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The U.S. Inflation Alphabet: A Primer

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In the U.S. we constantly hear about the Consumer Price Index, commonly referred to as the CPI. Most of us learned about it the hard way, during the high inflation episode of the late 1970s and early 1980s, when inflation was well over 10 percent per year. Today, most of us keep a close watch on the CPI, either to help gauge the value of our wage increase or because we know that our social security payments are adjusted every year based on the change in this inflation index. Indeed, we are all using the index exactly for what it was designed: measuring changes in the cost-of-living from month to month or year to year. Now, in their most recent semi-annual report on the state of the economy, we learn that the Federal Reserve is focusing on the something called the "PCE chain-type index." What is this alternative measure of inflation, and should we care about this change?

There are really three basic types of price indices used to measure inflation: Fixed-weight indices, deflators and chain-type indices. The CPI is an example of the first, and it is designed to the answer following question: "How much more would it cost for people to purchase today the same basket of goods and services that they actually bought at some fixed time in the past?" To construct such an index, government statisticians survey people every ten years or so to measure what they purchased. Inflation measured using the CPI tells you how much more money you need to give someone to restore the purchasing power they had in the earlier period when the survey was done. But adjustments in wages based on fixed-expenditure-weight inflation indices are known to over-compensate people in an unintended way. This over-statement of inflation is known as "substitution bias." Since inflation is not uniform, the prices of some products will increase by more than the prices of others, and people can escape some of the inflation by *substituting* away from the goods and services that have sustained relatively more inflation, buying more of those that have sustained relatively less. By assuming that any substitution makes people worse off, the index overstates to impact of price changes. And the longer it has been since the last expenditure survey, the bigger this bias.

The second inflation measure is know as a *deflator*, and is constructed from national income and product accounts data, such as the Gross Domestic Product (GDP) or the Personal Consumption Expenditure (PCE). Government statisticians compute both nominal GDP, that his the total dollar quantity produced in a given amount of time, and *real* GDP, which is the measure of the quantity of goods measured at prices in some past (base) year. Growth in nominal GDP can be divided into real growth and inflation, and the deflator is the inflation part. The actual computation of a deflator is straightforward, and simply involves dividing the nominal by the real, and looking at the change. Analysis of the deflator is pretty complicated, however, but in essence it is the answer to the

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following rather convoluted question: "How much more did it cost me to buy what I bought today than it cost me to buy what I bought yesterday?" The difficulty with a deflator is that the basket of goods is constantly changing. While this may not be a problem when examining adjacent quarters or years, if the goal is to compare years that are far apart, this creates a problem. Unlike a fixed-weight index, the deflator is known to systematically understate inflation by implicitly assuming that substitution never lowers people's standard of living.

The GDP and PCE deflators differ from the CPI in their coverage, as well as in the way in which the weights are constructed. That is to say, the CPI measures only out-of-pocket consumer expenditures, while indices based on GDP measure consumption, investment and government production. The PCE-based indices cover total consumption, including things that households do not pay for directly --- the prime example is medical care, which is mainly paid as an employer-funded benefit, not an out-of-pocket expense. I will return to this in a moment.

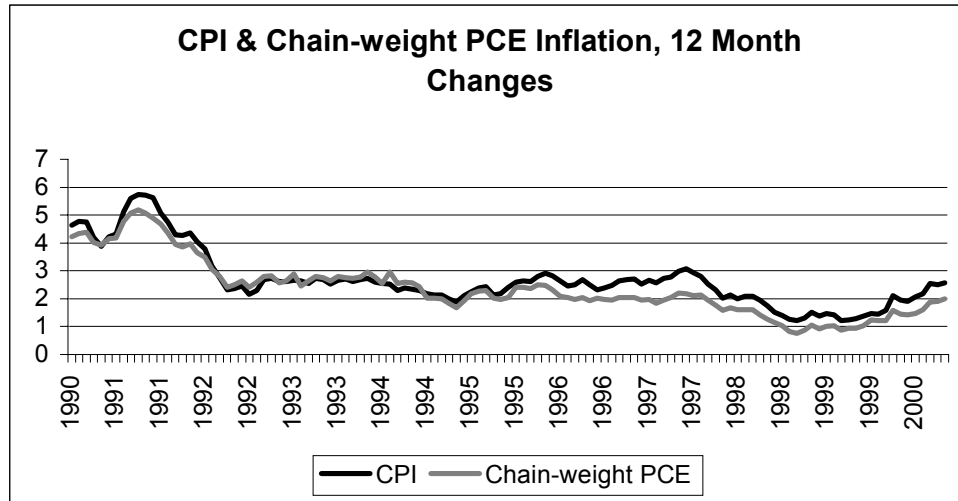
The third inflation measure is a *chain-weight* index, which is halfway between the fixed-weight and the deflator. It is the answer to the rather more straightforward question: "How much would it cost for people to purchase today the same basket of goods and services that they actually bought *last year*." What the statisticians do is to make a chain linking each year to the next, computing the increased cost of moving one year at a time. This dramatically reduces either the overstatement of the fixed-weight index or the understatement of the deflator, yielding an index that is known to be more accurate.

While the differences among the various measures of inflation may be important for indexing, and evaluation of the absolute level of inflation, does it really matter for monetary policy? To see, let us compare the CPI and the chain-type PCE index more directly. Looking into the details, the first thing one discovers is that these two indices are constructed from an almost identical set of price series. That is to say, in the U.S. there is really only one survey of retail prices, and so the CPI and chain PCE index are just a different weighting of the same fundamental data. There are, however, two sizable differences: the treatment of medical care services and housing. The PCE includes both medical care paid for by the government through programs like medicare and the employer-paid portion of medical insurance premiums. This means that inflation in medical care services --- doctors visits, hospital stays and tests --- receives a much higher weight in the PCE than it does in the CPI. The difference is dramatic, with this component accounting for only 4 1/2 percent of the weight in the CPI, but 15 percent of the weight in the PCE!

Turning to housing, in the CPI this accounts for about 40 percent of the total index, about three-quarters of which is rent or its homeowner's equivalent, and one-quarter is fuel, utilities, furniture, and the like. This high weight explains why the key to understanding long-run trends in the CPI is to study the behavior of the price of the shelter component. By contrast, in the PCE, housing is only one-half as important, accounting for only 20 percent of the weight, with the proportions being roughly the same proportions as in the CPI.

Looking to the data, we can ask whether any of this makes a practical difference. Does the FOMC's focus on the chained-weighted PCE index matter for monetary policy? Central banks that explicitly target inflation, including the Bank of England and the European Central Bank, do focus their attention primarily on indices of prices paid directly by consumers. The reason for this, in my view, is that most people have a fairly firm grip on what these CPI-style indices represent. These measures are well understood, and explicitly targeting them enhances the transparency of what the

central bank is doing, making them more accountable to the population at large. But the Humphrey-Hawkins Act, that guides the FOMC, describes the goal of price stability as an abstract objective. Does it matter if the committee chooses to focus on the CPI or the chain-weight PCE?



Source: BLS and BEA

To answer this question we need to go to look at the data. In the accompanying figure, I plot the twelve-month change in both the CPI and the chain-type PCE index, over the decade of the 1990s.¹ The results are interesting in that the PCE measure is usually the lower. In fact, on average during the decade, the PCE index has been 0.3% below the CPI --- an amount that can be explained by the substitution bias in the CPI. So, if you are worried about the level of inflation that represents price stability, the chain-weighted PCE index is more accurate, and you should focus your attention there.

Once we take this differential bias into account, is there any difference between these inflation measures? The answer is not much. They are very highly correlated (about 0.96), and so an increase in inflation in one measure will almost certainly imply an increase in inflation in another. In other words, if you need to know whether inflation is rising or falling, it doesn't make much difference which index you use.

Where does leave us? Does this change really mean anything for either monetary policy itself, or for our interpretation of the actions of the policymakers? The answer is almost surely no. The signal in the February 2000 Humphrey-Hawkins is that the FOMC will monitor its price stability objective with reference to an index whose *level* is a more accurate reflection of true inflation. A zero reading on the chain-weight PCE index is closer to price stability than zero on the CPI, which represents deflation of about one-half of one percent. But since the measures move closely together, the Committee could have achieved the same impact by defining price stability as CPI inflation of one-half of one percent per year, which would have negated the need for a new education project.

¹ Since the BLS has been improving the CPI over this period, I use the most recent data that is methodologically consistent, rather than the official data. This is comparable to the PCE data, which is often revised, where I use the most recently available.