

Myrmikan Research

January 14, 2020

Daniel Oliver
Myrmikan Capital, LLC
doliver@myrmikan.com
(646) 797-3134

Gold Past \$10,000

Gold in 2019 finally burst through the \$1,350 ceiling that had been established during the crash of 2013. Gold's current price of \$1,550 may be materially higher than where it has traded over the past six years, and it has returned most gold miners to profitability, but it is nothing compared to where the price of gold is headed.

For the benefit of new readers and to jog the memories of long-time followers, let us work through the admittedly circuitous but conceptually simple reasoning behind the reason why the dollar price of gold is heading well above \$10,000 per ounce.

The first step is to dispense with the quantity theory of money that underlies modern economics. This theory stretches back to the sixteenth century but was given its modern theoretical framework by Irving Fisher, who penned the famous equation that lies at the heart of monetarism: $M \cdot V = P \cdot T$, where M is the total amount of money in circulation on average, V the average frequency with which a unit of money is spent (its "velocity"), P the price level, and T the number of transactions, or volume of trade. "In short," wrote Fisher,

the quantity theory asserts that (provided velocity of circulation and volume of trade are unchanged) if we increase the number of dollars, whether by renaming coins, or by debasing coins, or by increasing coinage, or by any other means, prices will be increased in the same proportion. It is the number, and not the weight, that is essential. This fact needs great emphasis.*

A cursory analysis of Fisher's equation reveals it to be a tautology: the quantity of money transactions equals the quantity of sales in monetary terms, which is true by definition and thus makes the equation utterly useless.†

* Irving Fisher, *The Purchasing Power of Money, its Determination and Relation to Credit, Interest and Crises*, by Irving Fisher, assisted by Harry G. Brown (New York: Macmillan, 1922). New and Revised Edition.

† Milton Friedman claimed: "The tautology embodied in the quantity equation is a useful device for clarifying the variables stressed in the quantity theory." Except that it is not useful, as Benjamin Anderson explained in detail: "But it is important to note that in PT , as defined by Professor Fisher, we are at three removes from the concrete exchanges in which actual concrete causation is focused: we have first taken, for each commodity, an average, for a period, say a year, of the concrete prices paid for a unit of that commodity, and multiplied that average by the abstract number of units of that commodity sold in that year; we have then summed up all these products into a giant aggregate, in which we have mingled hopelessly a mass of concrete causes which actually affected the particular prices; then, finally, we have factorized this giant composite into two numbers which have no concrete reality, namely, an average of the averages of the prices, and a sum of the abstract numbers of the sums of the goods of each kind sold in a given year—a sum which exists only as a pure number, and which, consequently, is unlikely to be a causal factor! It may turn out that there is reason for all this, but if a causal theory is the object for which the equation of exchange is designed, a strong presumption against its usefulness is raised. Both P and T are so highly abstract that it is improbable that any significant statements

NOTE: This material is for discussion purposes only. This is not an offer to buy or sell or subscribe or invest in securities. The information contained herein has been prepared for informational purposes using sources considered reliable and accurate, however, it is subject to change and we cannot guarantee the accurateness of the information.

Keynes also adhered to the quantity theory, though his take was somewhat different because he added a cash preference variable that functioned something like this: Imagine that everyone holds enough cash for six weeks of expenditures. Now imagine everyone decides all at once to keep only three weeks of cash on hand—in other words, cash balance preference declines by half. Each person would go spend half his money on stocks, property, food, goods, services—it does not matter on what. But the money is not destroyed: every purchase has the effect of transferring the cash to someone else. The transferee of the cash must now spend not only half his original cash position but all of the newly received money as well. As everyone buys things in an attempt to lower his cash balance, the price level must rise. Ultimately, once the price level has doubled, then the same amount of cash for each person (and the same overall quantity in the economy) will be sufficient for only three weeks of expenditures. Milton Friedman (who based his monetarism on Keynesian formulations) concluded: “Let individuals on the average decide to hold half as much cash, and the ultimate result will be a doubling of the price level.”*

Keynes argued that a doubling of the money supply might not immediately double prices because such an event would change cash balance preferences, but, he added, “in the long run, this is probably true” and of the quantity theory concluded: “This Theory is fundamental. Its correspondence with fact is not open to question.”†

Let us open this theory to question by looking at an alternate theory of money developed by Carl Menger, founder of the Austrian school of economics. Menger posited that every good has its own level of liquidity, in other words, transaction costs needed to trade it. Menger divided liquidity into two qualities: spatial and temporal.

Spatial liquidity refers to the direct costs of trading a commodity and is determined by the elements of recognizability, uniformity, divisibility, distribution, and settlement costs. Spatial liquidity is expressed in the market by the spread between bid and ask and the depth of those bids and asks (i.e., the ability to make large transactions at the bid or ask without moving them) as well as settlement costs.

Temporal liquidity refers to the costs of holding a commodity over time, including rate of decay, storage costs, long-term stability, and short-term volatility.‡

Menger theorized that the way “money” developed was that over time each producer found it cheaper to trade his goods:

not only for such as he happens to be in need of [i.e., through direct barter], but, if this cannot be effected directly, for other goods also, which, while he did not want them himself, were nevertheless more saleable [liquid] than his own. By so doing he certainly does not attain at once the final object of his trafficking, to wit, the acquisition of goods needful to himself. Yet he draws nearer to that object. By the devious way of a mediate exchange, he gains the prospect of accomplishing his

can be made of either of them. As concepts gain in generality and abstractness, they lose in content.” M and V are similarly hopelessly abstract. (Anderson, B. M. (1917). *The value of money*. New York: The Macmillan Company: 162.)

* Friedman, M. (1994). *Money mischief: Episodes in monetary history*. San Diego: Harcourt Brace & Co.: 32.

† Keynes, John Maynard. 1923. *A tract on monetary reform*. London: Macmillan: 74.

‡ To illustrate the distinction between the latter two, consider oil: since the U.S. dollar was severed from gold in August of 1971, oil has increased 26 times in terms of dollars, or 8 percent per year on average. Oil in terms of gold is roughly the same, demonstrating long-term stability. Over that same time period, the rolling 12-month volatility of oil prices in dollar terms has been 63 percent, whereas pricing oil in gold reduces volatility to 40 percent, demonstrating the difference in short-term volatility.

purpose more surely and economically than if he had confined himself to direct exchange.*

As various commodities competed to become the mediate good of choice, the ones with physical attributes most conducive to liquidity would be used ever more frequently. As trade began to gravitate to certain monetary commodities, institutional mechanisms developed spontaneously to lower the costs of trade in that commodity still further.

At the dawn of history, copper became the supreme monetary commodity. Its physical liquidity profile is not as good as silver's or gold's, but it is more plentiful and, therefore, became widely distributed long before the precious metals. As silver became plentiful due to mining and distributed due to trade, it became the monetary center, a position it occupied for millennia. Gold has always been valuable, but its extreme scarcity reduced its liquidity below that of silver. It was not until the nineteenth century that enough gold became available and distributed that the market switched to the gold standard.

Importantly, it was not wise politicians consulting with expert economists that made the choice to switch the monetary center to gold—it was an emergent result driven by the liquidity demands of the market. As Horace White noted in 1893:

The most impressive fact in the world of finance is the dominance of the gold standard. A year or two ago Roumania passed under its sway, today it is Austria, next year or soon it will be India, by and by it will be Russia, and meanwhile it has lost no ground that it has ever held. Three international conferences have been assembled to stay this conquering march, while none has been called to promote or assist it. Yet the movement has been as little impeded as that of an ocean steamer would be by the action of a debating society in its own cabin. Is all this due to human perversity, or has it a rational cause founded in the needs of mankind?†

Gold may not have supplanted silver entirely until the late nineteenth century, but it had already been playing a monetary role for a couple of millennia. Silver is most liquid for small transactions but unwieldy to use for large transactions, at which gold excels. Thus, a bimetallic system reigned until the nineteenth century. As Adam Smith put it: “In the progress of industry, commercial nations have found it convenient to coin several different metals into money; gold for larger payments, silver for purchases of moderate value, and copper, or some other coarse metal, for those of still smaller consideration.”‡

Having a dual standard, as in the case of gold and silver, is, in fact, the rule not the exception. Friedrich Hayek noted:

The definition of money as the generally acceptable medium of exchange does not, of course, necessarily mean that even within one national territory there must be a single kind of money which is more acceptable than all others; there may be several equally acceptable kinds of money (which we may more conveniently call currencies), particularly if one

* Menger, Karl. “On the Origin of Money.” *The Economic Journal* 2, no. 6 (1892): 239-55.

† White, Horace. *The Gold Standard. How It Came into the World and Why It Will Stay. A Historical Sketch with Some Practical Reflections Thereon.* The Evening Post Pub. Co., 1893: 3.

‡ Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations by Adam Smith, edited with an Introduction, Notes, Marginal Summary and an Enlarged Index by Edwin Cannan* (London: Methuen, 1904). Vol. 1: 40.

kind can be quickly exchanged into the others at a known, though not fixed, rate.*

This concept may be somewhat foreign to Americans, but it continues to operate in the many parts of the world where the U.S. dollar circulates alongside the local currency, such as in Argentina and Russia: the local currency plays the role of copper and the U.S. dollar that of silver.

Once we understand that money is merely the instrumentality through which liquidity flows, we can see that the quantity of one particular form of money is not determinative of its value. If the quantity of gold were to decline suddenly by 99%, its value would surely rise, but not by 100 times—the market would instead make greater use of silver. And if silver were also to disappear, then the money market would switch back to copper, and further back in monetary history we find grain and cattle and pigs and sea shells.

Knut Wicksell used this deeper understanding of money to demonstrate the fallacy of Keynes's cash balance theory:

[The Quantity Theory] assumes, in the third place, that an almost constant *proportion* of all the business of exchange, even if not the whole of it, is transacted by means of money in the sense of coin or notes. In actual fact the border line between money in this sense and true instruments of credit (ordinary book credit, bills, cheques, etc.) is extremely vague; and over a wide range one can be substituted for the other—and on occasion is so substituted, as is demonstrated at every period of crisis.†

Having dispensed with the quantity theory to as a means to evaluate the value of a monetary unit, let us now explore the liquidity theory further by delving into some additional monetary history. Menger's deduction on why gold serves as the best money also serves to illustrate why the market preferred gold in coin form rather than in nugget form: coins are more identifiable and uniform. Through wear and clipping over time, however, each coin begins to have slightly differing amounts of metal in it. Records in Holland reveal that by the sixteenth century there were more than one thousand different *types* of coin circulating, and each *particular* coin was also slightly different through wear. Merchants had to weigh not only the goods they were selling but also the coins being tendered in payment.

The Bank of Amsterdam was chartered in 1609 to mitigate the Dutch coinage problem. The bank's function was simple. It accepted bullion coins on deposit, weighed and assayed them consistently, and then issued ledger accounts against the coins according to their metal content, not face value. Merchants could, at any time, withdraw the coin for a fee or transfer value from one account to another.

This checkbook money proved more liquid than coinage because it was perfectly uniform and was readily and credibly redeemable for bullion at any time. The additional liquidity caused the bank money to trade at a premium to bullion itself, enabling the bank to profit by charging for its services. Merchants did not seek the bank money because it was more valuable—the bank took most of the surplus value in fees—but because the money was more liquid: the spread between bid and ask was tighter and trading with it entailed smaller transaction costs.

* Hayek, Friedrich A. von. *The Denationalisation of Money: the Argument Refined: an Analysis of the Theory and Practice of Concurrent Currencies*. The Institute of Economic Affairs, 1990: 55.

† Wicksell, Knut. *Interest and Prices*. Translated by R. F. Kahn, Macmillan and Co. Limited, 1936:40-41.

It is often claimed in the present time that gold is not money because retail stores will not accept gold coin. Merchants, in fact, have not preferred physical bullion for at least four centuries. This does not mean that paper somehow suddenly became more liquid than gold, merely that man's genius raised gold to a higher level of liquidity beyond the coin. The value of paper money derived from gold just as the value of gold derived from market demand for the most liquid element to enable trade.

With this paper money we enter the realm of banking and balance sheets. The Bank of Amsterdam recorded physical gold deposits as assets and its notes as liabilities. Its sole function was to enhance liquidity, not create credit. As long as the market value of gold matched the face value of the notes, its notes could not lose value. Adam Smith wrote of the bank: "no point of faith is better established than that for every guilder, circulated as bank money, there is a correspondent guilder in gold or silver to be found in the treasure of the bank."*

The Dutch were not the only ones to balance paper with metal. Chinese scholar Wang-k'i writing in the fourteenth century A.D. recorded how paper money began in China:

If the law of redemption shall be carried out an equal amount of copper money should be deposited when notes are issued, as it was when in Sse-tsuen for the first time bills of exchange were emitted. The private persons who managed this issue took care that the notes came in when the copper money when out, whereas when the notes were issued the copper money deposited, and in this way metallic money and notes circulating side by side measured all merchandise of the empire, and in those days there was not the least reason why they should not circulate.†

In the days of the classical gold standard, banks issued notes not just against bullion but also against short-term commercial invoices maturing into gold, known as commercial bills. Commercial bills were radically different than mortgages. Bills had maturity dates no longer than 90 days from issuance and could come into existence only after a commercial transaction had been consummated, with settlement the only remaining risk. They were nearly immune from credit risk, being backed by invoices on consumer goods near consumption, and their short terms meant they had almost no interest rate risk. Banks that monetized bills were adding liquidity, not credit.

When a bank lends against a mortgage, by contrast, it grants purchasing power to a buyer of an asset before a transaction, which augments the borrower's purchasing power. The more banks lend against mortgages, the more asset prices rise, until high prices prompt overinvestment; overcapacity then reduces cash flows, leading to mass defaults and an economic crash. Mortgages thus have greatly higher credit risk than bills. In addition, unlike bills, which mature within 90 days, mortgages may remain outstanding for decades and, therefore, they also have pronounced interest rate risk.

The founders of the Federal Reserve recognized this distinction between commercial bills and mortgages. The Federal Reserve's initial charter allowed it to monetize "notes, drafts, and bills of exchange arising out of actual commercial transactions ... but such definition shall not include notes, drafts, or bills covering merely investments or issued or drawn for the purpose of carrying or trading in stocks, bonds or other investment securities," and only such bills having "a maturity at the time of discount of not more than ninety days." In other words, the Federal

* Smith (1904): Vol. 1, 450.

† Vissering, W. 1877. *On Chinese currency. Coin and paper money*. Leiden: E.J. Brill. p. 30.

Reserve was founded to enhance liquidity without adding credit, the proper function of a bank.

Having covered briefly the principles of liquidity and banking, let us now examine the history of the Federal Reserve's balance sheet, examining the mix of assets that have backed the dollar.

In 1915, the Federal Reserve's assets were 77% gold, 7% commercial bills, and 2% government bonds (the remainder a smattering of various "amounts due" from other institutions). By 1923, those figures had shifted to 61% gold, 22% commercial bills, and 3% government bonds. There was no possibility that the Federal Reserve's liabilities (i.e., the dollar) could decline in value when they were so backed: the Federal Reserve's assets had almost no credit risk nor interest rate risk. Those who held dollars could at any time demand that the Federal Reserve redeem their dollars into gold, but few would want to given that the dollar was more liquid than gold and so solidly backed.

During the credit collapse of the 1930s, asset prices crashed against real money (gold) as malinvestments liquidated. Roosevelt made holding gold a felony, but there was little need: the dollar, backed by gold and commercial bills, remained relatively constant. Gold, in fact, flooded into the central bank from Europe: by 1940, Federal Reserve assets were comprised of 85% gold, 0% commercial bills, and 9% government bonds.

Contemporaneous economists understood that the dollar had not become "too strong" in the 1930s; it was asset prices that had been too high in the 1920s. But then the age of Keynes arrived, and the Federal Reserve embarked its new mission of funding the government instead of liquefying trade. By 1971, the Federal Reserve had increased its assets and liabilities by five times and lost over half of its gold to European governments (which retained the right to redeem dollars into gold): its balance sheet shifted to 12% gold, 0% commercial bills, and 71% government bonds. The Federal Reserve was no longer a liquidity provider in the mold of the Bank of Amsterdam, but a credit creator for the state.

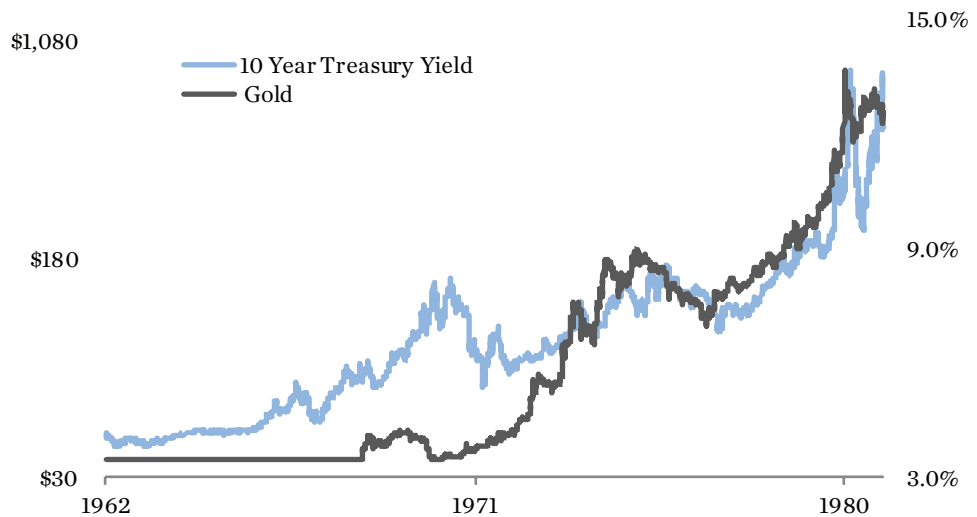
In 1971, Nixon closed the gold window, and U.S. physical gold reserves have remained nearly constant since. But the Federal Reserve bought enormous amounts of government bonds in the 1970s to keep interest rates low to prop up government spending and financial market excesses. By the end of 1980, the Federal Reserve had increased its liabilities (i.e., the number of raw dollars) by 76% by buying government bonds. The dollar's value collapsed.

Under the quantity theory, a 76% increase in the number of dollars should have produce a 44% decline in its value. Or, if we look at M2, which increased by 125%, the dollar should have fallen by 55%. Instead it fell against gold by 96%.

The chart below shows what happened: as the government printed more money, interest rates rose, and the bonds the Federal Reserve holds to back the currency fell in value. It wasn't that there were too many dollars chasing too few goods—as the monetarists claim—it was that each dollar was stripped of that which gave it value. It would as if the Bank of Amsterdam had suddenly announced that half of its gold reserve had been stolen: the value of its paper currency would immediately fall in half.

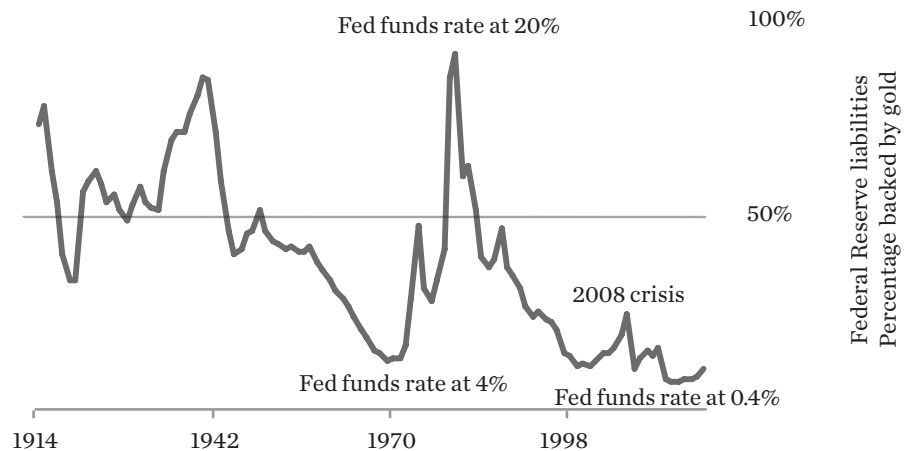
The surging price of gold—really the devaluation of the dollar—exactly tracked the increase in nominal interest rates. Note that the first surge in rates occurred when

the price of gold was still fixed—instead of the price of gold rising, the U.S. lost 15% of its gold reserves to European governments.



The next chart shows the Federal Reserve’s balance sheet in terms of its gold backing. It shows clearly what happened when the Keynesians took over economic power in the 1940s and stuffed the Federal Reserve full of Treasury bonds. Then, in 1971, the reaction set in: interest rates soared and as did the the price of gold until the Federal Reserve’s existing stock backed Federal Reserve liabilities by over 100%.

Then they did it again from 1981 to today (only this time they called themselves monetarists). The Federal Reserve bought government bonds to fund the growth of the state and keep interest rates low to stimulate industry artificially. Leading up to the 2008 panic, gold increased to a price that caused it to backed Federal Reserve liabilities by nearly 30%. But then the Federal Reserve issued dollars to buy Treasuries and mortgage-backed securities, massively expanding its balance sheet and saving the malinvestments.

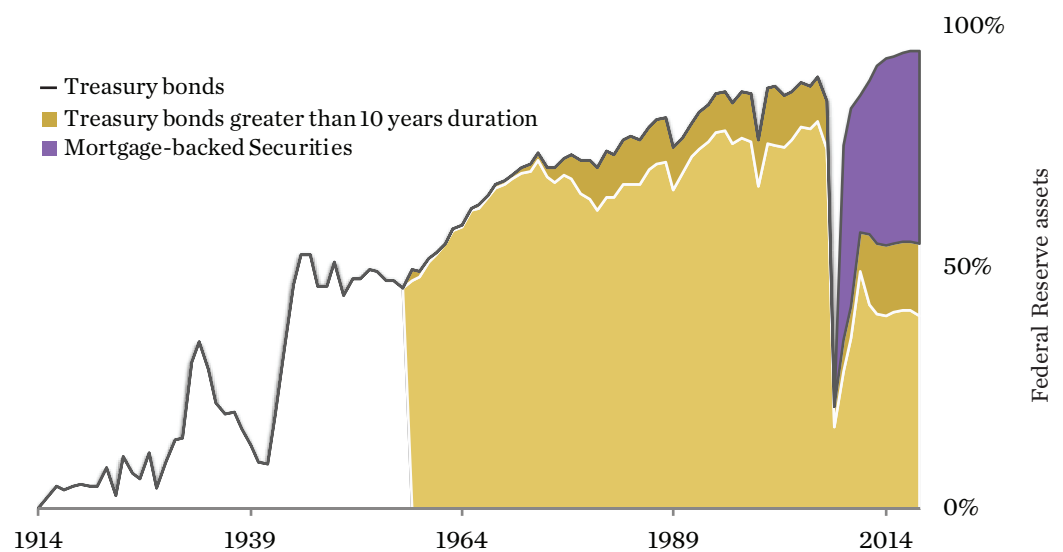


Sources: Federal Reserve Bank of St. Louis; Myrmikan Capital, LLC

NOTE: This material is for discussion purposes only. This is not an offer to buy or sell or subscribe or invest in securities. The information contained herein has been prepared for informational purposes using sources considered reliable and accurate, however, it is subject to change and we cannot guarantee the accurateness of the information.

By the time QE's were complete, the gold backing of the dollar had fallen to just 6% (as opposed to 12% in 1969). In other words: in 2016, with gold trading at \$1,050 per ounce, the price of gold was half what it had been in 1969 in terms of the Federal Reserve's balance sheet. And, as the chart below shows, the composition of that balance sheet in 2016 was much worse than it had been in 1969 (the dip in bond holdings in 2008 was due to temporary swap lines with other central banks and other short-term extraordinary bailout programs).

In the 1970s, the duration of the Treasury bonds on the Federal Reserve's balance was only a few years—now it is over a decade. Plus, the duration of mortgage-backed securities is inverse to the movement in rates: few borrowers refinance in a rising interest rates environment. Unlike at the Federal Reserve's founding, when its assets were virtually immune from interest rate risk, its assets now are highly sensitive.



At the moment, when the Federal Reserve prints money to buy bonds, the result is rising prices and falling interest rates, which keeps the government funded and financial markets aloft. The end of the dollar will begin when this dynamic flips, as it did in the 1970s. At some point, the market will demand a premium to protect against the weakening position of the Federal Reserve's balance sheet. The more the monetary authorities print, the higher rates will go, the more money the government will need to print to cover its interest payments and deficit, the lower the dollar will sink, and the higher gold's nominal price will be.

The question is when will the dynamic flip? The great economist Ludwig von Mises argued that psychological factors are determinative:

Finally, the public becomes aware of what is happening. People realize that there will be no end to the issue of more and more money substitutes—that prices will consequently rise at an accelerated pace. They comprehend that under such a state of affairs it is detrimental to keep cash. In order to prevent being victimized by the progressing drop in money's purchasing power, they rush to buy commodities, no matter what their prices may be and whether or not they need them. They prefer everything else to money. They arrange what in 1923 in Germany,

NOTE: This material is for discussion purposes only. This is not an offer to buy or sell or subscribe or invest in securities. The information contained herein has been prepared for informational purposes using sources considered reliable and accurate, however, it is subject to change and we cannot guarantee the accurateness of the information.

when the Reich set the classical example for the policy of endless credit expansion, was called *die Flucht in die Sachwerte*, the flight into real values.*

Mises's description of what happens after the panic begins is undoubtedly accurate, but there is no need to rely on psychology to determine when panic sets in: the cause is the collapse of cash flows from business projects due to overcapacity, which is what ended the canal boom of the 1830s, the railroad boom of the 1850s and 1870s, the stock market and real estate booms of the 1920s, 1960s, and 2000s.

After the last panic, the Federal Reserve managed to lower structural interest rates by around 4%. Existing projects looked more valuable, and the lower rates stimulated industry to build all the marginal projects that suddenly appeared to be profitable. Instead of a thorough liquidation of the financial and economic systems, the Federal Reserve engineered a new boom.

The next panic will similarly require not just a bailout of the banks but also a structural lowering of rates in order to avoid complete liquidation. This is why Bernanke announced earlier this month from his perch at the Brookings Institute that "new policy tools can provide the equivalent of 3 percentage points of additional policy space." These new tools include: "the future use of negative short-term rates, both because situations could arise in which negative short-term rates would provide useful policy space."

Negative interest rates that (adding the commercial banks' spread) result in near-zero rates for large industry might well serve to keep the economy and government from complete collapse for a time. The consequences, however, would include providing gold with a positive carry as against government bonds and further deterioration of the composition of the Federal Reserve's balance sheet.

At some point, whether it is during the next panic or the following one, the market will discover that much of society's wealth has become entrapped in non-cashflowing malinvestments. Tax revenues will plummet, and the assets that our central bank holds will be shown to be near worthless. That is when gold will shoot into the multi-thousands of dollars per ounce.

History allows us to make some projections: The average gold backing for Bank of England liabilities from 1720 to 1900 was 33%. Private banks in the U.K. maintained a similar percentage of gold backing during this time. This percentage was set more by the market than by policy-makers: until World War I, anyone could deposit gold and demand paper or vice-versa. The composition and size of the Federal Reserve's balance sheet requires gold to trade above \$5,000 to reach one-third backing.

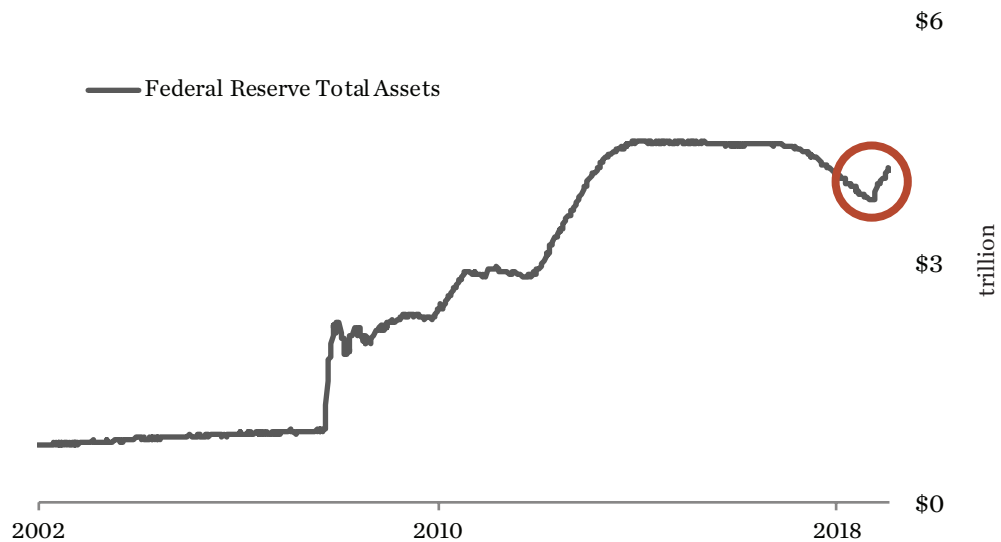
Looking at American history, Federal Reserve notes were freely exchangeable for gold until 1933, and the average gold backing of the Federal Reserve through that time was 54%. To reach that level of backing would currently require a gold price above \$8,500.

Recall, however, that the above figures occurred when the non-gold assets on central bank balance sheets were nearly all commercial bills. Given the current composition of the Federal Reserve's balance sheet, the market will demand more backing than one third or even a half.

* Mises, Ludwig Von. *The Causes of the Economic Crisis: And Other Essays before and after the Great Depression*. Edited by Percy L. Greaves. Auburn, Ala.: Ludwig Von Mises Institute, 2006: 197-8.

The panic in 1980, for example, sent gold to a price that caused Federal Reserve liabilities to be gold backed by an absurd 135%—to achieve the similar figure today would require gold to trade over \$20,000 per ounce. That was the peak of a dollar panic, not an equilibrium price, but it shows how crazy the gold market can get.

The nominal figures above assume that the Federal Reserve will keep the size of its balance sheet constant. But, of course, as Bernanke has telegraphed, the central bank will start printing as soon as recession looms. The Federal Reserve has, in fact, already starting printing to support the repo market, the primary funding mechanism for both the state and real estate loans.



Bernanke claimed on *60 Minutes*: “We could raise interest rates in 15 minutes if we have to. So, there really is no problem with raising rates, tightening monetary policy, slowing the economy, reducing inflation, at the appropriate time.” This is exactly what Federal Reserve governors thought would happen in 1979 when they boosted rates to 21%. Instead, the dollar went into its final swoon as the Federal Reserve’s bond portfolio collapsed in value.

The money to push gold over \$10,000 per ounce has already been printed. And now they are going to print more. The bubble economy is already teetering. No doubt strong fiscal and monetary intervention may extend its life for a time, but then the ultimate price objective for gold will then be markedly higher. The gold miners will do even better.



MYRMIKAN CAPITAL LLC

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon, this information by persons or entities other than the intended recipient is prohibited. If you received this in error, please contact the sender and delete the material from your computer.

The material contained herein is for discussion purposes only and is not an offer to buy or sell securities. It has been prepared using sources considered reliable and accurate, however, it is subject to change and the accurateness of the material cannot be guaranteed.