**CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE**

Faculty of Economics and Management

*Department of Economics*


Bachelor Thesis

# ECONOMIC ANALYSIS OF GOLD COMMODITY

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# BACHELOR THESIS ASSIGNMENT

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Thesis title

**Economic Analysis of Gold Commodity**

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**Objectives of thesis**

Evaluate current and future development of the price of gold. Particularly, compare gold to other safe haven investment vehicles such as CHF. Determine main factors affecting price of gold and provide trading recommendations.

**Methodology**

Literature review is conducted using methods of extraction, synthesis, induction and deduction. Goals of the analytical section are achieved using various particular methods of fundamental and technical analysis of quantiative data (SMA, EMA, correlation).

**Schedule for processing**

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commodity, gold, technical analysis, fundamental analysis, futures, exchange

**Recommended information sources**

MALONEY, Michael. Guide to investing in gold and silver: everything you need to know to profit from precious metals now. New York: Business Plus, c2008. ISBN 04-465-1099-8.

WORLD GOLD COUNCIL. An Investor's Guide To The Gold Market,: 2nd Edition [online]. New York, NY 10017, United States of America, 2010 Available from: www.gold.org

NESNÍDAL, Tomáš. Obchodování na komoditních trzích: průvodce spekulanta. 2. rozš. vyd. /. Praha: Grada, 2007, 200 s. ISBN 80-247-1851-0.

ROGERS, Jim. Žhavé komodity: jak může kdokoliv investovat se ziskem na světových trzích. 1. vyd. Praha: Grada, 2008, 2 s. ISBN 978-80-247-2342-6.

G. MALKIEL, Burton. A Random Walk Down Wall Street. W.W. Norton & Company, Inc., 2011, 240 s. ISBN 978-80-7349-30

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Dean

**Prague March 7. 2013**

**Declaration**

I declare that I have worked on my bachelor thesis "Economic Analysis of Gold Commodity" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague ……

……..

Ondřej Novák

**Acknowledgement**

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Author: Ondřej Novák

# Economic Analysis of Gold Commodity

Ekonomická analýza komodity zlata

**Souhrn**

Tato bakalářská práce se zaměřuje na ekonomickou analýzu komodity zlata. Analyzuje tuto problematiku zejména z pohledu fundamentální a technické analýzy, ale nepovažuje je jako jedinou část práce. Aby byl tento projekt plně analyzován, autor přistupoval k problematice z různých pohledů. První kapitola je věnována literární rešerši, která pomáhá pochopit problematiku a mapuje vývoj zlata od monetární historie po investování ve formě derivátů. Druhá kapitola se věnuje analýze, která je rozdělena na několik podkapitol. První část analyzuje nabídku a poptávku, zhodnocuje různé trhy, kde zlato působí a jejich vývoj. Druhá část je věnována technické analýze, kterou autor považuje jak stěžejní část této práce. Detailně analyzuje výkon zlatých futures a podává detailní obrázek současného stavu zlata. Poslední část zkoumá existující korelace mezi ropou a měnami. Výsledek této bakalářské práce je dokázat investorům, zda koupit nebo prodat zlato, pokud se berou v úvahu analýzy použité v této práci.

**Klíčová slova:** zlato, deriváty, korelace, technická analýza, fundamentální analýza, futures, komodity, vývoj

**Summary**

This bachelor thesis is focused on economic analysis of gold commodity. It assesses this topic mainly from technical and fundamental point of view, but it is not the only part of this thesis. In order to fully understand this subject, author applied a combination approaches. First chapter is dedicated to literature review, for better understanding of a subject and maps the development of gold from monetary history to investing in the form of various derivates. Second chapter is analytical part, which is divided to several parts. First part analyzes supply and demand; evaluate different markets and their development. Second part is technical analysis, which author considers as a main part of analytical chapter. This part thoroughly assesses charts and gold futures market performance. It also gave the most recent picture of the state of gold. Last part is dedicated to correlation between oil and currency exchange. The outcome of this thesis is to give predictions to investor, whether to buy or sell gold, relying solely on analysis used in this thesis.

**Keywords**: gold, derivates, correlation, technical analysis, fundamental analysis, futures, commodity, development

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# 1 INTRODUCTION

Gold is one of the most valuable precious metals, which people found interest from nearly beginning of time. Thorough the years, gold has proven itself as a key player in the world of economy, serving well in time of need and became an indicator of wealth. Gold has immensely vital role in a monetary system and still is a one of the major form of monetary reserve. After the gold abandoned the gold standard and USD was no longer exchangeable to gold, this precious metal became exposed to growing of international gold trade in the form of derivates. Currently the world is experiencing a major bull market of gold which started in 2001 and still continues today. There is a question how long can it last, since the prices grew to nearly unbelievable heights. It is fascinating to follow and analyze this fast development of gold. This bull market attracts many investors, who want to be a part of the history. Not only individual investors understand the importance of gold. Even central banks, which used to be considered as a supplier, change their sides and starts buying gold in large amounts and complete turn themselves from the supply side to demand side. During the time of crisis many people took a look in the past to understand, that gold works remarkably well as a hedge against inflation and it also protect their assets as well as it helps to diversify their portfolio. The reason why author of this theses chose this topic is because he started to analyze gold in the second year of his study and wanted to expand his knowledge in the world of trading and also understand how gold investing works. Gold is all around a good investment, and in order to successfully invest and make a profit, there are many tools which can be used to analyze the current state of gold.

# 2 OBJECTIVES AND METHODOLOGY

## 2.1 Objective

The main objective of this bachelor thesis is to thoroughly evaluate gold as a commodity and also closely analyze the price development of the gold. The investing in precious metal like gold can be highly profitable, but the volatile nature of gold can end up in disaster to your investment. This is the reason why this bachelor thesis closely analyzes whether the current state of the gold market is good for purchasing of gold or selling. It is also necessary to find whether there is a different security or commodity which closely follows the price development of gold. The answer that author searches is whether is a good time to invest in gold, based on analysis used in this thesis.

## 2.2 Methodology

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 extraction, synthesis, induction and deduction. In other words, author tried to understand the basic facts concerning the gold prior to analyzing its current state and predict the future development. It helped the author to understand the difficult past of gold and evaluate the role of gold in today's economy. It also informs the reader about the basic facts, sketching the reason why gold works well as an investment and what are the reasons that such a vast number of investors consider gold as a good investment. Fundamental analysis gave a broader understanding what is on the supply and what is on the demand side. It also showed and explained how the gold market changed over time and where is the largest market for gold. It is an exceptionally good read. Technical analysis served as a main part of the analytical part, and author consider it as the most important. Using charts and application of various technical tools on gold futures uncovered the current state of the gold price and showed tips how to react in the future. For this purpose author used one of the many available interactive charts available on numerous websites. Last part was dedicated to correlation between oil and USD/EUR and CHF/EUR.

# 3 LITERATURE REVIEW

## 3.1 Gold characteristics

Before we talk about the role of gold in today's economy, let's focus on its specifications. Specifications of gold determine its use and the way it is operated on market. Gold (Au, Aurum) is yellowish precious metal, with the atomic number 79. This number stands for 79 protons in the nucleus of every atom of gold. It is a precious metal with excellent workability and density 19.3kg/dm$^3$. The traditional unit of weight is troy ounce[1], which is 31.1034768g. Even though, troy ounce (oz) and grams are among the most popular units, mainly used in Europe and North America, it differs from different parts of the country. Below is showed other units used in different parts of World.

- Tael
  - It is a unit of gold used mainly in Chinese-speaking countries such as China or Taiwan
- Tola
  - Unit used in Middle East countries like Pakistan, Singapore, India and is equal to the weight of 1 silver rupee.
- Baht
  - Mainly used in Thailand. Another unit, which is locally used is Salung, where 1 Salung equals 0.25 Baht[2].
- Dons and Chi
  - Dons is a measurement of weight in Korea and Chi in Vietnamese metric system.

To make it clear, all units are summed up in Appendix (Table Appendices 1 Conversion of various measurments)

Purity is a very important factor when it comes to measurement of gold. Purity is measured in carats (spelt karats in USA and the Continent). Highest purity, which can achieved is 24 carat; this is purest gold available. It can be expressed as 1000/1000, often is used .999, because it is exceedingly hard to get pure gold without impurities and also due

[1] This unit is used throughout the whole Bachelor Thesis. Every amount of gold is in troy ounce.

[2] *Thai Gold Price: Thailand Gold Info and Live Price Updates* [online]. 2012 [cit. 2013-01-24]. Available from WWW: http://www.goldpricethai.com/facts

to legal reasons. Usually bullion coins and bars have finesse from 0.900 to 1000. 22, 18, 16, 14 or fewer carats mean that there is another metal added. It is because gold in pure form is extremely soft and can be shaped very easily, so it is needed to add different metal, such as silver and copper[3].

- 22 carat – 916.6/1000 it is rarely used in today's jewellery market. It is still too soft. Among others, Krugerrand bullion coin has this amount of carats. Often found in antique jewels.
- 18 carat – 750/1000 it is often used in jewellery, it has much more rich and deep colour than 14 carats.
- 14 carat – 585/1000 it is most common purity of gold used in jewellery

## 3.2 History of gold

One of the most notable characteristics of gold is that it preserves wealth and provides liquidity to both individuals and institutions. Because of that, gold played the crucial role as a central bank reserve asset since the late nineteenth century. The fact that gold is considered as homogenous and is characterized only by its purity, it serves well as a comparable measure of currency across the world. As history tells us, there have been numerous agreements, known as the gold standard, in nations which valued their nation's currency in relation to their gold reserves[4].

**History of Gold in International Monetary System**

Gold had a vital role in the monetary system for centuries. To illustrate the importance of gold in monetary developments in the last century, we can begin with the end of the British Gold Standard in 1914 as a result of inflationary financing of World War I since the Pound Sterling and USD have lost 98% and 94% of its value of purchasing power. Like all monetary inflations, it leads building up of debt as the public borrowed in order to spend money before it lost its purchasing power.

[3] Usually for dental and jewellery *All about gold carats* [online]. [cit. 2013-01-24]. Available from WWW: http://buying-gold.goldprice.org/2006/03/all-about-gold-carats.html

[4] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 713. ISBN 13 978-0-470-11764-4.

The end of monetary deflation in 1921 brought stability back for the United Kingdom and United States of America along with low interest rates and rising Bond and Equity market price. As the price rose, the Intrinsic Value[5] declined. In 1929, due to complete collapse of demand of overpriced equity market with intrinsic value produced deflation, which due to high and unsustainable debt level, resulted in the worst Depression in American history. The resolution for Depression came in 1935 when the debt was lowered by devaluation the paper money in which debt was denominated. This was achieved by raising the paper money price of gold, which increased the total World Monetary Base to well beyond the paper money level of debt. The solution for stabilizing and avoiding possible future inflation Foreign Exchange Rate were "fixed" against gold. This made US Dollar convertible into gold at a set price.[6]

The last international gold standard was the Bretton-Woods system established in July 1944. Purpose of this system was re-established international trade after World War II ended. In terms of monetary policy, one of the key features was that the central banks had to peg their currency to within 1% of the US Dollar which was fixed price at 35 USD/oz of gold. That means that US dollar became fiat currency and could be exchanged directly in gold, which had in effect that many countries had US Dollars as a reserve currency. In other words, non-US Central Banks could exchange US dollars to gold, when they feared that the value of US dollar will be devaluated through excess creation of money[7] Another direct impact of Bretton-Woods system is establishing two distinguished banking institutions, the International Bank for Reconstruction and Development (IBRD) and the IMF. The Bretton-Woods system worked until 1971 because the requirement to stay within 1% put a lot of pressure on the global economy, which ended in the suspension of all conver-

[5] It is the actual value of a company or an asset, including all aspect of the business, both tangible and intangible factors.

[6] MILLAR, R. Peter W. The Relevance and Importance of Gold in World Monetary System. 2006,

[7] MILLAR, R. Peter W.The Relevance and Importance of Gold in World Monetary System. 2006, p 2., Available from WWW Gata.org

sion rights from US Dollar to gold[8] and the pressure of inflationary financing Vietnam War and the US welfare state, which eventually lead to Great Inflation in 1970's.

The Great Inflation ended in 1981, leading to decrease interest rates and strengthening bond and equity prices. It was an attempt by World Central Banks with US Central Bank, under Paul Volcker. He is credited for ending The Great Inflation which peaked at 13.5% in 1981, and was lowered to 3.25% in 1983[9] "*to maintain the integrity of the means of exchange or the quality of Money by keeping the rate of change in Total International Monetary Reserves (IMR's) as close to zero as possible."*[10] That remained official policy ever since. This monetary cycle has highly similar pattern, which has five phases:

1. Phase Stability under the gold standard till 1914
2. Phase Inflation until 1921, ended up with a major increase of debt
3. Phase Disinflation brought stability; it allowed asset inflations until 1929, encouraged future build-up of debt
4. Phase Deflation of assets from over-priced levels combined with a massive debt, put the economy into Depression
5. Phase Monetary reform; reevaluating of Gold to overcome debt depression.

The second part of the twentieth century, there is a repetition of same three cycles:

1. Phase Gold Standard stability from 1944 – 1968
2. Phase Inflation in years 1968 – 1981 caused by financing Vietnam War and US Welfare State led up to another build-up of debt
3. Phase Disinflation from 1981 until the 20th Century

[8] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 713. ISBN 13 978-0-470-11764-4.

[9] HUTCHINSON, Martin. New York Times. [online]. 2008 [cit. 2013-01-29]. Available from WWW: http://www.nytimes.com/2008/11/05/business/05views.html?_r=0

[10] MILLAR, R. Peter W.The Relevance and Importance of Gold in World Monetary System.2006, s 2.

According to this document[11] author suggested that in 2006, which was the year the document was published, the World is in Phase 4 (which eventually end up in Great Recession) and suggested that Phase 5, reevaluating of Gold is inevitable.

## 3.3 Why invest in gold

This chapter will zoom-in why somebody should become an owner of gold. The reason why author used term invest and not buy, is because author consider gold as an asset, which can generate profit. Portfolio diversification, Inflation hedge, Currency hedge and Risk management are the topic of this chapter.

### 3.3.1 Portfolio Diversification

To equally diversify your portfolio is one of the most vital tasks a new investor should do. The strategy of putting all your money in one investment, even if it is gold, is not remorseful for your investment, and entire net worth can be lost. Normal portfolio usually consists of stock and bonds. Adding commodity to your portfolio, especially gold can help protect your investment since the price of gold is determined differently than other assets.

### 3.3.2 Hedging against inflation

Hedge has the following definition*: "A strong (weak) hedge is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio on average."*[12]

When we talk about hedging against inflation, in order to protect our investments, there are two candidates, who can full-fill this position: IIBs[13], also known as TIPs or

[11] MILLAR, R. Peter W.The Relevance and Importance of Gold in World Monetary System.2006, s 2., Available from WWW Gata.org

[12]BAUR Dirk G. and THOMAS K. *Is Gold a Safe Haven?: International Evidence* [online]. September 2009 [cit. 2013-02-05].

[13] Inflation-indexed bonds

precious metals. Gold prove itself as a commodity which hold grounds in the time of uncertainty, can protect against inflation and is superior to IIB[14].

### 3.3.3 Currency Hedge

Gold is work as a good indicator of fluctuating currency. Usually when leading currency like US Dollar is experiencing weakness, the price of gold increases as a result that investors are covering its assets in the safe haven investment, such as gold. According to study which analyzed the relationship between gold and other various currency from 1971 to 2002, it suggested that even though there is a large volatility during this period, gold still provides good protection against currency fluctuations.[15] As a different prove can serve China, which continue to import gold from Hong Kong, 69.7 metric tonnes as a result of hedge against the weak dollar.[16]

### 3.3.4 Tail Risk Management

Tail risk is defined as a form of risk that arises when there is a possibility than an investment will move more than three standard deviations from the mean that is greater than what is shown by a normal distribution.[17] Simply put, tail risk does not happen frequently, but when they emerge they can have a significant impact on the portfolio in unexpected ways. Portfolios which include gold in any form prove to reduce unexpected losses in rare circumstances. According to study by World Gold Council even small investment to gold, from range 2.5% to 9.0 % can have a positive impact on the structure of portfolio.[18]

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[14] "How best to immunize a portfolio against inflation: TIPs or gold?" Interest-Rate Outlook, H.C. Wainwright & Co., Economics Inc. , June 29, 2001

[15] CAPIE, Forrest, Terrence C. MILLS a Geoffrey WOOD. *Gold as a hedge against the dollar* [online]. [cit. 2013-02-05].

[16] Forbes. *China Loading Up On Gold As Hedge Against U.S. Treasuries* [online]. [cit. 2013-02-05]. Available from WWW: http://www.forbes.com/sites/greatspeculations/2012/11/09/china-loading-up-on-gold-as-hedge-against-u-s-treasuries/

[17] Investopedia: Definition of Tail Risk. [online]. [cit. 2013-02-05]. Available from WWW: http://www.investopedia.com/terms/t/tailrisk.asp#axzz2K35OVj5K

[18] Gold: Hedging against tail risk. In: [online]. [cit. 2013-02-05]. Available from WWW: www.spdrgoldshares.com

## 3.4 Instruments

There are many ways how investor can invest in gold. Let's take a look at some popular ways to invest.

### *3.4.1* Physical gold

Bullion coins and bars are well-known and traditional way among all types. There are many standards and countless numbers of styles and weights, but there are several rules, which all physical gold must obey. This part will introduce some of these rules.

**Bullion Coins**

The reason why coins are called "*Bullion"* is to emphasize that they are used mainly for investing. What makes investment gold coin an investment gold coin is according to *Her Majesty's Revenue and Customs (HMRC)* mined after 1800 that[19]

- Purity is not less than 0.900
- Is, or has been, legal tender in its country of origin, and
- Is of a description of coin that is normally sold at a price that does not exceed 180 per cent of the open market value of the gold contained in the coin.

All Bullion Coins have its standard features, which can be categorized as following[20]:

- **Issued at prices that are not fixed but based on the prevailing value of their gold content.**
    - Due to this feature, coins are traded by investors and dealers at prices, which reflect the current value of international gold price.
- **Mass produced in large quantities.**

[19] HM Revenues & Customs: HMRC. CROWN COPYRIGHT. [online]. February 2012. [cit. 2013-01].Available:http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageLibrary_ShowContent&propertyType=document&id=HMCE_CL_000108#P15_1050

[20] Gold Bars Online: Gold Bullion Coins, an International Guide. GRENDON INTERNATIONAL RESEARCH PTY LTD. [online]. 2012. pub. [cit. 2013-01-23]. Available from WWW: http://www.goldbarsworldwide.com/PDF/BI_14_GoldBullionCoins.pdf

    - It ensures that the premiums which they are traded above the value of their solid gold content are relatively stable.
- **Legal tender coins in their country of issues.**
    - This feature provides that all technical specification is related to the value of their solid gold content.
- **Nominal or no face values.**
    - Whether it is issued with or without monetary face value, their market value is related to the value of gold content.

**Gold bars**

Gold bars can be fitted in two categories: **cast** and **minted**. Cast bars are produced directly from gold, which was melted. On the other hand, minted gold is the type of gold which is cut from cast bar that has been rolled to uniform thickness[21]. Gold bars have many sizes and weights, currently there are around 110 accredited bar manufacturers and brands in 27 countries[22]. That counts up to over 400 types of standard gold bars, all of them contains more than 99.5% of pure gold.

### 3.4.2 Exchange Traded Funds

Exchange traded funds are particularly useful and popular way for a small investor to enter commodity market without a large amount of capital. They are intended for an investor to take part in gold bullion market, without the need of handling gold physically. For example when you are buying ETF on gold, you are not buying specifically gold, but assets which are backed with gold.

[21] Gold Bars World Wide: Definition of gold bars. In: [online]. [cit. 2013-02-03]. Available from WWW: http://www.goldbarsworldwide.com/PDF/BI_4_DefinitionsGoldBars.pdf

[22] According to Gold Bars World Wide

### 3.4.3 Derivates

#### Forwards

Forward contracts in gold are just as same as any other type of contract, such as forward interest rates or forward exchange rates. They are a type of agreement to buy or sell gold, at some point in the future based on the price today.[23]

#### Futures

What futures are essentially exchange-traded standardized forward contracts. The futures represent an agreement between two parties to settle the conditions of trade. Futures contracts are standardized agreements, where is an exchange of certain goods (in this case gold) in certain amounts, and a future maturity date[24]. The main factor which determines the number of futures price is the market's perception of what the carrying cost will be at the given time. In futures contract is also interest cost of borrowing gold as well as insurance and storage. Therefore gold futures are usually higher than gold spot price[25].

The place for trade of futures contract is on commodity exchanges. The largest commodity exchange is the New York Mercantile Exchange Comex[26] division, the Chicago Board of Trade and The Tokyo Commodity Exchange.

#### Options

Option represents the right of the owner of the option to buy ("call" option) or sell ("sell" option) a specified amount of asset (gold in this case) at a predetermined price and at a predetermined date.[27] The cost of the option is determined by a number of factors, such

[23] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 717. ISBN 13 978-0-470-11764-4

[24] ŽEHROVÁ, Jana. *Finance*. Vyd. 5. V Praze: Česká zemědělská univerzita, Provozně ekonomická fakulta, 2010, s. 151. ISBN 978-80-213-2124-3.

[25] It is the current delivery price of a commodity traded in the spot market.

[26] Recently rebranded CME Globex, after a merger between Chicago Mercantile Exchange and NYMEX

[27] ŽEHROVÁ, Jana. *Finance*. Vyd. 5. In Prague: Česká zemědělská univerzita, Provozně ekonomická fakulta, 2010, s. 153. ISBN 978-80-213-2124-3.

as the current spot price of gold, interest rates, anticipated or implied volatility, time to expire and immensely important factor, the strike price.

**Call option** – it is the right (not an obligation) of the owner to buy underlying stock
**Sell option** – gives the owner the right to sell the underlying stock or security.
**Strike price** – it is defined as the price at which the holder of an option can buy or sell the underlying security when the option is exercised. The strike price is also known as the exercise price.

### Warrants

Gold warrants have similar features as options. The investor buys a warrant ant that gives him right to buy gold on a specific date and specific price. The difference between options and warrants is that warrants can be issued only by investment banks or companies, which have the permission. In 1980's gold warrants were often used as a financing tool for mining projects.[28]

### Mining Stocks and Funds

There are many possible ways how to invest or buy mining stocks including mutual funds, open-ended funds and unit trusts. These are traded in all around the world and for the most part, they are regulated financial products. More than 300 gold mining companies are currently listed and can be traded on many US stock exchanges. The stock price of mining companies stocks differs from trading physical gold. There not only geographical factors, such as reserves of unmined gold below but also it is needed to take in consideration the quality of management which can have a substantial impact on the value of stock[29].

[28] FABOZZI, Frank J., FÜSS Roland and KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 713. ISBN 13 978-0-470-11764-4

[29] ROGERS, Jim. *Hot commodities: how anyone can invest profitably in the world's best market*. Paperback ed. New York: Random House Trade Paperbacks, 2007. ISBN 978-081-2973-716.

**Gold Certificates**

When United States of America was in a middle of Civil War, gold certificates were used as a sort of gold standard. Basically, gold certificates were bank notes, which could be exchanged directly to an exact amount of gold[30]. In 1933 however, the U.S. Department of Treasury stopped issuing certificates and they are no longer in circulation. That made them exceptionally valuable among collectables.

Currently gold certificates are common in Switzerland and Germany. They are issued by investment banks. The reason why investors invest in gold certificates is because they do not have to deal with physical storage, security or insurance. On the other hand, you cannot be sure whether the physical gold actually exists, since it is not directly exchangeable to physical gold.

## 3.5 Gold market

Gold like any other investment is traded around the world in many markets. The most influential market for physical gold is currently London with its Over-The-Counter London Bullion Market. There are also many other places where gold is traded such as New York (COMEX), Hong Kong, Zurich, Dubai etc. In this chapter it will be explain how the most respected market, which is controlled by London Bullion Market Association, works. For now, let's take a look at the gold price development.

### 3.5.1 Gold price development

The development of the price of gold is showed in Figure 1. It shows that the price of gold was in the beginning remarkably stable and the stability sustained nearly for hundred years. The price of gold was fixed at 20.65 USD/oz. In 1934 the price of gold was set to 35 USD/oz due to Gold Reserve Act of January 1934. Every American citizen was banned from owning any physical gold and must return it to the state. The price 35 USD/oz was direct part of the Bretton-Woods system, which is mentioned in Chapter 2.1. It made USD exchangeable directly to gold only for foreign central banks; American citizen could not own physical gold and had to return it to the state. In 1954 when London Bullion Mar-

[30] MALONEY, Michael. *Guide to investing in gold and silver: everything you need to know to profit from precious metals now*. New York: Business Plus, c2008, p. cm. ISBN 04-465-1099-8.

ket was reopened after World War II the price of gold was floating around 34.85 USD and 35.17 USD. Foreign central banks, under the Bretton-Woods, were able to go directly to the Federal Reserve in New York and convert their gold in USD and vice versa for a fixed price 35 USD. So, when the price of gold in London well down to 34.79 USD, foreign central banks bought gold in London for a lower price, ship it to New York and sell it there for the fixed price of 35 USD. When the price of gold in London went up i.e. 35.18 USD it was logical to buy gold from US Treasury for fixed price and sell it in London for a higher price.[31] In the following period the pressure grew stronger in the direction of the market price of gold. Gold pool was officially canceled in 1968. On 15th August 1971 ended availability to exchange gold to USD, which had an effect on increasing volatility of gold.[32]

**Figure 1 Price development 1974 – 2013**


*Source: goldprice.org*

[31] *The Economist: Through The Roof*. London: Economist Newspaper Ltd., 1960, n. 197, p. 85. ISSN 0013-0613.

[32] ROGERS, Jim. *Hot commodities: how anyone can invest profitably in the world's best market*. Paperback ed. New York: Random House Trade Paperbacks, 2007. ISBN 978-081-2973-716.

**Events in 1980's**

The 1970 and 1980 was famous for steep increase in price of gold. Also many milestones were met. On 31st June 1978 the price of gold hit 200 USD/oz. The beginning of 1980 was the time, when gold hit 500 USD/oz. In January that year world experienced a dramatic increase in price, when the price stopped at 850 USD/oz on 21st January 1980. Then the price suffer dramatic decline and with the same speed and fashion dropped down. Although it seems like similar development, which is seen in the current market, the reasons are different.

The factors that were affecting the price of gold in this era had little to do with typical economic movements. It was driven with fear and speculation and those factor combined pushed the price of gold up so fast and also are the reason for steep fall. For illustrating how high price of gold was in 1980, below is calculated real price of gold in 2011 USD.

The formula for counting real price is:

$$Real\ price = \frac{CPi_{current\ year}}{CPi_{base\ year}} \times Nominal\ price\ of\ gold$$

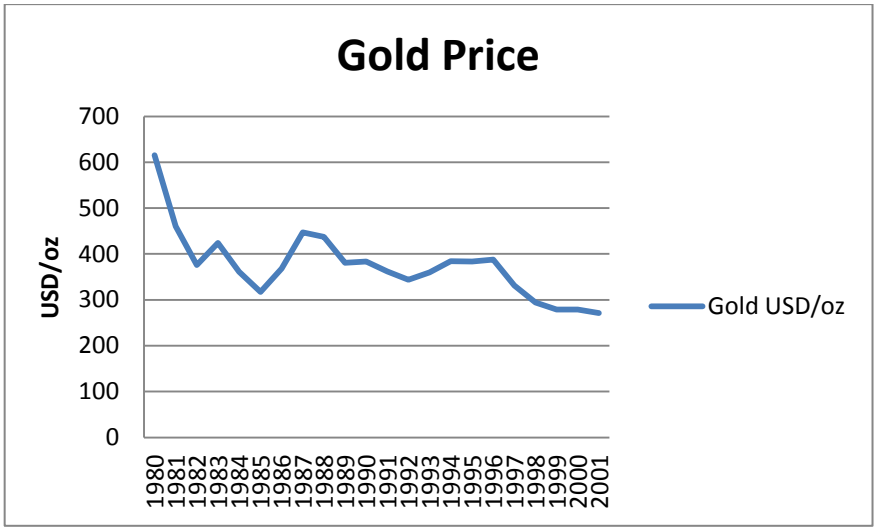
CPI stands for Consumer Price Index and it is cost of a bundle of goods and services by a normal consumer compared to bundle of goods and services in the base period.

If the numbers are add to the formula the result is **2367.6 USD/oz**. Therefore the real price of gold in 1980 in today dollars is the highest price recorded, if calculated in 2012 USD. Why the price jumped so highly in 1980? What was the reason? The reason for such an enormous jump in few days was due to strong oil prices, high inflation, Soviet intervention in Afghanistan and also the impact of Iranian revolution. *As a safe haven in times of panic and strife, gold simply reflected that fear. Notice how quickly the buying panic subsided and in fact turned into a* ***selling*** *panic after the emotion had been digested and rationality returned.*[33]

[33] *Bull Not Bull. [online]. [cit. 2013-02-21]. Available from WWW : http://www.bullnotbull.com/archive/gold1980.html*

**Bear Market 1980 – 2001**

**Figure 2 Bear Market 1980 - 2001**




*Source: own graph, data collected from nma.org*

After the bull market in 1970, which is explained mostly by the end of the gold standard, beginning of gold trade and numerous war conflicts, the role of gold entirely changed and entered a bear market and stayed there for over 20 years. It was caused by numerous factors. One of them is economic stagflation in the 1970s and inflation under control. In 1990s president of USA Bill Clinton applied a new long economic recovery, which was called New Economy. It was essentially transition from heavy industry and manufacture to technology oriented technology.[34]

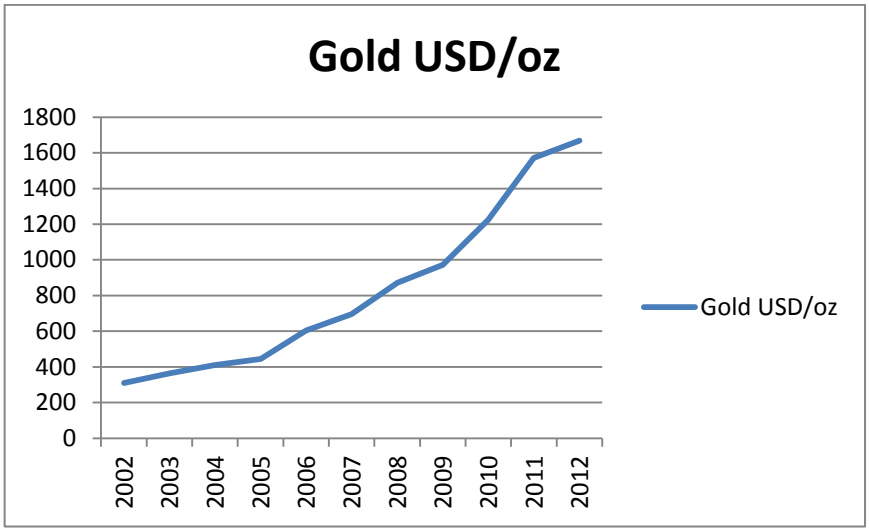
**Bull Market 2001 – now**

The recent bull market, which began in May 2001, has begun with price from 255 USD/oz to nearly 1900 USD/oz in 2011. This bull market is driven by global trade imbalances, which led to devaluations in every currency. That was the reason for low interest rates all over the world which led to enormous asset price inflation. The inflation began in stock markets, and then it turned in property and probably even corporate earnings. Debt levels rose strongly, as a direct result of escalating asset prices. The outcome was the de-

[34] GILLEN, Rory. *Gillen Markets: The Gold Bull Market - Shortened Edition*. [online]. [cit. 2013-02-28]. Available from WWW: http://www.gillenmarkets.com/featured_articles/the-gold-bull-market-shortened-edition.cfm

stabilization of the global financial market and complete collapse in property and financial markets. The answer for that came in the form of injecting significant liquidity into the system. When the liquidity is not withdrawn at a certain point of time, it will result in too much many in the circulation chasing few assets which is a gate for high inflation. If you read my thesis you will probably heard similar scenarios in the past. Gold, as usual, provides the ultimate hedge against these situations. Even though all bull markets in the past century have different reasons and causes, it is clear that there is a common theme to it. Substantional increase in the supply of money in circulation is uneven with the equal increase in the number of goods and services traded.[35]

**Figure 3 Bull Market 2002 - now**




*Source: own graph, data collected from nma.org*

### 3.5.2 COMEX

*"The world's largest physical commodity futures exchange. Trading is conducted through two divisions: the NYMEX Division, which is home to the energy, platinum and palladium markets, and the COMEX Division, where metals like gold, silver and copper and the FTSE 100 index options are traded. The NYMEX uses an outcry trading system during the day and an electronic trading system after hours.*

[35] GILLEN, Rory. *Gillen Markets: The Gold Bull Market - Shortened Edition*. [online]. [cit. 2013-02-28]. Available from WWW: http://www.gillenmarkets.com/featured_articles/the-gold-bull-market-shortened-edition.cfm

*In 1872, a group of dairy merchants founded "The Butter and Cheese Exchange of New York", and in 1994, the NYMEX merged with the COMEX (commodity exchange). Futures and options on energy and precious metals have become great tools when companies try to manage risk by hedging their positions. The ease with which these instruments are traded is vital to hedging activities and gauging future prices, making the NYMEX a vital part of trading and hedging worlds."*[36]

### 3.5.3 London Bullion Market

London Bullion Market is one of the largest market for physical gold and silver. The participants of the markets are usually central and private banks, gold producers, refineries and others. The minimum amount of traded gold is generally 1,000 ounces of gold and for silver it is 50,000 ounces of silver. Members of the London bullion market usually trade between each other on the principal-to-principal basis, therefore every risk is between two counterparts to a transaction[37].

#### Loco London

Loco London is one of the most prominent aspects of gold trading in London Bullion Market. It represents the basis of international trade of gold and also silver. It is a contract which can be made anywhere in the world, but the settlement is made in the London under London rules.

### 3.5.4 Gold Fixing

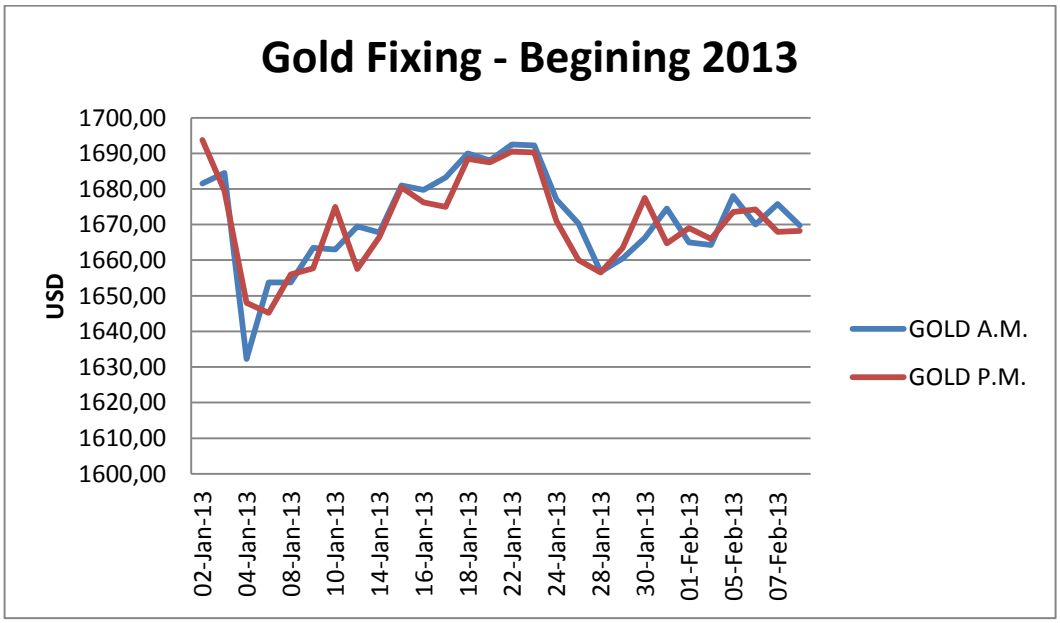
The London Gold Fixing involves five leading banks, which establishes a transaction price for a large pool of purchase and sale orders. All banks are part of London Gold Market Fixing Ltd. Currently it is Scotia-Mocatta, Barclays Capital, Deutsche Bank, HSBS and Société Générale. That happens twice a day. The Morning Fix at 10:30 a.m. and the

[36] *Investopedia: New York Mercantile Exchange - NYMEX*. [online]. [cit. 2013-03-10]. Available from WWW: http://www.investopedia.com/terms/n/nymex.asp#axzz2N9Vjeg7N

[37] *The London Bullion Market Association: LBMA* [online]. [cit. 2013-02-05]. Available from WWW: www.lbma.org.uk

Afternoon Fix at 3:00 p.m.[38] Basically what Gold Fix do, is that it sets the price at when the gross amount of demand met the gross amount of sell orders, among all participating banks. The person which is Gold Fix Chairman sets the price, which is usually close to spot market gold price. The fixing process has started. Next the participant banks will aggregates all orders they received, both from sellers and buyers and present the quantity of gold they are willing to buy or sell for the given price. The fixing price is increased or decreased, until there is a balance between demand and supply and the equilibrium price is set and for that price all transactions are made with 20 cents for ounce spread.[39]

**Figure 4 Gold Fixing - Begining 2013**




*Source: http://www.lbma.org.uk/stats/goldfixg*

According to Martyn Whitehead, who is director of commodities at Barclays Capital and vice-chairman of LBMA "Normally it's a 10 or 15-minute process, but it can take up to half an hour.

[38] *Bullion Vault: Gold Fix* [online]. 2013 [cit. 2013-02-09]. Available from WWW: http://www.bullionvault.com/guide/gold/Gold-fix

[39] GRABBE, J. Orlin. *The Gold Market* [online]. 2000. [cit. 2010-02-20]. Available from WWW: http://orlingrabbe.com/gold_index.htm.

# 4 ANALYSIS

## 4.1 Supply and demand of gold

To understand the role of gold in the market, world economy and role as an investment asset, it is necessary to understand the dynamics and forces which move supply and demand.

### 4.1.1 Gold Supply

Gold supply comes from different sources: above-ground gold (Figure 7), which is gold already in circulation, newly mined gold and recycled gold. Let's now take a look how supply of gold evolved in the past. It can be stated that demand of gold is always balancing between East and West, dominated by US, Europe, China and India, supply side has experienced much wider dispersion across the World.

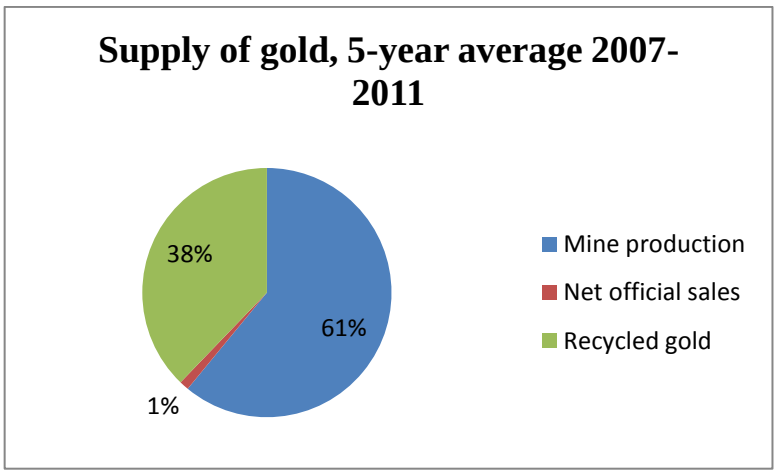
In the world was mined approximately 200 thousand tonnes of gold, in last 50 years was mining production increased. Unlike other raw materials 90% of gold is still in circulation[40]. In 2011 total demand and supply is remarkably similar although demand is usually a bit higher. Central bank gold sales and gold recycling are helping to make up this supply deficit.

Mine production historically consisted around 60-70% of total gold supply, with recycling (not measured in 1970's), net central bank sales, net producer hedging and disinvestment making the rest of the percentage.[41] One of the most obvious differences between the current market and past market is geographical concentration of mine production). Gold from South Africa dominated in first decades was staggering.

[40] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 713. ISBN 13 978-0-470-11764-4

[41] Liquidity in the global gold market.*: World Gold Council* [online]. 2012. vyd. London [cit. 2013-02-03].

**Figure 5 Distribution of gold demand by category**




*Source: Thomas Reuters GFMS, WGC*

In 1970, South Africa produced 79% of total mined gold[42]. Today not more than 14% of global gold is produced by one country. As in 2010, China was considered as the largest single country with a production of 13%, followed by Australia (10%), United States (9%), Russia (8%), and South Africa (8%).

In terms of supply, in 2011, gold consisted of 61.4% mine gold, 1.7% of official sales and 37% of recycled gold[43]. Unlike oil or copper commodity, even though that a majority of supply comes from mine sector, the price of gold is not exactly sensitive in changes the level of mined production. It is simply because the other two sources, official sales and recycled gold stand for the "actual" supply of gold.

**Mine production**

(2,377 tonnes average 2007-2011) – Mining gold is allowed on every continent except Antarctica. The global production level is relatively stable. If we take gold which was mined on average in 5 years, the production level is around 2,600 tonnes of gold. This number is around 2% of gold in circulation. The long-term stability of production is mainly

[42] The Evolving Structure of Gold Demand and Supply. In: *World Gold Council: WGC, GFMS* [online]. [cit. 2013-01-30] Available from WWW: http://www.gold.org

[43] WORLD GOLD COUCIL. *Gold in the official sector* [online]. London: Public Policy Centre of the World Gold Council, 1997- [cit. 2013-01-31]. Available from WWW: http://www.gold.org/media/press_releases/archive/2011/05/updated_official_sector_reserve_statistics/

because that new developing mines are to replace the old one, not to increase global production.

**Recycled gold**

(1 499 tonnes average 2007-2011) –The recycled gold is readily available supply, which helps to take care of increasing demand and therefore keeping the gold price stable.

**Central Banks**

Theoretically, all the gold hold by central banks and privately owned gold can be supplied to the market. Central banks and supranational organizations, such as International Money Funds, play a major role in the gold market, since they own about one-fifth of all gold as reserve assets[44]. The key role, which central banks and supranational organizations play on the market is, that they affect the gold price, because of lending, swaps and other derivative activities[45]. Governments hold on average around 15% of gold as official reserve assets, although this number varies from country-to-country. Advanced economical countries, mainly in Western Europe and North America, hold up to 40% of their external reserves in gold, mostly because of history of the gold standard. Developing countries on the other hand have no such legacy; they own around 5% of total external reserves in gold[46].

There has been significant shifting in this sector in recent years. Since 1989 the official sector was considered as stable net seller, in recent years however, there was an incredible shift towards gold and central banks seems to change their minds in terms of selling their gold reserves. For approximately last two decades official sector was a net seller of a significant amount of gold to the private sector markets. In 1999, all selling from

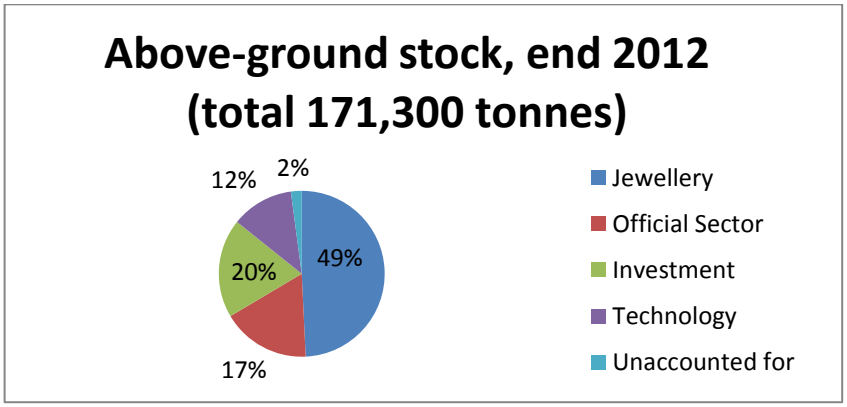
[44] WORLD GOLD COUNCIL. *World Official Gold Holdings: International Financial Statistics*. January 2013.

[45] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 715. ISBN 13 978-0-470-11764-4

[46] Germany owns around 3,500 tonnes of gold. Czech Republic around 13 tonnes

central banks was regulated by Central Bank Gold Agreements (Figure Appendices 1) That period came to end in 2009 when there was the first year of net buying in last 21 years[47].

**Figure 6 Above-ground stock, end 2012**




*Source: GFMS, World Gold Council*

The result of such enormous shift towards retrieving gold to the official sector, central banks transform from fundamental of supply to the largest net buyers in 2010, when they purchased a total of 77 tonnes and 2011 with 440 tonnes of gold. This trend continued in 2012 and it is highly unlikely, that official sector will change back to supplier, knowing the importance of gold as a tool to keep stability and confidence. Also there are available data of world gold reserves by country in appendices.

### 4.1.2 Gold demand

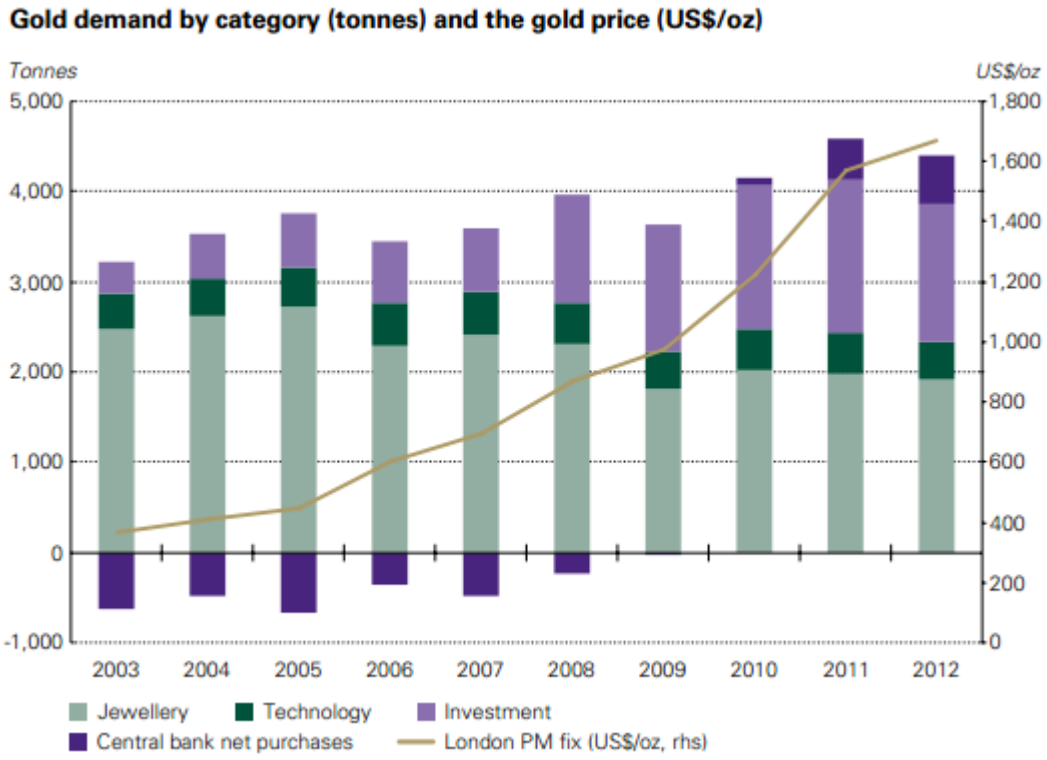
As it was with supply, even demand experienced a radical shift across the continents. In 1970 Europe and North America held around 47% of global market, which later grew in 1980 to 68%. Then the demand for gold changed places. After 1980 the portion of total demand shifted from Europe and North America, which dropped to 38% in 1990, 28% in 2000 and as low as 27% in 2010. This kind of dropped were because of emerging demand from the other side of world; Indian Sub Continent and East China, which thanks to the fast-growing economy rose demand for gold from 35% in 1970 all the way to 58%

[47] WORLD GOLD COUCIL. *Gold in the official sector* [online]. London: Public Policy Centre of the World Gold Council, 1997- [cit. 2013-01-31].

by 2010[48]. In 2011 gold hit  all time high in price. The current and historical data of gold demand from 2003 – 2012 are available in appendices (Table Appendices 2)

In 2012 demand totaled 4,405.5 tonnes, which is down by 4% from 2011. It is because of increase of demand from institutional investors and central banks only partly offset a year-on-year decline in consumer demand. Major player in those years were China's devotion to the gold, fast growing India and central bank purchases, reaching a 48-year high.

**Figure 7 Distribution of gold demand by category**




*Source: Gold Demand Trends Full Year 2012, World Gold Council*

In demand, there are several main categories: jewellery being the largest one, investment and industry. The distribution across the categories shows, that investment takes

[48] The Evolving Structure of Gold Demand and Supply. In: *World Gold Council: WGC, GFMS* [online]. [cit. 2013-02-01].

up a large part of total demand in 2010, with 38% of total demand (Figure 7). Although the numbers in 1980 look similar, the reason and geographical dispersion is quite different.[49]

**Jewellery demand**

Jewellery was always vital part of world demand of gold. Looking in recent history, jewellery experienced significant global shift from East to West and currently India and China are key players in global jewellery market. Crucial factor in jewellery market is seasonal nature. Fourth-quarter of year is when lot of end-year celebrations are, such as Christmas and currently appealing for jewellery market Hindu festival of Diwali, where jewellery gifts are common. The beginning of year is second strongest because of Chinese New Year, Indian wedding season and also Valentine's Day. Another extremely significant factor and particularly current in last year's is large economic development in China and India, which drives the demand for jewellery up. For example India, the middle class grew to 200 million people in recent years. This kind of economic prosperity allow people with high disposable income to buy more gold jewellery and this factor is contributing not only the seasonal change, but also increase the demand for gold[50].

**Technology Demand**

Gold is well-established as an important material in the world of electronics, with total demand up to 300 tonnes in this sector[51]. Industrial and medical uses represent about 12% of global demand, expecting to hit around 450 tonnes in 2012. The reason why gold is used in this sector is because of its unique characteristics such as conductivity, corrosion resistance, malleability and many more. Other sectors are automotive, medical, electronics, space and engineering. Currently gold seems to be an ideal candidate in the world of nano-technology.

[49] More in chapter Important milestones in gold price development in modern history

[50] FABOZZI, Frank J., Roland FÜSS a KAISER. *The Handbook of Commodity Investing*. New Jersey: John Wiley & Sons., 2008, s. 716. ISBN 13 978-0-470-11764-4

[51]Gold for good: Gold and nanotechnology in the age of innovation. In: World Gold Council: WGC [online]. [cit. 2013-02-04].

**Central Banks Demand**

The demand for gold from the official sector is currently the highest since 1964. Although the list of countries, which actively expand their official gold holdings is focused mainly on developed markets, in 2012 new players entered the game of official gold holdings such as Brazil and Paraguay, both making significant purchases in 2102. Official holdings for each country are available in appendices (

**Investment Demand**

Demand for investing gold experienced same shift from East to West. On the other hand we can see the return of investing power back in Europe after 2008[52], as a result of hedging against weak economy and trouble with Euro-Zone. Since gold itself prove to be a safe investment, not only for its ability to preserve wealth, but for its diversification properties. Demand for investment gold is steadily increasing.

## 4.2 Technical Analysis

Technical analysis is a crucial part of this bachelor thesis. It can be defined as *"a method of evaluating securities by analyzing statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity."*[53]

Technical analysis can be applied in a variety of things, but the core of a technical analysis stand in understanding the supply and demand by studying the market itself and to understand the forces behind it. There are over 250 tools which can be applied. This thesis is focusing on selected tools -> Simple Moving Average, Exponential Moving Average, Moving Average Converge-Diverge, Bollinger Bands, Relative Strength Index and Stochastic. Each part of analysis have its own chapter in order to make things more well-

[52] The Evolving Structure of Gold Demand and Supply. In: *World Gold Council: WGC, GFMS* [online]. [cit. 2013-03-01].

[53] ELDER, Alexander. Trading for a living. New York : John Wiley & Sons Ltd, 1993. 194 pages. ISBN 0-471-59225-0.

aranged. The whole Technical Analysis computations are made in Advinion Professional Chart™ which was available on investing.com

### 4.2.1 Simple Moving Average (SMA)

**Definition**

Moving averages are one of the oldest and most traditional technical analysis tools. Moving Average is described as the average price of security in a specific period of time. A Simple Moving Average can be expressed as a following:

$$SMA = \frac{\sum_{i}^{n} closing\ price}{n}$$

$n$ = number of time periods in the moving averages.

It biggest use is in observing changes in price. Investors buy a security when the price goes above the SMA and sells when the price goes below SMA. This technological analysis helps to get investor on the right side of a market, on the other hand, every buy and sell using this strategy is delayed. When the trend does not last for a significant period of time, you're risking losing your money. Application on price of gold USD/oz

**Figure 8 Sample Moving Average 8/2012 - 2/2013, n =10, daily**


*Source: graph made in Advinion Professional Chart, available on Investing.com*

For this calculation was used 10 daily moving average, as it prove itself as a reliable and consistently profitable. As it is seen on Figure 8 the prices of gold were moving above the moving average and then down. The red lines are showing when the prices were above the moving average. The blue lines are showing when the prices were below the moving average. We can see a pattern here. Up until March 2013 the prices were steadily increasing, then there was a drop. This case repeated again in a short period in November 2012 then the prices fell again. Last increase in price of gold was in the beginning of 2013, but the prices did not hold up for long. Each time, when the price increases the slope was getting weaker and weaker.

## Double crossover method

**Figure 9 Double crossover method**


*Source: graph made in Advinion Professional Chart, available on Investing.com*

There are many popular and often used combinations. In this case, we are using the classical 10-50 day averages.[54]

In this case buy signal is created when the shorter average crosses above the long term. That did not happen terribly often. As we can see on Figure 9, the 10 day average gives earlier signals, on the other hand the long-term average is more reliable. The strong buy signal was up until late October, where the short-term crossed the long term bellow.

[54] MURPHY, John J a John J MURPHY. *Technical analysis of the financial markets: a comprehensive guide to trading methods and applications*. New York: New York Institute of Finance, c1999, xxxi, 542 p. ISBN 07-352-0066-1.

**Conclusion**

Using both SMA and SMA with double crossover method, with the current state of the market it is suggested to **SELL** gold when it is measured daily.

### 4.2.2 Exponential moving average (EMA)

**Definition**

EMA also known as exponentially weighted, is calculated by applying a percentage of the current price to the most recent moving average value.[55] EMA focuses more on recent prices as it puts more weight on them. Exponential moving average is also more sensitive than Simple moving average. It can be expressed both in percentage and time periods. Since the time period was used in SMA, author decided to use time periods.

$$Today's\ close \times \%\ +\ (Yesterday's\ moving\ average\ \times \%)$$

For converting exponential percentage to time periods, following formula is used:

$$Time\ periods = \frac{2}{\%} - 1$$

For example, when you want to calculate 10% EMA for gold it is 19 days.

**Application on price of gold USD/oz**

It is clearly shown that EMA is more sensitive to change than SMA as EMA reacts more and faster on spikes. This is particularly attractive and the combination of both moving averages; the exponential and simple showed that there is a slight difference. It can be observed that using both moving averages helps to evaluate the current state and also give more information how to react to recent development. In this case however, both moving averages showed the same result, the price of gold futures is bellow both of them, which is a direct signal to sell. It is highly unlikely that the price of gold will jump over the moving averages in next weeks.

[55] ACHELIS, Steven B. Thomson Reuters Metastock: Technical Analysis from A to Z. [online]. [cit. 2013-02-15]. Available from WWW: http://www.metastock.com/Customer/Resources/TAAZ/?c=3&p=74

**Figure 10 EMA, SMA 8/2012 -2/2013 daily n=40**


*Source: graph made in Advinion Professional Chart, available on Investing.com*

**Conclusion**

EMA as well as SMA show that the prices are below moving average with suggest **SELL.**

### 4.2.3 Moving average convergence/divergence (MACD)

**Definition**

MACD is an oscillator technique that uses 2 EMA. This technique was developed by Gerald Appel. In Figure, the MACD line is the difference between the two exponentially smoothed moving average of closing prices. Even though in the graph there are two lines, for calculation are used three lines. Traditionally, it is the last 12 and 26 days or weeks and 9 periods exponentially smoothed average of the MACD line.

Buy and sell signals are present when the two lines cross. Buy signal appears when the MACD line crosses above the slower signal line is a buy signal. Sell signal appears when the MACD crosses bellow slower signal line.

However MACD values also fluctuate above and below the signal line. It indicates whether gold or any other commodity or stock is overbought or oversold. When the MACD line is high above the zero line, it indicates that the commodity is overbought. If the MACD line is far below the zero line, the security is oversold.

Histogram is another useful feature used in Moving average convergence/divergence. The histogram plot warns in advance when the current trend is losing momentum.[56]

**Data application on gold USD/oz**

The MACD can be perfectly used in measuring development and finding patterns in gold. As it is showed in Figure, gold was very volatile in the measuring period and if an investor only analyze the price development in the price line, he/she will overlook a significant warning that gold is overbought.

[56] MURPHY, John J a John J MURPHY. *Technical analysis of the financial markets: a comprehensive guide to trading methods and applications*. New York: New York Institute of Finance, c1999, xxxi, 542 p. ISBN 07-352-0066-1

**Figure 11 MACD 8/2012 - 2/2013 daily**


*Source: graph made in Advinion Professional Chart, available on Investing.com*

The blue dots showed input when the MACD line crosses above the signal line and that was a sign to buy gold. Between August 2012 and February 2013 there were 3 buy periods: during August, in the middle of November and in beginning in January 2013. Note that in histogram the line is approaching to zero line a prematurely gave as a warning that the trend is ending.

The red dots showed input when the MACD line crosses below the signal line, which gave us a sign to sell gold. That happened three times during given period. On the graph is clear that the gold was severely overbought and even though the price line continues to rise in the middle of September, the MACD line and histogram showed that the trend is approaching to its end.

**Conclusion**

The MACD line is a powerful tool to analyze gold price development; it showed many signs that could not be seen in the price line. However it is hard to tell future development as the price are not overbought or oversold and fluctuating around zero line. When we measure the data in daily time span the value -7.46 suggest selling**.**

### 4.2.4 Bollinger Bands

**Definition**

Bollinger bands are bands drawn in and around the price structure on a chart. The purposes of bands are to define relative definition of high and low; prices near the upper band are high, prices near the lower band are low. The base is, as usual, a moving average. The average is known as the middle band and its default length is 20 periods, and in this bachelor thesis is used default length. The width of the bands is determined with a standard deviation. The upper and lower bands are drawn at default distance of two standard deviations from the average.[57]

**Data application on gold USD/oz**

Let's now apply Bollinger Bands on price development of gold. Notice that in this case it is used very short-term time range, as it clearly showed indicators which can be crucial for people who are trading with gold.

[57] BOLLINGER, John. *Bollinger on Bollinger bands*. New York: McGraw-Hill, c2002, xxiv, 227 p. ISBN 00-713-7368-3.

**Figure 12 Bollinger Bands 8/2012 – 2/2013**


*Source: graph made in Advinion Professional Chart, available on Investing.com*

There are quite a few patterns, some of them very recent. Notice the blue lines which are showing *W* pattern. It showed us that the new low is on the right side, we see a lower low and it can be characterized as a fear and discomfort in the gold market. The reason for using short term time span for this analysis is to show that the when the market closed in 15th February 2013 the price of gold hit 1600 USD/oz for the first time since August and it is sing for recovering US economy optimism.[58] But the Bollinger Bands suggesting that the prices in the short-term will jump up again as it did in November-December 2012.

[58] DEBARATI, Roy. Bloomberg. [online]. February 2013 [cit. 2013-02-17]. Available from WWW: http://www.bloomberg.com/news/2013-02-15/gold-set-for-weekly-drop-as-equities-rally-soros-cuts-holdings.html

**Conclusion**

According Bollinger Bands it is suggested to buy gold in short-term since the market closed at remarkably low price and the W pattern suggest that the price will grow.

### 4.2.5 Relative Strength Index (RSi)

**Definition**

Relative Strength Index was created by J. Welles Wilder and was presented in 1978 book New Concepts in Technical Trading Systems. RSI measures momentum by comparing the extent of the stock's recent gains and losses by transforming this info into a number between 0-100.

$$RSI = 100 - \frac{100}{1 + RS}$$

$$RS = \frac{Average\ of\ x\ days'\ up\ closes}{Average\ of\ x\ days' down\ closes}$$

Usually 14 day/week span is used. RSI measures momentum by comparing the recent gain and losses of security by transforming it into numbers between 0-100. Movements above 70 is considered overbought, oversold condition appear when RSI line fell below 30.

Relative strength index can be used for signals when the trend will shift. When the price of security is below 30, investors wait until the security crosses the 30 and goes up, that usually signals that the trend is shifting upwards. Also when the security is above 70 and drop below the line, it is often considered as a sell signal.[59]

[59] MURPHY, John J a John J MURPHY. *Technical analysis of the financial markets: a comprehensive guide to trading methods and applications*. New York: New York Institute of Finance, c1999, xxxi, 542 p. ISBN 07-352-0066-1

## Data application on gold USD/oz

**Figure 13 Rsi(14) with MA(200) Daily**


*Source: made in Advinion Professional Chart, available on Investing.com*

As we can see on Figure 13 gold market was severely *overbought* in September and October 2012 as the price of gold was over 70. In the end of 2012 the price appeared under the 30 line for a short period of time which suggested that gold was oversold. Currently the price of gold is moving under 30 which signal that gold is currently oversold.

## Conclusion

RSI = 25.56 which suggests that the price of gold is currently oversold, but it did not show the sign of changing trend as the price entered below 30 line very recently. With the information we have it is suggested to **SELL**, but it suggested to hold and wait if the price of gold will stay below the 30 line. On the other hand the price of gold is oversold which can indicate that the trend can change.

### 4.2.6 Stochastic

**Definition**

The Stochastic oscillator was popularized by George Lane (president of Investment Educators Inc., Watseka, IL). This technique is based on observation that as price increase, closing prices tend to be closer to the upper end of the price range. In downtrends, the closing price tends to be near the lower end of the range. Two lines are used in Full Stochastic:

- Full %K = Fast %K smoothed with X-period SMA
- Full %D = X-period SMA of Full %K

These lines oscillate between 0 and 100. The K line is a faster line, while the D is slower. When the price of the security is above 80, the security is considered overbought. When the security is below 20, the security is considered oversold.

Usually Stochastic is used in combination with RSi. Relative Strength index is less volatile than Stochastic. The best signal occurs when both RSi and Stochastic are both in overbought or oversold territory.[60] There is a reason why RSi and Stochastic works together as it shows essentially the same thing, only with a different approach. Investor can use one of these techniques and use the second one as a support to the first one. Author believes that this approach works much better as it is more informative but on the other hand it can look confusing to a beginner. That is why this thesis showed these two methods separately, but uses the same coloring to underline the similarity. As it is showed in Figure 17 the

[60] MURPHY, John J a John J MURPHY. *Technical analysis of the financial markets: a comprehensive guide to trading methods and applications*. New York: New York Institute of Finance, c1999, xxxi, 542 p. ISBN 07-352-0066-1

## Data application on gold USD/oz

**Figure 14 Stochastic (20,5,5) daily 8/2012 - 2/2012**


*Source: made in Advinion Professional Chart, available on Investing.com*

In the Figure 14 the price of gold was in overbought territory for a long period up until October 2012. In last six months the price of gold was considered overbought three times, in the beginning of October, in late November and in the end of January 2013. Oversold territory was visited twice, in late December and now.

## Conclusion

The Stochastic method it seems to confirm what RSi told us, that the price of gold is currently oversold. It can go both ways and it create two groups of investors. First group are investors who think that gold will lose its value and focus or different securities. Second group of investors believe that the price of gold will rise again as they believe in technical analysis and see the patterns.

**Table 1 Simple Averages, Daily 20th February 2013**

| Period | SMA | EMA | Status |
|---|---|---|---|
| MA10 | 1627.07 | 1621.75 | Sell |
| MA20 | 1646.15 | 1639.17 | Sell |
| MA50 | 1660.88 | 1660.83 | Sell |

*Source: own graph*

**Table 2 Technical Analysis Results, Daily 20th February 2013**

| Technical tools | Value | Status |
|---|---|---|
| Bollinger Bands | BBLower 1591.05 | Oversold |
| MACD | -12.060 | Sell |
| RSI | 20.429 | Oversold |
| Stochastic | 11.92 | Oversold |

*Source: Own Graph*

## 4.3 Correlation

In this chapter of this bachelor thesis it will be analyzed the relationship between various variables, which are affecting the price of gold. Basically, what author is looking for is a *correlation coefficient* $r_{2.}$ That will show how strong relationship between the variables is.

This chapter has three parts, each one with one analysis. Author wanted to determine the correlation between the price of gold and various variables. The variables are EUR/USD and EUR/CHF. Even though gold is known for weak correlation with other commodities, one stands out. Last part of this chapter is dedicated to the relationship between price of gold and price of oil. The purpose of this analysis is to find out, what factors affect the price of gold and how much the price will change when the variables change. For this purpose author will use Microsoft Excel 2007, as it proves to be a useful tool to analyze relationships between variables. All gold price collected data were collected from statistics database at London Bullion Market Association and currency exchange values were collected from the database at Investing.com. Data used for this analysis are collected in the appendix section of the thesis.

### 4.3.1 Gold vs. Oil

In this part we will try to find a relationship between the price of gold and the price of oil. Using Excel, we will find to what degree is gold affected by oil. It was measured the prices for last 42 years, e.g. 1970-2012. This will help us to understand the moving forces behind gold. The result is that the coefficient of correlation of **0.90**, which means, that price levels of gold and price levels of oil are strongly correlated.

### 4.3.2 Gold vs. EUR/USD

Let's now focus on the relationship between gold and EUR/USD. The data were collected from 2nd January 2013 – 28 February 2013 daily, whether the current downfall of the price of gold has any relationship with EUR/USD exchange rate.

Coefficient of correlation of **0.38** is a weak correlation. It suggests that there is no significant relationship between the price of gold and USD/EUR exchange rate on a daily basis.

### 4.3.3 Gold vs. EUR/USD

Let's now analyze the relationship between price of gold and EUR/CHF. We use Swiss franc as a strong currency in very economically stable country the Switzerland. It is interesting because Swiss franc is also considered as a safe haven. The data again were collected from 2nd January 2013 to 28th February 2013. The Excel gave us answer that the correlation coefficient is **0.24**, which means that price levels of gold and EUR/CHF exchange rate have no significant relationship.

# 5 RESULTS AND DISCUSSION

## 5.1 Fundamental Analysis Summary

This part analyzed supply and demand for gold. It was determined what the key market on the demand side is and what are the major supplies. The whole market for gold currently stands on a strong economy such as China and India. Current situation is very different from the past. Official holdings changed the role from supplier to buyer, knowing the importance of holding gold. Author expects that in future years official sector will continue in this trend. Next thing is the question of achievable sustainability of China and India as the key players that support demand the most. If they can control their development and keep it as it is, gold will benefit from it.

## 5.2 Technical Analysis Summary

The technical analysis suggested that during the writing of bachelor thesis the price of gold in USD/oz is steadily decreasing, therefore the gold status is currently SELL when measuring with SMA, EMA and MACD. There can be numerous reasons why is the price of gold declining. One of them is general economic optimism as the economy is showing signs of improvement. Also lot of sellers appeared when the price hit the psychological barrier of 1600 USD/oz and people started to retreat from gold to other investments, such as equities and real estate.

On the other hand let's look at Bollinger Bands. It showed us that gold is currently outside the lower band, which suggested that the price of gold is currently oversold. The same thing showed Relative Strength Index; the price of gold is below the 30 line which is another fact that supports the idea that the price of gold is oversold. In 20$^{th}$ February 2013, the price of gold is still declining; however this can change during next month. It is more of a gamble really. On one hand you can trust economy that IS actually recovering and bet that investors will move to different security or believe that this decline is a short term and price of gold will recover as some of the tools suggesting.

## 5.3 Correlation analysis summary

Even though gold is considered as a commodity, which is not correlated with other commodities, it was found that there is a strong correlation between price levels of gold and price levels of oil. There are possible scenarios which can explain this result. One that high price of gold is generally unsuitable for economy, slowing growth and taking down share prices. As a result, investors look for different, more secure investments. The correlation between gold and both USD/EUR and USD/CHF was weak when measuring daily from the beginning of 2013.

# 6 CONCLUSION AND RECCOMMENDATION

Bachelor thesis, Economic Analysis of Gold Commodity, showed complex world of gold from history to current development and was analyzed using various tools from fundamental, technical to correlation analysis. It showed that it is exceedingly hard to produce certain strong opinions, since the price of gold was highly volatile during the time of writing this thesis. Author suggests that the best solution for someone who wants to enter the world of gold investing is to buy physical gold for long term as it is a low-risk investment and if it is true, and history will repeat itself, the price of gold will rise again. Currently, gold is experiencing downfall but the prices are still high, even though it floats bellow 1600 USD/oz. Using technical tools as the main part of analytical part of the thesis, suggested that is a good time for sell. Even in these waters, profit can be made. Selling on short ETF such as SPDR Gold Trust (GLD) is one way to make a profit from the downfall of gold. It is very risky, because the current price of gold is highly volatile so if you are not experienced author would not recommend it. If you already own physical gold, good for you, keep it as a long term investment. If you do not own physical gold do not do anything. Wait till the price calms down. Also author recommends to focus on supply and demand analysis, which was part of the fundamental analysis, as it gives useful information what are the markets for gold and where should investor place his bets, which is currently China and India.

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# 8 APPENDIX

**Table Appendices 1 Conversion of various measurments**

| Unit | Grams (g) | Troy Ounces (oz) |
|---|---|---|
| 1 Troy Ounce | 31.1034768 | N/A |
| 1 Gram | N/A | 0.321507466 |
| 1 Tael | 37.429 | 1.2 |
| 1 Tola | 11.6638048 | 0.375 |
| 1 Baht | 15.244 | 0.49 |
| 1 Dons | 3.8 | 0.12 |
| 1 Chi | 3.8 | 0.12 |

*Source: own table*

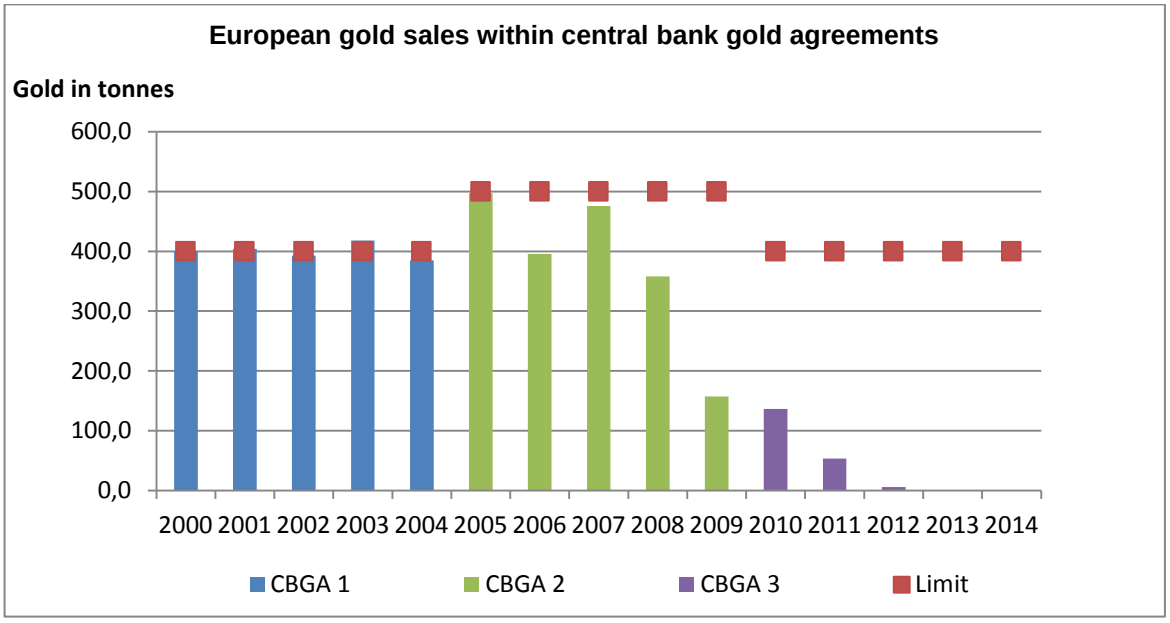
**Table Appendices 2 Gold demand and supply 2011 - 2012**

| **Gold demand (tonnes)** | **2011** | **2012** | **Q4'11** | **Q4'12'** | **Q4'12 vs Q4'11 (%)** |
|---|---|---|---|---|---|
| **Jewellery** | **1,972.1** | **1,908.1** | **472.4** | **525.3** | **11** |
| **Technology** | **452.9** | **428.2** | **103.5** | **100.9** | **-3** |
| Electronics | 319.9 | 302.7 | 72.7 | 71.2 | -2 |
| Other industrial | 89.6 | 85.7 | 20.3 | 19.9 | -2 |
| Dentistry | 43.4 | 39.9 | 10.5 | 9.8 | -7 |
| **Investment** | **1,700.4** | **1,534.6** | **462.9** | **424.7** | **-8** |
| Total bar and com demand | 1,515.4 | 1,255.6 | 358.5 | 336.6 | -6 |
| Physical bar demand | 1,182.4 | 941.1 | 281.8 | 249.5 | -11 |
| Official coin | 245.2 | 201.1 | 58.7 | 52.7 | -10 |
| Medals/imitation coin | 87.8 | 113.4 | 18.1 | 34.3 | 90 |
| ETFs and similar products | 185.1 | 279.0 | 104.4 | 88.1 | -16 |
| Central bank net purchases | 456.8 | 534.6 | 112.8 | 145.0 | 29 |
| **Gold demand** | **4,582.3** | **4,405.5** | **1,151.7** | **1,195.9** | **-4** |
| **London PM fix (USS/oz)** | **1,571.5** | **1,669.0** | **1,688.0** | **1,721.8** | **2** |

| **Gold Supply (tonnes)** | **2011** | **2012** | **Q4'11** | **Q4'12** | **Q4'12 vs Q4'11 (%)** |
|---|---|---|---|---|---|
| Mine production | 2,835.6 | 2,847.7 | 721.3 | 735.2 | 2 |
| Net producer hedging | 11.3 | -20.0 | -13.5 | -9.9 | - |
| Total mine supply | 2,846.9 | 2,827.7 | 707.8 | 725.3 | 2 |
| Recycled gold | 1,668.5 | 1,625.6 | 427.9 | 407.9 | -5 |
| **Total supply** | **4,515.4** | **4.453.3** | **1,135.7** | **1,133.2** | 0 |

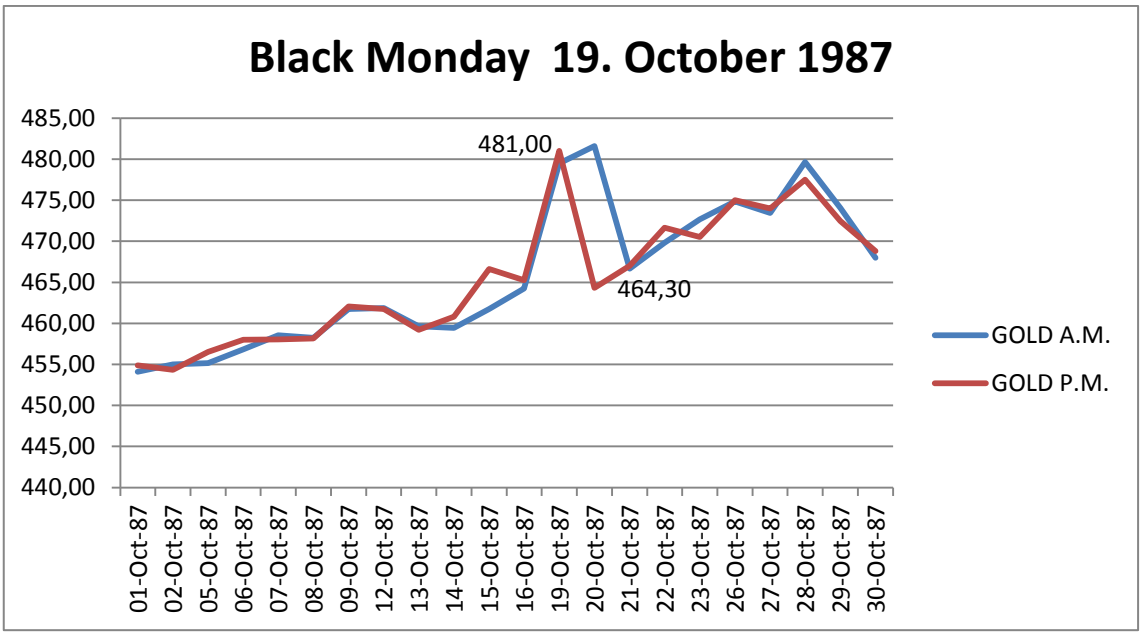
*Source: own graph, Gold demand trends full year 2012, World Gold Council*

**Figure Appendices 1 Distribution of gold demand by category, own graph**




*Source: IMF, International Financial Statistics and European Central Bank*

**Figure Appendices 2 Black Monday 19. October 1987**




Source: http://www.lbma.org.uk/stats/goldfixg

**Table Appendices 3 Daily values USD/EUR, USD/CHF and USD/oz**

| Date | USD/EUR | CHF/EUR | USD Gold | EUR Gold | Date | USD/EUR | CHF/EUR | USD Gold | EUR Gold |
|---|---|---|---|---|---|---|---|---|---|
| *02-Jan-13* | 1.3184 | 1.2103 | 1693.75 | 1277.627 | *31-Jan-13* | 1.3612 | 1.2375 | 1664.75 | 1226.968 |
| *03-Jan-13* | 1.3026 | 1.209 | 1679.5 | 1281.865 | *01-Feb-13* | 1.3642 | 1.2383 | 1669 | 1225.044 |
| *04-Jan-13* | 1.3069 | 1.2084 | 1648 | 1262.932 | *04-Feb-13* | 1.3511 | 1.2281 | 1666 | 1227.166 |
| *07-Jan-13* | 1.3123 | 1.2086 | 1645.25 | 1260.149 | *05-Feb-13* | 1.3582 | 1.2333 | 1673.5 | 1236.241 |
| *08-Jan-13* | 1.3083 | 1.2088 | 1656 | 1266.636 | *06-Feb-13* | 1.3522 | 1.2308 | 1674.25 | 1238.351 |
| *09-Jan-13* | 1.3053 | 1.2088 | 1657.75 | 1270.404 | *07-Feb-13* | 1.3383 | 1.2295 | 1668 | 1242.921 |
| *10-Jan-13* | 1.3274 | 1.2134 | 1675 | 1270.479 | *08-Feb-13* | 1.3369 | 1.226 | 1668.25 | 1245.706 |
| *11-Jan-13* | 1.3343 | 1.2188 | 1657.5 | 1243.249 | *11-Feb-13* | 1.3402 | 1.2341 | 1652 | 1235.602 |
| *14-Jan-13* | 1.3378 | 1.2344 | 1666.5 | 1248.034 | *12-Feb-13* | 1.3453 | 1.2333 | 1647.5 | 1227.279 |
| *15-Jan-13* | 1.331 | 1.2398 | 1680.5 | 1260.123 | *13-Feb-13* | 1.3444 | 1.2335 | 1645 | 1221.051 |
| *16-Jan-13* | 1.3285 | 1.2373 | 1676.25 | 1262.997 | *14-Feb-13* | 1.335 | 1.2313 | 1646 | 1233.883 |
| *17-Jan-13* | 1.3374 | 1.2482 | 1675 | 1254.4 | *15-Feb-13* | 1.3362 | 1.2316 | 1612.25 | 1207.407 |
| *18-Jan-13* | 1.3315 | 1.2443 | 1688.5 | 1269.072 | *18-Feb-13* | 1.3349 | 1.2325 | 1610.75 | 1207.368 |
| *21-Jan-13* | 1.331 | 1.2439 | 1687.5 | 1268.034 | *19-Feb-13* | 1.3396 | 1.2353 | 1607.75 | 1203.136 |
| *22-Jan-13* | 1.3313 | 1.2374 | 1690.5 | 1270.098 | *20-Feb-13* | 1.3273 | 1.2319 | 1588.5 | 1188.019 |
| *23-Jan-13* | 1.3307 | 1.2375 | 1690.25 | 1267.719 | *21-Feb-13* | 1.3192 | 1.2279 | 1577 | 1192.799 |
| *24-Jan-13* | 1.3368 | 1.2427 | 1671 | 1250.281 | *22-Feb-13* | 1.3188 | 1.2262 | 1576.5 | 1199.133 |
| *25-Jan-13* | 1.3453 | 1.247 | 1660 | 1233.101 | *25-Feb-13* | 1.3067 | 1.2175 | 1586.25 | 1194.106 |
| *28-Jan-13* | 1.3447 | 1.2457 | 1656.5 | 1230.775 | *26-Feb-13* | 1.3068 | 1.2174 | 1590.5 | 1216.723 |
| *29-Jan-13* | 1.3488 | 1.2439 | 1663.5 | 1233.501 | *27-Feb-13* | 1.3155 | 1.2218 | 1604.25 | 1225.554 |
| *30-Jan-13* | 1.3568 | 1.2363 | 1677.5 | 1236.912 | *28-Feb-13* | 1.3076 | 1.2218 | 1588.5 | 1213.614 |

*Source: London Bullion Market Association, Investing.com database*

**Table Appendicse 4 Gold USD/oz and Oil price**

| Year | Gold USD/oz | Oil |
|---|---|---|
| 1970 | 36.02 | 3.39 |
| 1971 | 40.62 | 3.6 |
| 1972 | 58.42 | 3.6 |
| 1973 | 97.39 | 4.75 |
| 1974 | 154 | 9.35 |
| 1975 | 160.86 | 1.21 |
| 1976 | 124.74 | 13.1 |
| 1977 | 147.84 | 14.4 |
| 1978 | 193.4 | 14.95 |
| 1979 | 306 | 25.1 |
| 1980 | 615 | 37.42 |
| 1981 | 460 | 35.75 |
| 1982 | 376 | 31.83 |
| 1983 | 424 | 29.08 |
| 1984 | 361 | 28.75 |
| 1985 | 317 | 26.92 |
| 1986 | 368 | 14.44 |
| 1987 | 447 | 17.75 |
| 1988 | 437 | 14.87 |
| 1989 | 381 | 18.33 |
| 1990 | 383.51 | 23.19 |
| 1991 | 362.11 | 20.2 |
| 1992 | 343.82 | 19.25 |
| 1993 | 359.77 | 16.75 |
| 1994 | 384 | 15.66 |
| 1995 | 383.79 | 16.75 |
| 1996 | 387.81 | 20.46 |
| 1997 | 331.02 | 18.64 |
| 1998 | 294.24 | 11.91 |
| 1999 | 278.98 | 16.56 |
| 2000 | 279.11 | 27.39 |
| 2001 | 271.04 | 23 |
| 2002 | 309.73 | 22.81 |
| 2003 | 363.38 | 27.69 |
| 2004 | 409.72 | 37.66 |
| 2005 | 444.74 | 50.04 |
| 2006 | 603.46 | 58.3 |
| 2007 | 695.39 | 64.2 |
| 2008 | 871.96 | 91.48 |
| 2009 | 972.35 | 53.48 |

| | | |
|---|---|---|
| 2010 | 1224.53 | 71.21 |
| 2011 | 1571.52 | 87.04 |
| 2012 | 1669 | 93.02 |

*Source: National Mining Association, Inflation Data oil historical data*

**Table Appendices 5 World Official Gold Holdings January 2013**

| WORLD OFFICIAL GOLD HOLDINGS | | | | | |
|---|---|---|---|---|---|
| International Financial Statistics. January 2013 | | | | | |
| | | %of | | | %of |
| | Tonnes | reserves | | Tonnes | Reserves |
| 1 United States | 8.133.5 | 76.3% | 51 Ukraine | 35.1 | 7.3% |
| 2 Germany | 3.391.3 | 73.5% | 52 Peru | 34.7 | 3.1% |
| 3 IMF | 2.814.0 | D | 53 Slovakia | 31.8 | 68.3% |
| 4 Italy | 2.451.8 | 72.8% | 54 Iraq | 31.1 | 2.5% |
| 5 France | 2.435.4 | 71.2% | 55 Ecuador | 26.3 | 42.4% |
| 6 China | 1.054.1 | 1.7% | 56 Syria | 25.8 | 7.9% |
| 7 Switzerland | 1.040.1 | 11.0% | 57 Morocco | 22.0 | 7.3% |
| 8 Russia | 937.8 | 9.9% | 58 Afghanistan | 21.9 | 17.3% |
| 9 Japan | 765.2 | 3.3% | 59 Nigeria | 21.4 | 2.7% |
| 10 Netherlands | 612.5 | 60.6% | 60 Serbia | 14.9 | 6.3% |
| 11 India | 557.7 | 10.3% | 61 Cyprus | 13.9 | 62.8% |
| 12 ECB | 502.1 | 33.6% | 62 Bangladesh | 13.5 | 6.1% |
| 13 Taiwan | 423.6 | 5.9% | 63 Jordan | 13.4 | 7.8% |
| 14 Portugal | 382.5 | 90.4% | 64 Cambodia | 12.4 | 14.9% |
| 15 Venezuela | 363.9 | 75.3% | 65 Qatar | 12.4 | 1.8% |
| 16 Saudi Arabia | 322.9 | 2.7% | **66 Czech Republic** | 11.6 | 1.5% |
| 17 Turkey | 314.0 | 14.8% | 67 Columbia | 10.4 | 1.6% |
| 18 United Kingdom | 310.3 | 16.2% | 68 Laos | 8.9 | 39.3% |
| 19 Lebanon | 286.8 | 30.3% | 69 Ghana | 8.7 | 8.4% |
| 20 Spam | 281.6 | 30.5% | 70 Paraguay | 8.2 | 9.4% |
| 21 Austria | 280.0 | 56.0% | 71 Latvia | 7.7 | 6.0% |
| 22 Belgium | 227.5 | 40.5% | 72 Myanmar | 7.3 | 5.6% |
| 23 Philippines | 194.6 | 13.2% | 73 El Salvador | 7.3 | 15.9% |
| 24 Algeria | 173.6 | 4.8% | 74 Guatemala | 6.9 | 5.7% |
| 25 Thailand | 152.4 | 4.7% | 75 Macedonia | 6.8 | 13.8% |
| 26 Singapore | 127.4 | 2.7% | 76 Tunisia | 6.7 | 4.7% |
| 27 Sweden | 125.7 | 13.3% | 77 Ireland | 6.0 | 19.3% |
| 28 South Africa | 125.1 | 13.7% | 78 Lithuania | 5.8 | 3.8% |
| 29 Mexico | 124.7 | 4.1% | 79 Tajikistan | 5.0 | 53.4% |
| 30 Libya | 116.6 | 5.5% | 80 Bahrain | 4.7 | 5.2% |
| 31 BIS | 116.0 | D | 81 Mauritius | 3.9 | 7.3% |
| 32 Greece | 111.9 | 82.6% | 82 Mongolia | 3.6 | 7.4% |
| 33 Kazakhstan | 111.5 | 21.3% | 83 Sri Lanka | 3.6 | 2.8% |
| 34 Romania | 103.7 | 12.4% | 84 Canada | 3.4 | 0.3% |
| 35 Poland | 102.9 | 5.4% | 85 Mozambique | 3.3 | 6.1% |
| 36 Australia | 79.9 | 9.2% | 86 Slovenia | 3.2 | 18.9% |
| 37 Kuwait | 79.0 | 13.1% | 87 Aruba | 3.1 | 20.9% |
| 38 Egypt | 75.6 | 26.5% | 88 Hungary | 3.1 | 0.4% |

| | | | | | |
|---|---|---|---|---|---|
| 39 Indonesia | 73.1 | 3.7% | 89 Kyrgyz Republic | 3.0 | 8.5% |
| 40 Korea | 70.4 | 1.2% | 90 Suriname | 2.3 | 13.2% |
| 41 Brazil | 67.2 | 1.0% | 91 Luxembourg | 2.2 | 12.2% |
| 42 Denmark | 66.5 | 4.1% | 92 Brunei Darussalam | 2.1 | 3.8% |
| 43 Pakistan | 64.4 | 26.4% | 93 Hong Kong | 2.1 | 0.0% |
| 44 Argentina | 61.7 | 7.6% | 94 Bosnia and Herzegovina | 2.0 | 2.7% |
| 45 Belarus[4,] | 51.2 | 31.9% | 95 Iceland | 2.0 | 2.6% |
| 46 Finland | 49.1 | 24.4% | 96 Papua New Guinea | 2.0 | 2.7% |
| 47 Bolivia | 42.3 | 17.0% | 97 Trinidad and Tobago | 1.9 | 1.1% |
| 48 Bulgaria | 39.9 | 11.3% | 98 Albania | 1.6 | 3.3% |
| 49 WAEMU[J:] | 36.5 | 15.1% | 99 Yemen | 1.6 | 1.4% |
| 50 Malaysia | 36.4 | 1.5% | 100 Honduras | 0.7 | 1.6% |

*Source: World Gold Council*

## Table Appendices 6 Official gold holdings January 2013

| WORLD OFFICIAL GOLD HOLDINGS | | | | | |
|---|---|---|---|---|---|
| International Financial Statistics. January 2013* | | | | | |
| | | %of | | | %of |
| | Tonnes | reserves | | Tonnes | reserves |
| 1 United States | 8.133.5 | 76.3% | 51 Ukraine | 35.1 | 7.3% |
| 2 Germany | 3.391.3 | 73.5% | 52 Peru | 34.7 | 3.1% |
| 3 IMF | 2.814.0 | D | 53 Slovakia | 31.8 | 68.3% |
| 4 Italy | 2.451.8 | 72.8% | 54 Iraq | 31.1 | 2.5% |
| 5 France | 2.435.4 | 71.2% | 55 Ecuador | 26.3 | 42.4% |
| 6 China | 1.054.1 | 1.7% | 56 Syna | 25.8 | 7.9% |
| 7 Switzerland | 1.040.1 | 11.0% | 57 Morocco | 22.0 | 7.3% |
| 8 Russia | 937.8 | 9.9% | 58 Afghanistan | 21.9 | 17.3% |
| 9 Japan | 765.2 | 3.3% | 59 Nigena | 21.4 | 2.7% |
| 10 Netherlands | 612.5 | 60.6% | 60 Serbia | 14.9 | 6.3% |
| 11 India | 557.7 | 10.3% | 61 Cyprus | 13.9 | 62.8% |
| 12 ECB | 502.1 | 33.6% | 62 Bangladesh | 13.5 | 6.1% |
| 13 Taiwan | 423.6 | 5.9% | 63 Jordan | 13.4 | 7.8% |
| 14 Portugal | 382.5 | 90.4% | 64 Cambodia | 12.4 | 14.9% |
| 15 Venezuela | 363.9 | 75.3% | 65 Qatar | 12.4 | 1.8% |
| 16 Saudi Arabia | 322.9 | 2.7% | **66 Czech Republic** | 11.6 | 1.5% |
| 17 Turkey | 314.0 | 14.8% | 67 Colombia | 10.4 | 1.6% |
| 18 United Kingdom | 310.3 | 16.2% | 68 Laos | 8.9 | 39.3% |
| 19 Lebanon | 286.8 | 30.3% | 69 Ghana | 8.7 | 8.4% |
| 20 Spam | 281.6 | 30.5% | 70 Paraguay | 8.2 | 9.4% |
| 21 Austna | 280.0 | 56.0% | 71 Latvia | 7.7 | 6.0% |
| 22 Belgium | 227.5 | 40.5% | 72 Myanmar | 7.3 | 5.6% |
| 23 Philippines | 194.6 | 13.2% | 73 El Salvador | 7.3 | 15.9% |
| 24 AJgena | 173.6 | 4.8% | 74 Guatemala | 6.9 | 5.7% |
| 25 Thailand | 152.4 | 4.7% | 75 Macedonia | 6.8 | 13.8% |
| 26 Singapore | 127.4 | 2.7% | 76 Tunisia | 6.7 | 4.7% |
| 27 Sweden | 125.7 | 13.3% | 77 Ireland | 6.0 | 19.3% |
| 28 South Afnca | 125.1 | 13.7% | 78 Lithuania | 5.8 | 3.8% |
| 29 Mexico | 124.7 | 4.1% | 79 Tajikistan | 5.0 | 53.4% |
| 30 Libya | 116.6 | 5.5% | 80 Bahrain | 4.7 | 5.2% |
| 31 BIS[15] | 116.0 | D | 81 Mauntius | 3.9 | 7.3% |
| 32 Greece | 111.9 | 82.6% | 82 Mongolia | 3.6 | 7.4% |
| 33 Kazakhstan | 111.5 | 21.3% | 83 Sri Lanka | 3.6 | 2.8% |
| 34 Romania | 103.7 | 12.4% | 84 Canada | 3.4 | 0.3% |
| 35 Poland | 102.9 | 5.4% | 85 Mozambique | 3.3 | 6.1% |
| 36 Australia | 79.9 | 9.2% | 86 Slovenia | 3.2 | 18.9% |
| 37 Kuwait | 79.0 | 13.1% | 87 Aruba | 3.1 | 20.9% |
| 38 Egypt | 75.6 | 26.5% | 88 Hungary | 3.1 | 0.4% |
| 39 Indonesia | 73.1 | 3.7% | 89 Kyrgyz Republic | 3.0 | 8.5% |
| 40 Korea | 70.4 | 1.2% | 90 Surmame | 2.3 | 13.2% |
| 41 Brazil | 67.2 | 1.0% | 91 Luxembourg | 2.2 | 12.2% |
| 42 Denmark | 66.5 | 4.1% | 92 Brunei Darussalam | 2.1 | 3.8% |
| 43 Pakistan | 64.4 | 26.4% | 93 Hong Kong | 2.1 | 0.0% |
| 44 Argentina | 61.7 | 7.6% | 94 Bosnia and Herzegovina | 2.0 | 2.7% |
| 45 Belarus[4,] | 51.2 | 31.9% | 95 Iceland | 2.0 | 2.6% |
| 46 Finland | 49.1 | 24.4% | 96 Papua New Guinea | 2.0 | 2.7% |
| 47 Bolivia | 42.3 | 17.0% | 97 Tnmdad and Tobago | 1.9 | 1.1% |
| 48 Bulgana | 39.9 | 11.3% | 98 Albania | 1.6 | 3.3% |
| 49 WAEMU[J: | 36.5 | 15.1% | 99 Yemen | 1.6 | 1.4% |
| 50 Malaysia | 36.4 | 1.5% | 100 Honduras | 0.7 | 1.6% |

**Table Appendices 7 Historical Gold Demand**

| Historical data for gold demand | | | | | | |
|---|---|---|---|---|---|---|
| | Tonnes | | | | | |
| | Jewellery | Total bar and coin invest | ETFs and similar | Technology | Central banks | Total |
| 2003 | 2,484 | 304 | - | 386 | -620 | 2,594 |
| 2004 | 2,616 | 355 | 133 | 419 | -479 | 3,044 |
| 2005 | 2,719 | 396 | 208 | 438 | -663 | 3,098 |
| 2006 | 2,300 | 414 | 260 | 468 | -365 | 3,077 |
| 2007 | 2,423 | 435 | 253 | 476 | -484 | 3,104 |
| 2008 | 2,304 | 869 | 321 | 461 | -235 | 3.720 |
| 2009 | 1,814 | 780 | 623 | 410 | -34 | 3,593 |
| 2010 | 2,017 | 1,205 | 382 | 466 | 77 | 4,147 |
| 2011 | 1,972 | 1,515 | 185 | 453 | 457 | 4,582 |
| 2012 | 1,908 | 1,256 | 279 | 428 | 535 | 4,405 |
| | USSbn | | | | | |
| | Jewellery | Total bar and coin invest | ETFs and similar | Tech-nology | Central banks | Total |
| 2003 | 29.0 | 3.6 | - | 4.5 | -7.2 | 30.3 |
| 2004 | 34.4 | 4.7 | 1.7 | 5.5 | -6.3 | 40.0 |
| 2005 | 38.9 | 5.7 | 3.0 | 6.3 | -9.5 | 44.3 |
| 2006 | 44.6 | 8.0 | 5.1 | 9.1 | -7.1 | 59.7 |
| 2007 | 54.2 | 9.7 | 5.7 | 10.6 | -10.8 | 69.4 |
| 2008 | 64.6 | 24.4 | 9.0 | 12.9 | -6.6 | 104.3 |
| 2009 | 56.7 | 24.4 | 19.5 | 12.8 | -1.0 | 112.3 |
| 2010 | 79.4 | 47.5 | 15.0 | 18.3 | 3.0 | 163.3 |
| 2011 | 99.6 | 76.6 | 9.4 | 22.9 | 23.1 | 231.5 |
| 2012 | 102.4 | 67.4 | 15.0 | 23.0 | 28.7 | 236.4 |