Box D. The price of everything

The consumer price index is a fundamental economic statistic for households, firms and policymakers. This number summarises the prices of hundreds of thousands of goods and services across the country. Yet the behaviour of individual prices is erratic, some rise and fall by an order of magnitude from one month to the next, others rarely change. These idiosyncrasies are central to understanding aggregate price dynamics (Gagnon, 2009; Nakamura *et al*., forthcoming).

What is the rate of inflation when the most volatile prices are excluded? This box answers this question by constructing a measure of trimmed mean inflation, which excludes a fraction of the highest and lowest price changes each month, calculating the arithmetic mean across the remaining observations.[1] We find that current trimmed mean inflation is a powerful predictor of future consumer price index inflation. Although trimmed mean inflation has fallen in recent months, it remains in line with the Bank of England's target.

We begin by collecting micro data on the prices of the individual items that underlie the all items consumer price index (CPI) for the United Kingdom. This data set contains the prices of up to 135,000 goods and services each month, which adds up to approximately 30 million price quotes since the 1990s.[2] This data will also allow us to monitor the variance, skewness, kurtosis and frequency of price changes at a regional and national resolution.

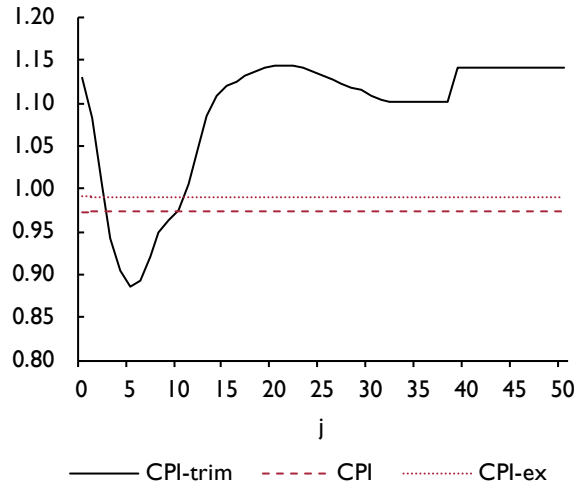
In order to calculate the trimmed mean, the first step is to calculate month-on-month inflation rates for items $i = 1,2...,N$ at time t : $\Delta p_{i,t} = \frac{p_{i,t}}{p_{i,t-1}} - 1$. The second step is to calculate the $j = 0,1,...,50$ per cent trimmed mean for each month, $\Pi^{m}_{j,t}$. The final step is to calculate the jth per cent annualised trimmed mean for each month: $\Pi^{y}_{j,t} = \left((1 + \Pi^{m}_{j,t}) \times (1 + \Pi^{m}_{j,t-1}) \times ... \times (1 + \Pi^{m}_{j,t-11}) - 1\right)$.

It is possible to discard anything from 0 per cent of the most extreme price changes, which is simply the mean of the full distribution, to 50 per cent, which is equivalent to the median.[3] In order to select the optimal trimming percentage, we run a simple horserace, where we assess how well the jth per cent trimmed mean forecasts future CPI inflation. In this race, we also include CPI inflation and CPI excluding energy, food, alcoholic beverages and tobacco inflation (CPI-ex) as benchmarks. Specifically, we calculate the root mean square error (RMSE) from the following equation:

$$\pi_{t+12} = \alpha + \beta x_t + e_t \qquad (1)$$

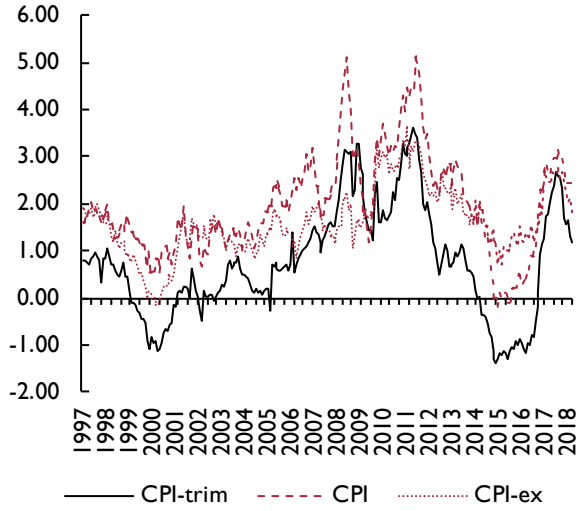
which regresses year ahead CPI inflation, π_{t+12}, on a constant, α, and a measure of inflation (either the jth trimmed mean, CPI or CPI-ex), x_t.

Figure D1. Forecasting inflation: RMSE (percentage points)



Note: RMSE of equation (1) based on the jth per cent trimmed mean. The sample period is January 1997 to June 2018.

Figure D2. Measures of inflation (per cent)



Box D. (continued)

The results are shown in figure D1. The results indicate that the 5 per cent trimmed mean is optimal. In addition, the 5 per cent trimmed mean yields better forecasts of future inflation than the CPI and CPI-ex not only at the 12-month horizon but also at the 24- and 36-month horizons.

Figure D2 plots the 5 per cent trimmed mean, CPI and CPI-ex inflation rates. The three measures are highly correlated, with a correlation coefficient of 0.90 between trimmed mean and CPI inflation and 0.74 between trimmed mean and CPI-ex inflation. The level of CPI-trim inflation is lower on average but more volatile than CPI inflation. These differences are due to how the largest price changes are treated and to how the prices are weighted, as trimmed mean inflation is an unweighted average of a truncated distribution, while CPI inflation is a weighted average of the full distribution.

An important result is how trimmed mean inflation has recently fallen. After the depreciation of sterling in 2016, both trimmed mean inflation and CPI inflation rose sharply following a spell of disinflation. Since October 2017, however, trimmed mean inflation has fallen by 1.5 percentage points, suggesting that the pass-through effects are fading. Based on the latest outturn of trimmed mean inflation, equation (1) suggests that CPI inflation will be 2.2 per cent in a year's time.

NOTES

1 See Dolmas (2005) and Bryan and Cecchetti (1994) for overviews of trimmed mean inflation measures. Trimmed mean inflation is based on the arithmetic mean, while the CPI typically uses the geometric mean.

2 Quotes are linked by the item ID, shop code, shop type and region to form a panel. Items that could not be uniquely linked between months were excluded, as were items where the price is zero.

3 Asymmetric trimmed means can also be calculated, where a different percentage is trimmed from each tail. While we only focus on integers, there are still 2450 possible combinations. For computational reasons, we focus on the 50 possible integers for symmetric trimmed means.

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This box was prepared by Jason Lennard.