

Inflation, Looking at the DATA

The following is taken from Chapter 3 of: <http://www.imf.org/external/pubs/ft/weo/2013/01/pdf/text.pdf>

The notation for equations, figures etc, corresponds to the notation in this document.

The Phillips curve in (3.1) page 3 is a simple straight line one

$$\pi_t = \pi_t^e - \kappa \tilde{u}_t, \quad (3.1)$$

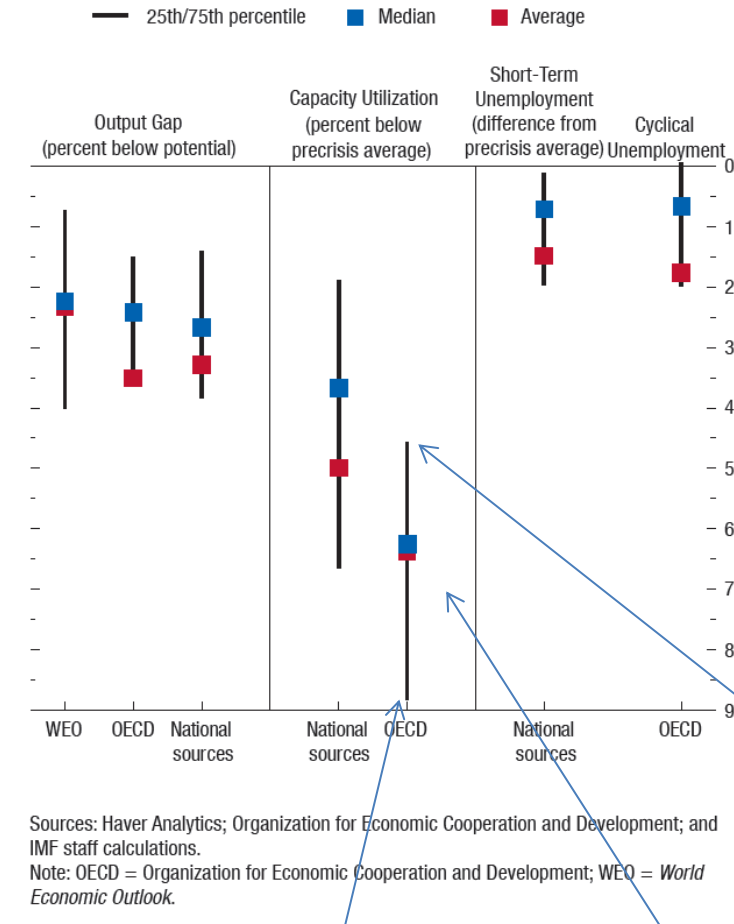
Inflation is π , π^e is expected inflation and κ is the slope of the Phillips curve (a straight line Phillips curve). \tilde{u} is cyclical unemployment, all defined at time t . The chapter is concerned with why inflation is not – in many countries – higher than it currently is. They offer several suggestions. First, inflation may not have fallen much because the increased unemployment was structural and there was minimal change in cyclical unemployment. Second, improved central bank credibility may have made inflation expectations more stable. Finally, the lower level of inflation at the beginning of the Great Recession, or other changes, may account for the reduced inflationary response to cyclical developments—that is, the Phillips curve is flatter than in the past and κ is smaller.

Looking at the Data

Is there slack (unused resources) in the economy?

Figure 3.2. Measures of Current Economic Slack

A wide range of indicators prepared by various institutions suggest that advanced economies are confronting considerable economic slack. This condition is particularly acute in a few countries, as seen in the fact that the cross-country means tend to be above the medians.



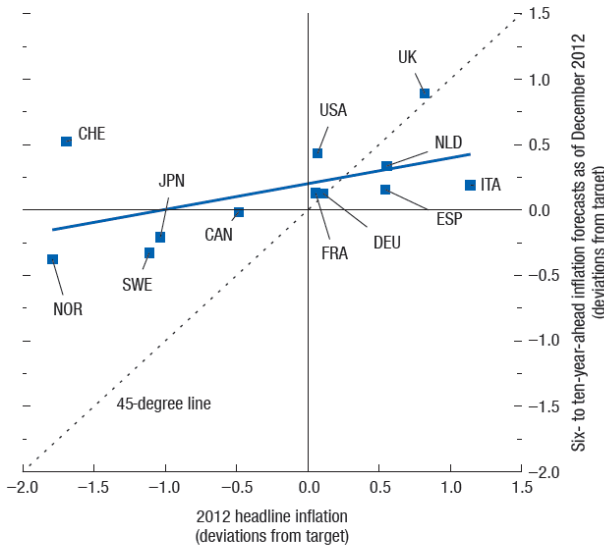
The diagram suggests yes. Take capacity utilisation. The OECD and national authorities estimate that capacity utilisation decreased by about 5 to 6 percent since the beginning of the Great Recession. For the OECD estimate both the mean and the median coincide at a fall of about 6.3%. For some countries this is less than 5% and for others it is close to 9%. The fall in unemployment is smaller but still there. Given the evidence from the output gap (the difference between actual and potential output) and capacity utilisation, they suspect that much of the increase in unemployment is due to cyclical factors.

Could it be expectations being impacted on by central bank's reputations?

Figure 3.3 compares long-term inflation expectations with 2012 inflation rates in advanced economies as deviations from central banks' inflation targets. Although current and expected inflation are positively correlated, the low regression slope suggests that expectations are strongly anchored to the central banks' inflation targets rather than being particularly affected by current inflation levels. Indeed, despite wide variations in actual inflation, long-term inflation expectations remain close to targets.

Figure 3.3. Current Headline Inflation Compared with Expectations

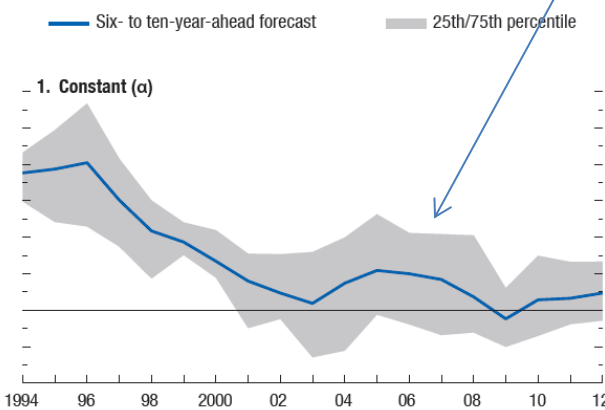
Long-term inflation expectations have remained very close to central banks' targets. This is true even in countries where 2012 inflation was significantly above or below target.



Sources: *Consensus Forecasts*; Organization for Economic Cooperation and Development; and IMF staff calculations.
 Note: CAN = Canada; CHE = Switzerland; DEU = Germany; ESP = Spain; FRA = France; ITA = Italy; JPN = Japan; NLD = Netherlands; NOR = Norway; SWE = Sweden; UK = United Kingdom; USA = United States.

Figure 3.4. Rolling Regressions of Inflation Expectations over Actual Inflation (Net of inflation target)

Inflation expectations are now better anchored to targets and respond less to actual changes in inflation. This is shown below in rolling regressions of inflation expectations over actual inflation in deviations from central banks' targets, which reveal that both the intercept α and the slope β have moved closer to zero.



They then estimated the degree of 'anchoring' over time using the following simple regression:

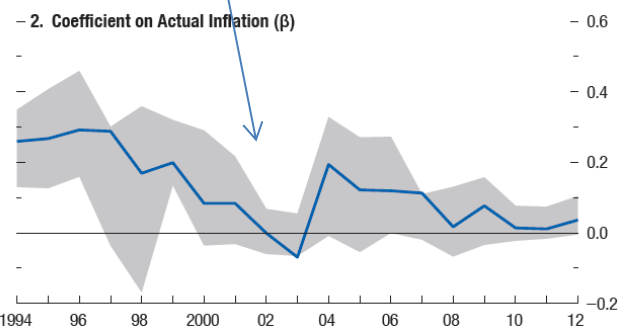
$$\pi_t^e - \pi^* = \alpha + \beta(\pi_t - \pi^*)$$

that is regressing the difference of long term inflation expectations (π_t^e) from the Central Bank's target (π^*) on the difference of inflation (π_t) from the central bank's target. This was done for every 5 year period for 12 advanced economies beginning in 1990, so first regression 1990-1994, then 1991-1995, 1992,1996, etc. That's what a 'rolling five year window' is

Inflation expectations that are strongly anchored to the inflation target should result in estimates for both α and β that are close to zero. A zero β coefficient implies that expectations are not influenced by the contemporaneous level of inflation, and a zero α means that the inflation expectations are centered at the target level.

As can be seen both coefficients are small and approaching zero over time. This suggests that Inflation expectations have become much more anchored around targets during the past two decades.

[Interesting, but they seem to be equating expectations with the views of economic forecasters (the consensus forecasts would be an average of experts forecasts). Now its not obvious to me that ordinary people's expectations can be equated to expert forecasts]. This is an example that economic papers are to be interpreted with caution, they may tell us the truth, they may not, they may tell us something in between.

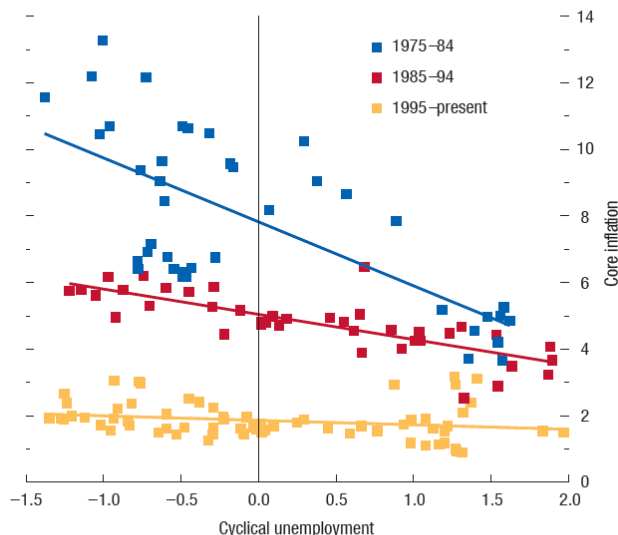


Sources: *Consensus Forecasts*; Organization for Economic Cooperation and Development; and IMF staff calculations.

The relationship between the level of inflation and the responsiveness of inflation to economic slack.

Figure 3.5. Inflation and Cyclical Unemployment
(Percent; average across advanced economies)

From its peak in the 1970s, the average level of inflation has fallen as a result of central banks' disinflationary policies. What is also noticeable is that the relationship between cyclical unemployment and inflation appears to have moderated as the level has fallen.



Sources: Organization for Economic Cooperation and Development; and IMF staff calculations.
Note: Each square represents the average across advanced economies of inflation and cyclical unemployment in one quarter.

Figure 3.5 shows the relationship between cyclical unemployment and the level of inflation. The figure shows the cross-country means of inflation and cyclical unemployment at quarterly frequencies since 1975, with fitted regression lines during several periods.

Broadly speaking, the curve was steep, in the late 1970s and early 1980s, when inflation was high; it was more muted between 1985 and 1994, when many economies experienced disinflation as central banks started establishing the current targeting regimes; and it was particularly flat after 1995, a period of stable inflation around 2 percent.

This preliminary evidence suggests that economic slack persists and that the recent stability of inflation is indicative of greater anchoring of expectations and a more muted relationship between economic slack and inflation.

Econometric estimates

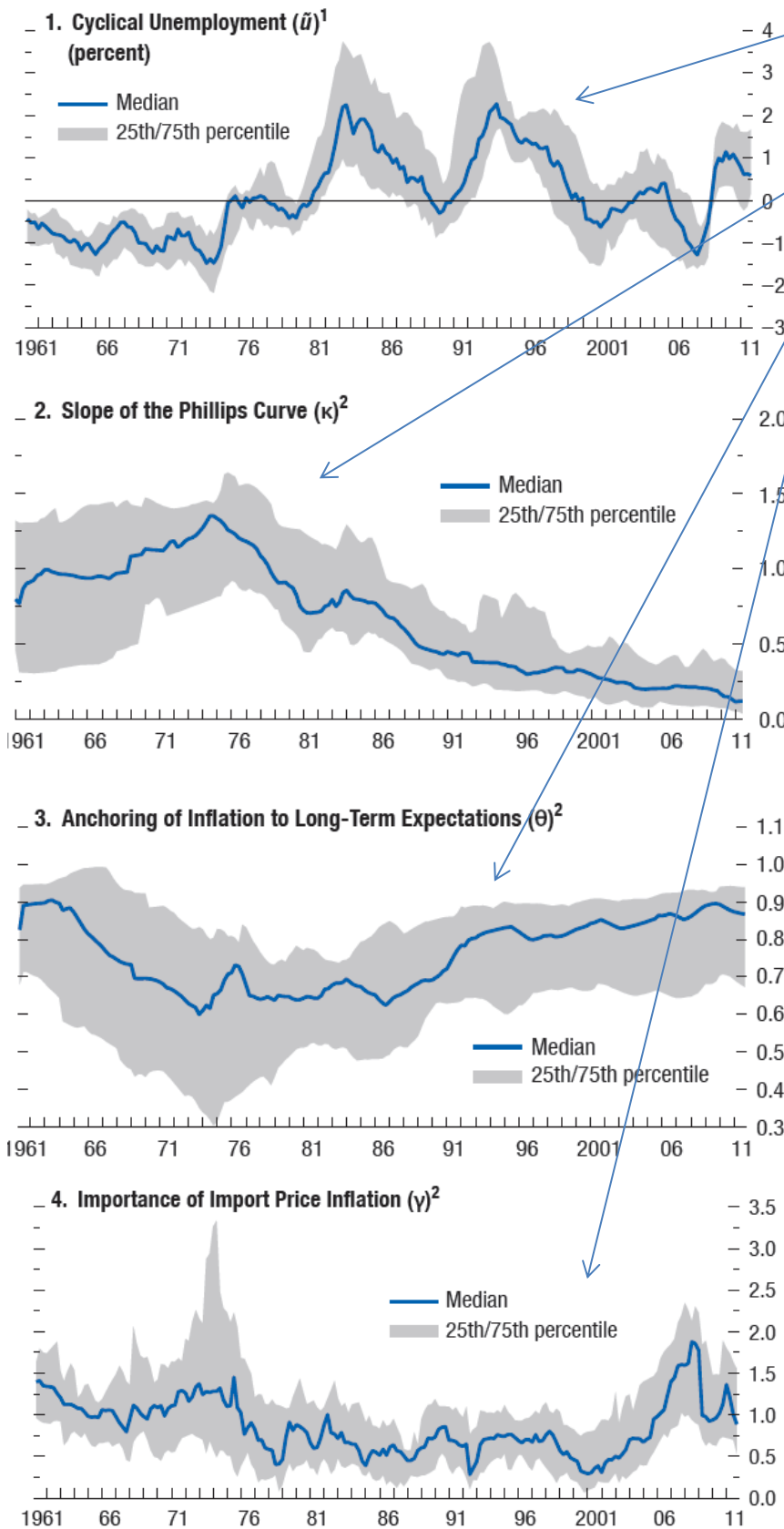
They estimate

$$\pi_t = (1 - \nu)\pi_{t-1} + \nu\pi_t^e - \kappa \tilde{u}_t + \gamma\pi_t^m \quad (3.3 \text{ from their chapter})$$

This is very similar to the New Keynesian Phillips curve given earlier in (3.1), but with lagged inflation added to allow for some inflation persistence. The idea is that when people set wages and prices, they may be incorporating both their expectations about future inflation and the latest actual inflation rate. The parameter ν determines the balance between these two factors. Secondly, they also introduce the import price inflation term, π_t^m , for two reasons. First, headline inflation is used to estimate the regression because historical core inflation data are generally not available. But because headline inflation includes many short-term fluctuations caused by commodity price volatility and because commodities are traded internationally, the import price term allows them to capture many of these fluctuations. Secondly, incorporating import price effects allows them to investigate the contention that globalization makes inflation more dependent on global factors (captured through the import price term) than on domestic factors. Cyclical unemployment, \tilde{u}_t , is derived by subtracting from the unemployment data the estimates of the NAIRU (non-accelerating inflation rate of unemployment). The NAIRU is the level of unemployment which produces a rate of inflation which neither increases or decreases. It is similar to Friedman's natural rate of unemployment and is determined by labour market conditions. It may be viewed as the long-term sustainable rate of unemployment.

They estimate the model for all advanced economies for which data are available, which produces estimates for 21 countries, usually starting in the 1960s. They use an econometric technique which allows the coefficients to vary over time. The diagrams summarise the results.

Figure 3.6. Changes in the Inflation Process



The recent rise in cyclical unemployment is similar to that in previous recessions, although the starting position was lower and there is a significant dispersion across countries.

There has been a decline in the responsiveness of inflation to unemployment—that is, the slope of the Phillips curve—

and a rise in the anchoring to long-term inflation expectations since the 1970s.

There is no clear trend in the importance of import price inflation.

[Not certain - seems it was rising from 2000 to 2008 (the crisis) and then fell sharply.]

Sources: Board of Governors of the Federal Reserve System; *Consensus Forecasts*; Organization for Economic Cooperation and Development; and IMF staff calculations. Note: Country sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

Notes:

1 Unemployment rate minus model-generated estimates of the nonaccelerating inflation rate of unemployment.

2 See equation (3.3) in the text.

These findings are also consistent with much of the earlier research.

First, many researchers find evidence that, since the mid-1990s, inflation has become better anchored around long-term expectations, which themselves have become more stable (for example: for example, Stock and Watson (2007) and Kuttner and Robinson (2010).) It is natural to associate this with the simultaneous trends toward more central bank independence and the adoption of inflation-targeting regimes across advanced economies.

Second, the observed flattening of the Phillips curve as inflation rates declined is consistent with evidence that there is downward nominal wage rigidity—that is, people are very resistant to nominal wage reductions (Yellen, 2012). The flattening of the Phillips curve at low levels of inflation may also reflect the fact that there are costs associated with adjusting nominal prices that lead firms to change prices less frequently when inflation is lower (Ball, Mankiw, and Romer, 1988). Cross-country evidence compiled by Klenow and Malin (2010) confirms that firms do change prices less frequently when inflation is lower.

As to whether globalization has affected the slope of the Phillips curve, consistent with their findings on the import price parameter, the evidence so far is either inconclusive or negative (Ball, 2006; Gaiotti, 2010)

Thus overall inflation stability during the Great Recession reflects a flat Phillips curve and the anchoring of inflation expectations, the paper concludes that “there seems little risk of strong inflation pressure during the ongoing recovery”. This may be optimistic, given the amount of quantitative easing I would have thought increased inflationary pressures in 5 years time is a distinct possibility.

Over the past couple of decades, many central banks have adopted inflation targeting or similar frameworks. These decades, at least until the Great Recession, were also some of the least troubled from a macroeconomic point of view, with stable economic growth and lengthy expansions. Indeed, some have linked ‘the Great Moderation’ (preceded the Great recession) with improvements to monetary policymaking over this period. And the acceptability of these frameworks by the public was certainly helped by their seeming ability to deliver stable inflation, low unemployment, and stable output growth.

The Great Recession changed all that. There are suggestions that, particularly in the current economic circumstances, *inflation-targeting frameworks* may be less than optimal. Wren-Lewis (2013) suggests that the combination of a flatter Phillips curve and persistent shocks to inflation that are unrelated to domestic cyclical conditions means that central banks may end up stabilizing inflation at the cost of economic growth. For example, central banks may cease providing stimulus to an economy that is experiencing high inflation due to exchange rate effects or commodity price cycles, even though unemployment remains high and there are large amounts of economic slack. Analogously, stabilizing inflation may involve much larger swings in economic activity than in the past because the flatter Phillips curve means central banks must effect larger changes in economic slack (i.e. unemployment) to obtain a given change in inflation.

These considerations suggest a need to reconsider how monetary policy can best contribute to general economic welfare under the circumstances now facing advanced economies. Any such reconsideration should, however, clearly recognize that the stability of inflation and the anchoring of expectations are essential in order to avoid repeating the experiences of the 1970s.

The key issue is whether there is a need to modify the monetary policy framework to ensure that stabilizing inflation is more consistent with stabilizing output. Various central banks have already adopted “flexible inflation-targeting” regimes that give weight to output stabilization if it is not in conflict with their inflation targets. For example, inflation is allowed to deviate from the target for extended periods if it results from external (e.g. oil) or tax shocks. To the extent that such shocks are now more important relative to domestic

cyclical conditions, extra flexibility may be appropriate. For example, in countries with considerable economic slack, the central bank can react less aggressively than in the past when inflation fluctuates above the target, provided expectations remain anchored.

Another approach is to focus on inflation measures other than the consumer price index that respond more closely to domestic cyclical conditions. For example, targets could be defined in terms of the rate of increase in labor earnings net of productivity gains. Monetary policy would thus be tightened when abnormal increases in wages signal bottlenecks in the labor market.

Another suggestion is to give asset price inflation (e.g. house price increases) more prominence in monetary policymaking, given the large asset price rises that occurred during the first decade of the 2000s and their role in the financial crisis.

A more far-reaching approach would complement the inflation target with an explicit mandate to stabilize output. In this “dual-mandate framework”, central banks’ decisions would be based not only on their views about inflation, but also on direct measures of output and unemployment gaps. Central banks would thus have more discretion to allow inflation fluctuations if addressing them would exacerbate cyclical downturns.

There is some debate about whether such a dual mandate is compatible with inflation targeting. Bullard (2012) argues that the two are compatible and that differences amount only to the relative weight that is placed on inflation and output fluctuations. Central banks are already making use of whatever flexibility they have in responding to the unprecedented circumstances following the Great Recession. However, changes in the behavior of inflation and profound challenges in the aftermath of the Great Recession may mean there is need for even greater flexibility. As such, it is worth thinking about whether improvements can be made to frameworks in light of the changed circumstances.

In terms of regional factors. Lower inflation probably means less price variability within countries. This will limit the possibility for regions of high unemployment to become more competitive by seeing lower price and wage growth than the more prosperous regions. But as already emphasised, this period of low inflation may not last that long, given the degree of quantitative easing.