

How tolerant should inflation-targeting central banks be?
Selecting the proper tolerance band – Lessons from Sweden

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February 2017

Abstract:

Should an inflation-targeting central bank have an explicit tolerance band around its inflation target? This paper provides an answer derived from the Swedish experience. The Riksbank is exceptional in the sense that it first adopted and later abolished an explicit band and is currently considering bringing it back. We conclude that the band should be explicit for several reasons. Most important, an inflation-targeting central bank should be open and transparent to the public regarding its actual ability to control inflation. We discuss how a numerical measure of the proper width of the band can be constructed to foster communication and credibility.

JEL Classification Numbers: E30, E31, E58.

Keywords: inflation targeting, tolerance band, tolerance interval, monetary policy, the Riksbank, Sweden

1. Introduction¹

Many central banks have adopted inflation targets over the past 25 years. The operational goal is quantified by a single number as the point target in most cases.² However, due to shocks and uncertainties, no central bank is expected to hold inflation exactly at the target month after month, year after year. Consequently, the point target is always combined with an explicit or implicit tolerance band, or interval, within which inflation is allowed to fluctuate without this variation being regarded as a breach with the target.

An explicit band is the most common case. In a recent survey, Hammond (2012) finds that 22 of 29 inflation-targeting central banks have an explicit interval.³ Notable exceptions are the ECB, the Swedish Riksbank, the US Federal Reserve and the Bank of England. The size of the tolerance band varies. It is usually of the target magnitude plus/minus 1 or 2 percentage points. For emerging economies, the band is commonly slightly larger than for developed countries.

The choice of the size of the explicit band has not been subject to much debate and research. A sign of this neglect is the fact that the index in several surveys of the recent experience of inflation-targeting monetary policy does not even refer to tolerance bands, or intervals.⁴ Few studies have arrived at numerical values for the optimal or proper dimension of the tolerance band. Policy makers, faced with uncertainty concerning their ability to steer the actual rate of inflation towards the point target, have commonly decided the size of the band based on expedience, past experiences, and the example set by other inflation-targeting central banks.

The purpose of this paper is twofold. First, we present the arguments for and against an explicit tolerance band based on our interpretation of the Swedish experience. Second, we discuss how a numerical measure of the proper width of the band can be constructed. Sweden is an interesting case, as the Riksbank first adopted a tolerance band and then abolished it after ten years of use. By comparing these two periods, we are able to draw conclusions

¹ This note is prepared at the general invitation of the Riksbank to comment on a recent study on the “pros and cons of various target variables and intervals” (Riksbank 2016). The views expressed are those of the authors. We have benefitted from comments by Mikael Apel, Claudio Borio, Urban Bäckström, Carl-Andreas Claussen, John Crow, Bengt Dennis, David Edgerton, Klas Fregert, Charles Goodhart, Håkan Frisé, Oskar Grevesmühl, Gill Hammond, Jesper Hanson, Lars Heikensten, Michael Hutchison, David Laidler, Douglas Laxton, Ulf Söderström, Joakim Westerlund and Geoffrey Wood. We owe a particular debt to Krister Andersson for informing us about the Canadian origins of the inflation target of the Riksbank. The usual disclaimer holds. We acknowledge financial support from the Jan Wallander and Tom Hedelius Foundation.

² A few central banks have adopted a target expressed as an interval or zone for the rate of inflation. We do not discuss this approach, as it does not involve any choice of a tolerance band. “Optimal” monetary policy within such a framework is discussed, e.g., by Orphanides and Wieland (2000).

³ Hammond (2012) excludes the ECB and the Federal Reserve. We have added these two central banks to our list.

⁴ See, for example, Truman (2003), Bernanke and Woodford (2005), Cobham et al (2010) and Bordo et al (2016).

concerning the problems facing the communication strategy of the Riksbank with and without an explicit band.

Our report is organized as follows. First, we give an account of the history of the tolerance band in Sweden. Next, in the main part of our report, we present arguments for and against an explicit band. After assessing the pros and cons, we derive a numerical measure for a new explicit tolerance band for the Riksbank. A short summary concludes.

2. Evolution of the tolerance band in Sweden

The theoretical root of inflation targeting goes back to Knut Wicksell's (1898) theory of the relationship between interest and prices, later christened the cumulative process. According to Wicksell, a central bank can affect the rate of inflation by the use of its policy rate. Based on this theory, he proposed that the goal of monetary policy should be a stable price level. In modern parlance, he suggested price level targeting. This task seemed quite simple to him. The price level could be "kept as scrupulously constant as the standards of weights and measures. And why should this not be in our power?"⁵ Judging from his writings, he envisaged not a completely stationary price level but one that showed very small fluctuations around a certain level. He never discussed the size of these fluctuations. To our knowledge, there is no mention of a tolerance band in his many contributions on monetary policy.

Wicksell inspired a long-lasting debate among Swedish economists on the merits of various forms of monetary norms – the term used by them for rules – with contributions by David Davidson, Gunnar Myrdal, Erik Lindahl and others.⁶ However, their analysis was on a theoretical level. They did not address the practical implementation of any of the rules that they examined and proposed. They focused on trends rather than on short-run price fluctuations and were not concerned with any possible volatility or uncertainty of the operational target of a rule-based monetary policy. Thus, as far as we have found, none of them dealt with the concept of a tolerance band.

In September 1931, when the Riksbank was forced to abandon the gold standard, Sweden became the first country to adopt Wicksell's norm of a stable price level. In the following years, the Riksbank pioneered price-level targeting. The first step was to turn to three professors who were experts in monetary economics, Gustav Cassel, David Davidson and Eli Heckscher, with a set of questions on how monetary policy should be conducted within the new framework.

⁵ This quotation is taken from Wicksell's talk in 1898 in Swedish to the *Nationalekonomiska Föreningen*, when he first presented his theory of the cumulative process to a Swedish audience. An English translation is available in Wicksell (1899) but does not do full justice to Wicksell's wording.

⁶ For surveys of the Swedish debate on monetary policy rules, see Fregert (1993) and Hammarskjöld (1955).

Neither the questionnaire nor the replies by the economists concerned the issue of volatility of the price level or the potential use of a tolerance band. To keep the price level, as measured by a newly constructed consumer price index, and numerically stable was a task that the Riksbank was apparently expected to manage without any problems. Not one of the experts made a statement contrary to this conclusion.⁷

Their lack of attention to short-run fluctuations in the consumer price index is consistent with the evidence from the policy of price-level targeting in the 1930s. The consumer price index remained fairly constant during the period 1931-1936. The Riksbank was not criticized in the media for failing to keep prices constant during this period.⁸ The impression that the Riksbank could control prices with great precision is consistent with the fact that the price index was calculated with two decimal points and published weekly.

A version of an explicit tolerance band appears for the first time in the Swedish monetary debate in a proposal by Jonung (1978). Inspired by the experience of the price-level targeting in the 1930s and the Swedish tradition of monetary rules, he suggested a major change in the stabilization policy regime in Sweden, from the fixed exchange rate of the krona to an inflation target defined as an interval between 0 and 2 percent of the annual rate of inflation of a consumer price index net after taxes and subsidies. This move to a monetary rule assumed the introduction of a floating exchange rate and the establishment of the Riksbank as an independent institution. The size of the target band was set to allow for “minor variations in the rate of inflation and seasonal fluctuations”. When the Riksbank had more experience with this regime, the band could eventually be reduced in width.

Eventually, following speculative attacks on the krona in the fall of 1992, the Riksbank was forced to abandon the fixed exchange rate. The very same day, November 19, the Riksbank contacted the Bank of Canada to ask for advice.⁹ A delegation was sent from Ottawa to Stockholm within a week. Early in 1993, the Riksbank at its own initiative announced an inflation target of 2 percent with a tolerance band of +/-1 percentage point. This numerical setup was copied from the Canadian framework of inflation targeting. In the Swedish context, the tolerance band was motivated by short-run changes in consumer price inflation that could not be controlled by the Riksbank.¹⁰

In the internal work of the Riksbank, an inflation target of 2 percent +/- 1 percentage point was seen as the most restrictive target possible given the history of rampant inflation in Sweden in the 1970s and 1980s. A goal below 2 percent was believed not to be credible and could potentially lead to restrictive monetary policies over an extended period. At the same

⁷ See Jonung (1979) and Berg and Jonung (1999).

⁸ See Carlson (2011) on the daily press coverage of the policy of the Riksbank in the 1930s.

⁹ Personal communication with Krister Andersson. As chief economist at the Riksbank, he took the initiative in 1992 to call the Bank of Canada, as he had been impressed by the Canadian central bank policy when working on the IMF team that prepared Article IV consultations with Canada.

¹⁰ Andersson (2003) gives a detailed account of the Canadian influence on the Swedish framework for inflation targeting.

time, it was recognized that an inflation rate of 2 percent was not strictly achieving price stability, but it was considered close enough and the only credible option.¹¹

In the late 1990s, the Riksbank developed the use of the tolerance band in the framing of monetary policy.¹² It became an integral part of the inflation target framework. However, after the 2008 global financial crisis, the Riksbank dropped the band because it was regarded as too narrow. Actual consumer price inflation had been outside the band for nearly half the time since the introduction of the inflation target regime. The financial crisis of 2008-09 pushed inflation even further outside the band.

According to the analysis in May 2010 by the Riksbank, the tolerance band had become “obsolete” for the following reasons:

The idea of the tolerance interval was to make it clear that deviations from the inflation target were probable and that the Riksbank’s aim was to try to limit these deviations. If the deviations are large and last for long periods, the target may lose credibility.

In the light of the experiences gained since the inflation target was introduced, there is reason to review the need for an explicit tolerance interval around the inflation target.

There is currently widespread understanding among the participants in the economy for the fact that monetary policy is conducted under uncertainty. Unforeseen events occur from time to time, which can cause inflation to overshoot or undershoot the target to a relatively large degree; sometimes by more than one percentage point. Deviations from the inflation target can also be part of a deliberate strategy by the Riksbank. The Riksbank conducts what is known as flexible inflation targeting. This means that at the same time as monetary policy is aimed at attaining the inflation target; it is also to support the objectives of general economic policy for the purpose of attaining good growth and a high level of employment. It is therefore possible to allow inflation to deviate from the target temporarily, as part of a deliberate strategy to stabilize production and employment. This is also one of the reasons why deviations from the inflation target can at times be larger than the tolerance interval. A recent example is the large repo rate cuts made in connection with the financial crisis, which contributed to CPI inflation undershooting the lower limit of the tolerance interval.

Since the inflation target began to apply in 1995 inflation has deviated from the target by more than 1 percentage point around half of the time. It has thus not been unusual for inflation to be outside of the tolerance interval. However, because of the confidence in the inflation target that has been established, these deviations do not have any tangible consequences for long-term inflation expectations among economic agents. To summarize, one can conclude that the tolerance interval has become obsolete: There is considerable understanding for the fact that inflation commonly deviates from the target and that the deviations are sometimes larger than 1 percentage point. Inflation can thus be outside of the tolerance interval without threatening the credibility of the inflation target. Such deviations have proved to be a natural part of monetary policy.

¹¹There were proposals from experts outside the Riksbank, among them from Otmar Issing at the Bundesbank, in consultations with Krister Andersson at the Riksbank, advocating a more ambitious target with an inflation rate below 2 percent. The Riksbank rejected this approach as well as proposals from a member of its advisory economist group for a mean reversion strategy implying no inflation over time. The chosen tolerance band was seen as a way to partly accommodate concerns of not achieving price stability, provided that the Riksbank would err on the side of caution.

¹² See the contributions by Berg (1999), Blix and Sellin (1998) and Heikensten (2002).

*Lastly, it can be noted that the Riksbank has for a long time now closely analysed and explained deviations from the inflation target in its Monetary Policy Reports and Monetary Policy Updates. This is done regardless of whether the deviation is outside of or within the tolerance interval. Removing the tolerance interval should thus have no consequences for the inflation target as such, or for the way in which monetary policy is conducted and communicated.*¹³

As seen from the above quotation, abolishing the band was not supposed to change the basic framework for monetary policy. In practice, it allowed the Riksbank to deviate more from the target than before without clearly breaking with the target.¹⁴ The wording is consistent with the view that the Riksbank implicitly increased the size of the band when it changed from an explicit to an implicit band, with the latter possibly being of greater magnitude than the former.

Initially, the abolishment of the band did not give rise to any debate. However, it has recently been proposed that the Riksbank should bring back the tolerance band in order to improve its communication strategy and to better explain persistent deviations from the point target such as those that have occurred in recent years. Now the argument has been made that the tolerance band should be larger than the initial band of +/- 1 percentage points, which was too narrow.¹⁵ The Riksbank has also expressed an interest in re-examining the case for an explicit band. A forthcoming parliamentary committee is expected to study the arguments for an explicit band as well.

3. Arguments for and against an explicit tolerance band

In New Zealand and Canada, the first countries to introduce formal inflation targeting, tolerance bands emerged as part of deliberations and agreements between the government and the central bank.¹⁶ The use of tolerance bands then spread to other central banks like the Riksbank which was heavily influenced by the Canadian approach. Here, we start from the Swedish experience of inflation targeting in order to distill arguments for and against an explicit tolerance band.¹⁷

¹³ Riksbank (2010).

¹⁴ Riksbank (2010).

¹⁵ See, for example, Jonung (2015) and Andersson and Jonung (2016) recommending a band of +/-2 percentage points.

¹⁶ Inflation targeting in New Zealand was initially inspired by a contract approach to the relationship between the central bank and the government (Walsh, 1995). The role of the tolerance band was then to indicate when the contract was breached. The contract approach has not endured while tolerance bands have persisted. For an insider's view on the introduction of inflation targeting in Canada, see Crow (2002).

¹⁷ In a survey of inflation targets and intervals, Apel and Claussen (2017) discuss in very general terms the use of tolerance intervals without a detailed discussion of the issues raised in this paper.

3.1. Arguments for an explicit band

There are several reasons for adopting an explicit band. They concern i) the choice of price index, ii) measurement errors, iii) model uncertainty, iv) forecasting uncertainty, v) uncertainty about the expected rate inflation of the public, and vi) the role of credible communication and accountability of an inflation-targeting central bank. We consider these reasons below.

i. Flexibility concerning the choice of price index. Every inflation-targeting central bank makes use of price indices to gauge its policy. Central banks are faced with a choice among several indices as guides, as no price index gives an exact measure of the “true” overall rate of inflation. According to the Riksbank law of 1998, monetary policy shall maintain stability in prices “in general” (i.e., the overall price level). However, there is no perfect measure of the overall price level. Existing price indices measure inflation in a subset of prices such as the consumer price index, the GDP deflator or the producer price index. Perhaps the closest measure of inflation in prices in general is found in the household barometer of the National Institute of Economic Research, in which households are asked about the perceived rate of inflation in “prices in general”.

Inflation-targeting central banks as a rule select a specific price index when defining the inflation target. The Swedish Riksbank chose the consumer price index (CPI) for several reasons. This index was familiar to the public and available in a timely manner. It was recognized that the interest component of the CPI was partly endogenous to monetary policy decisions. However, an exclusion was ruled out for fear of creating problems per se – a decision that was reversed later.

The Riksbank is aware that overall inflation may differ from the adopted operative inflation measure.¹⁸ Although inflation indices commonly follow a similar trend, substantial differences may emerge across various indices. For example, in 2015, CPI inflation in Sweden was 0.0 percent, CPIF inflation 0.9 percent and inflation according to the GDP deflator 1.9 percent. The spread between these three inflation measures was almost two percentage points. Even wider margins emerge when asset price inflation is measured as well. Some of these differences may be due to sector-specific developments that may eventually have economy-wide consequences.¹⁹

Turning to the financial sector, financial crises have shown the importance of monitoring and responding to asset inflation and unsustainable credit expansions. Failing to respond to such developments may impose large economic costs in terms of rising unemployment, output loss, higher government debt, and falling consumer inflation (Reinhart and Rogoff, 2009). An explicit tolerance band provides the central bank with essential degrees of freedom to take financial developments into account when deemed appropriate without abandoning a rules-based approach.

¹⁸ See Heikensten (2002), who discusses the proper choice of index from a monetary policy perspective, concluding that there is not one superior index for the Riksbank to use.

¹⁹ On this point, see, for example, Laidler (2007).

When inflation is higher or lower, depending on which index is used and/or which sector of the economy is studied, the central bank may need to take action even though the chosen price index does not register such developments. A tolerance interval around the inflation target gives the Riksbank additional flexibility to adjust to events that are not sufficiently reflected in the officially adopted index for inflation targeting.

ii. Measurement errors in the price index: Measurement errors are caused by various factors. The price indices include only a small subset of prices, as the index is based on prices from a limited sample of retail outlets, not all prices are updated regularly, quality improvements are difficult to control for, and spending shares used to combine the prices into one index are uncertain. Statistics Sweden estimates that the variance of the sampling error alone is of the magnitude ± 0.3 percentage points using a 95% confidence interval.²⁰ The size of the measurement error, taking all uncertainties into account, is of an even greater magnitude. It is not possible to derive an exact measure of the measurement error, but it is unlikely to be negligible. These measurement errors suggest the use of an explicit tolerance interval to allow for the lack of precision associated with the index set as the goal of monetary policy.

iii. Model uncertainty: The Riksbank, like every modern central bank, uses econometric models to evaluate its policy and to forecast future inflation and growth. There is considerable debate about the proper choice of model *per se*.²¹ Regardless of the model selected, no econometric model is an exact map of the world. The response of the actual economy to a chosen policy path will differ from the model's prediction.²² In addition, the response will differ over time. An explicit tolerance interval is one method to take model uncertainty into account.

iv. Forecasting uncertainty: The Riksbank uses forecasts derived from its models to evaluate the impact of its policy rate decisions on future inflation. These models incorporate available information when the forecasts are made. However, unexpected shocks impact inflation during the forecasting horizon, causing actual inflation to deviate from the forecasted path. Monetary policy affects inflation with a lag of at least one to two years, possibly longer. Thus, due to unexpected shocks, it is highly unrealistic to assume that the central bank will hit the exact target with such a long and variable time lag. We know from evaluations of the Riksbank model that its track record is far from impressive.²³ Of course, this does not imply that other models of the Swedish economy perform better.

In the long run, the sum of the forecasting errors should tend to be equal to zero, assuming that the econometric model is not systematically biased. Positive and negative shocks should eventually sum to zero. A key question here is what is the long run? The international financial crisis and the Eurozone crisis have clearly demonstrated that it is possible for the

²⁰ See

http://www.scb.se/Statistik/PR/PR0101/2014M12/PR0101_2014M12_SM_PR14SM1501.pdf.

²¹ See, for example, the discussion in the recent evaluation by Goodfriend and King (2016).

²² See Brainard (1967) for an analysis of model uncertainty and policy. We conclude that his discussion of parameter uncertainty gives support to an explicit tolerance band.

²³ See, for example, Riksbank (2015).

economy to be hit by a series of negative shocks over a longer period of time – possibly as long as 10 years. A ten-year average of inflation would then show a negative bias compared to the target.²⁴ A tolerance band may be needed not only to account for short-run fluctuations in inflation but also to account for more long-run persistent deviations from the target due to a series of unexpected negative or positive shocks.

It is impossible to obtain a separate estimate of the size of each type of error uncertainty discussed above. In addition, there is no reason to assume that they are additive. Still, we can obtain a rough overall estimate of the joint uncertainty. Figure 1 illustrates the Riksbank's inflation forecast of September 2016. The dotted line is the central forecast, and the blue fields represent the 50, 75 and 90 percent uncertainty intervals, based on historical forecast errors. According to this forecast, inflation at the beginning of 2018 is expected to be between -1 and +4 percent with 90% probability. This is a relatively wide forecasting band considering that actual inflation has been within this band 96 percent of the time between January 1995 and September 2016. This forecast gives a less certain prediction of future inflation than a forecast based only on the historical outcome would. The highly uncertain forecasts constitute strong arguments for a wide tolerance band.

v. Uncertainty in the measurement of inflation expectations: Economists are well aware of the challenges of getting accurate statistics for standard economic time series. Obtaining data for inflation expectations is a case by itself. These data play an important role in the preparation of monetary policy decisions, as much of the policy of inflation targeting is aimed at anchoring inflation expectations at the target rate. Inflation expectations are usually measured by interviews of representative samples of respondents in which every respondent is asked to give a number for the expected inflation rate. Respondents, however, are not fully certain of the accuracy of their expectations. Their numerical replies are associated with uncertainty, which can be measured in various ways: by the distribution of the replies, by the number of “don't know” answers and by explicitly asking respondents how uncertain they are about their expectations.²⁵ Regardless of which measure is used, uncertainty is substantial in the poll data. This uncertainty represents another argument for an explicit tolerance band.²⁶

vi. Facilitating central bank communication concerning the precision of monetary policy: Successful inflation targeting is based on public trust and confidence in monetary policy. Credibility can be built and maintained over the long term only through an honest and accurate communication of the Riksbank's objectives and the limitations of its policy. The performance of the Riksbank in the past – see Figure 1 – shows that the Riksbank has been far from able to keep the actual inflation rate at the target of 2 percent. CPI inflation has varied between -2 and 4 percent; CPIF inflation, which is a key underlying inflation measure that the

²⁴ See, for example, Regeringen (2016).

²⁵ See Jonung (1986) for a study of the uncertainty of inflationary expectations held by the public in Sweden. Here the respondents state explicitly how uncertain they feel about their point or interval expectations.

²⁶ The counter-argument here would be that a tolerance interval per se may increase uncertainty about the willingness of the central bank to stick to the target. We deal with this issue in the next section.

Riksbank uses, has varied less because it excludes the effect of the mortgage rate on inflation.²⁷ Still, this inflation measure shows large variations between 0 and 4 percent.

[Figure 1]

These wide fluctuations in the actual inflation rate constitute a strong argument for having an explicit tolerance band. By adopting such a band, the Riksbank is better able to explain to the public that its policy is not able to exactly hit the target. Actual inflation performance ex post should be consistent with the promises of the Riksbank ex ante. This is likely to be the case if a proper tolerance band is in place and is used influentially in the communication strategy of the Riksbank. This form of thinking had a hold over the Riksbank in 1993, when it adopted inflation targeting.

An important benefit of improved communication through an explicit band is that it enhances evaluation of monetary policy as the band sets the accepted range of deviation from the targeted rate. The Swedish experience of abolishing the tolerance band in 2009 clearly illustrates the problems for the communication strategy of a single numerical target without an explicit band. As discussed earlier (see Riksbank 2010), the tolerance interval was removed to allow the Riksbank to deviate from the lower or upper bound of the band to increase its leeway to stabilize growth and employment in the economy.²⁸ This step was viewed as necessary during the financial crisis in 2008. The Riksbank thus went from an explicit tolerance band of +/-1 percentage point to an implicit tolerance band that was much wider. However, the abolishment, in combination with the fact that the Riksbank did not clearly announce that it remained obliged to maintain the overriding objective of price stability, turned into a communication disaster for the Riksbank.

Without the tolerance band, the media and other observers began to focus solely on the specific number of 2 percent. Any deviation from this exact number was seen as a monetary policy failure, no matter how small the deviation was. The Riksbank was criticized for systematically having decided to deviate from its inflation target when CPIF inflation between 1995 and 2008 was 1.9 percent and not at the target of 2 percent. The debate became obsessed with the number of 2.0 despite the fact that the Riksbank had never announced that the rate of inflation should be exactly at 2.0 percent. The inflation target is set as 2 percent without any decimal points. An inflation rate of 1.5 or 2.4 percent is compatible with the target of “approximately 2 percent” once the proper rounding has taken place. Moreover, the fact that the new implicit tolerance band was actually wider than the old explicit band was lost in the

²⁷ The Riksbank uses the CPIF in its economic models, and it dominates the board’s monetary policy discussions. See Andersson and Jonung (2014) on the role of the CPIF.

²⁸

http://www.riksbank.se/Upload/Dokument_riksbank/Kat_publicerat/Pressmeddelanden/2010/nr27_beslutsunderlag.pdf.

debate. The lack of an explicit band gradually undermined the Riksbank's communication strategy.²⁹

The critique of Lars E. O. Svensson, both as a member of the board of the Riksbank and following his departure, built upon a similar argument.³⁰ The difference between the actual rate of inflation and the target – sometimes smaller than 0.5 percentage point in his calculations – was taken as evidence that the Riksbank had caused an additional 38,000 persons to be unemployed in the period 1997-2011 by not exactly hitting the target. Econometric evidence for this position is weak, but the claim fit well with the new focus solely on the 2 percent target, ignoring any explicit or implicit tolerance bands. This argument attracted much attention in public debate, undermining the credibility of the Riksbank. If the tolerance band had been in place after 2010, Svensson's critique could easily have been dismissed by concluding that the actual inflation rate was well within the tolerance band during the period considered by him.

3.2 Arguments against a tolerance band

The main argument against an explicit tolerance interval is the uncertainty that such a band may introduce about the conduct of monetary policy, in particular concerning the willingness of the central bank to stick to the target. Greater uncertainty as reflected in the size of the tolerance band around the rate of inflation targeted by the central bank would make it more difficult for households and firms to plan for the future.³¹ Thus, their inflationary expectations will be less anchored to the target, and inflation uncertainty will be higher. This line of reasoning does not take into account the fact that all central banks have an implicit band, nor that inflation will at times deviate from the target no matter what the central bank is doing. Let us examine these claims in the Swedish setting.

In the Swedish debate, it has been asserted that a tolerance band would make it more difficult for labor market organizations to strike collective wage agreements as they become more uncertain about the willingness of the Riksbank to reach the 2 percent target. Figure 2 illustrates one-year-ahead inflation expectations for households, firms and labor organizations in Sweden. The white area represents the period when the Riksbank had an explicit tolerance band and the gray area the period with an implicit tolerance band. As evidenced by Figure 2, inflation expectations have been volatile in both time periods. The standard deviation is 0.7

²⁹ More recently, Deputy Governor Henry Ohlsson of the Riksbank has criticized the belief in exact numbers in monetary policy making by invoking the concept of “the tyranny of the tenths.” Instead, more attention should be given to noise, the role of uncertainty, measurement errors in data and other factors that reduce the accuracy of official statistics.
http://www.riksbank.se/Documents/Protokoll/Penningpolitiskt/2016/pro_penningpolitiskt_161220_eng.pdf.

³⁰ See Svensson (2015) and the response in Andersson and Jonung (2015).

³¹ See, for example, Freedman and Laxton (2009) on the advantages and disadvantages of a tolerance band.

for all three groups during the time of an explicit tolerance band. It increases to 0.8 for households after the band was abolished, while it falls for firms and remains constant for labor organizations. All variations in the standard deviation are small, however, showing that removing the band did not affect the variability in expectations. Also evident in Figure 2 is that inflation expectations move with actual inflation such that the forecasting error is small or non-existent.³² There are consequently no signs that inflation expectations are less volatile or more anchored at 2 percent after 2010 than before 2010.

[FIGURE 2]

Another way of revealing the expectations of the labor market organizations is to examine the length of collective wage agreements in Sweden. Fregert and Jonung (2008) find that the introduction of inflation targeting in 1995 is associated with longer wage contracts than in the period before. A standard length of three years emerged from the mid-1990s until the crisis of 2008. This length remained in place, with an exception for the global financial crisis, until 2015, when contract length was shortened due to tensions within the labor union movement. This picture is consistent with the view that the abolishment of the tolerance band in 2010 did not reduce uncertainty.

The explicit tolerance interval that was in place between 1995 and 2010 apparently did not increase uncertainty compared to the period *after* 2010. In fact, there is some evidence that inflation expectations deviated more from the target after the explicit band was abolished. We cannot rule out the possibility that the removal of the explicit band has actually caused inflation expectations to deviate more from the target than before, due to the heated debate that emerged after the Riksbank had abolished the band.

We conclude from this reasoning that the argument that an explicit band – given that the band is not too large and well communicated – increases uncertainty does not carry much empirical weight in the Swedish context. Uncertainty about the ability and willingness of the central bank to stick to the point target will exist regardless of the choice of tolerance band – if it is explicit or implicit. In our opinion, there are stronger reasons to reduce uncertainty by making the band explicit than to increase uncertainty by having an implicit and thus an unknown band.

4. What is the proper size of the tolerance band?

As stated initially, a majority of central banks has adopted explicit tolerance bands as practical and simple rules of thumbs. Still, the choice of the numerical size of the tolerance band is an open issue. The Swedish experience, not least the public debate once the tolerance band was abolished, is evidence of the importance of a band. A key question is how large should the band be?

³² See Andersson and Jonung (2015).

We find it hard to believe that the width of the band can be derived from a theoretical model that will arrive at the optimal size of the tolerance band.³³ Such an approach is not fruitful, in our view, as the choice of numerical value for the target is influenced by so many relevant factors – as described above in our list of pros and cons – that they are difficult to capture by a single model. In addition, a band derived from a theoretical model is likely to vary over time as new data are fed into the model. There is a clear advantage for a central bank in its communication strategy to have a constant band, not one that changes over time and is dependent on a specific model.

Instead, we rely on our reading of the historical record. Thus, we focus on the actual behavior of the rate of inflation under inflation targeting. Our approach is built upon a mixture of historical and practical considerations.³⁴

The old band of +/-1 percentage points that the Riksbank introduced in 1993 has turned out to be too narrow. A key reason for the Riksbank to abolish it was that it wanted to allow inflation to deviate by more than the band allowed to support growth and employment. Figure 2 demonstrates that inflation measured by the CPI index and the CPIF index so far has fluctuated between 0 and 4 percent. This suggests that a band of +/-2 percentage points is appropriate. As evidenced by Figure 3, the forecast error is also approximately +/- 2 percent, lending further support to our proposed size of the band. For a small open economy like Sweden with an export sector amounting to half of GDP and thus strongly exposed to external shocks, this size of the band makes sense, judging from the history of its inflation variability.

³³ See, for example, Demertzis and Viegli (2009) for a model-based derivation of optimal tolerance bands for an inflation-targeting central bank. These calculations do not arrive at any practical recommendations concerning the proper size of the band.

³⁴ The analysis of the proper width of the tolerance band has some similarities with the discussion about the size of exchange rate bands, or zones, which set the exchange rate within an explicit (or implicit) interval or range. The idea is that under a fixed exchange rate regime, the central bank holds the exchange rate within the band through market interventions, counteracting speculation and/or external shocks and thus making the fixed rate more credible by anchoring expectations at the fixed rate.

We do not bring the literature on exchange rate bands to bear on our discussion of the tolerance band, as the two types of bands are fundamentally different: one refers to an official price index for which there is no market; the other refers to the price of a single asset, the currency that is traded on “thick” markets. No speculation on any financial market arises when the rate of inflation is getting close to the boundary of the tolerance band for inflation or is moving outside the band. Thus, there is no need for immediate central bank action when the band is breached.

Under exchange rate band targeting, the central bank is by definition forced to intervene in asset markets to maintain the credibility of the exchange rate regime. If intervention fails, the ultimate choice is to abolish the fixed exchange rate. This is the reason why inflation targeting has been adopted in many countries in recent decades. Inflation targeting gives more flexibility to the central bank than does exchange rate targeting.

[FIGURE 3]

An argument against such a wide band is that it may increase uncertainty about future inflation with negative effects on the wage bargaining process. However, considering that inflation has fluctuated within this interval for more than 20 years without any obvious negative effects, such fears are likely to be exaggerated. The lively debate on monetary policy that followed once the band was removed has probably caused greater harm.

Based on our reading of the evidence, we suggest that the inflation target for the Riksbank of 2 percent should be surrounded by a new tolerance band of ± 2 percentage points.³⁵ Eventually, in case the Riksbank manages in the future to hold the actual rate of inflation close to the target for a prolonged period, this band may be reduced to its original size of ± 1 percentage points.

5. Summary

No central bank can perfectly control inflation. For this reason, all inflation-targeting central banks have an implicit or explicit tolerance band around the targeted rate. In this paper we have argued based on the Swedish experience that an explicit tolerance band has three major advantages compared to an implicit band. First, it gives the central bank flexibility within the rules of the inflation targeting regime to respond to developments that may threaten future economic and financial stability. Second, it facilitates its communication strategy. The central bank can be honest about its actual capacity - or more frankly its inability - to fine-tune monetary policy towards the inflation target and about various trade-offs between policy goals in the short and long run. Being honest is the most important element in building long run trust in monetary policy. Third, it makes it easier to evaluate monetary policy. The explicit band hence strengthens the rules-based system inflation targeting system. The Swedish experience demonstrates empirically these advantages of an explicit tolerance band. The lesson for other central banks is to maintain their explicit bands or to move towards such a band.

The size of the band is key issue to which there is no easy answer. The size of the band is likely to vary from country to country. For Sweden, we show that a new band should be set broader compared to the old band. We suggest a band of ± 2 percentage points, as the old band of ± 1 percentage point, was too narrow according to the Riksbank's own analysis. This broader band will ensure that the Riksbank will reap all the benefits of a tolerance band without jeopardizing the benefits of the inflation target.

To further strengthen the inflation targeting regime, the Riksbank should explain fully how it envisages the use of the explicit tolerance band when it is re-introduced, stressing that its policy aims at hitting the mid-range of the new and broader tolerance band. It should not be a

³⁵ We have previously suggested this numerical size of the explicit band based on the inflation performance in Sweden during recent decades in Jonung (2015) and Andersson and Jonung (2016).

band of monetary indifference but a band of tolerance. If the new band is breached, the Riksbank should explain why to the public and to Parliament. Any misses should be regarded as bygones and should not impact the future policy of the Riksbank. The Riksbank should continue to be an inflation targeter – not a price-level targeter.

To sum up, comparing the pros and cons of an explicit tolerance band, we conclude that there are stronger arguments for an explicit than for an implicit band. In our opinion, these lessons from the Swedish monetary experience are relevant for inflation-targeting central banks.

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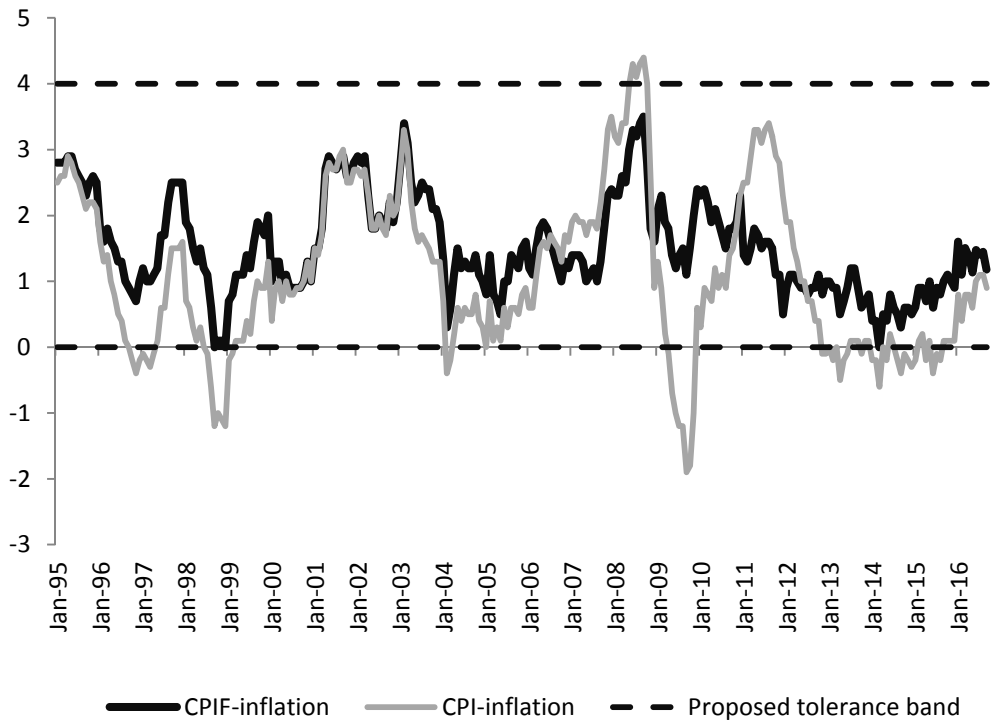


Figure 1. CPIF and CPI inflation (percent), and a tolerance band of +/- 2 percentage points.

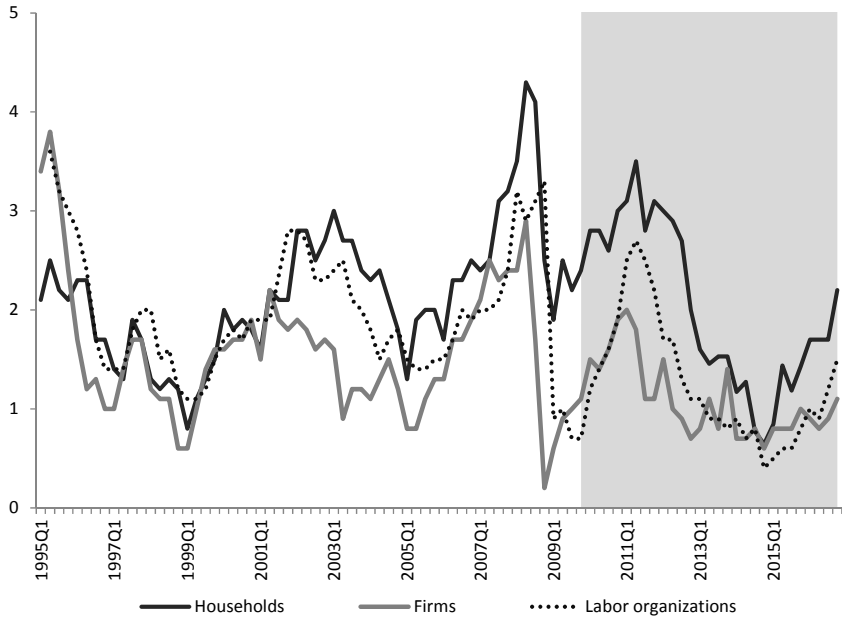


Figure 2. Inflation expectations (percent) one year ahead for households, firms and labor market organizations, 1995Q1 to 2016Q4.

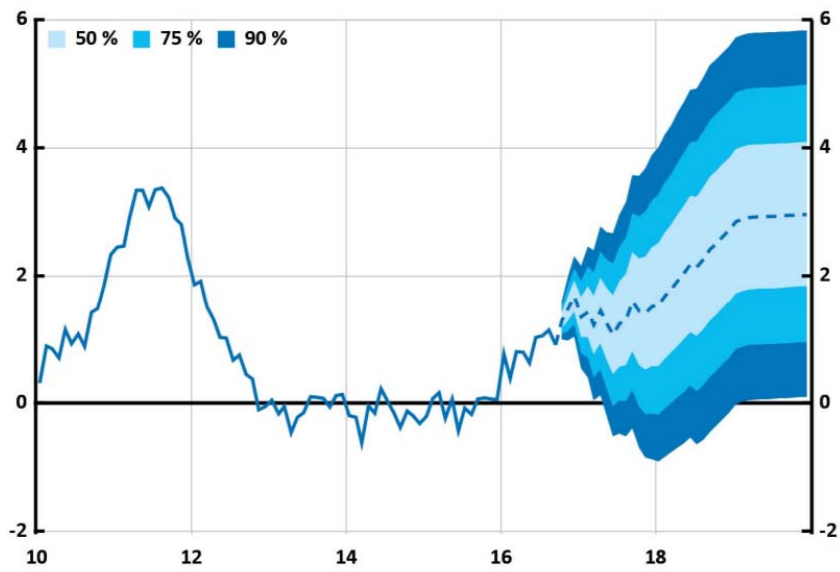


Figure 3. The Riksbank's CPI inflation forecast from September 2016.
Source: Riksbank's Monetary Policy Report, September 2016.