Chapter 4 – Inflation and Deflation

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Inflation is the scourge of the modern economy. It is one of the primary persistent threats that will undermine or even destroy decades of economic growth if unleashed and not curbed. It is feared by central bankers globally and forces the execution of monetary policies that are inherently unpopular. It makes some people unfairly rich and impoverishes others.

Inflation historically has destroyed entire economies and changed the course of human history. Inflation was one of the forces that unraveled the Roman Empire two millennia ago and the empire of the Soviet Union three decades ago. At the time this is being written the country of Venezuela is self-destructing from inflation rates of above 1,000% annually.

The impact of severe inflation often extends far beyond the economy. In the most telling story in modern history, the horrific inflation triggered by the Weimer Republic in Germany at the end of World War I caused prices to rise to such stupendous levels that the exchange rate of the German Mark to the Dollar exceeded three trillion to one! The resulting economic devastation created a political black hole from which emerged the National Socialist Party and Adolf Hitler, who exploited the ruination to become Chancellor of German in January 1933.

Inflation's mirror image, deflation, has less of a dark historical legacy, but is nonetheless a serious economic problem and one that haunts modern economies. Deflation defined price behavior during the Great Depression in the 1930s and has emerged as a potential economic problem in Japan, parts of Europe and even the United States after the last global recession just a few years ago. Isolated commodity deflation, such as the plunging price of crude oil seen in 2015, grabbed headlines globally because of the huge political and economic impact seen in commodity exporting nations.

This chapter explores the dual economic phenomenon of inflation and deflation at an introductory level. We will begin by defining inflation and deflation and explaining how they are measured in the modern economy. Then we will explore the construction of two primary prices indexes, the **Consumer Price Index** and the **Producer Price Indexes**, and will follow that with a lengthy discussion of why inflation and deflation are so harmful. Finally, using models already developed in other chapters in this series, we will explore the modern causes of inflation and consider elementary policy responses designed to curb inflation or stimulate an economy out of a deflation.

This chapter does not offer the final word about inflation and deflation. The range of available policy responses to inflation and deflation are discussed in greater detail in later chapters. Likewise, the complicated impact of exchange rate movements upon international inflation rates is also deferred to a later chapter on international trade and exchange rates.

1. Definitions

Because the term *inflation* is such a generic term used in many contexts, there is no commonly accepted definition of *inflation*, nor is there a common agreement on what constitutes acceptable levels of inflation, bad inflation, or hyper-inflation. Generally, it can be said that *inflation is a measure of a general increase of the price level in an economy, as represented typically by an inclusive price index, such as the Consumer Price Index in the United States*. The term indicates many individual prices rising together rather than one or two isolated prices, such as the price of gasoline in an otherwise calm price environment.

The *inflation rate* is typically expressed as an annual growth rate in prices (again, as measured by an index) even if measured over a shorter period of time. For example, if a radio report states that "consumer prices rose at an inflation rate of four percent last quarter," that would typically mean than the **Consumer Price Index for All Urban Consumers** (the most

quoted index) rose over the last three months at an annualized rate of around four percent, and the press would generally refer to the current inflation rate as around four percent.

The term *deflation* refers to a general *decline* in prices or the price level as measured by an inclusive price index and, again, is not a reference to isolated price declines, like natural gas declining in price, in an otherwise stable price environment.

During healthy economic times when the economy is experiencing neither inflation nor deflation, a term like *price stability* might describe the economic pricing environment at the time.

Table 1
Inflation Thresholds

<0%	Deflation
0% - 2.5%	Price stability
2.5% - 5.0%	Moderate inflation
5% - 8%	Serious inflation
8% - 12 %	Self-compounding inflation
12% - 20%	Hyperinflation
20% +	Explosive inflation

So at what point does an economy go from the desired status of price stability to inflationary (i.e. an economy experiencing inflation, which is almost always seen as a problem)? Although all economists recognize that the higher the rate of inflation, the more serious the economic problem (explained later), what constitutes the threshold of moving from good to bad and from bad the worse depends upon the economist and to some extent upon the context. Shown in **Table 1** is the somewhat arbitrary thresholds used by your teacher in his lectures and writings. Other economists would have thresholds a little more strident than this, yet others a little looser.

When you look at **Table 1** it is clear that a nominal amount of inflation, typically less than 2%, is accepted and might even be good for the economy.[1] But any sustained level above 2.5% or 3% will be seen as a potential problem, and the higher the rate, the more serious and dangerous the problem. Part of the reason for this is because once inflation moves up into the high single-digit range and then double-digit range, it begins to self-compound into a higher rate. In other words, once it reaches a certain rate, it sets in motion a series of forces that tend to move it automatically to a higher rate (explained later). More bluntly, a 12% inflation will automatically become a 15% inflation and then a 20% inflation if not dealt with using severe and relentless anti-inflation policies. Once inflation moves above the 20% range, lessons from history tells us that the tendency to self-compound is so great that the inflation becomes explosive and potentially ruinous to an economy.

Runaway inflation has the potential to turn an economy into a smoking black hole.

At this point it will be useful to look at a graph that shows the inflation rate in the United States over a series of decades. **Figure 1 CPI Inflation Rate: 1960-2018** shows that annual inflation rates, as measured by the most cited inflation index in the United States, the **Consumer Price Index for Urban Consumers, U.S. City Average, All Items**, which is released monthly (although the graph is using annual data). The vertical green lines represent the troughs of business cycles, the purple line the threshold between deflation and price stability (which shows that we had a small episode of deflation, which is very unusual, in 2009), and the dashed yellow line represents the approximate threshold, according to **Table 1**, of moving from a region of price stability into a region of moderate inflation and possibly higher. The average annual inflation rate over this period has been below 4%.

By inspection, though, it is very clear that the U.S. economy has suffered from two dangerous bouts of inflation over this fifty-eight-year period, moving in 1980 into the range identified in **Table 1** as hyper-inflation. That was indeed a dangerous year (30-year fixed mortgage rates on home loans were above 15% at the time) and it was only cured by an absolutely Draconian policy response (described in the lecture) that threw the economy into a very deep and serious recession.

The graph also shows that over the last decade inflation has not been a problem in the United States. In fact, in 2009 it was clear that if there is to be a modern looming problem with prices, it is in the domain of *deflation*.

[1] See Hellerstein, Rebecca, "The Impact of Inflation," Federal Reserve Bank of Boston, Winter 1997.

2. How Inflation is Measured and the Inflation Rate Calculated

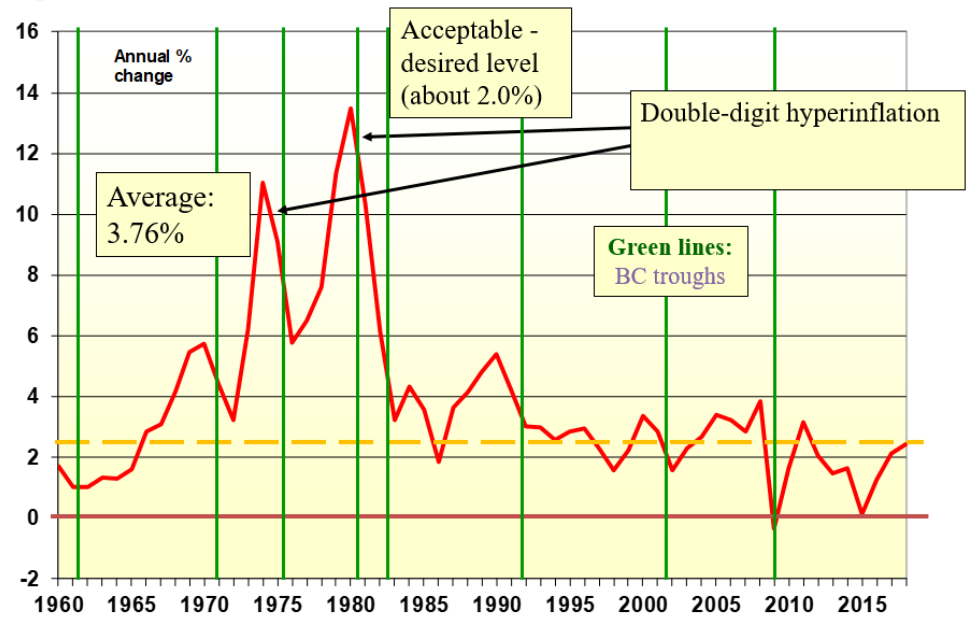
Figure 1 shows annual inflation rates as measured by the **Consumer Price Index**. This section will explain how that index is determined and how the inflation rate is calculated from the index. This section will also discuss the construction of other price indexes such as **Producer Price Indexes** and the special price indexes that are used to deflate nominal national GDP estimates to their *real* (inflation-adjusted) *growth rates*.

2.1 The Consumer Price Index

As the name implies, the **Consumer Price Index** (**CPI**)[2] is an index - a single number - not a growth rate. To convert it to an inflation rate two index values must be transformed into a growth rate using an elementary formula. The index itself is based upon a huge recurring survey conducted by a government agency, the **Bureau of Labor Statistics** (**BLS**), a division of the **U.S. Department of Labor**.[3] Generally, the survey attempts to evaluate and reevaluate the prices of thousands of items purchased by consumers. The **CPI** and related statistics are released each month, first in the form of a press release and then immediately thereafter in a database available to anyone who visits the **CPI** website.

Because the **CPI** is an index, it is normalized to a base, and the base currently used is the average of the raw index for the 36 months of calendar years 1982-1984, which is then assigned the value of 100.

Figure 1: CPI Inflation Rate: 1960-2018



CPI for urban consumers, U.S. city average, all items, NSA. Source: Bureau of Labor Statistics

Each month BLS data collectors use personal visits and telephone calls to retail stores, medical facilities and other businesses that serve consumers to collect price data on more than 80,000 items in more than 200 item categories, ranging from chicken

[2] The actual title of the CPI is **Consumer Price Index for All Urban Consumers, U.S. City Average**. Given that this is an aggregation, data are also available for select areas and cities within in the survey, such as Cleveland-Akron, Ohio.
[3] Details about methods used to compile the CPI, plus historical data, are generally available at the BLS website dedicated to the CPI, at http://www.bls.gov/cpi/ Information is scattered throughout in multiple pages. If searching for more depth than in provided here, it is a good idea to start with the list of FAQs provided by the BLS.

eggs to quarts of motor oil to college tuition and the cost of stamps. The price data is reviewed and adjusted (because quality, packaging, and myriad other issues may affect the definition of a commodity - what is a "large" egg, for example), then each price is multiplied by a weight then summed into a single index number:

$$CPI_t = 100 \sum \propto P_t / B_{1982-1984}$$

where α is the appropriate weight (it changes periodically, but not every month) and *P* is one of the thousands of prices. The summed, weighted value is divided by the base, the average of the raw CPI (essentially the formula to the left of the division sign) for the 36 months in 1982 to 1984. This would be interpreted to mean that if CPI_t equaled 110, then prices have risen about 10% since the base period.

This alpha summation shown above is called a *market basket* by the BLS and is meant to roughly represent the percentage of monthly outlays that consumers as a group spend on the overall categories and each little component within the category, so the alphas all add up to 100%. For example, in December 2018 the weight for the *Food* category equaled 13.255%, and the subcategory within Food for *Fruits and Vegetables* equaled 1.273%. Within that category, the weight for *Bananas* equaled 0.078%. This can be interpreted to mean that by the estimate of the BLS, U.S. consumers spend 13.255% of their monthly outlays on food, 1.273% on fruit and vegetables, and 0.078% on bananas.

Table 2
Consumer Price Index for All Urban Consumers
CPI-U NSA, December 2018

Category	Weight	Index	Rate
All items	**100**	**251.2**	1.9%
Food and Beverage	13.3	255.2	1.6%
Housing	41.9	261.4	3.0%
Rent	32.7	324.8	3.5%
Owner equivalent	23.9	320.0	3.2%
Apparel	3.1	120.5	-0.1%
Transportation	14.7	191.5	-4.1%
Gasoline	3.3	179.5	-19.7%
Medical Care	8.6	487.4	2.0%
Recreation	5.6	119.7	1.2%
Education	3.0	263.2	2.6%
College tuition and fees	1.6	800.7	2.8%

Purchasing power of the dollar	$0.398

1982-84 = 100

Rate shown is annual December to December.

College tuition and fees are net of financial aid.

Source: BLS Economic News Release, 1/11/2019 Tables 1 and 3.

These weights, which change more or less every two years, are based upon consumption surveys provided by thousands of households. At any given time about 7,000 families are asked to keep personal diaries of absolutely everything they purchase for a period of two weeks, which are then collected by the BLS. Over the two-year survey period the BLS will collect about 24,000 weekly diaries and, for additional information, will conduct approximately 48,000 interviews per quarter.[4]

Table 2 shows the weights and components of some major CPI categories along with some of the smaller components (randomly selected for interest) for the January 2019 release. The CPI is released with data that are seasonally adjusted (SA) (where seasonal price behavior is statistically smoothed out) and not seasonally adjusted (NSA). The aggregate weights discussed above can be seen (they are rounded) as well as the aggregate and individual category index numbers. Also shown is the annual inflation rate for the previous twelve months for each category (the method for calculating that is described below).

As can be seen, the overall index now stands at 251.2, which implies that prices in general have more than doubled since the base period. Looking down the column at the individual indexes, it can be seen that medical care has experienced an inflation rate much higher than the index as a whole, whereas apparel (clothing) has risen only 20.5% over the entire 30-year period, and the cost of recreation even less.

The worried college student might be irritated to see that college tuition and fees rank as one as the most inflated categories in all of the CPI listings, at 800.7, representing an eight-fold increase in prices since the period of the base. You would think that students would complain about this.

[4] Consumer Price Index Frequently Asked Questions, https://www.bls.gov/cpi/questions-and-answers.htm, accessed February 1, 2019.

Table 2 also shows a memo item, the *Purchasing Power of the Dollar*, at $0.398. This value is equal to

$$PP\$_t = 100/CPI_t$$

which is a measure of how much a dollar will purchase now compared to what it purchased in the base period. The January 2019 dollar is worth forty cents compared to the 1982-1984 dollar.

2.2 Calculating the Rate of Inflation from a Price Index

A price index is a single value with a known base, but the value has no inherent meaning. Any inflation index becomes much more useful when it is transformed into a *rate* of inflation. This section shows how the Consumer Price Index is transformed into a rate of inflation.

Typically, the rate calculated is annualized and is calculated as a discrete growth rate. The general formula for this discrete transformation expressed as a decimal point is

$$R_t = \frac{I_t - I_{t-1}}{I_{t-1}} = \frac{I_t}{I_{t-1}} - 1$$

which can be translated to say that the rate of change ending at any time *t* is equal to the value of the index at time *t* divided by the value of the index in the previous period (*t-1*) minus one. To express it as a percentage, this value above is multiplied times 100.

Therefore, one way to calculate the annual rate of change of consumer prices is to take the December CPI for any year and calculate the annual rate for that year using the December CPI from the previous year. For example, to calculate the December-to-December annual inflation rate for 2011, one would use the following formula:

$$R_{2018} = \frac{CPI_{12/18}}{CPI_{12/17}} - 1$$

Again, this value can be converted to a percentage gain by multiplying times 100.

Given that the CPI for December 2018 was 251.23 and for December 2017 was 246.52, then the December-to-December inflation rate was

$$R_{2018} = \frac{251.23}{246.52} - 1 = 0.0191 = 1.91\%$$

so the analyst can say that the inflation rate for 2018 as measured by the CPI was a little under two percent.

Because the CPI is calculated monthly one can calculate the *annualized* rate of inflation implied by the monthly index using the following formula:

$$R_a = \left({CPI_m}/{CPI_{m-1}}\right)^{12} - 1$$

For an example from the past, considering that the CPI for December 2010 was 219.18 and for November 2010 was 218.80, then the annualized inflation rate for the month of December 2010 was

$$R_{a12/10} = \left(\frac{219.18}{218.80}\right)^{12} - 1 = 0.0210 = 2.10\%$$

Be forewarned though that because the monthly values can be quite volatile, given that the annualized rates are calculated by compounding, any volatility in the monthly numbers will produce even greater volatility in the compounded annualized values calculated from those numbers. This is why we first used an old example. Remember that the CPI for December 2018 was 251.23. It turns out that the CPI for November 2018 was a higher number at 252.04! This would imply that the annualized inflation rate (actually, *deflation rate)* in December 2018 was

$$R_{a12/18} = \left(\frac{251.23}{252.04}\right)^{12} - 1 = -0.0379 \cong -3.8\%$$

To prevent this misleading volatility it is best to use annual comparisons (like the December-to-December example above).

2.3 Producer Price Indexes

In addition to the **CPI**, the Bureau of Labor Statistics also publishes a series of indexes called the **Producer Price Indexes** (**PPI**) for prices received by domestic producers for their goods and services produced and are generally divided into two categories, prices for *commodities* like natural gas, various farm products, and industrial chemicals, *industry* data, like primary synthetic rubber products or aluminum sheet, and *finished goods*, ranging from bakery products and roasted coffee to pet food, passenger cars, and costume jewelry. More than 10,000 products are itemized in the Producer Price Indexes, which used to be called the *Wholesale Price Index*, a name perhaps more descriptive than the current application.[5]

The monthly data sample for the PPI surveys more than 25,000 businesses (participation is voluntary) providing more than 100,000 price quotations.

The aggregations of the PPI that is used as primary economic statistics is the **Producer Price Index for all commodities**, although other aggregations such as *crude materials*, *farm products*, and *finished energy goods* will get media attention if they demonstrate unusual price movements in a key economic sector. This is partly because prices in the **PPI** are often leading indicators of where prices are likely to go a few weeks or months later in the consumer sector, as reflected eventually in the **CPI**. For example, if the price of crude oil or the wholesale price of gasoline rises in the respective **PPI**, if that price increase is sustained it is likely to show up in the section of the CPI dedicated to the cost of transportation.

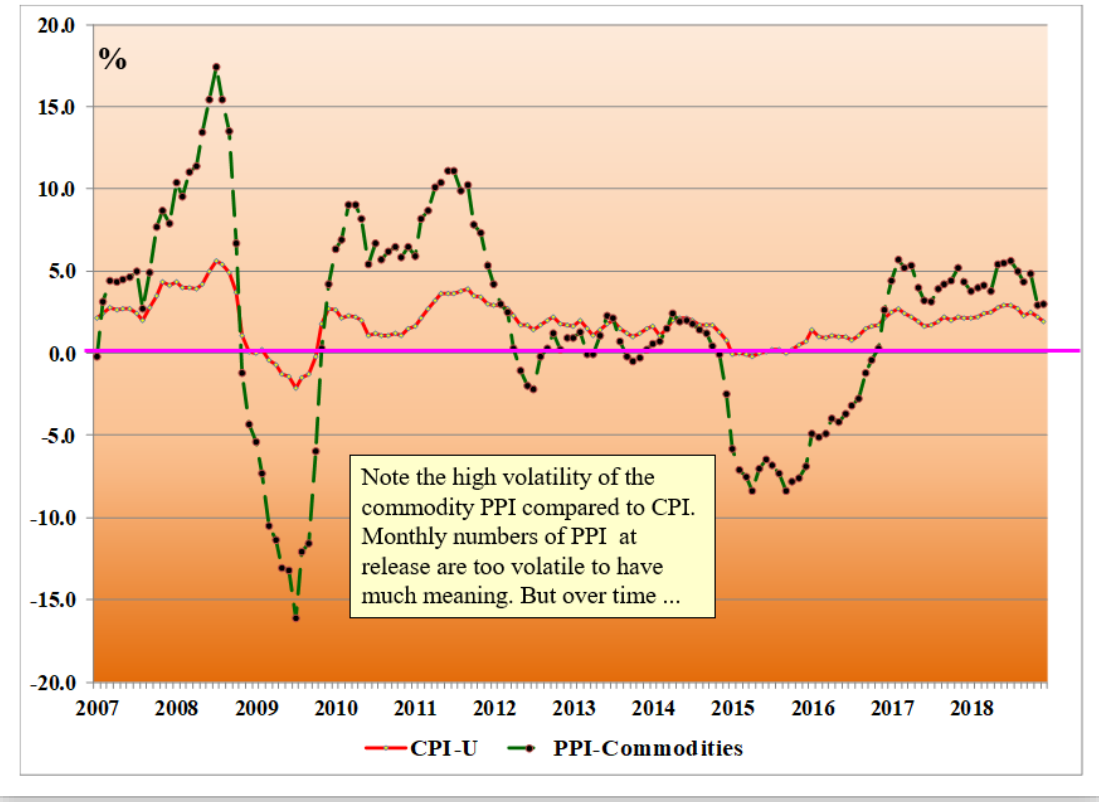
The aggregated indexes, such as the **Producer Price Index for all commodities,** are weighted sums of individual commodities, and use a weighting technique similar than that described above for the CPI. The determination of the weights, however, are more arbitrary and often slow to change. Given that the prices are collected in a survey from commercial producers, some of the weights are based more or less upon the producer's assignment of a weight based upon the relative importance of the commodity or good in question in the producer's general revenue stream. Basically, if sales from one commodity are double sales from another, the first will have double the weight. For commodities, weights are also calculated by estimations of the relative gross values of shipments - if the value of crude oil shipped is double the value of natural gas, crude oil will have double the weight of natural gas.

Figure 2 - Commodity PPI versus CPI-U compares the Producer Price Index for Commodities to the Consumer Price Index using annualized monthly rates for the six years between 2007 and 2018. As would be expected, the **PPI** for commodities is much more volatile than the **CPI** and shows that for more than a year commodities prices in general declined, provoking a decline also in finished goods and even a slight deflation in consumer goods (**Figure 1** did not show this clearly because annual data were being used there). It can be seen that after mid-2014 commodity prices again slumped into sustained very negative ranges, but they have since recovered

Generally commodity prices (oil and other energy products, grains and other agricultural products, copper and other metals and so forth) will be much more volatile than prices for either finished goods or consumer goods and services because they are bought and sold in competitive global markets and are subject to sometimes extreme variations in supply and demand, weather in the case of crops and energy products (hurricanes in the past have greatly impacted prices of oil and natural gas for short periods of time), and even the general cycle of growth in emerging countries like China, India, and Brazil.

[5] To appreciate the variety and complexity of the PPI, the reader should visit the overview pages and some of the data sets compiled by the BLS at http://www.bls.gov/ppi/

Figure 2 - Commodity PPI vs. CPI-U, monthly @ annual rates, 2007-2018 (f) NSA



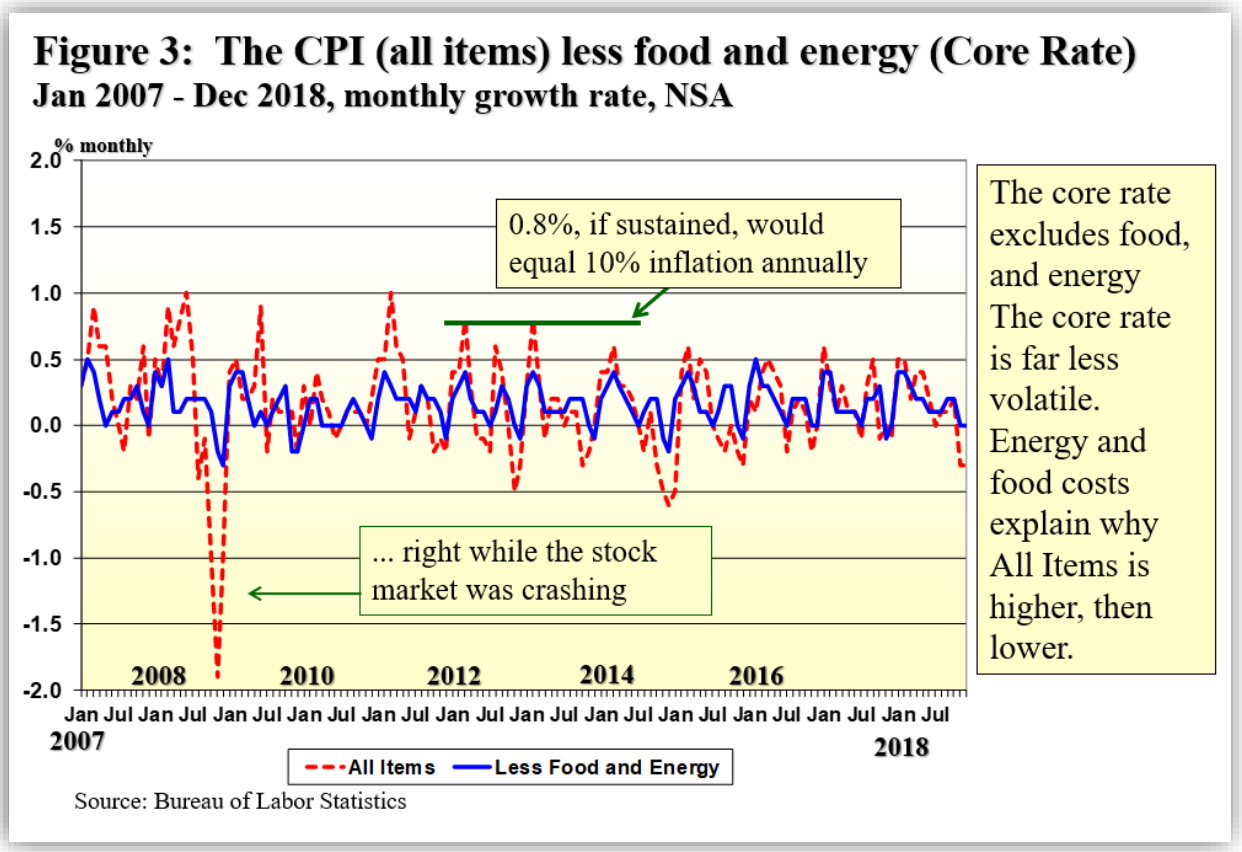
Because of the extreme volatility month-to-month values for any measure of the PPI are unreliable as indicators although they are more useful when the data is mathematically smoothed over a few months at time. Nonetheless a clear trend in consumer prices, whether inflationary or deflationary, is often anticipated by an earlier trend upward in commodity or finished good producer prices. The reason is pretty simple - many consumer goods are fabricated from these commodities, such as gasoline from oil and breakfast cereal from wheat. The extent of the relationship can be complicated. First, not all business in a competitive market are able to completely pass along cost increases through price increases that match. The airline industry, for example, has historically found it difficult to pass on fuel price increases in ticket prices because the industry is so competitive. In other cases, such as breakfast cereal, the commodity in question makes up only a small fraction of the price of the finished consumer good, so a 30% increase in wheat prices may result in only a 5% increase in the product on the shelf. On the other hand, crude oil is such a significant part of the cost of gasoline, when the price of crude oil goes up or down, the price of gasoline follows rather quickly.

2.4 Core Rate Inflation and Deflation

Because of this volatility discussed above in prices of finished goods reliant upon commodities, the Bureau of Labor Statistics also calculates a value for the CPI that excludes food and energy and calls it the **Core Rate.**

Refer to **Figure 3 The CPI (all items) less food and energy (Core Rate)** which compares the CPI for all items to the Core Rate, which removes all food and energy data from the calculation. Clearly the Core Rate is more stable than the overall **CPI** because it strips out the most volatile categories of consumer goods, those reliant upon volatile commodity prices. In the first full year of the deep recession that began in the fourth quarter of 2007, commodity prices in general, including oil and gasoline, plunged so greatly that consumer prices for food and energy, despite having a combined weight of only 15% (see **Table 2**), dragged the overall **CPI** deeply into deflationary territory, as can be seen on the graph. But when food and energy prices are stripped away, the deflation is mitigated greatly (although there still is a mild deflation).

It is very clear by inspection that the **Core Rate** is generally less volatile than the general **CPI** for all items (and this lesser volatility extends to years before 2007). Because so much emphasis is put on the importance of the **CPI** numbers and because the monthly data releases (and revisions of prior data) are followed closely by the financial markets and others, the financial media typically gives as much importance to the **Core Rate** as the overall **CPI** so that the volatility is not misinterpreted as a general trend in either inflation or deflation that really isn't there. Essentially it is a crude effort to strip out some of the statistical noise found in **CPI** volatility.



This doesn't imply, though, that prices for food and energy are unimportant. When the price of gasoline goes above $4.00 per gallon as it has a few times in the past it probably had a slight negative impact on other categories of consumer spending, which can lower the real GDP growth rate given the importance of consumer spending in the U.S. economy.

3. The Effects of Inflation and Deflation

Measurement of pricing trends would be little more than an academic exercise were it not for the fact that extreme trends in prices in either direction are extremely dangerous in an economy and can wreak havoc on wealth and income. Inflation is such a dangerous phenomenon that central banks around the globe, like our own Federal Reserve System and the European Central Bank in the Eurozone, see inflation fighting as their primary job (although since 2007 most of their activities have been oriented toward keeping the financial crisis from becoming worse, because as the data in the section above showed, at least for the United States, inflation was not a problem during the crisis).

Inflation and deflation have entirely different effects upon an economy so they will be considered separately, beginning with inflation.

3.1 The Effects of Inflation Upon Wealth and Income

Although inflation is generally harmful to an economy - a hyperinflation can destroy an economy and has in the past - it is *not* true that inflation harms every player in the economy. Although inflation can destroy wealth and income (explained below), inflation also has the pernicious effect of *redistributing* wealth and income, and doing so unfairly.

Generally, an unexpected inflation in the range of say 6% to 15%, will distribute wealth and income away from economic cohorts like renters, savers, lenders (especially those who lend at fixed rates for loans such as long-term mortgages), retired people (especially if living on a fixed or limited income), and much of the working population in general.

In the case of the general working population, studies have shown that generally wages and other forms of nominal income do not keep up with the general inflation rate once inflation becomes excessive, partly because employers are under no obligation to raise wages just because there is an inflation but also because many wages are fixed by contracts that are slow to change or simply not responsive to a rapidly emerging inflation, a phenomenon in economic research that is called "wage stickiness."

This same inflation though will often benefit owners of real assets, such as real estate and especially real estate financed with long-term fixed-rate mortgages (such as a 30-year fixed-rate mortgage), but also other commodities, such as precious metals, rare automobiles, gold and silver coins, and other valuable collectibles. Inflation benefits any class of borrower who was able to borrow at fixed rates, which includes mortgages as mentioned above, but also any form of market debt, such as long-term bonds initially sold at fixed rates (and therefore will benefit any business or government which has financed with such bonds).

The paragraphs above imply that anyone skilled and wealthy enough to anticipate an inflation, even as a possibility rather than a certainty, may make the kinds of financial investments that not only protect against the hazards of inflation but even profit *because* of the inflation. It should be obvious from the examples given that if one regards the prospect of inflation as a possibility (because of, for example, current government policy - more about that below) then the purchase of real estate, either a primary residence or a second home or rental, with a minimal down payment financed with a 30-year fixed rate mortgage at a relatively low interest rate (a combination of options that has certainly been available since 2010), may be the soundest investment a private investor could ever make. It is irrelevant that the real estate market went bust in 2007. That happened because of speculative excess, complete lack of effective regulation, and a combination of incompetency and fraud fueled by greed from some of the largest banks in the world.[6]

No democratically elected government is likely to survive a period of severe inflation, but just like real estate speculators governments sometime have an incentive to let inflation run for a while for at least two reasons. First, the very policy that has the potential to produce an inflation, such as running large budget deficits that are partially monetized by the central banking authority[7] can be very popular with the (naive?) voters who benefit from such excess, at least up until the inflation emerges and becomes a problem (sometimes long after the responsible politicians have left office). Second, the inflation can substantially reduce the real value of government debt, just as it does for private mortgage debt.

It follows that if not all are harmed by inflation, that indeed some parties benefit, then the political pressures to curb an inflation may be mixed and complicated. Not all players will necessarily be on board.

Finally, it should be obvious that the reallocation of wealth and income during an inflationary episode is disconnected from economic productivity and inherently unfair. After all, it punishes savers and rewards debtors and speculators and at least for a while rewards incompetence in government service.

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[6] The argument here is *not* that *all times* are good times to invest in real estate. Regional inflation isolated to real estate was part of the problem leading up to the crash that began in 2007, but that speculation happened for the reasons stipulated in the text. No economist would ever advise investing in real estate at the *peak* of a real estate inflationary boom. This chapter can't cover the causes of the real estate inflation and subsequent crash that began in 2007, but the interested reader might consult slides and chapters written by the author about real estate in the material for Economics 104, or read either of two good books that surveyed the problem, Gretchen Morgenson and Joshua Rosner, *Reckless Endangerment - How Outsized Ambition, Greed, and Corruption Led to Economic Armageddon*, Henry Holt and Company, 2011 (there also seems to be a revised 2012 edition of this book with a slightly different title) and Satyajit Das, *Extreme Money - Masters of the Universe and the Cult of the Rich*, Pearson Education, 2011.

[7] This complicated subject is discussed generally later in the chapter and in extensive detail at the end of the semester in the sections about monetary policy and fiscal policy if this is being read as part of the Economics 53 sequence.

3.2 Inflation Tends to be Self-compounding

Once an inflation begins, it tends to get worse as times goes by if left untreated with an aggressive policy designed to stop the inflation. By example, this means that a 3% inflation may soon become a 5% inflation, and at some point that will become a double-digit (10% or above) and worse.

The reasons are multiple and complicated.

First, emerging moderate inflation in some markets tend to accelerate demand for the products of those markets, which can compound the inflationary pressures for at least those products in those products This appears to be especially true for real estate, certain durable goods like automobiles, and key commodities for manufacturers and industrial users.

The real estate market provides a good example. For the homeowner, once a down-payment and startup fees are paid, the real cost of owning a home is the monthly payment of the home, which in turn is determined by the purchase price of the home and the interest rate on the mortgage loan. *Both* of those variables typically will rise during an inflationary episode. That the home value would rise should be clear - the only circumstance in which it wouldn't would be a strange inflation in all consumer categories except housing, which would be rare indeed.[8] But for reasons explained later, interest rates *also* rise during inflationary periods, so much so that generally mortgage rates for newly-issued mortgages will always be a percentage or two (or more) above the underlying inflation rate. This implies that if the inflation rate is 12%, then the 30-year fixed rate mortgage will be 14% or higher![9]

Table 3

Monthly Payments Arising from Select Mortgage Principal Values and Interest Rates

Mortgage Value ($)	Interest Rate	Monthly Payment
$300,000	5%	$1,610
$300,000	6%	$1,799
$400,000	6%	$2,398
$400,000	7%	$2,661
$450,000	9%	$3,620
$500,000	12%	$5,143

Payments for 30-year fixed rate mortage, monthly values rounded, does not include property tax, insurance or other impound payments.

What difference would that make upon a monthly payment? This is best shown by example. Refer to **Table 3 - Monthly Payments for Select Mortgage Values at Select Interest Rates.** This table is meant to illustrate what might happen to the monthly payment if a potential homebuyer waits to buy a home. Let us suppose that at the beginning of an inflationary period that home is available for financing with a mortgage of $300,000 at 5% interest on a 30-year fixed rate mortgage (this assumes that some down payment would be made on this home, leaving a principal balance *after* the down payment is made of $300,000). The monthly payment on this home would be $1,610. Just to see the effect of the interest rate alone on such a mortgage, if the same house were available at an interest rate of 6% rather than 5%, the monthly payment would be nearly $190 more monthly (about half a car payment). Interest rates matter.

Remember as this is discussed that if the consumer does buy the house with a loan for $300,000 at 5%, for *her* that payment is absolutely fixed for 30 years, or until she sells the house. It doesn't matter if the country has inflation like the Weimer Republic - for her the cost of housing is fixed at $1,610 per month plus property taxes and insurance.

But this same consumer also understands that if she procrastinates and fails to buy the home and it rises in value to $400,000 and the rate goes to 6%, now the *exact same house* has a monthly payment of $2,398. It is very clear that if the house goes to $450,000 at 9%, the house now effectively costs well more than double (and note that the house itself rose in value only 50%) and she has missed out, because it is very unlikely that her salary doubled over the same period.[10]

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[8] Remember that **Table 2** gave housing a weight of about 40% in the CPI. This includes more than the cost of a home payment or its rent equivalent, but it is still a big number compared to, say, transportation or food and beverage, both weighted at under 15%.

[9] This has actually happened in the United States, as will be shown in a graph showing the relationship between inflation rates and various interest rates later in this chapter.

[10] As extreme as this contrived example may seem, real estate appreciation on this scale, whether accompanied or not by rising interest rates, has happened more than once in regions of the United States in the modern era (the last, of course, ending in disaster). To see multiple examples, find the slides or reading material for real estate in the Economics 104 material taught by the author.

Mature consumers understand this all too well. They can easily develop the mentality that they have to strike when they can, and will accelerate the decision to buy a house if they begin to expect inflation in the near future. This kind of activity has the potential to become a national mania and when it does, any inflationary expectations becomes a self-fulfilled prophecy whether the original expectation had any logical merit - a very dangerous economic environment indeed.

Consumers can think the same way about autos as they do about houses, and consumers in developing nations will hoard food if they think it will become unaffordable (a *severe* and *common* problem in hyperinflations in developing or impoverished nations), and businesses will accelerate purchases of key commodities like oil or copper if they anticipate inflation in those commodities. Every one of these examples would accelerate demand for at least the product or commodity in question, exacerbating the inflation that is already there. What is bad gets worse.

To be a little more formal about this, remember in **Table 2** that the purchasing power of the dollar based upon the 1982-1984 average had declined to $0.398 from the base years. This implies that if an inflation pushes the **CPI** for all items from its current level of around 250 to, say, 400, then the purchasing power of the same dollar declines to 25 cents. That is certainly an incentive to spend the money before it decays further. It is this *acceleration* of spending plans that will compound the inflation.

3.3. The Economic Impact of the Policy Response to Inflation

Strangely, one of the most malicious economic effects of an inflation arises from the anticipation about what the government, and especially the central banking authority, is going to do about it. As mentioned above, inflation tends to be self-compounding (it automatically gets worse) and economists who work at the Federal Reserve System and other central banks know this, so monetary policy tends to get very aggressive when inflation threatens. Anti-inflation policies tend to be Draconian and can have a devastating short-term impact upon the economy.

A detailed discussion of the policy response to inflation is discussed below in later lecture about the Federal Reserve System, but a summary overview of some of the more extreme policy effects can be introduced here.

Generally, the Federal Reserve System, our nation's central banking authority, responds to inflation by tightening credit availability and raising interest rates, effectively making credit more expensive and harder to get.[11] Consumers and businesses at a minimum will slow down their use of credit and consequently credit-financed spending will decline, removing some of the inflationary pressure. This general increase in interest rates, which can be very severe if the inflation threat is serious, can have a devastating effect upon key industries like real estate and consumer durable goods and can even spread to categories of spending not typically impacted by high interest rates. The resulting downturn can be large enough to induce a recession.

To simplify, the policy makers can and sometimes will *intentionally* induce a recession to cure an inflation.

To make matters worse, if an inflation is already in place and strong (say with the **CPI** rising at a rate higher than a 5% annual inflation rate), then market interest rates will already be high and rising to reflect the inflation - nominal market interest rates are almost always higher than the underlying inflation rate. For example, if the underlying inflation rate is 6%, the long-term mortgage rate is not going to be 4%, it is going to be something like 8% or even higher.[12]

Therefore, when the policy makers as the Federal Reserve System tighten credit to fight inflation, interest rates are sent soaring to even higher levels. Although inflation is the root problem, high and rising interest rates are also a problem, and given that interest rates must be forced even higher, this essentially means that the *problem must intentionally be made worse before it gets better!*

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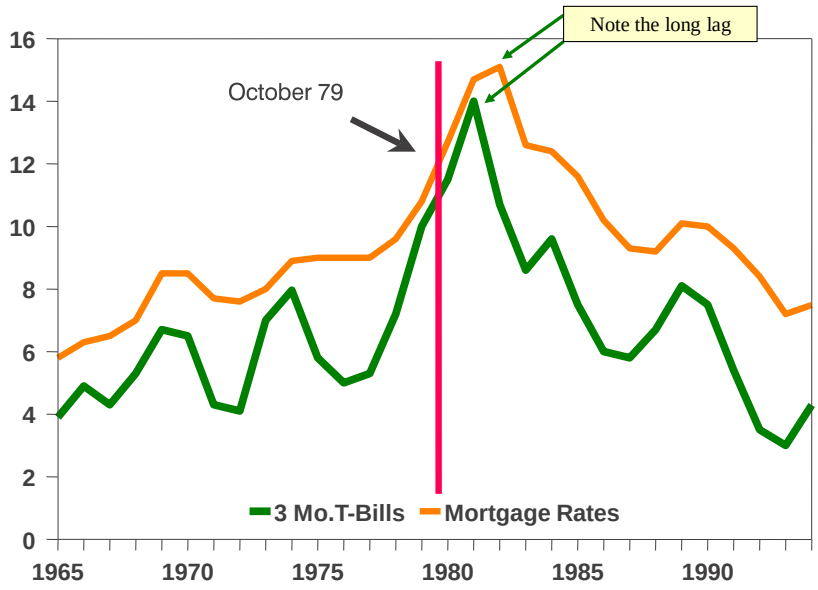
[11] A more traditional explanation would explain that the Federal Reserve System would take steps to slow the growth rate of the money supply and to some extent this is still a useful concept and valid explanation. But the correlation between money supply growth rates and spending or inflation rates has broken down in recent decades and the general growth of credit is now more directly correlated with spending surges and inflation. This is addressed in detail in later lectures in the class in which this chapter is assigned.

[12] This is explained in more detail below and has already been treated in the chapter about the Loanable Funds Model, assigned earlier in the macroeconomics class where this chapter is assigned.

Figure 4 - The Volcker Correction of 1979, an old lecture slide that has been used as an example for nearly four decades, clearly shows the effect described above.

Earlier in this chapter in **Figure 1 CPI Inflation Rate: 1960-2018** we saw that the economy had two very serious bouts of inflation in the 1970s. The second of these two inflations occurred during the presidency of Jimmy Carter (and is one of the reasons why Carter lost the 1980 presidential election to Ronald Reagan). As can be seen in **Figure 4**, by 1979 inflation had

Figure 4: The Volcker Correction of October 1979



become such a problem that long-term mortgage rates had soared to a level well above 10% and even the annual interest paid on a 3-month U.S. Treasury Bill, normally less than 4%, had also soared into double-digit territory. This was unacceptable, so President Carter appointed a known-inflation fighter named Paul Volcker as the Chair of the Board of Governors of the Federal Reserve System in August 1979. It took a few months for Volcker to consolidate his power and consider his options, but finally in a famous meeting in October, 1979 of the Federal Reserve Open Market Committee (the policy-making body of the Federal Reserve System), Volcker and the other committee members decided to embark on an aggressive anti-inflation policy, imposing a severe credit contraction and a large hike in interest rates. The date of that meeting is reflected as the vertical red line in **Figure 4.**

As can be clearly seen, mortgage rates, already at dangerous levels, soared even higher, eventually to a level above 15%! Additionally, rates stayed above the 1979 levels for more than 5 years! Equally important, rates did not return to healthy levels for nearly a decade. **Figure 1** makes it clear that this policy definitely worked, but what a cost! It was clearly a case of making a situation worse so that it could eventually get better.

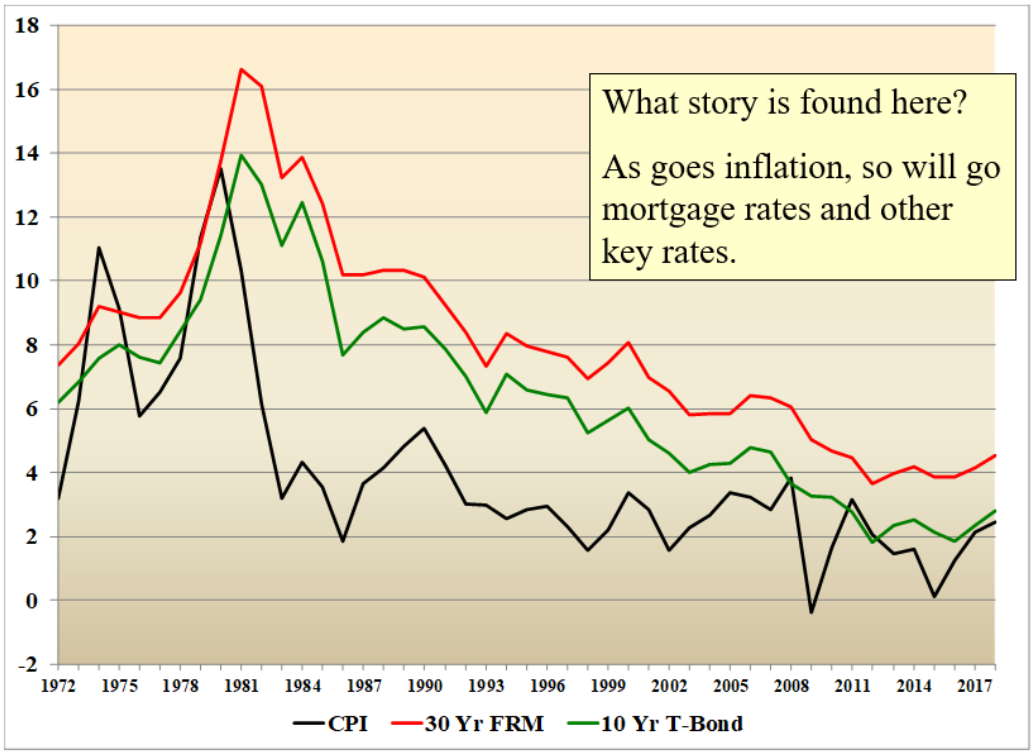
A second clear policy lesson emerges from this example: it is far, far better to pay the price to ***prevent*** an inflation than to allow an inflation to emerge and then correct it. The latter is a very damaging proposition indeed.

3.4 The Impact of Inflation Upon the Finance Markets and the Business Environment

The impact of inflation upon any given business depends upon how well equipped the business is to respond to inflation or even benefit from inflation. Businesses with large inventories of raw materials and processed goods (like oil inventories or stockpiles of copper) might actually benefit from inflation in the short run. Likewise, businesses sufficiently large and in a favorable competitive environment might be in a position to pass on rising costs as price increases to consumers, and if they succeed at delaying wage increases for their labor force, they might actually benefit from rising prices in general.

But constant re-pricing and trying to stay ahead of the inflation curve is a stressful, relentless battle and the enduring uncertainty of where prices are going to go next ultimately takes a toll. Businesses tend to become conservative with their long-term investment decisions during inflationary episodes, which can have a retarding effect upon GDP growth in important areas like fixed investment. This problem becomes especially acute for large-scale fixed investment projects that must be financed by borrowing. Borrowing costs will always be above the inflation rate, so long-term borrowing becomes impossible and funds dry up. For example, suppose the underlying inflation rate is 8%. All borrowing rates would be above 8%, and the rate on corporate 10-year bonds might be 10% to 12%, compared to possibly only 5% during normal years. What corporate treasurer is going to lock in a loan for, say, $100 million for a decade at a rate double the historical rate? Not only would the cash requirement to service the payments be high, but if the inflation is cured and market rates return to normal, the corporation with the long-dated loan is locked into the inflationary rates for the duration of the loan.[13] Because of this the demand for such loans dry up effectively eliminating these important categories of finance and curbing the types of spending traditionally financed by them.

Figure 5: CPI and Mortgage and 10-year Treasury Bond Rates: 1972-2018, annual data



Source for interest rates: **Federal Reserve Board data download program, H-15 series**

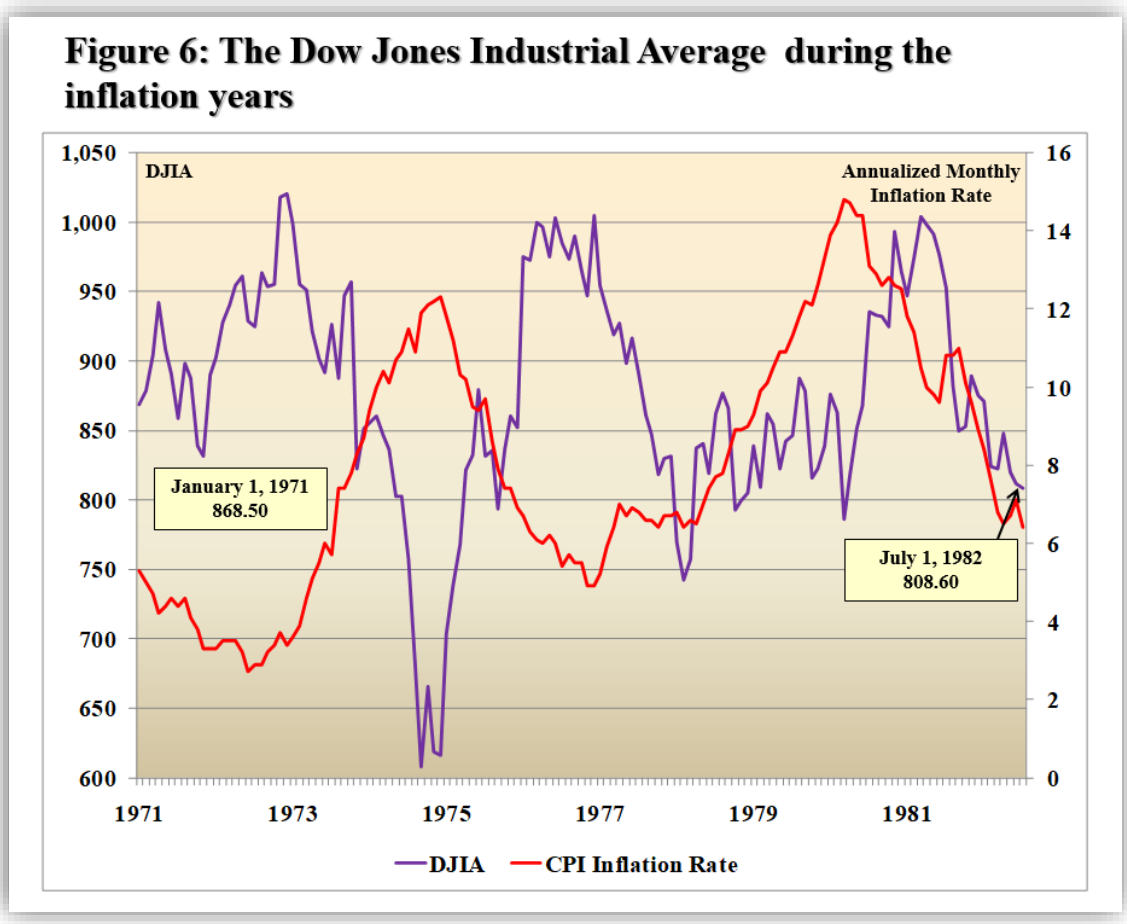
This problem is especially acute in commercial and residential real estate. Mortgage rates soar during inflationary periods, raising payments to unsustainable levels, seriously damaging sales. Refer to **Figure 5 – The CPI Inflation Rate, 30-year Mortgage Rate and U.S. Treasury 10-year Note Rate.** As can be seen clearly from this historic example, when inflation rates as measured by the CPI soared into double-digit range twice between 1978 and 1985, the average national rates on 30-year fixed-rate home mortgages stayed well above 10% and at one point touched 18%! As we already have seen, the monthly payment on any given home at that rate would be somewhere between double to triple the payment made during normal times.

[13] Sometimes debt can be refinanced, allowing a business to escape the long-term burden of inflationary borrowing, but if a corporation has sold non-callable long-term notes or bonds, it is stuck with the high interest rate for the full duration of the loan.

Clearly both commercial and residential real estate construction would be anemic at such high interest rates.

One might think that at least stock prices in the financial markets would rise during inflationary episodes because stock prices, after all, is a type of price and don't all prices rise during inflations?

In turns out that stock prices actually perform poorly during inflationary episodes. Refer to **Figure 6 – The Dow Jones Industrial Average During the Inflation Years**, a graph taken from a lecture from another class taught by the author. The graph shows the performance of the venerable stock market index during the same inflationary period discussed above, from the early 1970s until the end of 1982. Again, as can be seen, twice during this period the rate of inflation soared above 10%. On January 1, 1971, the Dow Jones Industrial Average stood at the value of 868.60. On July 1, 1982, more than a decade later and during the worst inflationary episode in the modern era, the same index stood at 808.60 – on net stock prices had not risen a bit over this entire period.

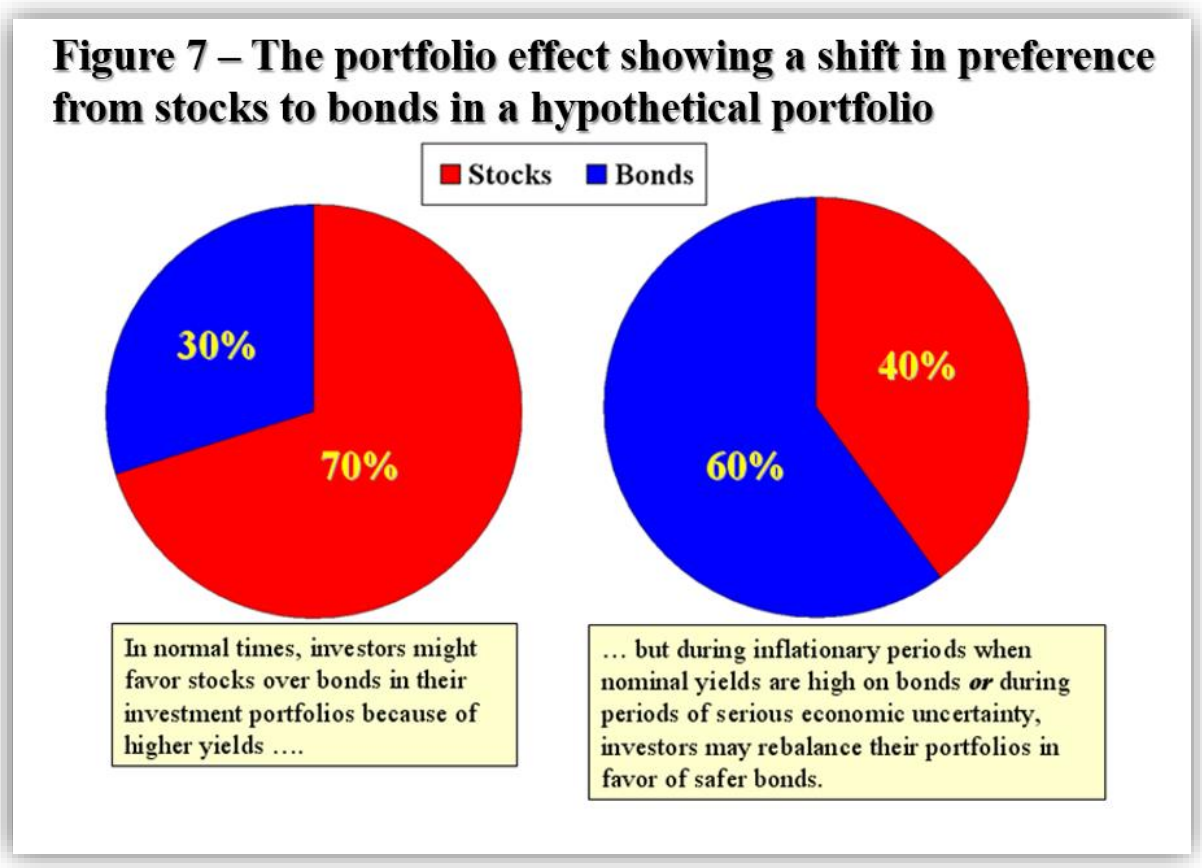


Further, it is clear by inspection of **Figure 6** that when the inflation got worse, the market plunged, but as the price picture improved, the market recovered. It is easy to see that the peak of the market neatly coincides with the trough of prices in 1972, then the plunges as the latter soars. Then the same pattern repeats itself. After 1980 the inverse correlation breaks down for a while, but after 1982 (not shown) when it was clear that inflation had been licked and was not returning, the stock market embarked on the largest and longest bull market in history.[14]

Part of the reason for the tepid performance is linked to the poor business conditions discussed above, especially in areas of commerce where financing is essential. But another more fundamental problem for stocks can arise. The high interest rates

[14] The Dow Jones Industrial Average would eventually rise from the low levels discussed here to above 11,000 by the year 2000.

that are curbing loan demand also represent the nominal yields that are available to investors and notes, bonds, and other interest-bearing financial assets. These high nominal yields can cause what is called a *portfolio shift* from stocks to bonds.



This phenomenon is represented in **Figure 7 The Portfolio Effect Showing a Shift in Preference from Stocks to Bonds in a Hypothetical Portfolio During an Inflationary Period.**

Generally large investment portfolios – especially those managed by professionals – will include some mixed composition of stocks and interest-bearing bonds and notes, such as the 70/30 split represented in **Figure 7**. As economic conditions change, investors and portfolio managers will shift the relative composition of those portfolios away from one of the components in favor of another, an activity called *rebalancing*. **Figure 7** shows a rebalancing shifting the composition of the portfolio from 70% stocks and 30% bonds to 60% bonds and only 40% stocks. The only way this can be done is by selling stocks and buying bonds, which will depress the price of stocks if done on a large enough scale.

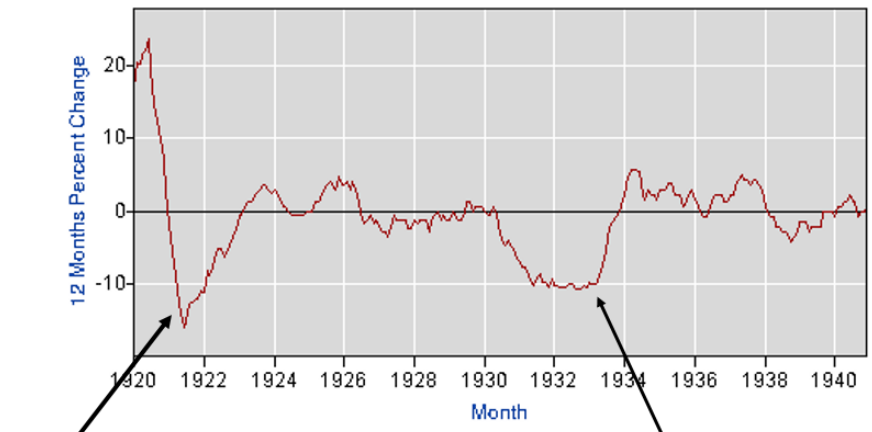
So why investors rebalance, causing a portfolio shift in favor of bonds and away from stocks during an inflationary period? As stated above, the nominal yields on interest-bearing assets like notes and bonds will rise with inflation, easily into regions above 10%. Although the *real* (inflation-adjusted) yields on these assets are still low, possibly only 2% or 3%, the capital gains on stocks must nonetheless compete with the *nominal* yields on these bonds to remain competitive, which is very difficult to do. In other words, during an inflation of 10%, a 10-year bond might have a nominal yield of 12.5%, which is a *real* yield of only 2.5%. But to compete with this, the stock price (or price plus dividend) must nonetheless rise a full 12.5%. That is a tough metric for stocks to meet, so the safer bets start to move funds from stocks to bonds, and down goes the stock market, as seen in **Figure 6**.

3.5 The Economics Costs of Deflation

Deflation, a general decline in the price level, which would be measured today by a few months of negative growth rates of the **CPI** or other major price index, is not normally regarded as a common threat in the United States. Although the **CPI**

actually registered negative growth rates in some months during the 2008-2009 recession, the price declines were shallow and short-lived. In late 2014 shallow monthly deflations returned periodically and were continuing up until the time of this revision. In the eighteen months between August 2014 and January 2016, for example, nine of those months showed price declines.[15]

Figure 8: Deflation during the Great Depression
CPI annualized monthly rates, 1920 to 1940



Post WWI

The Great Depression, although we were an agricultural economy then.

Source: BLS

Deflation has been a significant part of U.S. history in the past, however. Refer to **Figure 8 – Deflation During the Great Depression.** As can be seen, deflation surfaced in the United States right after World War I and was endemic during the Great Depression. In fact, the terrible depth and duration of the Great Depression can largely be explained by the financially devastating effects of the deflation.

In many respects a serious deflation, with deep price declines lasting for months or even years, can be more damaging to an economy than all but the worst inflations. Deflation is extremely damaging to the finance markets and financial institutions.

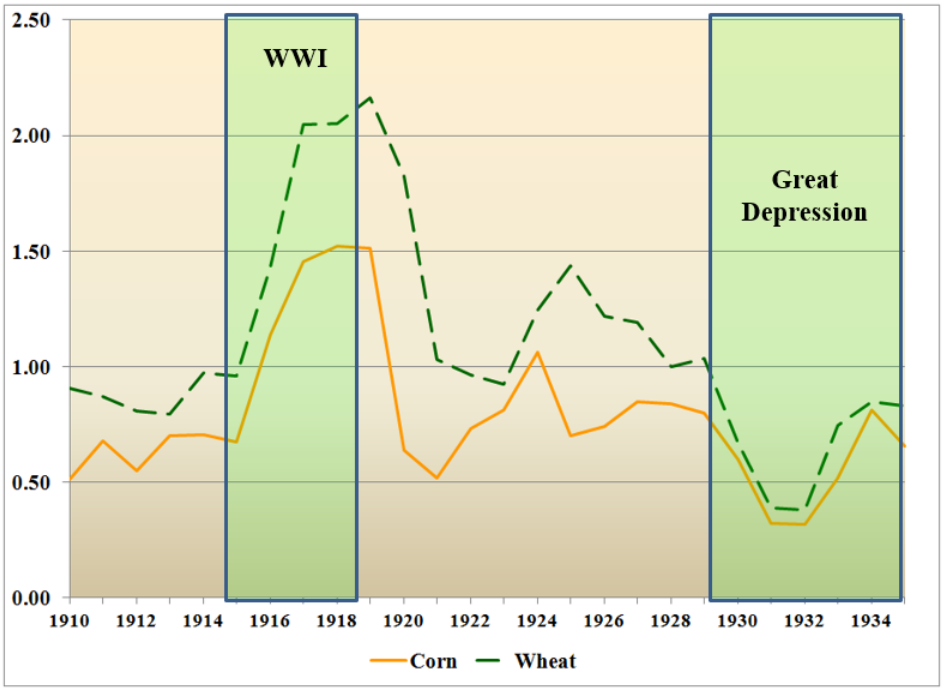
Generally, deflation reduces the capacity of those who are indebted to honor their debt service commitments, or to put it more simply, debtors are unable to pay their debts. Nominal incomes, including business receipts and wages, decline during a recession, but debts – especially mortgage debts – are fixed in nominal terms. In other words, a debt for $10,000 does not become a debt for only $8,000 just because inflation has set in or because wages have fallen. But if wages actually *have* fallen then the debt service as a percentage of income (the means to pay the debt) rises, ultimately to a level that makes the debt service impossible. Financial bankruptcy grows, which hurts lenders as much as the borrowers.

The deflation of the Great Depression is easier to understand if we remember that the United States was still an agricultural economy in the 1930s. Refer to **Figure 9 - The Price of Corn and Wheat during WWI and the Great Depression.** Clearly during World War I, U.S. corn and wheat prices soared, enriching farmers in the United States. So much European farm acreage was interrupted by the trench warfare that swept across France and Germany that for nearly three years the United States became the world's "bread basket," to use a term common to that era, and agricultural prices soared in the United States.

[15] For example, the CPI for July 2008 stood at 219.964 and fell to a trough of 210.228 in December 2008. In September 2014 the CPI stood at 238.03, in January 2015 it stood at 233.707, and the CPI did not rise about the September 2014 number again until June 2015 (238.638).

In the years immediately following the war the same prices plunged. They weren't plunging to new low values – they were simply returning from the lofty levels seen during the way to their pre-war levels.

Figure 9 - The Price of Corn and Wheat during WWI and the Great Depression, $ per bushel, U.S. annual national



Source: Historical Statistics of the United States 1789-1945, published by the U.S. Department of Commerce, Bureau of Census

Farm and home mortgage credit had blossomed during the prosperous 1920s, a period when farmers were enjoying their prosperity and using debt to finance purchases of some of the new consumer gadgets of the "Roaring 20s," as the era was called. The new Model T automobile, manufactured by The Ford Motor Company and available for around $300 would be found in the stable of any self-respecting farmer.

When deflation returned after the stock market crash in the fall of 1929, once again farm prices led the way, but this time it was due to a general collapse in demand. Wheat, which had been above $2.00 per bushel (in 1918 dollars!) and had generally maintained a price above $1.00 through the 1920s, plunged to 40 cents in the heart of the depression.

When farm commodity prices began to slump, debt service – especially mortgage debt service – became a growing problem. Farmers were driven to bankruptcy, imperiling those whom had lent to them. Banks and businesses suffered as a result, compounding the depression, spreading it from farming to manufacturing and consumer spending, triggering a deflationary spiral. Panicked bank customers demanded their deposits, triggering the famous bank runs of the era. Bank failures became so endemic that newly-elected President Franklin Delano Roosevelt had to declare a "Banking Holiday" as his very first act of office on March 9, 1933. All commercial banks were shut down for an audit and when they were allowed to resume business ten days later, nearly a third of all banks remained closed for good, and another third was forcefully merged into the healthiest third.

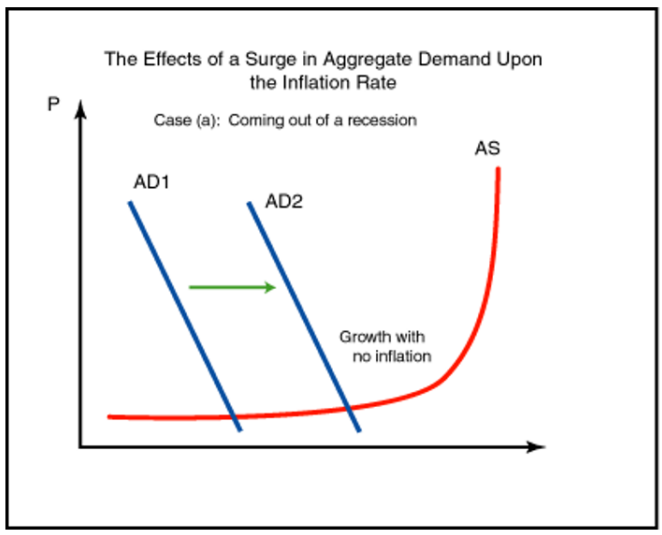
Prices stabilized by 1934 but the lesson had been learned – deflations are destructive and must be avoided, especially in economies with high levels of debt.

Although the United States has not since been threatened with serious levels of deflation, smaller exporting nations still are. In 2012 Japan, an advanced industrialized nation that nonetheless is vulnerable to inflation and deflation because of their huge export trade,[16] began to experience deflation levels so serious that, after a change in government, they embarked on a very aggressive expansionary monetary policy designed to trigger an intentional modest inflation.

In recent years, commodity exporting nations like Australia, Argentina, Brazil, and the oil exporting nations (like Venezuela, Russia, and Saudi Arabia) have suffered serious recessions because of collapsing prices for the commodities that they export.

4. Causes of Inflation from a Modeling Point of View

Figure 10: [AS/AD model]



Popular explanations of the causes of inflation are often too simple to provide a viable explanation of this complicated economic phenomenon. Sometimes it is said that "inflation is caused by too much money chasing too few goods." Although this is an appealing explanation it is not really supported by the facts, because however money may be defined, there have been significant bouts of inflation that have not been accompanied by a substantial monetary expansion and substantial monetary expansions that did not trigger an inflation.[17]

What follows therefore will be an attempt to explain the causes of inflation, and some of the options for corrective measures, by using two models, the **Aggregate Supply/Aggregate Demand (AS/AD) Model**, which was introduced in Chapter 2 of this series, and the **Loanable Funds Model**, which was introduced in Chapter 3. The construction of these models is not explained here and the reader should be thoroughly familiar with the models before beginning this section. If not familiar with the models, the two chapters should be read.

4.1. Conventional Demand-Pull Inflation Explained by the AS/AD model

Figures 10 and **11 The Effects of a Surge in Aggregate Demand Upon the Inflation Rate, Case (a) and Case (b)** are taken straight out of Chapter 2 and offer a simple explanation for the most common form of inflation, ***Demand Pull Inflation.*** Generally, Demand-Pull inflation is caused by some kind of strong economic stimulus, usually but not necessarily always triggered by some kind of stimulating government policy, which causes demand to surge, as is represented in both **Figure 10** and **Figure 11**. The comparison between the two cases is meant to illustrate that the inflationary effect after any expansionary stimulus depends entirely upon the context in which the stimulus takes place.

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[16] Nations that rely very heavily on exports and imports are more vulnerable to both inflation and deflation because of the role played by exchange rates in their economies. This won't be explained in this chapter but an example might suffice. Japan imports a lot of oil, and oil in the international market is priced in dollars. Suppose the price of oil on the international market equals $100 per barrel (a barrel is 42 gallons). What happens to the Yen price of oil if the Yen-to-Dollar exchange rate rises from 80 Yen to the Dollar to 100 Yen to the Dollar? A simple pen and paper calculation should demonstrate that such an event would be inflationary in Japan. An exchange rate move in the opposite direction would be deflationary.

[17] No evidence to this effect is shown here. This is partly because there has never been an acceptable definition of "money" that has withstood the test of time over more than one generation – what constitutes money in the 1960s becomes a list of obsolete financial assets in the 1990s. This issue is not addressed in this chapter, but is discussed in detail in later lectures concerning the Federal Reserve System and the choice of monetary targets. This is not a new subject for the author, whose 1981 dissertation was entitled *Structural Change and the Choice of Appropriate Monetary Targets.*

In **Figure 10** the stimulus is triggered when the economy is coming out of a recession, unemployment is high, and businesses are running at reduced capacity (where the Capacity Utilization Rate, for example, might be well below 75%). Given that resources are not fully utilized and the economy has room to expand without experiencing inflationary pressures, the stimulus produces strong growth in real GDP (probably the goal of the stimulus) with very little inflation.

Figure 11: [AS/AD model]

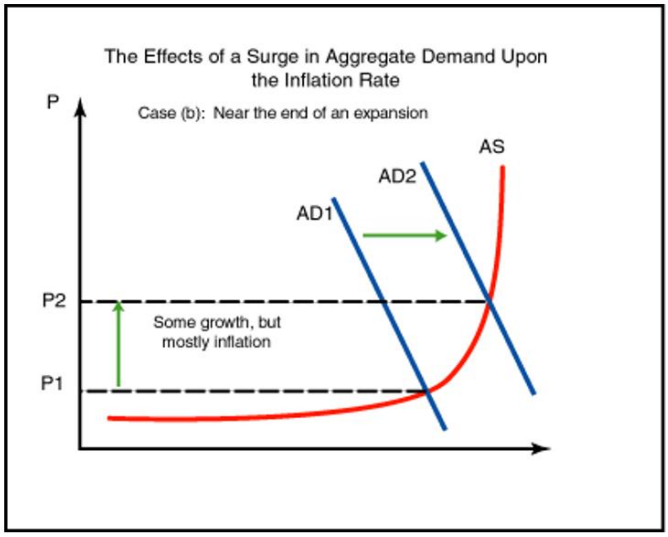


Figure 11 demonstrates though that if the exact same stimulus is applied when the economy is already running at near full capacity, with low levels of unemployment and emerging resource shortages in key commodity areas, like oil and metals, or labor shortages in key skill areas, or at a time when the Capacity Utilization Rate is above 85%, then the stimulus produces little in the way of real growth and instead generates inflation. The stronger the stimulus, the greater the inflation.

In a few words, the effect of a strong stimulus upon real GDP growth and inflation depends entirely upon the context in which the stimulus is taking place.

Of course a question immediately arises about what kind of demand stimulus might cause such a substantial shift in the demand curve represented in **Figure 10** and **Figure 11**.

It is certainly possible for the stimulus to come from the private sector, especially in a smaller economy where the surge might be explained by foreign demand due to a favorable exchange rate move. Likewise, if the private sector expands credit rapidly without a government policy accommodation, which is certainly possible, or consumers and businesses for whatever reason wind down their savings in order to spend (a process called *deleveraging*) then aggregate demand can expand for those reasons as well.

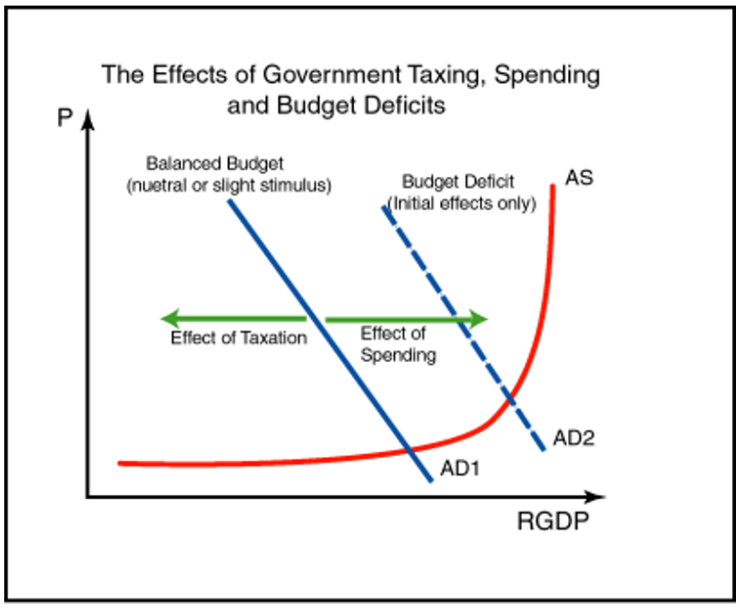
But in a mature and large economy like the United States that does not rely so much upon foreign trade, a strong stimulus or contraction to aggregate demand in a short period of time is likely to be due to government policy of some kind or another. If the policy is the consequence of government spending and/or taxing decisions, then the shift in the aggregate demand curve is the consequence of *fiscal policy*, whether intentional or accidental (some fiscal actions are not planned, or not planned very well). If the aggregate demand shift is engineered by the nation's central banking authority, the Federal Reserve System in the case of the United States (which is almost always planned to a meticulous degree) then the shift on the demand curve is the result of *monetary policy.* And of course sometimes the impact upon aggregate demand is the result of these two in combination.

4.2. The Impact of Fiscal Policy upon Aggregate Demand as a Possible Cause of Demand-Pull Inflation

Although any advanced discussion of fiscal policy should include the impact of government spending at the state and local level in addition to the federal level, in the United States individual state, county, and city governments do not execute fiscal policy with the intention of affecting the economy. They tax to fund services and provide services that their constituencies approve through voting. The economic effects are certainly there, but are generally not going to be the cause of inflation or amount to cures for inflation in the United States. In the context of discussing the cause of inflation. the only substantial influence will be found at the federal level. The rest of this discussion will therefore restrict itself to the fiscal policy of the U.S. Government.

Figure 12 shows us that increasing taxes in isolation without a corresponding increase in government spending would retard aggregate demand because it would reduce consumer disposable personal income (or business income if the tax was on

Figure 12 - Government Taxing, Spending, and Deficits



business), triggering a reduction in spending. Spending by the government, considered in isolation, would have a stimulating effect.

Generally, if the federal government runs a balanced budget, any increase or decrease in spending will likely have a neutral effect upon aggregate demand. Whereas federal spending rises, with a balanced budget tax receipts must also rise accordingly, which lowers after-tax disposable income, the primary source of consumer and business spending, so private spending will fall by roughly as much as government spending rises, which has a neutralizing effect upon aggregate demand. There will be no inflationary stimulus from a balanced budget even if federal spending rises.

However, when the federal government runs a budget *deficit*, which happens whenever government *spending* is greater than *revenues* from taxes and other sources (the difference between the two is the definition of the deficit) then the growth in the deficit will often be associated with a surge in aggregate demand. That is shown as a surge outward in the aggregate demand curve in **Figure 12.**

If the growth in the deficit has happened because the government has cut taxes without cutting spending, a common phenomenon in the United States because it is politically popular, then the surge in demand will come from the private sector as consumers and businesses spend their tax-cut windfall.

If the growth in the budget deficit is due to a surge in government spending that is not matched by tax increases, one of the most common causes of large demand shifts in governments globally (and one of the most common causes of inflation as a result) the impact upon aggregate demand is obvious - it will shift out and a large and growing deficit will cause it to shift out strongly. If when this happens the economy is already running at near full capacity as the hypothetical example in **Figure 11**, then the cause of inflation is well established - the cause of inflation is due to a government living beyond its means. But even this simple explanation requires more explanation, because the explanation must consider how the deficit is *financed* before the explanation is complete.

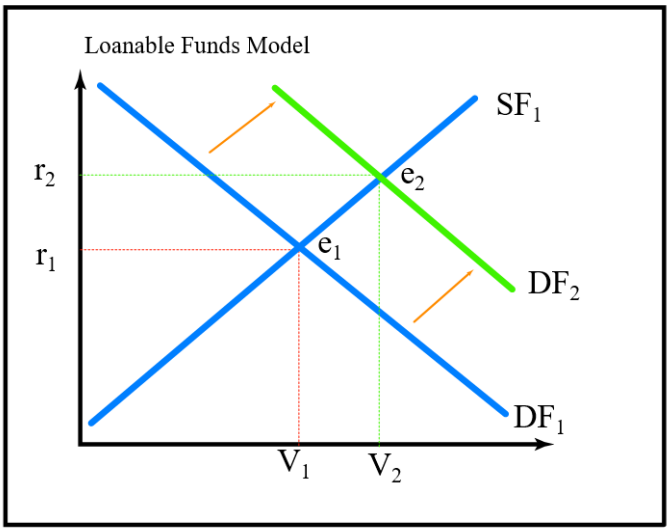
4.3. Why Expansionary Fiscal Policy is Usually Accompanied by an Accommodating Monetary Policy

Although it seems self-evident that a strong deficit-financed fiscal expansion will cause a demand-pull inflation as explained above in **Figures 11** and **12**, there is a little more to the story. Before we conclude that budget deficits are always expansionary, we need to evaluate the impact of budget deficits upon interest rates and the impact of those rates upon aggregate demand.

When looking at the **Loanable Funds Model** in Chapter 3 of this series, we must remember that because a deficit is financed by selling interest-bearing financial assets in the competitive markets, and the borrowing is competing with private borrowing, the funding of large deficits will have the tendency to push interest rates upward. This is shown in **Figure 13 - The Effects of Budget Deficits Upon Interest Rates**, which was taken straight from Chapter 3. As was explained in that chapter, this effect upon interest rates can contribute to an economic phenomenon called *crowding out*. Because of the higher interest rates, consumer and business spending that are funded by borrowing will decline to some extent because of the higher costs of securing private loans - government spending will *crowd out* private spending. Consider, for example,

mortgages. If financing federal budget deficits pushes competing mortgage rates up by, say, two percentage points, that will surely result in a fall in mortgage applications, which in turn will have a contractionary effect upon housing construction.

Figure 13: The effect of large budget deficits



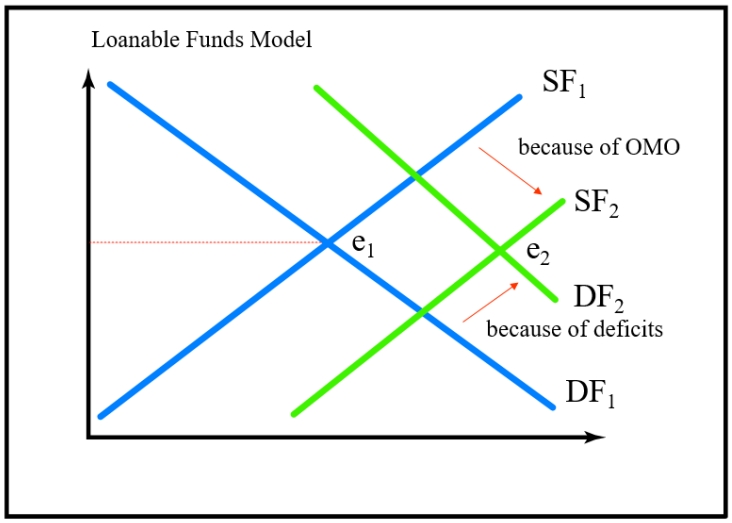
Although the degree of crowding out is not likely to be absolute (where every penny gained in federal spending is lost in private spending), the deficit-financed spending will certainly be watered down by the impact upon debt-financed private spending. In other words, the **Aggregate Demand Curve** is not going to shift very much, whether in the inflationary region or not.

However, the **Loanable Funds Model** also showed us that if the fiscal expansion is accompanied by an accommodating monetary policy, as represented in **Figure 14**, then interest rates will *not* rise - in fact they may fall - and the impact upon the **Aggregate Demand Curve** of the two policies combined is likely to be very robust. If the **Aggregate Demand** is already in the inflationary region of the **Aggregate Supply Curve**, as represented earlier by **Figure 11**, then inflation will be the final result.

Figure 14 should also make it obvious that if the aggressively expansionary monetary policy happens even in the *absence* of an expansionary deficit-fueled fiscal policy, such a policy can by itself cause an inflation. But historically these two expansionary policies tend to go together, especially when one is seeking the cause of an episode of demand-pull inflation.

4.4. The Role of Inflationary Expectations in Compounding the Inflation

Figure 14 – Budget deficits and expansionary monetary policy combined



If there is an aggregate-demand stimulus of the kind discussed in the section above, the resulting inflation is hardly the end of the story. Instead, it is essentially the beginning of a new story.

Why? Because once an inflation begins, it automatically gets worse. An earlier explanation of this was offered above in section III.2.

The reason can again be explained by another application of the **Aggregate Supply/Aggregate Demand Model.** In earlier chapters we learned about the formation of *economic expectations*, and in the context of this discussion, *inflationary expectations*. This refers to the formation of any general expectation on the part of the consuming public or the business community that inflation is imminent.

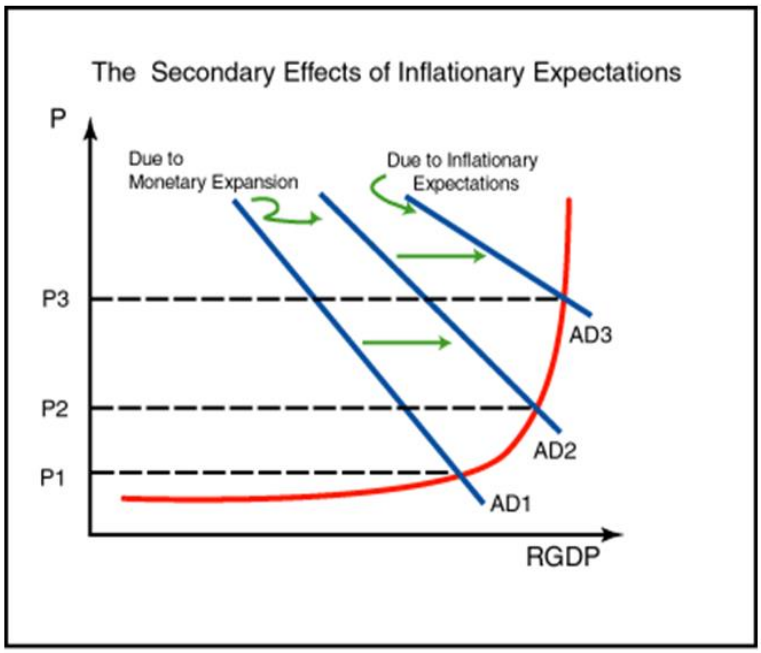
Inflationary expectations are typically classified as either *rational inflationary expectations* or *adaptive inflationary expectations.*

The former category generally refers to the rapid formation of inflationary expectations by professionals, especially in areas like finance, economics, or policy, who anticipate inflation because they believe a chain of events that they are witnessing will logically lead to inflation, or at least have a high probability of leading to inflation. They understand enough about the economy and the way it works to figure out the chains of cause and effect that lead from policy - especially bad policy - to inflation.

Adaptive inflationary expectations, on the other hand, more commonly attributed to the general public, arise as the result of inflation being experienced. Over time, once inflation is experienced, more is expected.

Why the distinction? Generally rational expectations are much quicker to form because they will form before the actual phenomenon is observed, a requirement that *defines* adaptive expectations. Therefore, the higher the degree of rational expectations, the quicker the formation of inflationary expectations.

Figure 15: [AS/AD model]



None of this would be important if the formation of inflationary expectations had no impact upon aggregate demand. But, alas, it does. The formation of *adaptive* inflationary expectations accelerates latent aggregate demand, causing a shift outward in the **Aggregate Demand Curve**, as shown in **Figure 15 - The Secondary Effect of Adaptive Inflationary Expectations Upon the Inflation Rate**. According to the logic of the model, no matter what the cause of the shift in the **Aggregate Demand Curve** from **AD1** to **AD2** (say it was the fiscal/monetary expansion discussed earlier), the mere *experience* of the shift will cause a secondary inflation-enhanced shift in the **Aggregate Demand Curve** from **AD2** to **AD3.**

By inspection, it can be seen therefore that if the formation of adaptive inflationary expectations causes the **Aggregate Demand Curve** to shift further outward as shown, then this explains why once an inflation is underway, it automatically tends to get worse.

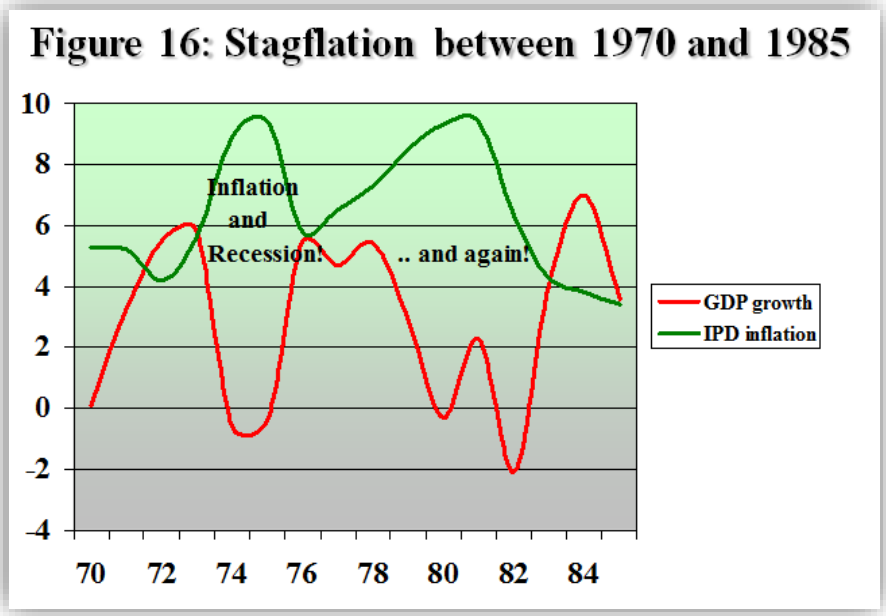
The formation of rational inflationary expectations differs in that it does not require the original shift from **AD1** to **AD2.** Rational inflationary expectations might form merely because a sufficient number of economic players might logically conclude that the fiscal/monetary expansion being set in motion has inflation as its final, logical outcome. In this case, a modest amount of inflation might happen simply because it is *predicted!*

4.5. Stagflation - Inflation with Recession

Demand-pull inflation is by far the most common form of inflation, but the use of the **Aggregate Supple/Aggregate Demand** model to explain it above makes it clear that it when demand-pull inflation is running strong, the economy is at least running at near full capacity and GDP is likely at a very high growth rate.

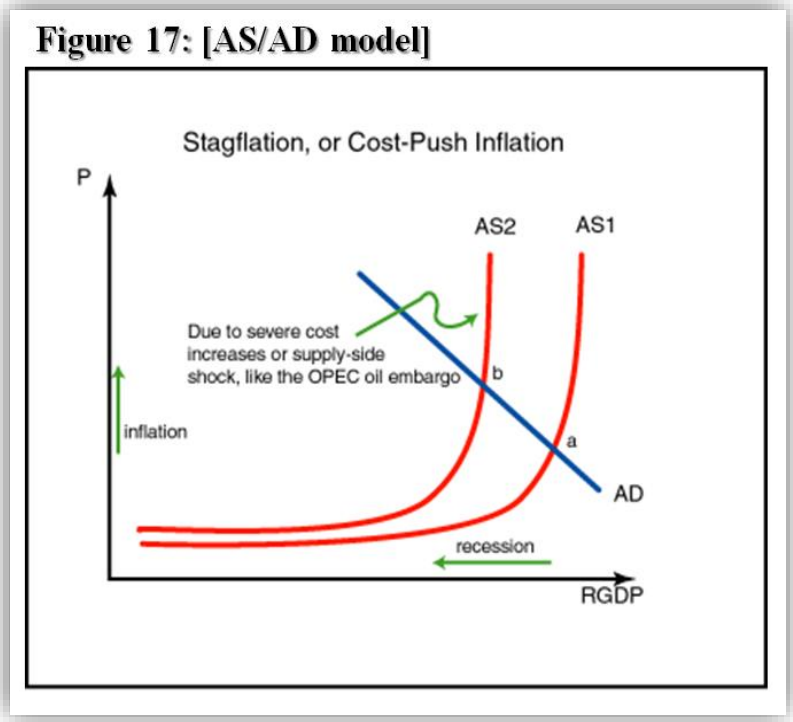
But some historical inflations have been characterized by high levels of inflation accompanied by recession - a phenomenon called *stagflation* (stagnation with inflation). Refer to **Figure 16 - Stagflation**, which refers to a period between 1970 and

1985 when the United States suffered from two separate episodes of stagflation. As can be seen in late 1974 the U.S, economy was suffering nearly double digit inflation rates but the economy was in recession. And although that was short-lived, the inflation returned again in 1981 and the economy dipped into a more serious recession in 1982 when GDP growth turned below minus two percent.



This phenomenon cannot be explained as demand-pull inflation. But it can be explained with the **Aggregate Supply/Aggregate Demand Model**. Refer to **Figure 17 - Stagflation, or Cost-Push Inflation.** In this scenario, inflation comes from the cost-push side and is represented by a backward shift in the **Aggregate Supply Curve**.[18] In the case of the time period represented by **Figure 16**, the single most significant contribution to cost-push pressures in the United States was due to a huge increase in imported oil prices, due largely to the two OPEC oil embargoes, the first in 1973 and the second in 1979. Oil and oil distillates played such a large role in the economy in those years that the increase in imported crude oil had a spread effect throughout the economy.

Figure 18 - The Relative Rise of Gasoline versus Food Prices during the OPEC Oil Embargos compares the relative increase of food prices, representing a primary consumer cost aside from fuel, compared to gasoline prices, representing a primary oil-derivate energy price, between 1967 and 1981. (An inset shows the price inflation of gasoline alone, unaltered and smoothed). The data are drawn from the CPI for the period. Both prices are normalized to values of 100 at the beginning so a direct comparison can be made. As can be seen both food and gasoline prices rose strongly over the period. But on net, gasoline prices rose more than four-fold over the period in question, whereas food rose by a multiple of only two-and-a-half.



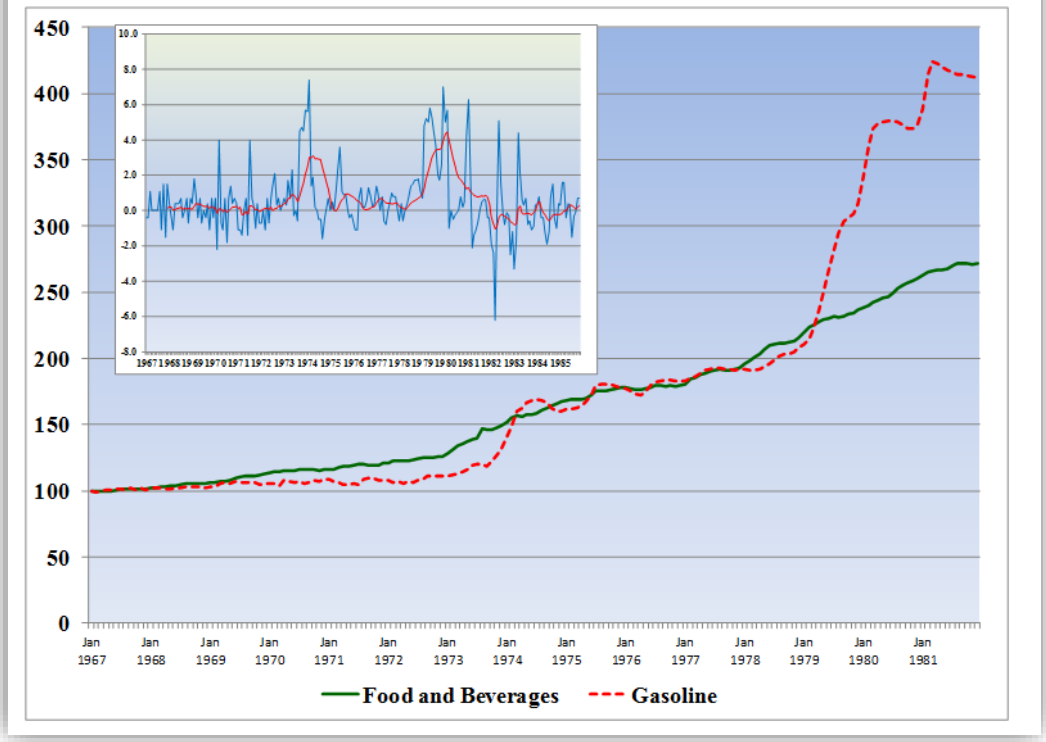
Generally, this kind of supply-side shock is modeled as stagflation as shown in **Figure 19**. Logically the rising costs of such economically important commodities as oil is shown as a shift backwards in the aggregate supply curve, which produced the double-jeopardy result of high inflation *with* recession, the sort of result represented in the historical data from **Figure 16.**

Any significant disruption to an important input commodity can be the cause of future stagflations, including oil and related energy products, food products, metals, or even water in areas where water is a scarce commodity. Smaller countries that are

[18] The explanation for the shift - why logically it should shift upward and backwards - is explained in Chapter 2 - **The Aggregate Supply - Aggregate Demand Model**.

more vulnerable to import prices of critical goods, like Japan, South Korea, and many of the South American and African nations, are all potentially vulnerable to supply-shock inflation.

Figure 18: The Relative Rose of Gasoline vs. Food Prices during the OPEC Oil Embargos [inset: gasoline inflation rates]



In the United States, the largest future supply-shock threat might be skilled labor in key industries like health care. Health care currently has a weight of 7.8% in the CPI and we have already seen that health care costs are rising more rapidly than other costs in the United States, and threaten to zoom above 10% going forward, introducing the modern crisis of *sector cost inflation*, which is double-digit or very high levels of cost-push inflation largely restricted to one sector. Rising health care costs are not restricted to skilled labor shortages in health care only, but the paucity of trained professionals will likely contribute to sector inflation in health care moving forward.

Another category of cost-push inflation can be classified as *import cost inflation* that can be the consequence of a devaluing local currency. For example, if the U.S. Dollar devalues relative to a foreign currency like the Euro, then the cost of imports coming from Europe will rise. For example, if the Dollar cost of a single Euro rises from $1.15 to $1.25, then an import valued at 20 Euros, say a bottle of wine, will rise in price from $23.00 to $25.00. The explanation of this complicated form of inflation, however, must wait until a discussion of the determination of exchange rates and their effect.

4.6 Can deflationary expectations push modest deflation into a more serious deflation?

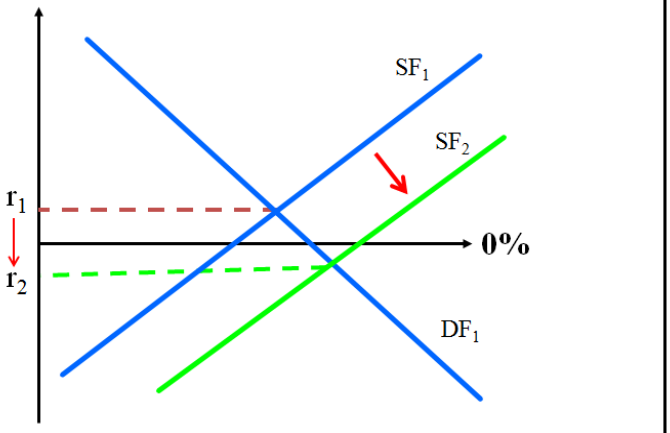
Above in **Section 3.5** we discussed the impact of deep deflation upon an economy using the Great Depression as an example. It should be understood that the deflation experienced in that era was very severe compared to anything that has been seen since. Although that deflation was so damaging it nearly destroyed the global economy, we should not infer that the little modest deflations sometimes seen since 2008 pose any equivalent danger.

Or do they?

At the time of this revision no current government was attempting to induce deflation into their economy. However, in 2015 and continuing into 2016, the Prime Minister of Japan, Shinzo Abe, implemented a national economic policy designed to push nominal market interest rates into negative territory with some success. Bank deposit rates turned slightly negative, which meant that consumers using bank savings accounts were required to *pay* a tiny amount of interest to the bank in which they held their savings. This practice was also practiced in Europe by Denmark and Switzerland and had spread to other European nations in early 2016.

Figure 19 - Negative Nominal Interest Rates

In this scenario, a central bank like the Bank of Japan, the European Central Bank or the Federal Reserve System increases the supply of funds until targeted nominal market rates are negative.



If you made a deposit in a bank account, the balance would gradually go down. If you bought a bond, you would owe periodic interest payments **to** the borrower (perhaps implicitly).

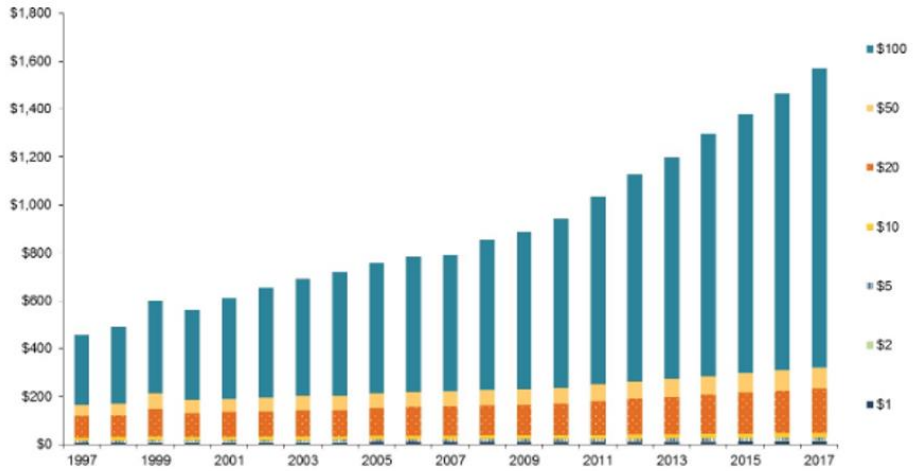
Some government debt issued in Japan and Europe was also trading at negative interest rates. On January 29, 2016 Abe's government formally adopted a negative interest rate policy, causing a plunge in the yield of the 10-year Japanese government bond to a yield of minus five basis points (-0.05%).

This phenomenon can be represented by the **Loanable Funds Model** in **Figure 19 - Negative Nominal Interest Rates**. In this case the central bank in question, whether the Bank of Japan, the European Central Bank, or the Federal Reserve System, when market rates are already close to zero, can increase the supply of funds sufficiently to drop target rates into negative territory, as shown.

The policy is intended to stimulate GDP growth in any economy in which it is applied *and* it is seen as an anti-deflation policy, intended in fact to provoke a modest inflation of around 2%.

One could argue, however, that such an unusual and untested policy merely acknowledges deeply-seated deflationary and recessionary expectations.

Figure 20 - Value of Currency in Circulation, U.S.
($Billions, as of December 31 each year, shown by denomination)



Source: Board of Governors of the Federal Reserve System, "Data for Currency and Coin Services," February 2019.

There are certainly two potential dangerous side effects of such a policy.

First, charging savers and business investors interest on their savings and high-grade note and bond purchases has a tendency to push savings and investment activities into relatively high-risk assets which offer more attractive yields. In the United States for example it might encourage retail investors to invest in exchange-traded products that invest in junk bonds. In China, low yields on traditional investment assets prompted Chinese savers to invest in shadow-banking operations, some little more than elaborate Ponzi schemes.

Additionally, negative interest rates might induce retail savers to simply hold cash. In the United States, the popular $100 bill emerges as a viable investment-grade financial asset when yields on bank deposits and short-term investment grade assets drop below minus-one percent.

As far-fetched as this may seem, according to **Figure 20 - Value of Currency in Circulation**, by December 2017, $1,571 billion of currency was in circulation, of which more than $1 trillion consisted of $100 bills. This was more than four times the number of $100 bills that were circulating in 1995. Although the growth of the popularity of the $100 bill was steady and cannot be attributed to negative interest rates or deflationary expectations, there is good reason to believe that this growth would *accelerate* in a negative interest rate or deflationary environment.

This same phenomenon is found in Europe. For whatever reason use and hoarding of the €500 note in Europe has soared since 2002 and 515 million of these notes were still in circulation as of August 2018. But European central banks have voted to force withdrawal of all €500 notes from circulation, and will no longer be issued by these central banks after April 26, 2019. Whereas government officials insisted that the withdrawal is designed to curb terrorism and other illegal activity, some critics insisted that this is an effort remove this class of asset as a viable investment option.[19]

History has shown that the hoarding of cash can have a contractionary effect upon the economy, shifting aggregate demand backwards possibly contributing to a deflationary recession. This outcome seems unlikely in 2019, but negative interest rates are certainly an unusual and unnerving experiment.

[19] See Tyler Durden, "*The War on Paper Currency Begins: ECB Votes to "Scrap" 500 Euro Bill,"* published online at http://www.zerohedge.com/news/2016-02-15/war-paper-currency-begins-ecb-votes-scrap-500-euro-bill