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K-Core Inflation

Alexander L. Wolman

Standard measures of inflation (for example, personal consumption expenditure [PCE] or consumer price index [CPI]) are constructed in order to accurately describe the behavior of consumption prices as a whole. However, to the extent that the inflation rate in a given period is accounted for by large relative price changes for particular goods and services, it may be desirable to have additional measures of inflation that adjust for those large relative price changes. These alternatives would be useful if large relative price changes are a source of noise, obscuring underlying patterns in the economy. Any such alternative inflation measure could never be the best measure of overall price changes, but it might provide valuable information about the behavior of future inflation, or more generally about the "state of the world" relevant for conducting monetary policy. This article describes a new class of measures of underlying inflation called "k-core inflation."

The term "core inflation" came into use in the 1970s, when large price increases for food and energy coincided with high overall CPI inflation and, in some years, with weak economic activity. Researchers using a Phillips curve framework at that time sought a notion of inflation that was consistent with a positive association between inflation and real activity. For example, Robert Gordon (1975) referred to "underlying 'hard-core' inflation" as distinct from the contributions made by food and energy, dollar devaluation, and the end of price and wage controls.[1] The Bureau of Labor Statistics responded to these conditions in 1977 by beginning to publish a measure of the CPI that omitted food and energy components ("the index for all items less food and energy").[2] Today that subindex of the CPI is widely referred to as the core CPI, and, more

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[1] Beryl Sprinkel (1975) seems to have used the same term ("hard-core" inflation) a few months earlier than Gordon.

[2] See the Bureau of Labor Statistics (2011).

generally, "core inflation" is understood to refer to some broad price index that excludes food and energy contributions.

Although both the term "core inflation" and the CPI measure originated in the 1970s, it was not until around 1990 (see Ball and Cecchetti [1990]) that the two became essentially synonymous. In recent years, economists have proposed many alternative measures of core inflation. One of the more prominent alternatives is trimmed mean inflation, which removes from the inflation calculation those price changes above and below specified percentiles in the distribution. K-core inflation, the measure proposed in this article, is a close cousin both to the standard core inflation measure (the index for all items less food and energy) and to trimmed mean inflation. Instead of removing food and energy prices—as core does—and instead of removing prices beyond specified percentiles in the distribution—as a trimmed mean does—k-core inflation removes items whose relative prices change by more than a specified threshold. If one's objective is to construct a measure of inflation on which large relative price changes have a limited effect, then k-core inflation seems clearly preferable to both inflation ex-food and energy and trimmed mean inflation. In periods during which food and energy prices move with the overall price level, whereas other categories experience large relative price changes, inflation ex-food and energy will exclude small relative price changes and include large relative price changes. In contrast, k-core inflation will always exclude—and only exclude—the large relative price changes. Likewise, in periods during which the distribution of relative price changes is unusually concentrated but asymmetric, trimmed mean inflation would exclude many small relative price changes, and could produce a measure that deviates markedly from overall inflation. In contrast, k-core inflation would simply replicate overall PCE inflation if there were no large relative price changes.

Section 1 provides some background information on the construction of PCE inflation and the behavior of the category price changes that go into constructing PCE inflation. Section 2 describes k-core inflation in general terms. Whereas the measure in Section 2 is a parametric family, in Section 3 we show how the properties of k-core inflation vary with that parameter (k, the criterion for a large relative price change). We specify a value for k and compare k-core inflation to core inflation and trimmed mean inflation. Section 4 suggests areas for future research and concludes.

1. INFLATION AND THE DISTRIBUTION OF PRICE CHANGES

The two most commonly discussed measures of inflation in the United States are PCE inflation and CPI inflation. PCE inflation is an index of the rate of price change for a broad array of consumption goods and services—technically the entirety of consumption in the national income and product accounts. CPI inflation is an index of the rate of price change for "out-of-pocket" consumption expenditures. As such, there are a number of differences between the components of PCE inflation and those of CPI inflation. Most importantly, PCE inflation puts a significantly higher weight on health care spending, and CPI inflation puts a significantly higher weight on housing services. There are also differences in the way the indexes are calculated; for details, see Clark (1999). Because the PCE index is a more comprehensive measure and is generally believed to be a more accurate measure of overall price changes, in the remainder of this article all references to inflation (without other qualifiers) will be to PCE inflation.

PCE inflation (π_t) is a Fisher ideal index of price changes for a large number (N) of categories of consumption goods; it is the geometric mean of the Paasche and Laspeyres indexes of price change. The Paasche index in period t, denoted π_t^P, is the rate of price change from period $t-1$ to period t for the consumption basket purchased in period t:

$$\pi_t^P = \frac{\sum_{n=1}^N p_{n,t} q_{n,t}}{\sum_{n=1}^N p_{n,t-1} q_{n,t}}. \tag{1}$$

In this expression, $p_{n,t}$ and $q_{n,t}$ are the price and quantity purchased of category n in period t. The Laspeyres index in period t, denoted π_t^L, is the rate of price change from period $t-1$ to period t of the consumption basket purchased in period $t-1$:

$$\pi_t^L = \frac{\sum_{n=1}^N p_{n,t} q_{n,t-1}}{\sum_{n=1}^N p_{n,t-1} q_{n,t-1}}. \tag{2}$$

Thus, the PCE inflation rate is given by the following formula:

$$\pi_t = \sqrt{\left(\frac{\sum_{n=1}^N p_{n,t} q_{n,t}}{\sum_{n=1}^N p_{n,t-1} q_{n,t}}\right)\left(\frac{\sum_{n=1}^N p_{n,t} q_{n,t-1}}{\sum_{n=1}^N p_{n,t-1} q_{n,t-1}}\right)}. \tag{3}$$

Note that both the Paasche and Laspeyres indexes can be written as weighted averages of price changes for each category, thus

$$\pi_t = \sqrt{\left(\sum_{n=1}^N \omega_{n,t-1}^P \pi_{n,t}\right)\left(\sum_{n=1}^N \omega_{n,t-1}^L \pi_{n,t}\right)}, \tag{4}$$

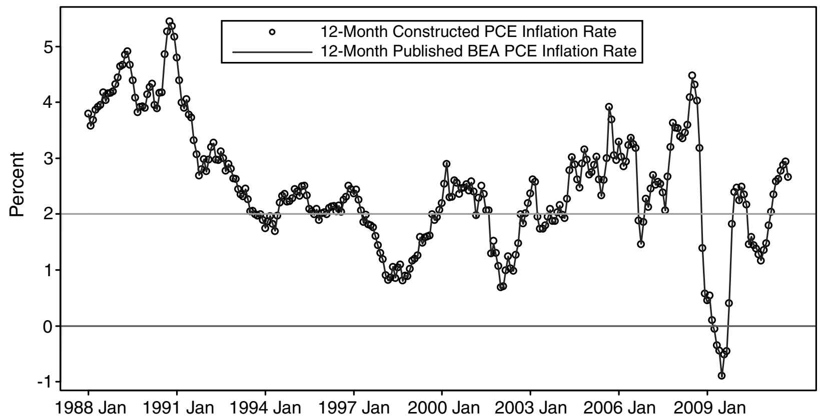
where $\pi_{n,t}$ is the rate of price change for consumption category n in period t (that is, $\pi_{n,t} = p_{n,t}/p_{n,t-1}$), and where the weights are given by

$$\omega_{n,t-1}^L = \frac{p_{n,t-1} q_{n,t-1}}{\sum_{j=1}^N p_{j,t-1} q_{j,t-1}} \tag{5}$$

and

$$\omega_{n,t-1}^P = \frac{p_{n,t-1} q_{n,t}}{\sum_{j=1}^N p_{j,t-1} q_{j,t}}. \tag{6}$$

Figure 1 PCE Inflation: Constructed and from the BEA



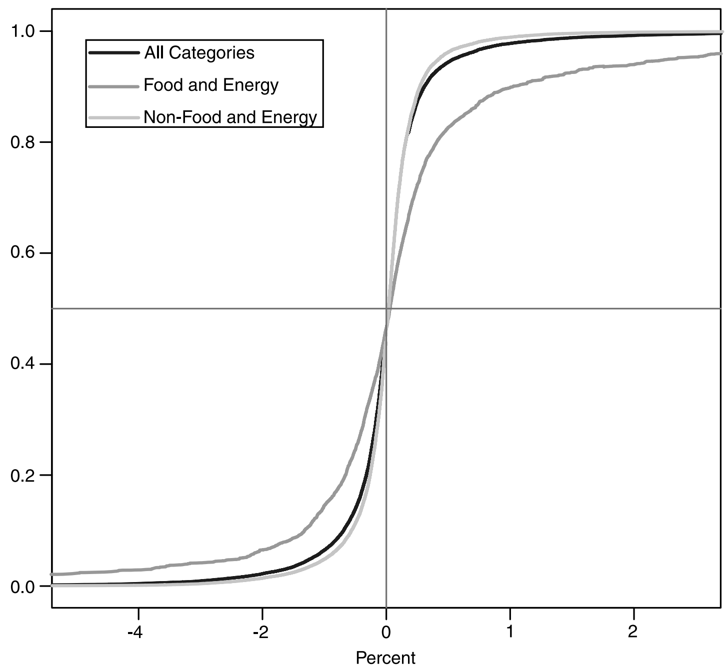
The Laspeyres weight, $\omega^L_{n,t-1}$, is the period $t-1$ expenditure share for category n, and the Paasche weight, $\omega^P_{n,t-1}$, is the hypothetical expenditure share associated with evaluating the period t consumption basket at period $t-1$ prices.

Hundreds of consumption categories comprise PCE inflation, which is compiled by the Bureau of Economic Analysis of the U.S. Department of Commerce (BEA). We aggregate some of those categories in order to have a consistent panel going back to January 1987, and are left with 240 categories, covering 100 percent of personal consumption expenditure, for the period from January 1987–October 2011. Figure 1 plots the behavior of official 12-month PCE inflation over this period (solid line), together with the series we constructed using (4) with 240 categories (open circles). A careful look at the figure reveals slight differences between the two measures in some periods. Overall however, the two series are close enough that it appears legitimate to proceed using the constructed PCE measure instead of the BEA's measure.

If the component price changes that aggregate up to PCE inflation were all close to each other, and thus close to PCE inflation, then there would be no reason to consider inflation measures that control for large relative price changes. The black line in Figure 2 displays the distribution of relative price changes for all categories across all periods in the sample, where the relative price change for category n in period t is simply the difference between the rate of price change for that category and the rate of PCE price change:

$$r_{n,t} = \pi_{n,t} - \pi_t .$$

Figure 2 CDF of Monthly Relative Price Changes, Jan. 1987–Oct. 2011



To construct the distribution, each $r_{n,t}$ is weighted by the corresponding expenditure share $\omega^L_{n,t}$. The distribution of monthly relative price changes is indeed concentrated around zero, with an interquartile range of (-0.23 percent, 0.25 percent). However, there are also many large relative price changes: For example, 12.1 percent of (weighted) relative price changes are greater than 1 percent per month in absolute value. Figure 2 also displays the distribution of relative price changes for the 28 food and energy categories (dark gray) and for the 212 non-food and energy categories (light gray). Food and energy relative prices vary much more than their complement: The interquartile range for food and energy categories is (-0.53 percent, 0.55 percent) compared to (-0.19 percent, 0.24 percent) for other categories.

In sum, from Figure 2 it is clear that (i) there is nontrivial variation in the relative prices of different categories of consumption, and (ii) the variation is especially large for food and energy categories. We take those facts as motivation for constructing measures of inflation that attempt to control for the contributions of *large* relative price changes.[3] We refer to any such measure below as a measure of underlying inflation.

2. OLD AND NEW MEASURES OF UNDERLYING INFLATION

Because food and energy prices are so much more volatile than the prices of other consumption categories (see Figure 2), a natural underlying inflation measure is one that simply removes food and energy prices from the inflation calculation. This measure, so-called "ex-food and energy" PCE inflation, has the virtue of simplicity. However, always and only removing food and energy prices does not mean always and only removing categories with the largest relative price changes. Of the top 10 price increases and the top 10 price decreases each period, on average less than one quarter of those largest price changes were from food and energy categories. And of the 20 smallest relative price changes each period (measured by absolute value), more than 8 percent were from food and energy categories.[4] Thus, removing only food and energy price changes means not removing most of the large relative price changes, and it means removing a significant number of very small relative price changes.

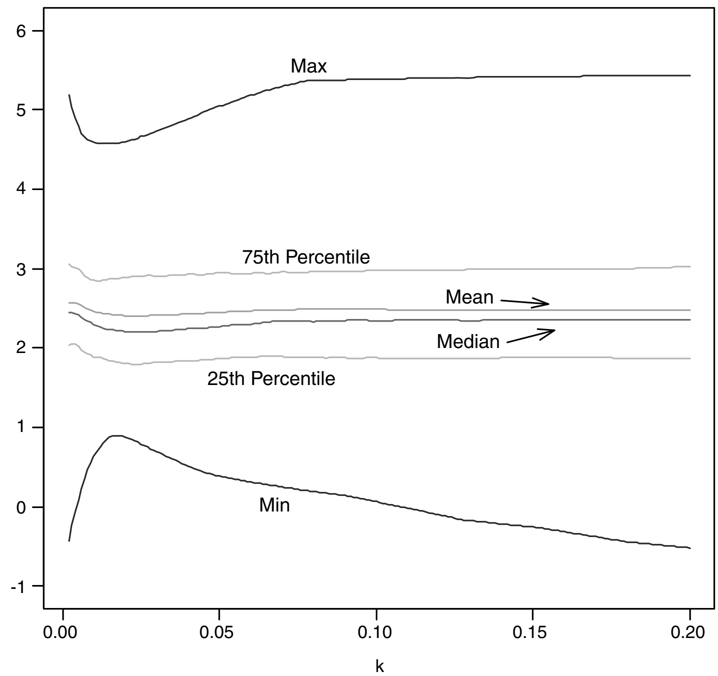
An alternative to ex-food and energy inflation that does remove only the largest price changes each period is trimmed mean inflation. Trimmed mean inflation begins with the weighted cumulative distribution function (CDF) of monthly price changes each period, and removes those price changes that lie outside upper and lower percentile cutoffs. If the upper and lower cutoffs are the 50th percentile, then trimmed mean inflation is simply the rate of price change for the median category. Bryan and Cecchetti (1994) and Dolmas (2005) provide detailed discussions of trimmed mean inflation, with the former focusing on the CPI and the latter on PCE inflation. They suggest various methods of choosing the specific percentile cutoffs for trimmed mean inflation. The Federal Reserve Bank of Dallas maintains a trimmed mean inflation series (Federal Reserve Bank of Dallas 2012)—currently, their preferred cutoffs are 24 percent from the bottom of the distribution and 31 percent from the top (see Section 3 for further discussion). From the data behind Figure 2, on average these criteria remove relative price *decreases* greater than 0.25 percent per month, and relative price *increases* greater than 0.18 percent per month.

If the goal is to construct a measure of underlying inflation by removing large relative price changes, then a trimmed mean has an obvious advantage

[3] From the definition of PCE inflation, it is tautological that *all* relative prices together account completely for the behavior of inflation.

[4] These statements refer to unweighted price changes—meaning that each category is weighted equally. There are 28 food and energy categories out of 240 total categories in our sample, so that if price change distributions were identical across categories then 11.6 percent of any range of price changes would be from food and energy categories.

Figure 3 How the Distribution (Across Time) of k-Core Inflation Varies with k

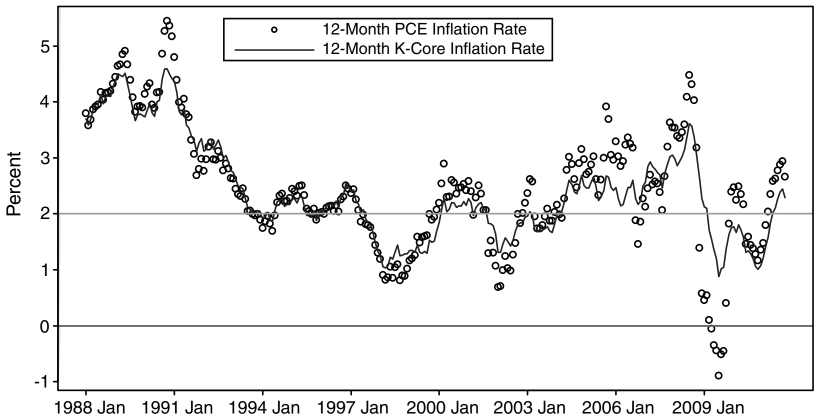


relative to ex-food and energy inflation: It removes categories with the largest price changes, regardless of whether they are food and energy categories. However, the fact that a trimmed mean removes fixed percentiles of each period's distribution of price changes has an important implication. Depending on how the distribution of price changes behaves in a given period, price changes of different sizes will be removed. That is, once one specifies the percentile cutoffs, the largest price changes are removed each period, regardless of the size of those price changes. But if the goal is to remove large relative price changes, it seems preferable to specify the size of relative price changes that will be removed and hold that size fixed each period. In the remainder of the article we consider such a measure, which we call k-core inflation.[5]

K-core inflation specifies a cut-off value, k, for the size of relative price changes. If the relative price change for category n is less than k in absolute

[5] Researchers such as Bryan and Cechetti (1994) and Dolmas (2005) motivate trimmed mean inflation partly on statistical grounds and partly on theoretical grounds. In the conclusion, we suggest a theoretical grounding for soft-core inflation.

Figure 4 Benchmark k-Core Inflation (k = 2 Percent Annual Rate)



value, then the price change for category n is included without modification. If the relative price change for category n in period t is greater than k in absolute value, then the price change for category n is truncated at k. Formally, for a given k, k-core inflation (π_t^{sc}) is defined as follows:

$$\pi_t^{kc}(k) = \sqrt{\left(\sum_{n=1}^{N} \omega_{n,t-1}^{P} \pi_{n,t}^{kc}(k)\right)\left(\sum_{n=1}^{N} \omega_{n,t-1}^{L} \pi_{n,t}^{kc}(k)\right)}, \qquad (7)$$

where

$$\pi_{n,t}^{kc}(k) = \begin{cases} \pi_{n,t}, \text{ if } \left|\pi_{n,t} - \pi_t\right| < k \\ \pi_t\left(1 + k \cdot sign\left(\pi_{n,t} - \pi_t\right)\right), \text{ if } \left|\pi_{n,t} - \pi_t\right| \geq k \end{cases}. \qquad (8)$$

Three assumptions embodied in this definition require some discussion. First, large price changes are truncated rather than being omitted. This choice is based on the facts that there is uncertainty about the proper value of k, and about whether or not every relative price change greater than k should be omitted from underlying inflation. An appealing implication of this assumption is that varying k between zero and infinity makes $\pi_t^{kc}(k)$ a smooth function that starts and ends at π_t. For low k all price changes are replaced with actual inflation, and for high k all price changes are admitted, which returns actual inflation. The second important assumption is that the criterion for truncating price changes is the size of relative price change, rather than the size of nominal price change. This choice simply reflects the view that it is large *relative* price changes that we want to control for. Third, the criterion (k) does not vary with the level of inflation. There is a large literature on the relationship between

Table 1 Summary Statistics for One-Month Inflation (Annualized Percent)

	Mean	Min	25th and	75th Percentiles	Max	Std. Dev.
PCE	2.51	−13.55	1.40	3.74	13.66	2.41
k-core	2.43	−1.31	1.43	3.37	6.28	1.38
XFE	2.56	−5.35	1.59	3.37	8.30	1.55
Trimmed Mean	2.47	0.30	1.87	2.99	5.68	0.95

relative price variability and inflation (see Hartman [1991], for example). Based on that literature, one might argue that k should be an increasing function of the inflation rate. Because the data used in this article is from a period of relatively low and stable inflation, we assume that such considerations are not quantitatively important.

From Figure 2, one can see how the choice of k maps into the fraction of price changes that will be truncated: $k \geq 0.04$ (4 percent monthly in Figure 2) would mean truncating a tiny fraction of price changes, whereas $k = 0.005$ (one-half percent monthly) would mean truncating 13.9 percent of weighted price changes because of relative price decreases, and 12.7 percent because of relative price increases. Of course, these are averages, and the fraction of expenditures (equivalently, price changes) affected in a given period would depend on the distribution of price changes in that period.

3. BEHAVIOR OF K-CORE INFLATION

Figure 3 plots summary statistics for 12-month k-core inflation as a function of k, using the entire sample. For each value of k, we compute the time series for k-core inflation and plot the summary statistics, mean, median, maximum, minimum, and 25th and 75th percentiles. The figure shows how these summary statistics of the time series vary with k. For low and high values of k, the statistics are similar, reflecting the fact that k-core inflation converges to overall PCE inflation as k approaches zero or infinity. The properties of k-core inflation are sensitive to k for values around 0.02 (2 percent monthly relative price change). The range (maximum minus minimum) of k-core inflation shrinks from almost six percentage points (the range for PCE inflation) for high and low k to less than four percentage points when k is around 0.02. Because it is a round number and comes close to minimizing the range of k-core inflation, we will use $k = 0.02$ as our benchmark.

Figure 4 plots the time series for benchmark k-core inflation, together with overall PCE inflation (the constructed measure from Figure 1). Although we construct k-core inflation as a monthly measure, using (7), the time series plotted in Figure 4 and in subsequent figures display the 12-month cumulative

Table 2 Summary Statistics for 12-Month Inflation (Percent)

	Mean	Min	25th and	75th Percentiles	Max	Std. Dev.
PCE	2.46	−0.91	1.86	3.02	5.42	1.11
k-core	2.41	0.88	1.81	2.88	4.59	0.88
XFE	2.55	0.98	1.84	2.67	5.19	1.10
Trimmed Mean	2.45	0.80	2.05	2.66	4.28	0.74

k-core inflation rate.[6] As expected from Figure 3, k-core inflation is notably less volatile than PCE inflation. The behavior of inflation in the depths of the Great Recession illustrates this point well: From mid-2008 to mid-2009, PCE inflation fell by more than five percentage points, whereas k-core inflation fell by less than three percentage points. However, it is not always the case that k-core inflation is a smoother version of PCE inflation. For example, in the second half of 2010, PCE inflation was relatively low (generally below 1.5 percent), yet k-core inflation was below PCE inflation.

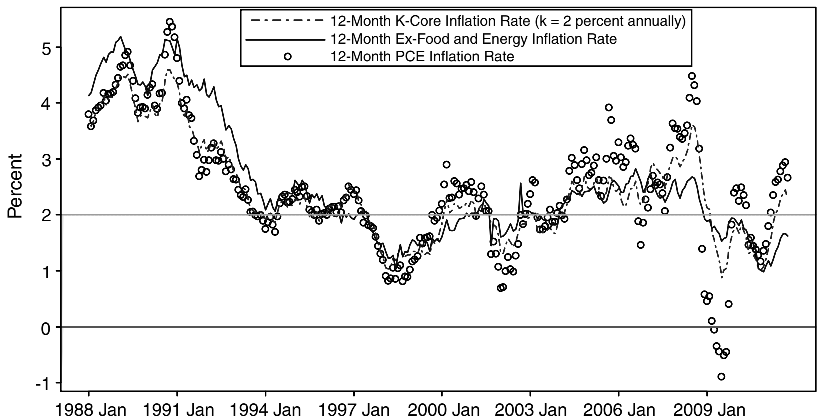
K-Core Inflation and Ex-Food and Energy Inflation

Having motivated k-core inflation as an appealing alternative to ex-food and energy inflation and trimmed mean inflation, we now compare the behavior of k-core to inflation ex-food and energy (henceforth XFE), and in the next section, to trimmed mean inflation (henceforth TMI). The top three rows of Tables 1 and 2 display summary statistics for one-month and 12-month PCE inflation, k-core inflation, and XFE.[7] For monthly price changes, both k-core and XFE are much less volatile than PCE inflation. This statement holds whether one measures volatility by max-min, standard deviation, or interquartile range. K-core inflation is less volatile than XFE, apart from the interquartile range measure. Moving from one-month to 12-month inflation, the comparisons become more muddied. Because each of these series has a substantial transitory component, the volatility of 12-month inflation is lower in every case than the volatility of the one-month measure. The transitory component is strongest in PCE inflation, so that the standard deviation of that series is cut by more than half when comparing one-month and 12-month changes. In contrast, the standard deviation of XFE inflation falls by just 29 percent, leaving the standard deviations of 12-month PCE and XFE inflation essentially identical. K-core's standard deviation is 36 percent lower for 12-month than one-month changes,

[6] The only reason for doing this is that one-month inflation is quite volatile. Some of the tables, as well as Figure 2, refer to one-month price changes.

[7] Note that the version of XFE analyzed here is not the version reported by the BEA. Instead, we calculate our own version by removing the 28 food and energy categories (and adjusting the other weights accordingly) in equation (3). The resulting series is close to the one reported by the BEA.

Figure 5 K-Core Inflation and Ex-Food and Energy Inflation



leaving it well below XFE (0.88 versus 1.10). However, the interquartile range for 12-month k-core inflation is well *above* that for XFE.

Figure 5 plots the time series for 12-month k-core inflation and XFE. Although Tables 1 and 2 indicate that k-core inflation is generally less volatile than XFE, Figure 5 shows that this volatility ranking is heavily influenced by the first few years of the sample, when PCE inflation was often above 5 percent. During that time, k-core inflation was well below XFE. In the last several years, by contrast, XFE has been markedly less volatile than k-core. The recent period has involved dramatic swings in energy prices. In September 2008 for example, 12-month inflation was 4.03 percent, whereas XFE was 2.52 percent. During this period, Figure 6 shows that there were many large relative price decreases that k-core inflation adjusted for, whereas XFE did not. As a result, k-core inflation was much higher than XFE, 3.37 percent, in the 12 months preceding September 2008.

From Figure 2, it is already clear that k-core inflation with $k = 0.02$ does not always truncate food and inflation categories, and sometimes truncates categories other than food and inflation. Table 3 lists the 15 categories whose price changes are truncated most frequently when $k = 0.02$, restricting to categories representing more than 0.01 percent of expenditure on average over the sample period.[8] Seven of the 15 categories are either food or energy categories (they are indicated in bold in the table). The 15 categories together

[8] The restriction based on expenditure shares meant that two categories were eliminated and replaced with other categories.

Table 3 Categories Whose Relative Price Changes Most Frequently Exceed k = 0.02 in Absolute Value

Category	Freq. Exceed k	Avg. Share
Eggs	81	0.0007
Fuel Oil	80	0.0023
Gasoline & Other Motor Fuel	79	0.0269
Fresh Vegetables	64	0.0040
Indirect Securities Commissions	64	0.0013
Mutual Fund Sales Charges	63	0.0011
Air Transportation	52	0.0060
Direct Securities Commissions	44	0.0032
Used Truck Margin	42	0.0017
Natural Gas	41	0.0065
Fresh Fruit	39	0.0027
Other Fuels	39	0.0002
Luggage & Similar Personal Items	35	0.0024
Tobacco	32	0.0096
Commissions for Trust, Fiduciary, & Custody Activities	31	0.0011

Notes: Food and energy categories are listed in bold.

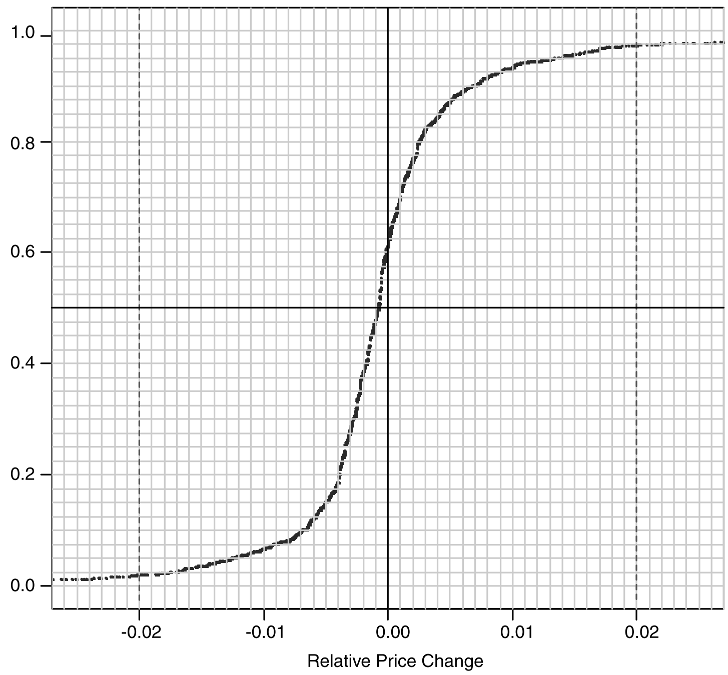
represent 7 percent of expenditures, and the seven food and energy categories represent 4.3 percent of expenditures.

K-Core Inflation and Trimmed Mean Inflation

Next, we compare our k-core inflation measure to TMI. To generate TMI we use a lower cutoff of 20 percent of expenditures, and an upper cutoff of 23 percent. Dolmas (2005) proposes three different criteria for choosing the upper and lower cutoffs. One of the criteria he uses is to minimize the squared deviations from a centered 36-month moving average of overall PCE inflation. Applying that criterion to our sample generates the 20 percent and 23 percent cutoffs. Note that for k-core inflation, our choice of $k = 0.02$ nearly represents the value of k that would minimize the deviation of k-core inflation from the 36-month moving average of overall PCE inflation; that value is $\tilde{k} = 0.018$. However, even this "optimized" version of k-core is considerably less successful than the optimized TMI at matching the moving average. The sum of squared deviations for the TMI is 7.5×10^{-5}, whereas the sum of squared deviations for k-core inflation is 1.2×10^{-4}.

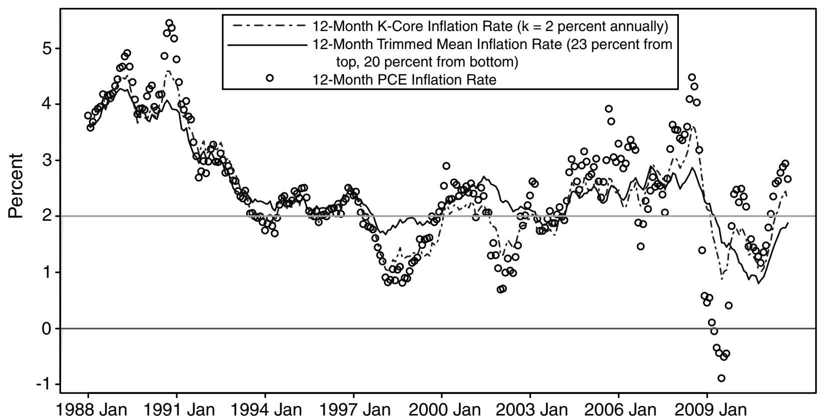
Tables 1 and 2 contain summary statistics for TMI, in the bottom row, and Figure 7 plots TMI along with k-core inflation and PCE inflation. TMI is less volatile than either XFE or k-core inflation. The difference is especially striking for one-month inflation, where the standard deviation of TMI is at least 30 percent lower than that of the other measures, and the difference between the maximum and minimum values is 5.4 percent for TMI, compared to 7.6

Figure 6 Pooled Distribution of Monthly Relative Price Changes from Sept. 2007–Sept. 2008



percent for k-core and 13.7 percent for XFE. The relative stability of TMI compared to k-core can be partly understood by referring back to Figure 2, the distribution of relative price changes. Although k-core inflation is not a trimmed mean, we can think of it as a "truncated mean," where the percentile cutoffs for truncation (at 0.02) change each period. From Figure 2, on average both the lower and upper cutoffs for truncation are close to 0.25 percent of expenditure-weighted price changes. Thus, TMI with cutoffs at about 20 percent results in a price index that differs much more dramatically from PCE inflation than does our k-core inflation measure. If we were to exclude categories instead of truncating their price changes, the resulting series would be precisely a trimmed mean with time-varying cutoffs. From the numbers reported in the previous section we know that relatively little trimming would be implied by $k = 0.02$. Figure 8 displays the somewhat smoother series generated by eliminating categories with $k = 0.02$ instead of truncating their price changes.

Figure 7 K-Core and Trimmed Mean Inflation

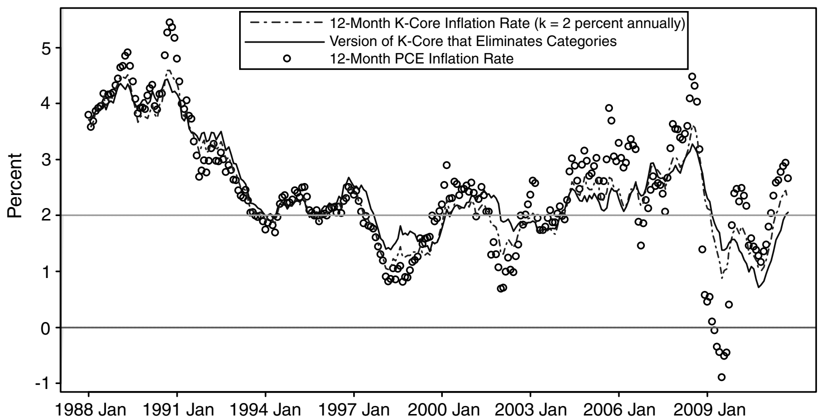


4. CONCLUSION

We have proposed a new measure of underlying inflation, referred to as k-core inflation. All such measures are motivated to some degree by the idea that large relative price changes may represent noise, which the monetary authority ought to filter out for the purpose of forecasting or for inferring the current stance of monetary policy. K-core inflation does this filtering by specifying a threshold for a large relative price change. Relative price increases or decreases beyond that threshold are truncated to be equal to the threshold. In contrast, inflation ex-food and energy excludes food and energy prices regardless of how much those prices change, and trimmed mean inflation excludes fixed percentiles of the price change distribution, regardless of the size of price changes to which those percentiles correspond.

The figures and tables in the article illustrate how k-core inflation behaves, and how it compares to inflation ex-food and energy and to trimmed mean inflation. Mid-2008 was a period in which the differences between k-core inflation and these other measures were particularly large and persistent. K-core inflation indicated significantly higher underlying inflation in mid-2008 than either ex-food and energy inflation or trimmed mean inflation. The situation looks somewhat similar today, when energy price increases are again in the headlines: In the 12 months preceding October 2011, k-core inflation was

Figure 8 K-Core Inflation when Large Price Changes are Eliminated Rather than Truncated



2.3 percent, compared to 2.7 percent for overall PCE inflation, 1.6 percent for PCE inflation ex-food and energy, and 1.9 percent for trimmed mean inflation.

This article is exploratory in nature. It would be interesting to investigate k-core inflation further in at least three dimensions. First, measures of underlying inflation are often evaluated on the basis of their ability to forecast PCE inflation. How does k-core inflation fare according to this criterion? Second, the definition of k-core inflation used here has maintained that PCE inflation is the correct inflation rate against which to measure relative price changes. Perhaps k-core inflation is instead the correct inflation rate against which to measure relative price changes. Applying this change to our definition would require solving a fixed-point problem to compute k-core inflation. Finally, and most importantly, it would be interesting to pursue possible theoretical underpinnings of k-core inflation. If there are large sector-specific shocks (as suggested by much research on price adjustment, such as Golosov and Lucas [2007]) and if the structure of the economy and the behavior of monetary policy are such that monetary policy does not generate large relative price changes, then something like k-core inflation might be a useful indicator of monetary conditions. It would be straightforward to study this issue in a multi-sector equilibrium model. Of course, it is also possible that large relative price changes could actually signal loose monetary policy. That would go against the spirit of this article, but it cannot be ruled out a priori. Whether or not such a possibility is empirically relevant would seem to depend on the nature of cross-sectoral variation in price stickiness and demand and supply elasticities. These issues could be studied in the context of a calibrated equilibrium model.

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