Inflation and Debt, as reported in 2022 and revised in 2023

Leading up to the recent bi-election, one of the major issues seized upon by those seeking office was the so-called burden of rampant inflation, especially of gasoline. As a former electrical engineer with no background in economics, nevertheless I became interested in this subject while doing some research on related matters discussed in Reflections, the last chapter of my new website. My only formal education on the subject was a freshman college class in Introduction to Economics in which I probably received a barely passing grade. Yet you never know. Some of the basics of that course may still be stashed away somewhere in my head. As usual, my plan here is to compile published date, mostly statistical in nature, and let others draw their own conclusions.

First, we deal with the misinformation regarding the "skyrocketing" (their much overused term, not mine) cost of gasoline. The cost of gas at $4 or $5 per gallon is less per mile now than it was when I got my driver's license in 1949. Cars now get about twice the miles per gallon. Then factor in decline of the dollar, as discussed in this report, and we actually come out slightly ahead now. Furthermore, gas is still cheaper here than almost anywhere else in the world. Nevertheless, the recent sudden price increase makes a handy issue for glib politicians to loudly campaign on.

Being curious, I decided to check with the presumed experts. A search for the ***causes of inflation*** on the Internet turns up many articles on the subject listing about a dozen different causes. Several of them use the exact same wording, "demand pull, cost push," suggesting to me that one is simply being copied by all the others, but who knows which one first came up with that catchy slogan. Among the other causes named are growth in money supply, organized labor, too low Federal Reserve interest rate, war in Ukraine, consumer expectations, less oil production, supply chain disruption, and COVID-19. Some of them stretch one's imagination, for example the Washington Post blaming the COVID ***vaccine***, because it put more people back in the mood of shopping. Forbes Advisor states that "inflation is caused by increases in the price of goods and services;" i.e. inflation is caused by inflation. Fox News predictably blames too much government welfare. Also predictable, Sen. Elizabeth Warren blaming corporate greed. And according to Robert Reich, the *real* reason is monopolistic lack of competition.

In evaluating some of these presumed causes, I find it useful to plot an easily measurable one, the Federal Reserve interest rate, and compare it with the *reported* inflation rate over the same period. The average price of things has been fluctuating ever since records were kept starting in the 1700s, nearly neutral for a long time and then mostly upward for the past 100 years. As for the comparison (Figure 1, top), if there is any cause and effect, positive or negative, I would call it slight. Yet several sources state that the rate of inflation is "controlled" by the Federal Reserve in their setting of prime interest rate. Again comparing the two graphs, one has to wonder how much control is achieved. It would appear to show little control, with the attempted controls often initiated too late rather than when most needed, and in some cases perhaps even the cause of, especially in 2021, unfortunately beyond the graph. Furthermore, when considering the overall historic

record of inflation, it looks like the Federal Reserve has had little long term control. (The bottom figure on page 4 is explained on page 9.)

The conclusion I gleaned from all of this is that there must be many causes of the monthly fluctuations in the "reported" rate of inflation, some not well understood, and that no one is able to identify them accurately, or more importantly, predict the future trends, not even the presumed experts on the Federal Reserve Board or others in the Treasury Department. And, incidentally, a lot of the information found on the Internet when seeking answers to questions like mine is opinion of very questionable reliability. So after that discouraging finding I then turned my attention to studying the *long term* trend, which most of the "causes" listed above fail to account for.

First of all, my intention was to concentrate on the overall long-term strength of the U.S. dollar, but this is not so easy. Most accessible is the Consumer Price Index, based on a collection of consumer items. But it does not take into account, for example, average wages or the value of the dollar against foreign currencies or precious metals. The Bureau of Labor Statistics has been measuring and reporting the CPI since 1914, based on the costs of various items such as phones and radios that necessarily change much over time, thus consequently subject to much inaccuracy. Further back, inflation is for the same reason even harder to gauge accurately. My figures come mostly from a questionable graph put out by the BLS, according to which inflation has been fairly neutral from 1800 to 1915, and for the past 50 years increasing between 3% and 4% per year, (Figure 2). For whatever reason, the BLS graph stops in 2015. If it had been continued into the present (2022), it would be closer to 4%. Several sources state that a 2% rate is desirable but do not explain why, or how that exact number was determined. Nor does it account for how our country managed well for 115 years with essentially no inflation, and now double that "desirable" rate. By the way, I am dismayed by finding so many faulty graphs on the Internet showing greatly distorted depiction of *cumulative* data such as inflation or debt. This sort of data needs to be plotted on semi-log paper to make any sense.

The Federal Reserve Board began a policy of trying to control inflation in 1978, but the often mentioned "desirable" 2% rate was not adopted until 2012. As noted above and in Figure 2, the reported inflation has averaged over 3% since 1930, with or without the Fed monkey with it, so what can be the reason?

I wondered if discontinuing our gold standard had anything to do with inflation. The gold (or silver) standard has a long and complicated history, on and off for over a thousand years throughout the world. One of the many problems with it was that the value of gold and silver, like everything else, fluctuates with supply and demand. Plus, of course, shipping of gold bullion has no place in this modern era of instantaneous electronic international exchange. In recent times, after the Bretton Woods agreement in 1944, the U.S. dollar "pegged to gold" has been the standard of exchange worldwide, but that could change. All ties to gold ended in the U.S. in 1971. Conclusion: probably not much effect.

A few of the internet sources mentioned above suggest that excess government spending might have some effect on chronic inflation, while others think not. I have always

wondered. Accordingly, I have plotted federal debt since 1790 (page 6) to compare with cumulative inflation (page 5) over the same period. The correlation is striking. But correlation does not necessarily indicate cause and effect. It might even be the other way around. It would appear that they probably both affect each other in some complicated way. The dip around 1840 is explained by the Jackson administration paying off nearly the entire national debt of about 50 M. The debt is here plotted on 7-cycle semi-log paper, which is the only way that makes any sense. I placed dots at one-year intervals and connected them all by a crooked line as best I could. Some fine detail may be missing, but I was more interested in the overall trend. An interesting feature of such graphs is that cumulative constant percent changes appear as diagonal straight lines, with the tangent of the angle of slope being proportional to the percentage change.

In an earlier version of this report, I plotted debt adjusted for "inflation" and then also for population. I am now deleting them, as I have no accurate historical data for inflation, and even if I did, they would not show much that we don't already know. In the long run, our average "reported" rate of inflation over the last 80 years of about 4% appears to be connected at least partly to a steady increase in national debt. Furthermore, if correct, and if our debt continues to increase at the present accelerating rate, inflation can be expected to do the same unless some drastic changes are made in the federal budget. Incidentally, I have been asked why I did not plot debt as a fraction of GDP. But many others have already done this, and the Internet is littered with such graphs. Furthermore, the GDP is difficult enough just to define, much less measure accurately, and might even be tampered with for nefarious purposes.

Which brings up some thoughts on the national debt. At the present rate of increase of nearly 5% per year for the past 50 years, by extrapolation it could reach 100 trillion around 2030. The interest on that debt can't just be ignored; it must be paid. At 3 % interest rate, that would be 3 trillion. Now, just to put that into perspective, imagine that payment being taken off the top equally from everybody's annual income tax payment. That would be $8,000 before funding anything else. (But see a more detailed estimate on page 7.) That is not likely to happen. More likely it will be financed by ever more borrowing.

So, these are just some thoughts and statistics by a non-expert with time to spare and a curiosity about all things. One final thought. You can look at it this way. Suppose Congress were to continue going blithely about enacting big spending bills, especially those that benefit their supporters and home district, and pay for them simply by borrowing or creating more and more money. There would be no need to raise taxes, or even have any at all. Something must be wrong, and now I realize this does indeed go back to that college course in basic common sense economics some 73 years ago, thanks to Professor S.

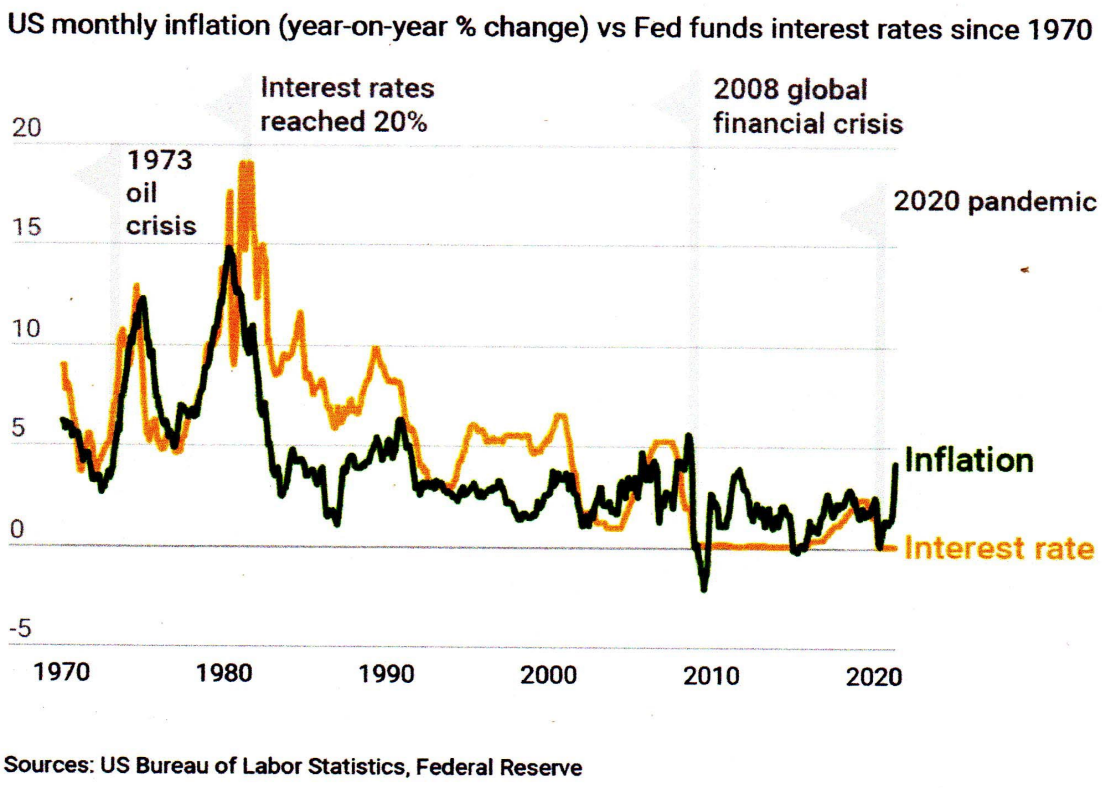

US monthly inflation (year-on-year % change) vs Fed funds interest rates since 1970
Interest rates reached 20%
2008 global financial crisis
1973 oil crisis
2020 pandemic
20
15
10
5
0
-5
1970
1980
1990
2000
2010
2020
Inflation
Interest rate
Sources: US Bureau of Labor Statistics, Federal Reserve

Figure 1

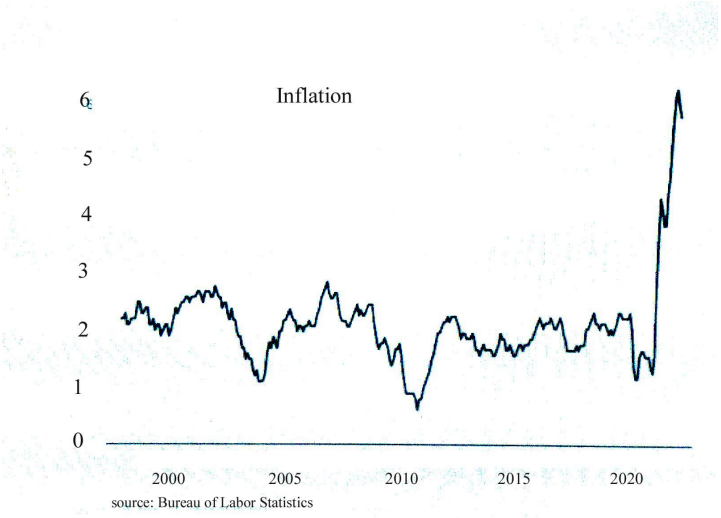
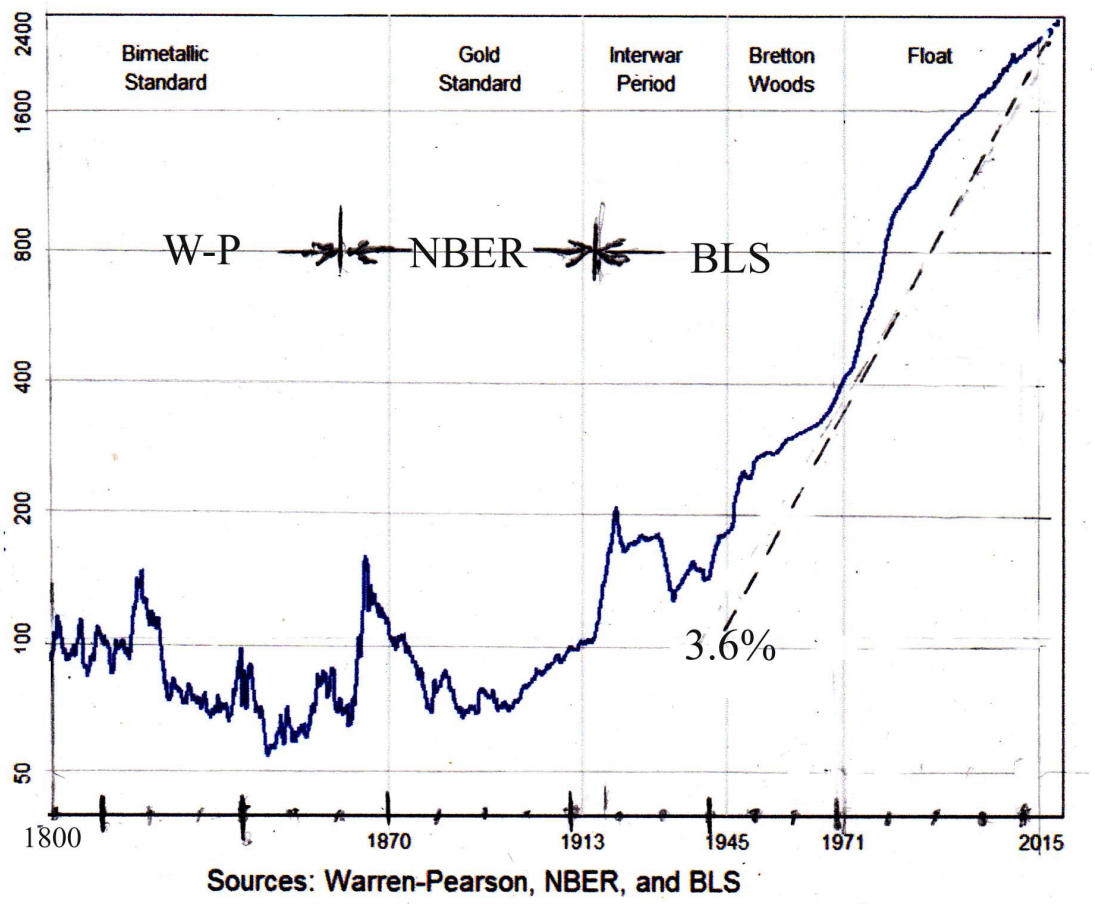
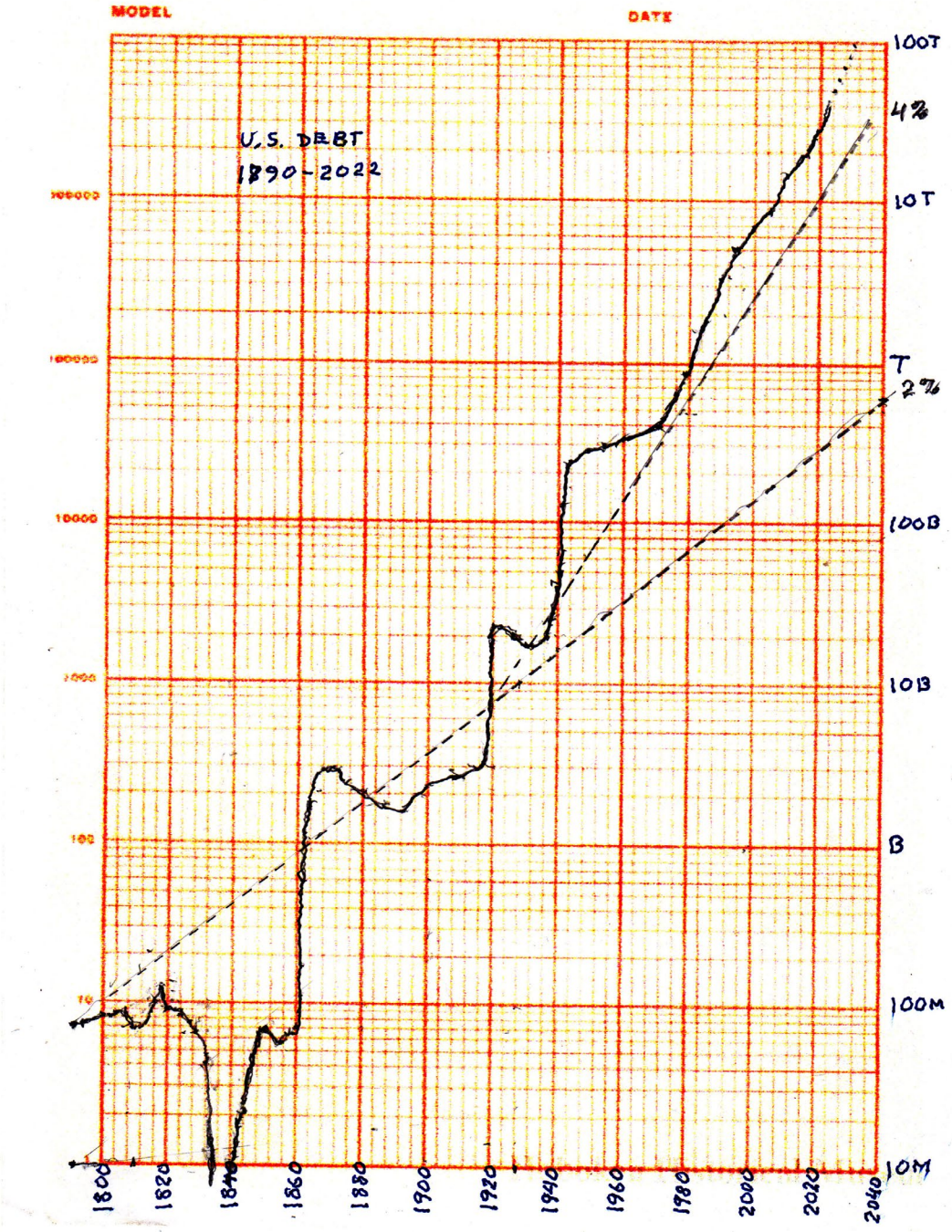

Inflation
6
5
4
3
2
1
0
2000
2005
2010
2015
2020
source: Bureau of Labor Statistics

Figure 2, Historic graph of "Inflation"

What is needed to buy what one dollar would buy in 1800

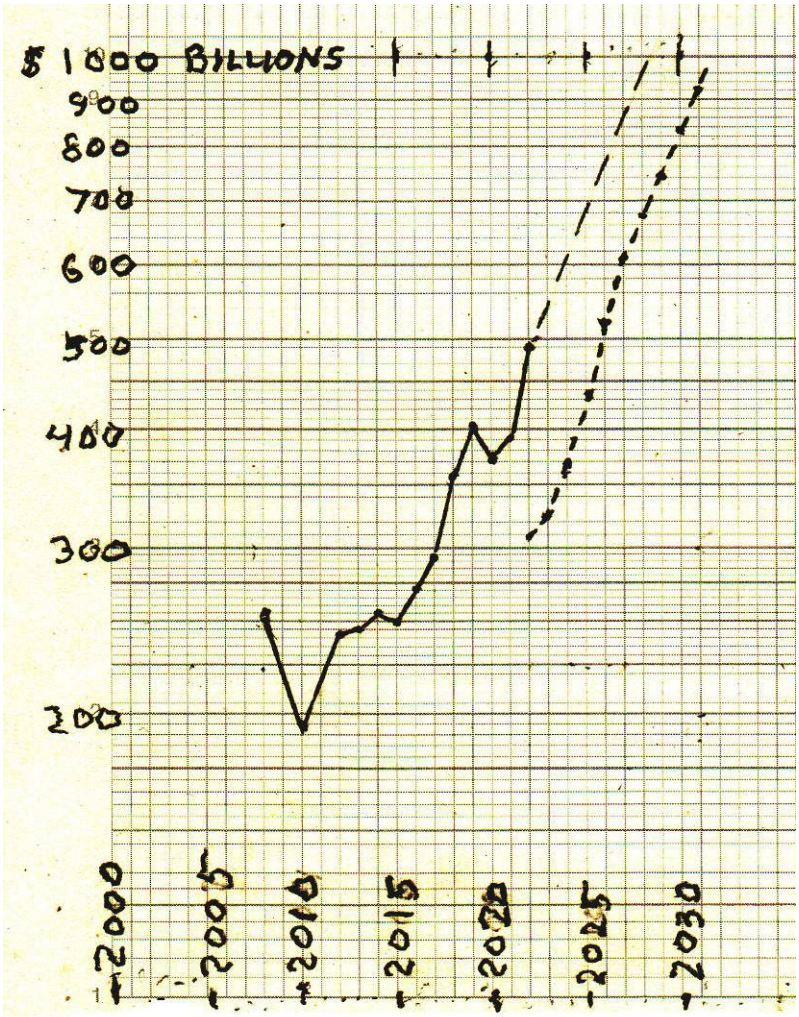


Sources: Warren-Pearson to 1860, NBER to 1917, and BLS to 2015. Evidently our trusty U.S. dollar had jumping fits in the early years. All three sources are of questionable reliability.


MODEL
DATE
U.S. DEBT
1890-2022
100T
4%
10T
T
2%
100B
10B
B
100M
10M
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040

Added note, February 2023

As already explained, I do not claim to be in any way an expert on economics. Nevertheless I do have some knowledge of graphic analysis of statistical information which I can put to good use, and which I find sorely lacking in much of what is found on the Internet, even including official sources. This plot of interest on the portion of the national debt held by the public from 2008 to the present is taken from CBO government sources. I have extrapolated it by dashed line into the future, which shows it reaching one trillion dollars around 2028. The other broken line is an estimate provided by the CBO that instead shows it reaching a trillion in 2032, and I unable to explain the discrepancy. The slope of both lines is about 12% per year. Where does all this lead? When and how does it end?



Added note, March 2023

Back on page 1 is a discussion of the Federal Reserve trying to control inflation by adjusting federal interest rate. I take an interest in this for a special reason. In my Reflections, found elsewhere in my website, is a description of my work with regulated power supplies at MIT. I had considered editing that out as being of little interest to most readers, but now I am glad I left it in. Stability or instability of closed loop systems is a subject that has broad ramifications. In general, regulation of such systems can be improved by increasing the "gain" of the system, but only up to some limit. Too much regulation, or too late in applying, can even be counterproductive, often causing unwanted overshoot or even instability and oscillation. Examine the graphs in Figure 1 and also what is taking place right now. This may or may not be the case with the actions by the Federal Reserve in their at best only partially successful attempts to control inflation, but one must wonder how much technical expertise goes into making these important decisions, or can it be more like guesswork? In the same vein, how did they ever arrive at the "optimum" 2% inflation rate? Please show us the science in that.

I would not want to try carrying this analogy too far. The electrical parameters of my power supplies were measurable and the resulting performance was possible to calculate. But, according to some experts, when it comes to inflation, the mysterious psychology of saving and spending must also be taken into account. At least based on my experience with the laughable Introduction to Psychology way back in college days, psychology was and probably still is anything but a science.

Added note, June 2023

At the beginning of this piece I mentioned some of the various "causes of inflation" found on the Internet and put forth by presumed experts. Our town library has about 100 books shelved under the classification 300 - Economics, and recently I have been going through them one-by-one looking for more insight on inflation and debt. What I find, first of all, are various schools of thought on the subject, with catchy names like post-Marxism, neo-Keynesian, new Minsky theory, neoclassical macroeconomics, monetarist model, large-scale econometric model, optimizing model, disequilibrium, and so on. Most of these theories (for want of a better word) tend to disagree with each other, and some of the adherents take exception to parts of even their own doctrines.

One of the most common topics of discussion I find in all this is our recurrent and never ending economic cycles of growth and contraction, and how these presumed experts would prevent or at least control them. Some authors, such as Magnuson, say that these cycles are an inherent feature of a capitalistic economy. In my reading, special attention is given to the causes of recession and all the mistakes that are said to have been made by those in charge, including Congress and the Administration. The Federal Reserve Board comes under the most severe criticism for not only failing to control recessions but often making them worse or sometimes even causing them. As I have said, I am not expert on any of this and am merely reporting what I find. What I find disturbing is that important decisions are now being made that determine the very economic future of our country,

and made apparently based at least in part on guesswork and amidst much disagreement by the presumed experts and those in charge. One final thought on the subject of economic growth and all the benefits to Wall Street. Families behind on rent and facing eviction do not much care about the stock market. I sometimes wonder if perhaps we might be placing too much emphasis on the wrong things. Instead, what about the growth of national happiness?

Added note, July 2023

As already mentioned, lately I have been intently studying books on economics in an effort to make up for my admitted ignorance of this dismal subject. What I find, first of all, is that many are written by authors with a political bias, liberal or conservative, Democrat or Republican, such as Greenspan, Friedman, Forbes, Krugman. Likewise the news - Fox vs New York Times. Beyond that, one finds a bewildering assortment of conflicting theories or "schools of thought," very much like religion (see my June notes on page 8). Many authors tend to align themselves with one of these faiths, but then with their own special slant of course, as otherwise what would be the point of publishing. It all makes one wonder how much science goes into making important decisions affecting our national economy.

The one thing we can know for certain is that they can't all be right, and one might just as well ignore much of the theory and instead simply resort to common sense. But what I do find quite useful is some of the presumably more reliable statistical data such as federal debt and interest rate. I have suddenly come to realize that from the start I have been making a careless mistake in my use of the term "inflation." It can have at least two quite different meanings that many authors and presumed experts fail to distinguish between, leading to much confusion.

In classic economics, at least as we were taught 73 years ago, inflation refers simply to the decline over time in the purchasing power of currency, in our case the dollar. For a quite different meaning, our Bureau of Labor Statistics keeps records called Consumer Price Index, updated monthly, of the cost of over 90,000 different consumer items in many different cities throughout the country. I wonder if a few dozen carefully selected items might do just as well. After all, it can be at best only a rough guide, since everyone's needs are different. How many of us buy cigarettes or pet grooming? I suppose some such statistic could be useful, now that so many households are reported to be struggling more than ever just to barely cover their daily needs. So why then does that list include such luxury items as sports tickets, alcohol, jewelry, and even chewing gum? To add to the confusion, the Feds now have several different categories for all this, such as CPI-U, Core CPI, Headline CPI, PCE, Core PCE, Trimmed Mean PPI, and others, all included under their casual and misleading definition of "inflation." It does make one wonder what fun the BLS must be having playing with its $740,000,000 annual budget. Adding even more to the confusion, the bottom figure on page 4 shows an alternate graph of "inflation," also from the same BLS. I could even show still more different graphs for the same time span, all labeled (or mislabeled) "inflation."

In my attempt to reduce the confusion, in this report I will use the term inflation to mean exactly that, the decline of the dollar. For all the other various uses and misuses of the term "inflation" I will put it in quotes.

Scattered throughout all the many hundreds of graphs and economic statistics now found on the Internet are those reported as "adjusted for inflation." I made what was perhaps a mistake when using that expression in the two graphs that are now deleted. I had hoped that the BLS published figures I used were fairly reliable, but now I have doubts, so I would treat with much skepticism any graphs that state "adjusted for inflation" when they actually mean "adjusted for CPI" or perhaps something else even more misleading.

Turning now to how one might accurately measure current inflation, I suspect it may not be so easy. I suppose the method used by the BLS would be the place to start. I would be suspicious of the cost of any one item that jumps up and down a lot, or that deviates too much from the average. Obviously it would be senseless to include new inventions like cell phones or laptops that didn't even exist until recently, and now keep changing and improving.

One of the more interesting books in my new reading list is *Trillion Dollar Triage*, by Nick Timiraos. The author heaps much praise on the Federal Reserve for managing "the economy" so skillfully, especially chairman Powell. The book was published in 2022, just as we were suddenly in the grip of the worst "inflation" in 40 years, caused at least in part by Powell, and I can just imagine the author rushing to the publisher and trying to stop printing until revisions could be made.

The author provides interesting bits on the inner workings of the Fed, such as:

Page 286: Yellen remained far less convinced (about inflation). "I still think the medium-to long-run problem is inflation too low rather than too high," she said in a June 2021 interview. "I don't believe secular stagnation is going away, and so most likely, we remain in a world of chronically low interest rates, and there will be more concern in the years ahead about inflation too low than too high. I know it's really easy to forget all of that when you've had such high monthly rates of inflation....But we've never undergone a shock like his before, and we have to have some humility about how it's going to play out."

Page 254. With Clarida, he (Powell, in 2019) had been driving the committee to a shift that sounded subtle but could in fact be quite radical. If inflation had run below 2%, the Fed would seek to push inflation temporarily above its 2% target in order to 1) persuade the public to expect inflation to average 2% and 2) set prices and wages accordingly.

Page 283. Now (2021) Summers was saying that the stimulus, on top of the Fed's policies, was too much too fast. If he was right, inflation would now menace the economy not just for a year or slightly more, but potentially year after year until the Fed hit the monetary brakes. (The author then disparages Summers for that remark that would soon prove to be prophetic.)

Page 256. (In response to criticism of his new policy) Powell was unfazed. "I'm not at all concerned that people are saying "Oh, it's not credible.'" Powell said two months after the announcement. "It'll be credible when we get inflation meaningfully above 2 percent for an extended period and we don't react to it. We'll just say, *Look at that*. That's the only thing that can build your credibility after a decade of running below 2 percent inflation."

By the time this book was published, "inflation" had suddenly jumped to over 9%, the highest in 40 years, and the Fed had belatedly begun a desperate attempt to reduce it by raising the interest rate and "cooling the economy." The Fed has a mandate, often mentioned, of "maintaining full employment." So how does one explain the recently stated policy of increasing *unemployment*! (I rarely use the exclamation mark in my writing.) Also, after leading the free world's economy for over half a century, but then going into a decline in the 1970s that is now growing even worse, why then is the Fed now trying to "cool the economy"? So many questions; so few answers.

Added in August 2023

This report was begun over a year ago when inflation had become a handy election issue for glib politicians to campaign on. My original focus was on the causes of inflation. Lately I have switched to questioning the accuracy of official reports on inflation. From the start, my suspicion of something being wrong was aroused by the Graph of Inflation on page 5. Why would the strength of the U.S. dollar jump around like crazy until around 1860, somewhat less so until 1940, and then settle down with smooth sailing to the present? The source of that graph is Warren-Pearson to 1860, then NBER to around 1917, and finally BLS to 2015. Warren was a professor of agriculture at Cornell. He and his student Pearson studied trends in commodity prices, especially agricultural. Hard to imagine why their jumpy data was used by the BLS as a measure of inflation. Perhaps the same should be asked of NBER data. How would retail stores have managed their pricing (or salaries) amidst such chaos? And one must wonder what the bond market might have been doing if our U.S. dollar really was jumping up and down by 50% or more for whatever reason every few years. A different and likewise questionable jagged graph of historic "inflation" was published by Reinhart and Rogoff, and yet another even worse by Reuters/Jeffries.

The BLS data presumably started out as an index of the price of things bought by a typical urban consumer, hence the name CPI-U. The methods used to compile this data have been changed at least 20 times, such as by adjusting the basket of goods to cheaper items. The reason given for this is that in times of high inflation, such as we are in right now, many poor consumers will adjust their spending habits to economize. Makes sense I suppose. But in doing so it becomes even more useless as a measure of inflation. To make matters even worse, these substitutions are made in secrecy. When I tried to obtain details from the BLS, all I got was a run-around. There are even, believe it or not, what are referred to as hedonic adjustments. If your new computer costs more but has more memory, that may not be considered a price increase but might even be a decrease. I will skip the bizarre details here because they are available on several websites. See especially

"Why Is the Consumer Price Index So Controversial," by Palmer and Kelly. It seems that the actual inflation rate may be much more than that reported by our Treasury Department and quoted so widely. For still more on the trick methods used by the BLS to adjust their method of measuring "inflation," refer to their 14-page Handbook of Methods, available on the Internet. It contains, by my count, 42 formulas used to "adjust" prices, two of which are shown below. Note that they even include a fudge factor for "elasticity." What do you suppose is meant by "elasticity" in the price of a stepladder?

Month-to-month price change under the constant elasticity of substitution formula is given by:

$$ {}_{l,A}IX^{C}_{[t-1:t]} = \frac{\left[\left(\sum_{i\in l,a\in A}\left(\left(\frac{E^{C}_{i,a,V,bx,\sigma}}{\sum_{i\in l,a\in A}E^{C}_{i,a,V,bx,\sigma}}\right)\left(\frac{IX_{i,a,t}}{IX_{i,a,V}}\right)^{(1-\sigma)}\right)\right)^{\left(\frac{1}{1-\sigma}\right)}\right]}{\left[\left(\sum_{i\in l,a\in A}\left(\left(\frac{E^{C}_{i,a,V,bx,\sigma}}{\sum_{i\in l,a\in A}E^{C}_{i,a,V,bx,\sigma}}\right)\left(\frac{IX_{i,a,t-1}}{IX_{i,a,V}}\right)^{(1-\sigma)}\right)\right)^{\left(\frac{1}{1-\sigma}\right)}\right]} $$

The constant elasticity of substitution pivoted expenditure weight for a annual

$$ E^{C}_{i,a,V,bx,\sigma} = P^{i,a}_{b} Q^{i,a}_{b} \left(\frac{IX_{i,a,V}}{IX_{i,a,bx}}\right)^{(1-\sigma)} $$

where,

A = all basic areas (U.S. city average);

a = CPI basic area;

i = CPI basic item;

l = all basic items;

t = month;

b = annual expenditure reference period;

x = index base period (initially December 1999 = 100);

V = pivot month;

$P^{i,a}_{b}$ = price of item i in area a during period b;

$Q^{i,a}_{b}$ = quantity of item i in area a during period b;

σ = elasticity of substitution for the index period; and

$IX_{i,a,t}$ = lower-level index for item i in area a in month t.

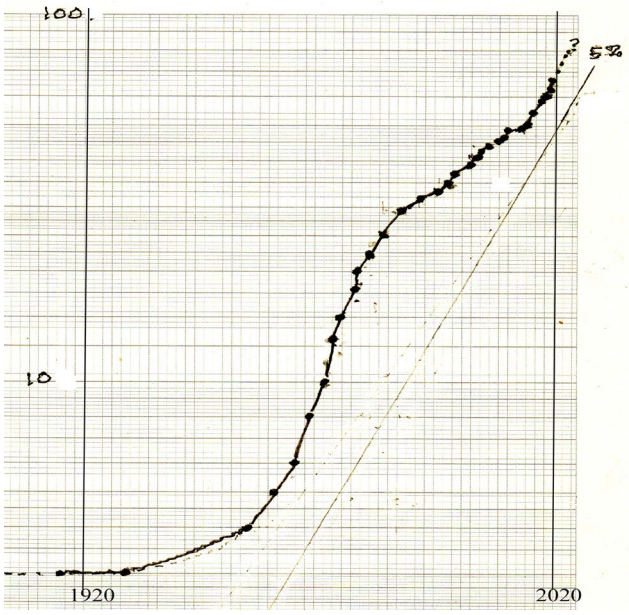
Just for fun, despite my admonition I have tried to plot my own rough measure of historic inflation, not by using 90,000 items and formulas like the one above, but rather just one judiciously selected item, as shown on the page 13. See if you can guess which one. My graph shows essentially no inflation until 1930, and an average inflation rate of almost 5% in recent years and continuing into the present. To double check but not shown here, I have also plotted the historic prices of bread and potatoes from 1940 to now, and they show a likewise fairly steady inflation rate of slightly over 4%, whereas the BLS graph on page 5 shows well under 4%. Take your pick. I think mine is more accurate.

If the Fed and others have been systematically under-reporting inflation, the question is why? Could it be that government officials, especially elected ones, hate to vote for tax increases, and inflation is a hidden tax that no one has to vote for? Moreover, many government benefits, such as Social Security, are adjusted for "inflation," and this error

results in a huge savings for our government, but at our expense. Perhaps even more to the point, it makes it look like the Fed was doing its job. But keep in mind that Congress and the Administration are also in on this monkey business.

At the start, I said I would just compile data and let others draw their own conclusions, but here I deviate. I have found how difficult it would be to accurately gauge the historic rate of inflation, and I now have the answer to that. Ignore all such graphs, including mine. They are mostly meaningless, including of course those "adjusted for inflation." And who cares anyway? It is the present rate that really matters. As nearly as I can tell, the basic underlying rate averages around 4% to 5%. If correct, then desperate efforts by the Fed to bring it down to near their "desirable" 2% might result in more of an economic decline than we are already in. Look at the graph on page 5, or probably better, mine below, and explain how this is even possible. Instead of "cooling" our economy and increasing unemployment, wouldn't it make more sense for our government to address the *causes* of inflation?

Speaking of which, right after World War II, the U.S. became the unrivaled leader of the free world economically, militarily, and in so many other ways. I remember it well. Then after a few decades we went into a relative lagging behind that has recently steepened. Does anyone know why, or even care? And what part does the Fed played in this decline? It might be a subject worthy of study, but I am getting tired of all this. At 93, perhaps it is time to think about quitting and retiring.



This is my own attempt, of questionable accuracy and usefulness, at a historic graph of inflation. At least it is probably more accurate than the one on page 5. The diagonal line is 5%.

Stewart Coffin, econeer