German monthly inflation toppled 29.500% in 1923; France had to let its currency depreciate by 93% against gold and silver between 1914 and 1939; in July 1946, Hungary experienced the highest rate of inflation ever reported: $4.19 \times 10^{16}$. The 20th century has witnessed radical impoverishment in Europe (and elsewhere) at the hands of inflation. With no significant inflation in the developed world since the 1980s, the recent economic turmoil has nonetheless managed to revive these old fears, pushing gold prices to spectacular new heights.

**The Supply and Demand of Money**

Inflation is a rather easily grasped concept: the value of goods, money included, is determined by their relative availability vs. other forms of wealth (Table 1). In other words, limiting the money supply should keep inflation under control. This is nevertheless a goal that is far from easy to achieve, as political authorities throughout history have instead seldom resisted the temptation to increase money supply in order to provide for wars and other unfunded public expenses.

Inflation is as old as money itself, and indeed is older than coinage since monetization began well before the first coin was struck. Miscellaneous pieces of cut silver and bronze alloys were used for a variety of monetary payments in ancient Eurasia, alongside other materials or goods such as cowries in most of Asia and Africa, or such as measures of grain, oil and wine in Egypt. As mining activities as well as the general production and circulation of goods developed, new supplies could affect the quantities of metal needed for commercial transactions.

China during most of its pre-imperial and imperial history (fig. 1), the Aztecs before the arrival of the Europeans (fig. 2) or several African nations well into the twentieth century, were among the areas using shaped forms of metal as monetary objects. Stamped monetary ingots served as money from the time of the Romans until as recently as 19th century Brazil (fig. 3).

The discovery of the American gold and silver mines by the Europeans is largely responsible for inflation in the 16th century. Similarly, increased circulation of base metals and shell-money as a result of European trade created strong inflationary conditions in many African areas: a slave was valued at 4 manillas in the 1400s vs. 57 in 1522 in West Africa (fig. 4); later on, a typical bride-price had risen from 50,000 cowries in 1850 to 700,000 in 1949 (fig. 5).

**Lydia**

The reasons why some authorities decided to coin standardized weights of metal have been debated for a long time. There was certainly an element of trade facilitation: trading a marked piece of metal theoretically allowed people to avoid the compulsory weighing step. This did not always work so well in practice since wear and deviations from weight standards led money users to often adjust coins’ relative values. Another important factor is that states played with the alloy content of their coins. That a profit could...
be realized in doing so certainly played a role in the
progressive (ab)use of marked pieces of precious metal
transacted at face value rather than at metal value.
The Lydian kingdom issued the first coins in the late
7th century BC., using electrum, a natural alloy of
gold and silver which was found in significant quanti-
ties in western Asia Minor (fig. 6). It is likely that in
producing these coins, authorities actually altered the
naturally occurring proportion of gold and silver in
the alloy, thus securing a profit since gold was about
ten to fifteen times more valuable than silver. The fact
that it was not easy to detect the exact proportion
of each metal in the coins and that electrum was so
abundant in the region probably helped motivate the
Lydian kingdom to begin minting coins, when other
sophisticated cultures of the Near East did not. Thus,
one of the reasons for issuing coinage from the very
beginning was the ability to deceive, illustrating how
public profits were often entangled with the concept
of official currency in Mediterranean cultures. Since
there are no records of prices for this period, we can
only guess whether or not prices of goods rose as a
result of this metallic manipulation.

Greece
From that moment onward, the rise or decrease of
prices in monetary terms became a combination of the
change in the relative supply of monetary metals and
of the degree of monetary manipulations undertaken
by the states issuing coins or other forms of marked
money. Greek and Roman history provide clear illus-
trations of the latter situations. Athens had from the
very beginning of its coinage stuck to very strict stan-
dards and issued silver coins of full intrinsic value,
supported by the resources of the Laurion mines. As
its coins became the standard anchor of value in the
Mediterranean world at the time, Athens took great
care in ensuring highly consistent quality and stan-
dards. But, cut off from its mining district and about
to lose its struggle against Sparta and its allies during
the Peloponnesian War, Athens started to produce
debased coinage consisting of plated coins in order
to keep up its war effort. In addition, the city’s gold
statues were melted down to produce an unheralded
gold coinage. Prices rose significantly during that
period, although, it is hard to determine the relative
impact of the debased coinage versus the grain short-
age in Athens that resulted from the partial blockade
by the city-state’s enemies. Once its political situation
had been restored, Athens demonetized this coinage
and returned to a stable silver currency. Other Greek
entities resorted to plated or debased coins. Elsewhere,
on-Athenian coins were usually traded at a discount
vs. Attic coins, implying a degree of price instability
in some areas of the Greek world as a result of official

Fig. 1. China. AE prototype knife, dao, ca. 800-400 BC (69.24 g).
(ANS 1937.197.19477, gift of Frances Reilly). 86.78 x 34.59 mm.

Fig. 2: Ancient Americas (Aztec Empire). AE "Hoe", ca. AD
1200-1520 (15.88 g). (ANS 0000.999.53380). 209.51 x 73 mm.

Fig. 3: Brazil (Pedro I). Gold inscribed ingot, Serro Frio, 1830 (167.22
g). Friedberg, Brazil 106. (ANS 1963.240.1, gift of R. Henry Norweb,
Sr.). 87.56 x 18.28 mm.

Fig. 4: Nigeria, British Colonial period. Bronze manilla, Birmingham,
ca. 1900 (86.32 g) (ANS 1991.8.6, gift of George M. Golden).
60.01 x 53.56 mm.

Fig. 5: Africa and Indo-Pacific region. 19 cowrie shells, 19th-20th
centuries. (ANS0000.999.56280)

Fig. 6: Lydia. EL 1/3 stater, 7th century BC (4.68 g). SNGBIB 1135.
(ANS 1972.258.9, gift of Burton Y. Berry). 13.46 mm (image enlarged).

Fig. 7.: Macedonia, Neapolis. AR-plated AE drachm, ca. 450 BC
(4.34 g). Neapolis (ANS 1954.86.12, gift of Dr. E. P. Robinson)
(image enlarged).
coinage manipulations including plated or debased coins (fig. 7).

Rome
Non-Greek Italian states initially based their monetary dealings on objects, bars and ingots of bronze (aes rude) which became progressively more standardized within regions and noted by specific designs (raimino secco), leading to the aes signatum in Rome (fig. 8). In the early 3rd century BC, the Roman Republic developed a cast bronze coinage upon the weight standard of the Roman pound, which weighed about 323 g (fig. 9). The heavy base unit, the as, initially weighed one Roman pound, while fractional coins were minted at proportions of this pound. At the same time, a silver coinage was initiated in order to connect Rome with the Greek monetary world.

Roman monetary weight standards quickly collapsed during the second Punic War (218-204 BC), triggering a massive rise in prices, in a fashion highly reminiscent of what had occurred in Athens at the end of the Peloponnesian War (Chart 1). The difference here is that Rome never returned to the previous standards and more debasements followed throughout the next two centuries, until Octavian stabilized the monetary system at the end of the 1st century BC. At the time, the Roman as weighed 1/24th of a Roman pound (fig. 10). As a result of these successive debasements, the Roman bronze monetary unit had been stripped of 95.8% of its metal value in about two centuries. Current prices were multiplied at least ten-fold during the same period.

The Roman Empire based its monetary system on a coinage of nearly pure gold and less pure silver (fig. 11). Starting with Nero, Roman emperors progressively debased the silver denarii. By the time of Septimius Severus in the early 3rd century AD, denarii included less than 50% silver and their overall weight had significantly decreased. This is clearly a major development in Roman monetary history since there is no strong evidence that this monetary debasement significantly threatened either price stability or confidence in the official coinage. This illustrates that the Roman state successfully managed to establish a partially fiat currency, no longer valued solely based on its metallic content.

Unfortunately, an ongoing budgetary crisis led to further debasements. A coin weighing 50% more than the denarius but valued twice as much was introduced under Caracalla in AD 215; we call it the antoninianus (fig. 12). During the crisis of the years AD 240-270 that followed soon after, silver vanished from that...
Signs of Inflation

Coinage (fig. 13) and prices skyrocketed; Egyptian papyri dating between AD 260-270 depict a ten to fifteen-fold increase for most observed prices.

Diocletian (AD 284-305) restored imperial order and established the Tetrarchy, a shared system of four co-rulers. By AD 295, a major currency reform aimed at emulating the previous Augustan system was implemented. It relied upon a system based on gold, silver, and billon (5% silver). The denarius was ‘resurrected’ as a unit of account, but not as a coin. Such a scheme could allow nominal price increases disconnected from any change in the coinage itself, since the nominal value of each coin could be modified by official decision. Much of medieval and pre-modern Europe operated under similar currency regimes.

Diocletian’s successors failed to keep the monetary system intact. The billon nummus became lighter and lighter, while its proportion of silver diminished (Figs. 14-15). Nominal inflation reached very high levels. In AD 301, one pound of gold was worth 72,000 denarii. It stabilized at about 3,000,000,000 denarii by the end of the 4th century. This is equivalent to an average annual compounded inflation of 12.5%. The depreciation of the base coinage itself was far more limited: one needed 7,200 nummi to purchase one pound of gold in AD 301. By the end of the fourth century, over 500,000 debased nummi were needed, implying an average rate of depreciation of 5% per year. Gold became the sole anchor of a system of a deteriorating base currency. The progressive debasement of the nummi is a very visible phenomenon (figs. 11-15).

Modern France

During the later medieval period, the emergence of a banking system led to fiduciary money. Money could be created through credit and the practice of fractional reserve. As the public learned to accept (and reject) paper money, modern European states were able to run unprecedentedly high deficits, which could be covered by flooding the market with paper money, as France did in 1720 with the Banque Royale of John Law (fig. 16).

Revolutionary France illustrates this pattern even better with the crisis of the assignats (1790-1797) (fig. 17). Initially issued in limited amount, the assignats were supposed to facilitate the sales of the vast, confiscated Church properties to the general public. As such, their notional amount should have remained below the value at stake, about 2 to 3 billion livres. As France was attacked by all its neighbors and had to use hard cash for its external supplies, it quickly ran out of precious metals and the assignats became compulsory paper money. By early 1793, their issued volume was higher...
than the properties supposed to guarantee them. By 1796, the overall stock of assignats was about 20 times the original French metallic money stock, and current prices had increased 500-fold or more compared to 1795 (Chart 2). The financial situation only stabilized with the conquests and looting of neighboring states, an exercise at which the young general Napoleon Bonaparte excelled.

On November 9, 1799, Napoleon Bonaparte seized power, overthrew the Directory and installed the Consulate, soon to be followed by the First Empire (December 2, 1804). The franc was defined in 1803 as 0.3225 g of 90% pure gold and 5 g of 90% pure silver, thus restoring a bimetallic system (fig. 18). This definition of the franc would hold until World War I and in theory until 1928. The return to a rather strict gold (and silver) standard at the beginning of the 19th century was part of a widespread phenomenon among most European, American and Asian countries. The Bank of France enjoyed a banknotes monopoly after 1848, with notes being convertible into gold or silver. The coverage ratio by metallic gold was very high: in 1914, the notes’ circulation represented close to 6 billion francs, equal to 1,710 tons of gold, while the Bank of France kept 1,200 tons of gold in its coffers. With the First World War (1914–1918), gold convertibility was suspended. War expenses exceeded the government’s income from taxes, so that the notes’ aggregates grew well above their pre-war level. By 1918, France had lost over 2 million men to casualties or injuries and close to half of its industrial infrastructure had been destroyed. The US insisted on full dollar repayment of war debts, even though there was little hope that France would collect the war damages theoretically owed by Germany as per the Treaty of Versailles (1919). The franc lost about 80% of its value against the dollar. In 1928, Prime Minister Raymond Poincaré linked the franc to gold again at 0.0655 g of 90% pure gold, hence making the loss of value official. This did not last for long: the combination of the Depression of the 1930s and the build-up for World War II (1939–1945) led to renewed devaluations from 1936 onward. After a period of deflation between 1931 and 1933, inflation resumed and reached 26% in 1937, to remain above 20% per annum throughout World War II. The rare gold coins issued after 1928 were hoarded (fig. 19), while no silver coins were issued with the exception of the 10-franc denomination, being replaced by base metal for the smaller denominations and banknotes for the larger transactions (fig. 20).

In the period immediately after the War, paper money was issued without limitation in an effort to help fund reconstruction. As a result, inflation went as high as 58.7% in 1948. As the franc was devalued within the Bretton Woods framework, 1 dollar went from 119.1 francs in 1945 to 350 francs in 1949. French coins and banknotes showed increasingly high notional values. In 1945, the franc still represented 7.461 mg of pure gold, but by 1958 only 1.80 mg (fig. 21). Between 1928 and 1934, the franc had weighed 58.95 mg of gold, indicating a depreciation of 97% in 25 years.

A major monetary reform led to the replacement of 100 ‘old’ francs by 1 ‘new’ franc in 1960. The 500-franc banknote depicting Blaise Pascal became the largest denomination issued by France between 1960 and the end of the franc in 1999 (fig. 22).

Hyperinflation

Coins always had a degree of intrinsic value. With paper banknotes, this constraint disappeared. These virtually free-of-costs monetary signs that could bear any officially decreed value led to a complete decoupling of intrinsic and nominal values. The temptation for many modern states to exploit this opportunity proved too great to be resisted, leading to the most extreme situations of inflation ever recorded (fig. 23).

The Hungarian situation between August 1945 and July 1946 is the most brutal outburst of hyperinflation ever. The pengo, defined at 3,800 to 1 kg of gold, was introduced on January 1, 1927, as the national currency of Hungary. As elsewhere, World War II led to a steep increase of the money supply. The end of the War did not stop this as the Soviet occupation troops used their own currency, leaving the Hungarian government to handle its own depleted budget. During the fighting of 1944–45, 40% of the wealth of Hungary had been destroyed and the country had to support the heavy costs extracted by Soviet occupation troops as well as the war indemnities insisted on by the USSR, Czechoslovakia and Yugoslavia. The rate of inflation culminated at 350% a day in the summer of 1946, and overall price levels increased by $2 \times 10^{12}$ in a 13 month period (fig. 24). On August 1, 1946, a set of fiscal measures was implemented and a new currency, the forint, was introduced. The value of the entire pengo money supply was effectively wiped out.

An Area of Limited Inflation: The US

In 1792, the young United States defined its standard unit of value as a dollar worth 24.057 g of pure silver (fig. 25), but the US government had no interest or ability to monopolize the money supply. Within a short time, theoretically-convertible banknotes were issued by about 1,600 local state-chartered banks (fig. 26). Gold was only sporadically minted by the US
government, with its unit of value, the eagle, worth 10 silver dollars (fig. 27). Usually, the half-eagle coins (= 5 dollars) were minted at a standard of 135 grains (= 8.01 g) of 91.67% fineness, or 1.6038 g of pure gold per dollar. Despite the monetary fights of the late 19th century between those vying for a single gold or silver standard, bimetallism persisted until March 14, 1900, when gold was made the sole legal standard, upholding the Coinage Act of January 18, 1837, which set 1.5 g of pure gold to the dollar (1.67 g of 90% gold). This was the equivalent of $20.67 per ounce of gold. All told, the price of gold remained relatively stable throughout the first century or so of US monetary history (Chart 3).

As noted, the government chartered banks meeting certain qualifications, authorizing them to issue standardized paper money, a system that would survive until the Great Depression of the 1930s. The Resumption Act of 1875 sought to withdraw the legal tender notes issued during the Civil War by 1879. This led to a controversy between ‘hard money’ advocates and those who thought the greenbacks were good for the economy by increasing the money supply. As the Treasury had accumulated enough precious metal to satisfy the demand for resumption, the public realized that the paper money was as good as gold or silver. The Act of December 23, 1913, created the Federal Reserve Banking System, which started to issue new type of notes that were originally convertible to gold or silver. The Federal Reserve and National banknotes, silver and gold certificates, and United States legal tender notes all added to the diversity of circulating paper and metal money.

As a result of the severe depression that plagued the US starting in 1929, the country entered a deflationary spiral. The general price index of consumer goods lost 25% between January 1930 and January 1933, an annual average rate of negative inflation of -9%. Intended to stem the tide, on April 5, 1933, President Franklin D. Roosevelt issued emergency measures that confiscated most privately held gold in the country, suspended the convertibility of dollars into gold, and devalued the dollar from $20.67 to $35 an ounce of gold. This alleviated the deflationary pressures, although the consumer price index was still 17.5% lower in January 1941 than in January 1930. Inflation had been decoupled from the price of gold (fig. 28).

The Second World War brought back some degree of inflation, since the government had to print money to pay for the war effort. By the end of 1945, consumer prices had risen 28.5% compared to the level
at the end of 1940, implying an annual average rate of 6.5%. The general reconstruction effort in Europe and Asia, combined with higher consumer demand in the US, led to more inflation after the war itself: between 1945 and 1948, prices rose by about 10% per annum. At Bretton Woods, in 1944, the Gold-Dollar Exchange Standard was devised. Contrary to the pre-1914 Gold Standard, it did not reintroduce any form of direct gold convertibility to the general public. The US pledged to keep the dollar stable against gold, at $35 an ounce, and to ensure its convertibility at that rate vis-à-vis the other participating countries’ official dollar reserves. But within a generation things began to change. The US continued to mint fractional silver coins until 1964, when high silver prices forced a change to new non-silver alloys (Figs. 29–31). The growing balance of account deficits accumulated by the US during the 1960s and a progressive resurgence of inflation from 1968 onward, led to the complete breakdown of the system of limited convertibility in 1971. From $35 an ounce, gold rapidly jumped to $180 in 1974, then toward $600–700 in 1980. At the same time, inflation picked up: until 1982, consumer prices stood 127% above their 1974 level, implying an average compounded inflation rate of 9% per annum. Inflation was effectively checked by Paul Volcker, the Federal Reserve Bank Chairman. Since that time, inflation has remained subdued in the US.

Conclusion: The Patterns of Inflation

Inflation started with the fluctuations in the supply and demand of monetary metals. When political authorities perceived the interest of striking standardized pieces of metals, the debasement of coinage either through changes in weight or alloy became the main source of inflation. The Romans learned to separate coins from units of value, something that provided a new degree of flexibility to monetary authorities and thus promised a great future of monetary manipulations. Increasing the notional values of coins and banknotes became the main source of inflation in the modern and contemporary periods. Observing the main outbursts of inflation through history provides us with a general pattern: inflation is one of the manners by which states have tended to cope with fundamental budgetary imbalances. It is no wonder that situations of inflation generally occur during or after major external or civil wars. The cases of Revolutionary France, the US Civil War, World War I and II, and a disintegrating Yugoslavia, perfectly illustrate these patterns. The resolution of the most extreme periods of inflation inevitably involves major fiscal reforms and very often regime changes.