AIER | AMERICAN INSTITUTE for ECONOMIC RESEARCH

Working Paper 004

Capturing the Inflation that People Experience: The Everyday Price Index vs. the Consumer Price Index

Polina Vlasenko[1]

Steven R. Cunningham[2]

Abstract

This paper presents the Everyday Price Index – an index designed to capture the changes in prices of the goods and services that people buy frequently. These prices tend to exert a stronger influence on the perception of inflation, and their volatility represents an important risk to household budgets.

The comparison of the Everyday Price Index and the Consumer Price Index reveals that the indexes began to diverge starting in the early 2000s while also becoming more volatile. This divergence suggests that everyday prices no longer follow the same trend as the overall price level.

The Everyday Price Index may be better than the Consumer Price Index at reflecting the concept of "prices in general" held by the public. Our analysis shows that the Everyday Price Index has better predictive power for inflation expectations than the Consumer Price Index when those expectations are derived from surveys of the general public.

JEL Codes: E31, C43, C82, D14, D84

Key words: price index, inflation, perception of inflation, inflation expectations

June 2015

[1] corresponding author, Senior Research Fellow, American Institute for Economic Research,
[2] University of Connecticut, Department of Economics

1. Introduction

Inflation is important. Changes in consumer prices affect the purchasing power of incomes and therefore the well-being of people. In addition, expectations of future inflation affect the decisions people make – decisions about consumption and saving, personal financial decisions, decisions about major purchases, and others. Inflation expectations are likely influenced by the price changes that people observe. Therefore, it is important to have an accurate measure of the price changes that are relevant for the decisions people need to make.

The inflation felt by consumers can be quite different from the inflation implied by the rate of increase in the Consumer Price Index (CPI). A recent headline in Time magazine illustrates the point – "If There is No Inflation, Why Are Prices Up So Much?" (Sivy 2013). People form their view of price changes based on the prices they see, not on the CPI data release.

Some prices are more important to people's everyday lives than others. This was perfectly illustrated by a remark during a visit of the New York Federal Reserve Bank's president William Dudley to Queens in 2011. As reported by Reuters (Cooke 2011), in trying to address the audience's concerns about rising food and gasoline prices, Mr. Dudley pointed out that other prices, such as those for iPads, are falling. To this he received a perfect response – "I can't eat an iPad."

The importance of the prices of various goods to people's life decisions may not be proportional to the expenditure shares of those goods. An iPad likely costs more than a monthly grocery bill for a family, yet it is the grocery bill that receives more attention, as Mr. Dudley has learned. The Consumer Price Index weighs the prices of various goods by their expenditure shares, which may not correspond to the importance people assign to these prices.

This example illustrates that in many cases the overall inflation rate may not be measuring the price phenomenon of interest to the public. The price trends relevant for people's lives and to the decisions they need to make may not be accurately reflected in the broad CPI.

Our goal is to create a price index that reflects that trend in prices relevant to everyday consumer decisions. The original motivation for creating such an index was a seemingly growing gulf between the inflation that people perceive and the official measures based on the CPI. It was hard to believe that the many accounts of people disbelieving the official inflation numbers could be all written off as mistakes. The idea was to see whether there is anything in the daily experiences of people that creates a perception of inflation that is at odds with the CPI numbers.

The Everyday Price Index described here attempts to measure the price trends of only those goods and services that people buy on a regular basis. These prices likely figure prominently in the perception of inflation. However, we are not aiming to measure perceived inflation. Rather, we want to create an index that reflects the actual price changes that people experience, which may be influencing the perception of inflation.

The paper is organized as follows: The next section presents the review of relevant literature. We then lay out the methodology for creating the Everyday Price Index and present the index itself. The Everyday Price Index is then carefully compared to the Consumer Price Index and important differences between the two are noted. Possible explanations for those differences are also explored. Finally, we discuss how and why the Everyday Price Index can be useful.

2. Literature

The discrepancy between the public's perception of inflation and the official inflation numbers has been documented in many settings.

When euro notes and coins were introduced into circulation in 2002, countries in Europe saw a spike in perceived inflation far above the official inflation measure based on consumer price indexes. Several studies document this phenomenon and seek to provide an explanation for it. See, for example, Del Giovane and Sabbatini (2005) for the case of Italy, Brachinger (2008) for the case of Germany, and Fluch and Stix (2005) and Stix (2009) for the case of Austria. Aucremanne et al (2005) perform statistical testing on price data for all euro-area countries and find that, starting in 2002, the inflation perception significantly diverged from the measured inflation in all countries that introduced euro notes and coins into circulation. In contrast, inflation perception remained close to the measured inflation in countries that did not introduce the euro.

Jungermann et al (2007) investigate which factors influenced the perceived inflation during the euro changeover. They find that the perceived inflation was higher for goods that were purchased more frequently, for goods whose prices had risen as opposed to fallen, for food products as opposed to non-food product and services, and for cheap goods as opposed to expensive goods. Antonides (2006, 2008) investigates the prices of which types of consumer expenditures affected the perception of inflation during the euro changeover. He finds that perceptions of inflation are based on a highly selective list of consumption items and that this list can differ substantially from one country to the next. It is no surprise, then, that perceived inflation can be quite different from the inflation measured by a standard consumer price index that includes a much more comprehensive set of price components.

Deviation of perceived inflation from the measured one was found in other settings as well. Bates and Gabor (1986) found that respondents to a survey in the United Kingdom dramatically overestimated general grocery price inflation. Bryan and Venkatu (2001) presented survey evidence indicating that Ohio residents reported levels of perceived inflation systematically and significantly exceeding measured inflation. They also found that women perceived higher rates of inflation than men – an observation for which they cannot find a convincing explanation. A similar finding was reported for Sweden by Jonung (1986). He attributed the higher perception of inflation on the part of women to their more frequent shopping experiences during which they are confronted with changing prices.

Another interesting finding of Bryan and Venkatu (2001) is that people report different levels of inflation

based on how the survey question is phrased. When asked, "By about what percent do you think the *Consumer Price Index* went up (down), on average, during the last 12 months?" the respondents' answers are fairly accurate – 2.9 percent compared with an actual increase in the CPI of 2.7 percent. But when those same people are asked, "By about what percent do you think *prices* went up (down), on average, during the last 12 months?" they report an average perception of price increases of 6.7 percent, much higher than the actual increase in the CPI. It appears that when ordinary people (as distinct from economists) think about price increases, they have in mind something quite different from changes in the Consumer Price Index. Therefore, perceived price inflation may be a very different thing from the perceived change in the CPI.

A more recent study provides further supports for this idea. Van der Kaauw et al (2008) report that seemingly small differences in how a survey question about inflation is worded lead people to consider quite different price concepts when describing their inflation expectations. Questions about "prices in general" tend to elicit responses based on the most visible prices, such as gasoline and food. Questions about the "rate of inflation" tend to elicit responses closer to the concept of the overall inflation that economists have in mind. This is evidence not only of the fact that survey questions need to be worded carefully, but also that people may have differing concepts of prices and inflation when answering identical survey questions.

In seeking to explain the discrepancy between the inflation perception and the measured inflation, most studies refer to the prospect theory of Kahneman and Tversky (1979) and related research (Kahneman and Tversky, 1984; Tversky and Kahneman, 1973; and Tversky and Kahneman, 1991).

Ranyard et al (2008) summarize this approach. In their framework, judgments of inflation are affected by the availability of price changes – that is, how easily people can recall them. Several aspects affect this availability: immediacy of purchase, frequency of purchase, the magnitude of price change and its direction. Price changes of products purchased more recently or more frequently are more easily recalled. The same is true for large price changes. Also, price increases, being more uncomfortable than price decreases, tend to make a bigger impression.

This approach implies that people's perception of price changes is biased away from the actual trend in prices by a number of factors. People base their estimation of the past price changes on the prices they can recall. This means that recent purchases and more frequent purchases get a higher weight in the perceived inflation. Also, "purchases" that lack an explicit purchasing action (such as a mortgage or rent payment) have less influence on inflation perception.

In addition, loss aversion (also found by Kahemann and Tversy, 1979) implies that people tend to remember, and weigh, price increases (losses in utility) more heavily than price decreases (gains in utility). All these psychological biases lead to the perceived inflation being different (usually, higher) from the official inflation numbers, which are coldly computed from price changes weighted by expenditure shares. An informal description of how these biases play into the inflation we see is presented by Leaonardt (2008).

The presence of frequency bias, the idea that people tend to weigh prices of more frequently purchased items more heavily when forming their view of inflation, was formally tested by several researchers. Jungerman et al (2007) found frequency affected the perceived inflation in Europe during the euro changeover. Huber (2011), in an experimental setting, found that the frequency with which people observe prices affects inflation perception. In his experiment subjects reported higher overall inflation when prices of frequently-seen goods were rising faster. Georganas et al (2014) used an improved experimental set-up and found that consumers' perception of aggregate inflation is systematically biased towards the perceived inflation rates of the frequently-purchased products.

Creating a (numerical) measure of perceived inflation, however, is challenging as many of these psychological biases are difficult to account for with the available data. Some attempts have been made, nonetheless.

Brachinger (2008) created a price index for Germany that accounts for the loss aversion and the frequency bias. His Index of Perceived Inflation (IPI) is computed as a weighted average of price changes of individual products, similar to the way most consumer price indexes are computed. But unlike the standard consumer price index, which uses expenditure shares as weights, the IPI uses frequency of purchase to weigh individual components of the index. The IPI also assigns higher weight to price increases than to price decreases to account for the loss aversion.

Using detailed consumer purchase data for Germany, Brachinger (2008) finds that purchasing frequency weights used to construct the IPI hardly correlate with expenditure share weights used to construct all existing CPIs. Items that have high expenditure weights tend to be expensive things purchased rarely – apartments and travel, in the case of Germany. Items that have high purchasing frequency weights tend to be relatively inexpensive everyday goods – newspapers, cigarettes, beer, and bread in Brachinger's data for Germany. It is no wonder that the index of perceived inflation and the official consumer price index, as well as inflation computed from them, move quite differently over time. For the period studied by Brachinger, 1996-2005, this difference is not always one-sided. For most years the IPI shows higher inflation than the CPI, but for some periods the CPI inflation is higher.

Constructing the analogous index of perceived inflation for the United States would be an extremely labor-intensive exercise, as it would require collecting data on purchase frequencies for the hundreds of positions composing the CPI.

In addition to psychological biases, some features of the construction of the CPI itself may explain why people's perception of inflation deviates from the CPI numbers. Ashton (2012) lists two such major factors. First, the quality adjustments, which are performed within the CPI so that it reflects the cost of maintaining a constant standard of living, are usually ignored by consumers when forming their perception of inflation. Second, people have difficulty accounting for imputed costs, specifically in the owners' equivalent rent-of-residence component of the CPI.

Quality adjustments apply to almost all durable goods, which collectively account for about 9 percent of

all consumer expenditures. They apply to some nondurable goods as well. Owners' equivalent rent-of-residence accounts for about 24 percent of the consumer expenditure. Therefore, treatment in the CPI of components that account for at least a third of all consumer expenditures differs significantly from the way ordinary people think of these expenditures and prices.

Aston (2012) proposes a quantitative way to account for some of the biases in inflation perception, namely the misperception of quality adjustments, loss aversion, and the perception of volatility as inflation. (He acknowledges that other biases, including the frequency bias, are also important, but are difficult to account for numerically.) The measure of perceived inflation created after accounting for these biases is consistently higher than the inflation based on the reported CPI for the period 2000-2010. The difference is considerable, sometimes as much as two percentage points.

Our goal in creating the Everyday Price Index (EPI) was somewhat different from the goal behind these other alternative indexes. We did not seek to measure perceived inflation. Therefore, we did not set out to explicitly adjust for the various perception biases. Instead, we aimed to create a measure that would reflect people's everyday experience in their shopping for the ordinary goods we all buy on a regular basis. This is related to perceived inflation under a reasonable assumption that people form their perception of price changes based on their own purchasing experience.

But the EPI reflects not only the perception, but also the actual experience. The price changes that people face when shopping for everyday goods and services may be what they have in mind when asked about their view of inflation. Moreover, the trend of everyday prices covered by the EPI might be more relevant to planning a household budget than the CPI inflation rate.

3. Methodology

3.1 Creating the Everyday Price Index

The goal of the Everyday Price Index is to capture the price changes people experience when purchasing the goods and services they need on a regular basis. It is important to note that the EPI does not measure the same thing the CPI does.

The goal of the CPI is to measure the overall price level, which is a combination of prices of *all* goods and services purchased by consumers. The goal of the EPI is to measure the prices of only a subset of goods and services people buy, the subset that people view as more important. The more important prices are those that have the potential to significantly affect the household budget because they meet the following two criteria: (1) goods and services are purchased frequently, which we define as at least once a month, and (2) there is no way to contractually fix the price for a prolonged period of time.

Measuring the prices of this particular subset of goods and services is important for several reasons. Products that are purchased every month and whose future prices cannot be contractually fixed represent the expenses people have to incur at the prices prevailing on the date of each transaction. Changes in these prices are something that people have no choice but to absorb in their budgets. The

volatility of these prices represents the real pricing risk people have to deal with. Therefore, the trend and volatility of these prices represent a very real phenomenon that consumers have to plan for in their household budgets.

Thus, the EPI should not be interpreted as some sort of an improved inflation measure. The EPI is not a better measure of the overall inflation than the CPI is. Rather, it is a measure of something that is more relevant to the everyday planning of consumers than the overall inflation is.

3.2 The Mechanics – Constructing the Index

The EPI is constructed in a manner identical to that of the CPI. The difference lies in the set of goods and services, prices of which are included in the index. The subset of goods and services to be included in the EPI is chosen from the full list of expenditure categories covered by the CPI by selecting only those categories that meet both of the following two criteria:

(1) If a consumer buys the product or service at all, he/she would buy it on a regular basis, defined as at least once a month;

(2) There is no option to contractually fix the price of the product or service for a prolonged period of time (six months or more).

The weights in the EPI are identical to the weights used in the CPI, normalized to sum to 1. The weights in the CPI represent the share of total expenditure devoted to each product. The weights in the EPI represent the share of the everyday budget devoted to each product.

The weights in the EPI vary over time, exactly as they do in the CPI. The CPI weights are derived from the Consumer Expenditure Survey conducted by the BLS. When the data are collected, they represent average annual expenditures on each component of the CPI as a percent of total expenditure. The weights actually used every month in computing the CPI are the relative importance ratios, which represent an estimate of how consumers would distribute their expenditures as prices change over time. We use these same relative importance ratios to compute the EPI.

The monthly composite percentage change in the EPI in month t is computed as follows:

$$\%ChangeEPI_t = \sum \text{Weight}_{t-1,i} \text{ x} \left(\frac{Price\ Index_{t,i}}{Price\ Index_{t-1,i}} - 1 \right)$$

where

i denotes expenditure categories included in the EPI;

$Price\ Index_{t,i}$ is the value of the price index for expenditure category *i* in month *t*, as reported by the Consumer Price Index program at the BLS, *taken prior to seasonal adjustment*;

and $Weight_{t,i}$ is computed as follows:

$$\text{Weight}_{t,i} = \frac{Relative\ Importance_{t,i}}{\sum_i Relative\ Importance_{t,i}}$$

where $Relative\ Importance_{t,i}$ is taken from the Consumer Price Index program at the BLS for each expenditure category *i* included in the EPI.

It is important to note that the EPI is constructed from price index data for individual components that have not been seasonally adjusted. We also do not seasonally adjust the EPI once constructed. Since the goal of the EPI is to capture people's actual experience with prices in their day-to-day shopping, unadjusted data is the most appropriate.

Table 1 lists the expenditure categories included in the EPI and, as an example, the weights of each category in December 2014. (As explained above, the weights change from month to month.)

As is evident from the table, the EPI includes frequently purchased products and services – food, gasoline, utilities, etc. These products have to be purchased on a regular basis, thus requiring that people pay the price prevailing at the time of purchase.

The EPI excludes big-ticket items and durable goods purchased infrequently – appliances, cars, furniture and the like. Purchases of such products can be planned for or postponed, eliminating the unexpected shock an increase in price can deliver to household budgets.

The EPI also excludes the shelter costs (rent and owners' equivalent rent of residence), an important expenditure item for most households. The reason for excluding it is the ability to contractually fix these payments for a prolonged period of time. Even a dramatic change in home prices does not translate into an immediate jump in rents or mortgage payments the way, say, an increase in oil prices translates into higher gasoline prices at the pump. Other payments that can be contractually fixed, such as car insurance or tuition payments, are excluded as well.

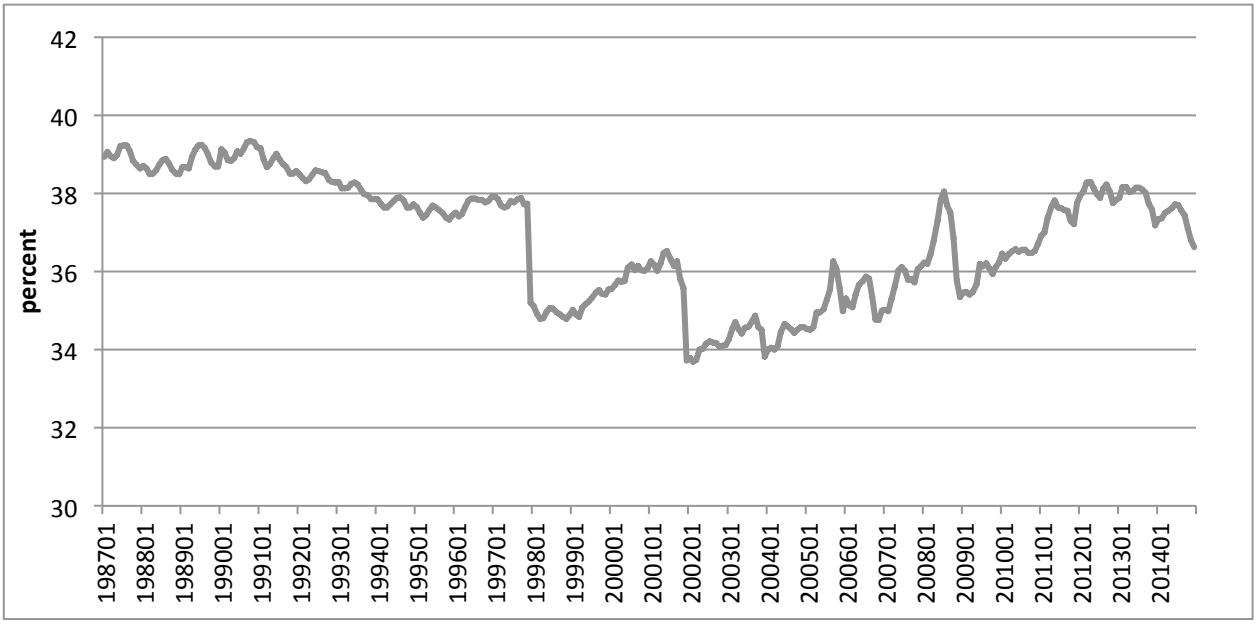
Taken together, products and services included in the EPI account for about 37 percent of total household expenditures, on average. This proportion varies over time as the spending patterns change (see Chart 1).

Table 1: Components of the EPI

Expenditure category	Dec 2014 weight	Expenditure category	Dec 2014 weight
EPI total	**100%**	**Recreation**	**9.10%**
Food and beverages	**41.71%**	Cable, satellite TV and radio service	4.01%
Food-at-home	23.02%	Video disks and other media, incl. rental of video and audio	0.25%
Food-away-from-home	15.92%	Audio disks, tapes and other media	0.12%
Alcoholic beverages	2.77%	Admissions (to movies, theaters, concerts, sporting events)	1.75%

Household utilities, supplies, and services	**18.24%**	Fees for recreational lessons and instructions	0.58%
Household fuels and utilities	14.40%	Recreational reading materials (newspapers, magazines, books)	0.60%
Housekeeping supplies	2.31%	Pets and pet products	1.80%
Domestic services	0.76%	**Communication**	**9.06%**
Gardening, lawn care services	0.76%	Postage and delivery services	0.39%
Motor fuel and transportation	**12.10%**	Telephone services	6.72%
Motor fuel	11.44%	Internet services and electronic information providers	1.94%
Intra-city public transportation	0.66%	**Tobacco and smoking products**	**1.96%**
Medical care	**4.63%**	**Personal-care products and services**	**3.72%**
Prescription drugs	3.67%	Personal-care products	1.98%
Nonprescription drugs and vitamins	0.96%	Personal-care services	1.74%

Chart 1: Cumulative Weight of EPI Components in Total Consumer Expenditures



Note: Sharp jumps occur when new weights are introduced in the CPI following a new edition of the Consumer Expenditure Survey. Several new expenditure categories were introduced into the CPI in 1997. Until 2000, the interval between updates was five years. Since then, the interval has become two years.

4. Results

4.1 Presenting the Everyday Price Index

This section presents the Everyday Price Index and compares it with the widely known Consumer Price Index for All Urban Consumers (CPI-U). In all comparisons we use the CPI-U without seasonal adjustment, to make it comparable to the EPI, which does not undergo seasonal adjustment.
The EPI is constructed for January 1987 onward. There was a major change in the CPI methodology around 1987, which significantly altered the definition and breakdown of the expenditure categories

that make up the CPI. Finding comparable categories of expenditures that preceded 1987 was impossible for many components of the EPI.

Chart 2 shows the evolution of the CPI and the EPI for Jan 1987-Dec 2014. Chart 3 shows the corresponding inflation rates, computed as a percent change from 12 months ago.

Chart 2: The CPI and the EPI over the Long Term

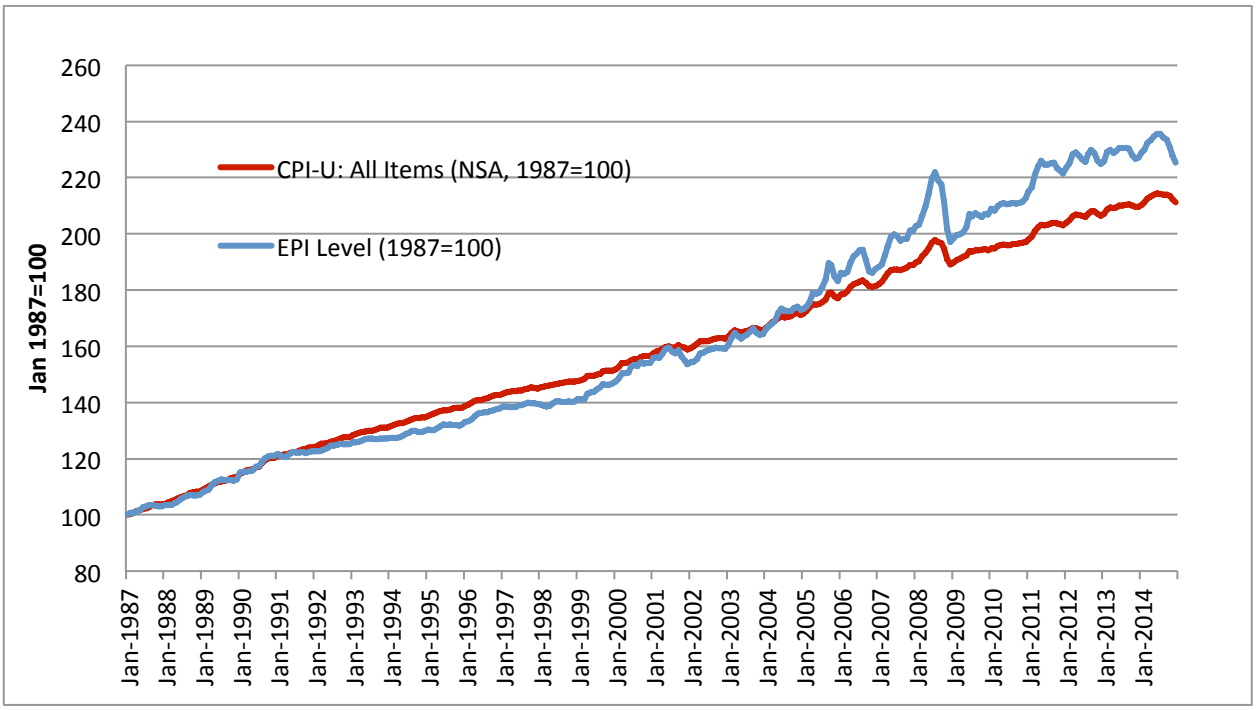
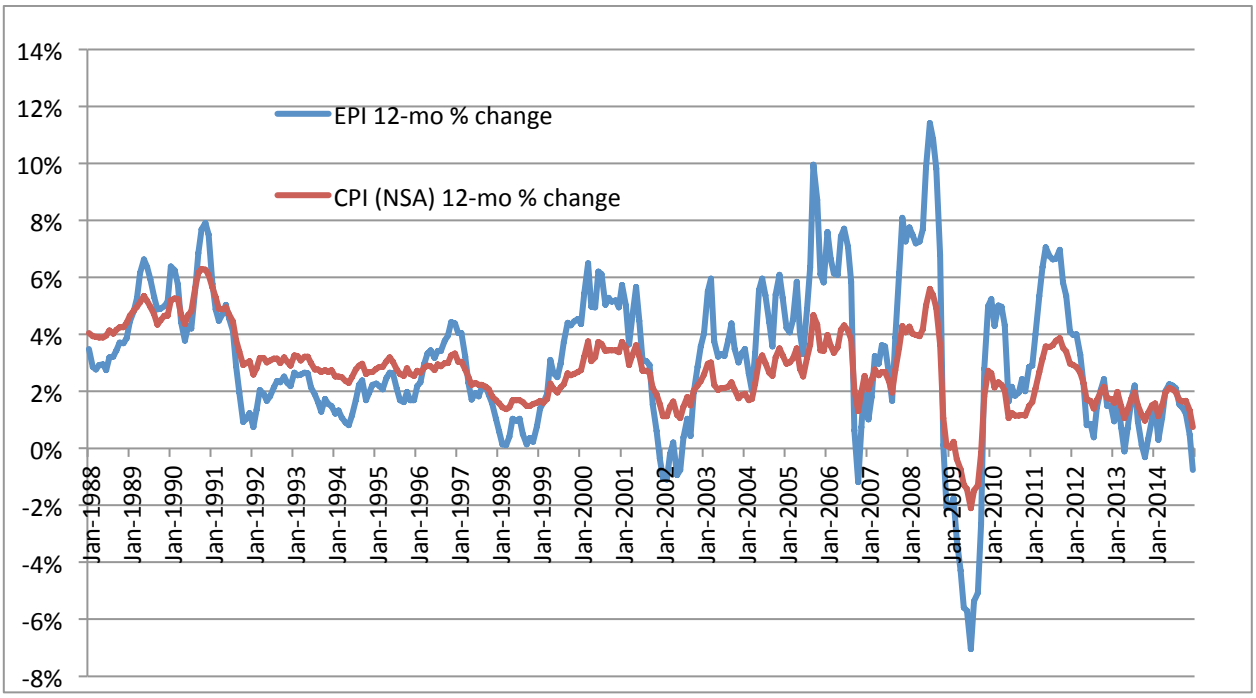


Chart 2 suggests that the EPI and the CPI moved closely together until sometime in the early 2000s, after which their trends diverged. The trend in the CPI became flatter than the trend in the EPI, resulting in substantial cumulative difference between the two indexes by 2014. For convenience, we assume the breakpoint occurred in January 2001; varying this date by a couple of years in either direction does not substantially change the results that follow.

From January 1987 to December 2000, both the EPI and the CPI increased about 55 percent (to be exact, the EPI rose 54 percent and the CPI rose 56.5 percent). But since January 2001, the CPI rose 35 percent while the EPI rose 46 percent. By December 2014, the EPI level was 6.7 percent above the CPI level.

Chart 3: Inflation – Overall CPI vs. Everyday Prices



The divergence between the CPI and the EPI means that EPI inflation was, on average, higher than CPI inflation after 2001, but the two inflation rates were similar prior to 2001. This break is not easy to see on Chart 3, but it is confirmed by statistical testing (see Table 2).

Table 2: EPI Inflation vs. CPI Inflation

		CPI 12-mo % change	EPI 12-mo % change
Entire period: Jan 1988-Dec 2014	mean	2.765	3.114*
	st dev	1.308	2.629*
Sub-period 1: Jan 1988-Dec 2000	mean	3.256	3.109
	st dev	1.129	1.773*
Sub-period 2: Jan 2001-Dec 2014	mean	2.308 ^	3.118*
	st dev	1.301 ^	3.232*^

* different from the same measure for CPI at 5% significance level

^ different from the same measure in Period 1 at 5% significance level

As shown in Table 2, for the entire period (Jan. 1988-Dec. 2014), the average EPI inflation was higher than the average CPI inflation. It was also more volatile. But the difference in inflation rate disappears if we look only at the early sub-period, Jan. 1988-Dec. 2000. EPI inflation remains more volatile than CPI inflation even in this period. The difference between the EPI inflation and the CPI inflation gets larger in the later sub-period (Jan. 2001-Dec. 2014), and the EPI inflation remains more volatile than the CPI inflation.

The average EPI inflation is the same, about 3.1 percent per year, in the early and the later sub-periods. But this is not the case with the CPI inflation. In the later sub-period the CPI inflation, at 2.3 percent, appears to be lower than in the earlier one, when it averaged 3.3 percent. Both the EPI inflation and the CPI inflation are more volatile in the later period than in the earlier one.

To summarize, the data suggest that everyday prices have always been more volatile than the general price level. This is not surprising, since the more volatile components of consumer prices (food, gasoline, household fuels) carry higher weight in the EPI than they do in the CPI.

The more interesting finding is that the trend in everyday prices (EPI) was essentially identical to the trend in the overall price level (CPI) until about 2001. It is only after January 2001 that the inflation in everyday prices started to differ significantly from the overall inflation.

If inflation perception is linked to everyday purchasing experiences, the above finding suggests that perceived inflation did not differ much from the official CPI inflation until about 2001. It did not matter that people, in their mental calculation of inflation, used a different set of prices than did the BLS in computing the CPI. The result was broadly similar until 2001. Only after 2001 did perception and reality depart from each other. The prices that people observed in their daily lives started to behave differently from the overall price level.

The above discussion can be summarized in the following findings about the EPI and the CPI:

(1) EPI inflation is more volatile than CPI inflation during the entire period.
(2) In Jan. 1988-Dec. 2000, the average level of EPI inflation and CPI inflation was the same.
(3) After January 2001, CPI inflation became noticeably slower than it was before, while EPI inflation remained unchanged; as a result, post-January 2001 the EPI inflation, on average, exceeds the CPI inflation.
(4) Both the EPI inflation and the CPI inflation became more volatile after January 2001 than they were before.

A later section discusses the possible explanations of these findings.

4.2 Sensitivity of the EPI to the Selection of its Components

The components of the CPI to be included in the EPI were selected based on our judgment of the frequency with which these products are purchased by an average consumer. Those products that we judged to be purchased at least once a month were included in the EPI.

However, our judgment may be disputed for some categories of products. Most people would not dispute that people buy food or gasoline every month. But other expenditure categories are less clear-cut. For example, tobacco products are not purchased by some people at all. Similarly, admission to movie theaters and sporting events may not be something that people pay every month. These are examples of categories that are included in the EPI. On the flip side, it may be argued that apparel is purchased often enough to warrant its inclusion in the EPI. These categories are currently excluded from

the EPI.

To check whether our decisions about what to include into the EPI significantly affected the resulting index, we consider several alternative formulations. In each version, one of the components has been removed or added to address various potential objections. Table 3 compares all alternative versions of the EPI to the original EPI.

Table 3: Exclusion of Certain EPI Components Does Not Affect the Trend or Volatility of EPI Inflation

	Entire period: Jan. 1988 – Dec. 2000		**Period 1: Jan. 1988-Dec. 2000**		**Period 2: Jan. 2001-Dec. 2014**		
12-mo. % change in:	**mean**	**st dev**	**mean**	**st dev**	**mean**	**st dev**	***Reason for excluding***
	percentage points		percentage points		percentage points		
EPI original	**3.114**	**2.629**	**3.109**	**1.773**	**3.118**	**3.232**	
EPI excl. tobacco	2.981	2.709	2.916	1.771	3.042	3.358	*may not purchase every month*
EPI excl. alcoholic beverages	3.123	2.701	3.097	1.810	3.147	3.328	*may not purchase every month*
EPI excl. domestic services	3.124	2.646	3.124	1.784	3.123	3.254	*may not purchase every month*
EPI excl. gardening services	3.114	2.641	3.108	1.772	3.121	3.252	*may not purchase every month*
EPI excl. domestic and gardening services	3.124	2.658	3.123	1.783	3.125	3.274	*may not purchase every month*
EPI excl. nonprescription drugs	3.118	2.630	3.109	1.773	3.126	3.235	*may not purchase every month*
EPI excl. cable and satellite television and radio service	3.093	2.702	3.065	1.791	3.118	3.337	*price may be contractually fixed*
EPI excl. admissions to movies, sporting events, etc.	3.100	2.670	3.076	1.785	3.123	3.391	*may not purchase every month*
EPI excl. video disks, rental, and other media	3.128	2.638	3.117	1.775	3.137	3.245	*may not purchase every month*
EPI excl. audio disks, tapes and other media	3.120	2.634	3.111	1.775	3.128	3.239	*may not purchase every month*
EPI excl. fees for lessons or instructions (recreational)	3.110	2.645	3.099	1.783	3.120	3.253	*may not purchase every month*
EPI add apparel	2.832	2.396*	2.883	1.646	2.784	2.929	

* different from the *EPI original* at 5% significance level.

All variations of the EPI are statistically indistinguishable from the original EPI series. The only modification that shows any statistical difference at all is the addition of apparel to the EPI. And even then, it only affects the volatility in one of the sub-periods. None of the modifications of the EPI affect the mean of inflation enough to make it statistically different from the original EPI. Making a different judgment about inclusion in the EPI for those series where the decision was not clear-cut would not significantly alter the trend or the volatility of the EPI inflation.

5. Analysis: EPI Inflation vs. CPI Inflation

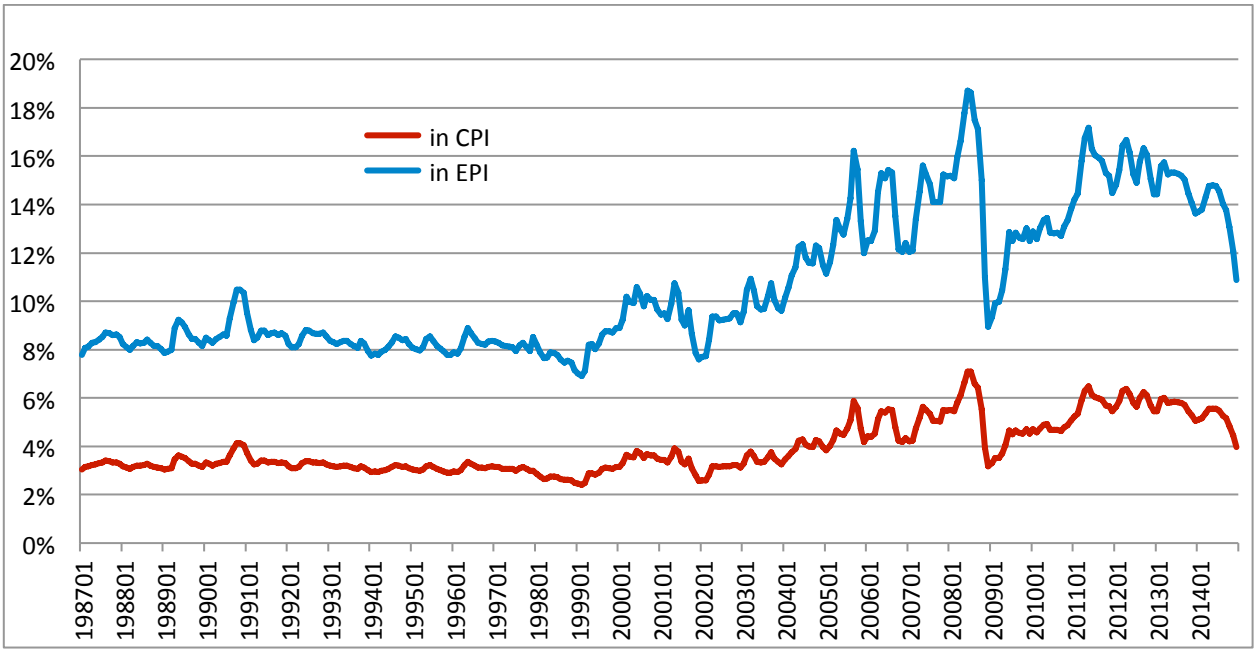
In this section we explore the causes behind the four findings about the EPI and the CPI listed in the previous section. We also explore the link between the EPI and expectations of inflation.

5.1 Higher Volatility of EPI Inflation compared with CPI Inflation

The higher volatility of the EPI, compared with that of the CPI, is easy to explain—the more volatile consumer prices (food, motor fuel, household fuels) receive higher weight in the EPI. These components are included both in the CPI and in the EPI, but because the EPI contains fewer components overall, the weight of the more volatile ones is higher.

Motor fuels is the most volatile component of either the EPI or the CPI. On average, over the entire period of 1988-2014, motor fuel's weight in the EPI, a bit above 10 percent, was about 2.5 times higher than its weight in the CPI, at a little under 4 percent. In 2014, motor fuel accounted for about 13.7 percent of everyday expenditures and only 5.3 percent of the total consumer expenditures. See Chart 4 for a full history of the weight of motor fuel in consumer expenditures.

Chart 4: The Weight of the *Motor Fuel* Component: EPI vs CPI.



The volatility of gasoline prices, especially in recent years, has been so high that it has overtaken all other price fluctuations. The EPI very noticeably moves with the gasoline price, possibly giving rise to a criticism that the EPI is essentially a gasoline price index, with a few things added in. This extreme sensitivity of the EPI to the gasoline price is not a shortcoming of the index. Recall that the components of the EPI receive their weights from the Consumer Expenditure Survey, the same way components of the CPI do. The apparent "overweighting" of the gasoline price in the EPI simply reflects the fact that gasoline accounts for a substantial portion of people's everyday budgets. This is also the reason why gasoline price increases receive much public attention in United States.

5.2 The Divergence of EPI and CPI after 2001

The data suggest that the divergence of the EPI and the CPI after 2001 came about because CPI inflation slowed down, not because EPI inflation sped up. Two forces likely contributed to the slowdown of overall inflation without slowing down the rise of everyday prices.

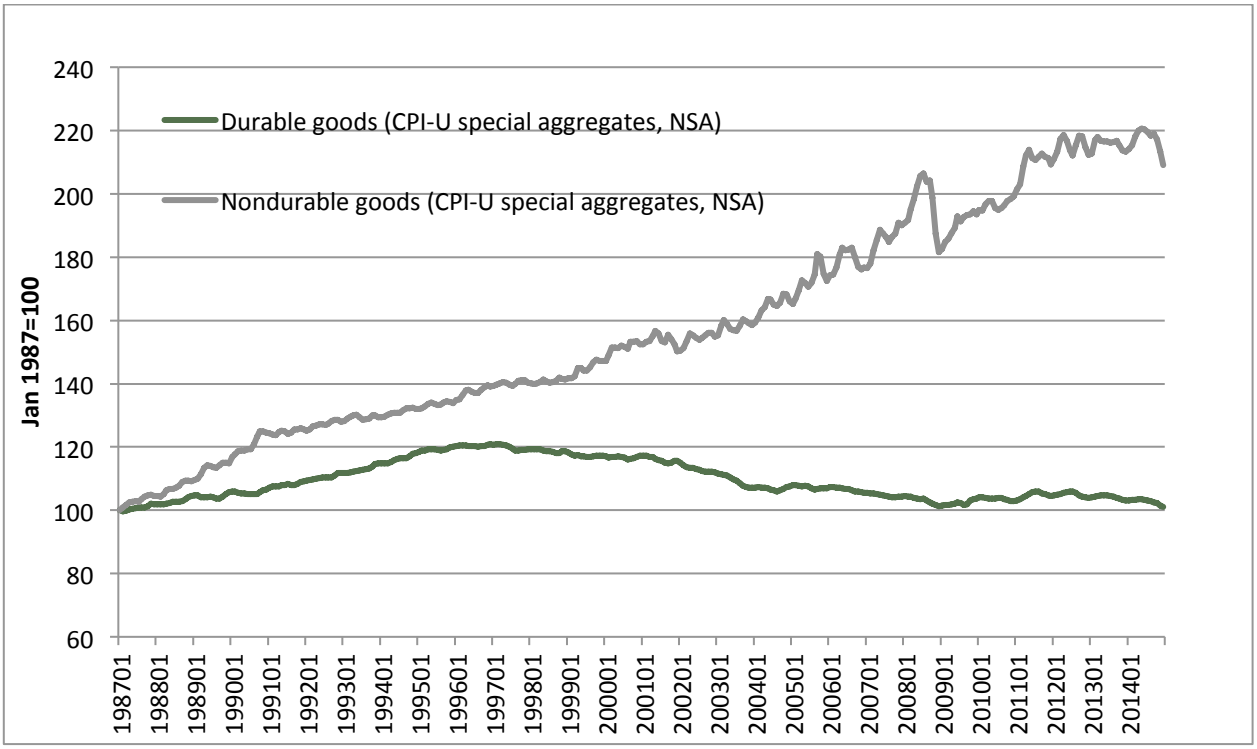
5.2.1 Quality Adjustment

The quality of many products, especially of the high-tech variety, has changed significantly over time. When a new computer is twice as powerful as last year's model but it sells for the same price, there has been a decrease in the price per unit of computing power. When the BLS constructs the price index for the computers category, it takes such quality improvements into account, which results in a slowdown or an outright decrease in the recorded prices within the CPI.

The influence of quality adjustments on the EPI is much smaller than on the CPI because most of the products included in it do not undergo quality adjustment. The quality of items such as food, gasoline, or toothpaste does not change much over time. A few series, such as cable TV services and telephone services, can potentially have quality adjustment applied to them. Such components account for less than 20 percent of the EPI.

The price-slowing effect of quality adjustments is much smaller for the EPI because it applies mostly to durable goods, which are excluded from the EPI. An illustration of the effect of quality adjustments can be seen in Chart 5, which compares price trends of durable goods, many of which undergo quality adjustments, and nondurable goods, few of which undergo quality adjustments.

Chart 5: Durable goods vs. nondurable goods – divergent price trends (NSA, Jan 1987=100)



Early on, prices of both durable and nondurable goods are rising. Prices of nondurable goods are rising faster, but nonetheless, both lines have an upward slope. Starting around 1997, prices of durable goods stagnate and later on start to decline. Prices of nondurable goods keep rising unabated.

Durable goods, as a group, account for about one-tenth of the CPI but they are completely excluded from the EPI. Thus, the decline in (quality-adjusted) durable goods prices slows the growth of the CPI but has no effect on the EPI. As the trends in durable and nondurable prices departed further from each other over time, the trends in the EPI and the CPI also diverged.

5.2.2 Increased import competition

The removal of international trade restrictions over time might have contributed to lower prices (or slower price increases) for certain categories of goods. Several free trade agreements have come into effect since late 1990s.

For example, the North American Free Trade Agreement (NAFTA) came into effect in 1994 and resulted in an increased inflow of goods from Mexico. In addition, between 1995 and 2004 the system of import quotas for textiles and apparel that existed for decades was phased out, resulting in much higher imports of these goods from Asia. All of this put a downward pressure on prices. This downward pressure is felt more keenly in the CPI than the EPI because many of the goods whose prices are affected by import competition (durables, apparels, home furnishings, etc.) are excluded from the EPI.

In the non-food, non-energy portion of the EPI, goods (as distinct from services) constitute about 15 percent. And all of them are nondurable goods, such as housekeeping supplies, prescription drugs, and personal-care products. In the non-food, non-energy portion of the CPI, the weight of goods is much higher – around 25 percent. This is a mix of durable and non-durable goods.

To the extent that freer trade and increased competition from imports restrained price growth for goods (but not for services, since those are harder to import), the effect was larger for the CPI than the EPI. Thus, the growth of the CPI slowed, while the growth of the EPI remained essentially unchanged.

5.3 Increased volatility of inflation after 2001, for both the EPI and the CPI

Table 2 shows that the volatility of inflation has increased after 2001 – for both EPI inflation and the CPI inflation. Conventional wisdom would suggest that food and energy prices have gotten more volatile in recent decades, producing higher volatility of inflation. We test this hypothesis by comparing the standard deviation of inflation for the following components of the EPI and the CPI:

- Food;
- Motor fuel;
- Household fuels and utilities;
- All energy commodities.

Food prices are included in both the EPI (with the weight of about 41 percent) and the CPI (with the weight of about 14 percent). If there was a substantial increase in the volatility of food inflation after 2001, it would significantly contribute to the increase in overall volatility of the EPI and the CPI.

Motor fuel and household fuels and utilities are the two components of the EPI related to energy costs. Their combined weight in the EPI is about 27 percent. If there was an increase in the volatility of gasoline price and energy costs after 2001, it would translate into higher volatility of the EPI.

The CPI includes more components related to energy costs, in addition to motor fuel and fuels and utilities. All of the energy commodities together account for about 5.5 percent of the CPI. Thus, increased volatility of the energy commodity prices would translate into a much smaller but still noticeable increase in the volatility of the overall CPI.

It remains to establish whether the volatility of food prices and energy prices increased since 2001. Table 4 gives the answer.

Table 4: Selected components of consumer prices pre- and post-2001

12-mo % change in ->		Food	Motor fuel	Fuels and utilities (household)	All energy commodities
Entire period:	mean	2.87	6.29	3.19	6.33

Jan 1988-Dec 2014	st dev	1.46	16.98	4.58	16.83
Sub Period1: Jan 1988-Dec 2000	mean	3.07	4.45	2.29	4.46
	st dev	1.48	12.56	2.30	12.59
Sub Period2: Jan 2001-Dec 2014	mean	**2.68**	**8.01**	**4.04**	**8.06**
	st dev	1.43	**20.13**	**5.84**	**19.86**

* Different from sub-period 1; difference statically significant at 5% level or better.

It appears that there had been no increase in the volatility of food prices after 2001. Moreover, the average food-price inflation slowed in the post-2001 period. Increased volatility of the EPI and the CPI after 2001 could not have come from food prices.

But there has been a significant increase in the volatility of prices of energy commodities in general and motor fuel and fuels and utilities in particular. In addition, prices of these energy-related products rose, on average, faster in the post-2001 period. Rising volatility of motor fuel prices and other energy-related costs appears to be the reason for the higher volatility of the EPI and the CPI after January 2001.

5.4 Everyday prices and inflation expectations

If everyday prices influence people's view of past and current inflation trends, it is likely that they also affect the expectations of future inflation. This effect would depend on the price concept people have in mind when responding to surveys seeking to measure expected inflation.

If the survey question specifically asks the respondents to forecast future changes in the Consumer Price Index, as does the *Survey of Professional Forecasters* conducted by the Federal Reserve Bank of Philadelphia, then one would expect past CPI values to have a stronger connection to the answers than past EPI values. On the other hand, if a survey asks the general public about changes in "prices in general," as is the case for the *Survey of Consumers* from the University of Michigan and the *Consumer Confidence Survey* by The Conference Board, then there is a chance that respondents may have a price concept in mind different from the CPI. In such cases, everyday prices may have a stronger influence on the survey responses, if everyday prices reflect the concept respondents implicitly use in answering the survey questions.

Therefore, our hypothesis is that the EPI, if it closely reflects the price concept the general public has in mind, would have a better predictive power that the CPI in explaining the expected inflation measures derived from surveys of the general public. But the CPI should have a better predictive power than the EPI in explaining measures of expected inflation derived from the *Survey of Professional Forecasters*, which asks respondents specifically to forecast future changes in the CPI. The predictive power of the CPI and EPI would differ most visibly during the period when the EPI and the CPI diverge significantly from each other (i.e., after 2001).

To test this hypothesis we use the measures of expected inflation derived from two surveys of the general public and one survey of professional forecasters. The full description of the data is given in Appendix 2. The hypothesis is that expectations of inflation are influenced by the observed past trends

in prices. We use Granger causality tests to determine changes in which prices—those reflected in the CPI or the EPI—have higher power in predicting expected inflation.

Two types of CPI and EPI measures are used – the percent change from a year ago (12 months for monthly data and four quarters for quarterly data) and the percent change from the most recent period (one month for monthly data and one quarter for quarterly data). The former measure assumes that people have a fairly long memory -- the past 12 months -- in formulating their view of inflation. The latter measure assumes that in forming their inflation expectations, people assign most weight to the price change observed more recently. In all cases, EPI and CPI data are not seasonally adjusted. The results are presented in Table 5.

Table 5: Predictive power from Granger causality tests

Full sample period: Jan. 1988-Dec. 2014

Measures of expected inflation	Variable with higher predictive power in Granger causality tests	
	CPI-12 vs EPI-12	*CPI-1 vs EPI-1*
Michigan Mean	CPI	EPI
Michigan Median	EPI	EPI
ConfBoard	EPI	EPI
ProfForecast	No Granger causality found	CPI

Note: Granger causality tests performed using six lags in monthly data and two lags in quarterly data. Full description of data and variables is given in Appendix 2. Full results for all tests presented in Appendix 3.

Our hypothesis is that the CPI should have higher predictive power in explaining the expected inflation measured by the Professional Forecasters Survey, but the EPI should have higher predictive power for other measures of expected inflation.

The results show that in general, for the entire sample period, Granger causality tests suggest similar predictive power for the EPI and the CPI in most cases. (Full results, including significance levels, are presented in Appendix 3.) As expected, the CPI does a better job than the EPI in predicting inflation expectations derived from the Survey of Professional Forecasters. The EPI does a better job predicting expected inflation measured by The Conference Board's survey and by the median survey response to the Michigan survey, in line with our hypothesis. But the CPI does a better job predicting the mean of the expected inflation derived from the Michigan Survey, contrary to our hypothesis.

Since the EPI and the CPI have similar trends for about half of the sample period (up to 2001), it is no surprise that they have similar predictive power in Granger causality tests. The predictive power of the CPI is more likely to differ from that of the EPI during the sub-period after January 2001, when the two series significantly diverge from each other.

To test this, we perform the same set of Granger causality tests for two different sub-samples – the early period of Jan. 1988-Dec. 2000 and the later period of Jan. 2001-Dec. 2014. We expect that in the

early period, the CPI and the EPI would have very similar predictive power in explaining expected inflation. In the later period, the EPI should have a higher power in predicting the expected inflation measured by the Michigan survey and The Conference Board's survey, but the CPI should be better at predicting expected inflation reported by the Professional Forecasters Survey. The results are presented in Table 6 (fuller details presented in Appendix 3).

Table 6: Granger causality tests for sub-samples

Early period: Jan. 1988-Dec. 2000

Measures of expected Inflation one year ahead	Variable with higher predictive power in Granger causality tests	
	CPI-12 vs EPI-12	CPI-1 vs EPI-1
Michigan Mean	No Granger causality found	CPI
Michigan Median	CPI	EPI
ConfBoard	CPI	CPI
ProfForecast	No Granger causality found	CPI

Note: Granger causality tests performed using six lags in monthly data and four lags in quarterly data. Full results for all tests presented in Appendix 3.

Later period: Jan. 2001-Dec. 2014

Measures of expected Inflation one year ahead	Variable with higher predictive power in Granger causality tests	
	CPI-12 vs EPI-12	CPI-1 vs EPI-1
Michigan Mean	No Granger causality found	EPI
Michigan Median	EPI	EPI
ConfBoard	No Granger causality found	EPI
ProfForecast	No Granger causality found	CPI

Note: Granger causality tests performed using six lags in monthly data and two lags in quarterly data. Full results for all tests presented in Appendix 3.

In the early period (Jan. 1988-Dec. 2000), the CPI mostly outperforms the EPI in terms of its power to predict expected inflation. But in the later period (Jan. 2001-Dec. 2014), when the CPI and the EPI diverge significantly, the picture is different. Whenever Granger causality is found, the EPI does a better job of predicting expected inflation based on the surveys of the general public. The CPI does a better job of predicting expected inflation reported by professional forecasters.

These results are in line with our hypothesis. The professional forecasters are asked specifically to forecast future CPI inflation, and thus we expect that the past value of CPI inflation would be a better predictor of their response than the past values of EPI-based inflation.

But the general public is asked to give their prediction about future changes in "prices in general." Which price concept people have in mind when answering this question is not immediately clear. Some may be thinking of a measure similar to the CPI, but others may have a different concept in mind. As we

have argued above, everyday prices may be closer to the concept of "prices in general" than the CPI is. If most respondents think of everyday prices when giving their prediction of future inflation, the EPI should have better power in predicting the expected inflation than the CPI does. This is what we find in the period after 2001.

Overall, our results suggest that everyday prices as measured by the EPI can do a better job than the CPI in predicting inflation expectations of the general public. Since inflation expectations are difficult to measure, having an index that can be helpful in predicting them is valuable.

6. Implications: Why we need the EPI in addition to the CPI

The EPI is constructed to reflect people's everyday experience with price changes. The everyday shopping experience might give people an impression of inflation different from that measured by the CPI. This is due to frequency bias, a tendency of people to pay more attention to the changes in prices they see often, as opposed to prices they see only rarely. If EPI inflation differs from CPI inflation, as it does after January 2001, it might result in people's perception of inflation being higher than the overall inflation.

The perception of inflation matters for the way people form expectations of future inflation. And expectations matter for the decisions and plans that people make for the future. People tend to act based on their expectation, whether or not those expectations accurately reflect the reality (Armantier et al 2011).

The EPI shows that, as far as price changes are concerned, the everyday experience of people might differ quite a bit from what the official CPI would suggest. We should not dismiss the claims that "personal inflation" differs from the CPI numbers. Such a difference is not an illusion, but rather it is based on a very real divergence in the behavior of everyday prices and the overall CPI.

The EPI is not a measure of the overall inflation. But it is a measure of something that may be of more interest to the general public than the overall inflation is. The EPI measures the pricing risk inherent in purchases that cannot be easily postponed or forgone. People have to incur these expenses on a regular basis and cannot contractually pre-set future prices of these products. For consumers, it is important to know what happens to prices of these products – for budgeting purposes, for personal financial decisions, etc.

Until the early 2000s, the CPI was a good enough guide to the price trends for everyday goods. The EPI and the CPI moved closely together, and there would have been no need to create a special price index to reflect a trend in the everyday prices. The CPI did a good enough job reflecting them.

But later the trend in everyday prices diverged from the CPI trend. Today, if people need, for their planning or budgeting purposes, to know the trends in everyday prices, the CPI is no longer an appropriate guide. The EPI is important today, when the everyday prices do not move the same way that

the overall price level does.

For some people, the EPI would be a more relevant measure of price changes than the CPI. Essentially, the change in the EPI represents the "personal inflation" of a person who (1) has his shelter costs pre-set (for example, owns a house that is fully paid off, or has a long-term housing arrangement with costs contractually fixed, such as retirement housing); and (2) has no need to buy appliances, cars, or other durables. For such a person, the only price uncertainty comes from buying the everyday goods – food, gasoline, utilities, newspapers, toothpaste, and the like. In this case, the EPI is a much more relevant index than the CPI.

People who fit this description are not that rare. For example, a retired person who owns his or her home and car outright fits this description quite well. Such a person already has a house with all appliances and other durables goods included, and thus has no need to buy them. He or she is likely to own a wardrobe, so that a new apparel purchase is not required very often. The set of products included in the EPI probably reflects the goods and services this person buys fairly well.

For such a person, the EPI reflects the pressure of rising prices on his or her budget much better than does the CPI. And if this hypothetical retired person is living on a fixed income (such as Social Security benefits) what matters for the real purchasing power of his or her income is the trend in the EPI, not the trend in the CPI.

The fact that the trends in the EPI and the CPI diverged after 2001 implies that the CPI no longer reflects the erosion of purchasing power that people on fixed incomes feel in their everyday budgets. On top of that, the fact that the EPI has become more volatile since 2001 implies that for those people who attempt to cover their everyday expenses with a fixed income, the task has gotten harder. When the income remains fixed but the prices of products this income has to cover become more volatile, budgeting for one's needs becomes more complicated.

7. Conclusion

The Everyday Price Index as constructed here reflects the trend in prices of goods that people purchase frequently. The trend of these everyday prices has diverged from the trend of the more comprehensive Consumer Price Index since the early 2000s. The trend of CPI inflation has slowed since 2001, from about a 3.3 percent annual rate to about 2.3 percent. But the trend in EPI inflation has remained unchanged at 3.1 percent. In addition, both EPI inflation and CPI inflation became more volatile after 2001, mostly due to the increased volatility of the fuel and energy-related prices.

This resulted in a divergence of the EPI from the CPI after 2001, which may explain why people's perception of inflation differs from the measured change in the CPI. If the trend in everyday prices were identical to the trend in the CPI, creating a separate Everyday Price Index would be a waste of resources. However, since the two trends started diverging in the early 2000s, it is now important to have a separate index that focuses on the everyday prices that are of more interest to the public than the

general Consumer Price Index is.

The EPI is not an alternative measure of the overall inflation. Instead, the EPI attempts to reflect the price changes that people face in their everyday experience, which may be far more relevant to their decisions than the more abstract CPI. There is evidence, as presented by Bryan and Venkatu (2001), that when asked about "price changes," what people have in mind may be quite different from the CPI.

If the EPI indeed captures the prices people pay attention to most, then it should inform inflation expectations more than the CPI does. We find that the EPI has better predictive power than the CPI for the inflation expectations derived from surveys of the general public. When expectations are derived from the survey of professional forecasters, who explicitly aim to forecast the CPI, the EPI no longer has better predictive power.

Even though our analysis has shown that various reasonable modifications of the EPI, created by altering the expenditure categories included in it, do not significantly affect its trend or volatility, it may be useful to track one particular modification of the index. Apparel, currently excluded from the EPI, accounts for about 4 percent of the overall consumer expenditures. And it is purchased frequently enough that it might be judged by some to be an everyday good. Inclusion of the apparel into the EPI does not make a statistically significant difference to its trend (as shown in table 3), but it makes a bigger difference than any other EPI modification tested. It is possible that, as the new data arrive in the future, the difference will become statistically significant. Therefore, it may be useful to track both the EPI as currently constructed and the EPI with apparel category added.

Currently, the EPI series starts in 1987 because a substantial change in the composition of the CPI's expenditure categories occurred at that time. It might be tempting to attempt to extend the index further into the past by finding, for each component of the EPI, a substantially similar expenditure category from the earlier version of the CPI. However, the usefulness of such an attempt is limited. The data show that the EPI and CPI moved closely together until the early 2000s. They likely moved closely together prior to 1987 as well. Therefore, not much new information would be gained by the efforts expended on building the EPI for the period prior to 1987.

References

Allcott, Hunt. 2011. "Consumers' Perceptions and Misperceptions of Energy Costs." *American Economic Review* 101(3): 98–104.

Antonides, Gerrit. 2008. "How Is Perceived Inflation Related to Actual Price Changes in the European Union?" *Journal of Economic Psychology* 29(4): 417–32.

Antonides, Gerrit, Wim Heijman, and Marleen Schouten. 2006. "Perceived Inflation and Actual Price Changes in the Netherlands." In *Heterodox Views on Economics and the Economy of the Global Society,* edited by G. Meijer, W. J. M. Heijman, J. A. C. van Ophem and B. H. J. Verstegen, 155-167. The Netherlands: Wageningen Academic Publishers.

Armantier, Olivier, Wändi Bruine de Bruin, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar. 2011. *Inflation Expectations and Behavior: Do Survey Respondents Act on Their Beliefs?* (Staff Report No. 509). Federal Reserve Bank of New York. http://www.fednewyork.org/research/conference/2010/consumer/Armantier_Experiment.pdf

Ashton, Michael J. 2012. "'Real-Feel' Inflation: Quantitative Estimation of Inflation Perceptions." *Business Economics* 47(1): 14–26.

Aucremanne, Luc and Marianne Collin. 2005. "Is there a discrepancy between measured and perceived inflation in the euro area since the euro cash changeover?" OECD Seminar, Paris. June2005.

Bates, John M., and André Gabor. 1986. "Price Perception in Creeping Inflation: Report on an Enquiry." *Journal of Economic Psychology* 7(3): 291–314.

Brachinger, Hans Wolfgang. 2008. "A New Index of Perceived Inflation: Assumptions, Method, and Application to Germany." *Journal of Economic Psychology* 29(4): 433–57.

Bruine de Bruin, Wändi, Wilbert Van der Klaauw, and Giorgio Topa. 2011. "Expectations of Inflation: The Biasing Effect of Thoughts about Specific Prices." *Journal of Economic Psychology* 32(5): 834–45.

Bryan, Michael F., and Guhan Venkatu. 2001a. "The Curiously Different Inflation Perspectives of Men and Women." *Economic Commentary*, Federal Reserve Bank of Cleveland, February 2001.

———. 2001b. "The Demographics of Inflation Opinion Surveys." *Economic Commentary*, Federal Reserve Bank of Cleveland, October 2001.

Cooke, Kristina. 2011. "iPad Price Remark Gets Fed's Dudley an Earful." *Reuters*. March 11. http://www.reuters.com/article/2011/03/11/us-usa-fed-dudley-ipad-idUSTRE72A4AC20110311

Del Giovane, Paolo, and Roberto Sabbatini. 2005. "The Introduction of the Euro and the Divergence between Officially Measured and Perceived Inflation: The Case of Italy." In *L'euro E L'inflazione. Percezioni, Fatti E Analisi*, edited by Paolo del Giovane, Francesco Lippi, and Roberto Sabbatini. Italy: Il Mulino.

Del Missier, Fabio, Rob Ranyard, and Davide Pietroni. 2008. "Fruitful Interactions between Psychology and Behavioral Economics: The Case of Perceived Inflation." *Sistemi Intelligenti*, 1/2008: 39-56.

Fluch, Manfred, and Helmut Stix. 2005. "Perceived Inflation in Austria – Extent, Explanations, Effects." *Monetary Policy & the Economy*, Q3/05: 22-47.

Georganas, Sotiris, Paul J. Healy, and Nan Li. 2014. "Frequency Bias in Consumers' Perceptions of Inflation: An Experimental Study." *European Economic Review* 67: 144–58.

Huber, Odilo W. 2011. "Frequency of Price Increases and Perceived Inflation. An Experimental Investigation." *Journal of Economic Psychology* 32(5): 651–61.

Jonung, Lars Birger. 1981. "Perceived and Expected Rates of Inflation in Sweden." *American Economic*

Review 71(5): 961–68.

Jungermann, Helmut, Hans Wolfgang Brachinger, Julia Belting, Katarzyna Grinberg, and Elisabeth Zacharias. 2007. "The Euro Changeover and the Factors Influencing Perceived Inflation." *Journal of Consumer Policy* 30(4): 405–19.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47(2): 263-291.

———. 1984. "Choices, Values, and Frames." *American Psychologist* 39(4): 341-50.

Leonhardt, David. 2008. "Seeing Inflation Only in the Prices That Go Up." *The New York Times*, May 7, http://www.nytimes.com/2008/05/07/business/07leonhardt.html?_r=0

Ranyard, Rob, Fabio Del Missier, Nicolao Bonini, Darren Duxbury, and Barbara Summers. 2008. "Perceptions and Expectations of Price Changes and Inflation: A Review and Conceptual Framework." *Journal of Economic Psychology* 29(4): 378–400.

Sivy, Michael. 2013. "If There's No Inflation, Why Are Prices Up So Much?" *Time*, March 12, http://business.time.com/2013/03/12/if-theres-no-inflation-why-are-prices-up-so-much/

Stix, Helmut. 2009. "Perceived Inflation and the Euro: Evidence from an Austrian Survey." *European Journal of Political Economy* 25(4): 547–61.

———. 1973. "Availability: A Heuristic for Judging Frequency and Probability." *Cognitive Psychology* 5(2): 207–32.

Tversky, Amos, and Daniel Kahneman. 1991. "Loss Aversion in Riskless Choice: A Reference-Dependent Model." *The Quarterly Journal of Economics* 106(4): 1039–61.

Van der Klaauw, Wilbert, Wändi Bruine de Bruin, Giorgio Topa, Simon Potter, and Michael Bryan. 2008. *Rethinking the Measurement of Household Inflation Expectations: Preliminary Findings*. (Staff Report No. 359). Federal Reserve Bank of New York. http://www.newyorkfed.org/research/staff_reports/sr359.pdf

Willenborg, John F., and Robert E. Pitts. 1977. "Gasoline Prices: Their Effect on Consumer Behavior and Attitudes." *The Journal of Marketing* 41(1): 24–31.

Appendices

Appendix 1: Data coverage for components of the EPI

Components of the EPI	Period covered
Food-at-home	Jan. 1987-Dec. 2014
Food-away-from-home	Jan. 1987-Dec. 2014
Alcoholic beverages	Jan. 1987-Dec. 2014
Fuels and utilities (household)	Jan. 1987-Dec. 2014
Housekeeping supplies	Jan. 1987-Dec. 2014
Motor fuel	Jan. 1987-Dec. 2014
Intra-city public transportation	Jan. 1987-Dec. 2014
Prescription drugs	Jan. 1987-Dec. 2014
Nonprescription drugs and vitamins	Jan. 2010-Dec. 2014
Cable and satellite television and radio service	Jan. 1987-Dec. 2014
Video discs and other media, including rental of video and audio	Jan. 1998-Dec. 2014
Audio discs, tapes, and other media	Jan. 1998-Dec. 2014
Pets and pet products	Jan. 1987-Dec. 2014
Admissions (to movies, theaters, concerts, sporting events)	Jan. 1987-Dec. 2014
Fees for lessons or instructions	Jan. 1987-Dec. 2014
Recreational reading materials (newspapers, magazines, books)	Jan. 1987-Dec. 2014
Domestic services	Jan. 1998-Dec. 2014
Gardening and lawn care services	Jan. 1998-Dec. 2014
Postage and delivery services	Jan. 1998-Dec. 2014
Telephone services	Jan. 1998-Dec. 2014
Internet services and electronic information providers	Jan. 1998-Dec. 2014
Tobacco and smoking products	Jan. 1987-Dec. 2014
Personal care products	Jan. 1987-Dec. 2014
Personal care services	Jan. 1987-Dec. 2014

Appendix 2: Measures of Inflation and Expected Inflation

Variable Name	Sample period	Description	Source
Michigan mean	Jan 1988-Dec 2014 monthly data	Expected inflation during the next 12 months; percentage points; ***average (mean)*** survey response	*Survey of Consumers*, University of Michigan
Michigan median	Jan 1988-Dec 2014 monthly data	Expected inflation during the next 12 months; percentage points; ***median*** survey response	*Survey of Consumers*, University of Michigan
ConfBoard	Jan 1988-Dec 2014 monthly data	Expected inflation during the next 12 month; ; percentage points; ***average (mean)*** survey response	*Consumer Confidence Survey*, the Conference Board
ProfForecast	1988Q1-2014Q4 quarterly data	Expected change in the CPI during the next 4 quarters; percentage points; forecast based on the ***median*** survey response	*Survey of Professional Forecasters*, Federal Reserve Bank of Philadelphia
CPI-12	Jan 1988-Dec 2014	CPI percent change from 12 month ago or 4 quarters ago; percentage points; not seasonally adjusted	Bureau of Labor Statistics
CPI-1	Jan 1988-Dec 2014	CPI percent change from 1 month ago or 1 quarter ago (for quarterly data); percentage points; not seasonally adjusted	Bureau of Labor Statistics
EPI-12	Jan 1988-Dec 2014	EPI percent change from 12 month ago or 4 quarters ago; percentage points; not seasonally adjusted	Author's calculations
EPI-1	Jan 1988-Dec 2014	EPI percent change from 1 month ago or 1 quarter ago (for quarterly data); percentage points; not seasonally adjusted	Author's calculations

Note: quarterly measures for CPI and EPI are created by taking the monthly values for the middle month of each quarter; this matches the month within a quarter when the quarterly Survey or Professional Forecasters is conducted.

Appendix 3: Granger causality tests

The measures of expected inflation come from three sources: *Survey of Consumers* by the University of Michigan, *Consumer Confidence Survey* by the Conference Board, and *Survey of Professional Forecasters* by the Federal Reserve Bank of Philadelphia.
In all cases, the measure reflects the inflation expected to occur during the 12 months following the month of the survey.
The Survey of Consumers from University of Michigan provides both the mean and the median of the survey responses. The Consumer Confidence Survey by the Conference Board provides only the mean value of survey responses. The Survey of Professional Forecasters provides the median response.

Full sample period: Jan. 1988-Dec. 2014

Measures of Expected Inflation	Granger causality test (p-values)			
	H0: CPI-12 does not Granger cause expected inflation	H0: EPI-12 does not Granger cause expected inflation	H0: CPI-1 does not Granger cause expected inflation	H0: EPI-1 does not Granger cause expected inflation
Michigan mean	**0.0147***	**0.0221***	**2.E-06****	**2.E-07****
Michigan median	**0.0007****	**0.0004****	**3.E-06****	**8.E-08****
ConfBoard	0.0618	**0.0162***	**9.E-05****	**9.E-05****
ProfForecast	0.2083	0.3757	**0.0067****	**0.0076****

Note: Granger causality tests performed using use six lags in monthly data and two lags in quarterly data.
***** statistical significance at 5% or better
** statistical significance at 1% or better

Early period: Jan. 1988-Dec. 2000

Measures of Expected Inflation	Granger causality test (p-values)			
	H0: CPI-12 does not Granger cause expected inflation	H0: EPI-12 does not Granger cause expected inflation	H0: CPI-1 does not Granger cause expected inflation	H0: EPI-1 does not Granger cause expected inflation
Michigan mean	0.1290	0.2860	**0.0074****	**0.0630***
Michigan median	**0.0011****	**0.0014****	**0.0149***	**0.0095****
ConfBoard	**1.E-05****	**0.0058****	**0.0125***	0.1594
ProfForecast	0.2079	0.1171	**0.0247***	0.2851

Note: Granger causality tests performed using use six lags in monthly data and two lags in quarterly data.
***** statistical significance at 5% or better
** statistical significance at 1% or better

Later period: Jan. 2001-Dec. 2014

Measures of Expected Inflation	Granger causality test (p-values)			
	H0: CPI-12 does not Granger cause expected inflation	H0: EPI-12 does not Granger cause expected inflation	H0: CPI-1 does not Granger cause expected inflation	H0: EPI-1 does not Granger cause expected inflation
Michigan mean	0.3851	0.4143	**0.0076****	**0.0015****
Michigan median	0.1064	0.0644	**0.0010****	**0.0003****
ConfBoard	0.2972	0.1607	**0.0098****	**0.0023****
ProfForecast	0.2812	0.4891	**0.0196***	**0.0250***

Note: Granger causality tests performed using use six lags in monthly data and two lags in quarterly data.

***** statistical significance at 5% or better

** statistical significance at 1% or better