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CNB CZECH NATIONAL BANK

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Project Coordinator: Jan Brůha

The Contemporary Role of Gold in Central Banks' Balance Sheets

Iveta Polášková, Luboš Komárek, Michal Škoda*

Abstract

This paper is devoted to the monetary policy context of gold in central banks' reserves. It examines the correlation between the nominal and real price of gold and selected macroeconomic variables and financial assets over the financial and business cycles. In this context, it analyses the investment diversification opportunity that gold offers central banks and other investors. The paper also highlights differences in gold holdings between the central banks of advanced economies (including those with reserve currencies) and those of emerging market and developing economies. It goes on to outline the history of gold holdings from the establishment of the independent Czechoslovakia at the end of 1918 to the present day. It concludes by presenting the rationale for the position of the CNB, which ranks among the modern central banks holding minimal amounts of reserve gold.

JEL Codes: E42, E58, F33, Q31.

Keywords: Central bank, gold, international monetary system, international reserves.

* Iveta Polášková, Czech National Bank, e-mail: iveta.polaskova@cnb.cz;
Luboš Komárek, Czech National Bank, e-mail: lubos.komarek@cnb.cz;
Michal Škoda, Czech National Bank, e-mail: michal.skoda@cnb.cz.
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1. Introduction

Gold has played the role of a store of wealth for centuries and still does so today. Gold holdings have always been perceived as a symbol of wealth not just of individuals, but also of nations. In bad times, private individuals have turned to gold in the hope that it will prevent their wealth from shrinking in value. However, the incentives for central banks to hold gold are broader than the private reasons for doing so. They reflect both the general principle of investment diversification and historical factors related to the past organisation of the international monetary system and the country's level of economic development, and also, for example, whether the country has a reserve currency.

Although gold has not been a pillar of the international monetary system for almost half a century now, its contemporary role is repeatedly debated. In this paper we therefore focus on the basic facts about gold from the perspective of the contemporary history of central banks, i.e. its price, its representation in international reserves and the benefits of investing in gold relative to other financial assets, particularly as regards central banks' ability to diversify the structure of their reserves. That structure, however, differs significantly across central banks.

This paper aims to summarise the facts and trends in central banks' gold holdings over recent decades. It is divided into five sections. Following this introduction to the topic, section 2 summarises the history of the gold price from both the nominal and real perspectives and compares the gold price with selected macroeconomic variables. Section 3 outlines the options for investing in gold from the perspective of central banks. Here, we focus, among other things, on assessing relatively new trends, including financial products and funds linked to gold. A special case is cryptoassets, which seek credibility by being tied to gold, i.e. to the tradition and trust associated with this precious metal throughout human history. Section 4 is devoted to the contemporary role of gold in central banks' reserves. It points out differences between the central banks of advanced economies (including those with reserve currencies) on the one hand and those of emerging market and developing economies on the other.[1] Here, we compare gold holdings not just from the perspective of the physical holdings (weights) of gold owned by selected central banks, but also in relative terms, for example with regard to the ratio of gold to GDP and the quantity of currency in circulation. Section 5 describes the domestic history of gold holdings from the establishment of the independent Czechoslovakia at the end of 1918 to the present. The final section summarises and generalises the findings.

[1] For the purposes of this paper, we divide countries into advanced economies and emerging market and developing economies according to the classification used by the IMF. Under this classification, the advanced economies are Australia, Austria, Belgium, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Macao, Malta, the Netherlands, New Zealand, Norway, Portugal, Puerto Rico, San Marino, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, the UK and the USA (IMF, 2019). Other countries are classed as emerging market and developing economies.

2. The Price of Gold in Context

2.1 A Historical Look at the Price of Gold in the 20th and 21st Centuries

The use of precious metals marked the end of the barter economy and the beginning of the development of the modern payment system. Gold played an important role for centuries, de facto until the gradual decline of the gold standard in the 1930s. The gold standard historically took three forms: the gold coin standard, the gold bullion standard and the gold reserve standard. The first form consisted of gold coins along with paper money convertible into gold at a fixed rate. The second form was created in response to a short supply of gold available for monetary purposes. Hundred per cent exchange of banknotes for gold could not be guaranteed, so limits were introduced and paper notes could not be exchanged for gold until those limits had been met. This made it possible to circulate notes that were not fully backed by gold. The third form was a response to growing demand for money and involved setting a lower limit on notes backed by gold. The gold reserve standard era was marked by a decrease in the amount of gold in central banks' reserves and in the gold content of banknotes (a fall in gold coverage;[2] Bott, 2013; Nathan, 2011; Bryan, 2010).

After World War II, the Bretton Woods agreements led to some renaissance in the role of gold in the international monetary system, but by then the dollar had taken over the central role in the system. The price of gold was set by means of a fixed exchange rate between the US dollar (USD) and gold. The member states of the International Monetary Fund (IMF) were required to maintain the exchange rates of their currencies within a band of ±1% from parity to the dollar using monetary interventions, while the dollar was firmly pegged to the gold price (the gold dollar standard; Bott, 2013; Nathan, 2011; Lewis, 2007).

Until the early 1960s, the Bretton Woods system showed stability in both of its fundamental characteristics, namely the central role of the dollar and a monetary system based on fixed exchange rates. From then on, however, two problems came increasingly to the fore: the consequences of the inflow of dollars into the rest of the world due to US investment and economic and military aid, and pressures to change the central parities (revaluation and devaluation) stemming from uneven economic growth across countries and related growth in speculative capital flows.[3] These processes resulted in a high US current account deficit and a risk of dollars flowing back into the USA and being exchanged for US gold reserves. This, however, would have led to devaluation of the dollar and jeopardised the stability of the entire international monetary system. In this system, devaluation of the dollar would have automatically meant revaluation of all other currencies against the dollar (Bott, 2013; Butler, 2012; Nathan, 2011; Lewis, 2007).

[2] According to Revenda (2018), convertibility (full or partial) of paper notes into gold was not universal even while the gold standard was in place, as mandatory convertibility was restricted as to both the amount of money and eligible entities. In the period of the Bretton Woods monetary system, only central banks could exchange banknotes for gold.

[3] More than a thousand devaluations (stabilising devaluations approved by the IMF, i.e. not competitive devaluations of a dumping nature) were made under the Bretton Woods monetary system. Several dozen of them were devaluations of world currencies. The rest were devaluations of currencies of emerging market and developing economies, which often had to devalue their national currencies because they were pegged to the dollar. The German mark in particular underwent revaluations.

To resolve the problems that arose during the functioning of the Bretton Woods system, two prices of gold were introduced in 1968. The market price increased rapidly and adjusted to the market, while the official price remained at the set level and was used for monetary purposes. After dollar/gold convertibility was ended, the gold price was determined solely by the interaction between gold supply and demand. Nevertheless, the relationship between the price of gold (and other precious metals) and the exchange rate of the dollar remains close to this day. In 1968, the USA revoked the requirement for gold backing of the dollar. A two-tier structure was established in which official transactions between central banks were conducted at a price of $35 per troy ounce while the price for the private sector was determined by the market. As a result, US gold stocks shrank and the Fed stopped selling gold to other central banks (Bott, 2013; Nathan, 2011; Lewis, 2007).

In the early 1970s, the link between the price of the US currency and the gold price loosened (dollar/gold convertibility was abolished on 15 August 1971 and the gold price has been determined by the market since then) and gold thus definitively lost its central role in the international monetary system (Bott, 2013; Butler, 2012; Nathan, 2011; Lewis, 2007).

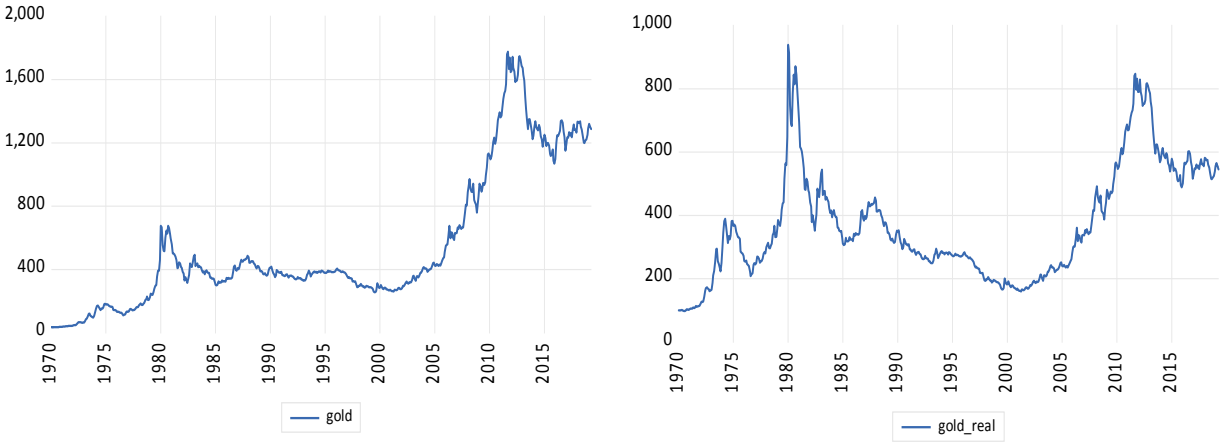
With the exception of the late 1970s and early 1980s, the price of gold was relatively stable until the start of the new millennium. The nominal price of gold (expressed in US dollars) gradually went up after the peg to the dollar was abandoned. In the late 1970s and early 1980s, a period characterised by a second oil price shock and by considerations of reintroducing the gold standard in the USA, the nominal and real prices of gold both rose significantly. After the economic instability abated, the gold price was relatively stable for the next 25 years.

The start of the new millennium saw growth in demand for gold, especially in the investment area for portfolio diversification purposes. This growth (alongside heightened uncertainty related to the crisis and growing geopolitical risks) fostered a rise in the price of gold. The price peaked in the second half of 2011, when gold was trading close to $1,700 per troy ounce and was even forecasted to attack $2,000 per ounce. However, disinflation tendencies then started to appear in the global economy, leading to a drop in the gold price.[4] In 2016, the price started to trend upward again (see Figure 1) on the back of growing uncertainty in the global economy and ensuing risks (growing debt in many advanced countries, Brexit, and rising protectionism in global trade) and also because of the start of interest rate normalisation, especially by the US Fed.[5]

[4] The dollar conversely strengthened at that time, in line with the observation that the gold price falls when the dollar appreciates.

[5] The gold price fluctuated around $1,300 per ounce in the first five months of 2019. It started going up in June and rose above $1,500 per ounce in early August. The price is expected to increase further due to geopolitical pressures. The latest developments can be found at: https://tradingeconomics.com/commodity/gold

Figure 1: Nominal and Real Gold Price from 1970 to the Present



Note: gold – nominal gold price in USD per troy ounce (oz t); gold_real – CPI-deflated real gold price in USA (1970=100).
Source: Refinitiv Datastream; authors' calculations.

2.2 The Relationship between the Gold Price and Selected US Macroeconomic Variables

The gold price is closely correlated with macroeconomic variables in the USA. The gold price often responds to changes in interest rates made by the US Fed, the latest exchange rate movements and also, for example, approaching presidential elections in the USA. All this reflects the USA's still unprecedented role in the global economy and global politics. The USA is also the fourth largest gold producer. On top of that, demand for gold in the country is strong and the US central bank has the biggest physical gold stocks in its reserves, which markedly exceed those of other countries (World Gold Council, 2018c; Stoeferle and Valek, 2017). The correlations between the gold price and the selected macroeconomic variables (real interest rates and the real exchange rate in the USA) tend to be negative (see Table 1).

The gold price (its growth) and real interest rates in the USA show the expected highly negative linear correlation in the period under review. The correlation is stronger in the post-crisis period. We can also observe an analogue of the Hotelling rule[6] applied to the gold market, namely that when interest rates are low it is better to leave a precious metal in the ground than to extract it, mainly because prices will be higher in the future than they are now. This rule may be one factor explaining the observed highly negative correlation between the real gold price and real interest rates in the USA, particularly in the wake of the crisis.

[6] The Hotelling rule expresses the condition of maximising the economic rent from a non-renewable resource. It is based on empirical evidence that there is a negative correlation between interest rates and real oil prices, which can be also applied to prices of other natural resources (see Hotelling, 1931).

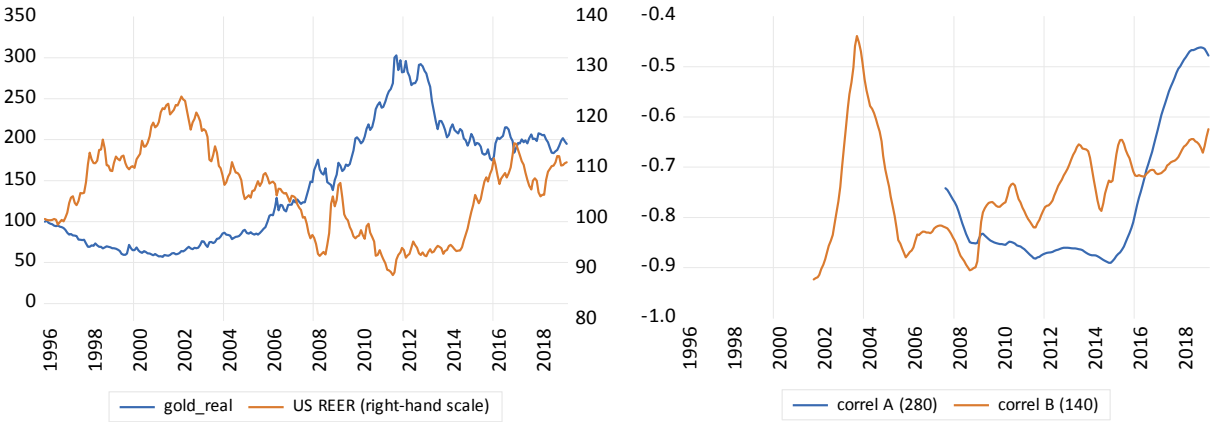
Table 1: Correlation between the Gold Price and US Macroeconomic Variables (1996–2019)

Gold price	Period		
	1996 Q1–2019 Q1	1996 Q1–2009 Q2	2009 Q3–2019 Q1
Real interest rates	-0.615	-0.212	-0,629
Real effective exchange rate (REER) of dollar	-0.666	-0,730	-0.620

Note: Real interest rates, the real effective dollar exchange rate and the real gold price deflated by the CPI in the USA; correlation between change in the gold price and interest rates and correlation between the real gold price and the real exchange rate.
Source: Refinitiv Datastream; authors' calculations.

The gold price and the dollar exchange rate also show a highly negative linear correlation. Gold has a specific position on financial markets, as it is regarded as a currency and movements in its price (expressed in USD) can thus be used as an indicator of movements of the dollar and indirectly also other currencies.[7] This is illustrated by Figure 2, which shows that the relationship between the real gold price and the real effective US exchange rate is inverse. The left part depicts the paths of these two variables, while the right part shows their rolling correlation coefficients, which are negative in the period under review.

Figure 2: Real Gold Price and Real Effective US Dollar Exchange Rate (1996–2019) and Their Rolling Correlation Coefficients



Note: gold_real – the real gold price (deflated by the CPI in the USA; 1996=100); USD REER – the real effective dollar exchange rate (deflated by the CPI in the USA; 1996=100; right-hand scale); monthly data; correl A (280) = rolling correlation coefficient with a rolling period equal to ½ of the data set, i.e. 280 months; correl B (140) = rolling correlation coefficient with a rolling period equal to ¼ of the data set, i.e. 140 months.
Source: Refinitiv Datastream; authors' calculations.

[7] Sjaastad and Scacciavillani (2003) developed a theoretical model of the relationship between the main world currencies and globally traded commodities, including gold. Their main conclusion was that floating exchange rates were the main source of price instability on the world gold market. Their finding is noteworthy as it contradicts studies concluding that the price of gold depends primarily on the factors that determine the supply of and demand for gold.

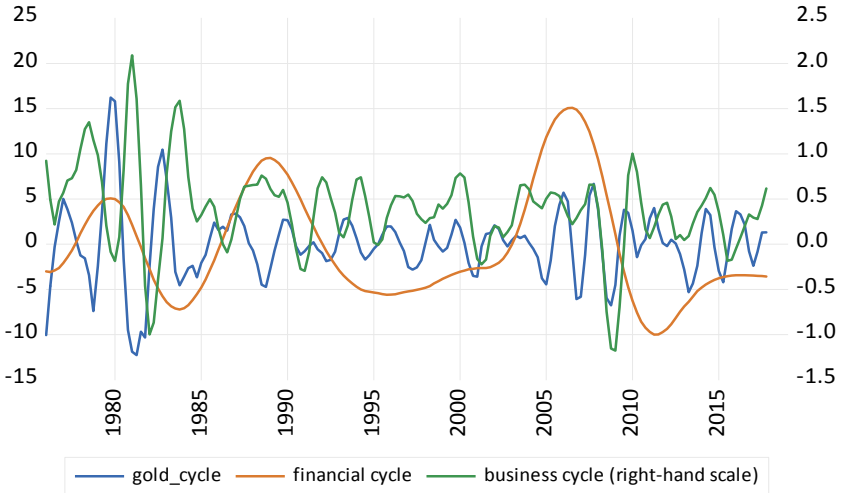
2.3 The Gold Market

The physical gold supply-demand relationship can be described as stable; demand is price-elastic, while supply responds with a visible lag. Gold producers can always sell gold in the open market, whereas production reacts very slowly to changes in gold prices on world markets. Wiggins (2003) notes that there is historically a five-year lag between a major price rise and significant production increases. At the start of the millennium, the price of gold was about 150% of the cost of production (and production was growing by about 1% a year), whereas in the early 1980s, when it peaked, the price was 200% of the cost of production (and production was growing by 6% annually; see Gold Field Mineral Services, 2019).

The supply of gold is determined mainly by the level of production and also affects the investment potential of gold. The gold supply consists of gold production, gold recycling and net producer hedging. However, the share of hedging in the total gold supply is very small. Gold production, which accounts for the largest part of supply, has been growing in recent years. The largest producers are China, Australia, Russia, the USA, Canada, South Africa and Peru.[8] The gold recycling rate depends on the gold price. Uncertainties in the global economy cause the gold price to go up. This then affects the amount of gold recycled, which in turn copies the gold price trend (World Gold Council, 2018c; World Gold Council, 2018d; McGuire, 2013; Mitchell, 2013).

Conversely, demand for gold is very price-elastic, so the price adjusts to changes in supply very rapidly. The private sector usually buys gold in good times and sells it in times of financial difficulty or when it considers the price to be very high. However, investing in gold does not seem to be a good defence against recession.

Figure 3: Nominal Gold Price since 1976 versus the US Financial and Business Cycles



Note: gold_cycle – the nominal USD gold price cycle; financial cycle – cycle of real credit, credit-to-GDP ratio and real house prices (definition and method by Drehmann, Borio and Tsatsaronis (2012)); business cycle – US real GDP cycle; cycle levels are given in percentages of the trend and were calculated using the bandpass filter suggested by Christiano and Fitzgerald (2003) with a frequency band between 6 and 32 quarters.
Source: Refinitiv Datastream; authors' calculations.

[8] It can be assumed that in some of these countries part of the gold mined is sold directly to the state or the central bank (especially in countries such as Russia and China). In the case of China, for example, this is suggested by Stoeferle and Valek (2015) and Mitchell (2013).

The price of gold and demand for gold are often independent of the business and financial cycles (see Figure 3). The gold cycle is faster than the business cycle and particularly the financial cycle. Investing in gold seems suitable when the domestic currency is losing its purchasing power (the situation in Germany between the wars, for example) or when the currency is significantly overvalued. On the other hand, gold does not earn interest and incurs storage costs, so it tends to be used by conservative investors as a long-term investment.

3. The Investment Potential of Gold from the Perspective of Central Banks and Other Investors

Due to its characteristics, gold is used for portfolio diversification by both private agents and central banks.[9] Those characteristics include resilience, durability, scarcity, divisibility and nobility (World Gold Council, 2018c; Bott, 2013; McGuire, 2013). Investment in gold increases at times of growing uncertainty and political and economic risks, as gold is considered a safe haven. Gold has proved to be a safe store of value. As with other investments, however, one must consider not only the safety of investing in gold, which is high, but also its investment potential and liquidity and political risks.[10] Gold-related investment activity depends on the evolution of wealth and the situation on financial markets, and is also affected by interest rates. Holders of dollar-denominated assets may have some advantage here, assuming the unlikely combination of fixed gold/dollar convertibility and a system of floating exchange rates, especially of those of major reserve currencies. In such a situation, gold would de facto represent additionally issued dollars and its holders would not be exposed to exchange rate risk when exchanging gold for dollars. Nevertheless, efficient foreign exchange markets should fully or largely take this possibility (of two-way exchange of gold for dollars at a fixed rate) into account in the exchange rate of the dollar against other currencies, and that includes ruling out arbitrage. Even so, fixed gold/dollar convertibility would subsequently have to be abandoned, as it would lead to an inflow or outflow of gold from the USA, which would probably be unacceptable for a number of reasons.

Gold investment opportunities are currently quite broad and include investment in paper and digital gold as well as physical gold. In the past gold was seen mainly as a currency, whereas now it is an important investment asset. It is also traditionally used in industry, jewellery and art and as a minting metal for investment and commemorative coins. Although gold holdings are associated with storage costs and do not earn any interest, central banks still invest in gold and include it in their reserves. Central banks use gold mainly for portfolio diversification and hedging against high inflation and currency volatility, and as a general store of value. Several specificities are attributed to gold which distinguish it from other investment assets. They include, for example, liquidity, a long horizon and lower risk, thanks to which gold is considered a better investment than other types of investment. Even so, gold assets account for less than 1% of total

[9] According to proponents of broader use of gold in the international monetary system, gold should account for between 4% and 10% of the central bank's portfolio (World Gold Council, 2018g). Nevertheless, the existence of a nascent group of advanced economies with "non-gold central banks" (e.g. Canada, Norway, Malta, Estonia, Croatia and Ireland, but also the Czech Republic and others) suggests that central banks can hold a much lower proportion of gold – or almost no gold – in their balance sheets.

[10] Sovereign risks include in particular the possibility of state authorities confiscating gold and manipulating the gold market (McGuire, 2013; Mitchell, 2013; Nathan, 2011).

global financial assets (World Gold Council, 2018c; World Gold Council, 2018f; McGuire, 2013; Speck, 2013).

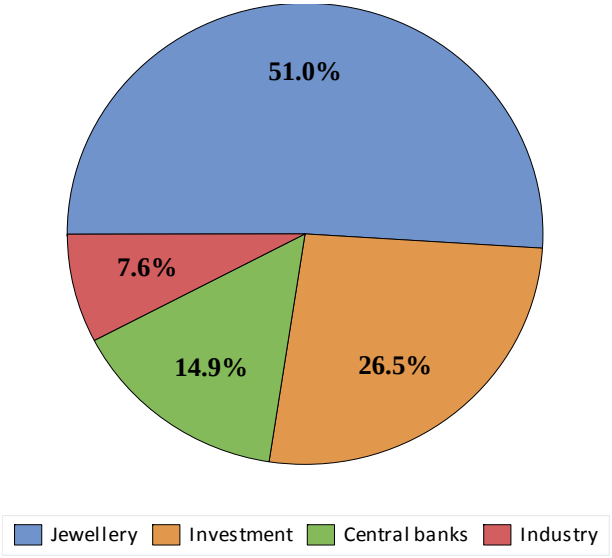
Investment in gold most often takes the form of physical metal, the best known and oldest form of such investment. Bars, ingots and coins are the most common forms of investment in physical gold.[11] Another option is to use financial products that have gold as their underlying asset. The most frequently used products are gold futures and options and investments in gold funds and gold mining shares. These usually take the form of certificates that guarantee exchange for gold, which are often issued when gold is leased out or as a guarantee for gold in mining companies. Gold exchange-traded funds (ETFs) are the best known form of such investment at present. Gold is mostly used as a strategic investment,[12] i.e. an investment planned for a period of several decades. Several factors have caused gold to become a strategic investment over the last two decades: the global financial crisis, growth of emerging economies, the establishment of gold-backed ETFs and demand from central banks (World Gold Council, 2018b; World Gold Council, 2018c; World Gold Council, 2018d; World Gold Council, 2018g; Stoeferle and Valek, 2016; Stoeferle and Valek, 2015; Mitchell, 2013).

Total investment in gold is the second-largest component of demand for gold after jewellery. Demand for gold is determined by jewellery, gold investment, central bank purchases and the needs of industrial sectors (see Figure 4). Jewellery accounts for the largest part of the demand for gold. This demand is traditionally highest in China and India. By contrast, central banks and industry account for only a small proportion of the demand. Investment makes up a large part of the demand, with bars and coins usually accounting for two-thirds of the total and investment in gold-backed ETFs for one-third. Most ETFs are held in North America and Europe. Central banks have also started investing in these funds. One example is the Canadian central bank, which uses this form of investment to diversify its portfolio (World Gold Council, 2018c; World Gold Council, 2018d; Stoeferle and Valek, 2015; McGuire, 2013; Mitchell, 2013).

[11] Demand for gold coins is the strongest. This is because a large proportion of the coins are minted by central banks around the word, which lends such investment some guarantee of trustworthiness. The uncertainty in the global economy is currently encouraging investment in physical gold in smaller bars, which are easier to convert into cash (World Gold Council, 2018c; World Gold Council, 2018d; McGuire, 2013).

[12] Nevertheless, some central banks, such as those of Argentina and Hungary, use gold not only as a strategic asset, but also as a means to achieve their tactical goals (World Gold Council, 2018f; World Gold Council, 2018g). The Hungarian central bank has stated that it has increased its gold reserves because holding gold is consistent with international trends, enhances the country's financial stability and the stability of its currency, and may strengthen market confidence in the Hungarian economy (MNB, 2018). The Central Bank of Argentina uses gold not only to diversify its portfolio, but also to increase the total returns on its portfolio using swaps (Banco Central de la República Argentina, 2018; World Gold Council, 2018f).

Figure 4: Structure of Demand for Gold at the End of 2018



Note: In per cent of total demand for gold.
Source: World Gold Council (2019).

Gold-backed funds offer great opportunities for the development this form of investment demand for gold, as they make it easier to invest in gold. Gold-backed ETFs held almost 2,400 tonnes of gold at the end of 2017. These funds have grown rapidly since they sprang up in 2003. Not only have they made it easier to invest in gold, they also offer the advantage of a large, liquid and more efficient market, lower fees and zero storage costs. In addition, they enable smaller investments and are less risky. Another benefit is that ETF share prices follow the market price of gold. However, ETF shares have the disadvantage that they only involve exposure to the price of gold, not physical ownership of gold (World Gold Council, 2018b; World Gold Council, 2018c; World Gold Council, 2018d; Mitchell, 2013).

Although they are growing rapidly, ETFs are not the only investment form of gold. The other most common forms of investment – used not just by central banks – are gold accounts at deposit institutions, gold held in physical form (deposited either at a foreign depository or on the investor's own premises) and gold futures. The most frequently used form of investment in gold is a gold account held at a deposit institution. Such accounts are similar to bank accounts and the funds deposited on them can be exchanged very easily for gold. This form of investment is not associated with any storage fees and is very liquid. However, it also entails risks in the form of an unsecured claim and a potential time lag if the demand for exchanging funds for gold is high. Physical gold stored at a foreign depository has the advantage of instant liquidity in the event of financial crises, when it can readily play the role of asset of last resort. However, it is associated with substantial costs (especially storage costs), and the very fact that it is located abroad constitutes a risk. By contrast, holdings of physical gold stored on the investor's own premises carry no such risk. In addition, such investment is viewed favourably by the public of the country concerned. However, it, too, is associated with storage costs (albeit reduced by the use of the investor's own premises[13]). Futures are not associated with costs of physically holding gold but do

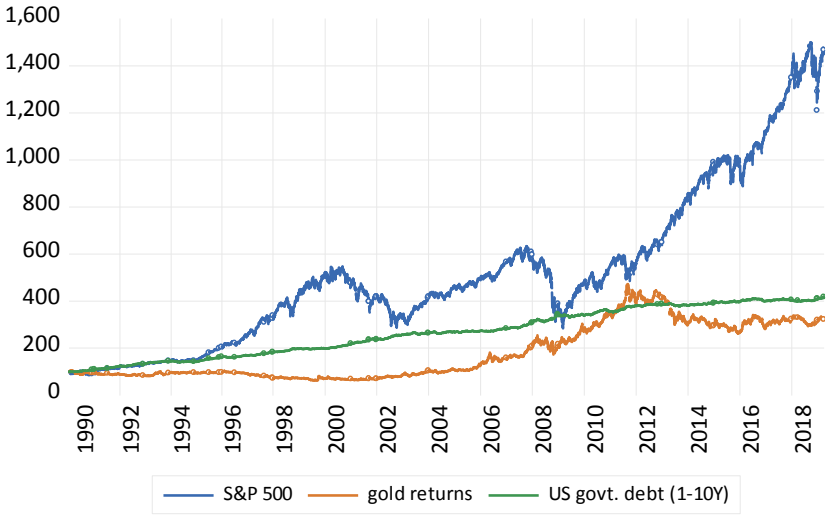
[13] Many European central banks have launched a process of gold repatriation in recent years. The countries that have started to repatriate their gold reserves include Germany, the Netherlands and Austria. One reason for this repatriation is the concern that the international monetary system will change into one where gold plays a bigger

entail credit risk and are a less liquid form of investment (World Gold Council, 2018c; World Gold Council, 2018d).

3.1 Gold Investment Returns and Market Risk

The dollar value of gold investments is relatively volatile. Figure 5 provides a fundamental view of the return specificities of investment in gold in relation to other asset classes. It compares the dollar value of gold investment with the index of US government bonds with maturities of between one and ten years (G502) and the S&P 500 stock index, including reinvested dividends,[14] over the long term (since 1990). The figure reveals fundamental differences in the behaviour of the assets concerned in the period under review, particularly as regards performance and volatility. The volatility of stock and gold investment contrasts with an almost linear increase in bond investment.

Figure 5: USD Value of Gold, Share and Bond Investment; in relative terms (2 Jan 1990=100)



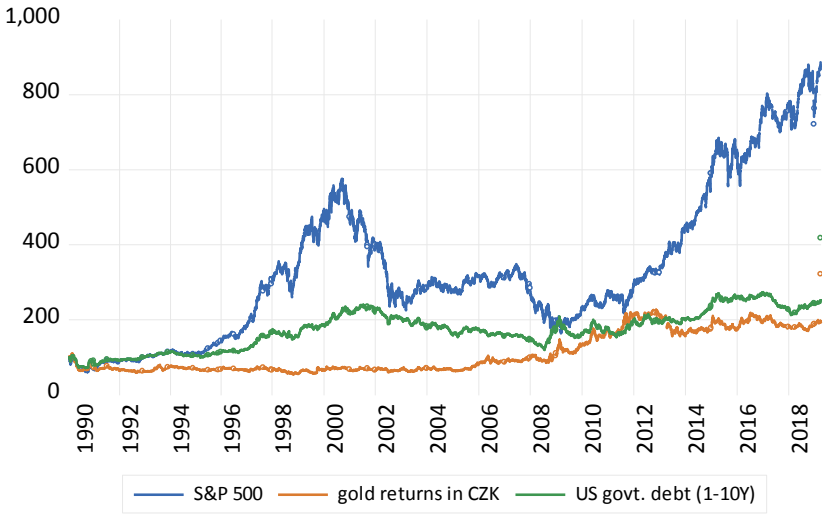
Source: Bloomberg; authors' calculations.

The koruna value of gold investment is also relatively volatile. When exchange rate risk comes into play and we express the relationships illustrated in the previous figure in koruna, the koruna value of gold investment is similar as in the previous case, whereas investment in the bond and stock indices shows much greater volatility (see Figure 6).

role. Nevertheless, a more realistic reason would seem to be the ability to better face political and economic risks (Stoeferle and Valek, 2015).

[14] These indices were used to filter out the exchange rate effect. Like the gold price, both are in dollars.

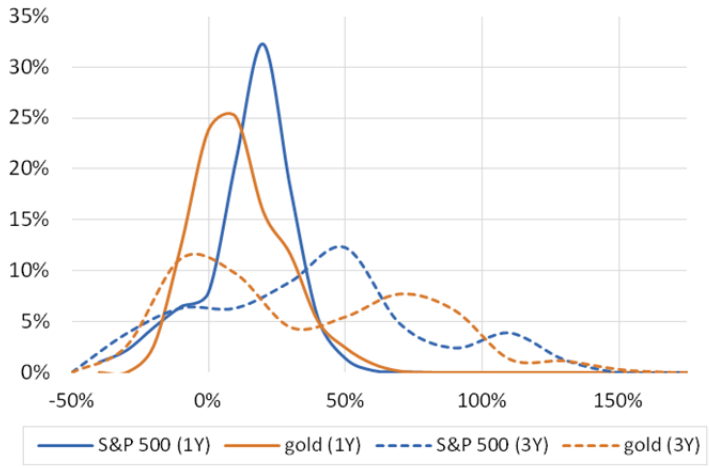
Figure 6: CZK Value of Gold, Share and Bond Investment; in relative terms (2 Jan 1990=100)



Source: Bloomberg; authors' calculations.

Due to the option of coupon and dividend reinvestment, the behaviour of stock and bond yields is affected by the length of the investment horizon selected. Gold lacks an income (interest) component, so lengthening the investment horizon does not have such a positive effect on the statistical distribution of returns as it does on the stock index. This is illustrated by Figure 7, which contains histograms of gold and stock returns for two investment horizons (one-year and three-year) over the last 25 years. For both investment instruments, the three-year return histogram is shifted to the right (higher averages) and more "spread" in space (higher volatility) than the one-year return histogram. In the case of gold, however, the shift to the right is not as distinct as that for the stock index. In addition, if we use the maximum instead of the average to measure the shift to the right, there is no shift to the right for gold and the peak of the three-year return histogram even moves a little to the left.

Figure 7: Comparison of Return Histograms for Gold and the S&P 500 for two Investment Horizons



Source: Bloomberg; authors' calculations.

We can get a basic idea of the diversification advantages of gold investment by analysing the return correlations between the prices of gold and other assets. In terms of diversification,

gold can be regarded as an asset class or a currency. Table 2 shows the correlation coefficients between gold and other asset classes calculated on the basis of monthly returns for five different time horizons. Stock indices are clearly the most favourable in terms of the diversification effect, showing a relatively stable negative correlation. For the other asset classes, the correlation initially worsens as the horizon shortens towards the present, i.e. the already positive correlation increases. In the last year, by contrast, it improves.

Table 2: Correlation Coefficients of Monthly Returns on Gold and Selected Assets (in USD)

	1Y	3Y	5Y	10Y	15Y
MSCI Euro	-0.17	-0.23	-0.22	-0.12	-0.06
S&P 500	-0.32	-0.15	-0.14	-0.05	-0.04
DE Govt	0.06	0.14	0.11	0.22	0.13
US Treas.	0.32	0.50	0.48	0.34	0.26
US Corp	0.23	0.43	0.39	0.34	0.20
MBS	0.26	0.41	0.36	0.33	0.24

Source: Bloomberg; authors' calculations.

The correlation of gold with the selected currencies in dollar terms is not negative for any currency (see Table 3) in any of the periods under review. The lowest correlation with gold in the last year is displayed by the Swiss franc. This correlation decreased significantly. The highest positive correlation is observed fairly constantly for the Japanese yen.

Table 3: Correlation Coefficients of Monthly Returns on Gold and Selected Currencies (in USD)

	1Y	3Y	5Y	10Y	15Y
EUR	0.33	0.36	0.33	0.29	0.39
CAD	0.15	0.24	0.28	0.27	0.34
AUD	0.15	0.41	0.32	0.33	0.39
JPY	0.47	0.68	0.63	0.44	0.36
GBP	0.44	0.07	0.05	0.14	0.29
CHF	0.04	0.32	0.48	0.40	0.43

Source: Bloomberg; authors' calculations.

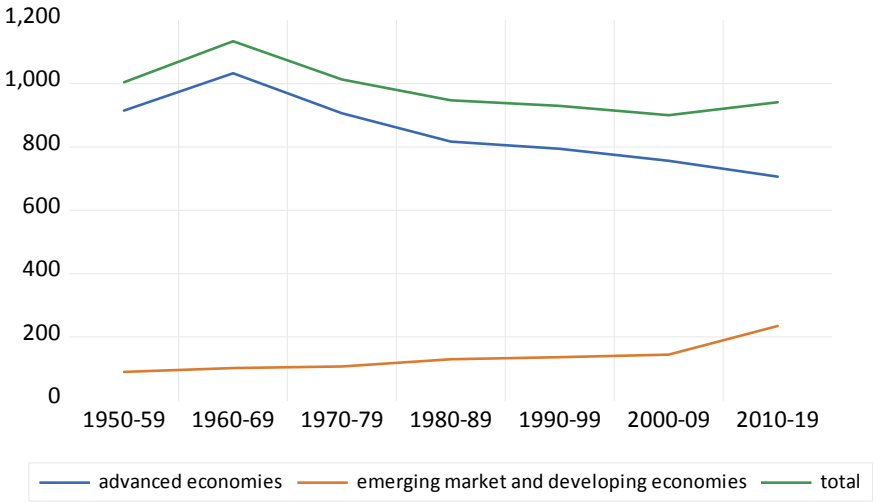
The correlation coefficients give no clear evidence for investment in gold being a suitable form of portfolio diversification relative to investment in other investment assets. With few exceptions there is no high positive correlation (unfavourable in terms of diversification) between gold and other asset classes and currencies, but the figures are certainly not unequivocally as favourably negative as those typical of the correlations between bonds and stocks, for example.

4. The Role of Gold in Central Banks' International Reserves

Gold was the pillar of the international monetary system until the start of the 1970s, so it played an important role in central banks' international reserves. Central banks' reserve gold holdings gradually increased to a peak in the 1960s. This growth was driven almost exclusively by advanced economies (Figure 8). Over the following decades, the central banks of advanced economies gradually reduced the amount of gold in their reserves. Even several decades on, however, many still hold a significant part of their reserves in gold.

Divergence, however, was apparent between advanced economies (especially those with reserve currencies) and emerging market and developing economies. In less advanced economies, there was a gradual long-term increase in gold on central banks' balance sheets, while in advanced economies its share gradually decreased. Until 2009, central banks were net sellers of gold, but this situation subsequently changed and central banks became net buyers, mainly due to increased gold purchases by emerging market and developing economies (Figure 8; World Gold Council, 2018h).

Figure 8: Gold Reserve Holdings by Groups of Nations, 1950–2019



Note: In millions of troy ounces; averages for individual decades from 1950 until 2019.
Source: Refinitiv Datastream; authors' calculations.

Central banks hold gold in their reserves mainly for historical reasons; the biggest stock of gold is held by the US central bank. This is due to the position of the USA in the global economy and is primarily a legacy of the post-war monetary system (see Figure 9 and the Appendix). Similarly, other central banks of advanced economies profit from gold reserves created during the gold standard era (for example Germany, France, Italy and Japan). Nonetheless, many of these central banks (such as those of Switzerland, the Netherlands and Portugal) sold gold in 2000–2005 under central bank gold agreements (CBGAs; World Gold Council, 2018a).

To prevent price volatility, CBGAs set volume limits on gold sales. These agreements were introduced in 1999 and are revised every five years.[15] The signatory central banks are mostly from European countries. The main benefits of CBGAs are enhanced stability of the gold market and greater transparency of gold sales, which prevents sharp price swings. The agreements established gold as an important part of international reserves (World Gold Council, 2018a). In the present millennium, the German central bank[16] has regularly been selling gold, and the central bank of Canada, for example, has not held an ounce of gold since selling all its holdings in 2016. Canada's gold reserves were gradually reduced because gold did not sufficiently meet the requirements for a reserve diversification asset. In particular, according to the Canadian central bank, gold is

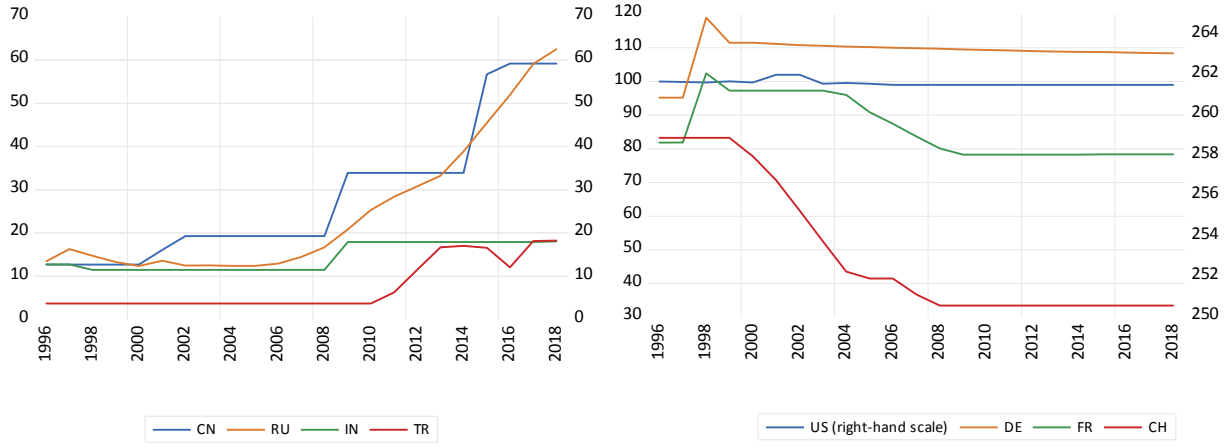
[15] According to the ECB, however, the revision due in September 2019 will not take place, as there is no longer a need for formal agreements given how the market has developed and matured since the last two revisions in 2009 and 2014 (ECB, 2019).

[16] Like the CNB, the German central bank uses its gold mainly to mint gold coins.

illiquid and has high transport and storage costs (Bank of Canada, 2019). Over the last few years, the Venezuelan central bank has lowered its gold reserves the most (due to economic problems in the country). On the other hand, the central banks of emerging market and developing economies, in particular China, Russia, Turkey and Kazakhstan,[17] have increased their gold stocks the most in the last decade.

Another major holder of gold reserves is the IMF, whose reserves were built up at the time of the Bretton Woods Monetary System. Although it has disposed[18] of part of its holdings, it still has the third-largest amount of reserve gold (Stoeferle and Valek, 2018; World Gold Council, 2018a; IMF, 2018; Mitchell, 2013; Speck, 2013). Gold was incorporated into the IMF's reserves in 1948 and gradually increased in amount due to the requirement for part of the member states' quotas to be paid in gold and to the need to make early loan repayments, which could only be done in gold. Since 1978, however, gold has not played an official role in either the international monetary system or the IMF (IMF, 2018).

Figure 9: Gold Reserve Holdings in Selected Countries, 1996–2019



Note: In millions of troy ounces; US – United States (right-hand scale); DE – Germany; FR – France; CH – Switzerland; CN – China; RU – Russia; IN – India; TR – Turkey; the appendix also provides data in tonnes for the first quarter of 2019.

Source: Refinitiv Datastream.

In most countries, the share of reserve gold, which depends on the total level of reserves and the price of gold on world markets, is relatively stable. However, this does not apply universally. In some countries, the ratio is conversely quite variable, reflecting economic volatility (an example being Venezuela at present) and related unconventional monetary policy actions by the central bank. Gold reserves account for more than 60% of total reserves in the central banks of

[17] The central banks of Russia and China currently have the sixth and seventh largest gold reserves respectively (World Gold Council, 2018h).

[18] Part of the gold was sold immediately after the closure of the gold window in the early 1970s. In 2009, the IMF was allowed under international gold agreements to sell one-eighth of its gold, which was sold not only to central banks (India, Mauritius and Bangladesh), but also on the market (IMF, 2018).

the USA, Germany, the Netherlands, Italy, Venezuela,[19] Greece, France and Cyprus (World Gold Council, 2018h; Appendix).

The rising quantities of gold in some central banks' reserves may indicate efforts to change the international monetary system. Calls for a reform of the system began to be made after the outbreak of the global financial crisis. There are now efforts to move from a dollar system, where the US dollar plays the central role, to a multi-currency one (Stoeferle and Valek, 2018; World Gold Council, 2018c; Farhi and Maggiori, 2016). The main agents in this respect are developing countries, most notably China and Russia, which would like to peg to gold again. These efforts are still at an early stage, but the steps taken by these countries' central banks to increase their gold reserves are sending clear signals in this regard. The gold reserves in the "vaults" of the central banks of China and Russia have more than tripled and quadrupled respectively over the last ten years, and both central banks are continuing to buy gold. The central banks of the two countries are trying to back their currencies with gold and hence disrupt the position of the US dollar in the global economy and change the international monetary system. The first country to attempt to realise this goal was Russia when it introduced a global dollar convertible into gold at a fixed rate (one global dollar per kilogram of gold) in 2013. It did this at a time when the Russian central bank's reserves had reached a sufficient level[20] to make the new currency credible. Although the step was a failure, mainly because it lacked broad support, it was the first harbinger of these efforts. China followed up in 2015 by establishing the Shanghai Cooperation Organization, which was later expanded to include a gold investment fund for central banks. This fund supports gold trade and facilitates access to gold for the central banks of the countries engaged in the project (Stoeferle and Valek, 2018; World Gold Council, 2018f; Farhi and Maggiori, 2016; Stoeferle and Valek, 2015; Mitchell, 2013; World Gold Council, 2013; Butler, 2012).

If some central banks decided to back their currency with gold and restore some form of the gold standard, they would need to ensure sufficient coverage of M2.[21] A gold stock of at least 20% of M2 is considered adequate partial coverage, as stated, for example, by Stoeferle and Valek (2015), Butler (2012), Nathan (2011) and Lewis (2007). According to these authors, the recommended range for the gold-to-M2 ratio is 10%–40% and would vary from country to country. The appropriate level depends on the approach to risk and on the level of trust in the economy and central bank in question. However, most countries are not even at the 10% level and would therefore have difficulty securing trust in their gold-backed currency. The USA, which, as mentioned above, has the largest stock of gold, currently has only around 2.3% of its M2 covered by the gold reserves of its central bank (see the Appendix). Of the countries under review, only Russia is within the recommended range. Its central bank currently holds over 2,000 tonnes of gold (i.e. more than 69 million troy ounces) and thus covers more than 12% of M2. By contrast, China, given its high M2 level and still relatively low gold stock, has a gold-to-M2 ratio of less than half a per cent. This is another reason why the central banks of Russia and China have

[19] The share of gold in Venezuela's international reserves is still high despite a reduction in its gold reserves. Besides oil, the Venezuelan government wants to use gold to cover the national digital currency due to sizeable reserves of this metal in its territory (World Gold Council, 2018h; Reuters, 2017).

[20] However, they remained well below the level usually recommended for backing a currency with gold (10%–40%; see below). At the time the global dollar was introduced, Russian M2 was only about 5% covered by gold.

[21] In the past, coverage of M0 (i.e. currency in circulation) was used to determine the amount of gold needed to restore the gold standard. Nevertheless, over time it was judged that this was insufficient in the modern world and that there was a need to cover a broader aggregate. In view of technological progress, M2 began to be used.

decided to increase their gold reserves. (Stoeferle and Valek, 2018; Stoeferle and Valek, 2017; Stoeferle and Valek, 2015; Butler, 2012; Nathan, 2011; Lewis, 2007).

The gold-to-monetary-aggregate ratio rule was primarily relevant to the gold standard and may not be suitable for application to modern advanced economies. At its current price, all the gold mined up to now[22] would not be enough to fully cover the M2 of the United States. In such case, the necessary market price of gold would exceed an astronomical $50,000 (per troy ounce). The necessary gold price for 40% coverage of US M2 would exceed $20,000 and that for 20% coverage would exceed $10,000 (Revenda, 2018; World Gold Council, 2018e; Stoeferle and Valek, 2017). Most countries do not have high enough levels from the perspective of the ratio of the price of gold to GDP, either (see the Appendix).

Whether high or low, the proportion of gold in international reserves has no affect on the practical "usability" of the reserves. It is generally believed that if an extreme crisis scenario such as a war were to arise, the use of international reserves, including gold, would probably have to be approved beforehand (for example, in cooperation between government and central bank officials). It should also be kept in mind that international reserves have counterparts on the central bank's balance sheet and in the balance of payments, so they are not simply assets with no associated liabilities. For example, the CNB holds international reserves to support its independent monetary policy-making. In addition, the reserves provide a source of foreign exchange liquidity for CNB clients, to whom the central bank sells foreign currency in exchange for koruna. The reserves can also be used to make foreign exchange interventions and to support the financial stability of the Czech banking system.[23]

Going forward, it can be expected that developing countries' efforts to increase the share of gold in their reserves will not cease and the upward trend in their gold reserves will continue. Many of these countries still see gold as the foundation of the monetary system, with gold inspiring unprecedented confidence not only among the general public, but also among the country's leaders. Nevertheless, the central banks of most advanced economies have long since abandoned any ideas of reintroducing the gold standard, so considerations of significantly increasing their gold reserves or even backing their currencies with gold are completely irrelevant to them (Stoeferle and Valek, 2018; Stoeferle and Valek, 2017; Stoeferle and Valek, 2015; Butler, 2012; Nathan, 2011; Lewis, 2007).

[22] By the end of 2017, approximately 190,000 tonnes of gold had been mined. Below-ground reserves of gold are estimated at roughly 54,000 tonnes (World Gold Council, 2018e). In addition, around 15,000 tonnes of gold have been irretrievably lost (Revenda, 2018).

[23] If the central bank did not have international reserves, it would not be able to dampen excessive volatility of the koruna's exchange rate where necessary.

5. The History and Significance of Monetary Gold Holdings in the Czech Republic since the Founding of Czechoslovakia

Czechoslovakia's gold reserves were established in 1919. Although it no longer has the role of underlying asset and is currently used mainly in the production of gold coins, gold has been held in the reserves of the Czech central bank and its predecessors from the creation of the First Czechoslovak Republic to the present day.

5.1 Historical View of Gold Holdings, 1919–1998

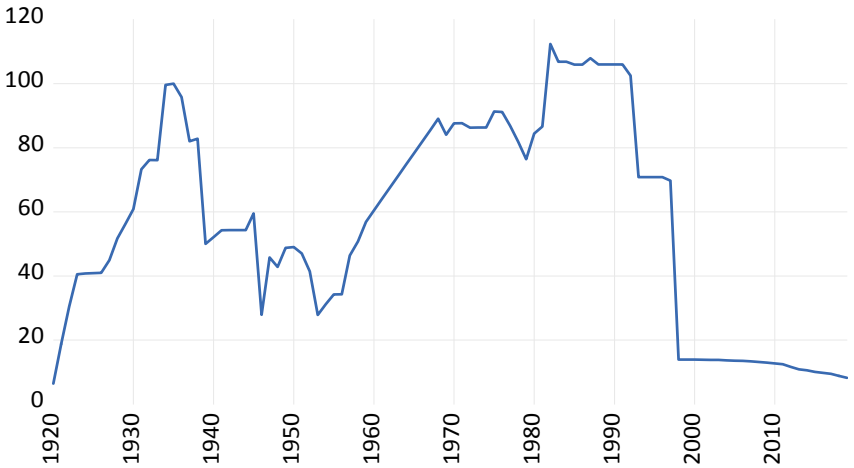
After the end of World War I and the break-up of the Austro-Hungarian Empire, the government of the independent Czechoslovakia decided to create a gold reserve. This step was intended to create backing for the new Czechoslovak currency and later also the introduction of the gold standard.[24] The basis of the gold reserve was the 12.1 tonnes of gold ceded from the Austro-Hungarian central bank to the newly formed state after the collapse of the monarchy, along with the "national gold hoard" (voluntary donations made by the public) and gold purchased from private individuals and obtained from four-year 4% loans in gold, silver and foreign currencies (CNB Archive, 2019; CNB, 2019a).

Gold holdings gradually increased from the founding of the independent Czechoslovak state until the end of the First Republic. The gold reserve expanded due to an obligation to offer cash and non-cash foreign currency to the state (first to the Banking Office of the Ministry of Finance and later to the Czechoslovak National Bank) by purchasing gold or exchanging silver for gold.[25] The Czechoslovak gold reserve reached 6.5 tonnes by the end of 1920 and 18.7 tonnes by 1921. By 1924, it had further increased to 40.7 tonnes thanks to the country's share in the liquidation of the Austro-Hungarian bank. The amount of gold held during the First Republic peaked at 99.98 tonnes in 1935. Owing to the threat of the impending war and to liquidity considerations, however, most of it was located outside Czechoslovakia, mainly in the UK and Switzerland (CNB Archive, 2019; CNB, 2019a). Figure 10 shows the gold holdings in the central bank's balance sheet from 1919 to the present.

[24] The introduction of a gold-backed currency was to have been the third and final phase of the Rašín Currency Reforms. This phase was preceded by a currency separation and a policy of deflation.

[25] Until 1929, the Czechoslovak central bank also held silver in its reserves.

Figure 10: Gold Holdings in the Balance Sheet of the Czechoslovak and Czech Central Banks, 1920–2019



Note: In tonnes; the period 1939–1945 is influenced by the war and transfers of gold to the Deutsche Reichsbank; the figure shows the data reported by the central bank; data for the period 1960–1967 are interpolated, as they are missing from the statistics; according to the available information, however, the central bank increased its gold holdings in that period.

Source: Compiled by the authors from materials in the CNB Archive, CNB ARAD.

After the Munich Agreement and the subsequent occupation of the rest of the Czech lands by Nazi Germany, the gold reserves decreased dramatically. The National Bank of Czechoslovakia, and subsequently the National Bank for Bohemia and Moravia, was forced to transfer part of the gold (15 tonnes and later another 23.1 tonnes) to the account of the Deutsche Reichsbank, and at the same time a substantial part of the Czechoslovak gold was withdrawn from abroad. The Germans did not receive the gold deposited at the Bank of England[26] and some other major central banks and part of the gold deposited at the Bank for International Settlements (almost 33 tonnes). After the proclamation of the Protectorate of Bohemia and Moravia, 6.4 tonnes of gold remained in Prague. Even it was ultimately moved to the Reichsbank in 1940, along with about 1 tonne still under the autonomous administration of important protectorate companies[27] (CNB Archive, 2019; CNB, 2019a).

The Czechoslovak central bank lost almost 45.5 tonnes of gold during the German occupation. When World War II ended, Czechoslovakia was entitled to claim the return of 24.5 tonnes of gold. The gold found on Germany territory was pooled there and subsequently distributed among countries according to a set ratio. This occurred after the signing of reparation agreements at the end of 1945 and the establishment of a special Tripartite Commission composed of representatives of the USA, the UK and France in 1946. The National Bank of Czechoslovakia applied for the return of 45.5 tonnes of gold and pushed for the exemption of coins of numismatic and historical value from the gold pool and their return to their original owners. In the end, Czechoslovakia was allocated only 24.5 tonnes of gold and the above-mentioned coins were not exempted from the gold pool. Czechoslovakia regained the first 6 tonnes as early as 1948, but the return of more gold stopped when the UK and the USA began to demand the repayment of war

[26] The Czechoslovak gold stored at the Bank of England was used to finance the war expenses of the Czechoslovak government-in-exile.

[27] Akciová společnost (formerly Škodovy závody in Pilsen) and Zbrojovka Brno.

loans and settlement of property claims.[28] The situation was finally resolved 34 years later. In the meantime (the 1950s through to the 1980s), the gold reserve was increased through targeted purchases of gold (CNB Archive, 2019; CNB, 2019a).

A final agreement on the settlement of obligations and claims dating from the war and post-war periods was not reached until 1982. In 1982, Czechoslovakia signed reparation agreements with the UK and the USA. Under these agreements, Czechoslovakia agreed to pay the financial compensation demanded, and, after payment thereof, it was to obtain the remaining gold it had been awarded by the Tripartite Commission. Czechoslovakia thus paid the UK £24.3 million and the USA $84.4 million and in return received the remaining 18.4 tonnes of wartime gold (Šír, 2006). This step marked the conclusion of a post-war settlement process taking over 30 years (CNB Archive, 2019; CNB, 2019a).

The end of the Czechoslovak Federation meant the division of monetary gold between the two successor states and their newly created central banks. The Czech National Bank (CNB) received 70 tonnes of gold and the National Bank of Slovakia 30 tonnes. The subsequent evolution of gold holdings differed in the successor central banks of the State Bank of Czechoslovakia. The National Bank of Slovakia maintained a roughly constant amount of gold in its reserves (and still holds around 30 tonnes), while the Czech National Bank significantly reduced its gold reserves (CNB Archive, 2019; CNB, 2019a; NBS, 2019).

5.2 The Czech National Bank and its Gold Holdings

The CNB sold off the bulk of its reserve gold in 1998. By this time, gold had ceased to meet the CNB's needs in terms of liquidity, security and returns. Furthermore, the CNB needed to increase its international reserves to be able to intervene in support of the Czech koruna at times of currency turbulence. It thus sold 56 tonnes of gold, thereby gaining greater liquidity and return stability, and was left with 14 tonnes (CNB Archive, 2019; CNB, 2019a).

The CNB uses its gold reserves exclusively to produce gold coins; this partly explains the low ratios of reserve gold to GDP and M2. The CNB has been using gold from its reserves to produce gold coins since 1995. This, together with the 1998 gold sale, has contributed to a gradual reduction in the gold reserves. Unlike in the past, when the central bank minted Czechoslovak ducats at the turn of the 1970s and 1980s, however, it no longer buys gold for the money received and so does not maintain a stable or slightly increasing level of gold reserves. The CNB regularly mints gold coins in series (e.g. Ten Centuries of Architecture, Industrial Heritage Sites, Bridges in the Czech Republic and Castles in the Czech Republic) and to mark anniversaries of important events connected with the Czech Republic (e.g. the Golden Bull of Sicily, the arrival of missionaries Constantine and Methodius, the burning at the stake of Jan Hus, the foundation of Czechoslovakia and the introduction of the Czechoslovak currency). In addition, a heavyweight gold coin with a nominal value of 100 million koruna was produced in 2018 to mark the 100th

[28] Czechoslovakia had obligations to the UK in the form of: (i) a loan that the government-in-exile had obtained from the British side after the gold reserves deposited at the Bank of England to finance the organisation and armament of the Czechoslovak army in the UK ran out; (ii) the "Munich loan" (a loan of £10 million provided to Czechoslovakia by the UK after the Munich Agreement to enable it to overcome economic difficulties after it had ceded a large part of its territory to Germany) and (iii) compensation for nationalised property to which the UK was entitled under a 1949 treaty with Czechoslovakia. The United States demanded financial compensation for the nationalised property of former Czechoslovak citizens who had become US citizens.

anniversary of the koruna[29] (CNB Archive, 2019; CNB, 2019a; CNB, 2019b; CNB, 2019c). Given the CNB's low gold stock (the CNB held 8.8 tonnes, or 0.282 million troy ounces, of gold at the end of 2018), the ratios of gold to GDP and M2 are also low. The CNB has lower gold reserves than the central banks of the other Visegrád Four nations (Hungary, Poland and Slovakia; see the Appendix).

The level of gold reserves in the CNB's overall international reserves thus been negligible for the past almost 20 years and currently makes up roughly 0.2% of the actively managed reserve portfolio (CNB, 2018). This statement is reinforced by the rise in the reserves that occurred at the time of the exchange rate commitment (7 November 2013 to 6 April 2017), when the CNB kept the koruna's exchange rate above CZK 27 to the euro. The dollar value of the reserves rose from $47.5 billion at the end of October 2013 to $136.2 billion at the end of April 2017. The dollar value of the reserves continued to rise over the next two years, reaching $143.5 billion at the end of April 2019.

The CNB's international reserves therefore reflect the purpose for which they are held, which is primarily to support independent monetary policy-making.[30] In response to the increase in the reserves that occurred while the CNB's exchange rate commitment was in place (2013–2017), the reserves were divided internally into two parts (tranches), which differ in investment horizon, risk parameters and expected returns. The ratio between the two tranches is determined by the IMF methodology used to estimate the appropriate size of international reserves. The liquidity tranche, which accounted for around 48% of the reserves at the end of 2018, is allocated to fixed-income money market instruments with a maturity of less than one year denominated in euros and US dollars, which, if necessary, can easily be converted into money without any major risk of capital losses. The remaining approximately 52% of the reserves make up the investment tranche, which consists of three components: fixed-income capital market instruments with maturities of more than one year, an equity part (around 10% of the international reserves) and a bond part (termed "new investments", i.e. agency mortgage-backed securities and covered bonds).[31] The currency composition of the investments is broader here, covering the Canadian and Australian dollars, the British pound and the Swedish krona as well as the euro and the US dollar. The equity portfolio is invested[32] on the following markets using the relevant benchmark indices: European (MSCI Euro), US (S&P 500), UK (FTSE 100), Japanese (Nikkei 225), Canadian (S&P TSX) and Australian (S&P ASX 200); see CNB (2018) and CNB (2017). The CNB actively invests most of its international reserves in accordance with its reserves management principles. The principles take into account the function performed by the international reserves and pay due regard to security, liquidity and returns. The largest part of the reserve portfolio is invested in debt securities issued by governments of economically advanced countries (especially OECD countries), selected government-guaranteed bonds and bonds issued by top-rated supranational institutions. Other instruments used for international reserves

[29] The coin is 53.5 cm in diameter and weighs 130 kg. It is the second-largest gold coin in the world (CNB, 2019b).

[30] The international reserves also serve as a source of foreign currency liquidity for CNB clients.

[31] In 2018, the CNB extended the range of investment instruments held in the investment tranche of its international reserves to include covered bonds of German banks and continued its preparations to include specific mortgage-backed securities guaranteed by selected US agencies.

[32] The CNB's equity portfolio is managed by BlackRock and State Street Global Advisors, both of which comply with the Global Investment Performance standards.

management include shares, repos, specific covered bonds, deposits with central banks, futures, and interest rate, currency and equity swaps. All creditor positions vis-à-vis private counterparties are backed by financial collateral.

6. Conclusion

The historical milestones of the 20th and 21st centuries have significantly affected central banks' gold holdings. Our first conclusion is that most central banks in advanced economies, in particular the US Fed and central banks with reserve currencies, hold more gold in their balance sheets than would seem appropriate from their perspective. In most cases, this is a historical legacy of past international monetary systems. In contrast, many advanced economies have gradually reduced their gold holdings, or even entirely abolished them, over recent decades. The category of "non-gold central banks" includes the CNB, which, 20 years ago, limited the gold holdings in its international reserves to a small amount earmarked for the production of gold coins.

Central banks of advanced economies often have motives and tendencies to hold gold that are opposite to those of central banks in emerging market and developing economies. Our second conclusion is therefore that the popularity of gold in the international reserves of emerging market and developing economies (in contrast to advanced economies) is growing over time. This reflects non-economic reasons, i.e. the historically and culturally based role of gold in these countries, where it plays an important part in life. In some of these countries, the upward trends in gold holdings are motivated by political reasons and by efforts to force out the US dollar from the unprecedented role it still plays in the global financial system. These efforts are being reflected in these countries making increased purchases of gold to create sufficient reserves to back their currencies with this precious metal. This, however, is very difficult, or even utopian, given the amount of physical gold currently available and the quantity of money in circulation. The main requirements placed on CNB from the perspective of its reserve structure meanwhile are to ensure that the reserves are liquid, usable and stable in value. Other roles, such as speculating on future growth in prices of assets (gold), are not and have never been the mission of the CNB.

Gold is nonetheless starting to be used as an underlying asset for new forms of investment. Our third conclusion points to the future possible use of gold not only by private investors, but also by central banks, in new forms of investment (ETFs and paper and digital gold). These may offer an alternative to physical gold. However, they involve exposure to the price of gold, not physical ownership of gold, a fact that complicates the position of these forms. In addition, these forms of investment are not time-tested and have therefore not earned sufficient trust to be used as underlying assets for currencies.

Neither gold nor the new forms of investment in gold offer satisfactory portfolio diversification; this is a clear argument against significant use of gold in central banks' international reserves. This fourth conclusion is based on tests of the correlation between the prices of gold and other assets and currencies. On the basis of these tests, the use of gold for portfolio diversification cannot be unequivocally recommended. Still less can gold be viewed as a foundation in which a larger – never mind substantial – proportion of central banks' reserves should be allocated. In our opinion, this applies to advanced economies and in particular to those with reserve currencies. On the other hand, we cannot entirely say that gold is a mere relic of the

past. This is evidenced both by the recent experience with gold in emerging market and developing economies and by the investment activity of private investors in gold. We attribute the partial renaissance of investment in gold to investment conservatism and unprecedented concerns about standard investment assets fuelled by the still historically low level of interest rates in the world economy. However, it should be kept in mind that gold is primarily a long-term investment and the price of gold, as we have shown, is very volatile. So, despite the growing interest in it (not always motivated by economic reasons), gold cannot be expected to regain its status as the foundation of the international monetary system.

References

BANCO CENTRAL DE LA REPÚBLICA ARGENTINA (2018): "Speech of Federico Sturzenegger, governor of the Central Bank of Argentina, at the 16th RAMP Executive Forum for Policy-Makers and Senior Officials, organized by the World Bank." Buenos Aires: BCRA. Available at: http://www.bcra.gov.ar/Institucional/DescargaPDF/DownloadPDF.aspx?Id=649

BANK OF CANADA (2019): "Taking Precautions: The Canadian Approach to Foreign Reserves Management." Ottawa: BoC. Available at: https://www.bankofcanada.ca/2019/02/taking-precautions-canadian-approach-foreign-reserves-management/

BOTT, S. (2013): "*The Global Gold Market and the International Monetary System from the Late 19th Century to the Present*." Houndmills: Palgrave Macmillan. ISBN 978-1-137-30670-8.

BRYAN, S. (2010): "*The Gold Standard and the Turn of the Twentieth Century: Rising Powers, Global Money, and the Age of Empire*." New York: Columbia University Press. ISBN 978-0-231-15252-5.

BUTLER, J. (2012): "*The Golden Revolution: How to Prepare for Coming Global Gold Standard*." Hoboken: Wiley. ISBN 978-1-118-13648-5.

CHRISTIANO, L. AND T. FITZGERALD (2003): "The band-pass filter." International Economic Review, 44(2), pp 435-65. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/1468-2354.t01-1-00076

CNB (2017): "CNB Annual Report 2017." Prague: CNB. Available at: https://www.cnb.cz/export/sites/cnb/en/about_cnb/.galleries/performance/annual_reports/download/vz_2017_en.pdf

CNB (2018): "CNB Annual Report 2018." Prague: CNB. Available at: https://www.cnb.cz/export/sites/cnb/en/about_cnb/.galleries/performance/annual_reports/download/vz_2018_en.pdf

CNB (2019a): "Československé zlato [Czechoslovak Gold]." Prague: CNB. Available at: http://www.historie.cnb.cz/cs/menova_politika/prurezova_temata_menova_politika/2_ceskoslovenske_zlato.html

CNB (2019b): "ČNB chystá na rok 2019 oslavy 100 let koruny; symbolem je druhá největší zlatá mince na světě [CNB plans celebrations of 100 years of koruna for 2019; symbol is second-largest gold coin in the world]." Prague: CNB. Available at: https://www.cnb.cz/cs/cnb-news/tiskove-zpravy/CNB-chysta-na-rok-2019-oslavy-100-let-koruny-symbolem-je-druha-nejvetsi-zlata-mince-na-svete/

CNB (2019c): "Numismatics." Prague: CNB. Available at: https://www.cnb.cz/en/banknotes-and-coins/numismatics/

CNB ARCHIVE (2019): "Stav veškerého zlata [The Stock of All Gold]." Prague: CNB Archive.

DREHMANN, M., C. BORIO, AND K. TSATSARONIS (2012): " *Characterising the financial cycle: don't lose sight of the medium term!*" Basel: BIS. ISSN 1682-7678. Dostupné z: https://www.bis.org/publ/work380.pdf

ECB (2019): "As Market Matures Central Banks Conclude that a Formal Gold Agreement Is No Longer Necessary." Frankfurt am Main: ECB. Available at: https://www.ecb.europa.eu/press/pr/date/2019/html/ecb.pr190726_1~3eaf64db9d.en.html

FARHI, E. AND M. MAGGIORI (2016): "A Model of the International Monetary System." Massachusetts: Harvard University. Available at: http://scholar.harvard.edu/farhi/publications/model-international-monetary-system

GOLD FIELDS MINERAL SERVICES (2019): "Gold Survey (various years)." Available at: http://www.gfms.co.uk/

HOTELLING, H. (1931): "The Economics of Exhaustible Resources." *Journal of Political Economy*, 39, pp. 137–175.

IMF (2018): "Gold in the IMF." Washington: International Monetary Fund. Available at: http://www.imf.org/external/np/exr/facts/gold.htm

IMF (2019): "WEO – Advanced Economies." Washington: International Monetary Fund. Available at: https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/weoselco.aspx?g=110&sg=All+countries+%2f+Advanced+economies

LEWIS, N. (2007): "*Gold: The Once and Future Money*." New Jersey: John Wiley and Sons, Inc. ISBN 978-0-470-04766-8.

MCGUIRE, S. (2013): "*The Silver Bull Market: Investing in the Other Gold*." Hoboken: Wiley. ISBN 978-1-118-38369-8.

MITCHELL, K. (2013): "*Gold Wars: The Battle for the Global Economy*." Atlanta: Clarity Press. ISBN 978-0-9860362-6-2.

MNB (2018): "Hungary's Gold Reserves Increase Tenfold, Reaching Historical Levels." Budapest: MNB. Available at: https://www.mnb.hu/en/pressroom/press-releases/press-releases-2018/hungary-s-gold-reserves-increase-tenfold-reaching-historical-levels

NATHAN, P. (2011): "*The New Gold Standard: Rediscovering the Power of Gold to Protect and Grow Wealth.*" Hoboken: Wiley. ISBN 978-1-118-04322-6.

NBS (2019): "International Reserves and Foreign Currency Liquidity." Bratislava: NBS. Available at: https://www.nbs.sk/en/statistics/balance-of-payments-statistics/international-reserves/international-reserves-and-foreign-currency-liquidity

REUTERS (2017): "Venezuela oil-backed cryptocurrency to launch in days – government." London: Thomson Reuters. Available at: https://www.reuters.com/article/venezuela-economy-cryptocurrency/venezuela-oil-backed-cryptocurrency-to-launch-in-days-government-idUSL1N1OS1GY.

REVENDA, Z. (2018): "Krytí peněz v současnosti – mýty, varianty a realita [Backing of Money at Present – Myths, Variants and Reality]." *Politická ekonomie*, 66(5), pp. 633–651.

ŠÍR, V. (2006): "Financování čs. jednotek ve Velké Británii, zlatý poklad [Financing of Czechoslovak units in Great Britain, the gold hoard]." Prague: Fronta.cz. Available at: https://www.fronta.cz/dotaz/financovani-cs-jednotek-ve-velke-britanii-zlaty-poklad

SJAASTAD, L. A. AND F. SCACCIAVILLANI (2003): "*The Price of Gold and the Exchange Rate*." In: Tcha, M. (ed.): Gold and the Modern World Economy. London: Routledge.

SPECK, D. (2013): "*The Gold Cartel: Government Intervention in Gold, the Mega-Bubble in Paper, and What This Means for Your Future*." Houndmills: Palgrave Macmillan. ISBN:978-1-137-28642-0.

STOEFERLE, R.-P. AND J. M. VALEK (2015): "In Gold We Trust 2015." Vaduz: Incrementum AG. Available at: http://www.incrementum.li/en/research-analysis/in-gold-we-trust-2015/

STOEFERLE, R.-P. AND J. M. VALEK (2016): "In Gold We Trust 2016." Vaduz: Incrementum AG. Available at: http://incrementum.li/wp-content/uploads/2016/06/In_Gold_we_Trust_2016-Extended_Version.pdf

STOEFERLE, R.-P. AND J. M. VALEK (2017): "In Gold We Trust 2017." Vaduz: Incrementum AG. Available at: https://www.incrementum.li/en/journal/in-gold-we-trust-report-2017/

STOEFERLE, R.-P. AND J. M. VALEK (2018): "In Gold We Trust 2018." Vaduz: Incrementum AG. Available at: https://ingoldwetrust.report/igwt-2018-en/?lang=en

WIGGINS, CH. (2003): "*Western Australian Mineral Commodity Outlook*." In: Tcha, M. (ed.): Gold and the Modern World Economy. London: Routledge.

WORLD GOLD COUNCIL (2013): "Gold, the Renminbi and the Multi-Currency Reserve System." London: World Gold Council. Available at: https://www.gold.org/sites/default/files/documents/gold_renminbi_multi-currency_reserve_system.pdf

WORLD GOLD COUNCIL (2018a): "Central Bank Gold Agreements." London: World Gold Council. Available at: https://www.gold.org/what-we-do/official-institutions/central-bank-gold-agreements

WORLD GOLD COUNCIL (2018b): "Gold-backed ETFs." London: World Gold Council. Available at: https://www.gold.org/research/market-primer/gold-backed-etfs

WORLD GOLD COUNCIL (2018c): "Gold Demand Trends Full Year 2017." London: World Gold Council. Available at: https://www.gold.org/research/gold-demand-trends/gold-demand-trends-full-year-2017

WORLD GOLD COUNCIL (2018d): "Gold Demand Trends Q2 2018." London: World Gold Council. Available at: https://www.gold.org/research/gold-demand-trends/gold-demand-trends-q2-2018

WORLD GOLD COUNCIL (2018e): "How Much Gold Has Been Mined?" London: World Gold Council. Available at: https://www.gold.org/about-gold/gold-supply/gold-mining/how-much-gold

WORLD GOLD COUNCIL (2018f): "Market Update: Central Bank Buying Activity." London: World Gold Council. Available at: https://www.gold.org/research/market-update/central-bank-buying-activity

WORLD GOLD COUNCIL (2018g): "The Relevance of Gold as a Strategic Asset." London: World Gold Council. Available at: https://www.gold.org/research/relevance-of-gold-as-a-strategic-asset

WORLD GOLD COUNCIL (2018h): "World Official Gold Holdings." London: World Gold Council. Available at: http://www.gold.org/research/latest-world-official-gold-reserves

WORLD GOLD COUNCIL (2019): "Gold Demand Trends Full Year and Q4 2018." London: World Gold Council. Available at: https://www.gold.org/goldhub/research/gold-demand-trends/gold-demand-trends-full-year-2018

Appendix: Gold Holdings of Selected Central Banks

Country	Gold			
	tonnes	% of total reserves	% of GDP	% of M2
Austria	279.99	49.79	10.62	2.98
Belgium	227.40	35.06	7.52	1.52
Bulgaria	40.45	5.99	11.77	3.06
Canada	0.00	0.00	0.00	0.00
China	1,885.48	2.46	2.48	0.28
Croatia	0.00	0.00	0.00	0.00
Cyprus	13.90	61.90	10.06	na*
Czech Republic	8.21	0.24	0.59	0.17
Denmark	66.55	4.01	3.29	1.35
Estonia	0.25	1.10	0.14	0.06
Finland	49.14	19.31	3.17	1.17
France	2,436.04	60.85	15.07	4.11
Germany	3,369.72	70.30	14.55	4.09
Greece	113.18	64.51	9.76	2.38
Hungary	31.51	4.26	3.62	1.47
India	612.57	6.14	3.24	4.32
Ireland	6.00	4.80	0.27	0.10
Italy	2,451.84	66.13	21.08	5.84
Japan	765.22	2.47	2.54	0.35
Latvia	6.62	6.26	3.57	1.68
Lithuania	5.82	4.54	2.00	0.78
Luxembourg	2.24	9.96	0.56	0.03
Malta	0.19	0.79	0.22	0.03
Netherlands	612.45	66.31	11.47	2.68
Poland	128.64	4.74	3.89	1.42
Portugal	382.54	57.98	27.80	6.24
Romania	103.70	10.72	8.96	4.76
Russia	2,168.30	18.50	24.24	12.84
Slovakia	31.69	22.85	5.35	1.82
Slovenia	3.17	13.73	1.04	0.44
Spain	281.58	16.38	3.50	0.86
Sweden	125.72	8.44	3.98	1.43
Switzerland	1,040.00	5.36	24.98	4.21
Turkey	293.80	13.96	12.22	5.52
UK	310.29	7.91	1.83	0.56
USA	8,133.46	74.80	6.50	2.31

Note: * M2 in USD is missing for Cyprus; end-2019 Q1 figures.

Source: Refinitiv Datastream; authors' calculations.

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Czech National Bank
Economic Research Division
Na Příkopě 28, 115 03 Praha 1
Czech Republic
phone: +420 2 244 12 321
fax: +420 2 244 12 329
http://www.cnb.cz
e-mail: research@cnb.cz
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