 25% of the world market. (SAFE HAVEN, Seasonal blips, 2006)

3.4.1.2.2 Investment demand for gold

Many factors, such as expectation of inflation or exchange rate; also fear from the future state and lack of correlation with different assets, influence investment demand for gold.

Can one be sure that relation between inflation and gold has persisted beyond era of Bretton Wood system? Around the world investors, recognize gold as one of the best instruments to long-time hedge against the inflation. Nevertheless, numerous economists have said that, over the long-time period, through both deflationary and inflationary, gold has always maintained its purchasing power.

If miners need to pay more for mining gold out from the ground, than price of gold will increase, same as other products.

In addition, relation of interest rate and gold is consequent. When returns on investment are lower than the inflation rate, consumers are more willingness to invest to the gold. If there is interest rate of 2.0 % and inflation rate is going to be 3%, you will lose your money. This is a right time to invest to the gold, because gold is stable.

Exchange rate and interest rate

As is known, central banks control interest rate and exchange rate, which have also influence on the price of gold. Central banks does not have to influence just by interest rates, also they can send money into market and higher money supply cause higher gold prices. According to World Gold Council the coefficient for the sensitive of changes in the price of gold to changes in money supply is in the USA almost perfect, because 1%

increase in US money supply tends to increase the price of gold by 0.9%. Not everywhere is this coefficient so high, for example in the Europe is equal to 0.5%, in the Turkey 0.05% and in the India 0.7%.

Chart 7 shows the slope for gold to act as a hedge against the inflation in the United States for period 1976 to 2006. In the period of the 1970s to beginning of the 1990s, the nominal price of gold appear above the hedge against the inflation, opposite case is seems from the end of 1990s until 2005. (WORLD GOLD COUNCIL, Short-run and long-run determinants of the price of gold, 2006)

Chart 7. US Dollar Price of Gold Required for Gold to be an Hedge against the inflation in the US, 1976-2006

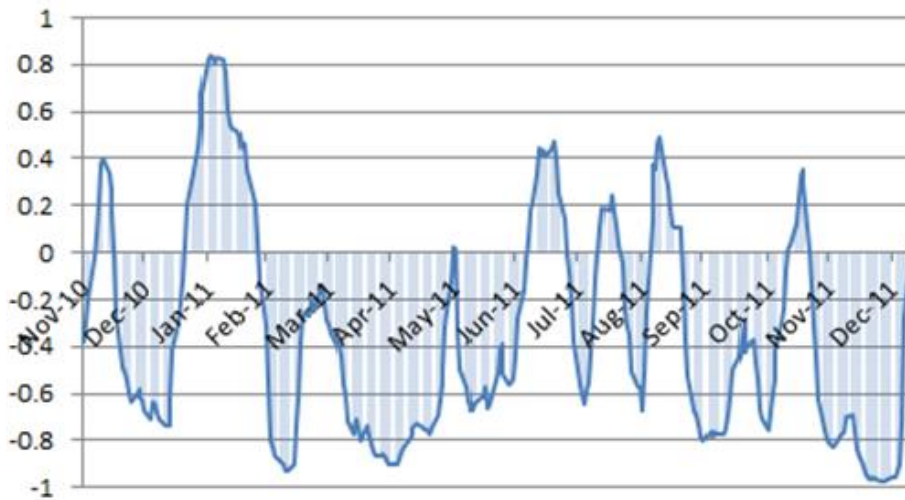


(Source: WORLD GOLD COUNCIL, Short-run and long-run determinants of the price of gold, 2006)

Inflation

If we considered that central banks own more than one fifth of all above ground resources of the gold, than is obvious, that central banks are important players on the gold pricing fields. (WORLD GOLD COUNCIL, Gold to Future Inflation and Linking Global Money Supply to Gold). The correlation between the US Dollar and price of gold is characterized by movement of these assets in opposite directions rather than no or positive correlation as we can see in the following Chart 8.

Chart 8. US Dollar and Price of Gold Correlation



(Source: BULLION VALUT, *Gold Prices and U.S. Dollar Correlation*, 2012)

Gold is work as a good indicator of fluctuating currency. Usually when major currency like US Dollar is experiencing weakness, the price of gold increases, as a result that investors are covering its assets in safe haven investment, such as gold. According to study that analyzed relationship between gold and other various currency from 1970 to 2003, it suggested that even though there is a large volatility during this period, gold still provides good protection against currency fluctuations. In a long-term period, gold is not highly correlated to any asset and that is what makes gold so appealing to many investors. When demand for the US Dollar decrease, investors and banks around the world invest more in gold and it causes the value of gold depreciate. That is what creates an inverse correlation between gold and US Dollar. Nevertheless, for Americans the gold will be more expensive if US dollar falls, but this status does not hold for other countries, which can buy more US Dollars for their currencies. It would not be correct to say that the US Dollar and price of gold always move in opposite way, because other factors also influence the prices of these two. (BULLION VALUT, *Prices of gold and US dollar correlation*, 2012)

3.4.1.2.3 Fear from instability of financial assets

When other assets losing their value, it arouse in people the financial stress and fear, that they will lose their financial holdings and in this case they consider that gold is safe harbor.

Mike Maloney often says: „*That the markets and the economy are both psychological and cycle-logical. Nobody can really understand the markets or the economy, but you can get an inkling of what they are about if you understand what drives them... greed and fear. And the most entertaining part of monetary history is the study of their byproducts; manias, panics, bubbles, and crashes. When you study these you quickly learn the meaning of the old saying - The bull climbs the stairs, but the bear jumps out the window. What it means is that it can take years to create a bubble, but only days or weeks for it to burst. This is because, when it comes to greed and fear... fear is by far the more powerful emotion.* ” (MALONEY, 2007)

3.4.1.2.4 Price of crude oil

The reasons wheatear there exist relationship between price of gold and price of crude oil is that price of oil influence inflation. Because price of oil, is item which is needed in critical activities such as heating homes and such as fueling of transportation, and that mean, if input cost rise, so should the cost of end products rise. Also in history, crude oil could be paid by gold and now a big part of revenues from the oil production is invested into gold. (THE TELEGRAPH, This oil price rise will drive inflation upwards, 2012)

3.4.1.2.5 Stocks – Dow Jones Industrial Average

The Dow Jones Industrial Average (Dow Index) is the most quoted stock market index in the world. The changes in the Dow Index are often perceived to be representative of the all stock market. The founder of this index is Charles Dow, one of the founders of Dow Jones & Co. created the first stock market index in the world. The DJIA has three significant deficiencies. Therefore first is that each company in the index is weighted by the price of its stock. The signification of company in the value of index does not depend on the total market capitalization of the company, but a highly priced stock has a higher weight than a lower priced stock. In addition, every time a company (in Dow Index) is divided the weight of company falls as the stock price decreases by the ratio of the split. Another reason is that the companies in the index are not representatives or leaders of the market as whole, because the components of the Dow Index are chosen freely by the Dow Jones & Co. to represent given industry. So we can say that the Dow Index is not an index of the 30 biggest companies in the US. (PIERCE, 1996)

The performance of gold ingots is sometimes compared to stocks due to their fundamental differences. Gold is perceived as a store of value whereas stocks are perceived as a return on value. Stocks and bonds perform best in a stable political environment with very strong property rights and little bit of turmoil. Stocks have continuously gained value if it is compare to gold in part because of the balanced of the US political system. This has been cyclical for stocks for long-run period and for gold. (SIEGEL, 1998)

Investors who understand to above mentioned demand side determinants are well equipped in an effort to protect their portfolio.

3.5 Gold as an investment

Gold is a risky asset but its returns are independent of those on other assets and that is what makes gold a good choice for diversification for portfolios. By using data from 1971 to 1987 Jaffe constructed four portfolios showing a typical big institutional portfolio with each being different in return and risk. He found that addition 5% of gold into certain portfolios increased the return of these portfolios, reduced the risk and adding 10% gold, the benefits grow even more. (JAFFE, 1989)

Hillier studied the diversification advantages of gold in the international market and US domestic market. There were used data from 1976-2004 for EAFE and S&P 500 and these data show us that gold in periods with poor performance and high volatility was especially useful diversifier. When twenty-three comparing buy and hold strategy against switching strategy with gold they found that the first was better and for the last twenty-five years, holding 9.6% gold in portfolio was the best choice of diversifying portfolio. (HILLIER, DRAPER, FAFF, 2006)

Gold is also often considered as an effective hedge against inflation and with data from 1977 to 2004, Levin (2006) found that the price of gold and US price level are statistically significant from long-run relationship point of view, supporting the state that a 1% increase in the US price level heads to a 1% increase of price of gold. Though they also found relationship in short-run period caused by short time changes in inflation volatility, in the US inflation rate, the US dollar exchange rate, credit risk and the gold lease rate. (GOSH, 2002) Maloney (2007), Struž and Studýnka (2005) are consistent with founding from Gosh (2002).

Other examined relationship is between gold and the exchange rate of currencies from different countries against the US dollar, which paid specific attention to the hedging

properties of gold in political and economic confusion. The price of gold in US dollars shows move in opposite direction to the US dollar and the movement was present. Capie (2004) considered for each exchange rate, that normal weekly movement against the US dollar creates a movement in the price of gold from 1 dollar. (CAPIE, 2004)

3.5.1 Physical holdings

3.5.1.1 Bullion Coins

Gold has been used as gold coins for thousands years since the Bronze Age and coin usage is split in two groups, first for the purpose of collection and the second as an investment. Collecting the coins is not considered as an investment, because piece of gold of same quality and certain size should have the same value as the second piece, which has same characteristic as the first one, and time factor should not play any role. However, when you collect your coin has different value according to age of a coin and rarity and story of a coin play crucial role in coins pricing.

The bullion coins have some advantages compare to bullion bars. For example, bullion coins contain smaller amounts of metal, authenticity is better recognizable and the quality is guaranteed by editorial states are easily marketable at any time. Gold coins are minted in 50 countries around the world. In 2003 was 131 tons of gold used for coinage and minting of medals, Turkey consume the largest part (47 tones), then India (21,5 tones) and in following the USA (15tones). (DĚDIČ, BARÁK, ZAGAR, 1992)

The most expensive and rarest gold coin on the whole world was minted in 1933. That year was minted 445 thousands of golden twenty dollars coins called Double Eagle, however before they get to the circulation, President Franklin D. Roosevelt ordered to melt down all of them. However, in 1934 was found that 10 coins were missing. Nine coins were discovered later and melted down as well but one of them has been lost for 60 years and in 1996, last Double Eagle appears when one British executive tried to sell this coin for 1,5 billion USD. Coin was transferred 14 days before the 11 of September 2001 and later sold for seven and half billions USD and proceeds were donated for the fait against the terrorism. (STRUŽ, STUDÝNKA, 2005)

3.5.1.2 Bullion Bars

The bullion bars have been between 350 to 430 fines ounces, usually they have 400 fines with minimum purity of 99,9%. Every bullion bar must have minted serial number,

four digits year of manufacture and stamp of refiner. Many institutions which trading with bullion bars are everywhere around the world. The LBMA is international trade association based in London but has a client base such as mining companies, producers, fabricators, refiners or private sector investors and of course, the majority consists of the central banks that hold gold. (GOLD BARS WORLDWIDE, Categories, 2013)

3.5.2 Exchange traded funds

Exchange traded funds has abbreviation the ETF. ETF tracks the price of gold, are traded on the major stock exchange together with closed-end funds (CEFs), and exchange traded notes (ETNs) what makes them different from mutual funds. ETF are 100% backed by gold, but not all of them needs to be backed fully by gold, for example ETNs using for tracking the price derivate. ETF usually increase when price of gold increase and they increase in the same amount. Pros of ETF are that you can buy small quantities of less than one ounce. (DĚDIČ, BARÁK, ZAGAR, 1992)

3.5.3 Gold accounts

Usually gold bullion banks offer two types of gold accounts and that are allocated account and unallocated account.

Allocated account is almost the same as keeping gold in a secure deposit box; we can consider due to the World Gold Council that this is the most secure form of investment in physical gold. Concrete coins or bars are numbered and identified by fineness, weight and hallmark. Particular investor pays the custodian for insurance and storage of gold.

Unallocated accounts represents that investor do not have concrete bars assigned to them. Usually, one of the advantage is that investor do not have to pay any insurance or storage fees, because the banks can lease the gold out. Traditionally, bullion banks do not operate in quantities less than one thousand ounces. Thus, their customers are institutional investors, gold market participants, central banks and private banks acting behalf of their clients. (DĚDIČ, BARÁK, ZAGAR, 1992)

3.5.4 Forward and Futures, Options, Swaps, Stocks and Bonds

3.5.4.1 Forward and futures

It is important at the beginning of this sub capture mention that investor do not invest in physical state of commodities, but invest to the commodities future. Forwards and futures are contractual in the present time about a future price, for example, if you buy gold

for a spot price, gold can be delivered in few days and while this time, price is usually different. Differences between short term prices between forwards and futures are usually not significant, thereby forwards price can be used for forward market and vice versa.

Main difference between futures and forwards is how can be traded. Futures are traded on stock exchange markets and forwards are traded outside on those markets. Expiration and volume of trade also differs. (FABOZZI, 2008)

3.5.4.2 Options

Gold options are contracts in which the basic asset is a gold future contract. The holder of a gold option has right to presuppose a long position in the case of call option or a short position, in the case of a put option, in the basic gold futures as the implementation price. This right lapse when option expires after market close expiration date. Gold call option is for traders who are bullish about gold price and gold put option is for trades who believe that gold price will fall. (DĚDIČ, BARÁK, ZAGAR, 1992)

Other opportunity how to sell option is strategy used by many professional traders. Options are traded at New York Mercantile Exchange (NYMEX) and Tokyo Commodity Exchange (TOCOM). NYMEX gold options are quoted in US dollars and cents per ounce and their underlying futures are traded in lots of one hundred troy ounces of gold. TOCOM gold options are traded in contract size of one thousand grams and their prices are quoted in yens per gram. (THE OPTIONS GUIDE, Gold Options Explained)

3.5.4.3 Swaps

Swaps are customized contracts that are traded in the Over the Counter (OTC) market among private parties. Dominant part at swaps market holds firms and financial institutions with few individuals. Because swaps occur on the OTC market, there is risk, that swaps will counterparty default. Commonly, swap is the exchange of one security for another to change the maturity (of bonds), quality of issues (of stocks or bonds), or because investment objectives have changed. Swaps recently have grown because of currency swaps and interest rate swaps. It can be considered that either swap is a portfolio of forward contracts, or it is a long position in one bond united with a short position in other bond. The vast majority of commodity swaps involve gold. Therefore, for example, a company that uses a lot of gold might use a commodity swap to secure a maximum of price of gold, in return, the company receives payments based on the market price. Simply

we can say that swaps mean the exchange of the same amount of metal in different location. For example, gold held with the Bank of England in London might switch for gold held with the Federal Reserve Bank in New York. The swap technique used to be practice in countries such as Brazil, South Africa and Philippines. (OECD, Gold Swaps, 2001)

3.5.4.4 Stock and bonds

It is usual that companies selling their stocks and bonds to get money from the market. Price of gold influences stocks and bonds of mining companies. If price of gold raises, stocks rise even more. Stocks can generate huge earnings than bonds, but stocks are more risky than bonds. *Gold miners have given investors little upside when the price of gold rises and handed them real losses when gold falls.* (FORBES, How Gold Miners Became A Terrible Investment, 2013)

Naturally, it depends how risk is define. According to Kennon, *the data make clear that, if risk is the chance of failing to earn a real return over the long term, bonds have carried a higher risk than stock. If you consider risk to be short-term market fluctuations, then stocks are riskier than bonds. As periods grow longer, though, stocks begin to beat bonds more and more frequently until any period of outperformance from bonds becomes a statistical anomaly. If the stock market is fairly valued or undervalued, it makes no sense for the average investor who is a young and has a long-time horizon to be stuffing his or her portfolio with fixed income securities such as bonds.* (JOSHUA KENNON, Stock vs. Bonds vs. Gold for the 200 Years, 2011)

3.6 Physical gold in the Czech Republic

Gold investment can be realized by buying a physical gold. The advantage of this investment is that eliminates risk such as the risk of the issuer. The main disadvantages are liquidity of physical gold and storage costs. We also must recon with the fact that if we want to sell gold, the purchasing price will not be a full price.

There is a variance between the purchasing and selling price. From this perspective, the author would therefore not recommend physical gold investment to short-term speculation. For this kind of investment would better fit strategy for purchase and holding of gold over a long-term period. The focus will be placed on the investment so-called investing to the gold bullions and coins, because this investment has several advantages

compared to the jewelry. Shortly the main advantages are an exemption from value added tax by law, lower transaction costs due to standardization, ease of awards and higher liquidity. (TRADE IN GOLD IN THE CZECH REPUBLIC, 2013)

3.6.1 VAT exemption

Investment gold is exempt from value added tax. However, investment gold must meet the conditions that are prescribed by law. These conditions are specifically defined in the Act No. 235/2004 Coll. „On Value Added Tax “in Section 92 "Special scheme for investment gold." The full text of this section is listed in following references. (SAGIT, Právní úprava a její změny, 2012) The law stipulates which gold can be considered as an investment. In particular, under this Act, gold is considered as investment to the gold bullions or pure gold coins with a purity of at least 900 thousands. For coins applies, that the Czech National Bank shall publish in its Bulletin a list of gold coins that are the scheme satisfies. The coins that are recognized are 1,000 koruna (CZK 1,000); 2,000 koruna (CZK 2,000); 2,500koruna (CZK 2,500); 5,000 koruna (CZK 5,000); 10 000 koruna (CZK 10,000). From the payment of value added tax is exempt investment gold in country, also its acquisition of another Member State and its import. In addition, exemption from VAT includes a transfer of ownership or legal right to own physical gold. The Act also defines the conditions of tax-exemption for suppliers and manufactures of gold. (COUNCIL DIRECTIVE, 2014)

3.6.2 Gold coins in the Czech Republic

Czech minting of investment coins is in hand of just one Mint in the Czech Republic and that is Czech Mint. Czech Mint, Inc. was founded in 1993 and the base is in Jablonec nad Nisou. Through its existence, Czech Mint acts as the exclusive supplier of circulation and commemorative coins for the needs of the Czech National Bank. It is therefore the only domestic Mint authorized to mint coins for the central bank. The Mint is making a complete set of circulation coins in denominations of 1 CZK to 50 CZK. In addition, there are minted commemorative gold and silver coins for needs of the Czech National Bank minted from 1994. In addition to the excavation of foreign circulation currency, for several states also own emission for own production of commemorative medals, replicas of ancient coins, tokens and medals. Semi-finished products for the circulation coins and commemorative mintage are purchased abroad from reputable certified producers because local production does not exist.

Some of the coins, which are issued by the Czech National Bank, are very expensive, but despite this, there is still great interest to buy them. The coins that are recognized are 1,000 koruna (CZK 1,000); 2,000 koruna (CZK 2,000); 2,500 koruna (CZK 2,500); 5,000 koruna (CZK 5,000); 10 000 koruna (CZK 10,000) with various themes. The coin sets were minted sequentially. First was minted set of Czech Koruna, then set of Karel IV., following by Ten Centuries of Architecture and in 2010 were minted also set of Industrial Heritage Sites coins and later on set of the Bridges. In following picture are seen the examples of gold coins of all five sets in chronological order. (ČESKÁ MINCOVNA, Set of Bridges, 2013)

Picture 1. Set of Czech Koruna coins



Picture 2. Set of Karel IV coins



Picture 3. Set of The Centuries of Architecture coins



Picture 4. Set of Heritage Sites



(Source for the picture 1, 2, 3, 4: AUREA Numismatic set of gold coins, 2013)

Picture 5. Set of Bridge coins



(Source: Česká Mincovna, Set of Bridges, 2013)

On the first picture, we can see Set of Czech Koruna coins. The largest coin of this set is Prague Groschen that weight one troy ounce and this coin is dedicated to Czech

Republic. On the face of those coins is large national emblem and on the reverse side is lion with the image of Prague Groschen. The second picture of the set of coins, which is issued by the Czech National Bank, is set to the name of Charles IV. It is also a set of four coins of different sizes with the same fineness of 999.9. Coins were minted from 1998 to 1999. Another series of coins is cycle of Ten Centuries of Architecture. This cycle contain ten equally sized coins that were issued between year 2001 and 2005. The coin motif contains significant architectural monuments from different regions of the country for example modern Dancing House in Prague. All coins are made of pure gold 999.9 and a weight is 1/5 of troy ounce, i.e. 6.22 grams. The penultimate cycle of coins is a set of ten coins as were sets of Ten Centuries of Architecture, this time with the name of Industrial Heritage Sites. These coins were issued from year 2006 to 2010 and the coins represent a significant public industrial heritage sites. All coins are made of pure gold 999.9 and weight is 1/4 of troy ounce, therefore 7.78 grams. One of these cultural monuments, which are displayed on the one of these coins, is picture of the brewery in Pilsner. (TRADE IN GOLD IN THE CZECH REPUBLIC, 2013)

Picture 6. Coin „Brewery in Pilsner“



(Source: ČeskáMincovna, Set of Bridges, 2013)

Finally, the last set of commemorative coins issued by Czech National Bank is set called Bridges. It is as in the two previous cases, the cycle of ten gold coins that will be issued between the years 2011 to 2015, always 2 coins per a year. Expected date of emissions is in May and October. Motifs on the coins, as the name suggests, will pose significant bridges that were built over eight centuries in Czech Republic. Each coin will weigh 1/2 troy ounce, therefore 15.55 grams. Coins will be made of pure gold 999.9 with a nominal value of CZK 5,000. (NUMISTA, 2013)

The most of the coins, issued by the CNB, are from the most part sold out and it is appropriate to mention some of the world's most famous gold coins, with which the investor may encounter also on the market in the Czech Republic. For these investment coins are also certain relatively high liquidity because investors know them and states that

emit these coins guarantee their quality. Often it is one of the oldest gold coins ever minted.

The largest production of gold in the world has traditionally South Africa due to the position of the largest gold deposits. The world's first and best-known investment coins are the South African Krugerrand. Krugerrand has been minted since 1967. (NUMISTA, Krugerrand, 2013)

Picture 7. Coin „Krugerrand“



(Source: NUMISTA, Krugerrand, 2013)

On the obverse Krugerrand bears the head of Paul Kruger, first president of South Africa. From both sides we can see the name of country, from one side in Afrikaans and from the other in English. The reverse of the coin depicts an antelope and name Krugerrand. The primary distribution of these coins includes primary companies from Great Britain and some banks in the USA and Germany. (NUMISTA, Krugerrand, 2013)

Famous coins minted at the Austrian Mint are called the Wiener Philharmoniker. The reverse of this coin is stamped with the motif of the Vienna Philharmonic and the obverse side depicts the organ of the golden concert hall. After the introduction of the euro in 2002, this coin was minted in the nominal value of 100, 50, 25 and 10 Eur. The Philharmoniker we can see in the picture below. (NUMISTA, 2013)

Picture 8. Coin „Wiener Philharmoniker“



(Source: NUMISTA, Wiener Philharmoniker, 2013)

In the 1979 were minted famous Canadian coins, which were called Maple Leaf. This coin weighs 1 troy ounce, i.e. 31.1 grams of pure gold 999.9. The obverse side has a typical maple leaf and on the reverse side we can see the bust of Queen Elizabeth II. (NUMISTA, Maple Leaf, 2013)

Picture 9. Coin „Maple L“



(Source: NUMISTA, Maple Leaf, 2013)

3.6.3 Gold bars in the Czech Republic

Gold bars or gold ingots are not according to species as varied as coins, because a gold bar does not contain artistic value. Bullion should represent only the net value of gold content. In practice, of course, is the price of bullion increased by premium. Bullions differ only by its weight and seal, which indicates the origin of the bullion. Usually the weight of gold bullion investment used by retail investors ranging from one gram to one kilogram, specifically the following weights: 1g, 2g, 5g, 10g, 20g, 1oz, 50g, 100g, 250g, 500g a 1000g.

Since the Czech Mint does not produce investment, gold bullions can be found on the Czech market several bullions from abroad. The most of these are Swiss gold bars, but also we can find production from Austrian bullion ingots and Australian Mint Münze Österreich. From Germany are imported bullions of the company Umicore AG and in Australia is company The Perth Mint that is also often represented at Czech market. Companies ArgorHeraeus, Matalor, UBS and Valcambi produce Swiss gold bars. In the following chapter will be briefly introduce the Swiss company ArgorHeraeus SA, because bullions ArgorHeraeus are mostly offered by Czech retailers. (TRADE IN GOLD IN THE CZECH REPUBLIC, 2013)

3.6.3.1 ArgorHeraeus

In 1998 after an appeal made by the UBS bank, became the new companion the bank Commerzbank, which acquired a stake of 35%. Since 2002 the refineries operates in the new ownership composition. Heraeus Holding GmbH provides for the company advance technology, research and development and its ownership is 26.5% of the shares. Commerzbank as a strong international bank provides financial stability and has an equal share, i.e. 26.5%. Other share include renowned Austrian State Mint Österreich, which is in charge of know-how and distribution network. Its share makes 24,3%. Last proportion, i.e. 22.7% belongs to the management of the company ArgorHeraeus.

Products of company ArgorHeraeus are diverse. It is a coins, bullions and other shapes made of gold, silver, platinum and palladium. This work is primary focused on investment gold bullions. These are divided primarily on bullions minted and bullions casted. The criterion of dividing bullions is their size and weight. Bullions weighing 1 gram, 2 grams, 5 grams, 10 grams, 20 grams, one troy ounce (31.1035 g), 50 g and 100 g ingots are minted. It is called minted bullion due to the technology of their production. First is poured gold

plate of a given thickness and then a special machine knocks out the required size of the bullion. Then presses after the correction of deviations in weight mint the company logo and other information on the each bullion.

Picture 10. Coin „Minted bars- ArgorHeraeus “



(Source: ArgorHeraeus, Casted bars , 2013)

Picture 11. Coin „Casted bars- ArgorHeraeus “



(Source: ArgorHeraeus, Casted bars , 2013)

Next categories of bullions companies ArgorHeraeus are cast bullions. Includes bulky ingots weighing 10 tola (1tola = 11.6638038 grams), 100 grams, 250 grams, 500 grams and 1 kilogram. Again, there is a different technology of production. Ingots are casting into a mold and then a special press engraves logo and all other essentials as is seen on the following picture. These ingots are also available along with a certificate of authenticity.

4 Practical Part

Gold has a positive correlation to oil and a negative correlation to stocks. The magnitude of this pattern increases as the data term length is increased.

4.1 Economic and statistics verification of price of gold determinants

Just as an investor needs to watch for shifts in market sentiment, he should also watch for shifts in inter-market correlations. Though there are logical fundamental reasons for these correlations, they do shift from time to time. For example crude oil/US dollar/US Inflation, usually move together and gold/Dow Jones Industrial Average Index often are correlated negatively. These pairings make sense because the currency-commodity connection is a major driver of market movements. The global economy drives expectations and capital flow.

This econometric model focuses on monitoring development of the price of gold in world in relation to the US Consumer Price Index (US CPI), GBP/USD exchange rate, Dow Jones Industrial Average Index (DJIA Index) as well as prices of different commodity such as crude oil. The model is static, simple containing one endogenous variable and four exogenous variables over a period of 35 years (1979-2013). The year 1979 was chosen due to one reason and it is availability of needed data. For better understanding of econometrics model, next four chapters contain either fundamental analysis or regression analyses of relationship between gold and one of the stated price determinants, as is US CPI, exchange rate of USD/GBP, Dow Index and price of crude oil.

4.1.1 Price of gold vs. US Consumer Price Index (US CPI)

In this study, inflation is defined as a general increase of the price level of goods and services due to the supply and demand dynamics of money and not of goods and services. The U.S. Bureau of Labor Statistics as Consumer Price Index represents the US inflation for All Urban Consumers: All Items. Microsoft Excel were used for calculating correlation and regression using monthly price change in percent, rather than using the raw prices. Over the period from January 1979 through December 2013, correlation between monthly gold changes or returns and inflation was a 0.1321. The lack of significant linear correlation between inflation and price of gold does not necessarily mean that there is no

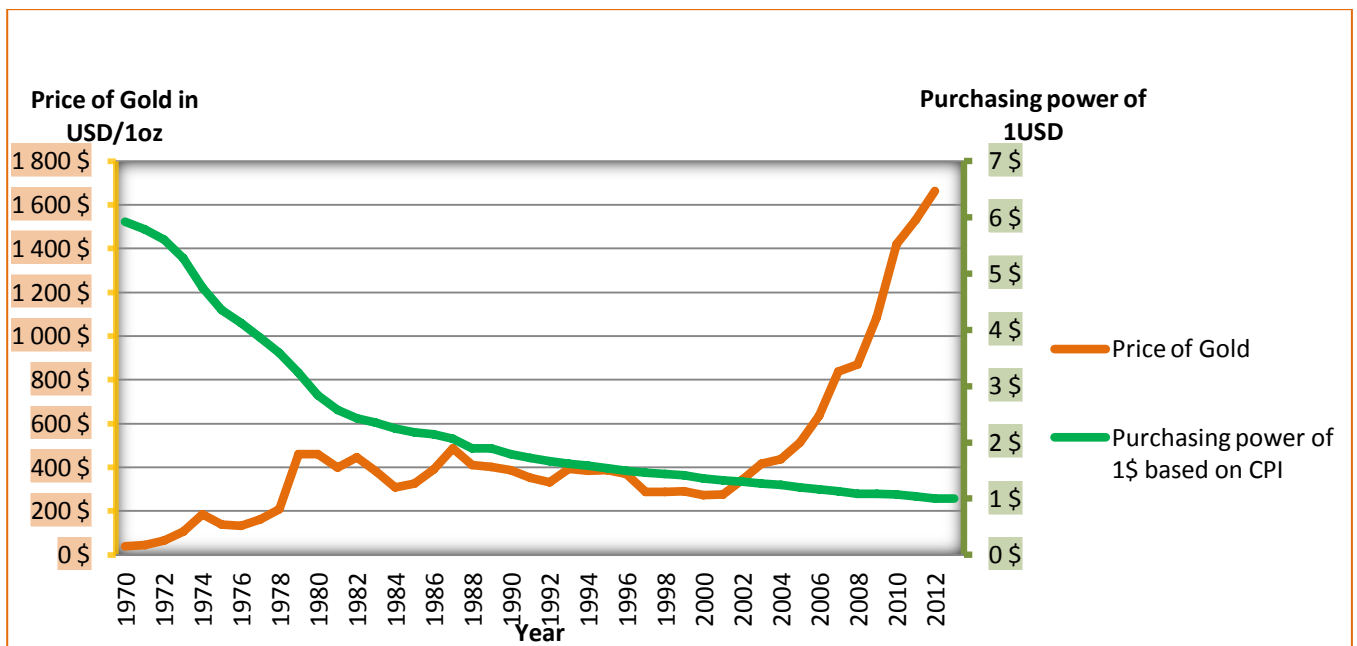
correlation at all. After all a strong non-linear correlation could exist, producing low linear correlation values.

4.1.2 Price of gold vs. GBP/USD exchange rate

Because the US dollar is the primary currency used in global transactions and is seen as a stable and reliable unit of exchange, countries aim to have ample reserves to be able to meet their US dollar denominated liabilities. As such, the dollar forms the lion's share of foreign reserve portfolios. However, governments need to manage the concentration risk in their reserves by diversifying into high quality, liquid assets that lack credit risk – like gold.

As gold is traded relative to its US dollar price, the value of the US dollar has a meaningful important impact on gold and more importantly, gold is viewed (and used) as a natural hedge to the US dollar as it is not directly linked to the monetary or fiscal policies of a particular government. This characteristic strengthens their inverse relationship between price of gold and value of the US dollar.

Chart 9. Development of Price of Gold and Purchasing Power of 1\$ based on CPI between 1970-2012



Source: data available at World Gold Council (price of gold) and Bureau of labor statistics (purchasing power of 1USD), 2013, own processing

While all these elements are very influential in the gold market over the long-run, the fluctuation of the US dollar is one of the most meaningful drivers in the short-term. Naturally, traders use the US dollar as a high frequency indicator to guide their positions in

the gold market. Over the long term, however, a protracted devaluation in the US dollar displays the value of hard currencies such as gold.

Gold is increasingly used as a hedge against fluctuations of the U.S. dollar, which is still considered the world's main currency. Gold and the US dollar are the main instruments of Central Bank reserve. If US dollar grows against other currencies (USD strengthens) usually decreases the price of gold in US dollars, and vice versa. Although this also applies to other financial instruments, but gold has in the past proved to be effective protection against a weak US dollar.

4.1.3 Price of gold vs. Dow Jones Industrial Average (DJIA Index)

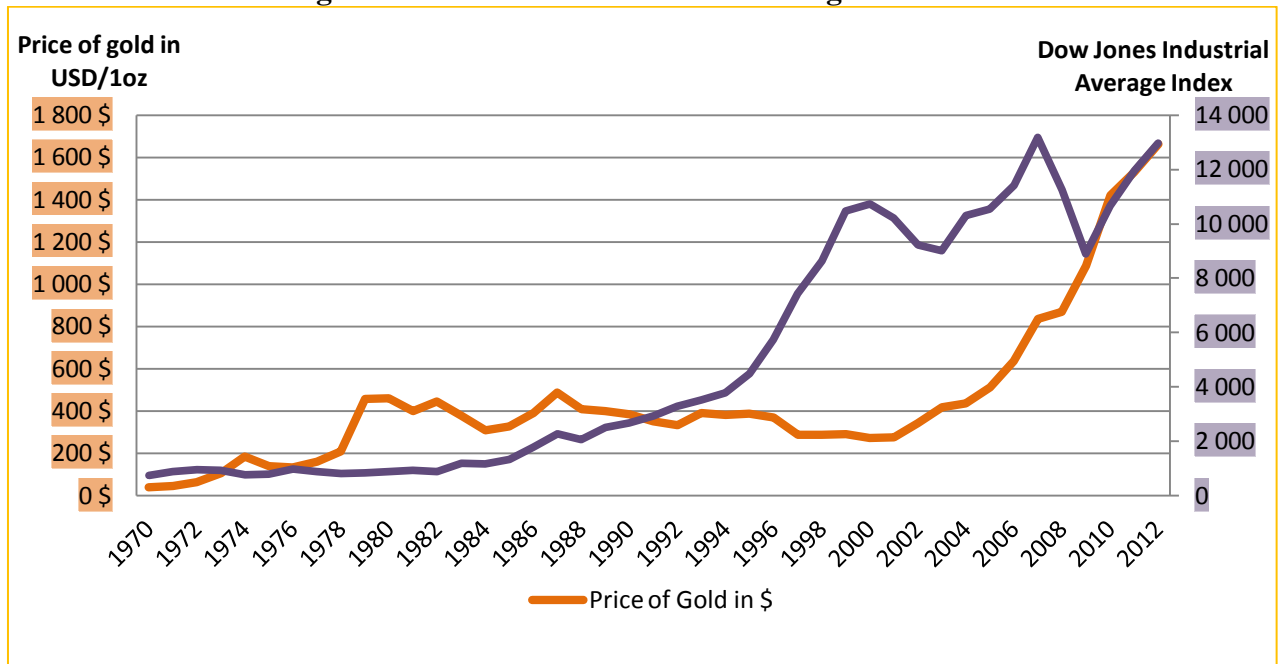
The output generated for the regression equation between gold prices and Dow Jones Average Industrial Index using Analyze-It tool pack of EXCEL.

H_0 There is no relationship between gold prices and Dow Jones Average Industrial Index.

H_1 : There exists a relationship between gold prices and Dow Jones Industrial Average Index.

The slope coefficient of regression indicates that if Dow Jones increases by one unit, gold price decrease by 0.056617 units. Since Dow Jones is an index measured in 100s, the coefficient of Dow Jones implies that the price of gold decrease by \$5.6617 for every one hundred extra Dow Jones rise. In addition, the value of adjusted R^2 comes to be 0.64 and R^2 comes to be 0.65, which is adequately high. We can evaluate Dow Jones Index as relatively good measure of the price of gold, because it explains 65 percent influence in the fluctuation in the price of gold. Nevertheless, this model is still unable to determine another 35 percent of the other extraneous variables that influence fluctuations in gold prices. The value of t is 12.5656, we can reject null hypothesis (H_0) and conclude that there exists a relation between price of gold and Dow Jones Index. The value of p is 0.0001, which is not too high to reject H_0 . The value of F statistics comes to be 33.057 which is much more than $F_{0,05}$ (4.1709) at (1, 30) degrees of freedom, therefore variation between gold prices and Dow Jones is significant. We can conclude that, when Dow Jones goes up gold prices comes down and on the contrary, the same.

Chart 10. Price of gold and Dow Jones Industrial Average Index 1970-2012



Source: available at World Gold Council (price of gold) and Patria (Dow Jones Average Index), 2013, own processing

4.1.4 Price of gold vs. Price of crude oil

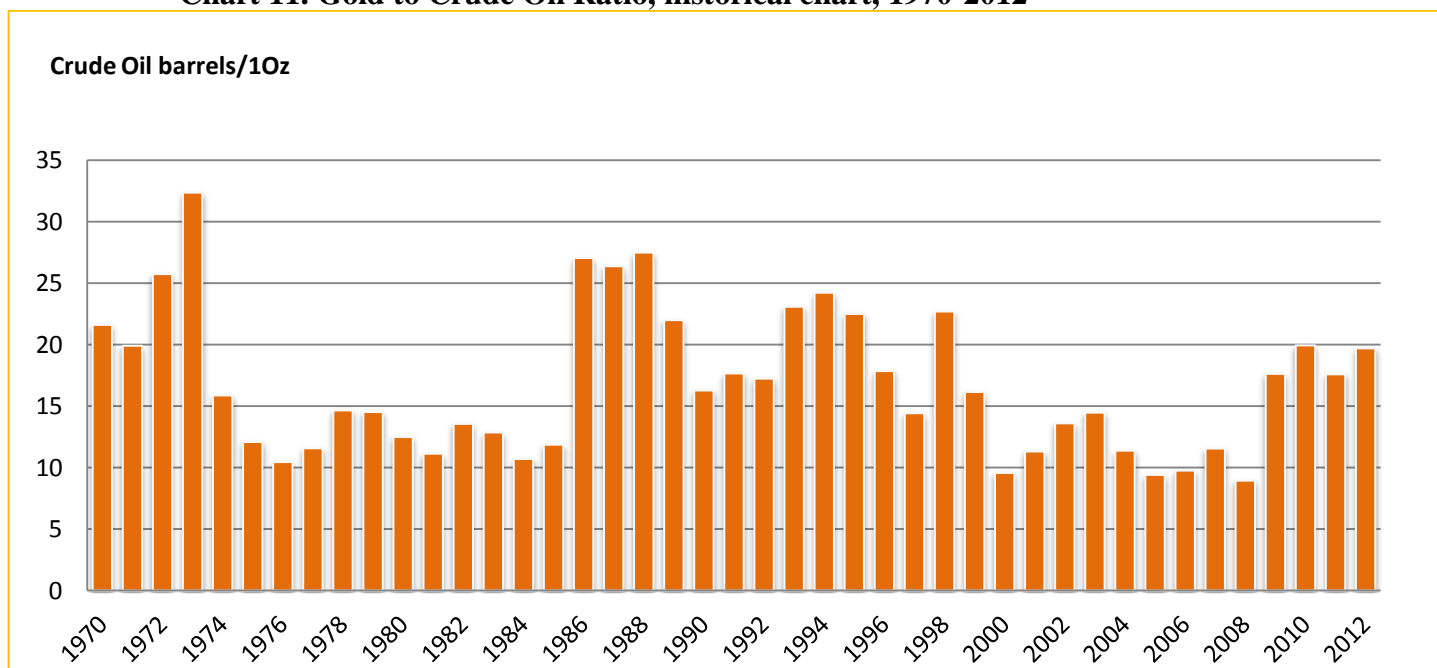
This subchapter is dedicated to find relationship between the price of gold and the price of crude oil. Using EXCEL, we will find to what degree is gold affected by crude oil prices for last 33years, e.g. 1970-2012. This will help us to understand the floating forces of the gold prices. The result is that coefficient of correlation is equal to **0.79**, which means, that price levels of gold and price levels of crude oil are highly correlated. There are possible scenarios, which could explain the result of this correlation. One reason is that high price of gold is generally bad for whole economy, share prices taking down and growth is slowing down. Naturally, investors then look for more secure investments.

Gold is commodity, which we considered as a commodity that not correlates with other commodities, but we have found strong relationship between price level of oil and price level of gold.

For gold is not necessary to measure its value just in US dollars. It is very interesting to observe how many barrels of crude oil we could buy for one troy ounce in the years 1970 to 2012 as is seen on the chart below. We can see on the chart x. starts of war between Israel and its neighbors in 1973. The result of this war was Arab oil embargo when crude oil fired from 3USD to 12USD per barrel and that year have been able to buy 33 barrels of crude oil for one troy ounce of gold. This has been follow by the 1978 revolution in Iran and the Iraq/Iran war in the year 1980, which ended in 1987 and in

average have been able to buy 12 barrels of crude oil per one troy ounce, but the ensuing Gulf War had a limited effect on gold prices in 1990. Then a quite stable period followed until 1997 when has been increased production while demand was declining, because of the Asian crisis, causing a depression in prices. In 2012 were possible to buy 19 barrels of crude oil for one troy ounce. The same quantity has been possible to buy in the year 1971.

Chart 11. Gold to Crude Oil Ratio, historical chart, 1970-2012



(Source: data available at World Gold Council (price of gold) and OECD (price of crude oil), 2013, own processing)

Various precious metals investors have probably analyzed the gold to silver ratio more than once, but such relationships can be found not only between precious metals. It is argued that prices of oil and gold are also related. Higher price of oil would translate in higher prices of gold. Since there is no apparent intuitive connection between what happens with oil and what happens with gold, there is need for some explanations here. The main idea behind the gold-oil relation is the one, which suggests that prices of crude oil partly account for inflation. Increases in the price of oil result in increased prices of gasoline, which is derived from oil. If gasoline is more and more expensive than it is very costly to transport goods and the prices raises. The last result is an increased of consumer price level –inflation. In addition, the fact that precious metals tend to appreciate with inflation rising (-in the current;-fiat currencies; -monetary situation) an increase in the price of oil can in some cases translate into higher precious metals prices. We know from history that oil purchases were paid in gold and a well today, a part of oil revenue ends up

as investment to gold. When oil prices increase, much of the revenue is invested, as it is surplus to hard assets as is also gold.

4.1.5 Declaring variables

This econometric model focuses on monitoring development of the price of gold in US dollars in relation to the US Consumer Price Index (US CPI), GBP/USD exchange rate, Dow Jones Industrial Average (DJIA Index) as well as prices of different commodity such as crude oil. The model is static, simple containing one endogenous variable and four exogenous variables over a period of 35 years (1979-2013). Exchange rate of GBP/USD was chosen for following analysis as one of the four exogenous variables that is considered as variable that influence the price of gold. Because a many currencies are a young, the author choose Great Britain Pound to United States Dollar due to the availability of data from 1979 to 2013. It was necessary to choose currency that goes back to the year 1979.

Assumptions and expected behavior of variables:

- The increase in price of crude oil (USD/barrel) causes an increase of the price of gold (USD/troy ounce).
- The increase of US CPI brings as consequence the increase in gold price.
- The decrease of Dow Jones Industrial Average Index causes an increase in the price of gold.
- The increase of exchange rate GBP/USD causes a decrease in the price of gold.

Declaring variables and units:

Variable	Description	Unit
Endogenous (β)		
Y_{1t}	The price of gold on the end of the month in time t	USD/troy ounce
Exogenous (γ)		
X_{1t}	Unit vector	USD/troy ounce
X_{2t}	US CPI	unit less
X_{3t}	Exchange rate GBP/USD	U.S. Dollars to One British Pound
X_{4t}	DJIA Index	unit less
X_{5t}	Price of crude oil	USD/barrel

Formulation of economic model:

$$\text{Price of gold} \quad Y_{1t} = f(X_{1t}, X_{2t}, X_{3t}, X_{4t}, X_{5t})$$

Formulation of econometric model:

$$\beta_{1t} Y_{1t} = \gamma_1 X_{1t} + \gamma_2 X_{2t} + \gamma_3 X_{3t} + \gamma_4 X_{4t} + \gamma_5 X_{5t} + U_{1t}$$

4.1.6 Data set

The number of observations is n=420. All variables are recorded monthly on the end of the period (month) in the years 1979-2013.

Table 1. Data set

Date	Y1t Price of gold in USD/troy ounce	X2t Exchange rate GBP/USD	X3t Dow Jones average index	X4t Price of crude oil in USD/barrel	X5t US CPI
31.1.1979	233.05	2.0053	839.22	14.9	72.2
28.2.1979	250.9	2.0042	808.82	15.9	72.9
30.3.1979	239.65	2.0378	862.18	15.9	73.8
30.4.1979	243.45	2.0735	854.9	15.9	74.7
31.5.1979	277.15	2.0587	822.33	18.1	75.6
...
...
30.8.2013	1392.75	1.5505	14810.31	107.98	188.248
31.9.2013	1335.75	1.5885	15129.67	102.36	188.409
30.10.2013	1333.75	1.6098	15545.75	96.29	187.624
30.11.2013	1245.25	1.61	16086.41	92.55	187.133
31.12.2013	1201.5	1.6383	16576.66	98.17	188.117

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program, 2013

Table 2. Correlation matrix (Correlation coefficients, using the observations from 1979-02-01 to 2013-12-31. 5% critical value (two-tailed) = 0.0958 for n = 420)

y1t	x2t	x3t	x4t	x5t	
1.0000	0.0100	0.5507	0.8622	0.6361	y1t
	1.0000	-0.0762	0.1474	-0.2012	x2t
		1.0000	0.6813	0.9352	x3t
			1.0000	0.6995	x4t
				1.0000	x5t

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program, 2013

There is an unwanted correlation between X5t, X3t and X4t, Y1t. It means that the first high correlation exist between the Dow Jones Index and the US Consumer Price Index. The second high correlation is between the price of gold and price of crude oil, but this correlation does not matter, because correlation between endogenous and exogenous

variables is desirable. In order to eliminate first correlation we will use the method of first differences. Therefore, the new data would be as following in the Table 3.

Table 3. Data set (adjustment- difference of US CPI data- X5)

Date	Price of gold in USD/troy ounce Y1t	Exchange rate USD/GBP X2t	Dow Jones average index X3t	Price of crude oil in USD/barrel X4t	Difference of US CPI X5t
28.2.1979	250.9	2.0042	808.82	15.9	1
30.3.1979	239.65	2.0378	862.18	15.9	0
30.4.1979	243.45	2.0735	854.9	15.9	0
31.5.1979	277.15	2.0587	822.33	18.1	2.2
...
...
31.9.2013	1392.75	1.5505	14810.31	102.36	-5.62
30.10.2013	1335.75	1.5885	15129.67	96.29	-6.7
30.11.2013	1333.75	1.6098	15545.75	92.55	-3.74
31.12.2013	1245.25	1.61	16086.41	98.17	5.62

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program, 2013

Table 4. Correlation matrix-adjusted (Correlation coefficients, using the observations from 1979/02/28 to 2013/12/31. 5% critical value (two-tailed) = 0.0957 for n = 419)

y1t	x2t	x3t	x4t	x5t-1	
1.0000	0.0130	0.5497	0.862	0.0375	y1t
	1.0000	-0.0721	0.1510	0.2031	x2t
		1.0000	-0.6806	-0.0310	x3t
			1.0000	0.1128	x4t
				1.0000	x5t-1

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program, 2013

Now we have eliminated the multicollinearity in the matrix by gradual differences of variable X5- US CPI and we calculate new correlation matrix, which was evaluated as appropriate for other calculation. The model is estimated by Ordinary Least Squared method using program GRETL.

Table 5. Parameter's estimation Ordinary Least Squared method:

<i>Model 1: OLS, using observations 1979-02-01 to 2013-12-31 (T = 419)</i>					
<i>Dependent variable: y_{1t}- The price of gold</i>					
X1(const.)	468.635	70.5078	6.647	9.48e-011	***
X2t	-219.039	41.5251	-5.275	2.15e-07	***
X3t	-0.0101431	0.00279729	-3.626	0.0003	***
X4t	13.1976	0.463076	28.50	1.16e-099	***
Diff. X5t	-21.2302	10.6348	-1.996	0.0466	**
Mean dependent var.	547.5338	S.D. dependent var.	374.1789		
Sum squared residual	13693866	S.E. of regression	181.8708		
R-squared	0.766013	Adjusted R-squared	0.763752		
F(4, 414)	338.8327	P-value(F)	4.2e-129		
Log-likelihood	-2772.201	Akaike criterion	5554.403		
Schwarz criterion	5574.59	Hannan-Quinn	5562.383		
Rho	0.946371	Durbin-Watson	0.107186		

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program, 2013

Formulation of econometric model:

$$\beta_{1t} Y_{1t} = \gamma_1 X_{1t} + \gamma_2 X_{2t} + \gamma_3 X_{3t} + \gamma_4 X_{4t} + \gamma_5 X_{5t} + U_{1t} \quad (4)$$

$$\beta_{1t} Y_{1t} = 468.635 * X_{1t} - 219.039 * X_{2t} - 0.0101431 * X_{3t} + 13.1976 * X_{4t} - 21.2302 * X_{5t} + U_{1t}$$

4.1.7 Economic verification

Analyzing the results, we can say that:

- The price of gold will be 468.635 US Dollars per troy ounce if the price of crude oil, exchange rate GBP/USD and Dow Average Industrial and the difference of Consumer Price Index will be equal to zero.
- There is a decrease of 219.039 USD per troy ounce in the price of gold if the exchange rate GBP/USD increases by 1 unit, therefore when 1 pound is equal to x dollars plus one dollar on the end of the month.
- There is a decrease of -0.0101431 USD per troy ounce in price of gold if the value of Dow Jones Average Industrial Index increases by one unit (100 points).
- There is an increase of 13.1976 USD per troy ounce of price of gold if the price of crude oil increases by 1 USD/barrel.
- If the difference of US CPI increase by 0,1 units, the price of gold decreases by 21.2302 USD per troy ounce.

4.1.8 Statistical verification

Adjusted R-squared **0.763752** **R^2 :**

The analysis tells that the changes in the price of gold explaining changes in price of crude oil, exchange rate GBP/USD, differences of US CPI and Dow Jones Average Index by 76.3752%. Therefore, there is a strong goodness of fit in the model.

1) **Durbin Watson test** is equal to 0.107186.

$4 - 1.79 = 2.26 = d\alpha$, there is no statistical evidence that the error terms are negatively autocorrelated.

2) **Breusch-Godfrey test for autocorrelation**

Table 6. Breusch-Godfrey test

<i>OLS using observations 1979:02-2013:12 (T = 419). Dependent variable: xyz</i>				
	Coefficient	std. error	t-ratio	p-value
x1	17.0920	22.5557	0.7578	0.4490
x2	-8.42741	13.2557	-0.6358	0.5253
x3	-2.22194	0.00089	-0.02499	0.9801
x4	4.08229	3.69948	1.103	0.2705
diff.x5	-0.104237	0.148456	-0.7021	0.4830
xyz_1	0.996126	0.0515103	19.34	0.7245

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program

H0: no autocorrelation, HA: autocorrelation,

p-value > α -- do not reject H0, p-value < α -- reject H0

There is no autocorrelation in the series of data since p-values are not significant, they are bigger than α therefore we do not reject H0.

3) Heteroscedasticity White test:

H0: no heteroscedasticity, HA: there is heteroscedasticity,

p-value > α do not reject H0, p-value < α : reject H0

There is no heteroscedasticity since there is no significance in parameters. P-values are bigger than α . The variance of U_t in this model is constant, hence it exist homoscedasticity. However, program GRETL detects that the matrix is close to singularity, this means that there may be a linear depending row and the matrix would not be suitable to be inversely calculated.

4) Ramsey’s reset test:

Table 7. Auxiliary regression for RESET specification test

*Auxiliary regression for RESET specification test, Dependent variable: Price of gold
OLS, using observations 1979:02-2013:12 (T = 419)*

	Coefficient	std. error	t-ratio	p-value
x1	-695.942	96.1012	-7.242	2.19e-012 ***
x2	788.836	74.5014	10.59	2.47e-023 ***
x3	0.0274823	0.00335211	8.199	3.12e-015 ***
x4	89.2826	11.2940	7.905	2.47e-014 ***
diff.x5	-48.8483	4.11712	-11.86	3.92e-028 ***
xyz^2	0.00635680	0.000423	14.86	2.72e-040 ***
xyz^3	-2.45914e-06	1.73320e-07	-14.19	1.74e-037 ***

Test statistic: F = 114.497299,
with p-value = P(F(2,412) > 114.497) = 2.86e-040

Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program

H0: model is well specified, HA: model is not well specified

p-value > α : do not reject H0, p-value < α : reject H0

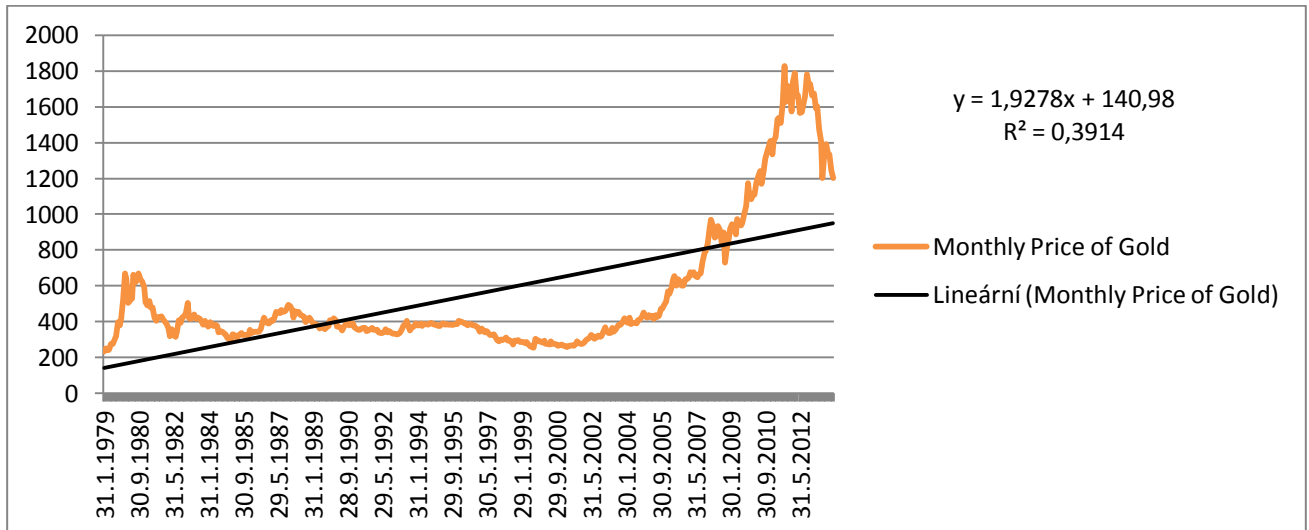
The output for p-value is higher than α . We do not reject H0 and we can say that model is well specified and data are prepared for predicting of future price of gold.

4.2 Prediction of Future price of gold

This chapter deals with the price of gold due to the linear trend line that has been computing by using function - Linear trend line in EXCEL program. For prediction of the price of gold were used monthly prices (the price of gold on the end of the month) of gold

since January 1979 to December 2013. The prediction will be applicable for next five years that mean for year 2014 to 2018.

Chart 12. Monthly Price of Gold and Linear Trendline of the Price of Gold from 1979/01/31 to 2013/12/31



Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETJ program

First was necessary to add trend line, which comes with the R-Squared value and linear function.

$$y = 1.9278x + 140.98, R^2 = 0.3914$$

With the help of linear function, we can predict the price of gold. The result is on the chart x., the red line represents estimated price of gold due to its linear function. This estimated price of gold is not influenced by any other factor than the price of gold in the time, therefore the R-Squared is equal to 0,3914 that mean that the model is explained by 39% just due to the time changes in the prices of gold.

Because we already know that the price of gold is influenced by many factors then just time, the other estimation will be done due to the factors that we already used in econometric model such as US CPI, exchange rate USD/GBP, Dow Index and price of crude oil. With the help of the program Gretl we were able to compute econometric equation for the price of gold that is influenced by mentioned factors. First, we used program EXCEL to compute trend function of a given determinant.

For all of them we used linear trend line except differentiation of US CPI, for this one we used logarithmic trend line. The equations for predicting determinants:

Dow Jones average index

$$y = 35.308x - 986.75, R^2 = 0.9032$$

Price of crude oil in USD/barrel

$$y = 0.1576x + 6.043, R^2 = 0.4812$$

US CPI differences

$$y = -0.018\ln(x) + 0.2838, R^2 = 0.0004$$

Exchange rate USD/GBP

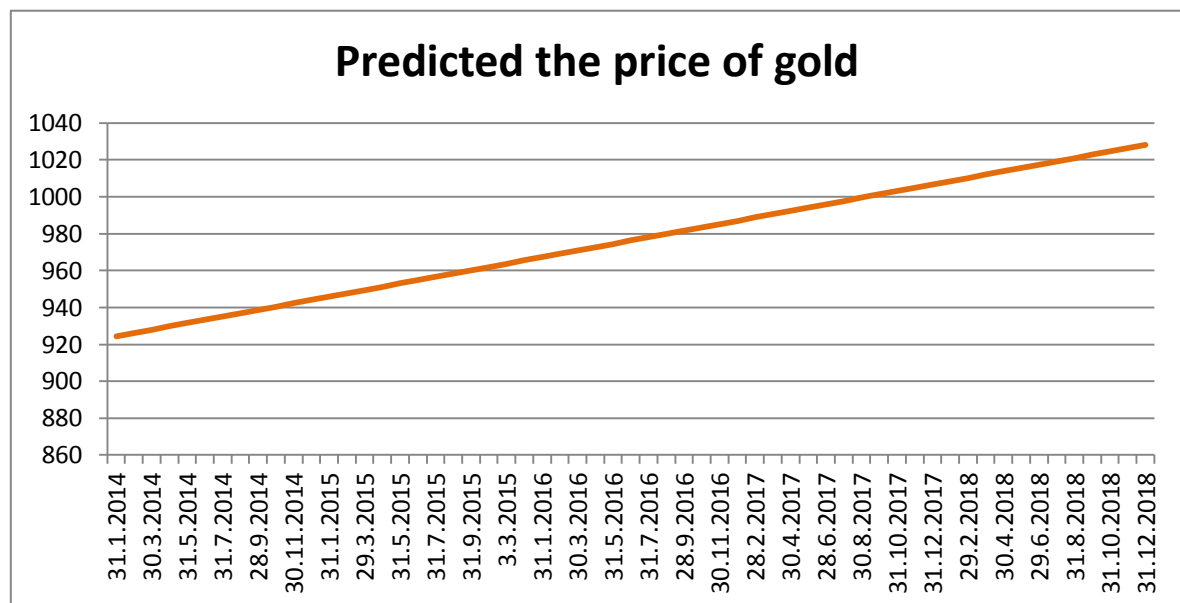
$$y = -0.0003x + 1.7396, R^2 = 0.0281$$

Then we will use estimated values due to their trendlines and implement them to the econometric equation:

$$\beta_{1t} Y_{1t} = \gamma_1 X_{1t} + \gamma_2 X_{2t} + \gamma_3 X_{3t} + \gamma_4 X_{4t} + \gamma_5 X_{5t} + U_{1t}$$

$$\beta_{1t} Y_{1t} = 468.635 * X_{1t} - 219.039 * X_{2t} - 0.0101431 * X_{3t} + 13.1976 * X_{4t} - 21.2302 * X_{5t} + U_{1t}$$

Chart 13. Predicted the price of gold in USD per troy ounce for next 5 years by using Linear equation of Trendline



Source: Data available at World Gold Council (price of gold), OECD (price of crude oil), and Patria (Dow Jones Average Index), Bank of England (Exchange Rate GBP/USD), own processing, using GRETL program

In the Chart 13 we can see that we predict the price of gold as increasing linear function in next 5 years. Due to those results, the price of gold should achieve USD1030 per troy ounce in the year 2018. The table with the predicted values of gold price and its determinants is possible to find out on the end of this thesis as the Annex B.

4.3 Analysis of gold market in the Czech Republic

The previous chapters have deal with the question of what can be getting on the Czech market in the field of investment gold items. In addition, the previous chapters presented some gold coins and gold bullions that are frequently available on the Czech market. This part also include where these gold items is possible to buy in the Czech Republic.

Sale of gold and silver investment in the Czech Republic is not regulated or restricted so far, therefore, we cannot find official list of companies offering these products. The author after some time of searching found nearly fifty Czech companies that offer these items. The most of the searched companies were limited companies except of six joint stock companies. The exception is the Czech Mint, Golden Gate CZ, OSDK, PRIMOSSA Corporation, STEP Finance and SAFINA. List of companies in Czech Republic that offer to buy investment gold, the author have stated in Annex A. List was compiled based on author's search of data internet and thus not guarantee that it is complete. The absence of official list made the author to rely only on his own search of portals and companies.

4.3.1 Market price (nominal price), Premium

What should an investor look for when choosing a company, if he wants to buy and sell gold? The first thing would be the price of gold. Not all companies charge the same premium. The amount of the surcharge varies. The author tried to calculate the average premium for gold bullion on 23January 2014. The author found all the weights of gold bullion investment by 30 Czech dealers and calculated average price for each weight using the market price of gold. With the help of these data, is calculated the price of gold content in the bullion and thus the average amount of the surcharge.

On 23 of January 2014 the market price of gold in the world was 1247.80 US dollars per troy ounce. Dollar against the Czech crown was, according to exchange list of CNB on 23 of January 2014, equal to 20.33719 CZK/USD. That will show us after a simple calculation of the price of gold per troy ounce in CZK.

$1247.80 * 20.33719 = \text{CZK } 25376.75 \text{ per troy ounce}$ (rounded to two decimal places).

Further, we substitute the values in the table that can be found on the next page.

Table 8. Comparing the margins on bullions of different weights, Data collected on 23 of January 2014.

Weight of gold bullion	Average price of gold bullion in CZK	Value of gold bullion in CZK	Premium In CZK	Premium in %
1g	1300	815.973	484.0273	37.20%
2g	2299	1631.94	667.06	28.99%
5g	5413	4079.86	1333.137	24.61%
10g	9956	8159.73	1796.273	18.02%
20g	18706	16319.5	2386.547	12.73%
1oz	27921	25376.75	2544.25	9.10%
50g	43546	40798.6	2747.367	6.30%
100g	87166	81597.3	5568.733	6.38%
250g	210237	203993	6243.833	2.97%
500g	420312	407986	12325.67	2.48%
1000g	840700	815973	24727.33	2.94%

Source: Own calculation based on construction data of the price of gold bullions

As is apparent from the table, that premium decreases with increasing weight of bullions. The results of the author measurements confirm expectations. For higher liquidity given by the smaller size of bullion, an investor pays tax in form of higher premiums for merchant. Still a margin of more than a quarter of value of bullion in one-gram piece makes the investment very unusable. However, it is necessary to mention, that not the whole amount of premiums goes to merchant. A part of the margin goes on bullion packaging and accessories such as a certificate of authenticity. In addition, some surcharges include transportation costs to Czech Republic and manufacturer of bullions is certainly not going to sell it for the price of gold content because the production also cost some money. If investors buy larger bullion, then they pay smaller premium, but disadvantage is low liquidity for large bullions. This problem is resolved when seller guarantees the repurchase.

Other aspects that should be considered when investor choosing the seller of investment gold is the credibility of a merchant, the possibility of repurchase and the possibility of storing bullion ingots in a vault for a discounted price. Sometimes it may also

play a role which kind of ingots seller offers, for example, if we prefer Swiss ingots, we have to find such a dealer who offers them.

4.3.2 Purchase prices (real price)

Some sellers offer an option to repurchase ingots, probably this offer the most sellers in the Czech Republic, but just few of them provide the purchase price (real price) on the web site.

4.3.2.1 Differences of purchase prices due to the size of ingots

The data (the purchase prices) were collected by surveying Czech market on the internet and phone interviews .On 23 of January 2014 have been obtained actual purchase prices from 45 different companies which can be seen in the Annex 1. These data help us analyses how and according to what purchase price of gold differ in the Czech Republic.

Table 9. Various weights of gold in the Czech Republic and its purchase ratio in which the purchase average price of gold is divided by the average market price.
Prices from 23 of January 2014.

Weight of gold bullion	Average market price of 1g/CZK	Average purchase prices of 1g/CZK	The ratio of the purchase price from
1g	1300	838	64,46154%
2g	2299	1568	68,20357%
5g	5413	4294	79,32754%
10g	9956	8220	82,56328%
20g	18706	16360	87,45857%
1oz	27921	25186	90,20451%
50g	43546	40146	92,19216%
100g	87166	81207	93,16362%
250g	210237	203687	96,88447%
500g	420312	408380	97,16116%
1000g	840700	819000	97,41882%

Source: Own calculation based on construction data of the price of gold bullions and data collected by own survey of purchasing prices

From the table is obvious that the most advantageous is if investor sells larger bullions. Sellers offer for them higher price of the repurchase. From the perspective of

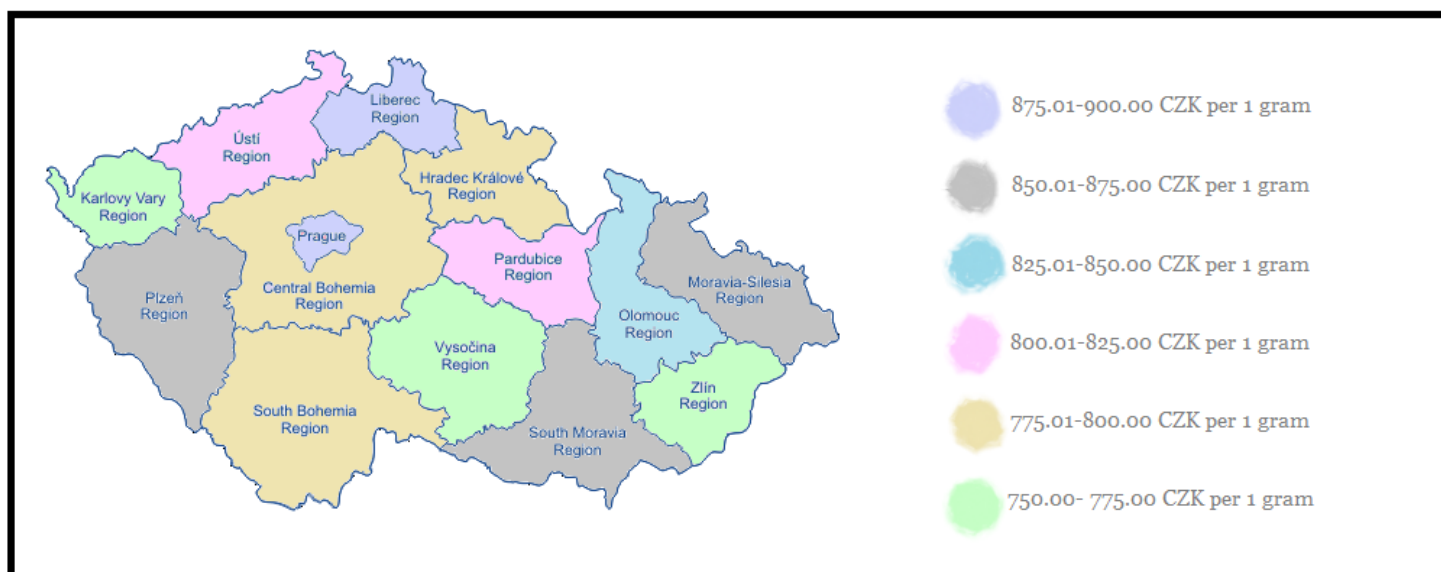
individual sellers is appropriate to say that the breadth of products is quite similar. The most retailers offer gold bullions and coins and also silver bullions and coins.

It is necessary to mention that several e-shops public just guide prices of gold. Real price is determined in the moment when the money comes on the clients account. Therefore, the final price could be different from the price that is public on the internet.

4.3.2.2 Differences of purchase prices due to the place of sale in the Czech Republic- Regional differences

Czech Republic has 14 regions as we can see on the map below. Purchase price of gold varies by a non-negligible amount in regions of the Czech Republic. The survey, which has been conducted on 27 January 2014, served us to recognize why it is so. The data were collected in one day and from 25 different companies that repurchase gold. From each region were obtained eight different purchase prices of gold per 1 gram in Czech crowns. $14 * 8 = 114$ (some companies have branches in more regions of the Czech Republic); from the 8 purchasing prices of the region were selected the three highest, which were averaged and classified in the highest average purchase prices of region. Interval was set up on 27 January 2014 and is split to six parts after 30 crowns in interval from 775.00 CZK/g to 900.00 CZK /g. For this interpretation was used 1 gram weights, because the purchase prices were preferably available on the website. Maximum purchase prices appear in the capital city Prague and in the Liberec Region. This is justified by the possibility to sell gold to Czech Mint, which is located at Jablonec nad Nisou (Liberec Region) and also there is possibility to sell gold in Czech National Bank that is located in the Prague. Purchase of gold in Central National Bank also covers the Czech Mint. Authorized personnel of the Czech Mint decide whether delivered gold or silver will be redeemed, then carry out a formal visual inspection (certificate, hallmark, weight) or ensure the purity test on Assay Office. Then the customer is going to be offered by purchase price. The Czech Mint definitely offers the highest purchase prices, at least approximate prices are published on the e-shop of the Czech Mint. The highest purchasing prices in the Prague and Liberec Region were on the 27 January 2014 in the interval 875.01-900.00 CZK per 1 gram.

Map 1. The map of various purchase prices of 1 gram of gold in 14 regions of the Czech Republic. (Data collected on 27 of January 2014)



(Source: Own calculation based on construction data of the price of Gold bullions and data collected by own survey of purchasing prices)

The lowest prices occurred on 27 January 2014 in the Karlovy Vary Region, Vysočina Region and Zlín Region. The biggest cities of the Czech Republic are Prague, Brno, Pilsner, Ostrava, Olomouc or Ústí nad Labem and we can say that the highest gold prices appear in the regions relevant to these largest cities of the Czech Republic. Approximately, the year 2009, became a year of starting businesses with gold. Moreover, because gold market is still a young market, there is very difficult to find analysis of purchase prices in the Czech Republic. This analysis should serve to smaller investors as a tool for finding the best purchase price in the Czech Republic.

5 Evaluation of the results and recommendations

The main objective of this econometric analysis was to try to find the main determinants of the price of gold, followed by determining their direction in the correlation with the price of gold, and explaining all the possible deviations from the expected correlation values. In the literature review of this thesis, the gold supply almost does not influence the price of gold and the mining production comprise just a small part of above ground gold, since this metal is nearly indestructible the majority of gold ever mined still exists. Hence, every growth in demand can be supplied by reserves of above ground gold. The correlation matrix shows that the price of gold is mainly driven by its investment demand. As a main determinants of investment demand were chosen already mentioned determinants (US CPI, Dow Jones Industrial Average Index, the exchange rate of USD/GBP and the price of crude oil). Choice of the first mentioned determinant seems to be clear, Dow Jones Average Industrial Index was chosen because it is considered as one of the most development indicators in the U.S. stock market. Its popularity is because of the time for which it has been calculated. It is one of the world's oldest indicators. The exchange rate of USD/GBP should mainly represent dollar depreciation or appreciation. British pound was chosen because it is currency that can be measured since the year 1979, thus it is old currency. Four out of four chosen determinants influence the price of gold in expected directions. Concisely, we conclude based on an econometric analysis and inquiry that for the determination of price of gold if individual values are considered for formulating a given econometric model, the results may give misleading numbers at different cases, but mostly our results are consistent with previous studies. We estimated long-run model to analyses the determinants for the price of gold. We found evidence that the US CPI, Dow Jones Average Industrial Index, exchange rate of USD/GBP and the price of crude oil were all statistically significant variables. US CPI was recalculated by gradual differences, because correlated with Dow Jones Index too much. The relationships between the price of gold and Dow Jones Average Index and the price of gold and US consumer price index is the most notable finding in this econometrics analysis. Using a correlation matrix and ordinary least squared method to examine the long-run relationship in the years 1979 to 2013 between the two, we found that the price of gold and the US price level move together.

One major issue needs to be further research. The issue concerns gold as a long-run inflation hedge for other countries than USA. If an investor is resident of a country, whose currencies depreciate against the US dollar more than is required, can holding of gold be requested and profitable. Nevertheless, it remains to be seen whether gold operate as a hedge against inflation or not for other countries. If an investor holds assets in US dollars, then he should profit, if he holds gold in his portfolio when the expected depreciation of US dollar realizes. The US dollar depreciation would increase the demand for gold and lower the price of gold. Because we use the exchange rate of USD/GBP, we can compare the two countries USA and UK. US dollar depreciation would be likely to increase inflation in the USA and gold would behave as a hedge against the inflation in this period, but for a British investor the dollar depreciation would decrease the price of gold and make it more appealing for them. Anyway, we think it is not possible to estimate or predict the future price of gold with a sufficient accuracy by using any economical or statistical methods. Briefly, we can say, that there are too many impacts that cannot be contributed for in models.

The history of money also shows us via the gold standard that gold will always has among the precious metals special status. In last years, we have witnessed an unprecedented growth in the price of gold and brought gold investment issues to the forefront. Ways how to invest in gold greatly increased. The question of how this development will be in the future was not my main problem. However, the author devoted to this topic and brought some data regarding projections into the future by using program EXCEL and Linear Regression Function. The results are not as clear-cut as it was in the past.

The second half of the practical part focuses on physical gold in the Czech Republic. We tried to examine the Czech market with physical gold, its nominal prices and its real prices (purchase prices). The main area of interest was of course physical gold, mainly because of its indisputable advantages, which include standardization, high liquidity, ease of awards and VAT exemption. Physical gold is specific in that it accumulates in a small volume of high value. We can transfer gold relatively easily, and its retention does not require too much space. You can buy real gold from a large number of retailers that operate on the Czech market. Offers therefore can compare and choose such a source of gold that will suit them.

The author examines the nominal prices of physical gold in the Czech Republic and the results of the author measurements confirm expectations. For higher liquidity given by the smaller size of bullion, an investor pays tax in form of higher premiums for merchant.

Also the purchase prices (real prices) of physical gold in the Czech Republic were surveying and evaluated as that maximum purchase prices appear in the capital city Prague and in the Liberec Region. This is justified by the possibility to sell gold to Czech Mint, which is located at Jablonec nad Nisou (Liberec Region) and also there is possibility to sell gold in Czech National Bank that is located in the Prague. For small investors is gold market in the Czech Republic relatively young. Approximately, the year 2009, became a year of starting businesses with gold. Moreover, because gold market is still a young market, there is very difficult to find analysis of purchase prices in the Czech Republic. This analysis should serve to smaller investors as a tool for finding the best purchase price in the Czech Republic.

The author recommends buying physical gold rather as long-run investment then as a short-run speculation. This is mainly due to the charges associated with the purchase, which are included in the price. Although probably this positive price trend of gold will not be repeated in the near future, gold remains an interesting alternative to investing. The author is not afraid of sudden bursting of the gold market and the sharp decline in its price. Within its portfolio of gold would certainly rank.

5 Conclusion

This diploma thesis focused on economic analysis of gold commodity and physical gold in the Czech Republic. Literature review contain complex world of gold from history to current development and was analyzed using several tools from fundamental analysis to correlation and regression analysis as well as own surveying.

In the last fifty years, gold demand has experienced an important move from Europe and North America to East Asia and India. In the time of economic crisis, the investment demand increases. Around the beginning of 1980's the US consumer price index in the United States was highest in the long history and this economic crisis influenced other parts of the world. In the last few years, weak economics result again in the growth in investment demand. The most significant parts of annual supply consist of mining production and scrap gold. On top of that, world's central banks can also supply market by gold. Since 1988, central banks had been acting as net sellers. Because the economic situation has changed in the last few years, central banks' demand has been growing. The United States central bank now owns the biggest amount of gold followed by Germany and the IMF.

Gold is traded in many forms around the world in every main exchange and is easily available to any investor that has access to these exchanges. Physical gold can be bought everywhere in the world either in physical form or in certificate. However, this thesis gives a good understanding of the gold determinants and how, the price of gold should move according to changes in different macroeconomic variables. It is very hard to produce certain opinions, because the price of gold was very volatile during the time of writing this diploma thesis. The author of this thesis suggests that the best solution for someone who wants to set foot into the world of gold investing is to buy physical gold for long-term as it is a low-risk investment and if the history will repeat itself, the price of gold will rise again.

6 Bibliography

6.1 Books sources and academic articles

- ; ABKEN, P., The Economics of Gold Price Movements Economic Review, Federal Reserve Bank of Richmond, 1979, p. 3–13, ISSN: 1309-2448
- ; BIERENS H. J., Specification of econometric models, 1st edition University Press, Cambridge, 2009, 398p., ISBN 052141900
- ; BORDO M., The gold standard and related regimes, Cambridge University Press, 1st edition, 1999, ISBN-10: 0521550068
- ; CAPIE, F., MILLS, T.C. and WOOD, G. 2004, Gold as a hedge against the US dollar, World Gold Council, research study no 30. ISBN 978-961-6914-07-9
- ; CORTI, CH. HOLLIDAY, R. Gold: Science and Applications, 1st edition CRC Press, Taylor and Francis Group, 2009, 416p., ISSN 1042-4431
- ; BARÁK, J. ZAGAR, T. Zákon o komoditních burzách, 1st edition Praha SEVT, 1992, 205p., ISBN 80-7049-043-8
- ; DURBIN J., WATSON G.S., Testing for Serial Correlation in Least Squares Regression I, 1951, Biometrika 37, 410–429. ISBN 978-0-582-11464-7
- ; EICHENGREEN, B. Globalizing Capital: A History of the International Monetary System, 2nd edition, 2008, ISBN 978-0-470-11764-4
- ; FABOZZI, F. and collective The Handbook of Commodity investing, 1st edition. New Jersey: John Wiley & Sons, Inc., 2008, ISBN 978-0-470-11764-4
- ; FRIEDMAN M., SCHWARTZ A.J., A monetary history of the United States, 1963, Princeton: Princeton University Press, 3rd edition, ISBN 0691041474
- ; GODFREY, L.G., Testing Against General Autoregressive and Moving Average Error Models when the Regressors Include Lagged Dependent Variables, Econometrica 46, 1293–1302, 1978, ISBN 0-521-26616-5
- ; GOLDFELD S.M., QUANDT R.E. „Some Tests for Homoskedasticity Journal of the American Statistical Association, (Amsterdam: North-Holland Publishing 1st edition, 1965, 735p., ISBN 978-1-4051-8257-7
- ; GOSH, D. P., LEVIN, E. J., MACMILLAN, P. and Wright, R.E, Gold as an inflation hedge?, Studies in economics and finance, vol. 22, 2004, ISSN 1086-7376

- ; GREENE, W.H., *Econometric analysis*, 5th edition, New York: Prentice Hall, 2002, 1026p., ISBN 0130661899
- ; GUJARATI D. D., *Basic of Econometrics*, 4th edition, MGH, 2004, ISBN 0070597936
- ; HILLIER, D., DRAPER, P. and FAFF, R., *Do precious metals shine? An investment perspective*, volume 62, issue 2, *Financial analysts journal*, CFA Institute, 2006, ISSN 1938-3312
- ; JAFFE, F. *Gold and gold stocks as investments for institutional portfolios*, 1st edition, *Financial analysts journal*, 1989, March/April 1989, Vol. 45, No. 2: 53-59
- ; MALONEY, M., *Guide to investing to the gold and silver*, 1st edition, *Business Plus*, 2008, 364p., ISBN-13:978-0-446-51099-8
- ; MANDEL, M. J., *Going for the Gold: Economists as Expert Witnesses*, *Journal of Economic Perspectives*- Volume 13, Number 2, 1999, Pages 113-120
- ; MIKULA, *The Best Trendline Methods of Alan Andrews and Five New Trendline Techniques*, 1st edition, Mikula Forecasting Co, 2002, 112p., ISBN-10: 0965051838
- ; MISHKIN, F. *The economics of money, banking and financial markets*, 7th edition Boston: Addison-Wesley, 2004, 679p., ISBN 0-321-12235
- ; MELZNER A. H., *A History of the Federal Reserve System*, 1st edition, The University of Chicago Press, 2004, ISBN-10: 0226520005
- ; PATEL S. A., *Gold as a Strategic Prophecy against Inflation and Exchange Rate*, *Business Perspective and Research*, Volume 2, Issue 1, p59-68, ISSN: 22785337
- ; PIERCE, S. *The Dow Jones Averages 1885-1995*, 4th edition, Chicago: Irwin, Editor, 1996, ISBN-10: 0786309741
- ; SIEGEL, J. J., *Stocks for the Long Run*, New York: McGraw-Hill, 2nd edition, 1998, ISBN-10: 007058043X
- ; STRUŽ J., STUDÝNKA B., *Zlato: příběh neobyčejného kovu*, 3rd edition, Praha Grada, 2005, 331 p., ISBN:80-247-0902-3

6.2 Internet sources

- ; ARGOR HERAEUS, *Minted bars*, [online]. [Cit.2013-08-13]. Available at: <<http://www.argor.com/?id=28>>
- ; ARGOR HERAEUS, *Casted bars*, [online]. [Cit.2014-02-02]. Available at: <<http://www.argor.com/?id=27>>

- ; AUREA Numismatic Set of gold coins, [online]. [Cit.2013-10-13]. Available at:
<<http://www.sixbid.com/browse.html?auction=772&page=1>>
- ; BANK OF ENGLAND, Exchange rate USD/GBP, [online]. [Cit.2013-10-11].
Available at:
<<http://www.bankofengland.co.uk/boeapps/iadb/index.asp?Travel=NIxRSx&TD=13&TM=Feb&TY=2014&into=GBP&CurrMonth=1&startDD=14&startMM=1&startYYYY=2013&From=Rates&C=C8P&G0Xtop.x=1&G0Xtop.y=1>>
- ; BANK OF ENGLAND, Quantitative Easing-How it Works, [online]. [Cit.2013-9-12].
Available at:
<<http://www.bankofengland.co.uk/education/pages/inflation/qe/video.aspx>>
- ; BULLION VALUT, Prices of gold and US dollar correlation [online]. [Cit.2013-8-12]. Available at: <http://goldnews.bullionvault.com/gold_prices_011120124>
- ; BUREAU OF LABOR STATISTICS, [online]. [Cit.2013-8-11]. Available at:
<http://www.bls.gov/data/inflation_calculator.htm>
- ; COUNCIL DIRECTIVE, 1998/80/ES of 12 October 1998 supplementing the common system of value added tax and amending Directive 77/388/EEC STATISTICS [online]. [Cit.2014-3-9]. Available at:
<http://europa.eu/legislation_summaries/taxation/131012_cs.htm>
- ; ČESKÁ MINCOVNA, Set of Bridges, [online]. [Cit.2013-12-12]
Available at: <<http://www.ceskamincovna.cz/investicni-zlato-mince-cnb-394-p/stranka2/>>
- ; TRADE IN GOLD IN THE CZECH REPUBLIC, [online]. [Cit.29-3-2013],
Available at WWW: <<http://www.mint.cz/cs/vyroba/ceske-mince/zlate-mince>>
- ; DATA-STOCK EXCHANGE INFORMATION, Yahoo Finance, [online]. [Cit.2013-10-11]. Available at: <<http://finance.yahoo.com>>
- ; FORBES, How Gold Miners Became a Terrible Investment, [online]. [cit.18-4-2013].
Available at WWW: <<http://www.forbes.com/sites/nathanvardi/2013/07/01/how-gold-miners-became-a-terrible-investment-2/>>
- ; DAVE MANUEL, Definition of Fiat Currency, [online]. [cit.18-6-2013]. Available at
WWW: <<http://www.davemanuel.com/investor-dictionary/flat-currency/>>
- ; GOLD BARS WORLDWIDE, Gold bullion coins, [online]. [cit.18-3-2013]. Available at
WWW: <http://www.goldbarsworldwide.com/PDF/BI_14_GoldBullionCoins.pdf>.
- ; GOLD BARS WORLDWIDE, Categories, [online]. [cit.18-3-2013].

- Available at WWW: <http://www.goldbarsworldwide.com/PDF/BG_10_Categories.pdf>
- ; JOSHUA KENNON, Stock vs. Bonds vs. Gold for the 200 Years, [online][cit.28-12-2013]. Available at WWW: <<http://www.joshuakennon.com/stocks-vs-bonds-vs-gold-returns-for-the-past-200-years/>>
- ; LEARN BONDS, QE1, 2, 3 and Operation Twist, [online][Cit.22-12-2013]. Available at WWW: <<http://www.learnbonds.com/quantitative-easing-qe-operation-twist/>>
- ; LEVIN, E.J. and Wright, R.E. 2006, Short-run and long run determinants of the price of gold, Research study no 32, The World Gold Council. Available: <http://www.gold.org/deliver.php?file=/rs_archive/rs_32_shortandlongrun.pdf>
- ; NUMISTA, [online][Cit.2014-02-01]. Available at: <<http://en.numista.com/>>
- ; NUMISTA, Krugerrand, [online][Cit.2014-01-01] Available at: <<http://en.numista.com/catalogue/pieces17854.html>>
- ; OECD, [online][Cit.2013-10-11] Available at: <<http://www.oecd.org/statistics/>>
- ; OECD, Gold Swaps, [online][Cit.2013-09-11] Available at: <<http://stats.oecd.org/glossary/detail.asp?ID=1127>>
- ; PATRIA [online][Cit.2013-10-11]. Available at: <<http://www.patria.cz/indexy/.DJI/dow-jones-industrial-average-index/graf.html>>
- ; SAGIT, Právní úprava a její změny, [online][Cit.2013-12-11]. Available at: <http://www.sagit.cz/pages/lexikonheslatxt.asp?cd=74&typ=r&levelid=DA_168A.HTM>
- ; SAFE HAVEN, Seasonal blips of gold, [online][Cit.2013-10-11]. Available at: <<http://www.safehaven.com/article/5062/seasons-of-gold>>
- ; SNBCHF, The Six Major Fundamental Factors that Determine Gold and Silver Prices, , [online].c2014 [cit. 2014-10-03]. Available at: <<http://snbchf.com/gold-history/gold-and-silver-prices/>>
- ; THE OPTIONS GUIDE, Gold Options Explained [online][cit. 2013-11-11]. Available at: <<http://www.theoptionsguide.com/gold-options.aspx>>
- ; THE TELEGRAPH, This oil price rise will drive inflation upwards, Explained [online][cit. 2013-12-11]. Available at: <<http://www.telegraph.co.uk/finance/comment/liamhalligan/10178088/This-oil-price-rise-will-drive-inflation-upwards.html>>

- ; WORLD GOLD COUNCIL, Gold to Future Inflation and Linking Global Money Supply to Gold, [online][cit. 2013-9-11]. Available at:
<http://www.gold.org/download/rs_archive/money_supply_paper_jan10.pdf>
- ; WORLD GOLD COUNCIL, Price of gold [online][cit. 2013-14-11]. Available at:
<<http://www.gold.org/search/?q=prices&x=-1402&y=-33> >
- ; WORLD GOLD COUNCIL, Global gold market liquidity, [online][cit.18-12-2013], Available at WWW:
<http://www.gold.org/download/rs_archive/liquidity_in_the_global_gold_market.pdf>
- ; WORLD GOLD COUNCIL, The evolving structure of demand and supply,[online][cit. 18-11-2013], Available at WWW:
<https://www.gold.org/download/pub_archive/pdf/The_evolution_of_gold_demand_and_supply.pdf>
- ; WORLD GOLD COUNCIL, Short-run and long-run determinants of the price of gold, [online][cit. 18-3-2012], Available at WWW:
<http://www.gold.org/download/rs_archive/rs_32_shortandlongrun.pdf>

7 Supplements and list of tables

List of tables, charts, pictures and maps

Table 1. Data set.....	51
Table 2. Correlation matrix.....	52
Table 3. Data set (adjustment- difference of US CPI data- X5)	52
Table 4. Correlation matrix-adjusted.....	53
Table 5. Parameter's estimation Ordinary Least Squared method:	53
Table 6. Breusch-Godfrey test	55
Table 7. Auxiliary regression for RESET specification test	56
Table 8. Comparing the margins on bullions of different weights.....	60
Table 9. Various weights of gold in the Czech Republic and its purchase ratio.....	61
Chart 1. Gold supply flows, 5-year average (2008-2012)	23
Chart 2. Distribution of mine production by region	24
Chart 3. Gold demand flows, 5-year average (2008-2012)	25
Chart 4. Distribution of investment demand by region	26
Chart 5. Price of gold in US dollars, 1970 to 2013.....	27
Chart 6. Total above ground stocks of gold (in tons)	28
Chart 7. US Dollar Price of Gold Required for Gold to be an Hedge against the inflation in the US, 1976-2006	31
Chart 8. US Dollar and Price of Gold Correlation.....	32
Chart 9. Development of Price of Gold and Purchasing Power of 1\$ based on CPI between 1970-2012	46
Chart 10. Price of gold and Dow Jones Industrial Average Index 1970-2012	48
Chart 11. Gold to Crude Oil Ratio, historical chart, 1970-2012	49
Chart 12. Monthly Price of Gold and Linear Trendline of the Price of Gold from 1979/01/31 to 2013/12/31	56
Chart 13. Predicted the price of gold for next 5 years by using Linear equation of Trendline.....	57
Picture 1. Set of Czech Koruna coins	40

Picture 2. Set of Karel IV coins	40
Picture 3. Set of The Centuries of Architecture coins	40
Picture 4. Set of Heritage Sites	40
Picture 5. Set of Bridge coins	40
Picture 6. Coin „Brewery in Pilsner	41
Picture 7. Coin „Krugerrand“	42
Picture 8. Coin „Wiener Philharmoniker“	42
Picture 9. Coin „Maple Leaf“	42
Picture 10. Coin „Minted bars- ArgorHeraeus “	44
Picture 11. Coin „Casted bars- ArgorHeraeus “	44
Map 1. The map of various purchase prices of 1 gram of gold in 14 regions of the Czech Republic	62

Annex A: List of companies that sell and buy investment gold in the Czech Republic

1)www.goldengate.cz - Golden gate, a.s.
 2)www.ceskamincovna.cz - Českámincovna, a.s.
 3)www.osdk.cz- OSDK, a.s.
 4)www.investicni-zlato.eu- STEP Finance a.s. Praha
 5)www.primossa.cz- PRIMOSSA corporation, a.s. Praha
 6)www.aurum-brno.cz- Brno
 7)www.zlatostribo.com, www.zlato-slitky.com - Money Works, s.r.o.
 8)www.investicni-zlato.eu - Jan Háze – fyzická osoba, podnikatel
 9)www.bessergold.cz - BESSERGOLD GmbH, organizační složka
 10)www.maxmetal.cz - MAXMETAL, s.r.o.
 11)www.zlatyportal.cz - Dagmar Jeřábková Zlatýportál - investiční zlato
 12)www.zlateslitky.eu - SPEKTATOR, s.r.o.
 13)www.silver-gold.cz - Jitka Richterová
 14)www.abros.cz - ABROS, s.r.o.
 15)www.zlato-eu.cz - EMS Gold Investments, s. r. o.
 16)www.zlate-investovani.cz - Golfstart, s.r.o.
 17)www.zlato-investicni.cz - U.CASH, s.r.o.
 18)www.zlate-mince.cz, www.investicni-zlato.cz - Ludmila Trtíková
 19)www.zlataky.cz - LINK Group, s.r.o.
 20)www.komoditni.cz - 1. Komoditní s.r.o.
 21)www.silverum.cz - SILVERUM, s.r.o.
 22)www.auportal.eu - AuPortal, s.r.o.
 23)www.saturitas.com - SATURITAS Spol. s.r.o.
 24)www.nakup-zlata.cz - FINOD, s.r.o.
 25)www.zlataky.cz- Praha
 26)www.sginvest.cz- SGD invest- Brno
 27)www.zlateslitky.cz- Vrchlabí
 28)www.zlato-slitky-mince.cz- Ing Jan Zimmermann Zlín
 29)www.ekka-gold.cz- EKKA- Ostrava
 30)www.maxmetal.cz MAXMETAL- Hranice
 31)www.zlatarezerva-hodonin.cz- Zlatá Rezerva, Hodonín
 32)www.golddelivery.cz Gold Delivery, s.r.o., Praha
 33)www.zlatonato.cz ADEKR Invest, s.r.o., Praha
 34)www.aurock.cz- AUROCK, s.r.o., Praha
 35)www.bessergold.cz- BESSERGOLD GmbH, Praha
 36)www.zlato-eu.cz- EMS Gold Investment, s.r.o., Praha
 37)www.abros.cz- ABROS, s.r.o., Praha

38)www.zlatostribo.com- Money Works, s.r.o., Praha
 39)www.komoditni.cz- Komoditní.cz, Prostějov
 40)www.investicni-zlato-praha.cz - Praha 4, Kestáčirně
 41)www.tangallatrade.com - TANGALLA TRADE, s.r.o., Praha
 42)www.swiss-gold.cz -SWISS GOLD, s.r.o., Praha
 43)www.vykup-zlatostribo.cz - BEER INVEST, s.r.o., Praha
 44)www.silver-deluxe.eu - Silver Deluxe, s.r.o., Dašice
 45)www.gzmetal.eu -GZ Metal, s.r.o., Liberec
 46)www.aurenta.cz - AuRENTA, Ledeč nad Sázavou
 47)www.bonapartes.cz - BONAPARTE'S NUMISMATIC LIMITED - organizační složka, Praha
 48)www.sporenivezlate.cz - Lucie Peterková Frýdek-Místek-Frýdek, Lubojackého
 49)www.sporenivezlate.cz - Marta Matějková , Ostrava-Mariánské Hory, 28. října
 50)www.zlatnictvivtescu.cz - Věra Pavlacká, Uherský Brod, Moravská
 51)www.rsvsystem.cz - RSV system, s.r.o., Praha
 52)www.zlatarezerva.cz -ZLATÁ REZERVA, s.r.o., Zlín
 53)www.cabrha.cz - CABRHA team, s.r.o., Ostrava-Vítkovice
 54)www.vohralik.wz.cz -Ing. Radovan Vohralík, Hradec Králové
 55)www.financni-zdravi.cz -BRÜNN reality, s.r.o., Brno
 56)www.mavvos.ic.cz - M&V, v.o.s., Měnin
 57)www.comfortconsulting.cz - Comfort Consulting, s.r.o., Brno
 58)www.praskovekovy.cz - Ing. Josef Vrba, Třebíč
 59)www.finance.regin.cz - PaedDr. Jaroslav Halík, Liberec
 60)www.mincovni-obchod.cz- Český mincovní obchod, Plzeň
 61)www.nakup-zlata.cz- Uherský Brod, Dolní Váhy
 62)www.goldczech.cz-BOWLCZECH Limited, organizační složka, Praha
 63)www.investicni-zlato-plzen.cz- NAKUPZLATO.CZ, Plzeň

Annex B. Predicted values of gold price determinants for next 5 years, using EXCEL,
Linear Trendline Function

Date	Exchange rate USD/GBP	Dow Jones average index	Price of crude oil in USD/barrel	US CPI differences	Price of gold
31.1.2014	1,6136	13842,61	72,235	0,175075	924,3984
29.2.2014	1,6133	13877,92	72,3926	0,175033	926,1869
30.3.2014	1,613	13913,23	72,5502	0,17499	927,9753
30.4.2014	1,6127	13948,53	72,7078	0,174947	929,7637
31.5.2014	1,6124	13983,84	72,8654	0,174905	931,5521
29.6.2014	1,6121	14019,15	73,023	0,174862	933,3406
31.7.2014	1,6118	14054,46	73,1806	0,17482	935,129
31.8.2014	1,6115	14089,77	73,3382	0,174778	936,9174
28.9.2014	1,6112	14125,07	73,4958	0,174736	938,7058
31.10.2014	1,6109	14160,38	73,6534	0,174694	940,4942
30.11.2014	1,6106	14195,69	73,811	0,174652	942,2826
31.12.2014	1,6103	14231	73,9686	0,17461	944,0711
31.1.2015	1,61	14266,31	74,1262	0,174568	945,8595
28.2.2015	1,6097	14301,61	74,2838	0,174527	947,6479
29.3.2015	1,6094	14336,92	74,4414	0,174485	949,4363
30.4.2015	1,6091	14372,23	74,599	0,174444	951,2247
31.5.2015	1,6088	14407,54	74,7566	0,174402	953,0131
28.6.2015	1,6085	14442,85	74,9142	0,174361	954,8015
31.7.2015	1,6082	14478,15	75,0718	0,17432	956,5899
30.8.2015	1,6079	14513,46	75,2294	0,174279	958,3782
31.9.2015	1,6076	14548,77	75,387	0,174238	960,1666
31.1.2015	1,6073	14584,08	75,5446	0,174197	961,955
3.3.2015	1,607	14619,39	75,7022	0,174156	963,7434
3.4.2015	1,6067	14654,69	75,8598	0,174116	965,5318
31.1.2016	1,6064	14690	76,0174	0,174075	967,3202
29.2.2016	1,6061	14725,31	76,175	0,174035	969,1086
30.3.2016	1,6058	14760,62	76,3326	0,173994	970,8969
30.4.2016	1,6055	14795,93	76,4902	0,173954	972,6853
31.5.2016	1,6052	14831,23	76,6478	0,173914	974,4737
29.6.2016	1,6049	14866,54	76,8054	0,173874	976,2621
31.7.2016	1,6046	14901,85	76,963	0,173834	978,0504
31.8.2016	1,6043	14937,16	77,1206	0,173794	979,8388
28.9.2016	1,604	14972,47	77,2782	0,173754	981,6272
31.10.2016	1,6037	15007,77	77,4358	0,173714	983,4155
30.11.2016	1,6034	15043,08	77,5934	0,173674	985,2039
31.12.2016	1,6031	15078,39	77,751	0,173635	986,9923
28.2.2017	1,6028	15113,7	77,9086	0,173595	988,7806
29.3.2017	1,6025	15149,01	78,0662	0,173556	990,569
30.4.2017	1,6022	15184,31	78,2238	0,173516	992,3573
31.5.2017	1,6019	15219,62	78,3814	0,173477	994,1457
28.6.2017	1,6016	15254,93	78,539	0,173438	995,934
31.7.2017	1,6013	15290,24	78,6966	0,173399	997,7224
30.8.2017	1,601	15325,55	78,8542	0,17336	999,5107
31.9.2017	1,6007	15360,85	79,0118	0,173321	1001,299
31.10.2017	1,6004	15396,16	79,1694	0,173282	1003,087
30.11.2017	1,6001	15431,47	79,327	0,173243	1004,876
31.12.2017	1,5998	15466,78	79,4846	0,173205	1006,664
31.1.2018	1,5995	15502,09	79,6422	0,173166	1008,452
29.2.2018	1,5992	15537,39	79,7998	0,173128	1010,241
30.3.2018	1,5989	15572,7	79,9574	0,173089	1012,029
30.4.2018	1,5986	15608,01	80,115	0,173051	1013,817
31.5.2018	1,5983	15643,32	80,2726	0,173013	1015,606
29.6.2018	1,598	15678,63	80,4302	0,172974	1017,394
31.7.2018	1,5977	15713,93	80,5878	0,172936	1019,182
31.8.2018	1,5974	15749,24	80,7454	0,172898	1020,971
28.9.2018	1,5971	15784,55	80,903	0,17286	1022,759
31.10.2018	1,5968	15819,86	81,0606	0,172822	1024,547
30.11.2018	1,5965	15855,17	81,2182	0,172785	1026,336
31.12.2018	1,5962	15890,47	81,3758	0,172747	1028,124
31.1.2019	1,5959	15925,78	81,5334	0,172709	1029,912
28.2.2019	1,5956	15961,09	81,691	0,172672	1031,701
29.3.2019	1,5953	15996,4	81,8486	0,172634	1033,489
30.4.2019	1,595	16031,71	82,0062	0,172597	1035,277
31.5.2019	1,5947	16067,01	82,1638	0,17256	1037,066
28.6.2019	1,5944	16102,32	82,3214	0,172522	1038,854
31.7.2019	1,5941	16137,63	82,479	0,172485	1040,642
30.8.2019	1,5938	16172,94	82,6366	0,172448	1042,431
31.9.2019	1,5935	16208,25	82,7942	0,172411	1044,219
31.10.2019	1,5932	16243,55	82,9518	0,172374	1046,007
30.11.2019	1,5929	16278,86	83,1094	0,172337	1047,796
31.12.2019	1,5926	16314,17	83,267	0,172301	1049,584

