International evidence on inflation expectations during Sustained Off-Target Inflation (SOTI) episodes

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Abstract

This paper analyses inflation expectations during Sustained Off-Target Inflation (SOTI) episodes in inflation-targeting countries. The evidence suggests that short and medium-term inflation expectations have tended to drift in the direction of the deviation of inflation from target. But these movements are driven by movements in inflation itself as well as the output gap: we find no evidence that the inflation expectations generating process is systematically different in SOTI episodes relative to periods when inflation is closer to target. We find evidence that survey measures of medium-term inflation expectations do affect wage inflation, although such measures account for only a small part of the overall variability of wages.

Key words: Inflation expectations, inflation, wages

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Summary

The relatively high level of UK inflation in recent years raises the possibility that inflation expectations may drift upwards, making the period of high inflation persist for longer. There are various channels through which inflation expectations can influence inflation. For example, if households expect high inflation in the future, they are likely to demand higher nominal wages and thus push up on companies' costs. And if companies expect to bear higher production costs, then they will raise their own prices for the goods and services they produce.

Since 1992, when inflation targeting was introduced in the United Kingdom, inflation has generally been close to its target, so this paper considers lessons from the experience of other inflation targeting countries that have seen inflation persistently deviate from target. Prior to the current episode there was only one other period when inflation was persistently away from target in the United Kingdom – what the paper refers to as Sustained Off-Target Inflation (SOTI) episode. This article therefore expands this sample by collecting data on household and firm expectations for another thirteen countries, providing a total sample of 23 SOTI episodes (not including the current UK experience). This paper examines only other inflation targeting countries given this monetary policy regime provides a metric to determine 'off-target' inflation and is comparable to the current regime in the United Kingdom.

The evidence suggests that short and medium-term inflation expectations have tended, on average, to drift in the direction of the deviation of inflation from target. But generally the movements in inflation expectations were more gradual than movements in inflation itself, and expectations returned to their previous level once inflation returned to target.

Although inflation expectations drift in the direction of the deviation of inflation from target during a SOTI episode, underlying factors drive the deviation of expectations rather than the simple fact that a country is experiencing a SOTI episode. When allowance is made for the effects of inflation, the inflation target, the output gap and the age of the inflation targeting regime, there is no evidence that inflation expectations behave differently in SOTI episodes compared with times when inflation is close to target.

Having observed that inflation expectations do pick up during SOTI episodes, an important question for policymakers is whether this feeds through into higher wages (and hence into prices). An estimated model of nominal wage inflation that allows for the effects of productivity and unemployment on wages finds that short-term inflation expectations do not help explain wage inflation, but medium-term expectations do. However, even with survey data on inflation expectations, the model can explain only a small proportion of the overall variability of wage inflation. This suggests that the effect of measured inflation expectations on short-term movements in wages is relatively small.

The paper then compares the current UK experience with what might have been expected given past experience in other countries. The current UK experience is atypical, with inflation expectations moving both up and down during the current SOTI episode, probably reflecting the temporary fall back in inflation part way through the current UK SOTI episode. Comparisons between the current UK experience and that of other countries that had SOTI episodes of a similar length are clouded by volatility in the inflation expectations data and the limited sample of countries that have experienced long SOTI episodes. The deviation of UK inflation expectations appears to be lower than what might have been expected just on the basis of the duration of the SOTI episode. However, analysis suggests that differences in the underlying state of the economy drive this result. Once differences in the output gap and the deviation in inflation from target are accounted for, the level of UK inflation expectations in 2011 is broadly in line with projections based on past international experience.

1 Introduction

New Zealand was the first country to adopt a formal inflation target in December 1989, with a host of others including Australia, Canada, Chile, Israel and the United Kingdom subsequently following suit.[1] In such a regime, the key aim for policy makers, as Bernanke et al (1999) highlight, is to provide a credible commitment to anchor inflation expectations at a known low level.[2] Svensson (1997) argues that the target simplifies the assessment of policymakers' performance (through the measurement of ex post deviations from target) and the credibility of the regime (through the comparison of inflation expectations to the target). This in turn increases the strength of the commitment mechanism, reducing any inflation bias.

But even with inflation targeting it is not easy to assess the performance of policymakers. As Svensson notes, the lag between the peak effect of monetary policy on inflation means the success of current monetary policy can only be assessed with a long lag. Despite this, Corbo et al (2002), Levin et al (2004) and Gurkaynak et al (2006) found empirical evidence that expectations are better anchored in inflation targeting economies than elsewhere. Kuttner and Posen (1999) attribute this to an increased transparency under inflation targeting, directly through setting a target and publishing forecasts, which in turn allows monetary policy to react with greater flexibility to price shocks.

However, what happens when inflation deviates from the target for a prolonged period? Does the benefit of inflation targeting hold? In such a scenario, inflation expectations may move as people begin to view policy makers as unwilling or unable to keep inflation at the target. Empirical studies are yet to focus on Sustained Off-Target Inflation (SOTI) episodes, so this paper aims to fill that gap.[3] We therefore propose to answer two sets of questions:

1) Do SOTI episodes cause inflation expectations at a short, medium or long-term horizon to drift in the direction of the deviation in inflation from target? Is any such movement greater than what can be explained by normal macroeconomic factors?
2) Do variations in inflation expectations affect wage growth and is the effect different during SOTI episodes?

The paper is structured as follows: section two outlines how our paper relates to the existing literature on inflation expectations and section three outlines our data and explains how our sample of international SOTI episodes was constructed. Subsequent sections (four and five) observe the behaviour of inflation during SOTI episodes before considering the movements in

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[1] See Hammond (2011) for a full list of inflation targeting countries and information regarding each regime.
[2] Not necessarily the level of the inflation target itself. For example UK households have often perceived inflation to be greater than it actually was, and thus expectations are likely to suffer from the same upward bias.
[3] Corder and Eckloff (2011) presented a description of movements of inflation expectations during SOTI episodes, but did not attempt to control for the underlying causes of the deviation in inflation or the cyclical developments in each country.

inflation expectations during and immediately after them. Section six discusses a simple empirical model of expectations and assesses whether expectations behave differently in SOTI episodes. Section seven then presents a simple empirical model of wages incorporating inflation expectations. Finally we consider the implications for the United Kingdom and present our main conclusions.

2   Relation to the literature

New Keynesian models generally assume people have rational, forward-looking, model consistent expectations, which, assuming there were no unexpected shocks, would precede movements in inflation. But given the difficultly in observing economic activity and the shocks hitting the economy, Lucas (1973) noted that people face a signal-extraction problem that delays their ability to process information. A more substantial counter to rational expectations is that the cost of forming such expectations, such as the time taken processing economic news, often outweighs the benefit gained (Sims (1998, 2003)).

One response to the costs of forming expectations is for agents to update their expectations infrequently. Mankiw and Reis (2002) formulated a 'sticky information' framework that assumes only a proportion of households update their expectations each period. Barnett et al (2010) tested their framework for the United Kingdom and estimated that UK households update their information sets once every year.

The other response to the costs of forming expectations is for agents to use simpler methods for forming expectations. An early example of this is 'adaptive expectations', which was first used to model hyperinflation (Cagan (1956)) and demand and supply in the agricultural sector (Nerlove (1958)). In these models, households simply adjust their previous expectations (   ) by some proportion ( ) of their forecast error (   ):

Posen (2011) found evidence that a range of recent data determines short-term inflation expectations, but there is no sign of a memory effect beyond that. More sophisticated backward-looking expectation processes, described as 'adaptive learning', have been presented by Evans & Honkaphoja (2001), who suggested that households base expectations on their recent experiences, and Carroll (2003), who argued that households process information through media references to inflation. Branch (2004) argued that US household inflation expectations are consistent with people rationally switching between different models of inflation with varying complexity depending on the relative cost and accuracy of the models. In a similar vein, Brazier et al (2008) suggested that people would switch between different 'heuristics' – or rules of thumb – in forming expectations dependent on the forecasting success of each.

All these models demonstrate ways in which inflation expectations can deviate from the simple model consistent expectations. We do not test any of these models specifically in this paper. Instead we attempt to fit our international data to a hybrid new Keynesian Phillips curve, and then consider whether the fit is improved by allowing for differences in the behaviour of inflation expectations during SOTI episodes.

3 Data sources, definitions and composition of the sample

3.1 Inflation expectations data

We collected data on inflation expectations at short, medium and long-term horizons throughout our identified SOTI episodes. We define short-term as expectations at the one-year horizon; medium-term the 2 to 4 year horizon and long-term as anything in excess of the four year horizon. Our data comes from a variety of international sources; these are listed in Appendix 1.

Given the limited number of countries with data on household inflation expectations, this paper also includes business surveys to produce as large a sample of expectations as possible. Where a country had multiple surveys at a specific time horizon (for example, both household and business surveys at a short-term horizon), the median was used. Chart 1 plots the six-month change in household expectations against the change in business expectations for those countries in the sample with both. Whilst household inflation expectations appear to have been more variable, they have tended to respond to news in the same direction. This relationship holds during SOTI episodes (Chart 2). Analysis of the movements in inflation expectations during SOTI episodes suggested that excluding business expectations had only a small effect on the median measure and did not offset the gains from having a larger sample size.

Chart 1: Relationship between household and business inflation expectations
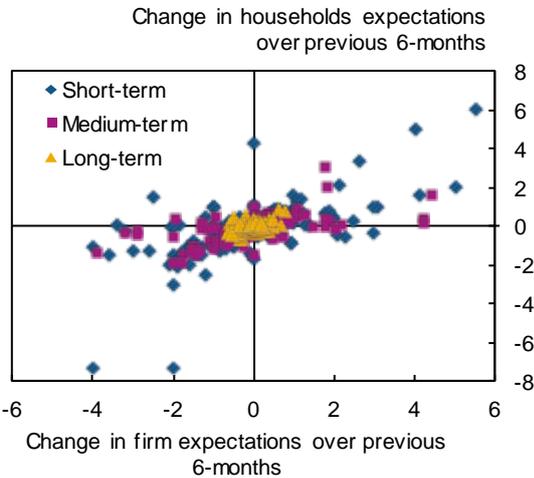
Source: National sources and Bank calculations.

Chart 2: Relationship between household and business inflation expectations (SOTI episodes only)
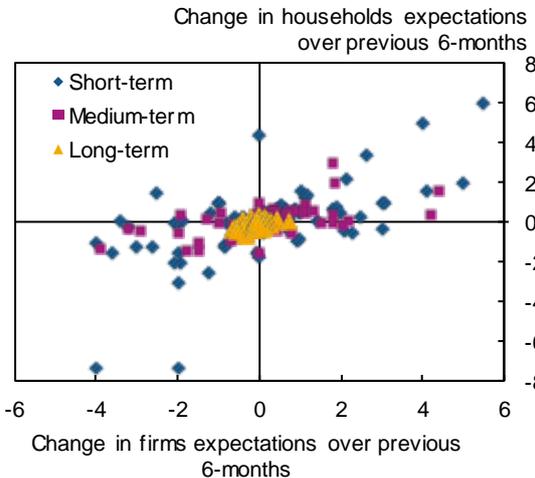
Source: National sources and Bank calculations.

3.2   Definition of a SOTI episode

This paper uses each country's inflation target as a metric for assessing 'normal' levels of inflation. This provides a way to categorise periods of persistently high or low inflation, referred to as SOTI episodes, by comparing inflation with the target at each point in time. The definition of 'off target' used in this paper depends on the precise nature of the inflation target being used. For countries with a target range (e.g. Australia: 2%-3%) or a point target with a tolerance band (e.g. South Korea: 3% ±1pp), inflation is 'off target' if it is outside that range or tolerance band. For these countries the deviation from 'target' is defined as the difference between inflation and the range or band. For those countries with a point target and no tolerance band (e.g. United Kingdom: 2%), the 'target' is defined as the point target plus or minus 0.5 percentage points. Inflation is therefore deemed 'off target' if it moves outside that range.[4] Consequently our definition ignores small deviations in inflation from the point target that are unlikely to have significant effects on inflation expectations.

There are two main criteria used to define a SOTI episode:

1) Inflation must have been 'off target' for 75% of any period of 24 months or more; and
2) It begins more than 18 months after an announcement of the adoption of inflation-targeting (not necessarily the adoption itself).

The first criterion implies SOTI episodes must be at least 18 months long. Brief one-off price shocks, which appear in the annual inflation data for a year before dropping out, are therefore not included in the sample. A period of 18 months also allows time for people to update their expectations, at least if people in all countries in our sample are similar to those in the UK and update expectations once a year as suggested by Barnett et al (2010). The second criterion aims to exclude any transitory movements in inflation expectations during changes in the monetary policy regime where inflation expectations may have been affected by the introduction of a target as well as any deviation in inflation from that target.

For practical purposes, two other conventions for defining a SOTI episode are used. The first is that both the start and end date of a SOTI episode must themselves be periods of 'off target' inflation. This allows us to define SOTI episodes of less than 24 months if the deviation from 'target' is concentrated within a continuous period of 18 months or more.[5] The second relates to economies that use or have used a year-end or average inflation target, as opposed to a continuous target. This type of target is problematic in determining SOTI episodes as it provides only one point per year where inflation performance can be measured. Therefore in our analysis, a year-end target is treated as a continuous target throughout the whole year. This

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[4] The choice of 50bp is somewhat arbitrary, but we chose it to be narrower than the target ranges used by any country using such a range. Some central banks with point targets, such as the Bank of England, use 'open letters' as part of their accountability to national parliaments, but the Bank has stressed that the thresholds that trigger an open letter are not a target range.

[5] For example, if inflation was at 'target' for the first 5 months of a 24-month period and then 'off target' thereafter, only the 19 'off target' months would be classed as a SOTI episode.

is consistent with the technique used by many central banks with year-end targets, as they often evaluate intra-annual inflation outturns against their December target (e.g. Polish Inflation Report, Q3 2002). Average inflation targets are also treated as continuous targets throughout our analysis to avoid similar restrictions. Table A lists all episodes meeting these criteria.[6]

3.3   Other data

Alongside data on inflation and inflation expectations we also gathered data on the output and unemployment gaps, wages and productivity. Output gap estimates were derived from a Hodrick-Prescott filter of quarterly GDP data.[7] Unemployment gaps were estimated by collecting both unemployment and NAIRU series for each country in our sample, from the OECD Economic Outlook publication. This publication was also used for our productivity (output per person) data for all but those countries where the series had been discontinued. For these countries, we constructed a similar productivity index using output and employment data from national sources. For nominal wages, data on compensation per employee were obtained for most countries from the OECDs' Economic Outlook, Main Economic Indicators and Quarterly National Accounts databases. National sources were used to generate comparable series for New Zealand and Mexico.

Table A: Sustained Off-Target Inflation (SOTI) episodes

Country	Date	Above/below 'target'
Australia	Q1 1995 - Q2 1996	Above
Australia	Q4 1996 - Q4 1999	Below
Australia	Q2 2000 - Q4 2001	Above
Colombia	Q4 2002 - Q2 2004	Above
Colombia	Q1 2007 - Q1 2009	Above
Czech Republic	Q2 2002 - Q3 2005	Below
Hungary	Q1 2003 - Q4 2004	Above
Hungary	Q4 2006 - Q2 2011	Above
Iceland	Q2 2004 - Now	Above
Korea	Q3 2005 - Q3 2007	Below
Mexico	Q3 2002 - Q2 2005	Above
Mexico	Q2 2008 - Q4 2010	Above
New Zealand	Q4 1994 - Q4 1996	Above
Norway	Q3 2003 - Q4 2007	Below
Poland	Q3 2001 - Q4 2003	Below
Poland	Q4 2007 - Q3 2009	Above
South Africa	Q1 2002 - Q3 2003	Above
South Africa	Q2 2007 - Q4 2009	Above
Sweden	Q2 1996 - Q3 2000	Below
Sweden	Q1 2004 - Q1 2006	Below
Sweden	Q1 2009 - Q3 2010	Below
UK	Q3 1995 - Q1 1997	Above
UK	Q2 2008 - Now	Above

Sources: National sources, Thompson Reuters DataStream and Bank calculations

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[6] The table excludes episodes where surveys of inflation expectations for households or firms are not available (eg Turkey and Brazil). Canada is also not in our sample as the country did not experience a SOTI episode since it adopted inflation targeting. Deviations from 'target' are measured at the same frequency as the inflation data are themselves published (i.e. generally monthly). As many inflation expectations surveys are conducted quarterly, the analysis in this article uses quarterly data. A quarter is included at the start of a SOTI period if inflation is 'off target' in the first or second month of that quarter. A quarter is included at the end of a SOTI period if inflation is 'off target' in the second or third month of that quarter.
[7] The results are similar to OECD estimates that utilise a production function approach based on data for total factor productivity, capital services and potential employment (Beffy et al (2006)). The HP filter estimate allows us to include a wider range of countries in our sample.

4   Inflation during SOTI episodes

Chart 3 shows a swathe representing the interquartile range of deviations in inflation from 'target' — as defined earlier — throughout our identified SOTI episodes. In addition it shows the deviation of UK CPI inflation from 'target' throughout the current UK episode. At each quarter into each SOTI episode in the sample, the deviations from 'target' are calculated and the interquartile range of these deviations measured. Zero on the x-axis is the last point at which inflation was at 'target'. Deviations in 'below-target' SOTI episodes are inverted to make the movement in inflation comparable to 'above-target' SOTI episodes — thus the y-axis represents the standardised movement in inflation from 'target'.[8]

The median length of SOTI episodes in our sample is nine quarters, varying from just six quarters — the minimum possible given the definition of a SOTI episode — to 29 quarters. Individual SOTI episodes are dropped from the sample once they end. This has the effect of gradually reducing the sample size shown in the swathe in Chart 3 from 22 episodes after six quarters to only six episodes after thirteen quarters. Chart 3 indicates this reduction in sample size by the lighter shades on the right-hand side of the swathe. Changes in the sample size mean that movements in the swathe and in the median deviation may reflect changes in sample as well as movements in inflation itself.

Chart 3: Inflation throughout SOTI episodes[a]

Standardised change relative to target range (percentage points)[b]

Quarters into SOTI period
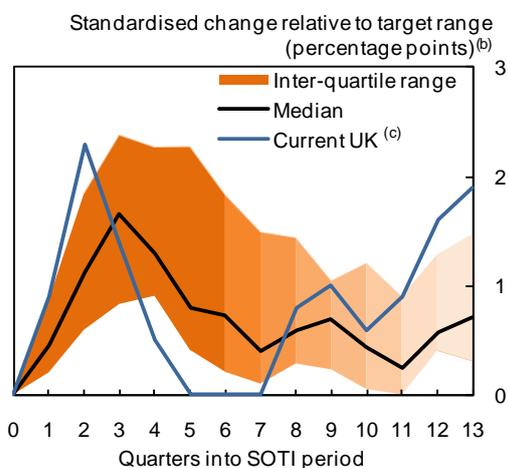
Sources: National sources, Thomson Reuters DataStream and Bank calculations.
(a) The chart shows deviations from 'target' as defined in the article. Thus for countries with a target range or a point target with a tolerance band, inflation is 'off target' if inflation is outside that range or band. For countries with a point target and no tolerance band, such as the United Kingdom, inflation is 'off target' if the deviation from the point target exceeds 0.5 percentage points. Thus in the case of the United Kingdom, CPI inflation must either exceed 2.5% or fall below 1.5% to be deemed 'off target'.
(b) Deviations in 'below-target' SOTI episodes are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI episodes.
(c) The current UK SOTI episode began in 2008 Q2.

Chart 3 shows that, on average, inflation deviations picked up from the start of the SOTI episode, deviating around 1.7 percentage points from 'target' after three quarters. Inflation deviations then gradually fell back. The median deviation of inflation from 'target' remains above zero throughout Chart 3 as countries that have returned to 'target' are dropped from the sample. The current UK experience looks atypical, with a sharp fall in inflation in the middle of

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[8] Analysis suggests that inflation expectations move by a similar magnitude when inflation rises above or falls below its 'target'. So analysing standardised moves in inflation expectations should not bias the results.

the SOTI episode, in part reflecting the cut in VAT and the fall in energy prices following the global recession. It is also currently four quarters longer than the median SOTI episode length. Furthermore on the basis of the MPC's February 2012 *Inflation Report* forecast, which estimates CPI inflation will return to 'target' in 2012 Q3, the current UK SOTI episode may extend to 17 quarters. Only four of the 22 other episodes have lasted longer than four years.

5   How did inflation expectations react during SOTI episodes?

5.1   Short-term inflation expectations

As might be expected, one-year-ahead inflation expectations tended to move in line with inflation developments. Chart 4 shows a swathe constructed in a similar manner to Chart 3, but now evaluates the deviation in one-year-ahead inflation expectations from their four-quarter average prior to the SOTI episode. To compare movements in inflation expectations across both 'above-target' and 'below-target' SOTI episodes, the sign of the movement in inflation expectations is standardised so that movements in inflation expectations in the same direction as the movement in inflation are treated as positive values. Thus a positive value either means that inflation expectations rose during an 'above-target' SOTI episode or fell when inflation fell persistently below 'target'. The chart also shows the movements in one-year-ahead inflation expectations in the current UK SOTI episode, where negative values

Chart 4: One-year-ahead inflation expectations

Standardised change relative to pre-SOTI four-quarter average (percentage points)[a]
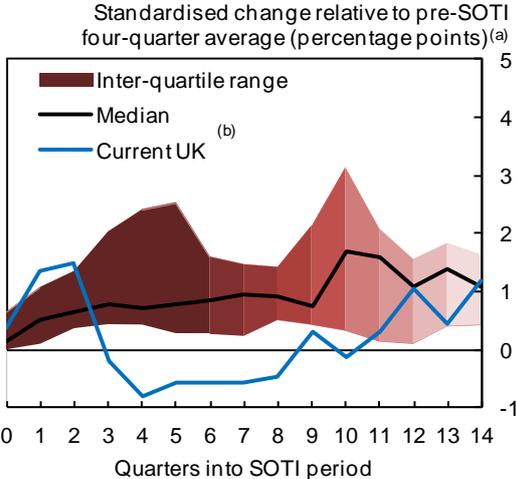
Sources: Bank of England, Barclays Capital, Citigroup, GfK NOP, national central banks, Thomson Reuters DataStream, YouGov and Bank calculations.

(a) Deviations in 'below-target' SOTI episodes are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI episodes. A negative value therefore implies that expectations are either below their pre-SOTI average in 'above-target' SOTI episodes or above their pre-SOTI average in 'below-target' SOTI episodes.

(b) The median of the Bank/NOP, Barclays Basix and YouGov/Citigroup surveys at the one-year horizon.

indicate that inflation expectations fell even though inflation deviated above 'target' for most of the episode.

Chart 4 shows that, over the first thirteen quarters of the SOTI episodes in our sample, one year ahead inflation expectations on average moved just under one percentage point in the direction of the deviation from 'target' away from their average in the four-quarters prior to the start of the SOTI episode. Table B shows this move is statistically different from zero (the higher average deviation from zero reported in Table B reflects the difference between the mean and median deviation from the pre-SOTI average). This is significantly less than the peak

movement in inflation, but the drift in inflation expectations is more persistent than the move in inflation. The chart also shows that UK inflation expectations picked up more sharply early in the current SOTI episode, but fell sharply as inflation also fell. Expectations have since risen again to be more in line with other countries' experience. The latest data, however, have highlighted the volatility in the survey measures of one-year-ahead inflation expectations.

Table B: Statistical significance of absolute deviation of inflation expectations from pre-SOTI average[a]

	Short-term		Medium term		Long term	
Constant (all data)	**1.05**	(0.10)	**0.75**	(0.09)	0.00	(0.05)
Constant (first 13 quarters of SOTI only)	**1.07**	(0.11)	**0.77**	(0.10)	0.00	(0.05)
Constant (matched sample and first 13 quarters only)	**1.01**	(0.11)	**0.77**	(0.10)		

(a) Coefficients shown in bold are significant at the 5% confidence level. Values in brackets are the coefficient standard errors.

5.2   Medium-term inflation expectations

Chart 5 evaluates movements in medium-term expectations — at a two or four-year horizon — compared to their pre-SOTI four-quarter average and presents them in a similar manner to Chart 4. Inflation expectations on this measure also appear to drift in the direction of the deviation of inflation from target. And this is confirmed by simple statistical tests which show the average movement in medium-term inflation expectations is statistically different from zero (Table B). Again the current UK experience is atypical: inflation expectations fell sharply two quarters into the current SOTI episode as inflation also fell. There is some evidence that expectations drifted up again as inflation picked up part way through the SOTI episode, although the data are again volatile.

Chart 5: Two to four year ahead inflation expectations
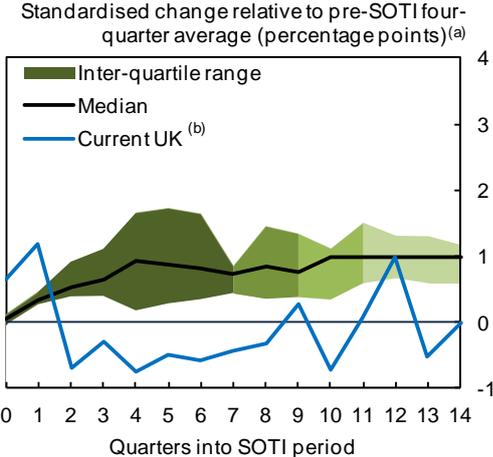
Standardised change relative to pre-SOTI four-quarter average (percentage points)[a]

Sources: Barclays Capital, national central banks, Thomson Reuters DataStream and Bank calculations.

(a) Deviations in 'below-target' SOTI episodes are inverted to make the deviations from 'target' comparable to 'above-target' SOTI episodes. A negative value therefore implies that expectations are either below their pre-SOTI average in 'above-target' SOTI episodes or above their pre-SOTI average in 'below-target' SOTI episodes.

(b) Barclays Basix survey at the two-year horizon. The Bank/NOP survey at the same horizon could not be used as it began part way through the current SOTI episode.

Analysis suggests that medium-term expectations are less variable than short-term expectations. The median standardised change in medium-term expectations two years into a SOTI episode was similar to that shown in Chart 4. But not all countries have medium-term inflation expectations data. This means the median lines in Chart 4 and Chart 5 are not strictly

comparable. Chart 6 shows a scatter plot of the deviation in short-term and medium-term inflation expectations from their pre-SOTI average for a matched sample at every point throughout the SOTI episodes. The majority of the data are tilted relative to the 45° line, indicating that changes in medium-term inflation expectations are smaller than those for short-term expectations. Table B also suggests that the average deviation in medium-term inflation expectations is smaller than that for short-term expectations in a matched sample.

Chart 6: Comparison of changes of short and medium-term inflation expectations

Sources: Barclays Capital, national central banks, Thomson Reuters DataStream and Bank calculations.

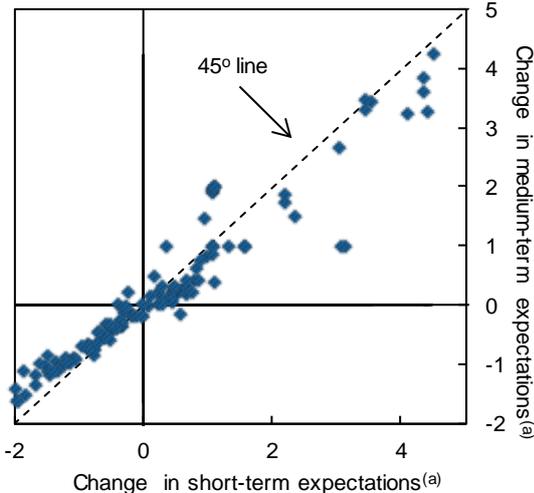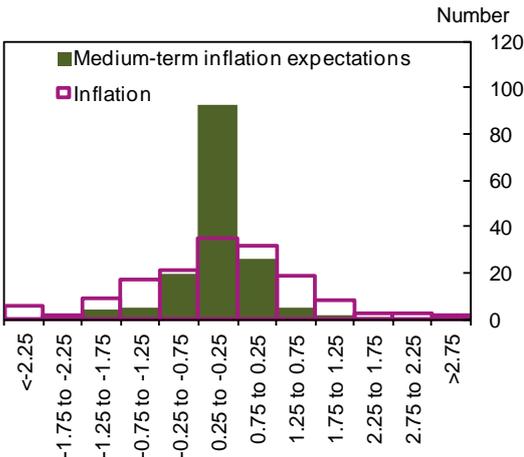(a) Percentage point change relative to four-quarter average prior to SOTI episode. Sample excludes two outliers from the end of the Icelandic SOTI episode.

Chart 7: Distribution of quarterly changes in inflation and inflation expectations

Sources: Thomson Reuters DataStream and Bank calculations.

Both Chart 4 and Chart 5 suggest there is little evidence of a sharp movement in inflation expectations. Movements in expectations tended to accumulate gradually over time and were generally smaller than those in annual inflation itself (Chart 7). This suggests that policymakers should be wary of a slow drift up in inflation expectations rather than looking for sudden movements.

5.3   Long-term inflation expectations

Few countries have assembled surveys that measure inflation expectations at the five-year horizon; Norway and Sweden are the only countries to have collected these data during previous SOTI episodes.[9] Drawing robust conclusions from the four available episodes from these two countries is obviously fraught with difficulty.

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[9] Market measures of inflation expectations are available for some countries, but as explained in Macallan *et al* (2011), not all the movement in these measures can be attributed to movements in inflation expectations. This article does not consider these measures of inflation expectations.

At first glance, Chart 8 might suggest that longer-term inflation expectations did react to SOTI episodes in these two countries – but this is misleading. The large deviation in inflation expectations in Sweden in the late-1990s did accompany a period when inflation was persistently below target, but it also followed the introduction of the inflation targeting regime. The fall appears to reflect the convergence of inflation expectations towards the new target, rather than a response to the deviation of inflation from target. Ignoring this case, the evidence from Norway and Sweden's later SOTI episode suggests that inflation expectations are reasonably well-anchored at their respective central targets (Chart 8). The median deviation in long-term inflation expectations in this small

Chart 8: Five-year-ahead inflation expectations
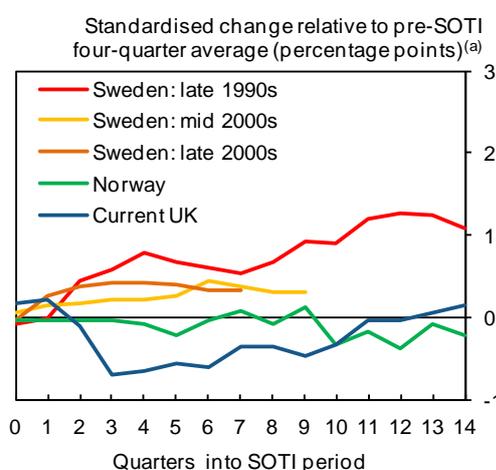
Standardised change relative to pre-SOTI four-quarter average (percentage points)[a]

Sources: Thomson Reuters DataStream and Bank calculations.
(a) Deviations in 'below-target' SOTI episodes are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI episodes. A negative value therefore implies that expectations are either below their pre-SOTI average in 'above-target' SOTI episodes or above their pre-SOTI average in 'below-target' SOTI episodes.

sample is less than that for short and medium-term expectations. And simple statistical tests show that the movements in long-term inflation expectations are not statistically different from zero (Table B). UK long-term inflation expectations (as measured by the YouGov/Citigroup survey of expectations 5–10 years out) are similarly little changed.[10]

5.4   How did inflation expectations react after the SOTI episode?
An important question for policymakers is how quickly, if at all, inflation expectations return to their pre-SOTI average. Chart 9 and Chart 10 show how short- and medium-term inflation expectations moved at the end of SOTI episodes. Zero on the x-axis is the final quarter of the SOTI episode.[11] Some countries' SOTI episodes ended within the past two years so data is not available for the full eight quarters after the SOTI episode ended. As in earlier charts, when a country falls out of the sample due to a lack of data, the shading of the interquartile range changes to reflect this.

The evidence suggests that inflation expectations did return to their pre-SOTI average, but only after inflation itself returned to 'target'. Chart 9 suggests that short-term expectations reached their pre-SOTI average after around three to six quarters. Chart 10 shows a similar chart for medium-term inflation expectations at the end of SOTI episodes. If households and businesses

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[10] The Bank/NOP and Barclays Basix surveys at the five-year horizon could not be used as they began part way through the current SOTI episode.
[11] As in earlier charts, inflation is defined as back at 'target' if it is within the central bank's target range or tolerance level limit (or within 0.5 percentage points of the target for those central banks with a point target and no tolerance range).

were forward-looking, medium-term inflation expectations would fall back to target before short-term expectations. But, if anything, Chart 10 suggests that medium-term expectations take longer than short-term expectations to return to their pre-SOTI average. This may indicate that many households are backward-looking, extrapolating both short and medium-term expectations from recent inflation.

Chart 9: One-year ahead inflation expectations after SOTI episodes[a]
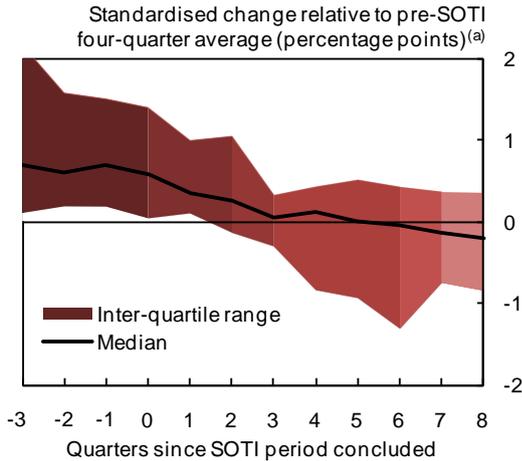
Standardised change relative to pre-SOTI four-quarter average (percentage points)[a]

Quarters since SOTI period concluded

Sources: National central banks, Thomson Reuters DataStream and Bank calculations.

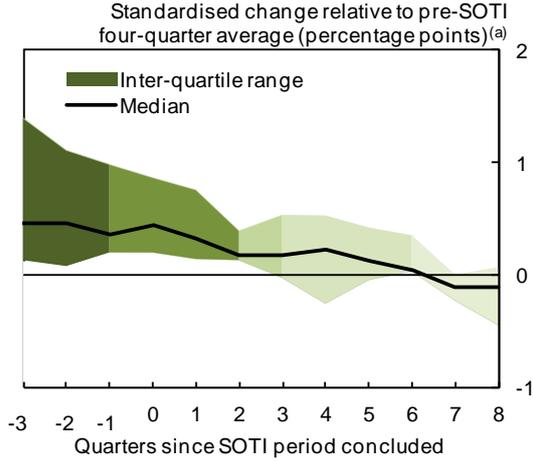**Chart 10: Two to four-year ahead inflation expectations after SOTI episodes[a]**

Standardised change relative to pre-SOTI four-quarter average (percentage points)[a]

Quarters since SOTI period concluded

Sources: National central banks, Thomson Reuters DataStream and Bank calculations.

(a) Deviations in 'below-target' SOTI episodes are inverted to make the deviations in inflation from 'target' comparable to 'above-target' SOTI episodes. A negative value therefore implies that expectations are either below their pre-SOTI average in 'above-target' SOTI episodes or above their pre-SOTI average in 'below-target' SOTI episodes.

6   Modelling the behaviour of inflation expectations

The earlier analysis suggests that SOTI episodes might have an effect on inflation expectations. But the above analysis does not account for the other factors that could be driving expectations. As an initial step we conduct a panel regression based on a hybrid New Keynesian Phillips Curve (NKPC), rearranged in terms of inflation expectations, with the output gap as a proxy of the deviation of marginal costs from its steady state. We include country fixed effects.

Before running the regressions we decided to omit several outliers. Some of these outliers relate to the first Polish SOTI episode in the early 2000s; the rest relate to Icelandic expectations during the financial crisis. Inflation expectations in Poland fell sharply during the year prior to the SOTI episode. As a result deviations in inflation expectations relative to their pre-SOTI average look very negative even though the change relative to the level of expectations in the final quarter preceding the SOTI episode is more in line with other countries. The financial crisis led to a sharp depreciation of the Icelandic krona, this in turn led to a sharp rise in inflation and inflation expectations. These observations were omitted from the regression to avoid the model placing too much weight on a small number of extreme data points. We also omitted the

current UK SOTI episode from the sample to enable us to compare the recent UK experience with what might have been expected given lessons from other SOTI episodes (these results are discussed in Section 8).

Table C: Determinants of short-term inflation expectations[a]

	Equation 1		Equation 2		Equation 3		Equation 4	
Inflation $_t$	**0.47**	(0.09)	**0.48**	(0.10)	**0.31**	(0.07)	**0.11**	(0.05)
Inflation target $_t$	**0.46**	(0.17)	**0.45**	(0.13)	**0.53**	(0.23)	0.20	(0.13)
Output gap $_t$	0.02	(0.03)	0.03	(0.03)	0.04	(0.04)	**0.06**	(0.02)
Inflation expectations $_{t-1}$							**0.57**	(0.08)
Constant	**1.37**	(0.39)	**1.34**	(0.37)	**1.39**	(0.38)	**0.78**	(0.20)
Interaction with SOTI dummy								
Inflation $_t$			-0.05	(0.10)	-0.16	(0.12)	-0.09	(0.09)
Inflation target $_t$			0.13	(0.15)	0.12	(0.13)	0.08	(0.07)
Output gap $_t$			-0.01	(0.04)	0.04	(0.04)	0.00	(0.03)
Inflation expectations $_{t-1}$							0.06	(0.06)
Constant			-0.06	(0.40)	0.29	(0.65)	-0.16	(0.32)
Constant (below target SOTIs)			-0.17	(0.17)	-0.63	(0.40)	-0.17	(0.21)
Country fixed effects	Yes		Yes		Yes		Yes	
Interaction with dummies for developing economies and young inflation targeting regimes[b]	No		No		Yes		Yes	
R^2 (within effects)	0.518		0.520		0.556		0.752	
Number of observations in sample	630		630		630		620	
Number of countries in sample	14		14		14		14	
Fisher-type test of unit root in residuals (p-value)	0.000		0.000		0.000		0.000	

(a) Coefficients shown in bold are significant at the 5% confidence level. Values in brackets are the robust standard errors of the coefficients.

(b) Not shown for brevity.

The initial model suggests that inflation and the inflation target[12] are statistically significant determinants of short and medium-term inflation expectations, but the output gap isn't.[13] Equation 1 in Table C and Table D show the estimation results for a pooled regression of short and medium-term expectations. The insignificance of the output gap may indicate that it is a poor proxy of deviations in marginal costs. Households' short-term expectations are more

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[12] In these regressions, the target is either the point target defined by the national central banks, or the centre of the target range.
[13] It was not possible to estimate a regression for long-term expectations because of the small number of observations available during SOTI episodes.

sensitive to current inflation relative to the inflation target than medium-term expectations (as might be expected): the coefficients on inflation and the inflation target are broadly equal for short-term expectations, but the target is more important for medium-term expectations.

Given the earlier analysis of the behaviour of inflation expectations during SOTI episodes we test to see if expectations behave differently in SOTI episodes: we find mixed evidence in the simple hybrid NKPC. We combine all the variables with a dummy to indicate whether a country was in a SOTI episode.[14] For short-term inflation expectations there was no evidence of asymmetry in the effects of above or below target inflation SOTI episodes. None of the interacted variables were individually statistically significant in the model of short-term expectations (equation 2, Table C). For medium-term expectations (equation 2, Table D), some of the SOTI-related variables do appear to be statistically significant, with the expected sign. The statistically significant positive coefficient on inflation during SOTI episodes suggests households and firms place more weight on current inflation. This would be consistent with prolonged deviations in inflation from target causing households and firms to reassess how quickly the central bank is willing or able to return inflation to target.

The simple hybrid NKPC estimated above omits other potentially important drivers of inflation expectations: the age of the inflation targeting regime; whether a country is economically developed; and past inflation expectations. Siklos (2008) suggests that inflation persistence has fallen less in developing economies than advanced economies, which might suggest that inflation targeting regimes in these countries are seen as less credible by households and firms (at least initially). Various papers (for example, Erceg and Levine (2003) and Barnett and Ellison (2011)) show how changes in inflation targeting regimes may take time to feed into inflation expectations if central banks require time to build up credibility. We therefore estimated further versions of the hybrid NKPC where dummies for developing economies and for inflation targeting regimes less than five years old were interacted with the inflation, inflation target and output gap (equation 3 in Table C and Table D).

The results suggest that inflation expectations do behave differently when the inflation target is relatively new: these variables collectively are significant at the 1% significance level. Consistent with central banks taking time to become credible, the coefficient on inflation is greater for inflation targeting regimes under five years old, with a smaller coefficient on the target. There is less evidence of statistically significant difference between developing and advanced economies: none of the variables are individually statistically significant at the 5% significance level.

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[14] As we thought the average level of inflation expectations might move differently in above and below-target SOTI episodes we included two separate constants depending on the type of SOTI episode.

Table D: Determinants of medium-term inflation expectations[a]

	Equation 1		Equation 2		Equation 3		Equation 4	
Inflation$_t$	**0.22**	(0.09)	0.08	(0.07)	0.08	(0.07)	0.00	(0.03)
Inflation target$_t$	0.36	(0.19)	**0.41**	(0.19)	**0.42**	(0.18)	**0.19**	(0.07)
Output gap$_t$	0.00	(0.05)	0.06	(0.04)	0.10	(0.05)	**0.05**	(0.01)
Inflation expectations $_{t-1}$							**0.67**	(0.04)
Constant	**1.90**	(0.49)	**2.12**	(0.45)	**2.12**	(0.40)	**0.57**	(0.15)
Interaction with SOTI dummy								
Inflation$_t$			0.05	(0.08)	0.05	(0.07)	0.00	(0.04)
Inflation target$_t$			**0.29**	(0.12)	0.30	(0.14)	0.14	(0.07)
Output gap$_t$			-0.09	(0.05)	-0.07	(0.04)	-0.02	(0.03)
Inflation expectations $_{t-1}$							0.04	(0.03)
Constant			-0.36	(0.36)	-0.49	(0.40)	-0.33	(0.16)
Constant (below target SOTIs)			**-0.85**	(0.33)	-0.68	(0.37)	-0.17	(0.20)
Country fixed effects	Yes		Yes		Yes		Yes	
Interaction with dummies for developing economies and young inflation targeting regimes[b]	No		No		Yes		Yes	
R^2	0.274		0.379		0.401		0.777	
Number of observations in sample	375		375		375		368	
Number of countries in sample	9		9		9		9	
Fisher-type test of unit root in residuals (p-value)	0.005		0.035		0.058		0.000	

(a) Coefficients shown in bold are significant at the 5% confidence level. Values in brackets are the robust standard errors of the coefficients.

(b) Not shown for brevity.

To ensure our models were correctly specified we used a Fisher-type panel unit-root tests to check the residuals were stationary. For all the short-term expectations models the tests strongly reject the null hypothesis that all the panels contain unit roots. For the medium-term expectations equations there is some evidence that the residuals are non-stationary once effects of SOTI episodes are included. We therefore estimated a further version that included the lag of inflation expectations to account for persistence in inflation expectations that might be the result of learning by households and firms (equation 4 in Table C and Table D). Lagged expectations are statistically significant, over and above the effect of current inflation (although current inflation remains a statistically significant driver of short-term inflation expectations). The inclusion of lagged expectations also removed any non-stationarity in the residuals. Although the coefficients of standard dynamic fixed effect models are biased, Nickell (1981) finds that

this bias diminishes as the length of the panel increases. The average number of periods per country in our panel is over 40, so any bias in the coefficient should be negligible. Once these additional factors are accounted for, the evidence that SOTI episodes affect inflation expectations is limited. In contrast to the results for the simple hybrid NKPC, none of the interacted variables were now individually statistically significant in the model of short or medium-term expectations (equation 4, Table C and Table D), nor were they were collectively significant at the 5% level. This would suggest that much of the apparent effect of SOTI episodes on inflation expectations described in section five is due to underlying developments in inflation and output, rather than a special factors relating to the SOTI episode itself.

7   The effect of expectations on wages

We then considered whether inflation expectation feed into wages, and whether the effect is different in SOTI episodes. We estimated a wage equation for our panel of countries over the period 1990-2010 (subject to data availability for individual countries). We used a similar approach to Posen (2011), estimating nominal wage growth as a function of productivity growth, the unemployment gap, the labour share (the ratio of real wages to productivity) and inflation expectations. Posen (2011) noted that short and medium-term inflation expectations were not significant in these simple empirical models of UK wages (although a trend based on 10-year inflation breakevens was significant).

We find evidence that medium-term inflation expectations do affect wages to some degree, but any effect of expectation is small and is no greater in SOTI episodes. Table E shows four models of quarterly changes in nominal wages. Equation 1 shows a baseline model with 4-quarter moving averages of nominal wage inflation and productivity growth, the unemployment gap, the labour share and the level and quarterly change in short and medium-term inflation expectations. Lagged short-term movements in wages and productivity are not statistically significant. The effects of the change in short-term inflation expectations are statistically insignificant in a model of quarterly wage inflation. The level of short-term expectations and the change in medium-term expectations do appear to be statistically significant, but the coefficient is the wrong sign (equation 1), suggesting that the equation is mis-specified. Dropping the insignificant short-term dynamics in wages, productivity and short-term inflation expectations and the counterintuitive inflation expectations variable gives a revised equation with coefficient of the expected sign (equation 2). But only the medium-term inflation expectations coefficient is statistically significant. While this might point to a role for medium-term inflation expectations in driving wages, the fit of the equation is poor, with an R^2 excluding the fixed effects of 8% (reflecting the volatility of quarterly wage inflation). The results suggest that inflation expectations are not a very good indicator of short-term movements in wages. Adding on interactions with a SOTI episode dummy makes little different to the fit of the

model, and none of the coefficients on the SOTI variables are statistically significant in the simplified equation (equation 4).

Table E: Determinants of quarterly nominal wage inflation

	Equation 1	Equation 2	Equation 3	Equation 4
Quarterly nominal wage growth (4-quarter moving average)$_{t-1}$	-0.13 (0.19)		-0.57 (0.30)	
Productivity growth (4-quarter moving average)$_{t-1}$	-0.14 (0.16)		-0.32 (0.17)	
Unemployment gap$_{t-1}$	-0.06 (0.05)	-0.10 (0.11)	-0.10 (0.08)	0.01 (0.11)
Labour share$_{t-1}$	**-5.88** (2.11)	-4.41 (3.03)	**-5.12** (1.80)	-4.42 (3.16)
Quarterly change in short-term inflation expectations$_{t-1}$	0.12 (0.11)		0.48 (0.58)	
Level of short-term inflation expectations$_{t-1}$	**-0.34** (0.08)		0.08 (0.13)	
Quarterly change in medium-term inflation expectations$_{t-1}$	**-0.31** (0.12)		-0.55 (0.32)	
Level of medium-term inflation expectations$_{t-1}$	**0.69** (0.17)	**0.29** (0.07)	**0.38** (0.05)	**0.28** (0.05)
Constant	0.10 (0.19)	0.20 (0.22)	0.36 (0.20)	0.20 (0.19)
Interaction with SOTI dummy				
Quarterly nominal wage growth (4-quarter moving average)$_{t-1}$			0.56 (0.23)	
Productivity growth (4-quarter moving average)$_{t-1}$			**0.31** (0.12)	
Unemployment gap$_{t-1}$			0.05 (0.09)	-0.22 (0.14)
Labour share$_{t-1}$			-1.30 (2.37)	-0.99 (3.44)
Quarterly change in short-term inflation expectations$_{t-1}$			-0.40 (0.60)	
Level of short-term inflation expectations$_{t-1}$			**-0.43** (0.18)	
Quarterly change in medium-term inflation expectations$_{t-1}$			0.31 (0.40)	
Level of medium-term inflation expectations$_{t-1}$			0.31 (0.40)	0.03 (0.07)
Constant			0.17 (0.15)	0.20 (0.19)
Country fixed effects	Yes	Yes	Yes	Yes
R^2 (within effects)	0.17	0.08	0.22	0.09
Number of observations in sample	330	341	330	341
Number of countries in sample	7	7	7	7
Fisher-type test of unit root in residuals (p-value)	0.000	0.000	0.000	0.000

(a) Coefficients shown in bold are significant at the 5% confidence level. Values in brackets are the robust standard errors of the coefficients.

8   Implications for United Kingdom

Since the start of 2008, UK inflation has exceeded the 2% target set by the Government in 44 of the past 50 months and averaged 3.3%. That means that the United Kingdom is now more than three years into a SOTI episode, as defined above. This is longer than the majority of the other SOTI episodes considered. But a small number of countries have experienced similarly long SOTI episodes and may provide some insight for the current situation in the United Kingdom.

Chart 4 and Chart 5 both show that survey-based measures of inflation expectations can be volatile, clouding comparisons with past SOTI episodes. As noted earlier, for much of the current UK SOTI episode, UK inflation expectations were lower than the average in the four-quarters prior to the current SOTI episode. This may reflect the volatility of inflation in 2009. More recently, UK inflation expectations have drifted up and were comparable to past episodes twelve quarters into the SOTI episode.

The comparisons in Chart 4 and Chart 5 appear to indicate that the time spent within a SOTI episode is a key driver of the deviation of inflation expectations from target; but regression analysis has shown this is not the case. Other factors such as the scale of the output gap, the inflation target and the level of inflation itself are more important drivers of inflation expectations.

As noted earlier, the current UK SOTI episode was not included in the sample used to estimate the regressions shown in Table C and Table D. This allows us to see the out-of-sample forecast for the UK. Given our model includes the lag of inflation expectations, Chart 11 shows three forecasts for UK short-term inflation expectations: one based on the simple NKPC estimated in equation 1 in Table C; one that includes the estimated SOTI effects in equation 2; and a third that includes the effect of lagged inflation expectations (equation 4). To ensure a fair comparison with the first two projections, the third projection is a dynamic forecast using lagged forecasts of inflation expectations from the start of the current SOTI (2008 Q2). Chart 12 shows the same but for medium-term expectations.

For both short and medium-term expectations, the equations pick up the broad trends in inflation expectations. In both charts the model predicts the rise and fall in inflation expectations as a result of the movements in inflation. Taking account of differences between SOTI and non-SOTI episodes has little effect on the forecast (consistent with our earlier findings that SOTIs

were not significant drivers of inflation expectations). Both forecasts appear to do better than one based on lagged inflation.

The current levels of both short and medium-term inflation expectations are broadly in line with forecasts based on international experience. This result is consistent with other work by the Bank of England on the recent behaviour of UK inflation expectations. Macallan et al (2011) discuss how a range of indicators might be used to monitor the risk to inflation from inflation expectations. That article suggests that there is little evidence of longer-term UK inflation expectations becoming less well anchored to the target. The signals regarding shorter-term inflation expectations are more mixed but there are few signs that they have become significantly de-anchored.
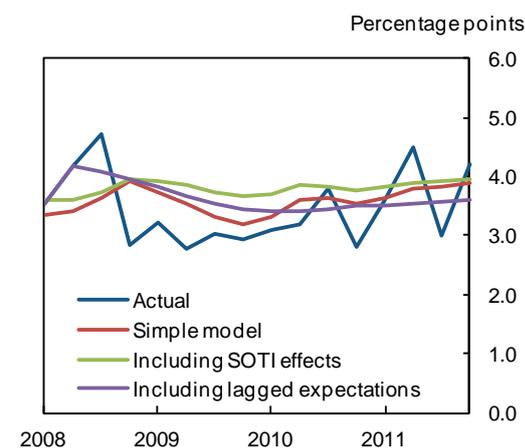
Chart 11: UK short-term inflation expectations relative to out-of-sample forecasts[a]
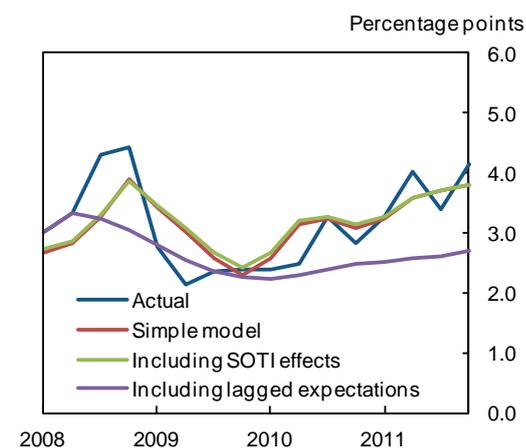
Source: ONS and Bank calculations.
(a) Forecasts based on equations 1, 2 and 4 in Table C.

Chart 12: UK medium-term inflation expectations relative to out-of-sample forecasts[a]

Source: ONS and Bank calculations.
(a) Forecasts based on equations 1, 2 and 4 in Table D

9   Conclusion

This article suggests that across a sample of inflation-targeting countries, when inflation has deviated from 'target' for a sustained period, short and medium-term inflation expectations have tended to drift in the same direction as the deviation of inflation from 'target'. Initial movements were smaller than inflation itself. However they were more persistent than the rise in inflation and, on average, short and medium-term inflation expectations returned to their pre-SOTI average around three and six quarters after inflation itself returned to 'target' respectively. Evidence at longer horizons is sketchier, but seems to suggest that movements in long-term inflation expectations in other countries were smaller than at shorter horizons.

Analysis based on a simple hybrid New Keynesian Phillips Curve model of inflation expectations suggests that the movement in inflation expectations during SOTIs is a result of the underlying drivers of expectations – inflation, the inflation target, the output gap and the age of the inflation targeting regime – rather than the SOTI itself. There is no evidence that the expectations generating process is different during SOTI episodes once these factors have been taken into account.

Analysis of the relationship between inflation expectations and wages suggests that medium-term inflation expectations do positively affect wage inflation. But the low explanatory power of the model suggests that even if statistically significant, the effect of inflation expectations on short-term movements in wages is relatively small.

Comparing the current UK SOTI episode to past international experience, we find that while the UK experience looks atypical this is a result of the volatile path for UK inflation during the current SOTI episode. Inflation expectations have moved both up and down during the current SOTI episode. The deviation of UK inflation expectations appears to be lower than what might have been expected just on the basis of the duration of the SOTI episode. However, once differences in the output gap, and the deviation in inflation from target are accounted for, the level of UK inflation expectations in 2011 is broadly in line with projections based on past international experience.

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Appendix 1: Inflation expectations data sources

Country[a][b]	Data source for inflation expectations data		
	Short-term[c]	Medium-term[d]	Long-term[e]
Australia	Melbourne Institute of Applied Economic and Social Research: • Business	-	-
Chile	Central Bank of Chile: • Business, 11 months ahead, median response	Central Bank of Chile: • Business, 23 months ahead, median response	-
Colombia	Banco de la Republica: • Business managers	-	-
Czech Republic	Czech National Bank: • Households • Non-financial corporations	Czech National Bank: • Households, 3-year ahead • Non-financial corporations, 3-year ahead	-
Hungary	Magyar Nemzeti Bank: • Households	-	-
Iceland	Central Bank of Iceland: • Households, median response • Business, median response	Central Bank of Iceland: • Business, median response	-
Korea	Bank of Korea • Consumer Survey Index		
Mexico	Bank of Mexico: • Business, mean response	Bank of Mexico: • Business mean annual inflation expectations over horizon, of 1-4 years	
New Zealand	Reserve Bank of New Zealand: • Business, National Bank of New Zealand: • Business,	Reserve Bank of New Zealand: • Business	-

Norway	Norges Bank: • Employees' organisations • Employers' organisations • Managers • Households	Norges Bank • Employees' organisations, • Employers' organisations, • Managers • Households, 2-3-year ahead	Norges Bank: • Employees' organisations • Employers' organisations
Poland	National Bank of Poland: • Business, mean	-	-
South Africa	Bureau for Economic Research: • Business representatives • Trade union representatives	Bureau for Economic Research • Business representatives • Trade union representatives	-
Sweden	Sveriges Riskbank/TNS SIFO Prospera: • Employees' organisations • Employers' organisations • Purchasing managers • Households	Sveriges Riskbank/TNS SIFO Prospera: • Employees' organisations • Employers' organisations • Purchasing managers	Sveriges Riskbank/TNS SIFO Prospera: • Employees' organisations • Employers' organisations • Purchasing managers
United Kingdom	Barclays Basix: • Household, median response Bank/NOP • Household, median response YouGov/Citigroup: • Household, median response	Barclays Basix: • Household, median response)	YouGov/Citigroup: • Household, 5-10 years ahead, median response

(a) Armenia, Brazil, Guatemala, Ghana, Indonesia, Israel, Peru, Philippines, Romania, Serbia, Thailand and Turkey are also inflation targeting countries, but no data on household or PNFC inflation expectations are available during their SOTI episodes.

(b) Canada was excluded from our analysis because the country has not entered a SOTI episode during its inflation-targeting regime.

(c) One year ahead unless otherwise stated.

(d) Two years ahead unless otherwise stated.

(e) Five years ahead unless otherwise stated

Appendix 2: Dates of SOTI episodes under alternative definitions

Defining a SOTI episode in the way described in the paper does have one empirical drawback as the start date may be unstable. To highlight this, consider the current SOTI episode in the United Kingdom where CPI inflation has exceeded 'target' in 39 of the 47 months (83%) since April 2008[15]. If, instead, the period from November 2006 is considered (i.e. from the beginning of the previous stint of 'off target' inflation), CPI inflation has exceeded the 'target' in 45 out of 64 months (70%) and thus not considered a SOTI episode. However, should inflation remain above target until February 2013, this is no longer true as inflation would have exceeded the

Chart 13: Alternative calculations for proportion of time inflation is above target in current UK SOTI[(a)]
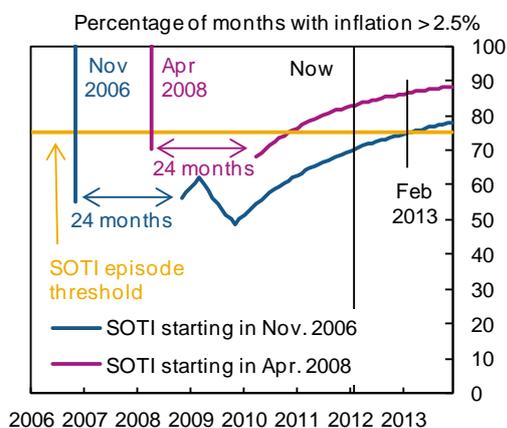
Source: ONS and Bank calculations
(a) Scenario based on assumption that CPI remains above 2.5% continuously after December 2011.

'target' in 57 out of 76 months (75%). At this point, the current UK SOTI episode would be deemed to have started in November 2006 and not April 2008. The profile of the SOTI episode would also alter as what was originally the first quarter of the episode may become the fifth or sixth quarter. This scenario is shown in Chart 13.

To avoid this pitfall, other variations of the first criterion were considered.

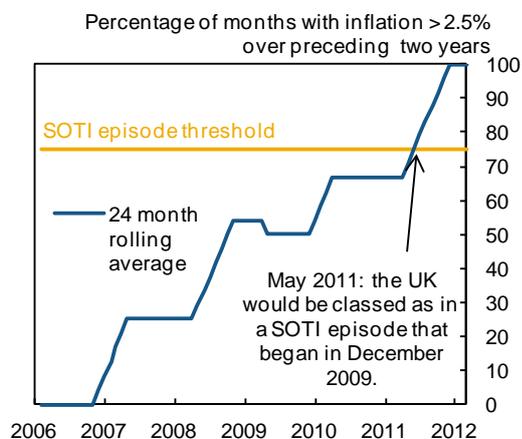Alternative 1: *Inflation must have been 'off-target' for 75% of a 24-month rolling window.*

This definition utilises a 24-month rolling window as opposed to any period of at least 24-months. Thus at any point in time, if 18 or more of the previous 24 months' inflation outturns were 'off target', that period would be deemed as a SOTI episode. As only one 24-month window is considered at each point in time, a SOTI episode has a definitive start date, regardless of how long inflation remains 'off target' in the future.

Using this definition, however, implies that the United Kingdom has only just, as of May 2011, entered a SOTI episode (Chart 14). Furthermore, it implies that the SOTI episode began in December 2009 as opposed to April 2008. This seems odd given the general consensus that UK inflation has exceeded the 2% point target for much of the last 5 years.[16]

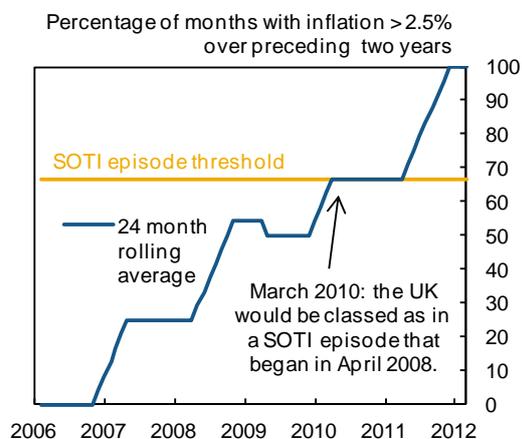[15] For the UK, 'target' is defined as the point target (2%) plus or minus 0.5 percentage points.
[16] This alternative definition would also include periods when inflation had returned to target, although we could continue to use the convention that a SOTI episode must begin and end in a period when inflation is off-target.

Chart 14: Meeting alternative SOTI episode definition one - UK example

Percentage of months with inflation > 2.5% over preceding two years

SOTI episode threshold

24 month rolling average

May 2011: the UK would be classed as in a SOTI episode that began in December 2009.

Sources: ONS and Bank calculations.

Chart 15: Meeting alternative SOTI episode definition two - UK example

Percentage of months with inflation > 2.5% over preceding two years

SOTI episode threshold

24 month rolling average

March 2010: the UK would be classed as in a SOTI episode that began in April 2008.

Sources: ONS and Bank calculations.

Alternative 2: *Inflation must have been 'off-target' for two-thirds of a 24-month rolling window.*

This definition gives a start date for the current UK SOTI episode that is more consistent with the general consensus. As only two-thirds of inflation outturns are now required to exceed the 'target', this definition determines the United Kingdom to have entered a SOTI episode over a year earlier than the previous alternative, in March 2010 (Chart 15). The adjudged start date is therefore also earlier, April 2008. But, unlike the definition used in this paper, it is stable given only one 24-month rolling window is considered.

As with the other definitions, this alternative does have its imperfections. Using this definition could give SOTI episodes as short as 16-months. As previously mentioned, we wished to avoid including one-off price shocks that appeared in the annual inflation data for 12-months before dropping out. A SOTI episode lasting just 16 months provides slightly less assurance that this would be the case.

Regardless of which definition was chosen, the sample of SOTI episodes overall was little changed. Appendix 2 shows how the samples from alternative definitions one and two compare with our actual preferred sample. There are 23 SOTI episodes in our preferred sample. Moving to a rolling 24-month window, but retaining the requirement that inflation must be 'off-target' for at least 75% of the time, changes the start or end date of only four episodes (including the current UK example highlighted above). Modifying the definition further to require only two-thirds of months to be off-target again changes only four SOTI episodes relative to our preferred sample (though now not including the current UK SOTI episode), though it would also introduce two new short SOTI episodes. The results presented later in the paper are little affected by the choice of SOTI definition used.

Alternative definition 1 sample:

Country	Date	Above/below 'target'
Australia	Q1 1995 - Q2 1996	Above
Australia	Q4 1996 - Q4 1999	Below
Australia	Q2 2000 - Q4 2001	Above
Colombia	Q4 2002 - Q2 2004	Above
Colombia	Q1 2007 - Q1 2009	Above
Czech Republic	Q2 2002 - Q1 2004	Below
Hungary	Q1 2003 - Q4 2004	Above
Hungary	Q4 2006 - Q2 2011	Above
Iceland	Q2 2004 - Now	Above
Korea	Q3 2005 - Q3 2007	Below
Mexico	Q3 2002 - Q2 2005	Above
Mexico	Q3 2007 - Q1 2010	Above
New Zealand	Q4 1994 - Q4 1996	Above
Norway	Q3 2003 - Q4 2005	Below
Poland	Q3 2001 - Q4 2003	Below
Poland	Q4 2007 - Q3 2009	Above
South Africa	Q1 2002 - Q3 2003	Above
South Africa	Q2 2007 - Q4 2009	Above
Sweden	Q2 1996 - Q3 2000	Below
Sweden	Q1 2004 - Q1 2006	Below
Sweden	Q1 2009 - Q3 2010	Below
UK	Q3 1995 - Q1 1997	Above
UK	Q1 2010 - Now	Above

Legend: New (blue), Changed (orange)

Alternative definition 2 sample:

Country	Date	Above/below 'target'
Australia	Q1 1995 - Q2 1996	Above
Australia	Q4 1996 - Q4 1999	Below
Australia	Q2 2000 - Q4 2001	Above
Colombia	Q4 2002 - Q2 2004	Above
Colombia	Q1 2007 - Q1 2009	Above
Czech Republic	Q2 2002 - Q1 2004	Below
Hungary	Q1 2003 - Q4 2004	Above
Hungary	Q4 2006 - Q2 2011	Above
Iceland	Q2 2004 - Now	Above
Korea	Q3 2005 - Q3 2007	Below
Korea	Q1 2008 - Q1 2009	Above
Mexico	Q3 2002 - Q2 2005	Above
Mexico	Q3 2007 - Q4 2010	Above
New Zealand	Q4 1994 - Q4 1996	Above
Norway	Q3 2003 - Q3 2006	Below
Poland	Q4 1999 - Q4 2000	Above
Poland	Q3 2001 - Q4 2003	Below
Poland	Q4 2007 - Q4 2009	Above
South Africa	Q1 2002 - Q3 2003	Above
South Africa	Q2 2007 - Q4 2009	Above
Sweden	Q2 1996 - Q3 2000	Below
Sweden	Q1 2004 - Q1 2006	Below
Sweden	Q1 2009 - Q3 2010	Below
UK	Q3 1995 - Q1 1997	Above
UK	Q2 2008 - Now	Above