Inflation: Causes, Costs, and Current Status

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Summary

Since the end of World War II, the United States has experienced almost continuous inflation—the general rise in the price of goods and services. It would be difficult to find a similar period in American history before that war. Indeed, prior to World War II, the United States often experienced long periods of deflation. It is worth noting that the Consumer Price Index (CPI) in 1941 was virtually at the same level as in 1807.

During the last two economic expansions, March 1991-March 2001 and November 2001-December 2007, the inflation rate remained low by the standards of previous decades, and has remained low since this recession began. This is true regardless of which index is used to calculate the rate at which the price of goods and services rose. A low inflation rate is especially significant since the U.S. economy was fully employed, if not over fully employed, according to many estimates for the last three years of the 1991-2001 expansion and during 2006-2007. Yet, contrary to expectations, the inflation rate accelerated only modestly. Keeping an economy moving along a full employment path without igniting a burst of inflation is a difficult policy task.

Because labor costs make up nearly two-thirds of total production costs, the rate at which they rise is often regarded as an indication of future inflation at the retail level. They tended to rise in the latter stage of the 1991-2001 expansion and to moderate during the subsequent contraction, recovery, and expansion that ended in December 2007.

Rather than measure inflation by using the rate at which prices overall are rising, some economists prefer a measure that reflects primarily the systematic factors that raise prices. This yields the "underlying" or "core" rate of inflation. Price increases over this period have been especially sharp in food and energy, which are not included in the core rate.

Why should the United States be concerned about inflation? This study reports the distilled knowledge of economists on the real cost to an economy from inflation. These are remarkably more varied than the outlays for "shoe leather," long reported to be the major cost of inflation ("shoe leather" being a shorthand term for the resources that have to be expended on less efficient methods of exchanges).

The costs of inflation are related to its rate, the uncertainty it engenders, whether it is anticipated, and the degree to which contracts and the tax system are indexed. A major cost is related to the inefficient utilization of resources because economic agents mistake changes in nominal variables for changes in real variables and act accordingly (the so-called signal problem). Inflation in the United States during the post-World War II era may not have been high enough for this cost to be significant.

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Introduction

Inflation—the general rise in the prices of goods and services—is one of the differentiating characteristics of the U.S. economy in the post-World War II era. Except for 1949, 1955, and 2009, the prices of goods and services have, on average, risen each year since 1945. The cumulative effect of this inflation is staggering: the price level has risen more than 1,000% since the end of World War II.[1] Inflation rose in the 1960s, peaked in the 1970s and early 1980s, and has been generally low but positive since then.

This was not true in the pre-World War II period. On the eve of that war, 1941, the U.S. price level was virtually the same as in 1807. During the periods from 1846 to 1861 and 1884 to 1909, the United States experienced a near constant price level. And in the 15 years from 1865 through 1879, the price level either remained constant or declined. The principal periods of inflation between 1800 and 1941 were associated with wars and the discoveries of gold and silver both here and abroad (and with increased efficiencies in extracting both metals).

Inflation Defined

Inflation can be defined as a sustained or continuous rise in the general price level or, alternatively, as a sustained or continuous fall in the value of money. Several things should be noted about this definition. First, inflation refers to the movement in the general level of prices. It does not refer to changes in one price relative to other prices. These changes are common even when the overall level of prices is stable.[2] Second, the prices are those of goods and services, not assets. Third, the rise in the price level must be somewhat substantial and continue over a period longer than a day, week, or month.[3]

Causes of Inflation

There has been practically no period in American history in which a significant change in the price level has occurred that was not simultaneously accompanied by a corresponding change in the supply of money.[4] This has led to a widely held view that "inflation is always and everywhere

[1] In this and the following paragraph, all changes in the price level are as measured by the Consumer Price Index.

[2] Especially troublesome for the definition of inflation is how to define a rise in the price of an important commodity such as oil. Since it enters as an important input into the production process as well as being a final product, it may cause many other individual prices to rise. Is this a rise in relative prices or is it more appropriately defined as inflation? Economists differ on how to describe this phenomenon. Some blame OPEC for the inflation of the 1970s and early 1980s. Others treat this as a rise in relative prices and attribute the inflation of the period to misplaced policies of the Federal Reserve.

[3] The words "somewhat substantial" cannot be defined precisely. All of the major price indexes have a number of shortcomings, such as only imperfectly correcting for changes in the quality of the goods and services contained in the index. For that reason, relatively low rates for inflation (e.g., plus or minus 2% or less) are often taken to be equivalent to price level stability.

[4] Perhaps the only exception to this statement is the inflation during the Korean War of 1950-1953.

a monetary phenomenon resulting from and accompanied by a rise in the quantity of money relative to output."[5]

Although this view is generally accepted, it is, in fact, consistent with two quite different views as to the cause of inflation.

In one view a more rapid rate of money growth plays an active role in inflation and results either from mistaken policies of the Federal Reserve or because the Federal Reserve subordinates itself to the fiscal requirements of the federal government and finances budget deficits through money creation. Examples of Federal Reserve policies that are likely to produce inflation are those that fix rates of interest too low or that support unrealistic foreign exchange values of the dollar. According to this view, the control of inflation rests with the Federal Reserve (Fed) and depends upon its willingness to limit the growth in the money supply.[6] Because of this relationship, some economists are concerned about the rapid growth in the portion of the money supply controlled by the Fed (called the monetary base) from 2008 to 2011, although to date the rise in the monetary base has not been accompanied by a proportionate increase in the broader money supply, mainly because of the large slack in the economy at the time.[7]

An alternative view comes in several versions. They have in common a belief that the major upward pressure on prices comes from activities which would produce a fall in real output. A favorite candidate is the attempt by organized labor to obtain increases in real wages. Other activities include the monopolistic pricing behavior of OPEC, major crop failures or changes in the terms of international trade produced by a decline in the foreign exchange value of the dollar. The decline in real output that these activities produce will, in general, lead to rises in unemployment. To prevent unemployment from increasing, in one version of this alternative, the Federal Reserve is seen to pump up demand by easing the growth of money and credit. In the process it ratifies the rise in the price level. Thus, in this version, while a growth in the money supply is necessary to ratify the upward movement in the price level, it is not the cause of the rise in prices.

It is interesting to speculate what would happen if the Federal Reserve refused to expand demand in the face of the rise in unemployment. Presumably, after a protracted period, the additional unemployment would lead to a fall in wages, costs, and other prices. Over the longer run, output would return to its previous level or growth path, the price level would fall back to its previous level and only relative prices and wages would be different. Thus, while the Federal Reserve has the power to curb inflation, it is unlikely to exercise this power in the face of a large run up in unemployment.

In another extreme variant, what the Federal Reserve does is really irrelevant. Should it refuse to expand what is conventionally called money to pump up demand in the presence of these developments that reduce output, money substitutes under the guise of credit will emerge that will allow demand to grow and the price increases to be ratified. This variation, interestingly, precludes excessive money growth from causing inflation, for it also holds that the Federal

[5] Milton Friedman, *What Price Guideposts in Guidelines: Formal Controls of the Marketplace*, Aliber, Robert and George Schultz, ed. (University of Chicago Press, 1966), p. 18.

[6] For more information, see CRS Report RL30354, *Monetary Policy and the Federal Reserve: Current Policy and Conditions*, by Marc Labonte and Joseph R. McCormack.

[7] For more information, see CRS Report R41540, *Quantitative Easing and the Growth in the Federal Reserve's Balance Sheet*, by Marc Labonte.

Reserve cannot force too much money on the economy. Inflation, then, cannot be a case in which too much money is chasing too few goods.[8]

The first two explanations for inflation find many adherents among American economists, whereas the third is more common among some British economists.

The Relationship Between Inflation and Unemployment

In most years, inflation tends to rise when unemployment falls, and vice versa. Economic theory explains this relationship in terms of a full employment rate of unemployment, also called the natural rate of unemployment or the non-accelerating inflation rate of unemployment (NAIRU).[9] Whenever the actual unemployment rate is above the full employment rate, total spending in the economy will fall, and the resultant slack will cause the inflation rate to fall (since there is less demand for goods and services). As the inflation rate falls, the expected rate of inflation should also fall if economic agents believe the government is sincere in its efforts to end inflation (i.e., that the government will not reverse its policy in the face of rising unemployment). As inflation expectations fall so will wage demands, and falling wage demands will bring about a lower unemployment rate (since employers will have more demand for labor when labor costs fall). Ultimately, the economy will move back to full employment at a zero inflation rate or a stable price level. Thus, the important steps in the sequence are (1) a convincing government policy to reduce the inflation rate to zero; (2) toleration of an above normal rate of unemployment; and (3) the adjustment of inflation expectations and wage demands to the lower rate of inflation. In practice, policymakers have shown a preference for stimulating the economy before inflation hits zero, so that unemployment returns to the full employment rate faster. As a result, most recessions have featured a falling but still positive inflation rate.

Inflation and Expectations

Economists believe that expectations of future inflation play an important role in the relationship between inflation and unemployment. To illustrate why, consider the example of tightening monetary policy (raising short-term interest rates) to reduce the inflation rate. Higher interest rates reduce spending on interest-sensitive goods, such as business investment spending, consumer durables, and housing. As spending on these goods declines, so will employment in the sectors producing these goods. If inflation expectations are low, the overall decline in spending and employment will put downward pressure on prices, as discussed in the previous section. But if inflation expectations are high, prices will respond less quickly to the same decline in spending and employment. As a result, spending and employment would have to fall further and longer to produce the same decline in prices. Whether inflation expectations are high or low will depend importantly on the perceived credibility of the Fed's commitment to maintaining low inflation. If businesses and workers do not believe that the Fed will stick with a policy of tighter monetary policy when faced with higher unemployment, they may not be willing to lower their price demands and wage demands, respectively.

[8] This view is commonly held by economists associated with the late Nicholas Kaldor and systematically explained by him in "Monetarism and U.K. Monetary Policy," *Cambridge Journal of Economics*, vol. 4 (1980), pp. 293-318.

[9] For more information, see CRS Report RL30391, *Inflation and Unemployment: What is the Connection?*, by Brian W. Cashell.

The Economic Costs of Inflation

Economists often discuss jointly the costs to an economy from unemployment and inflation because, for much of the period since the late 1950s, it was generally believed that a long-run tradeoff existed between the two.[10] While the cost of unemployment was well articulated, the cost of inflation was relegated to "shoe leather."[11]

The high U.S. inflation rate of the late 1960s, 1970s, and early 1980s caused economists to rethink the costs of inflation to an economy. What follows is a distillation of those efforts.

Describing the costs to an economy from inflation can be confusing for several reasons. First and foremost there is the confusion over the cost to the economy versus the cost to specific individuals. Costs to individuals may not impose a burden on the economy because they are in the nature of a redistribution of either income and/or wealth. What is lost by some is gained by others. Nevertheless, some of these redistributions can have real effects.

Second, some of the costs of inflation are permanent in the sense that so long as the inflation continues the costs will be incurred. Others are only transitory and arise as the economy moves from one inflation rate to another or because the rate of inflation itself is variable.

Third, some costs are incurred only because the inflation is unanticipated while other costs arise even when the inflation is fully anticipated. Finally, some costs occur only because of the absence for one reason or another of appropriate safeguards: for example, the absence of indexed contracts.

Inflation Costs in a Fully Indexed Economy

As an introduction to understanding the costs imposed on an economy by inflation, consider first an economy that is completely indexed for inflation. Thus every conceivable contract is adjusted for changes in the price level including those for debt (bonds and mortgages) and wages and salaries; where taxes are imposed only on real returns to assets, where tax brackets, fines and all payments imposed by law are indexed, where the exchange rate is free to vary and there are no legal restrictions imposed on interest rates, etc.

In this economy, the distinction between anticipated and unanticipated inflation is unimportant except if the inflation rate is high and the indexed adjustments are not continuous. Then real costs can occur. However, for analytical purposes, assume that all individuals perfectly anticipated the inflation and that the indexed adjustments are continuous.

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[10] A comprehensive discussion of the costs of inflation can be found in Fischer, Stanley, and Franco Modigliani, "Towards an Understanding of the Real Effects and Costs of Inflation," *Weltwirtschaftliches Archiv*, vol. 114, no. 4 (1978), pp. 736-787.

[11] Before financial institutions could pay explicit interest on deposits that function as money, economists believed that individuals and businesses would shift their wealth into savings-type deposits on which interest was paid. Because of this, they would have to make more frequent trips to banks to obtain money. This involved primarily a cost of shoe leather, as shoes wore out more frequently because of the increased number of trips. Hence the often expressed view that the primary cost of inflation to an economy was "shoe leather." More generally, it refers to the resources devoted to avoiding anticipated inflation.

In this economy, inflation can impose only two real costs: the less efficient arrangement of transactions that result from holding smaller money balances and the necessity to change posted prices more frequently (the so-called menu costs).

The first of these, entailing the rearrangement of transactions due to the higher costs of holding money, is the one cost uniformly identified in the text books as "the cost of inflation." It is worth considering what is involved.

Both individuals and businesses hold money balances because it allows each to arrange transactions in an optimum or least cost way (e.g., for business this involves paying employees, holding inventories, billing customers, maintaining working balances, etc.) and to provide security against an uncertain future. Holding wealth or assets in a money form, however, is not costless. A measure of the so-called opportunity cost is the expected rate of inflation, a cost that rises because wealth can be held in alternative forms whose price or value rises with inflation.

When inflation occurs or when the rate of inflation rises, holding money becomes more costly. Individuals and businesses then attempt to get by with less money (for businesses this may mean billing customers more frequently, paying employees more frequently, etc.). This means that least cost transactions patterns are no longer least cost. The new patterns are less efficient—they use more time or more resources to effect a given transaction. In addition, holding smaller real money balances also reduces the security money provides against an uncertain future.

The magnitude of this cost has been reduced in the United States in recent years because financial institutions can now pay interest on a variety of deposits that function as money. Thus, the primary cost of inflation on money holding applies to currency on which no interest is paid. To the extent, however, that financial institutions are slow to raise interest rates in tandem with inflation, deposit holders will economize on holding deposits and arrange transactions less efficiently, thereby imposing a short-run cost on the economy.

The other cost imposed by inflation in a fully indexed economy is the so-called menu cost, which involves the extra time and resources that are used in adjusting prices more frequently in an environment where prices are rising. These additional costs are incurred mainly with goods and services that are sold in nonauction markets. It does not apply to auction markets where prices change more or less continuously in response to shifts in supply and demand.

Inflation Costs in a Partially Indexed Economy

Inflation Anticipated

Very few economies are fully indexed, even those in which inflation is severe. In the United States, indexation is incomplete. As such, inflation can impose costs even if it is fully anticipated. A case in point involves the arrangements for levying taxes. Taxes are levied in several instances on nominal as opposed to real income. As a result, the interaction of inflation and taxation can impose real effects on an economy by altering the incentives to work, save, and invest. Several examples should suffice to explain what is involved.

First, consider an individual who, in a non-inflationary period, earns a real rate of interest of 5% and who pays taxes of 30% on this income. The aftertax real rate of interest is 3.5%, that is,

[5% –(30% × 5%)]. Now, assume that a 10% rate of inflation is expected over the one-year term of the loan. As a result, the market rate of interest rises to 15% (composed of a real rate of 5% and an expected inflation rate of 10%). At a tax rate of 30%, the aftertax rate of return falls to 0.5%.[12] To the extent that saving is responsive to the real aftertax rate of return, taxing nominal yields, as is done in the United States, distorts the incentive for individuals to save.[13] (The existing empirical evidence for the United States suggests that private sector saving is quite insensitive to the aftertax rate of return.)

Second, consider what happens to the real aftertax rate of return on business capital during an inflation. For tax purposes, the depreciation of business plant and equipment is based on actual or historic costs. During an inflation, charging depreciation based on historic cost raises the nominal profits of businesses and the basis on which corporate profits taxes are levied. As a result, the aftertax real rate of return falls and this discourages businesses from adding to their stock of plant, equipment, and structures—the bases for future economic growth.[14] [15]

Third, to the extent that income tax brackets are not indexed or not indexed completely, inflation in a progressive income tax system can reduce the real aftertax income for wage and salary earners over time, distorting the incentives to work.

During the 1980s, the U.S. tax code was rewritten to adjust the tax brackets for inflation as well as to reduce the level and progressivity of the federal income tax. As a result, inflation has a much reduced interaction with federal taxes in reducing aftertax real income.

Several private sector practices also interact with inflation to produce real economic effects. The first is the continuation of level payment nominal mortgages for financing housing. This practice front loads the real cost of a mortgage during an inflation and, as a result, it discourages the purchase of homes, especially by younger first-time buyers.

Second, business firms continue to record all data in terms of the dollar even though the real purchasing power of this important unit of measure varies considerably over time. This practice has the potential for distorting the real profitability of business over time as well as the valuation of other relevant magnitudes. Since these nominal magnitudes are frequently used as the basis for borrowing and lending decisions, they have the potential for seriously distorting resource allocations.[16]

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[12] The after-tax real rate is equal to: 15% - 4.5% (which is 30% of 15%) = after-tax nominal yield of 10.5% - 10.0% inflation = 0.5% real after-tax yield.

[13] The possibility arises that the interaction of inflation and the taxation of nominal rates of return will produce negative aftertax real rates of return.

[14] The taxation of nominal profits may also encourage business to opt for shorter-lived capital during an inflation. In addition, since interest expenses are deductible for tax purposes, inflation encourages businesses to finance expansion by the use of debt as opposed to equity. This can impart an element of instability to the financial structure of the economy.

[15] Inflation can also influence some public decision-making because it leads to a misrepresentation of the reported statistics on which these decisions are made. Specifically, the Federal budget deficit tends to be overstated because the inflation premium in interest rates that represents the repayment of principal, is reported as interest expense in both the federal budget accounts and the GNP accounts. To the extent that public concern centers on the current operating outlays of the federal government, true interest outlays are considerably less than currently reported in the budget and, thus, the current operating deficit is much smaller than reported in the federal budget document.

[16] These distortions could be minimized if the dollar was defined as a real unit of account (e.g., defined in terms of a standard basket of commodities). Several proposals for doing so have been put forth. See Warren L. Coats, Jr., *In*

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Inflation Unanticipated

In this section, the real effects of inflation are analyzed in an environment where it is unanticipated and where the economy relies on nominal or unindexed contracts. In this situation, an important effect of inflation is to redistribute both income and wealth. It would be a mistake, however, to conclude that because gainers and losers cancel, there can be no real effects from inflation.

To see one such real effect, consider what happens to the interest bearing public debt. Inflation reduces the real value of the public debt and with it the real value of the wealth of the private sector, the ultimate owners of most of that debt. Thus, inflation redistributes wealth from the private to the public sector. But who constitutes the public sector? These are the taxpayers who also happen to be the members of the private sector, some of whom own the debt.

Thus, redistribution reduces the real value of the taxes needed to service this debt, and the reduction is most beneficial for the younger workers in the current population and for future generations. As a result of the fall in real tax burden, their real disposable income rises, both today and in the future. They are thus able to save more while older workers and retirees will, no doubt, have to reduce their consumption, for while they are faced with a large wealth loss, they gain very little from the reduced tax burden. Thus, the redistribution of wealth between the private and the public sectors is really a redistribution between generations that could have an effect on the rate of capital formation.

Perhaps the most serious effect of unanticipated inflation in a market economy is its potential to make the price system malfunction and misallocate resources. Those who live in market economies are apt to take its functioning for granted. They may fail to appreciate or understand the vital role that prices perform in such a system. As standard textbooks in economics teach, the price system determines what is produced, how it is produced, and to whom the output is distributed.

For the price system to perform these functions efficiently, producers must be able to discern a change in real or relative prices from a change in nominal prices which essentially leaves all relative prices unchanged. Only with the former will it be profitable to alter production. A similar phenomenon holds for workers. A rise in money wages may bring forth a greater quantity of labor time if workers are convinced that this is a rise in real wages, that is, money wages relative to prices.[17]

It is easier for producers and workers to discern these changes in real prices and wages if the price level is stable or if the inflation rate is constant. It is more difficult when the rate of inflation is rising and/or more variable. Under these circumstances market economies are apt to have "signal" problems. That is, producers and workers mistake changes in nominal prices and wages for changes in corresponding real magnitudes and act accordingly. The resulting changes in output

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Search of Monetary Anchor: A "New" Monetary Standard, IMF Working Paper, 1989.

[17] The key word in this explanation is "may," for a rise in real wages has both a substitution and an income effect. The substitution effect will cause workers to substitute work for leisure while the rise in real income will make leisure a more attractive option to working. Whether the quantity of labor time increases or decreases as the real wage rises will depend on which effect is stronger.

and labor time are inefficient and would not have occurred but for the mistakes in perception. Some economists, including Fed Chairman Ben Bernanke, have argued that low and stable inflation is conducive to higher long-term economic growth.[18] A "signal extraction" problem may not have arisen in the United States, however, since rates of inflation have been relatively low and stable.

Inflation and Uncertainty

Empirical studies completed in the 1970s support the view that inflation is associated with greater uncertainty about future prices and that the degree of uncertainty rises with the rate of inflation.[19]

Rising uncertainty about future prices is believed to produce several possible "real" effects. First, individuals appear to shift from buying assets denominated in nominal terms (e.g., bonds) to so-called real assets such as residential structures, land, precious metals, art work, etc. Because some of these assets are in fairly fixed supply, the resulting capital gain produced by the shift could conceivably raise private sector wealth by a sufficient amount to cause a fall in the saving rate. Second, to compensate for the perceived greater uncertainty, lenders appear to require a greater real reward for supplying funds for investment. Third, contracts tend to be shortened.

The first two developments lead to rising real interest rates, which tend to reduce the rate of investment and capital formation. The third development leads businessmen to prefer shorter lived assets.

Can A Little Inflation "Grease the Wheels" of the Economy?

A few prominent economists have broken with the mainstream view that inflation should be kept to a minimum. They have argued that moderate rates of inflation, in the 3%-5% range rather than the 1%-3% range, might be useful for smoother economic adjustment.[20] In a downturn, economic output falls because of "price stickiness"—prices and wages cannot adjust quickly enough to maintain full employment, so total spending falls below the productive capacity of the economy. These economists argue that with a higher average rate of inflation, adjustment would happen more quickly because real wage or price cuts would be possible while avoiding nominal wage cuts. For example, a worker might resist a 2% nominal cut in his wages when inflation is zero, but accept a 3% nominal wage increase when inflation is 5%. In both cases, real wages would have adjusted downward by 2%, but the latter example would have possibly occurred more quickly. Inherent in this view is that individuals suffer from some "money illusion" at moderate rates of inflation (i.e., a 2% real wage cut is accepted because the 3% nominal increase is not seen

[18] Ben Bernanke Testimony Before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate November 15, 2005.

[19] There are numerous studies that provide support for this view. Some are cited in the references in the Fischer and Modigliani study on which this section is based.

[20] See, for example, George A. Akerlof, William T. Dickens, George L. Perry, *The Macroeconomics of Low Inflation*, Brookings Papers on Economic Activity, Vol. 1996, No. 1 (1996), pp. 1-76. Laurence Ball, *Testimony Before the House Committee on Financial Services*, March 25, 2010.

as a cut.) The existence of "money illusion" is inconsistent with anticipated inflation, and is only possible if inflation is insignificant; there is significant evidence that individuals in high inflation economies are highly sensitive to the inflation rate.[21]

Another argument made for targeting a higher (but still moderate) inflation rate is that deflation (falling prices) is a more serious problem than inflation, with Japan as an example of a country stuck in a long period of deflation and sluggish economic growth. A higher average inflation rate makes it less likely that a country would slide into deflation during a downturn. The reason that it could be hard to escape deflation is related to the "zero bound" on monetary policy.[22] The Federal Reserve can only reduce short-term interest rates to zero when it is stimulating the economy, but sometimes, as was the case in 2008, further stimulus is needed to end a recession. With a higher average rate of inflation, average interest rates would also be expected to be higher. Higher average interest rates would be further from the zero bound on average, so that the Federal Reserve could undertake more stimulus before hitting the zero bound. This argument neglects the fact that the Fed can undertake (and has recently undertaken[23]) unconventional monetary policy actions and expansionary fiscal policy to further stimulate the economy at the zero bound.

Economic Costs of Inflation: Summary

What is the cost of inflation? It is customary in textbooks to answer this question in terms of a situation where the rate of inflation is anticipated by all market participants who can either continuously re-contract or in which everyone is protected from inflation through indexation. In this world the cost to an economy from inflation is the increased resource cost from conducting transactions with reduced holdings of money—popularly termed "shoe leather" costs. If the inflation is serious, this cost is by no means trivial.[24]

However, inflations are seldom perfectly anticipated. In this situation, perhaps the most serious real effect comes from the ability of rising prices to jam the price signals that are so important to the smooth and efficient functioning of a market economy. Evidence suggests that this may not have been a problem for the United States in the post-World War II era.

In general, the cost of inflation to an economy will be larger the higher the rate of inflation, the more variable the rate, the less it is anticipated, the greater is the uncertainty it causes, and the less indexed is the economy.

[21] While proponents of a higher but still moderate inflation target would not deny that there would be higher "shoe leather" costs associated with such a proposal, they would argue that the higher costs would not be great enough to outweigh the benefits.

[22] See, for example, Olivier Blanchard et al., "Rethinking Macroeconomic Policy," International Monetary Fund, *Staff Position Note 10/3*, February 2010.

[23] For more information on recent unconventional monetary actions, see CRS Report RL34427, *Financial Turmoil: Federal Reserve Policy Responses*, by Marc Labonte.

[24] It should be noted that this is not a one-time cost. The costs will be incurred as long as the inflation continues.

The Measurement of Inflation

Changes in the Prices of Goods and Services

There is no single measurement of inflation. The rise in the general level of prices, the essence of inflation, is measured by using a price index that aggregates the price of different goods and services. Ideally, the price index used should be broad based and one in which the individual prices are weighted to indicate their importance to the economy. Many different price indexes are available in the United States that measure different types of inflation rates.

For purposes of this report, two separate price indexes are used. The first is very broad based and derived from the measurement of the nation's gross domestic product (GDP), covering price changes of consumption, investment, government, and traded goods. The other is the Consumer Price Index (CPI), which prices a "market basket" of goods and services purchased by an urban family, a market basket whose individual items are weighted by how much the urban family spent on them in a base year period—currently 1982-1984. Inflation rates according to the two measures are usually similar. Inflation, according to the CPI, was very low (usually below 2%) in the 1950s and early 1960s, began rising in the late 1960s, was relatively high in the 1970s and early 1980s (rising above 10% in 1974 and 1979-1981), began falling in the mid-1980s, and generally remained in the 2%-3% range in the 1990s and 2000s. [25] Inflation tends to rise over the course of an economic expansion and decline during an economic recession, for reasons discussed above (see "The Relationship Between Inflation and Unemployment").

Current CPI data can be accessed at http://www.bls.gov/news.release/pdf/cpi.pdf.

Current data for the GDP price deflator can be accessed at http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm.

The Underlying or Core Rate of Inflation

When comparing purchasing power over two time periods, the overall (referred to as "headline") inflation rate is the relevant measure. Comparisons over time of wages, wealth, rates of return, government transfers such as Social Security payments, and so on should all use a headline measure of inflation, because all of these concepts depend on a broad measure of inflation. Although the headline rate of inflation can provide much useful information to policymakers on the state of the economy, it can also be misleading since it responds to both systematic and random forces. The latter can best be understood by reference to the food component of the CPI. An unusual cold spell in Florida in January that damages a substantial part of the fresh produce crop can send food prices and the CPI soaring. A similar effect can be produced by an unusually wet summer in the Midwest. Alternatively, an unusually good combination of rain and sunshine can produce a bountiful harvest and lower prices. Energy prices are also susceptible to such random effects associated with events such as turmoil in major oil producing nations.

[25] Given that the CPI imperfectly measures the "true" rate of inflation, a stable price level or a "true" zero rate of inflation is thought to prevail when the inflation rate as measured by the CPI falls within a range of from 0.5% to 2.0%—this being the possible range of error in the current CPI.

To minimize the confusing signals that could arise from the use of the actual rate of inflation, some economists prefer to use a price index that reflects basically only systematic forces to measure inflation. For some economists, this can be achieved by using the CPI less its food and energy components. (It should be noted that food and energy represent about 25% of the current CPI.) Others want to use a moving average either of the CPI itself or of the current CPI less its food and energy components. The use of a moving average is based on the belief that if there are random factors that influence the actual inflation rate, they have an average value of zero. Hence, the use of a moving average should minimize their influence. Others prefer a more complicated measure that trims off whatever prices have changed most in that period.[26]

Policymakers, particularly at the Federal Reserve, often refer to core inflation in their policy decisions. Some policymakers prefer to use core inflation to predict future overall inflation because food and energy price volatility makes it difficult to discern trends from the overall inflation rate. A drawback of an over-reliance on core inflation, however, is that an extended period of rapidly rising food or energy prices could cause all other prices to accelerate. A focus on core may cause policymakers to fail to react to such a rise in inflation until it is too late. This scenario may have occurred in the last decade. Since CPI less food and energy was higher than headline CPI in each year of the decade except 2002 and 2009, a focus on core inflation may have led policymakers to wait too long to tighten policy in the expansion. Furthermore, several studies have failed to find core inflation to be a good forecaster of future inflation, casting doubt on the very rationale for relying on it.[27]

Current data for the CPI less food and energy can be accessed at http://www.bls.gov/news.release/pdf/cpi.pdf.

[26] Economists have tried to find the best measure of core inflation according to different criteria. See Timothy Cogley, "A Simple Adaptive Measure of Core Inflation," *Journal of Money, Credit and Banking*, vol. 34, no. 1, February 2002, pp. 94-113; Danny Quah and Shaun P. Vahey, "Measuring Core Inflation," *The Economic Journal*, vol. 105, no. 432, September 1995, pp. 1130-1144; Michael Bryan and Stephen Cecchetti, "Measuring Core Inflation," in N. Gregory Mankiw, ed., *Monetary Policy*, (Chicago: University of Chicago Press, 1994), p. 195; Todd Clark, "Comparing Measures of Core Inflation," Federal Reserve Bank of Kansas City, *Economic Review*, 2002:2, p. 5.

[27] See Robert Rich and Charles Steindel, "A Review of Core Inflation and an Evaluation of Its Measures," Federal Reserve Bank of New York, staff report no. 236, December 2005. This study examines the forecasting power of inflation less food and energy, as well as alternative definitions of core inflation that have been proposed by others, and found that "no core measure does an outstanding job forecasting [headline] CPI inflation ... we find no strong evidence to suggest that a selected core measure will be able to retain its usefulness as a tool to forecast inflation for any given period...." Todd Clark, "Comparing Measures of Core Inflation," Federal Reserve Bank of Kansas City, *Economic Review*, 2002:2, p. 5. This study did not find a statistically significant relationship between core inflation and future headline inflation, although the relationship becomes significant when limited to a more recent time period. Michael Bryan and Stephen Cecchetti, "Measuring Core Inflation," in N. Gregory Mankiw, ed., *Monetary Policy* (Chicago: University of Chicago Press, 1994), p. 195; and Julie Smith, "Weighted Median Inflation: Is This Core Inflation?" *Journal of Money, Credit, and Banking*, April 2004, vol. 36, no. 2, p. 253. Both of these studies compared the forecasting ability of many measures of inflation, and concluded that headline inflation is a better predictor of future headline inflation than core inflation and weighted median measure of inflation performed best. Frederic Mishkin, "Headline versus Core Inflation in the Conduct of Monetary Policy," speech at the Business Cycles, International Transmission and Macroeconomic Policies Conference, Montreal, Canada, October 20, 2007. This study used the Fed's macro model of the U.S. economy to show that when the Fed reacts to changes in headline inflation instead of core inflation, future inflation will be slightly less volatile, but unemployment will be significantly more volatile.

Changes in Labor Costs

Because labor costs comprise nearly two-thirds of the value of final output, some economists believe that they are an important determinant of the rate of inflation. However, changes in the rate of growth of labor costs must be read with care. Wage increases can be driven by productivity increases, tight labor markets, inflation, or fears of inflation. One way to determine the force or forces driving wage increases is to examine what happens to per-unit labor costs. To this end, two major measures of labor cost are available, a comprehensive measure of wage and benefit costs, the *employment cost index*, and *per-unit labor costs in the nonfarm business sector*.

The growth rate of both measures of labor cost generally showed a tendency to accelerate during the expansions of the 1980s and 1990s as labor markets tightened. Subsequent recessions and growing unemployment had a depressing effect on the rise in both measures. During the expansion beginning in 2002, the rate of increase in both measures was fairly comparable to the inflation rate (meaning real wage growth was low) even as the unemployment rate fell.

Current data for the employment cost index can be accessed at http://www.bls.gov/news.release/pdf/eci.pdf.

Current data for per unit labor costs can be accessed at http://www.bls.gov/news.release/pdf/prod2.pdf.

Conclusion

Inflation can impose a real cost on society in terms of the efficiency with which the exchange mechanism works, by distorting the incentives to save, invest, and work, and by providing incorrect signals that needlessly alter production and work effort. Because of this, policymakers should be concerned with the ongoing rate of inflation and any tendency for it to accelerate. An additional reason for concern arises because efforts to reduce the rate of inflation have often been associated with economic downturns. It should not be forgotten that the double-digit inflation of the early 1980s was reduced only through an economic downturn during which the unemployment rate rose to its highest level since the Great Depression of the 1930s. It is argued that the tendency for the inflation rate to accelerate in the late 1980s was a major reason why the Federal Reserve tightened monetary policy, which was also an important factor causing the recession of 1990-1991. Inflationary developments subsequent to that recession have been encouraging. The inflation rate has shown either no or only a modest tendency to rise as unemployment came down. Using various measures, the inflation rate since 1993 was low by standards of the preceding decade. Nonetheless, inflation has risen modestly preceding the 2001 and 2009 recessions, illustrating that this is still an important measure to watch for evaluating the state of the economy. Given the relationship between inflation and the money supply, some economists are concerned that the rapid growth in the portion of the money supply controlled by the Fed from 2008-2011 could cause rapid inflation. To date, those concerns have not been realized, primarily because of the large slack in the economy.

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