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Inflation: How Long Has This Been Going On?

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Inflation is a central issue in monetary policy debates—in the press, in congressional hearings, and among monetary policy decisionmakers. Two widely held perceptions of the nature of inflation ensure its prominent place in discussions of government policies. First, inflation is considered costly. Second, government policies influence the inflation rate. To the general public at least, the high inflation the United States experienced during the mid-1970s and early 1980s demonstrated that inflation is costly; the nature and size of its costs are still under study. Likewise, policymakers in particular are continuing to refine their understanding of the latter point. In what ways do government policies affect inflation?

Behind that question is the larger one of what forces drive inflation, and a working understanding of these forces should be a key element of policy discussion and design. There is a significant body of economic research analyzing recent inflations and episodes of hyperinflation, and these analyses offer useful insights regarding the underlying causes of inflation. Delving further into history, this article expands the set of inflations typically examined to include numerous episodes beginning with ancient times. The discussion explores the relationship between inflation and government policies in these various inflationary periods, in search of common features across these experiences. It becomes clear that inflations have arisen historically in various degrees and in countries worldwide amid a variety of institutional structures and monetary standards.

The analysis covers an extensive time period and examines a variety of inflationary episodes, briefly surveying the political, fiscal, and monetary circumstances of the countries in which inflationary episodes occurred. Among these inflations, the most notable common feature is the exploitation

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of money creation in times of extreme fiscal demands and insufficient tax revenue sources.[1] These circumstances made money creation an attractive and in some cases the only viable revenue source. The discussion then focuses on similarities and differences apparent among the various historical inflations and suggests how their characteristics may inform decisionmakers about the efficacy of government policies in modern times.

Background

In the United States most policy debates on inflation center on relationships among inflation, monetary and fiscal policies, and other relevant variables observed in or implied by recent data. By concentrating on the short term, such analysis ignores the general patterns that occur over many inflations, losing sight of the long-run factors that generate inflation.

The purpose of this study is to add perspective to the policy debate on inflation, providing background broader than that painted by, for example, examining only the post–World War II U.S. domestic experience or the past twenty years of U.S. inflation. The vast amount of previously unexploited information available in the numerous inflations that have occurred throughout economic history should help improve the understanding of how and why inflations start and persist. If common sources underlie a large number of inflations, identifying them could provide useful insights for current policy debates.

In his influential studies of modern inflations and hyperinflations, Thomas J. Sargent (1986) argued that reducing inflation effectively has required major reforms in both fiscal and monetary policies. To be credible and to sustain inflation reduction, the reform policies had to break the perceived pattern of recurrent fiscal profligacy and debt monetization (that is, the monetary authority creating new money to purchase the increasing amounts of new debt issued by the fiscal authority) by establishing long-term policy reform.

The predilection toward inflation is often associated with the choice of monetary standards. The economies that Sargent studied operated with fiat money standards; the prevalence of inflation worldwide in industrialized nations during the past twenty years has been associated with the predominant use of fiat money in modern economies (see the box on page 4). Some analysts have suggested that restraining inflation in the long run may require developed nations to alter the institutional structure that determines government policies. Early "supply-side" arguments suggest that a return to a commodity money standard—for example, a gold standard for the dollar—would restrain the growth of the money supply and, thus, hold down the inflation rate.[2] This analysis investigates inflation in economies with various monetary standards for whether the same factors determine inflation.

Historical Precedents: Inflation through the Ages

Economies have progressed from commodity monies (often using coinage of precious metals) to modern fiat paper currency, an inconvertible claim issued by the government. Any type of monetary system can experience persistent and undesirable rates of inflation; however, the technological differences between earlier forms of money (transactions media) and modern currency affect how fast the monetary authority can increase the money supply. It has often been suggested that a fiat currency standard is necessary for the production of extremely high rates of inflation.[3] The extreme inflation rates that can result from the faster money creation in a fiat money system distinguish losses of purchasing power in historical instances from modern inflation. Despite the differences, there also seem to be similarities among earlier inflations in their underlying causes as well as between those historical instances and more recent inflations.

The historical evidence challenges certain conventional wisdoms. For example, can inflation—that is, sustained price level increases—occur in a commodity money system? Did ancient empires and medieval nation-states suffer dramatic price level increases as well as long-lived inflation? General observations drawn from examining diverse historical inflationary periods may reinforce findings from studies of modern inflations.

Hard Currency (Commodity Money) Inflations: Ancient to Medieval Times

The discussion of historical inflations concentrates on the price level increases and the political circumstances under which the inflations occurred. Unrestrained fiscal policies preceded these historical inflations and remain key determinants in modern instances.

There are, however, distinguishing features of these earlier economies that are noteworthy. For example, among kingdoms and empires there was no market for promissory notes as there is between countries today.[4]

The Roman Empire. In the third century, the Roman Empire experienced significant inflation, the proximate cause of which was that fiscal expenditures (mostly for wars during the Germanic incursions to the north) continually exceeded revenues from tax collections. Without a debt market—that is, a market for debt of the Roman Empire—fiscal deficit spending had to be funded some other way. The only other method available at that time was seigniorage, the difference between the value of the precious metal bullion used for coinage and the face value of the minted coins. The Roman emperor had the power to mint coins and thus could choose the purity and weight of the precious metal content of coinage. If the value of the coinage exceeded the raw bullion value, he could increase revenues by reducing either the quality or weight of its precious metal content so that the same denomination coin would have lower intrinsic value, a process called debasing.[5]

In Rome, gold coins, notably, were not debased; however, these coins were so high in value that they were not generally used in market transactions (Paul Einzig 1966, 229). Silver coinage debasement and the overissuance of fiat coins made of base metals led to a substantial and persistent inflation. The price level increased fiftyfold from 200 A.D. to 300 A.D., implying an average rate of inflation between 3 percent and 4 percent per year (Forrest H. Capie 1991, 5). However, it seems that some subperiods may have experienced dramatic price increases. In the latter part of the inflation, the Roman emperor Diocletian (285-305 A.D.) felt it necessary to impose wage and price controls to alleviate inflation (Rondo Cameron 1989, 41). To spur compliance, violations of the restrictions were punishable by death. Even so, the regulation of prices and wages was unenforceable, and the restrictions were eventually revoked. A more long-lived solution was achieved when Diocletian imposed fiscal reforms by reorganizing the Roman bureaucracy and making the collection of taxes more efficient, thus reducing the need for financing by coinage debasement.

Medieval Europe. The "Great Debasements" of coinage during the fourteenth and fifteenth centuries in Medieval Europe were, like the Roman inflation, generally a byproduct of wars (Peter Spufford 1989, 289). War expenditures during the Middle Ages were the most expensive endeavors undertaken by sovereign states. As in Rome, the instances of debasement occurred when the sovereign ruler also had control of the minting of coinage.

Not all medieval European economies experienced inflation resulting from debasement. The Florentine florin, for example, retained nearly the same weight and fineness of gold, fluctuating within 6 percent of its initial weight in gold units throughout the fourteenth and fifteenth centuries (Spufford 1989, 300). The florin can therefore serve as a benchmark for assessing inflation in other currencies. Extant records of Italian traders' foreign exchange transactions show the number of foreign coins exchanged per unit of florins. The depreciation of a coinage relative to the florin reflects the loss of purchasing power in that currency. In lieu of price data (which are unavailable), the exchange rate data help estimate the inflation rate in these medieval economies. The data do not, however, provide direct measures of prices for various goods during an episode.

The experiences of the Kingdom of Castile provide one notable example of a persistent medieval inflation. From 1300 to 1500, the kingdom engaged in a series of foreign and civil wars financed largely by coinage debasement. Over these two hundred years the maravedi, the Castilian unit of account, fell to only 1/65 of its initial value versus the Florentine florin, implying an annual average rate of inflation of slightly more than 2 percent, a relatively small amount by modern standards (Spufford 1989, 295). However, in various subperiods during those centuries, the inflation rate rose more substantially. For example, between 1462 and 1473, when Castile was at war with Navarre, the Castilian price level more than doubled, and the annual average rate of inflation was between 6 percent and 7 percent—an unpleasant level in modern, developed economies and likely disruptive in these earlier economies (Spufford 1989, 299).

Inflation in Castile displays persistence because the large-scale coinage debasement was not followed by effective reestablishment of the initial coinage value. Such attempts at coinage reform were often met with revolt by debtors, renters, peasants, and other groups who stood to lose the most by a return to a strong coinage (Spufford 1989, 315). Because the debasement continued, the Castilian maravedi over time depreciated further. The downward drift of its value is the most continuous inflation in that era.

At about the same time, a series of inflationary episodes took place in France. The exchange rate of the French tournois in 1300 in comparison with its value in 1500 seems to indicate much greater stability than the maravedi. The tournois in 1500 was only one-fourth its value relative to the florin in 1300, implying

Monetary Standards

A country's choice of monetary standard is often thought to affect the likelihood of inflation. According to most theories of inflation, the quantity of money in circulation largely determines the level of prices in the economy; thus the growth in this money supply directly influences the inflation rate. There are institutional differences in the money standards and the ways in which they can be manipulated to generate inflation.

Various monetary standards existed during the inflationary episodes examined in this article, which range over thousands of years. The form of money in use generally evolved on the basis of its desirability as a transactions medium.[1] A number of valued commodities were used as the medium of exchange, but early economies generally evolved toward favoring silver and gold. Over time, monetary standards moved toward the fiat standard prevalent in modern developed economies.

Commodity money was the earliest and simplest transactions medium. The commodity itself had value in other uses, so the population had a demand for it. The commodities used as money ranged from Yap stones to rice (in China) to nails (in the colonial United States). Coinage of precious metals became the dominant form of money in the early economies examined in this review. Gold and silver had innate value desired by the population, and the process of having coins minted by the government ensured a level of weight and purity of the metal at given pressings. Coinage eliminated the need to weigh bullion in every exchange transaction to determine their value. Another advantage was that if the value of the raw metal was less than the value of the coinage, the government could profit by the difference. The resulting source of revenue is referred to as seigniorage.[2]

Commodity Money

Commodity money systems are not immune to inflation. For example, if the supply of the commodity money grows at a rate beyond the increased demand for it, the price level increases. Such external supply changes are not the type of inflation examined here, however. Rather, in the episodes examined in this discussion, inflation arose from active debasement of the coinage by the government for the purpose of extracting seigniorage revenue. Debasements reduced the precious metal weight, fineness (purity), or both of the coinage as the metals were minted into new coins. Debasements occurred throughout history and resulted in an increase in the transactions medium, much as an increase in printed currency expands the money supply today.

According to economists and numismatists, the use of representative money, or commodity-backed paper currency, developed along the lines of the following story about the goldsmith. As commodity money—in this case, gold—became more widely used, people accumulated it in sizable enough amounts that they felt more comfortable depositing the gold with a goldsmith for safekeeping. In exchange, the depositor received from the goldsmith a paper receipt that served as a claim for the deposited gold. As the practice spread throughout the economy, receipts for gold deposited with goldsmiths traded as money. Because the commodity-backed paper currency could be converted into the commodity or coined value backing it, the value of the representative money was tied to the value of the commodity.[3] To maintain the credibility of paper money convertibility, governments held commodity reserves sufficient to meet the possible conversion demands. Under the commodity-backed money scheme, it is believed that the threat of conversion to specie (coinage) hindered the use of seigniorage for revenue production because the value of paper claims could not greatly exceed the value of the backing. A relevant point for the purposes of this discussion, however, is that there is always an incentive for the government to glean some seigniorage from money creation, and the question is whether they will break the rules set by the monetary standard to accumulate the desired revenue.

Commodity-backed money need not be convertible; for example, after 1933 the United States no longer exchanged gold for gold certificate dollars for domestic U.S. citizens; however, the country remained on an international gold exchange standard and provided gold in foreign transactions. While the gold dollar standard hindered attempts to raise revenue from seigniorage, the potential to achieve profits and the temptation to exploit it remained.

Fiat Money

Most developed nations have severed the institutional link between their currencies and gold and instead issue their money as legal tender for all debts by government order (fiat). Such a monetary standard is referred to as a fiat standard. Because the money is unbacked paper currency, there is no underlying constraint on its issuance. The incidences of hyperinflation in the twentieth century—for example, Germany, 1921-24; Hungary, 1920-24 and 1945-46; and China, 1947-49—give glaring testimony to the potential excesses that can occur in a fiat money system that fails to practice proper monetary restraint.[4] However, fiat money is not the root of these problems; rather, it is only a facilitator.

The fiat money era that began in the mid-1970s was different in a number of ways from the preceding era, es-

pecially on the international markets. First, the major nations began a system of flexible exchange rates that allowed rates of exchange between currencies to change in response to the relative market demands and supplies of the currencies. In the Bretton Woods exchange rate system, rates between currencies had been fixed at a given ratio, which was altered only infrequently. Presumably as a result of major oil supply shocks, a number of developed nations experienced persistent inflations after the break-up of the Bretton Woods system. In the United States, inflation attracted widespread attention especially during the late 1970s and early 1980s. There were a variety of proposals to reduce the inflation rate, including an institutional reform that called for a return to the gold standard.[5] The current low inflation environment worldwide has quelled many of the demands for a return to the gold standard and offers at least slight evidence that low inflation can be sustained under fiat money systems.

The examination of inflations in this article suggests that the choice of monetary system may have some influence on the inflation rate that an economy may experience. However, the more fundamental issues concern whether significant inflation can arise under any money standard and whether inflation observed today shares a common source with inflation in medieval and ancient times.

Notes

1. The desirable attributes are durability, divisibility, portability, homogeneity, difficulty of counterfeiting, and a stable demand for and supply of the money.
2. The marginal costs of making coins from bullion were minimal.
3. In many instances the paper currency coexisted with coinage in the economy. In the United States at the turn of the century, many paper bills were convertible into gold, and gold coinage remained in use as well.
4. See Sargent (1986) for an interesting discussion of a selection of hyperinflations. See also Capie (1991).
5. Aside from the price level issues discussed in this review, the gold standard was associated with a variety of problems that may make it unattractive as a modern monetary standard (see Tallman and Moen 1993). Governments may break the rules implicit in any monetary standard to exploit seigniorage. Thus, an ingredient that is key to the success of a monetary standard is the likelihood that a government will abide by the implicit restrictions.

an average inflation rate of slightly more than one-half of 1 percent per year. Within these arbitrary endpoints, however, there were shorter periods of inflation in which the exchange value of the tournois fluctuated significantly.

The French episodes of inflation were typically more severe and sharper than those in Castile. French inflation over the 200-year period appears less virulent because of the moderate average annual inflation rate. However, French rulers typically would enforce a coinage reform following periods of rapid coinage debasement. Unlike in Castile, French authorities restored coinage to the weight and fineness of precious metal content that existed before the debasement, thus essentially resetting the coinage to its initial exchange rate.

The explosive price increases and precipitous declines in the foreign exchange value of the tournois generated the most notorious inflations in the medieval era. At its most severe, the average inflation rate in France exceeded 50 percent per year. These extreme increases in the price level produced substantial redistributions of wealth from creditors to debtors. The reform measures often taken to return the coinage to near its initial value imposed redistributions from debtors to creditors over very short periods of time. Such disruptions of course led to political strife in the country.

In France as elsewhere, the main driving force behind coinage debasement was the need to generate seigniorage revenues for funding wars. But in France the debasement of coinage was taken to extremes not frequently observed. An example of the basic accounting of coin production—that is, the number of coins minted from an amount of bullion—conveys the extent of debasement that took place over a short time. In 1336 the French minted sixty coins at 96 percent silver content. From the same amount of silver bullion, in 1355 they minted 480 coins of 20 percent silver content (Spufford 1989, 305). Containing less of the valued metals, the later coins were thus less valuable. The foreign exchange markets recognized the fall in value almost immediately. Spufford notes that exchange rates would reflect large debasements—or substantial reforms that raised value significantly—in weeks or even days (1989, 293).

The rapid inflations in France during this period were especially notable given the amount of time, labor, and capital input necessary for debasing the coinage, which required melting down bullion or circulated coinage and then reminting coins.[6] In the five-year period ending in 1342, the foreign exchange value of the tournois fell to only one-fifth its initial level in 1338, implying an annual average rate of inflation approaching 40 percent (Spufford 1989, 297). In 1343, monetary reform returned the coinage to its initial precious metal content and fineness; however, the extensive financial demands of the ongoing Hundred Years War and the lack of any existing mechanism for direct taxation in France inevitably forced the ruler to resort again to debasement as a means of finance. By 1360, the foreign exchange value of the tournois had fallen to less than 1/25 its 1343 value, an average annual inflation rate of nearly 60 percent per year (Spufford 1989, 297).

The exploitation of coinage debasement for revenue by French rulers led certain interest groups, mainly those hurt most by inflation, to complain and to question the right of the sovereign to mint and debase coins at will. Spufford notes that the *De Moneta* of Nicholas Oresme written in the middle of the fourteenth century verbally attacked the exploitation of debasement: "In such a kingdom internal trade is disturbed and hindered in many ways by such changes, and while they last, money-rents, yearly pensions, leases, cesses [censure] and the like, cannot be well and justly assessed, or valued, as is well-known. Neither can money be safely lent or credit given" (Spufford 1989, 306). His statement suggests that contemporaries recognized the difficulties that inflation imposed on an economy.[7]

Oresme's writing also gives some insight into his understanding of fiscal and monetary factors in generating inflation. He argued that the right to coin money should not be in sole possession of the royal authority. In essence, he was proposing that some restriction should prevent the royal authority from being able to exploit the revenue creation potential of seigniorage. Oresme's treatise foreshadows the modern viewpoint that the fiscal authority and the monetary authority should not be under the same control. Modern inquiries in this area by Alberto Alesina and Lawrence H. Summers (1993) show a positive correlation between the average inflation rate in a country and the degree of fiscal influence on monetary policy.[8]

Political agreements between French rulers and the nobility prevented further coinage debasements for several centuries. The aristocratic class—the wealthy—had been the group most adversely affected by inflations and thus had a strong incentive to restrict royalty from exploiting seigniorage. As an alternative source of revenue, the nobility offered the royal authority a method of reliable taxation.[9] French reform measures in 1360 not only returned the coinage to its strong base but also included provisions for direct taxation by the ruler as a mechanism to avert large fiscal deficits.

The Roles of Monetary and Fiscal Policy. Two simple features of these previous inflations are particularly noteworthy in comparison with modern inflationary episodes. First, the inflations discussed were generated by the decisions of a ruler acting as both the coining authority—comparable to the monetary authority in the U.S. economy—and the fiscal authority. In the countries that experienced notable inflations, the government relied on seigniorage as a major source of revenues. Countries that avoided inflation caused by coinage debasement established agreements that replaced renewal of coinage, with the opportunities it provided for debasement, with reliable taxation as an alternative form of revenue as early as the twelfth century (Spufford 1989, 316). Clearly, effective fiscal reform was a necessary ingredient for reducing the inclination toward financing by seigniorage.

A second important element of these inflations is that they occurred without the existence of a primary fiat currency—that is, a nonconvertible (often paper) claim issued by the government, unbacked by any commodity, to serve as a medium of exchange.[10] Commodity-based money could be exploited via coin debasement to generate seigniorage for a government revenue. The resulting inflation was a by-product of the method of fiscal finance, chosen in large degree by default. In most cases, the existing fiscal demands far outpaced the fiscal revenues and, given the absence of a debt market, seigniorage was the only revenue source available.

Regardless of the form of money and the rules implicit in any particular monetary standard against inflation financing, governments have an incentive to raise revenue by seigniorage financing. Throughout history, there have been situations in which rulers exploited such financing, and the resulting inflations generally unsettled their economies. Descriptions of historical inflation episodes suggest, however, that fiscal and monetary policies combined to generate inflation, as seems to be the case in modern economies (see Sargent 1986). The instances of inflation occur when fiscal spending exceeds the tax revenue base, requiring money creation as a solution; the fiscal deficits become monetized when seigniorage revenue finances the shortfall. As noted earlier, in the historical episodes cited, the ruler generally retains the power to coin or print

money, and, as contemporary observers of medieval inflation like Oresme understood, this control of the production of the transactions medium by the fiscal authority seems to be an important ingredient in generating inflations.

The First Paper Currency Inflation: Twelfth-Century China

The first true paper currency was introduced in China during the Sung dynasty in the tenth century. The paper money was a substitute for iron coinage that had been the medium of exchange.[11] The population deposited coins with bank-like institutions and held in exchange more easily handled paper receipts for these deposits.[12] The receipts played the role of a currency, a representative money.[13]

As in the episodes of inflation discussed previously, the Chinese inflation occurred in the midst of wartime expenditures by the government. When the invasion of the Tartars sometime after 1127 forced the Sung dynasty to move south, the initial paper monetary system collapsed. In 1161, a new paper currency, hui-tzu ("check medium"), was introduced as a replacement (Lui 1983, 1069). The government carefully regulated the amount of the currency outstanding and apparently ensured that adequate coinage reserves backed the currency.[14] For twenty years, the exchange rate between the paper currency and copper coins, a market-determined rate, was stable. For its responsible monetary policy—that is, maintaining the value of the currency—the government gained credibility, and the use of the paper currency spread throughout the nation.[15]

The Chinese paper currency thus was a commodity-backed money that the government controlled. Under a commodity-backed money system, to avoid inflation the amount of backing should fluctuate with output so that if there were more economic output, there would be more backing. As long as the Chinese currency was properly backed, governmental control of the amount outstanding did not impose an inflation. The currency supply could increase without generating inflation because it increased with the amount or value of economic transactions, essentially rising because of demand rather than excess currency supply generated by the monetary authority. The stable value of the paper currency did not continue, however. Wars against the Tartars and later against the Mongols increased the fiscal demands, and the government turned to paper money creation as a means to raise revenue. As the paper money supply increased, the backing of the money actually diminished, further depreciating the currency's value. In essence, the government broke the rules implicit in its commodity-money standard and in doing so lost the credibility built up over those twenty years of relative stability.

As in ancient Rome and the economies of the Middle Ages, the extreme fiscal demands of war expenditures pressured government revenue sources. Given the government control of money issue and the absence of a viable market for sovereign debt, inflationary finance was an obvious alternative. Price level measures in China increased approximately fortyfold from 1160 to 1240, implying an average annual inflation rate between 4 percent and 5 percent.[16] Lasting over an eighty-year span, the Chinese experience is an example of a persistent inflation preceding modern fiat currency inflations by centuries. This inflationary instance demonstrates that a commodity-backed currency can still be exploited for seigniorage if the rules of the standard are not maintained. In such a case, a commodity-backed money approaches the concept of fiat money.

Fiat Money Inflation: The Assignat

The assignat, a paper currency issued in postrevolutionary France (1790-97), was issued as a backed paper money, although the public perception of the currency approached that of a fiat money over time.[17] In the initial issue, the assignats were an interest-bearing transactions medium with interest payments that would be supported by the sale of land confiscated from royalty or the church. For this first issue of 400 million livres, the money was not legal tender; rather, it was to be redeemed systematically over five years. Assignats, then, were viewed as mortgages on the church or royal land. Within four months of the first issue, however, a second issue (also 400 million livres) offered the money as noninterest bearing and as legal tender.[18] The assignats would be retired when citizens purchased confiscated lands with accumulated currency.

The French government in those years had no reliable mechanism for collecting taxes; the government failed to enforce the most lucrative taxes from the prerevolutionary era. Especially following the outbreak of war in 1793 with Spain, Holland, and England, substantial war expenditures led to the creation of assignats as a major source of revenue. From 1790 to 1795, only 20 percent of government revenues were from taxation.[19]

Table 1 presents data on the number of assignats in circulation and also provides a measure that indicates the value of assignats in circulation as a percent of their value when they were first introduced.[20] Assignat value depreciated to 70 percent of its initial value after two years of circulation, a fairly stable level relative to what followed. From 1792 to 1793, the inflation became noticeable enough to spark public protests. During the Reign of Terror (from September 1793 to June 1794), the government imposed maximum price limits and other restrictions to maintain the value of assignats. In the latter half of 1794, after the Reign of Terror had ended, the strained and weakening economic system experienced additional depreciation of the assignats. The key period of depreciation occurs in the data for 1795, however, after the repeal of maximum price restrictions.

As assignat depreciation accelerated in 1795, the government was forced to issue more of them to generate the necessary revenue. The revenue extracted depended on how much the new assignats would buy in the marketplace—that is, on their market value. As inflation accelerated, the population was less willing to hold assignats. The demand for them diminished, and new issues were causing more rapid depreciation. As Table 1 shows, the amount in circulation more than doubled from February to November 1795. The price level data shown in Table 2 suggest that over the same period the inflation rate averaged nearly 25 percent per month. By November the assignat had lost a tremendous amount of its value—down to less than one percent of the initial value. The suspension of land sales for assignats enacted on November 20, 1795, removed from the money the last vestige of a backed currency so that assignats became fiat. Their value fell still further. In December the inflation process and the seigniorage reached unprecedented extremes. The government printing presses essentially doubled the supply outstanding in that month, and the price level more than doubled from November to December. The demise of the assignat as a transactions medium was imminent.

The price level data in Table 2 show how the index of prices rose most rapidly at the end of the assignat era. In terms of the inflation rate, several months in revolutionary France appear to qualify as times of hyperinflation; the key element in the assignat inflation was the tremendous increase in notes outstanding.

The reliance of the fiscal authority on revenues from seigniorage links the instance of assignat inflation with historical inflationary episodes cited above. What differentiates the assignat inflations, though, is that the extreme degree of inflation was created by the combination of the printing press and a fiat money. The high inflation rates in this case fed fears that issues of fiat currency inevitably lead to rapid inflation, risking hyperinflation (see Andrew Dickson White

Table 1
Assignat Depreciation

Period	Issuance	In Circulation	Percent of Initial Value[a]
1790-1791	1,860 M	1,490 M	88
January-May 1792	2,200 M	1,660 M	72
January-August 1793	4,950 M	4,050 M	39
September 1793-July 1794	8,450 M	7,200 M	46
August 1794[b]		7.6 B	39
November 1794		8.0 B	32
February 1795		8.8 B	22.5
May 1795		11.4 B	11
August 1795		16.4 B	3.5
November 1795[c]		19.7 B	.8

[a] *The figures for percent of initial value use the local data (see note 20).*
[b] *Figures for each issuance after 1794 are not available.*
[c] *By January 1796, the amount of assignats in circulation exceeded 39 billion livres.*

Source: Calculated from data in Harris (1930, 163-86).

1980). The assignat inflation experience in fact foreshadows numerous hyperinflationary episodes in recent history.[21]

U.S. Inflation in Wartime

Several rigorous treatments provide in-depth analysis of war-related inflations in the United States.[22] This brief summary of the fiscal expenditures, revenue sources, and political environment that relate to these inflationary episodes emphasizes that the United States has in its history experienced inflations driven by the same forces as those discussed above. Fiscal and monetary policies remain the key linkages among inflationary episodes throughout time and across countries.

The inflation from the American Revolutionary War period presents a clear example of fiscal deficits during wartime sparking the use of seigniorage financing.[23] The Continental Congress had no power to tax, and the war with England began as a revolt over taxes. Thus, the colonial government was unlikely to exploit direct taxation as a major source of revenue for the war effort (Capie 1991, 10). In fact, the colonies raised only 6 percent of their revenues via taxation. Sovereign loans and gifts from France and Spain covered less than 20 percent of the revenue needed for the war.[24] The Continental Congress financed the remaining deficit by money creation—that is, by printing paper fiat currency known as continentals.

The inflation produced by the seigniorage financing raised the price level (measured by an index of wholesale prices in Philadelphia) from 100 in 1776 to higher than 6,500 in 1780 (Stanley Lebergott 1984, 42). The depreciation of the continental was mild at first but accelerated rapidly; Capie (1991) noted that prices increased by more than 1,000 percent during the two-year period from 1779 to 1780, implying an annual average inflation rate of greater than 300 percent. The phrase "not worth a continental" refers to the perceived worthlessness of this paper currency.

During the Civil War the Confederacy faced similar fiscal difficulties. In the early Confederacy no existing machinery could impose and collect direct taxes. With the revenues from taxes greatly limited, the Confederacy instead raised 23 percent of its funds from bond issues. The most striking statistic, though, is that from February 1861 to October 1864, 58 percent of the Confederate revenues were generated by money creation. From October 1861 to March 1864, the monthly rate of inflation averaged about 10 percent.[25] The supply of Confederate bills increased elevenfold over their first three years. As the end of the war approached and Union victory seemed assured, the price level in the Confederacy skyrocketed.[26]

Inflations experienced in the Civil War by the Union, in World War I, and in World War II (analyzed in detail by Milton Friedman 1991) differ notably from those of the colonies and the Confederacy. For the purposes of this discussion, a specific element of war-related inflation is of interest: the way in which the inflation rate varied in relation to the proportion of revenue generated through taxation as opposed to through seigniorage.

The Union experienced inflation averaging 25 percent per year, as measured by wholesale prices. Tax revenues covered about 21 percent of the war expenditures. The government relied on money creation to finance 23 percent of the accumulated deficits for the war effort. During World War I, the United States collected tax revenue to cover 43 percent of the expenditures for the war effort, whereas money creation financed only 11 percent of the accumulated deficits. Given the lower degree of money creation, it is not surprising that wholesale price inflation was lower during World War I than for the Union during the Civil War: the inflation rate averaged 16 percent per year from August 1914 to May 1920. Even more impressive is the success of U.S. efforts to hold down inflation during World War

Table 2
Price Level Data: General Index
(1790 = 100)

Date	Price Level	Percent Change Per Month
January 1795	580	NA
February 1795	510	−12.8
March 1795	720	34.5
April 1795	900	22.3
May 1795	NA	NA
June 1795	1,310	NA
July 1795	2,180	50.9
August 1795	2,710	21.8
September 1795	3,100	13.4
October 1795	NA	NA
November 1795	5,340	NA
December 1795	12,990	143.3

Source: Harris (1930, 108).

II. Fiscal responsibility was a key ingredient; tax revenues covered nearly 60 percent of the wartime expenditures. Wholesale inflation increased an average annual rate of 9 percent per year over the period from September 1939 to August 1948.[27] The fraction of the accumulated deficit financed by money creation was 11 percent.

Sovereign Debt

Most of the inflations described in this article occurred in conjunction with wartime fiscal deficits because the extreme demands for wartime expenditures placed strains on existing financing mechanisms. Although it may appear that governments turned to financing via money creation because it offered a simple solution, more often, especially in the most egregious misuses, there was no viable financing alternative immediately available. As noted above, the early inflations took place in economies that could not finance their government expenditures (in excess of revenues) through the issue of sovereign debt. The fiscal deficits, then, had to be monetized essentially as they arose.

In modern instances of U.S. inflation, the use of sovereign debt issue has given governments an option not available under the strict government budget constraints that impinged on the earlier economies. By issuing debt, governments are able to finance wartime expenditures while maintaining relatively stable tax revenues over time and avoiding increasing taxes. Robert J. Barro (1981) has called this process "tax smoothing." Barro's study shows that the most significant increases in the public debt are associated with wartime fiscal expenditures. The government "smooths" taxation over time so that the tax demands on the economy during the war are not so extreme. After wartime, the government must raise more revenue to shrink the accrued debt. Modern economies have benefited from the ability to finance wars by spreading out the welfare costs of distortionary taxation across more time periods and especially over periods without war through the issuance of debt.[28]

The existence of government debt as an alternative does not eliminate the temptation to exploit seigniorage as a revenue source. Rather, the accumulation of debt and related interest expenses represents liabilities of the government that will ultimately require repayment—through tax revenue or seigniorage revenue. Responsible policies on the part of both fiscal and monetary authorities are necessary to resist the temptation to inflate away government debt.

Conclusion

This article focuses on the combination of fiscal and monetary policies that generated inflation in certain historical instances. The discussion centers on the role of fiscal deficits, a recurring factor in periods of inflation since the time of the Roman Empire and the Middle Ages as well as through American history. Fiscal deficit–induced inflations took place in economies with various forms of monetary standard: commodity, metal-backed paper, and fiat currency; however, as suggested by Capie (1991), fiat paper currency allows the inflation rate to reach tremendously high annual rates when governments pursue inflationary financing.

In examinations of modern high or hyperinflationary instances, it is clear that unchecked fiscal spending and untenable fiscal deficits preceded the cases of hyperinflation.[29] These circumstances seem to have precedents in earlier economies. In the historical inflations, some perceptive observers recognized not only the redistributive aspects of inflation but also the ultimate fiscal (and monetary) causes. Critical writings from the medieval era, specifically Oresme, foreshadow analysis by modern economists suggesting that the basic principles that generated inflations in medieval times still operate today. The lesson in these historical treatments for the modern reader lies in the fact that long-lived solutions invariably involved reforming both fiscal and monetary policies.

The problems that fiscal deficits create arise in many modern episodes of high inflation. Latin America during the early 1980s and the current circumstances in the Eastern Bloc nations present dramatic examples of the disruption that this extreme inflationary circumstance imposes on an economy. Some economists (for example, Eric Leeper 1993) suggest that the movement toward European Monetary Union is a reaction to high average inflation among these industrialized countries. In general, domestic fiscal deficits in Europe forced some degree of domestic monetary accommodation and thus inflation. European Monetary Union will remove the discretion of a domestic monetary authority to engage member countries in seigniorage financing.

Despite the dramatic differences in the economic structure over thousands of years, the underlying causes of inflation seem to remain basically the same. In

historical episodes, the ultimate source of inflation was the combination of recurrent fiscal deficits and their monetization. This finding suggests that adequate methods of raising revenue from taxation may help prevent a reliance on potentially harmful seigniorage financing.[30]

Notes

1. Most inflation incidents used as examples here occurred during the fiscal pressures of wartime; however, neither fiscal pressures nor inflations connected with them are exclusively related to war. Any major fiscal initiative that results in large deficits could result in inflation.
2. Analysts that support a commodity money standard argue that it maintains the price level better than the prevailing fiat money standard by involving rules that limit a central bank's discretion for generating excessive money creation.
3. Capie, for example, suggests that high inflation or hyperinflations occur in fiat monetary systems because the printing press—all that is necessary to generate fiat paper currency—makes it possible to produce a rapid enough increase in the stock of currency to support inflation (1991, 28-29).
4. Hamilton (1947) provides a brief history of the early issuance of sovereign debt.
5. The process of debasing coinage is analogous to the depreciation of paper currency when it is overproduced. If the monetary authority prints money at too fast a pace and increases the currency supply, the price or value of the paper money declines and the prices of other goods measured by the price level increases.
6. In comparison, fiat money seigniorage requires only printing presses to create new currency.
7. Certain interest groups profited from the decline in the purchasing power of the coinage; the writings of contemporary observers recognized this redistributional aspect of inflation. For example, the nobility preferred strong and stable currency that preserved their wealth and maintained the real value of their rents that were normally in fixed nominal amounts. Debtors obviously profited from inflations because fixed rents are repayed in less valuable money. During a coinage reform, the debtors, most often the least powerful subjects, sparked outbreaks of violence. In Castile, reforms in both 1391 and 1473 sparked riots in urban areas (Spufford 1989, 315). Modern economies have developed institutional features that help alleviate some of the redistributional aspects of inflation, yet that aspect of inflation remains. Garfinkel (1989) presents a useful discussion of inflation costs in the modern context.
8. See Pollard (1993) for a critical review of this literature.
9. Because seigniorage as the main source of revenue imposed high costs on the most powerful subjects, it was unlikely to be long-lasting without producing political tension.
10. Some economies—for example, Rome—circulated fiat coinage composed of base metals.
11. The discussion in this section follows closely the text in Lui (1983).
12. Initially, the government offered a group of wealthy families the privilege of organizing and issuing the paper claims, called chiao-tzu, or "exchange medium" (Lui 1983, 1069). After some time, though, the provincial government took over the role of issuing the money.
13. See the box on page 4. The representative money scheme played out much like the evolution of paper currency backed by gold in medieval Europe.
14. There was convertibility between the paper currency and coinage, but it was not at a 100 percent conversion rate.
15. Lui notes that the use of the hui-tzu did not extend to the province of Szechuan, which had its own paper currency (1983, 1069).
16. Notably, the money supply measures increased nearly fifty-fold over the same period. Descriptions of the measures of money and prices are described in Lui (1983, 1073-74).
17. In 1715, the Duke of Orleans had allowed John Law to establish a bank and issue a paper currency supposedly backed by the land of the Mississippi territories. The associated "Mississippi Bubble" burst in 1720, leaving a worthless paper currency and the French with bad memories of such money. The public opposed subsequent attempts to issue paper currency; for example, an issue of interest-bearing paper currency in 1788 was revoked before it was issued (see Harris 1930, 8). Under these circumstances, how the assignats were packaged for public acceptance is an interesting story in itself.
18. At this point, the assignats were considered backed by the value of real estate confiscated from the church. As a matter of public perception, they were differentiated from the paper money issued on the security of property in the Mississippi territory because the lands backing assignats were local. See Harris (1930, 9).
19. Hamilton notes that the French accumulated a huge debt from the extreme expenditures for the Seven Years War (1756-63). That debt and the continuing fiscal deficits of the Revolutionary Era were the main motivations for issuing assignats (1947, 124).
20. Harris explains the source of the assignat value data (1930, 112). The Treasury collected from local sources the prices of gold, silver, food, merchandise, and land; these five prices were combined to indicate the local value of the currency. During the Reign of Terror, some of the prices in the index were subject to controls.
21. See Capie's (1991) discussion of more recent instances of hyperinflation. See also Sargent (1986).
22. See Capie (1991), Lerner (1991a and 1991b), and Friedman (1991).
23. Smith (1984, 1985) discusses the experience of inflation in the colonial era.
24. The colonies also gained revenue from confiscating property of the crown.

25. Lerner (1991b, 393) notes that these statistics refer to the eastern section of the Confederacy.
26. Burdekin and Langdana (1993) suggest that the rapid deterioration of the Confederate currency at the end of the war reflected the likelihood that the South would lose the war. The decline may reflect the option value of the bills because they were supposedly payable in gold two years following the end of the war. A loss by the Confederacy, however, would make the currency worthless, and holders took this fact into account.
27. Price controls were enforced during wartime.
28. Ohanian (1993) compared the welfare cost of the Korean War (financed by taxation) with World War II (financed largely by debt issuance). His results suggest that there are large welfare gains from tax smoothing.
29. See Sargent (1986) and Rogers and Wang (1993).
30. Burgess and Stern (1993) have suggested that seigniorage in developed economies represents a small percent relative to real GDP (approximately .5 percent). However, the seigniorage revenues of Argentina from 1980 to 1985 were only 4 percent of real GDP, yet they had disastrous results on the inflation rate.

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Business Cycles and Analysts' Forecasts: Further Evidence of Rationality

William C. Hunter and Lucy F. Ackert

Expectations about the future play an important role in economic behavior. Borrowing and investment decisions by consumers and businesses, purchase and labor contracts, and job choices require at least a crude forecast of economic variables. Thus, it should not be too surprising that explaining how expectations are formed has become a central point in the study of economics and economies. The issue is not of simply academic interest. Given that there are several alternative explanations or theories of how individuals form their expectations, the choice among these theories can influence both conclusions about how economies work and recommendations for macroeconomic policies designed to influence prices, output, and employment.

One major school of thought in this area—called rational expectations—can be seen as an attempt to provide a general theory of expectations formation. This theory, developed and refined over the past thirty years since its first statement by John Muth (1961), asserts that decisionmakers in the economy form their expectations or forecasts in the best way they know on the basis of all economically relevant information available to them at the time. Thus, the hypothesis asserts the rather reasonable position that decisionmakers make efficient use of all of the information that they currently have in predicting the future. This idea is consistent with the assumption that individuals do not act arbitrarily or without thought in their economic life, in forming expectations as in other economic decisions. Stated differently, people do not make systematic mistakes: in the long run they behave as if they understand the process generating the values of the variables that

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they are trying to predict. If people efficiently use available information and doing so in fact leads to systematic over- or underestimates of some important economic variable, then that information can be used to correct their future estimates.[1]

A large body of empirical literature has developed since Muth's first statement of his hypothesis, and there has been a long-running debate, exemplified in work by Edward Prescott (1977) and Michael C. Lovell (1986), on whether testing the rationality of economic agents' expectations is useful, or even possible.[2] While much of this research has applied rationality tests to surveys of economists about future values of economic variables such as inflation and gross domestic product, an important part of this literature deals with the expectations of stock analysts about firms' earnings. Because stock analysts' reputations and livelihoods depend at least in part on their accuracy, their forecasts are particularly appropriate subjects for rationality tests. One would assume that their forecasts are seriously considered and accurately reported. Such forecasts should more closely represent those of economic agents made in connection with real decisions than do more casual "opinion" forecasts often reported by economic surveys. Stock analysts' forecasts are also attractive for research because two sets of forecasts are systematically collected and reported, one in the Institutional Brokers Estimate System (I/B/E/S) data base produced by Lynch, Jones, and Ryan, and Standard and Poor's *Earnings Forecaster*.

With greater interest in expectations formation and attention to serious forecasters, the volume of research on the rationality of financial analysts' forecasts of corporate earnings has increased significantly over the past two decades.[3] Until recently much of this research has simply evaluated the accuracy of analysts' forecasts relative to naive extrapolations of past earnings. For example, analysts' forecasts of future earnings were evaluated against or compared with forecasts that assumed that current or past earnings were the best predictors of future earnings. More recently, however, research on earnings forecasts has addressed the much more fundamental issue of the economic rationality of these forecasts.

The growth in the number of studies examining analysts' forecasts has not clarified the issue of rationality, though. Results reported in the literature continue to be conflicting. Lack of a consensus may be partially explained by differences in the samples, data sets, and time periods examined by various researchers. Researchers' choices of statistical tests have no doubt been a contributing factor as well.

An oversight common to these studies results from their treatment of the relationship between the individual analysts' forecasts. Because the analysts arrive at their forecasts individually, one might argue that their forecasts should be thought of as independent. Researchers doing statistical tests of rationality have taken this forecaster independence as support for the statistically convenient assumption that individual analysts' forecast errors are not related to errors in any other analysts' forecasts.

However, if forecast errors are in fact correlated, statistical tests based on this assumption may not measure accurately. Because analysts' forecast errors are likely to be influenced by the effects of macroeconomic activity on particular companies' performance, there is good reason to believe that they are related. For example, a sharp, unexpected disruption in the supply of a critical productive input—such as might be caused by a weather-related natural disaster—can adversely affect the cost structure of firms across industries. Such adverse supply shocks can result in analysts' systematically overpredicting earnings (as they fail to account for higher production costs) and, hence, errors would be correlated across their forecasts. Under such conditions, standard statistical hypothesis tests that assume independence of forecast errors may reject rationality when it should be accepted. Research by Michael P. Keane and David E. Runkle (1990) points out that the effects induced by macroeconomic shocks or business cycles cause the standard errors in typical rational expectations or forecast models to be biased downward when forecast errors are assumed to be independent. However, when this bias is accounted for, valid tests of rational expectations formation in security analysts' forecasts can be conducted.

This article investigates whether earnings forecasts made by security analysts are economically rational—that is, whether they satisfy the rational expectations hypothesis. As noted above, this hypothesis makes the most sense from an economic perspective. However, recent studies have cast doubt on its applicability to security analysts' forecasts. For this study, statistical tests of the rationality of security analysts' forecasts were conducted with procedures similar to those reported in the previous literature. Using this approach demonstrates that erroneous conclusions can be reached and incorrect inferences made if the analysis does not properly account for biases introduced into analysts' forecasts by aggregate economic shocks. The study shows that once the effects of these biases are accounted for, it is not possible to conclude that security analysts' forecasts are inconsistent with rational expectations.

Rationality Testing

It is obvious that the process of forecasting any variable will be improved by incorporating as much information as possible about how the variable is determined. Because a forecaster who does not use all available relevant information is acting inefficiently, his or her forecast error—the difference between the actual realized value of the variable and the forecasted value—will be unnecessarily large and may exhibit systematic biases. Thus, it should come as no surprise that forecast error plays a central role in characterizing rational forecasts.

Two key properties, each involving forecast error, have been identified for testing the rationality of forecasts. First, if the forecasts are rational, a time series of forecast errors should have a mean of zero—that is, the forecasts should equally overshoot and undershoot the actual data. This property is called unbiasedness in this article. Secondly, the forecast errors should not be correlated with any relevant economic information readily available at the time the forecast was made, including the values of past forecast errors—referred to here as efficiency. Tests of the efficiency involving only current and past values of forecast errors are called serial correlation tests.[4]

Previous Studies of Analyst Forecast Rationality

The body of literature examining the properties of analysts' earnings forecasts is large, and many studies have directly addressed the issue of forecast rationality.[5] Most of these studies conduct tests of rationality using unbiasedness or lack of serial correlation tests—for example, studies by Timothy Crichfield, Thomas Dyckman, and Josef Lakonishok (1978), Lawrence D. Brown and Michael S. Rozeff (1979), Dov Fried and Dan Givoly (1982), Givoly (1985), Werner F.M. De Bondt and Richard H. Thaler (1990), and Ashiq Ali, April Klein, and James Rosenfeld (1992). However, none of the existing studies adjust for the possibility that individual analysts' forecast errors are correlated on the basis of such factors as macroeconomic shocks.

The study by Crichfield, Dyckman, and Lakonishok (1978) provides a good example of an unbiasedness test. These authors use the mean forecasts of earnings growth taken from Standard and Poor's *Earnings Forecaster*. They estimate the following simple regression model:

$$A_t = a + b \cdot E_t + e_t, \qquad (1)$$

where A_t represents realized earnings (or earnings growth), E_t is the predicted earnings (or earnings growth), and e_t is a random error expected to equal zero. Under rationality, expected earnings should neither consistently overstate nor understate actual earnings. Thus, the unbiasedness test examines the hypothesis that the parameters a and b are simultaneously equal to zero and one, respectively.

Analyzing forecasts made for forty-six companies for each year from 1967 to 1976, these authors concluded that analysts' forecasts were indeed rational in the sense that the estimated a and b values were not significantly different from their hypothesized values. Using a different approach, Burton G. Malkiel and John G. Cragg (1970) examined five-year earnings growth predictions made by several investment firms in the years 1961 through 1969 and reported similar results.

In a test of the efficiency property of the rationality hypothesis—that people use all relevant information available at the time of the forecast—Fried and Givoly (1982) examined whether financial analysts' earnings forecasts exploit what is known about actual earnings. That is, they tested whether publicly available information is incorporated in earnings forecasts. The specific public information examined was stock market earnings. Using a statistical methodology similar in spirit to that used by Crichfield, Dyckman, and Lakonishok and data from the *Earnings Forecaster* for the 1969-79 period, Fried and Givoly concluded that the financial analysts in their study not only fully exploited the time series properties of actual earnings but also fully incorporated the information available in stock market earnings (as represented by Standard and Poor's Composite 500) into their forecasts. In a related study Givoly (1985) tested forecast rationality using annual forecasts from the *Earnings Forecaster* and found that analysts made full use of information contained in the past forecasts and actual earnings.

More recently, however, De Bondt and Thaler (1990) applied unbiasedness tests for rationality to consensus I/B/E/S data and reached a different conclusion. They concluded that the forecasts are overly optimistic—forecasted earnings systematically exceeded actual earnings—and thus are inconsistent with rationality. Similarly, Ali, Klein, and Rosenfeld (1992) reject rationality in their study of behavior of analysts' earnings forecasts over time using consensus I/B/E/S

Table 1
Unbiasedness Test

$$A_t = a + b \bullet E_t + e_t$$

Coefficient	OLS with White Correction
a	−0.0110 (−0.709)
b	0.9928** (64.278) [−0.466]
R^2_{Adj}	.686
F	1.414

**Significant at the 1 percent level
*Significant at the 5 percent level

Note: OLS estimates are corrected for nonhomogeneous variances with the White (1980) correction. The estimated coefficients are reported along with t-statistics corresponding to the null hypotheses that the coefficient is 0(.) or 1[.]. An F-test is used to test the joint hypothesis that $a = 0$ and $b = 1$, that is, the hypothesis of rational expectations. A_t is actual quarterly earnings per share, E_t is forecasted quarterly earnings per share, and e_t is the error term.

Table 2
Serial Correlation Test

$$A_t - E_t = a + b(A_{t-1} - E_{t-1}) + e_t$$

Coefficient	OLS with White Correction	WLS Weight=SD	Bootstrap Method
a	−.0146 (−1.325)	−0.0022 (−0.722)	−0.0158 (−1.441)
b	0.0970 (1.572)	0.0417** (3.663)	0.0974** (6.279)
R^2_{Adj}	.0112	.0037	
F	2.0200	6.987**	

** Significant at the 1 percent level
* Significant at the 5 percent level

Note: The first column reports OLS estimates with the White correction for nonhomogeneous variances, the second column reports the weighted least squares (WLS) estimates using the standard deviation as the deflator, and the third column reports the bootstrapped coefficients and standard errors. The F-test statistic applies to the joint test for rational expectations—that is, $a = 0$ and $b = 0$. A_t is actual quarterly earnings per share for quarter t, E_t is the earnings per share forecasted for quarter t, and e_t is the error term.

forecasts. These authors also document what seems to be a significant overprediction bias. Studies by Jeffrey Abarbanell and Victor L. Bernard (1991) and Robert Mendenhall (1991) also report evidence that does not support the rationality of analysts' forecasts.

Two features of the tests reviewed above call for further research. First, applying similar tests to different data sets, the researchers do not agree on rationality. Second, the existing tests fail to account for possible correlation introduced into analysts' forecast errors by macroeconomic shocks or business cycle factors that affect all forecasters. It is possible that correction for the latter flaw would introduce greater uniformity into the results of rationality tests.

To facilitate comparisons with other studies, the research reported on in this article ran a series of tests using the unbiasedness and serial correlation tests common in research on rational expectations. The unbiasedness tests uses equation (1) above. The serial correlation uses the equation

$$A_t - E_t = a + b(A_{t-1} - E_{t-1}) + e_t, \qquad (2)$$

where the variables are as previously defined and the subscripts refer to time periods, to test the relationship of current to past errors. The possible bias introduced by macroeconomic shocks or business cycles was then accounted for.

Empirical Analysis

The tests applied equations (1) and (2) above to analysts' quarterly earnings forecasts from the I/B/E/S data base for the years 1984 through 1990. Both the mean and the median forecast were used as the measure of the consensus forecast. The results were strikingly similar, so only those obtained using the median are reported. Each firm was required to have at least three earnings forecasts in any given quarter for that quarter to be included in the sample. Further, in order to maximize the number of firms in the sample, the analysts' forecasts of quarterly earnings were sampled one month before the end of each quarter for which earnings are forecast. Earnings estimates for a sample of 220 companies, chosen randomly, were included for analysis. A total of 3,640 observations were included in the final sample.

Unbiasedness and Serial Correlation Tests. The results of the statistical tests are displayed in Tables 1 and 2. Following Crichfield, Dyckman, and Lakon-

ishok (1978) and Givoly (1985), Table 1 presents the results of a simple unbiasedness test using the model presented in equation (1) above. The coefficients in Table 1 were estimated using ordinary least squares (OLS) regression, where the standard errors were corrected for nonconstant variance, using the procedure developed by Halbert White (1980).[6] Under rational expectations, a regression such as that outlined in equation (1) should yield coefficient estimates of $a = 0$ and $b = 1$. In Table 1, both the estimated constant and slope appear very close to their hypothesized values. The F-test of the joint hypothesis that $a = 0$ and $b = 1$, reported in the fourth row of Table 1, does not reject rationality.

Table 2 reports tests of the hypothesis that analysts use the information contained in their past forecast errors in their current forecasts as outlined in equation (2). Three different statistical procedures were used to conduct these tests. The parameter estimates in the first column in Table 2 were obtained using OLS, where the standard errors were corrected for unequal variances using White's procedure. The estimates in the second column were obtained using weighted least squares (WLS) regression, where the standard deviation was used as the weighting variable. The third column in Table 2 presents the results obtained using a statistical method known as bootstrapping. This procedure is used to control for possible quarterly cross-sectional correlations across the firms included in the sample.[7] If analysts forecast rationally, new forecasts should reflect all information contained in past prediction errors—that is, $a = b = 0$. The coefficient estimates again appear to be fairly close to their hypothesized values. However, for two of the three alternative methods used (weighted least squares and bootstrap), the slope coefficient (b) does differ significantly from zero. The joint test of the rational expectations hypothesis is not rejected using OLS with the White correction (F-test with degrees of freedom two and infinity) but is rejected using the weighted least squares procedure.

The results presented in Tables 1 and 2 are inconclusive and similar to those reported in the literature.[8] Although it is not possible to give a definitive reason for the discrepancies, as will be explained below, the failure to account for possible time effects of macroeconomic shocks or business cycles could be a contributing factor, particularly in cases in which rationality is rejected.

Tests for Macroeconomic Shock or Business Cycle-Induced Time Effects. In order to determine whether the rational expectations hypothesis was rejected because of a failure to account for the possibility that forecast errors are not independent across the cross-sections of firms included in the sample, a careful examination was conducted of the residuals from the regressions summarized in Tables 1 and 2. This analysis indicates the presence of significant time series dependence.[9] Without correction, the presence of this type serial correlation can easily invalidate hypothesis tests. As stated in the introduction, because aggregate shocks affect the economic variables underlying the earnings being forecasted, they can induce bias into observed forecast errors. Furthermore, these aggregate shocks not only cause cross-sectional correlations but because of the cyclical nature of these variables, they may also lead to autocorrelated residuals.[10] As a result, it is possible to reject rational expectations when the hypothesis is actually valid. Given the somewhat inconclusive results in the initial tests, it is appropriate to account for these effects in the analysis.

This research involves two approaches to examining business cycle effects. The first runs regressions across analysts' forecasts for each quarter of the period covered.[11] Table 3, in which the results are reported, shows that the slope coefficient (b) is quite variable, suggesting that it is not stable over time. In addition, the model is rejected in a subset of the quarters.[12] These results suggest the presence of time or business cycle effects.

To test for the presence of the suggested business cycle effects, a fixed time effects model was used (see George G. Judge and others 1987, section 13.4). This model is basically a quarterly dummy variables model, which allows each time period a different intercept (the constant [a] in equations [1] and [2]) and allows testing for the rationality while the model is shifting over time.[13] Table 4 reports the results of an F-test for homogeneity of quarters along with the unbiasedness and serial correlation tests for rationality.

If the analysts' forecasts are rational, the slope coefficients (b) in the unbiasedness and serial correlation tests with the inclusion of fixed time effects should not differ significantly from 1 and 0, respectively. The test results in Panels A and B in Table 4 show that the hypothesis of no time effects is strongly rejected at the 1 percent level by the F-test of homogeneity of quarters. On the other hand, the unbiasedness and serial correlation tests with the inclusion of fixed time effects do not reject rationality. As can be seen in Panel A of Table 4, the null hypothesis that the slope coefficient (b) is equal to 0 is rejected, but the rational expectations hypothesis that it is equal to the value of 1 cannot be rejected. Similarly, in Panel B, the null hypothesis

Table 3
Quarterly Examinations of Past Forecast Errors

Quarter	OLS		WLS		Number of Observations
	Constant (*a*)	Slope (*b*)	Constant (*a*)	Slope (*b*)	
85:2	–0.1262*	–0.1276*	–0.0025	–0.0862	121
	(–1.965)	(–2.465)	–0.161)	(–1.032)	
85:3	–0.1114	0.8102	0.0393	0.6371**	133
	(–1.839)	(0.995)	(1.149)	(3.138)	
85:4	–0.0349	0.02740	–0.0129	0.0053	169
	(–1.160)	(0.993)	(–1.276)	(0.445)	
86:1	–0.1008**	–0.1695	–0.0064	0.3383	163
	(–3.275)	(–0.925)	(–0.805)	(0.370)	
86:2	0.0095	0.1608**	–0.0014	0.0677	149
	(0.539)	(3.367)	(–0.255)	(0.968)	
86:3	–0.0107	0.2111	–0.0031	0.2040**	154
	(–0.522)	(1.754)	(–0.692)	(3.872)	
86:4	–0.0544	0.2022	–0.0027	0.1779	213
	(–1.498)	(1.707)	(–0.385)	(1.869)	
87:1	0.0518**	0.0552	0.0118	0.0081	195
	(2.807)	(0.914)	(1.758)	(0.265)	
87:2	–0.0780	0.6409**	–0.0014	0.0459	179
	(–1.276)	(3.363)	(–0.104)	(0.754)	
87:3	0.0728	0.0214	–0.0025	0.0078	200
	(1.321)	(0.494)	(–0.160)	(0.087)	
87:4	–0.0097*	0.1181	–0.0256	0.0721	223
	(–2.282)	(0.999)	(–1.201)	(0.894)	
88:1	0.1482**	0.0291	0.0019	–0.0230	217
	(3.028)	(0.900)	(0.183)	(–0.778)	
88:2	0.0536	0.3480**	0.0008	0.2253**	201
	(1.343)	(5.285)	(0.070)	(4.365)	
88:3	–0.0324	0.2816*	–0.0292	0.2434	160
	(–0.677)	(2.342)	(–1.710)	(0.120)	
88:4	–0.0280	0.0136	–0.0120	0.6003**	205
	(–0.695)	(0.050)	(–0.827)	(7.499)	
89:1	0.0946*	–0.1292	0.0065	–0.2540**	163
	(2.390)	(–1.653)	(0.684)	(–3.908)	
89:2	–0.0484	0.7760	–0.0168	0.2638**	199
	(–1.495)	(1.928)	(–1.878)	(2.956)	
89:3	–0.1126*	0.0689	0.0011	0.1257**	150
	(–2.330)	(1.237)	(0.182)	(2.618)	
89:4	–0.0680*	0.2367	0.0058	–0.0231	219
	(–2.202)	(1.887)	(0.607)	(–0.339)	

** Significant at the 1 percent level
* Significant at the 5 percent level

Note: Each column reports estimates of the coefficients and corresponding *t*-statistics using two estimation techniques. The first column reports OLS estimates with the White correction for nonhomogeneous variances while the second column reports the weighted least squares (WLS) estimates using the standard deviation as the deflator. The *F*-test statistic applies to the joint test for rational expectations—that is, *constant* = 0 and $b = 0$ from the model $A_t - E_t = constant + b(A_{t-1} - E_{t-1}) + e_t$, where A_t is actual quarterly earnings per share for quarter t, E_t is the earnings per share forecasted for quarter t, and e_t is the error term.

Table 4
Test for Fixed Time Effects

Panel A

Unbiasedness Test
$A_t = FTE + b \bullet E_t + e_t$

b	0.9884 {0.017} (58.485)** [–0.686]
R^2_{Adj}	.690
F	3.545**

Panel B

Serial Correlation Test
$A_t - E_t = FTE + b(A_{t-1} - E_{t-1}) + e_t$

b	0.0967 {0.061} (1.585) [14.808]**
R^2_{Adj}	.023
F	3.509**

** Significant at the 1 percent level
* Significant at the 5 percent level

Note: In each panel, the first row reports the estimated slope coefficient, the associated standard error in braces {}, and t-statistics corresponding to the null hypotheses that the coefficient equals zero (.) or one [.]. The second row reports the adjusted coefficient of determination (R^2). The third row reports the F-statistic, which tests for homogeneity of quarters—that is, no time effects.

that the slope coefficient is equal to zero as implied by the rational expectations hypothesis cannot be rejected, but the hypothesis that it is equal to the value 1 can be. These results are consistent with those reported for price expectations by P.C. O'Brien (1990) and Keane and Runkle (1990) and provide evidence in support of the rationality of analysts' forecasts. In addition, and perhaps more importantly, the analysis and discussion also raise questions concerning the robustness of recent studies that reject rationality but do not test or account for the presence of time or business cycle effects of the type induced by macroeconomic shocks. Because these effects can easily invalidate or reverse the conclusions reached in these studies, caution must be used in interpreting the results reported.[14]

The delicate nature of rational expectations tests may raise questions about their results. Nonetheless, to explain rejection of analysts' rationality by saying that analysts repeatedly and systematically make costly mistakes and do not learn from them does not seem realistic. Such seemingly nonrational behavior is within the realm of possibility, but, in the absence of an acceptable theoretical foundation, it seems unlikely for professionals whose livelihood depends on rational forecasts.[15] These points are buttressed by the fact that the rational expectations hypothesis is most applicable in situations in which the phenomena being forecasted are well understood by economic agents, as would appear to be the case with security analysts regularly providing earnings forecasts. As Robert E. Lucas (1977) has observed, "In so far as business cycles can be viewed as repeated instances of essentially similar events, it will be reasonable . . . to assume [that economic agents'] expectations are rational, that [economic agents] have fairly stable arrangements for collection and processing information, and that they utilize information in forecasting the future in a stable way, free of systematic and easily correctable biases" (1977).

Conclusion

This article evaluates the rationality of earnings forecasts by security analysts participating in the I/B/E/S data base. Following previous studies, the analysis considers unbiasedness and serial correlation tests. The results of the initial tests are generally negative and inconclusive, similar to several past studies. Like the results generally reported in the literature, the findings are ambiguous because of the possible presence of time or business cycle effects induced by, for example, macroeconomic shocks. Such effects could cause the standard errors in forecast models to be biased, invalidating standard hypothesis tests. The study documents the presence of significant quarterly time effects in the sample and, as a result, conducts unbiasedness and serial correlation tests that explicitly account for these time effects. Using this more general statistical model, the hypothesis of analyst forecast rationality cannot be rejected.

The results presented in the article provide support for the notion that security analysts engage in their forecasting activities in a rational fashion. That is, these analysts appear to learn from their past forecasting mistakes, make use of all economically relevant

information in forming their forecasts, and process information efficiently. Thus, the results call into question the conclusion reached in studies that found that security analysts do not forecast in a rational manner. Taken literally such a conclusion makes it difficult to explain, from an economic survival perspective, the continued employment of analysts to forecast corporate earnings. The results reported in this article demonstrate the effects that business cycles can have on analysts' forecasts and how important it is that statistical tests examining the rationality of these forecasts properly account for these effects. As shown above, failure to do so can lead to erroneous conclusions and inferences concerning the usefulness of analysts' forecasts.

By providing evidence suggesting that stock analysts' forecasts are rational, these results confirm that these forecasts are the best available, given current knowledge. Because they are rational, the forecasts can be considered trustworthy as inputs into formulating policies. They can provide valuable information for use in both economic decisionmaking and the formation of economic policy.

Notes

1. Most alternative explanations of how expectations are formed necessarily rely on a belief in systematic mistakes—that is, the belief that people do not learn from their past forecasting mistakes. The rational expectations hypothesis is attractive to economists because it assumes that individuals learn from their past mistakes and take steps to avoid repeating these mistakes; it seems consistent with how people really behave.
2. The econometric analysis of direct expectations and forecasts has a long history in economics. Earlier studies by Anderson (1952) and Theil (1952, 1955, and 1966) and the more recent studies by Pesando (1975), Mullineaux (1978, 1980), B. Brown and Maital (1981), Figlewski and Wachtel (1981), Keane and Runkle (1990), and others have contributed immensely to the authors' understanding of how agents form their expectations as well as the statistical properties of these expectations.
3. Studies by Crichfield, Dyckman, and Lakonishok (1978), L. Brown and Rozeff (1979), Givoly and Lakonishok (1979, 1980, 1982, 1984), Elton, Gruber, and Gultekin (1981), Givoly (1985), Ofer and Siegel (1987), and De Bondt and Thaler (1990) are just a few of the papers examining various aspects of financial analysts' forecasts. For a comprehensive review of this voluminous literature, see Givoly (1985) or various editions of the *Institutional Brokers Estimate System* bibliography produced by the brokerage firm Lynch, Jones, and Ryan.
4. It should be noted that these properties need not hold, in the sense of Muth (1961), if expectations or forecasts are formed on the basis of a misspecified model or a correct model structure that has incorrect parameter values. In addition, the efficiency property is also used to define an efficient market. Thus, there is no fundamental distinction between the hypothesis that expectations are rational and the hypothesis that markets are efficient.
5. See Givoly (1985) for a comprehensive bibliography of studies addressing the rationality of analysts' earnings forecasts.
6. Previous studies have employed various deflators in attempts to correct for nonhomogeneous—that is, unequal—variances. Givoly (1985) and Ali, Klein, and Rosenfeld (1992) conclude that the choice of deflator does not materially affect the statistical inferences. The present study also estimated the coefficients using weighted least squares (WLS), where the standard deviation was the weighting variable. The results obtained using this alternative procedure were not significantly different from those reported in Table 1.
7. The bootstrap procedure described in Noreen (1989) was used. This procedure was also used by Ali, Klein, and Rosenfeld (1992).
8. For example, De Bondt and Thaler (1990) used standard WLS techniques and rejected the rationality of annual I/B/E/S forecasts for the period from 1976 to 1984. (De Bondt and Thaler normalized using the standard deviation of earnings per share.) Crichfield, Dyckman, and Lakonishok used standard techniques, and the rationality of annual *Earnings Forecaster* forecasts for the 1967-76 period is not rejected. As is often the case in this literature, they do not weight their variables.

   The results of other studies are also conflicting (for instance, see Ali, Klein, and Rosenfeld 1992 in comparison with Givoly 1985). Similarly, rationality is not rejected for certain samples of forecasts (annual *Earnings Forecaster* 1967-76 [Crichfield, Dyckman, and Lakonishok 1978], annual *Earnings Forecaster* 1969-79 [Givoly 1985], quarterly I/B/E/S 1984-90) and rejected for other samples (annual I/B/E/S 1976-84 [De Bondt and Thaler 1990], quarterly *Value Line* 1976-86 [Abarbanell and Bernard 1991], annual I/B/E/S 1976-90 [Ali, Klein, and Rosenfeld 1992]).
9. The usual battery of diagnostics for serial dependency in the residuals were conducted.
10. Ali, Klein, and Rosenfeld (1992) attempt to control for cross-sectional correlations caused by aggregate shocks using a bootstrap procedure. This method does not, however, correct for the serial dependence resulting from these shocks.

11. As in other tests, OLS with the White correction and WLS were used.
12. P. Brown, Foster, and Noreen (1985) also document large yearly variations in mean and median forecast errors.
13. O'Brien (1990) uses a similar methodology to test for analyst, firm, and year effects. Using individual I/B/E/S forecasts for nine industries, she finds significant firm and year effects for most of the industries examined.
14. This point is amplified if one considers the fact that recent studies rejecting analyst forecast rationality—for example, Ali, Klein, and Rosenfeld (1992) and De Bondt and Thaler (1990)—examine time periods characterized by significant macroeconomic shocks or business cycles. Thus, the bias discussed above would seem to be more pronounced for these studies.
15. In a forthcoming paper, the authors offer and test a dynamic model of analysts' earnings forecasts (Ackert and Hunter 1994). The paper demonstrates that what is often taken to be irrational behavior on the part of security analysts can be shown to be consistent with a dynamic, more complicated form of rationality.

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FYI

Are International Comparisons of Inflation and Employment Valid?

Michael J. Chriszt

Understanding the performance of foreign economies is essential for investors, academics, and policymakers, especially in light of the international economic developments of the 1980s. Greater interdependence of national economies and the globalization of financial markets have profoundly changed the world economy.

With attention focused on the economies of the world at large, comparisons of various countries' economic reports are inevitable. Most countries have several broad economic indicators that are widely reported, and comparing reports among countries can serve as a useful yardstick for judging how well one economy is doing with respect to others. How valid are these comparisons, though? Are the reports similar enough to be compared, or are there subtle differences that preclude useful comparisons?

Two of the most important economic data reports frequently observed are the monthly inflation and labor market (employment and unemployment) reports. Although it may be tempting to draw specific assumptions about the meaning of particular reports from scanning the headlines for the latest inflation or unemployment rate, it is important to keep in mind that the construction and methodology of these reports differ from country to country. The purpose of this article is to demonstrate the ways in which seemingly comparable reports can differ (no attempt is made to define or compare national economic performance). Specifically, the discussion focuses on the consumer price indexes and labor market reports of the G-7 countries—the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada.

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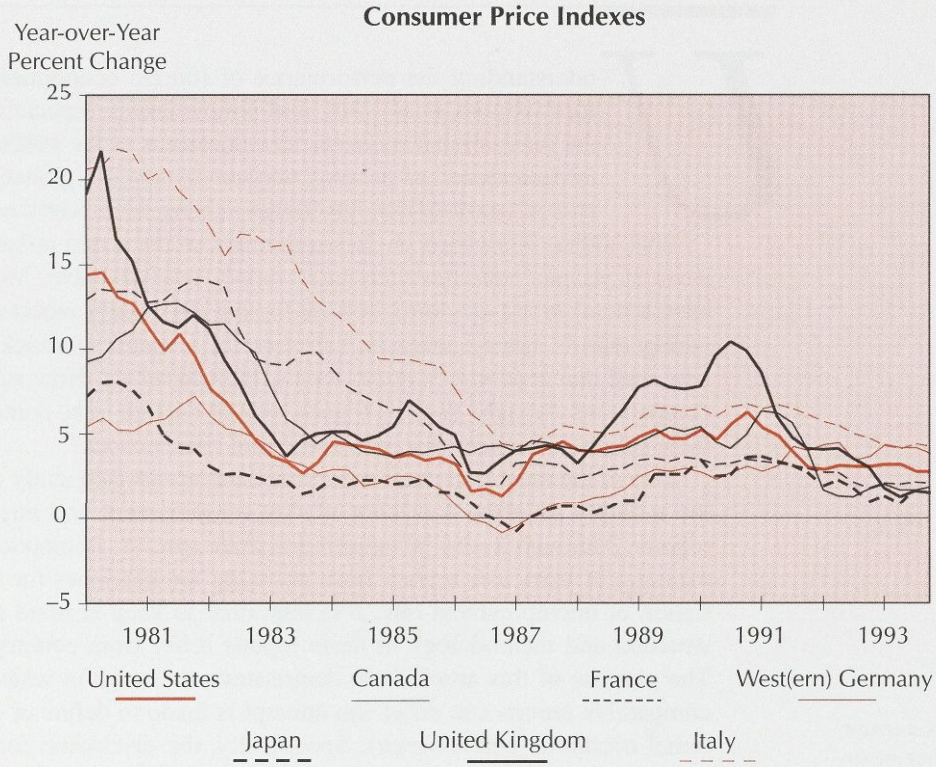
Consumer Inflation

The consumer price index (CPI) is considered one of the most useful measures of inflation in the United States and abroad (see Chart 1). Based on monthly surveys, the CPI measures prices at the middle-income, urban consumer level for a fixed basket of goods and services. Because the CPI is an index, it is used to compare the current level of prices with some base period. For example, in the United States, the base for the CPI is the average level of prices from 1982 to 1984. This base is then set to 100. By comparing the current level of the CPI with, say, its level of a year ago, the rate at which consumer prices have risen during the past twelve months can be determined. Other countries use different base years, and subtle but important differences exist in how countries' CPI indexes are compiled. (See Box 1 on page 30 for a summary of consumer price indexes in the G-7 countries and Appendix 1 for a description of the mathematical formula, the Laspeyres formula, used to compile the consumer price index.)

Important Components. For the United States, the largest component of the consumer price index is housing, accounting for more than 40 percent of the total. In comparison, the housing component of most other industrialized nations' CPIs is significantly lower. However, the U.S. housing component encompasses many items that other countries measure separately. For example, the German CPI housing—or "rent"—component is 17 percent, but Germany has fuel and light expenses and furniture and household items as separate components; the U.S. CPI housing component includes all these items.

Food and clothing outlays also receive heavy weights in consumer price indexes. In the U.S. CPI measure, food and beverages account for 17.6 percent of the total index. In other industrial countries, this component carries a larger weight. In Japan, for example, food accounts for almost one-third of the overall CPI measure. Importantly, though, the United States does not include tobacco in its food and beverage component while Japan and Germany do, adding to the weight of their overall food components. Like the United States, the

Chart 1
Consumer Price Indexes



Source: Calculated by the Federal Reserve Bank of Atlanta using data from International Monetary Fund, International Financial Statistics.

United Kingdom, Canada, and France track tobacco in submeasures other than food.

After the housing and food components, transportation and communication goods and services constitute the largest group in national CPI measures—17 percent of the overall CPI in the United States. Only Canada weights this area more heavily. In most other industrialized economies, the transportation component accounts for 10 percent to 15 percent of the overall price measure.

Among the other significant components is the clothing and footwear subset. In Italy, this component constitutes more than 10 percent of the total measure. In the United States, it accounts for slightly more than 6 percent. On average, this component constitutes about 8 percent of industrial countries' overall CPI.

Weighting. Every country weights its CPI components differently, both in construction and aggregation, because the CPI measure is designed to account for national preferences in consumer purchases. For example, in the United States the CPI weights are derived from the Consumer Expenditure Survey conducted from 1982 through 1984. The expenditure weight for each item is an estimate of the population's total expenditure for that item, averaged over the three-year period. Weights are revised slightly each December based on price fluctuation (see Appendix 1).

Most industrial nations construct their CPI weights in this manner. France and Britain, however, update the weights in their CPI measures annually on the basis of ongoing consumer expenditure survey results. Weights for Japan's CPI are derived from the household expenditure survey of 1990; for Canada's, from a 1986 survey; and for western Germany's, from a survey compiled in 1983 (updated in 1985). Japan, Canada, and Germany do not update weights annually.

Although nations differ in their methods for gathering and computing their consumer price indexes, the variations are not significant enough to warrant discarding or ignoring comparisons. Because each country establishes its respective CPI on the basis of national spending patterns, transnational dissimilarities in index construction are to be expected. The value inherent in perceptions that the current CPI measures are accurate clearly seems to outweigh relatively small differences in index composition. Therefore, even with their different weighting schemes, national consumer price indexes continue to be valid tools for comparing inflationary trends among countries. Table 1 illustrates the components and weights of the leading industrialized economies' CPIs.

Unemployment

Apart from gross domestic product (GDP), which measures an economy's total output, reports focusing on employment are probably the next most keenly watched economic indicators. Because of their scope and frequency, employment data are a particularly rich source of information on the level and range of economic activity. Like GDP, employment measures reflect activity in almost all sectors of the economy (no other economic report does). In addition, countries usually release employment and unemployment figures monthly, providing more current information than the quarterly GDP (see Chart 2).

Labor market data generally consist of two kinds of reports: employment and unemployment. Employment reports, which simply tally the total number of employed people in a given month, provide facts and figures covering most sectors of the economy, from which several assumptions (or forecasts) can be made. For example, counting the number of production employees engaged in manufacturing in a given month allows estimates of that month's level of industrial production.

Unemployment reports, although perhaps not as useful to analysts as employment reports, seem to get the most attention. An increase in a country's unemployment rate is perceived as a sign of economic weakness, and a decline is seen as a sign of strength. In truth, however, unemployment data are a lagging indicator because firms do not typically react to declines in demand for their goods or services by cutting the payroll immediately. Hours may be reduced, for instance, before layoffs are considered. And, clearly, management does not rush into a hiring frenzy immediately following one month's pickup in sales.

Changes in the labor force react to changes in demand for goods and services and also to underlying conditions. When activity shows signs of improvement, many people appear to reenter the labor force in search of work. At the same time, the lack of labor demand usually continues for a while, and the unemployment rate may actually increase as the economy is beginning to improve. Despite such limitations, unemployment rates are an economic indicator to which populations are sensitive, and these statistics therefore have significance for policymaking.

The unemployment rate of a given country is computed by dividing the total number of unemployed by the labor force, stating the number as a percentage. While countries share this basic approach, methods of

Table 1
Weighting Schemes of National Consumer Price Indexes
(Through 1992)

Canada

Source of weights. The weights and items were obtained from the 1986 family expenditure and family food expenditure surveys.

Item	Weight (100)
Housing	31.4
Transport	18.3
Food	18.1
Recreation, Reading, and Education	8.8
Clothing and Footwear	8.7
Tobacco and Alcohol	5.6
Furnishings and Equipment	4.9
Health and Personal Care	4.2

France

Source of weights. The weights are revised at the beginning of each calendar year using the results of continuing family expenditure surveys conducted among 10,000 households and data from the system of national accounts.

Item	Weight (100)
Furniture and Items, Tobacco	25.6
Food	22.7
Other Services	12.5
Housing	9.7
Clothing and Footwear	8.4
Fuel and Light	8.2
Transport and Communication	6.8
Personal and Medical Care	6.1

Germany (Western)

Source of weights. The weights were derived from a 1983 expenditure survey of roughly 55,000 private households and were updated in 1985 on the basis of a budget survey of about 1,000 selected private households.

Item	Weight (100)
Food and Tobacco	23.0
Rent	17.8
Transport and Communication	14.4
Other Goods and Services	10.9
Education and Entertainment	8.4
Fuel and Light	7.3
Furniture and Household Items	7.2
Clothing and Footwear	6.9
Personal and Medical Care	4.1

Italy

Source of weights. The weights were gleaned from consumption patterns and national accounts data for the first two quarters of 1989 and the last two quarters of 1990.

Item	Weight (100)
Food and Tobacco	22.8
Other Goods and Services	18.0
Transport and Communication	13.5
Clothing and Footwear	10.8
Furniture and Household Utensils	10.6
Education and Recreation	10.0
Housing	7.6
Medical Care	6.7

Japan

Source of weights. The weights were calculated from an expenditure survey of approximately 8,000 households conducted in 1990. The monthly weights of fresh food items were gathered from average expenditure data for 1989 and 1990.

Item	Weight (100)
Food	31.4
Housing	14.8
Transport and Communication	11.9
Reading and Recreation	11.2
Clothing and Footwear	8.6
Fuel, Light, and Water	5.5
Education	4.7
Miscellaneous	4.5
Furniture and Household Utensils	4.4
Medical Care	3.1

United Kingdom

Source of weights. The weights are revised in February each year using the latest results of the household expenditure survey. About 7,000 private households participate in the survey.

Item	Weight (100)
Housing	17.2
Transport and Vehicles	16.3
Food	15.2
Durable Household Goods and Services	12.5
Alcohol	8.0
Other Goods	7.5
Clothing and Footwear	5.9
Meals outside home	4.7
Fuel and Light	4.7
Other Services	4.4
Tobacco	3.6

United States

Source of weights. Weights are derived from the consumer expenditure survey of about 5,000 consumer units carried out during the 1982-84 period.

Item	Weight (100)
Housing	41.5
Food and Beverages	17.6
Transport	17.0
Medical Care	6.7
Other Goods and Services	6.7
Clothing and Footwear	6.1
Entertainment	4.4

data collection and definitions of what it means to be "unemployed" and of what constitutes the labor force can differ and distinctly affect international comparisons of unemployment rates (see Box 2).

Data Collection. Collecting data through surveys provides a broad look at unemployment because participants answer a variety of questions. In the United States, the unemployment report is based on a survey of roughly 60,000 households (0.05 percent of the labor force). The "household survey" is conducted over a week in the middle of each month. Japan's survey covers about 40,000 households (0.06 percent of the labor force) and is carried out during the last week of the month. Canada surveys roughly 55,000 households (0.4 percent of the labor force) over a week, usually in the middle of the month. The Italian survey contacts 70,000 households (0.3 percent of the labor force) but is only a quarterly endeavor: Italy's unemployment report is taken during the first week of the first month of every quarter.

The British, French, and German unemployment reports are not gathered through surveys; rather, the data are obtained by analyzing what is called "registration data." Registration data are gathered from government offices at which people apply for work and collect unemployment benefits. On the last day of the month, officials in France and Germany look at how many people are registered and who also fit the national definition of "unemployed." This number becomes the total number unemployed for the month. The United Kingdom examines data on the Thursday in the second week of the month.

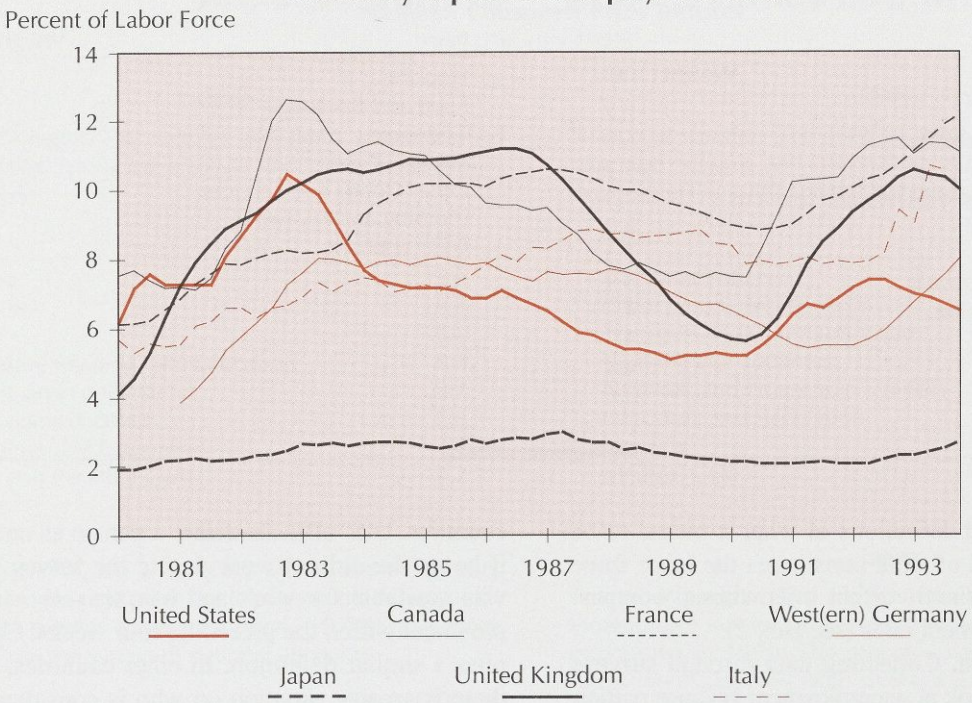
Definition of Unemployed. The criteria for being counted as unemployed vary considerably among countries. U.S. officials define a person as unemployed if he or she did not work during the survey week but was available for work and has actively sought employment within the preceding four weeks. Canada applies a similar definition. In other countries, however, there is greater variation on who is considered unemployed. In Japan and Italy, the requirement is only that individuals were actively seeking employment at the time of the survey. In Britain, an individual simply has to be registered at the Unemployment Benefit Office on the survey date. In France and Germany, unemployed status refers to those registered for three months. In addition, in Germany an individual must be seeking a job of more than twenty hours per week, and in France, a job of more than thirty hours per week.

There are other, more subtle differences in identifying the unemployed. For example, the United States considers only individuals sixteen years of age or older economically active members of the labor force. Canada, Germany, Japan, and Britain have set fifteen as the lower age limit. In Italy the age is set at fourteen, and in France there is no mention of an age limit.

Most countries include layoffs in their definition of unemployed; Japan and Britain do not, however. In addition, recent graduates looking for their first jobs are included in most nations' tally of the unemployed as long as they meet the other criteria. Britain is the exception, not counting its "school-leavers" among the ranks of the unemployed.

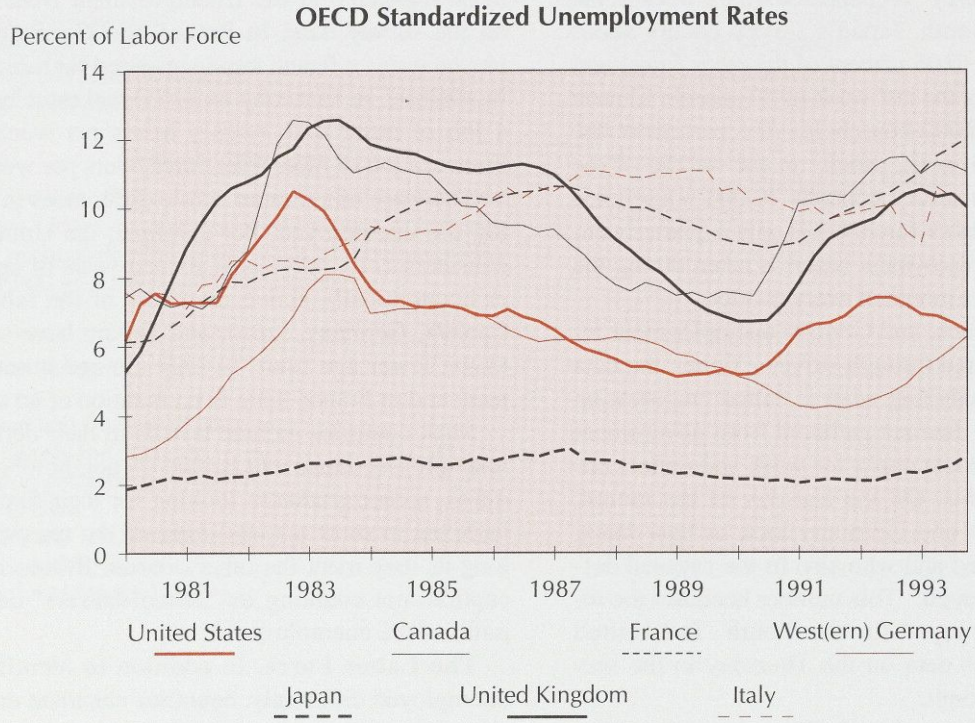
The Labor Force. In addition to identifying the unemployed differently, countries calculate unemployment rates differently as well, on the basis of somewhat different definitions of the labor force. In the

Chart 2
Nationally Reported Unemployment Rates



Source: National authorities of each country; see Box 2.

Chart 3
OECD Standardized Unemployment Rates



Source: Organisation for Economic Cooperation and Development, Main Economic Indicators.

United States, Canada, and Italy the labor force includes both employed and unemployed, excluding overseas members of the armed services. Japan, the United Kingdom, and France include members of the armed services in their measure of the labor force. Germany's measure excludes armed service members as well as the self-employed.

The result is considerable variation among national unemployment rates. For instance, Germany's rate appears high compared with other nations' measures but in fact is overstated by comparison. In addition to excluding the armed forces and the self-employed from its labor force measure, Germany relies on registration data, which tends to undercount the actual number of unemployed, and the unemployment rate is higher than if it were calculated differently.

Because the national unemployment rates are based on such varying data, comparing them may be misleading. The data are, however, valuable for analyzing employment developments within individual countries. For international comparisons, a measure developed by the Organisation for Economic Cooperation and Development (OECD) may be more suitable.

The OECD's Standardized Unemployment Rates. The Organisation for Economic Cooperation and Development computes and publishes standardized unemployment rates for many industrialized countries (see Chart 3). The standardized rates give the number of unemployed persons as a percentage of the total labor force. The OECD definitions for unemployment and labor force conform with those adopted by the thirteenth Conference of Labor Statisticians, which are generally referred to as the "ILO Guidelines" (see Appendix 2).

According to these guidelines, the labor force consists of civilian employees, the self-employed, unpaid family workers, professional and conscripted members of the armed forces, and the unemployed. Unemployment status refers to those who, in a specific period, are without work and are seeking employment.

As seen above, countries often look to registration data as their main source of unemployment statistics. According to the ILO Guidelines, however, registering at employment offices is only one way that the "seeking employment" criterion can be satisfied. Direct applications to employers, answering newspaper ads, and checking at work sites are other actions the ILO considers as seeking employment. Relying solely on registration data therefore results in underestimating both the total number of unemployed persons and the total labor force.

Labor force surveys, on the other hand, are more comprehensive and are therefore seen as more reliable. Not all countries conduct monthly labor force surveys, however. The United States, Canada, and Japan conduct monthly surveys; Italian authorities manage quarterly polls; and Germany, France, and the United Kingdom have annual surveys. To calculate a standardized monthly unemployment rate for the latter countries, the OECD uses monthly registration data for estimating monthly changes in unemployment between their annual surveys.

Establishment Surveys

National authorities also measure the total number of jobs in the economy. This figure differs from the number of persons employed because people can hold more than one job at a time. Periodic (usually monthly) surveys of employers—"establishment" surveys—provide these data (see Box 3). The size and scope of these surveys across national borders limits comparability. For example, the U.S. survey includes most types of firms while Great Britain includes only those engaged in manufacturing activity. In addition, countries handle part-time and seasonal workers and striking or laid-off employees differently. While these differences make international comparisons of data from establishment surveys likely to be misleading, within each country establishment surveys are often more useful than household surveys because of the greater scope and detail of information provided.

Conclusion

Gauging and comparing countries' economic performance demands both a broad perspective and attention to detail. A country's current inflation or unemployment rate alone offers little perspective, and definitive inferences should be avoided unless details have been thoroughly analyzed.

A review of methods and measurements shows that comparing national CPI measures is not wholly accurate, but slight differences are accounted for by national preference and are relatively insignificant in the long run. Comparison of nationally reported unemployment rates and particular data from establishment surveys across countries is not advisable, however. The OECD calculates standardized unemployment rates that may be used comparatively.

Box 1
Summary of Consumer Price Indexes

Canada

Official Title	Consumer Price Index
Organization	Statistics Canada
Frequency	Monthly. Official release is usually during the second week of the month following the measured month.
Scope and Method	Prices for food, gasoline, and most other commodities are collected once a month. Prices for automobiles are gathered quarterly; prices for furniture and household appliances are recorded six times per year. All private households in urban areas with populations greater than 30,000 are covered.
Base Year, Formula	1986 = 100, Laspeyres formula

France

Official Title	Consumer Price Index for Urban Households
Organization	INSEE (Institut Nationale de la statistique et des études économiques)
Frequency	Monthly. Preliminary estimates released the first week of the month following the measured month. Official, or "definitive," release is during the third week of the month following the measured month.
Scope and Method	Prices are collected monthly for most goods and services and twice monthly for fresh products. Furnishings and clothing prices are collected quarterly. Agents record prices at 30,000 retail outlets and service establishments in 108 urban centers with more than 2,000 residents.
Base Year, Formula	1990 = 100, Laspeyres formula

Germany (Western)

Official Title	Consumer Price Index for All Private Households
Organization	Federal Statistical Office
Frequency	Monthly. Preliminary estimates based on four Lander CPI results are released during the last week of the measured month. Official release is usually during the second week of the following month.
Scope and Method	Prices are collected in the middle of the month in 118 municipalities at 15,000 retail outlets and service centers.
Base Year, Formula	1985 = 100, Laspeyres formula

Italy

Official Title	National Consumer Price Index
Organization	ISTAT (Instituto Nazionale di Statistica)
Frequency	Monthly, released during the first week of the month following the measured month.
Scope and Method	Prices are collected in the ninety-three provincial capitals from roughly 26,300 retail stores and from 6,000 service establishments. Data are collected on the fifteenth of each month; for fresh goods, prices are gathered three times per month. Household durable goods and some services prices are collected quarterly.
Base Year, Formula	1990 = 100, Laspeyres formula

Japan

Official Title	Consumer Price Index
Organization	Management and Coordination Agency, Statistics Bureau
Frequency	Monthly. A national CPI is released toward the end of the month following the measured month. A CPI for the Tokyo area is released toward the end of the measured month.

Scope and Method	(National Index) Prices are gathered on the week that includes the twelfth of each month in 167 municipalities. Some prices for fish and fresh vegetables are recorded three times each month.
Base Year, Formula	1990 = 100, Laspeyres formula

United Kingdom

Official Title	Retail Prices Index
Organization	Central Statistical Office
Frequency	Monthly. Data are released toward the middle of the month following the measured month.
Scope and Method	Prices are collected in 180 localities. The index relates to a single day of the month, usually the second Tuesday of the month.
Base Year, Formula	1987 = 100, Laspeyres Formula

United States

Official Title	Consumer Price Index for All Urban Consumers (CPI-U)
Organization	U.S. Department of Labor, Bureau of Labor Statistics
Frequency	Monthly. Data are released the second Friday of the month following the measured month.
Scope and Method	Prices are gathered in eighty-five sample urban areas. Food and fuel prices are collected each month in all eighty-five survey areas. Prices on most other goods and services are gathered monthly in only the five largest cities and every other month in the remaining eighty urban centers.
Base Year, Formula	1982-84 = 100, Laspeyres formula

Box 2
Unemployment Report Comparisons

Canada

Organization	Statistics Canada
Frequency	Monthly. Official release is usually the second Friday of the month following the measured month.
Scope and Method	Sample survey of about 55,000 households.
Definition of Unemployed	Persons without work who are currently available for work and who also sought employment within the previous four weeks.

France

Organization	Minister des Affaires Sociales et de l'Emploi
Frequency	Monthly, released toward the end of the month following the measured month.
Scope and Method	Based on registration data.
Definition of Unemployed	Persons without work who are currently available for work and who have sought a full-time position (thirty hours or more) for more than three months.

Germany (Western)

Organization	Federal Labor Office
Frequency	Monthly, released during the first week of the month following the measured month.
Scope and Method	Based on registration data.
Definition of Unemployed	Persons without work who are currently available for work and have been registered for a minimum of three months as seeking a job of twenty or more hours per week.

Continued on page 10

Box 2 *(Continued)*

Italy

Organization	ISTAT (Instituto Nazionale di Statistica)
Frequency	Quarterly, released during the fifth week of the measured quarter.
Scope and Method	Sample surveys of about 70,000 households.
Definition of Unemployed	Persons without work who are currently available for and seeking employment.

Japan

Organization	Management and Coordination Agency, Statistics Bureau
Frequency	Monthly. The report is released toward the end of the month following the measured month.
Scope and Method	Sample survey of about 40,000 households.
Definition of Unemployed	Persons without work who are currently available for employment and who also actively sought a job or are preparing to begin work.

United Kingdom

Organization	Department of Employment
Frequency	Monthly. Data are released toward the middle of the month following the measured month.
Scope and Method	Based on registration data.
Definition of Unemployed	Persons claiming benefits at Unemployment Benefit Offices.

United States

Organization	U.S. Department of Labor, Bureau of Labor Statistics
Frequency	Monthly. Data are released the first Friday of the month following the measured month.
Scope and Method	Sample survey of about 60,000 households.
Definition of Unemployed	Persons who did not work during the survey week but were available for work and had actively sought employment within the preceding four weeks.

Box 3
Establishment Surveys

Canada

Organization	Statistics Canada
Businesses Covered	Industrial: forestry, mining, oil wells, manufacturing; construction; transportation, communication, and other utilities; trade; finance, insurance, real estate; commercial, business, and personal services; public administration.
Not included	Agriculture, fishing and trapping, private household services, religious organizations, and the military.
Geographical Coverage	Entire country.
Persons Covered	All persons drawing pay for services rendered or for paid absences, and workers for whom the employer is required to complete a Revenue Canada T-4 form. Military services are excluded.
Frequency	Monthly, since 1966.
Concepts and Definitions	
Establishment	The smallest separate operating entity capable of reporting all elements of basic industrial and payroll data. All types and sizes of establishments are covered.
Employment	Full-time, part-time, and temporary employees are covered. Working owners, directors, partners, and other officers of incorporated businesses are included as well.

Not covered	Self-employed, unpaid family workers, homeworkers, and those not receiving any pay during the reference period (strikers, lockouts, layoffs, and workers on unpaid leave).
Data Collection	Survey conducted by mailed questionnaires, reporting statements, and telephone calls.
Reference Period	The last pay period or the last seven days of the month.

France

Organization	Service des études et de la statistique, Ministere du Travail, de l'Emploi et de la Formation Professionnelle
Businesses Covered	Industrial—mining and manufacturing; electricity, gas, and water; wholesale and retail trade and restaurants and hotels; transport, storage, and communication; finance, insurance, real estate, and business services; community, social, and personal services.
Not covered	Agriculture, public administration, domestic services.
Geographical Coverage	Entire country.
Persons Covered	Wage earners and salaried employees.
Not covered	Working proprietors and directors, unpaid family workers, and homeworkers.
Frequency	Quarterly, since 1946.
Concepts and Definitions	
Establishment	A group of employees (ten or more) working under the control of a single legal entity at a single location.
Employment	Employees who have an employment contract, whether it is in force or not, whatever their age. This includes full- and part-time wage earners and salaried employees, as well as seasonal workers. Excluded are temporary employees and homeworkers.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	The last day of every quarter.

Germany (Western)

Organization	Federal Statistical Office
Businesses Covered	Industrial—mining and manufacturing; electricity, gas, and water; building and civil engineering work; wholesale and retail trade; finance and insurance.
Geographical Coverage	States of the former West Germany.
Persons Covered	Wage earners and salaried employees.
Not covered	Working proprietors and directors, unpaid family workers, homeworkers, apprentices, part-time, temporary, and seasonal workers. Also excluded are workers absent because of unpaid vacation, temporary layoff, and temporary military service.
Frequency	Quarterly, since 1950. (Monthly series available for manufacturing employment beginning in 1981.)
Concepts and Definitions	
Establishment	Local unit of an enterprise.
Employment	Employees are those whose regular monthly gross earnings are below DM9,000 ($5,300). They include wage earners and salaried employees and those temporarily absent because of paid leave, strike, lockout, or sickness.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	The first month of every quarter.

Italy

Organization	Ministerio del Lavoro e della Previdenza Sociale
Businesses Covered	Industrial—mining, manufacturing; electricity, gas, and water; construction.
Geographical Coverage	Entire country.
Persons Covered	Wage earners and salaried employees.
Frequency	Quarterly, since 1965. Monthly from 1947 to 1964.

Continued on page 12

Box 3 *(Continued)*

Concepts and Definitions	
Establishment	Local unit or the place where the central administrative office of the enterprise is located and where production is ensured. Covers firms of fifty or more employees.
Employment	Wage earners and salaried employees.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	First month of every quarter.

Japan

Organization	Policy Planning and Research Department, Ministry of Labor
Businesses Covered	Industrial—mining and manufacturing; electricity, gas, and water; construction; wholesale and retail trade, restaurants and hotels; transport, storage, and communication; finance, insurance, real estate, and business services; community, social, and personal services.
Not included	Agriculture, hunting, forestry, fishing, and household services.
Geographical Coverage	Entire country.
Persons Covered	Wage earners and salaried employees.
Not covered	Working directors and proprietors, unpaid family workers, and homeworkers.
Frequency	Monthly, since 1950.
Concepts and Definitions	
Establishment	An economic unit that produces goods and services at a single location. All establishments with thirty or more regular employees are covered.
Employment	Regular employees, including wage earners, salaried employees, apprentices, part-time, temporary, seasonal workers. Also included are those on paid and unpaid leave. Workers who are temporarily off the payroll, such as strikers, lockouts, layoffs, and other authorized or unauthorized employees are also included.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	One month.

United Kingdom

Organization	Department of Employment
Businesses Covered	Industrial—manufacturing.
Geographical Coverage	Great Britain (Northern Ireland is not included).
Persons Covered	Working directors, wage earners, and salaried employees.
Not covered	Working proprietors, unpaid family workers, and homeworkers.
Frequency	Monthly, since 1971.
Concepts and Definitions	
Establishment	Workplaces that participate in the survey (those with ten or more employees).
Employment	Employees on establishment payrolls. Apprentices, part-time, temporary, seasonal workers, and those on paid and unpaid leave are included. Workers who are temporarily off the payroll, such as strikers, lockouts, layoffs, and other authorized or unauthorized employees are also included.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	One day in each month.

United States

Organization	Bureau of Labor Statistics of the Department of Labor in cooperation with State Employment Security Agencies
Businesses Covered	Industrial—mining, manufacturing; electricity, gas and water; construction; wholesale and retail trade; transport, storage, and communication; finance, insurance, real estate, and business services; community, social, and personal services; local, state, and federal government.

Not included	Agriculture, hunting, forestry, fishing, private households, and the military.
Geographical Coverage	Entire country.
Persons Covered	Working directors, wage earners, and salaried employees.
Not covered	Working proprietors, unpaid family workers, and homeworkers.
Frequency	Monthly, since 1915.
Concepts and Definitions	
Establishment	An economic unit that produces goods and services at a single location and is engaged in one type of economic activity. All types and sizes of establishments are covered.
Employment	Employees on establishment payrolls who receive pay for any part of the pay period that includes the twelfth of the month. Part-time, temporary, seasonal workers, and those on paid leave are included; workers on unpaid leave are excluded. Strikers and locked-out employees are also excluded.
Data Collection	Survey conducted by mailed questionnaires.
Reference Period	The pay period which includes the twelfth day of the month.

Appendix 1
The Laspeyres Index Formula

The mathematical formula used to calculate CPI in the United States and the other G-7 countries is the Laspeyres index formula:

$$I_t = \frac{\sum p_t q_a}{\sum p_o q_a} \times 100,$$

where

I = index;
p = price;
q = quantity;
Σ = the summation of the products of price and quantity for all the items in the index;
t = the time period to which the index refers;
a = the base period to which the quantity weights refer; and
o = the base period to which the prices refer.

If the measured period is the same as the base period (t) and weights (a), the formula is precisely equivalent to the Laspeyres index. In this case, movement in the index reflects changes only in the prices paid by consumers for that fixed basket of goods. Therefore, the formula is altered to permit the index to be calculated without having to determine specific weights. That reformulation is:

$$I_t = I_{t-1}\left[\frac{\sum (p_{t-1}q_a)(p_t / p_{t-1})}{\sum p_{t-1}q_a}\right].$$

The first term in the numerator—the same as the first term in the denominator—represents the portion of consumer spending on each item in the fixed basket if the consumer purchased the base quantities. It is called a *relative importance* and may change from period to period if the price of the item changes relative to all other prices. The relative importance can be employed to compute indexes for specific periods from the component price series composing the CPI.

Appendix 2
International Labor Office Definition of Unemployment

The following is extracted from the Resolution Concerning Statistics of the Economically Active Population, Employment, Unemployment, and Underemployment (Resolution 1, Thirteenth International Conference of Labor Statisticians, Geneva, 1982).

(1) The "unemployed" comprise all persons above a specified age who during the reference period were:
   (a) "without work," i.e., were not in paid employment or self-employment;
   (b) "currently available for work," i.e. were available for paid employment or self-employment during the reference period; and
   (c) "seeking work," i.e., had taken specific steps in a specified recent period to seek paid employment or self-employment. The specific steps may include registration at a public or private employment exchange; application to employers; checking at worksites, farms, factory gates, market or other assembly places; placing or answering newspaper advertisements; seeking assistance of friends or relatives; looking for land, building, machinery or equipment to establish own enterprise; applying for permits and licenses, etc.

(2) In situations where the conventional means of seeking work are of limited relevance, where the labor market is largely unorganized or of limited scope, where labor absorption is, at the time, inadequate, or where the labor force is largely self-employed, the standard definition of unemployment given in subparagraph (1) above may be applied by relaxing the criterion of seeking work.

(3) In the application of the criterion of current availability for work, especially in situations covered by subparagraph (2) above, appropriate tests should be developed to suit national circumstances. Such tests may be based on notions such as present desire for work and previous work experience, willingness to take up work for wage or salary on locally prevailing terms, or readiness to undertake self-employment activity given the necessary resources and facilities.

(4) Notwithstanding the criterion of seeking work embodied in the standard definition of employment, persons without work and currently available for work who had made arrangements to take up paid employment or undertake self-employment activity at a date subsequent to the reference period should be considered as unemployed.

(5) Persons temporarily absent from their jobs with no formal job attachment who were currently available for work and seeking work should be regarded as unemployed in accordance with the standard definition of unemployment. Countries may, however, depending on national circumstances and policies, prefer to relax the seeking work criterion in the case of persons temporarily laid off. In such cases, persons temporarily laid off who were not seeking work but classified as unemployed should be identified as a separate subcategory.

(6) Students, homemakers, and others mainly engaged in non-economic activities during the reference period who satisfy the criteria laid down in subparagraphs (1) and (2) above should be regarded as unemployed on the same basis as other categories of employed persons and be identified separately, where possible.

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