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An Assessment of Lars E. O. Svensson's Critique of the Riksbank's Inflation Targeting, 1997-2012

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Abstract: We examine Lars E O Svensson's prominent critique of the monetary policy of the Sveriges Riksbank (the Swedish central bank) from 1995-2012. Our main objection concerns Svensson's conclusion that the original pre-Friedman/Phelps version of the Phillips curve based on constant inflation expectations has returned for Sweden. Based on estimates of this model, Svensson claims that the Riksbank's policy has contributed to an average of 38 000 more unemployed a year between 1997-2011. This result is based on Svensson's unrealistic as well as unnecessary assumption of constant inflation expectations anchored at the Riksbank's inflation target of 2 per cent. Data show, however, that the public's inflation expectations have varied between 0 and 4 per cent, thus they have not been anchored. The negative employment effect found by Svensson vanishes once actual data on inflation expectations are included in the estimates of the Phillips curve. The long run non-vertical Phillips curve is transformed into a vertical one, in line with the Friedman/Phelps theory.

We have additional objections to Svensson's reasoning. First, we show that the Riksbank has on average met its inflation target between 1995 and 2012. Second, we suggest that the original Phillips curve is too simple a model to draw any firm policy conclusions about unemployment and monetary policy in a small open economy such as Sweden. Third, we do not want to overburden Swedish monetary policy by making the Riksbank responsible for three objectives. It has already two objectives: price stability and financial stability. Criticising the Riksbank for employment losses, as Svensson does, gives priority to a third objective, high employment. Finally, Svensson adopts a short-term perspective by focusing on the period 1995-2011. When we compare the Riksbank's inflation targeting regime with previous monetary policy regimes over the past 100 years, inflation targeting in the past fifteen years is clearly one of the most successful.

Key words: Sweden, inflation targeting, Phillips curve, inflation expectations, the Riksbank, unemployment.

JEL code: C51, D84, E2, E24, E31, E42, E50, E58, N14

The Return of the Original Phillips curve? An Assessment of Lars E O Svensson's Critique of the Riksbank's Inflation Targeting, 1997-2012

1. Introduction¹

The aim of this paper is to examine Lars E O Svensson's prominent critique of the Swedish Riksbank's monetary policy. In recent years, he has energetically and consistently put forward his views on Riksbank's policy - first as a member of the Executive Board of the Riksbank from 2007 to 2013 and since May 2013 as an independent researcher.² His arguments, which have attracted considerable media attention, have raised the level of debate on monetary matters in Sweden. His views deserve close attention.

Swedish monetary policy has been based on an inflation target since 1995. The inflation target consists of a central value, or target point, of 2 per cent and a tolerance band of ± 1 percentage point. Svensson's critique of the Riksbank is based on two arguments. First, average inflation has been lower than the announced central value. Second, too low inflation has led to unnecessarily high unemployment. We focus mainly on these two arguments. We analyse the entire period since the introduction of the inflation target (1995-2013) as well as the period covered by Svensson's (2013a) econometric analysis (1997-2011).

Our paper is organised in the following way. We start by describing how the Riksbank has implemented its inflation target. We then analyse to what extent the Riksbank has hit or missed the target. Our next step is to examine Svensson's assertion that the Riksbank has contributed to an average of 38 000 more unemployed each year from 1997 to 2011. We focus on Svensson's claim that the original pre-Friedman/Phelps version of the Phillips curve has returned for Sweden. Here we replicate his econometric work, analysing his critical assumptions and the robustness of his results.

¹ We have benefitted from discussion with Claes Berg, Michael Bergman, Villy Bergström, Robert Boije, Urban Bäckström, David Edgerton, Daniel Ekeblom, Karolina Ekholm, Martin Flodén, Niklas Frank, Klas Fregert, Oskar Grevesmühl, Jesper Hansson, Per Jansson, John Hassler, Daniel Heymann, Michael Hutchison, Axel Leijonhufvud, Stefan Palmqvist, Irma Rosenberg, Joakim Sonnégård, Hans Tson Söderström, Ulf Söderström, Eskil Wadensjö and Anders Vredin. The usual disclaimer holds.

This report is an extension of our article in Swedish "Riksbanken och inflationen 1995-2012 – missar Svensson målet?" ("The Riksbank and the rate of inflation 1995-2012 – does Svensson miss the target?") published in *Ekonomisk Debatt*, no. 3, 2014. Here we present a more detailed review of the econometric estimates that due to limited space could not be included in *Ekonomisk Debatt*. We thank Barbara Burton for a skilful translation into English.

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² See, for example, Svensson (2013a and b) and his many contributions in Swedish at <http://ekonomistas.se/author/leosven/>.

Next, we broaden our perspective and take up three issues inspired by Svensson's critique. First, how reasonable is it to draw policy conclusions from Svensson's claim of a stable non-vertical long-run Phillips curve with constant inflation expectations? Second, how much weight should the Riksbank assign to employment as its third objective in addition to its two prime objectives: financial stability and low inflation? Third, how well does the recent inflation targeting regime fare in comparison with previous monetary regimes in Sweden in the 20th century? Finally, we summarise our discussion.

2. The Riksbank's inflation target

Price stability has been the Riksbank's primary objective since it was forced to abandon the fixed exchange rate for the krona in November 1992. In January 1993, the Riksbank announced, on its own initiative, that an inflation target with a central value of 2 per cent as measured by the consumer price index (CPI) would be introduced in January 1995. Until 2010 the 2 per cent central value was supplemented by a tolerance band of ± 1 percentage point around the central value. The tolerance band showed "the Riksbank's ambition to limit the inevitable fluctuations around the central value" (Bäckström 1995, p. 10).

The explicit tolerance band was abolished in 2010 because the Riksbank had at times deliberately allowed inflation to move outside it in order to support growth and employment (Riksbank, 2010a). The tolerance band was not eliminated because the Riksbank wished to reduce the fluctuations in inflation to less than ± 1 percentage point, nor did the Riksbank's overall monetary policy strategy change when the tolerance band was abolished.

As monetary policy affects inflation with a time lag of a few years, the Riksbank designs its policy so that "inflation is expected to be reasonably close to the target in two years" (the Riksbank 2010b, p. 6). The Riksbank also takes the short-term effects of monetary policy on growth and employment into account. The Riksbank can therefore temporarily allow inflation to deviate from the central value in order to the overall economy (Heikensten 1999, the Riksbank 2010b, c and 2013).

In the short term, CPI inflation is directly affected by changes in the Riksbank's repo rate via interest costs on owner-occupied housing. If the repo rate is raised, CPI inflation increases. Likewise, if the repo rate is reduced, CPI inflation decreases. In other words, when the Riksbank reduces the repo rate with the aim of stimulating the economy and raising inflation over the next few years, the short-term inflation effect will actually be the opposite.³ The Riksbank disregards this short-term effect of a change in the repo rate on CPI inflation by focusing on the medium- to long-term effect on inflation, because "to try to counteract a reduction in CPI created by the direct effects of interest rate cuts with further cuts would, in terms of monetary policy, be tantamount to chasing one's own tail" (Heikensten 1999, p. 10).

³ Palmqvist (2013) stresses that the CPI for Sweden is more sensitive to changes in the repo rate than the CPI of other countries.

In the long run, when interest rate increases and decreases have been of the same magnitude, the average interest effect on CPI inflation will be zero.

The Riksbank uses different measures of the underlying rate of inflation to eliminate the interest rate effect on CPI inflation. A key measure here is CPIF inflation which is calculated assuming a fixed mortgage interest rate. The Riksbank uses this measure in its Ramses model of the Swedish economy and in its monetary policy decisions.⁴

Svensson (2013f) stresses the fact that CPIF is an important inflation measure for the Riksbank. Following large repo cuts and consequently a decline in CPI-inflation, he noted “there is a generally accepted principle that over the coming few years it is CPIF inflation that is relevant. The reason for this is that in the short term, CPI inflation is affected directly by the Riksbank’s own policy-rate adjustments and monetary policy should not react to these temporary effects”.⁵ Once all interest rate cuts are matched by equally large interest rate increases, CPI inflation and CPIF inflation by construction are equal.

The Riksbank is not the only central bank to exclude mortgage costs from the price index. The Bank of England and the European Central Bank use price indices where mortgage costs are not included while other central banks such as the Reserve Bank of Australia and the Reserve Bank of New Zealand target underlying inflation where the mortgage costs effect has been eliminated. For an international comparison see for example Pétursson (2004).

Since 1999, a price stability objective has been inscribed in the Riksbank Act. According to the preparatory works for the Act, this objective should “be interpreted in terms of change, not in absolute terms, i.e. the objective should be stated as a target for the inflation rate rather than as a target for the absolute price level” (Bill 1997/98:40, p. 53).⁶ This means that if inflation deviates from the central value, the Riksbank should not compensate for this deviation so that average inflation is 2 per cent. Thus, the Riksbank does not respond to undershooting with overshooting or vice versa. In short, there is no memory built into the inflation target: bygones are bygones. At each decision point, the objective is to meet the central value in the near future without taking previous results into account.

Consequently, a comparison between the inflation outcome and the central value “does not necessarily show how well monetary policy has been conducted” (The Riksbank, 2013). Moreover, sometimes the Riksbank deliberately ignores the inflation target to support growth and employment. This was the case in 2009 following the financial crises when, due to the

⁴ CPIF was introduced as a measure of underlying inflation in 2008. See Hansson and others (2008). Other measures of underlying inflation were previously used, but these “removed a little too much” (The Riksbank 2010c, p. 60). As these measures removed too much, we have based our examination on CPIF for the entire period. See also Wickman-Parak (2008).

⁵ The same argument is given by Bergström and Boije (2005).

⁶ At the monetary policy meeting of the Riksbank board in February 2009, Lars E O Svensson and Svante Öberg discussed whether the Riksbank would temporarily gain by switching to a price level stability objective. Svante Öberg thought that such a step would damage the Riksbank’s credibility. No switch was made.

cuts in the repo rate, CPI inflation became negative (Riksbank, 2010a). CPIF inflation, however, remained positive.

The Riksbank's view of the inflation target, as its official documents make clear, can be summarised as follows: since 1995, the objective has been to hold CPI inflation as close to the 2 per cent central value as possible, within an explicit tolerance band up to 2010, and within an implicit band thereafter. Minor deviations from the central value do not mean that the Riksbank has missed or disregarded its inflation target. Furthermore, we have to take into account that the Riksbank has sometimes deliberately allowed CPI inflation to deviate from the central value due to the interest rate effect on housing costs or to support growth and high employment. CPIF is thus an alternative and better inflation measure than CPI when evaluating Swedish monetary policy over the medium term.

3. Has the Riksbank met the inflation target?

Svensson (2013c) pursues the view that “if average inflation over a longer period clearly exceeds or falls below the inflation target, it could be argued that the Riksbank has disregarded price stability”. This interpretation of the inflation target is too narrow, in our opinion, compared to how the Riksbank has defined its inflation target. Nevertheless, in this section we analyse the average inflation outcome compared to the inflation target because it's the key component in Svensson's critique of the Riksbank.

Unlike Svensson, who only focuses on CPI inflation, we also examine CPIF inflation for the reasons stated above: CPIF is used when making monetary policy decisions as well as in the Riksbank's Dynamic Stochastic General Equilibrium (DSGE) model of the Swedish economy, the Ramses model.

In addition to these two measures of inflation, households' perceptions of inflation are of key interest. This measure of the rate of inflation is obtained through surveys, where a representative selection of Swedes answers the question: “compared with 12 months ago, how many per cent higher do you think prices are now?” Here the respondents state what they perceive current inflation to be using numerical values. The perceived rate of inflation is a valuable complement to the official price indices as it is reasonable to assume that households to a large extent base their economic decisions on their perceived rate of inflation.⁷

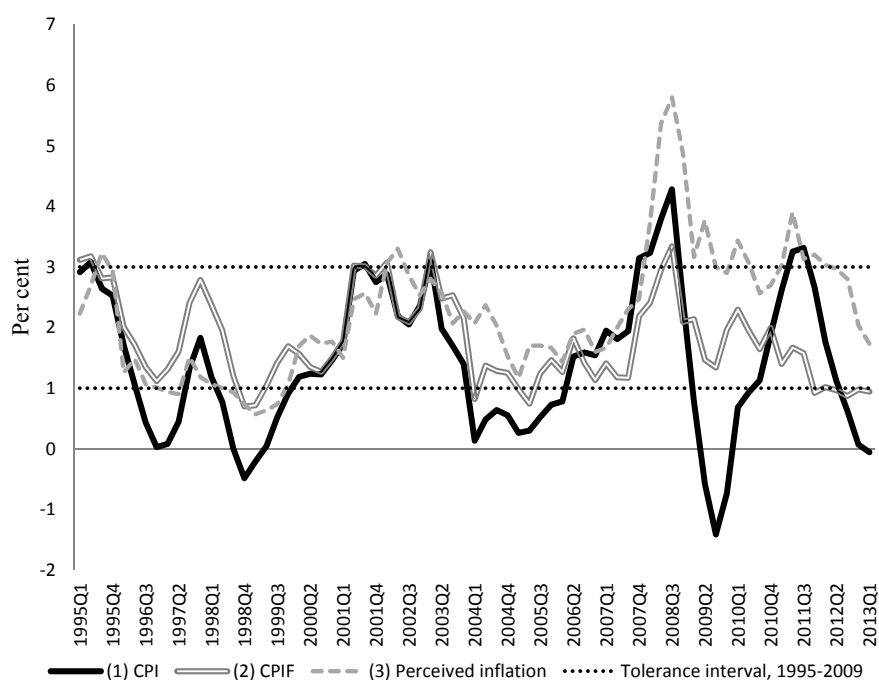
Table 1 shows the average inflation and deviation from the central value for three periods, the entire inflation target period 1995-2013, the period examined by Svensson (2013a, b) 1997-

⁷ Jonung (1981) argues that perceived inflation is an excellent complement to Statistic Sweden's consumer price index. Much suggests that the perceived rate is a most useful measure of the actual rate of inflation in Sweden. On this point see Jonung and Laidler (1988).

2011, and the period preceding the financial crisis 1995-2008. Figure 1 depicts the inflation rate in these three series and the tolerance band surrounding the central value up to 2010.⁸

CPI inflation, the principal measure studied by Svensson, shows the lowest rate of inflation, regardless of the choice of period. Average CPI inflation has been between 0.5 and 0.6 percentage points lower than the central value. The greater part of this deviation can be explained by the downward trend in interest rates since the end of the 1990s.⁹

Figure 1. Annual CPI, CPIF and perceived inflation for 1995 Q1 to 2013 Q1.



CPIF inflation, which eliminates this interest effect, averages between 0.1 and 0.2 percentage points below the central value, depending on the time period chosen. If we disregard the large shocks associated with the global financial crisis and the European debt crisis, average CPIF inflation is 1.9 per cent. It deviates only -0.1 percentage points from the 2 per cent central value.

Judging from Figure 1, the Riksbank has been successful in stabilising average inflation at close to 2 per cent. The large reduction in inflation in 2009 following the financial crisis and

⁸ Our data sources are described in Appendix 1.

⁹ Irma Rosenberg (2007), as a member of the Executive Board of the Riksbank, explained it thus: “between 1995 and 2006, inflation averaged 1.3 per cent measured with CPI. Inflation measured with UND1X, on which we normally base monetary policy, averaged 1.7 per cent in the same period. ... Regardless of the measure used, the price stability objective as given in the law of the Riksbank has been achieved. On average, however, inflation has been lower than the inflation target defined by the Riksbank”. (In 2008, CPIF replaced UND1X as a measure of the underlying rate of inflation.).

the increase in inflation during 2011 is mostly due to changes in the mortgage interest rate, influenced by the Riksbank's reduced repo rate. We regard the stable inflation close to the target as an excellent record.

If we look at households' perceived rate of inflation, the average is about the same or somewhat higher than the central value of 2 per cent. Thus, households' perceived inflation has on average been close to the central value. Here too we give the Riksbank a clear pass.

Table 1. Average CPI; CPIF and perceived inflation and deviation from the central value

	1995Q1 – 2013Q1	1995Q1 – 2008Q3	1997Q4 – 2011Q4
<i>Average inflation</i>			
(1) CPI	1.4	1.5	1.5
(2) CPIF	1.8	1.9	1.8
(3) Perceived inflation	2.2	2.0	2.3
<i>Deviation from the central value</i>			
(1) CPI	-0.6	-0.5	-0.5
(2) CPIF	-0.2	-0.1	-0.2
(3) Perceived inflation	+0.2	± 0	+0.3

We summarise our results as follows. Based on the Riksbank's goal of keeping inflation within a tolerance band of plus/minus one percentage point from the central value, we must conclude that on average the Riksbank has met its inflation target as measured by all three inflation rates from 1995 to 2012. Inflation is 1.8 percent, only -0.2 percentage points from the target if we, like the Riksbank, exclude the effect on inflation of changes in the interest rate.

Data uncertainty: When the deviations from the central value are as small as in Table 1, potential measurement errors in the data have to be taken into account. According to Statistics Sweden's estimates, the margin of error in the annual estimates of CPI inflation is ± 0.3 percentage points.¹⁰ Furthermore, in 2005 Statistics Sweden introduced a change in the method of calculating indices for inflation that affected the weights in CPI and CPIF. This affected the inflation rate estimates. CPI and CPIF inflation are on average 0.2 percentage points *lower* using the new methodology to construct the price indices compared to the old methodology.¹¹ This difference in the inflation rate is small, but as our measures of inflation deviate relatively little from the central value, the impact on the margin of error and the change in method on the results are not negligible. In order for us to be able to say with certainty that inflation has deviated from the central value, average inflation deviations have to be considerably larger than in Table 1.

¹⁰ http://www.scb.se/Statistik/PR/PR0101/_dokument/PR0101_BS_2013.pdf.

¹¹ Here our basis is the period 1995 Q1 to 2004 Q4, i.e. the period for which we have inflation data under both the old and the new method. Inflation data for the period after 2005 Q1 are only available under the new method.

Expectations uncertainty: All econometric work using survey data on the perceived and expected rate of inflation uses an estimate calculated as the average over all the respondents given numerical values. This is the approach used in Figure 1 and 2. This methodology ignores the uncertainty that the public attaches to its replies concerning perceptions and expectations of inflation. People associate their perceived and expected rates with considerable uncertainty as demonstrated in Jonung (1986). For example, where the perceived inflation rate is 2.2 per cent as in Table 2, there is a confidence interval surrounding this point estimate that should be kept in mind when interpreting the survey responses and when evaluating the Riksbank's inflation targeting approach.

4. Is the original Phillips curve back?

According to Svensson (2013d), the Riksbank has “systematically disregarded the inflation target by allowing an average inflation that is significantly lower than the target of 2 per cent”. According to him, this undershooting has contributed to an average of 38 000 more unemployed every year from 1997 through 2011.

In this section, we test the robustness of Svensson's analysis, in particular, his assumption of constant inflation expectations. Our focus is on exploring his claim that there is a stable long-run non-vertical Phillips curve that can be exploited for policy purposes.

We begin by estimating several different Phillips curves in Section 4.1. Here we replicate Svensson's empirical results and test what happens if we include actual data on inflation expectations in the model rather than assuming that inflation expectations are constant. Next in Section 4.2, we analyse the inflation expectations of different groups and estimates of the unemployment gap in more detail. Finally, we summarise the results and discuss the stability and policy use of the Phillips curve in Section 4.3.

4.1 Estimating the Phillips curve

Svensson assumes that inflation expectations have been constant and exactly on a level with the 2 per cent central value – right on the target. He claims that the Riksbank has successfully anchored expectations at 2 per cent, thanks to the inflation targeting regime. Introducing the assumption of constant inflation expectations implies that he adopts the specification behind the original Phillip curve as set out by Phillips (1958) – a model that has been highly criticised for not taking inflation expectations into account. The assumption of constant inflation expectations is the basic objection of Friedman (1968) as developed in the expectations-augmented Phillips curve, commonly classified as the Neoclassical version of the famous curve. Here the long-term Phillips curve is vertical.

The expectations-augmented Phillips curve is given by,

$$\pi_t = \pi_t^e - \gamma(u_t - u_t^*) + \varepsilon_t, \quad (1)$$

where π_t is inflation, π_t^e expected inflation, $(u_t - u_t^*)$ the unemployment gap, i.e. how much actual unemployment (u_t) deviates from equilibrium unemployment (u_t^*), γ is a parameter with a positive value and ε_t is a supply shock.¹² Svensson (2013a) assumes inflation expectations and equilibrium unemployment are constant. Imposing these two assumptions Svensson obtains the following econometric model,

$$\pi_t = \beta_0 + \beta_1(u_t - u_{t-1}) + \beta_2 u_{t-1} + \varepsilon_t \quad (2)$$

where β_1 represents the short-term relationship between unemployment and inflation and β_2 represents the long-term relationship between unemployment and inflation.¹³ This specification corresponds to the original Phillips curve model. The long-run parameter is the main parameter of interest in the sense that Svensson uses it to calculate the long-run unemployment effect. We highlight the long-run parameter estimates in grey in our tables presenting the regression results.

Svensson measures inflation as quarterly inflation at an annual rate. The quarterly inflation rate is calculated as,

$$\pi_t^q = 4 \times [\ln(P_t) - \ln(P_{t-1})] \quad (3)$$

where P is the price index, in this case the CPI. The inflation target was introduced in 1995Q1, but Svensson argues that inflation expectations did not become constant until the end of 1997. He therefore excludes the first years of the inflation targeting regime and only uses from data 1997Q4 and onwards. His final observation is 2011Q4.

In Table 2 column 1, we replicate Svensson's results. According to our estimates, the short-run parameter is -2.68 and the long-run parameter is -0.80, which are almost identical to Svensson's estimates of -2.70 and -0.81. We also estimate the same model for CPIF.¹⁴ The long-run parameter is smaller for CPIF inflation compared to CPI inflation (-0.34); see column 2 in Table 2.

The only difference between CPIF and CPI is that the short-term inflation effect of a change in the interest rate is excluded from CPIF. Because the absolute value of the long-run parameter is smaller for CPIF inflation compared to CPI inflation, we draw the conclusion that part of the effect captured by the unemployment rate in the CPI model is the correlation between mortgage interest rate and unemployment.

¹² See equation 1 in Svensson (2013a).

¹³ As a robustness check, we have also estimated Phillips curves with the Riksbank's estimate of equilibrium unemployment. These results are similar to the ones presented in the paper. The assumption of constant equilibrium unemployment has no major effect on the results.

¹⁴ CPIF was introduced in 2008, replacing CPIX. There are no major differences between the results for CPIF and CPIX and thus we only show the results for CPIF.

Table 2. Estimated Phillips curve with quarterly inflation at an annual rate.

Model	Constant inflation expectations				New Keynesian Phillips curve				Neoclassical Phillips curve			
Price index	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF
Inflation expectations	Constant	Constant	Constant	Constant	Firms	Firms	Labour Market	Labour Market	Firms	Firms	Labour Market	Labour Market
Estimation technique	OLS	OLS	OLS	OLS	TSLs	TSLs	OLS	OLS	OLS	OLS	TSLs	TSLs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
β_0	7.14*** (1.25)	4.14*** (1.14)	6.16*** (1.25)	4.68*** (1.24)	7.10* (3.66)	4.79* (2.62)	8.08*** (2.35)	6.29** (2.44)	5.71*** (1.53)	4.05*** (1.44)	6.56** (1.65)	4.41*** (1.41)
u_{t-1}	-0.80*** (0.17)	-0.34** (0.15)	-0.65*** (0.17)	-0.42** (0.17)	-0.72** (0.31)	-0.43* (0.23)	-0.79*** (0.24)	-0.55** (0.24)	-0.63*** (0.18)	-0.39** (0.17)	-0.67*** (0.18)	-0.27* (0.16)
$u_t - u_{t-1}$	-2.68*** (0.82)	-0.53 (0.49)	-1.53* (0.80)	-1.16* (0.63)	-1.65 (1.14)	-1.17 (0.75)	-1.56* (0.79)	-1.18* (0.63)	-1.65* (0.84)	-1.32* (0.72)	-1.37 (0.87)	1.50 (0.99)
$repo_{t-1} - repo_{t-2}$	---	---	1.22*** (0.41)	-0.67** (0.32)	1.37** (0.55)	-0.65 (0.50)	1.45*** (0.44)	-0.48 (0.42)	1.27*** (0.43)	-0.61* (0.32)	1.20*** (0.39)	0.01 (0.16)
$\pi_{t+4 t}^e$	---	---	---	---	-0.29 (1.14)	-0.03 (0.81)	-0.46 (0.47)	-0.37 (0.48)	---	---	---	---
$\pi_{t t-4}^e$	---	---	---	---	---	---	---	---	0.19 (0.37)	0.27 (0.35)	-0.13 (0.41)	-0.45 (0.35)
Adjusted R^2	0.27	0.04	0.34	0.06	0.30	0.04	0.30	0.03	0.33	0.05	0.33	0.06

Note:

a. ***, *** and * denote statistically significant values at the 1 per cent, 5 per cent and 10 per cent levels respectively.

b. Standard errors are estimated using Newey Wests robust standard errors.

c. The main parameter of interest is the long-run parameter for unemployment, which is highlighted in grey.

d. Inflation expectations are instrumented to avoid a problem of simultaneity. The one quarter lag of inflation expectations is used as an instrument.

The mortgage interest rate is highly correlated with the Riksbank's repo rate. For example, the correlation between the repo rate and the 5-year mortgage rate is 0.9. Changes in the repo rate, in turn, are correlated with changes in unemployment. In other words, the Riksbank's monetary policy decisions are affected by changes in unemployment. The correlation we find between unemployment and CPI inflation thus partly captures the theoretical relationship hypothesised by the Phillips curve, and partly captures the Riksbank's response to changes in unemployment (i.e. its response function to changes in the business cycle). The estimated long-run parameter for CPIF inflation (-0.34) is thus a more accurate estimate of the long-term trade-off between unemployment and inflation than the long-term estimate for CPI inflation, which captures both the long-term trade-off and the Riksbank's response to changes in the business cycle (-0.80).

To isolate the Phillips curve effect from the Riksbank's response function, we include the change in the repo rate as an explanatory variable in the model. As expected, including the repo rate has no major effect on the estimated long-run parameter for CPIF inflation, but it reduces the size in absolute value of the estimated long-run parameter for CPI inflation from -0.80 to -0.65; see columns 3 and 4 in Table 2.

Next, we expand the model by including actual inflation expectations to examine Svensson's argument that his data on inflation expectations have no significant effect in his regression model and that he can consequently assume that inflation expectations are constant.

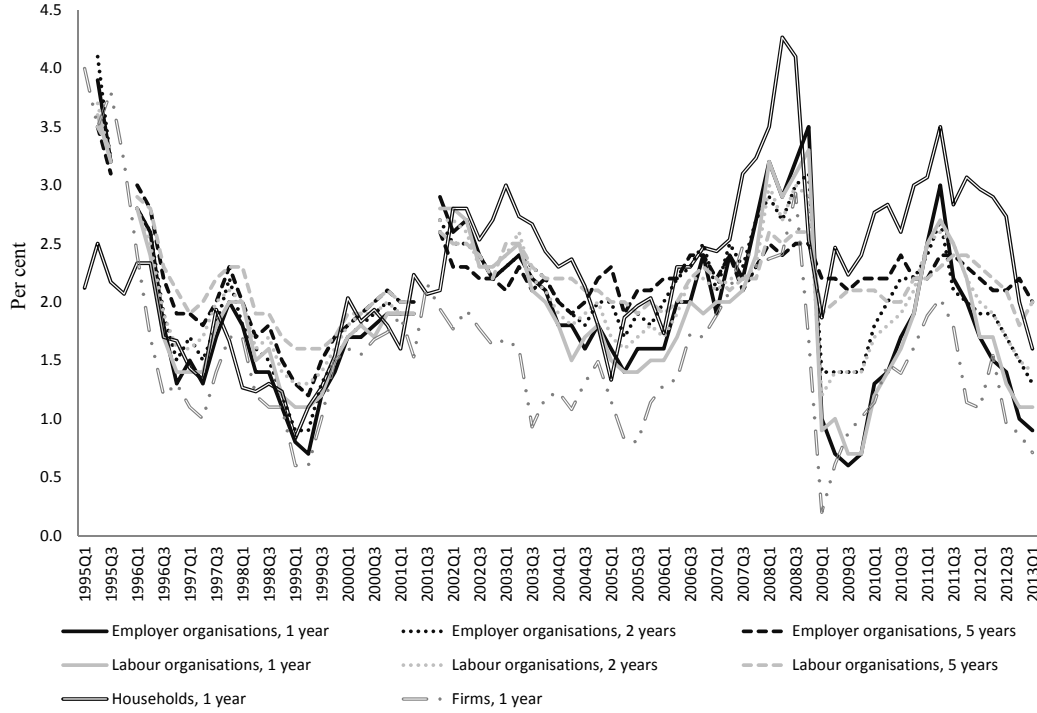
Figure 2 shows inflation expectations with a one-year horizon for four important groups in Swedish society: households, employer and employee organisations, and businesses for the period 1995-2013. Figure 2 also depicts the rate of inflation that employer and employee organisations expect two years and five years ahead.¹⁵

Inflation expectations have fluctuated between 0.5 and 4 per cent. One-year-ahead expected inflation is more volatile than five-year-ahead expected inflation. Business often has slightly lower inflation expectations than other groups. As a rule, households' expectations slightly exceed the expectations of other groups. Data on inflation expectations in Sweden as shown in Figure 2 clearly demonstrate that expected inflation has *not* been constant over time.¹⁶ Svensson's crucial assumption of constant inflation expectations is *not* consistent with actual data on expectations.

¹⁵ Households answer the question "how many per cent do you think prices will rise in the next 12 months". Employer and employee organisations answer the question "how much inflation do you expect in Sweden... measured as the percentage change in the consumer price index".

¹⁶ In a subsequent study, Svensson (2013e) includes data on inflation expectations. However, these are derived from surveys of a small and unrepresentative group of actors in the private sector. Their response concerns expected CPI inflation - which is not necessarily the price index they use for their decisions. He finds that this measure of expectations is insignificant in his estimated model. Our estimates of the Phillips curves show that as a inflation expectations are significant.

Figure 2. Household and businesses' 12-month expected inflation rate and employer and employee organisations' 12-month, 2-year and 5-year expected inflation rate.



Note: No data are available for employer and employee organisations' expectations for three quarters: 1995 Q1, 1995 Q4 and 2001 Q3.

What happens with Svensson's result if we use available inflation expectations data and do not assume, as he does, that inflation expectations have been constant at 2 per cent? To find the answer, we estimate two versions of the expectations-augmented Phillips curve: the New Keynesian Phillips curve and the Neoclassical Phillips curve:

For the New Keynesian Phillips curve, we estimate the following model,

$$\pi_t = \alpha_0 + \alpha_1(u_t - u_{t-1}) + \alpha_2 u_{t-1} + \alpha_3(r_{t-1} - r_{t-2}) + \alpha_4 \pi_{t+4|t}^e + v_t \quad (4)$$

where, r is the repo rate, which is included to control for the short-term interest rate effect on CPI inflation and $\pi_{t+4|t}^e$ is the expected inflation rate in period t for period $t+4$ (i.e. expected inflation one year ahead). For the Neoclassical Phillips curve, we estimate the following model,

$$\pi_t = \gamma_0 + \gamma_1(u_t - u_{t-1}) + \gamma_2 u_{t-1} + \gamma_3(r_{t-1} - r_{t-2}) + \gamma_4 \pi_{t|t-4}^e + \omega_t, \quad (5)$$

where $\pi_{t|t-4}^e$ is the expected inflation rate in period $t-4$ for period t (i.e. expected inflation one year ago). Expectations data is collected from both the National Institute of Economic Research (NIER) on firm's expected inflation one year ahead and TNS Sifo Prospera's data on labour market organisations' expected inflation one year ahead. These are calculated as the average of the employer organisations and the employee organisations inflation expectations.

The regression results for the New Keynesian Phillips curve are presented in Table 2, columns 5 to 8 and the results for the Neoclassical Phillips curve are presented in Table 2, columns 9 to 12.

Our results, like Svensson's show that inflation expectations have no significant effect in the model of the long-term relationship between inflation and unemployment. However, this result is obtained because inflation is measured as the quarterly rate of inflation (see equation 3) while inflation expectations measure the expected yearly rate of inflation. The quarterly inflation and the yearly inflation rates are related processes but they are not identical. Yearly inflation is equal to,

$$\pi_t^y = [\ln(P_t) - \ln(P_{t-4})] = \sum_{i=0}^3 \pi_{t-i}^q. \quad (6)$$

As seen in equation (6), the yearly inflation rate is the sum of four quarterly inflation rates. The yearly inflation rate is smoother than the quarterly inflation rate since some of the short-term volatility in the quarterly inflation rate cancels out in the summation of the quarterly rates. The yearly inflation rate is also phase shifted between one or two quarters compared to the quarterly inflation rate. In other words, quarterly inflation commonly peaks/bottoms out about one to two quarters ahead of the annual inflation rate.¹⁷ In fact, a Granger causality test shows that the quarterly inflation rate Granger causes the annual inflation rate.

Figure 3a illustrates quarterly and annual CPI inflation and Figure 3b illustrates quarterly and annual CPIF inflation. As can be seen in the Figure, quarterly inflation is more volatile than annual inflation. The phase shift is also visible in Figure 3b. For example, during the financial crisis in 2008/09, CPI inflation fell. Quarterly CPI inflation bottomed out in 2009Q1 while annual inflation bottomed out first in 2009Q3.

The phase shift and the short-term volatility in quarterly inflation can potentially cause inflation expectations to be insignificant in the models. We therefore shift from modelling quarterly inflation to modelling annual inflation so that both inflation expectations and inflation are annual rates.

¹⁷ A similar example for GDP growth is available from the Bank of Canada. <http://www.bankofcanada.ca/core-functions/monetary-policy/framework/measuring-economic-growth>.

Figure 3a. Quarterly and annual CPI inflation 1995 to 2011.

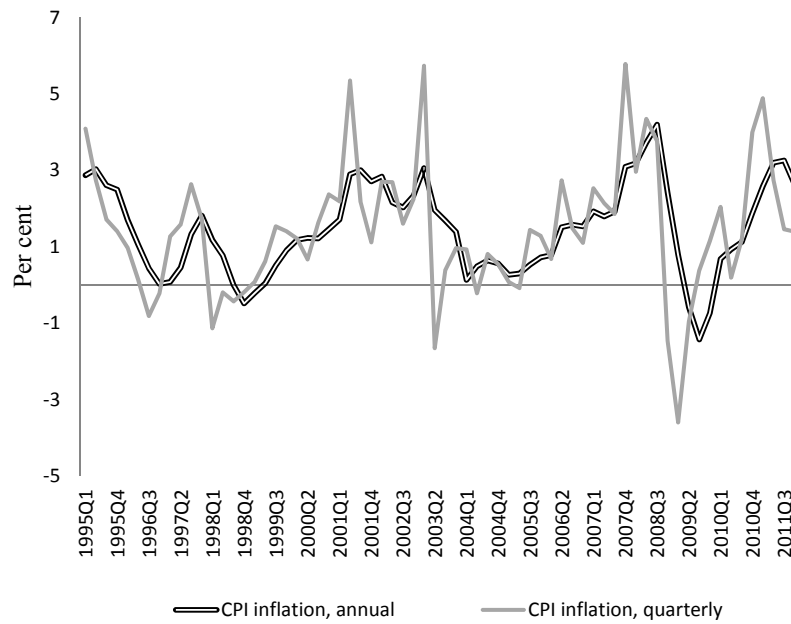
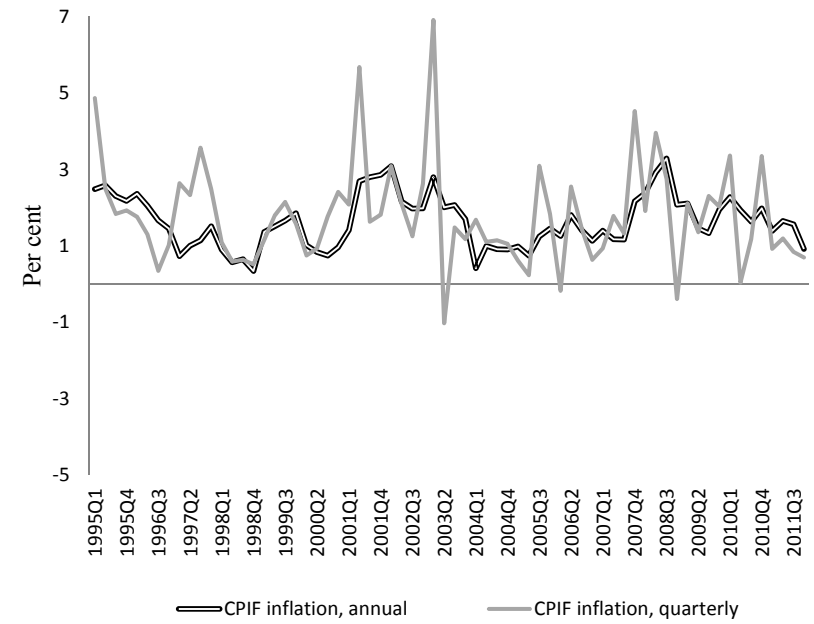


Figure 3b. Quarterly and annual CPIF inflation 1995 – 2011.



The main argument for using quarterly rather than annual inflation is that using annual inflation at a quarterly data frequency introduces econometric problems caused by overlapping data (Svensson, 2013). Overlapping data may cause the parameter estimates to be biased and the errors to be autocorrelated. To solve these potential problems, we use a two-stage-least-squared (TSLS) where we instrument the explanatory variables to avoid the bias problem and Newey-West robust standard errors to control for autocorrelated errors.¹⁸

We use the same basic models for annual inflation as for quarterly inflation, but we adjust the short-term dynamics in the models. If we combine the models for quarterly inflation, equations (2), (4) and (5) with the expression for annual inflation, equation (6) we obtain the following models for annual inflation:

The original Phillips curve with constant inflation expectations (Svensson's model)

$$\pi_t^q = \beta_0 + \beta_1(u_t - u_{t-4}) + \beta_2\bar{u}_{t-1} + v_t \quad (7)$$

where $\bar{u}_{t-1} = \frac{1}{4} \sum_{i=0}^3 u_{t-1-i}$.

The New Keynesian Phillips-curve

$$\pi_t = \alpha_0 + \alpha_1(u_t - u_{t-4}) + \alpha_2\bar{u}_{t-1} + \alpha_3(r_{t-1} - r_{t-4}) + \alpha_4\pi_{t|t-4}^e + \varepsilon_t. \quad (8)$$

The Neoclassical Phillips curve

$$\pi_t = \gamma_0 + \gamma_1(u_t - u_{t-4}) + \gamma_2\bar{u}_{t-1} + \gamma_3(r_{t-1} - r_{t-4}) + \gamma_4\pi_{t|t-4}^e + \omega_t. \quad (9)$$

Regression results for annual inflation are presented in Table 3. Columns 1 and 2 show the results for the model with constant inflation expectations (Svensson's model) and columns 3 and 4 the results for the model with constant inflation expectations and including the repo rate to control for monetary policy's short-term effect on CPI inflation. Columns 5 to 8 show the results for the New Keynesian Phillips curve and columns 9 and 12 show the results for the Neoclassical Phillips curve.

As for quarterly inflation, there is a significant long-term relationship between inflation and unemployment when inflation expectations are assumed to be constant. The estimated long-term relationship between unemployment and CPIF inflation is similar to the parameter estimate when quarterly inflation was used: -0.26 for annual inflation compared to -0.34 for quarterly inflation. The long-run parameter estimate for CPI inflation is smaller in absolute value for annual inflation compared to quarterly inflation although the 95% confidence bounds for the two parameters overlap. The estimated long-run parameter of yearly CPI inflation is -0.58 for annual inflation compared to -0.80 for quarterly inflation.

¹⁸ As instruments we use the 5th and 6th lag of the explanatory variables in the models and the 5th and 6th lag of US inflation, euro area inflation, US unemployment and euro area unemployment.

Table 3. Estimated Phillips curves with annual inflation

Model	Constant inflation expectations				New Keynesian Phillips curve				Neoclassical Phillips curve			
Price index	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF	CPI	CPIF
Inflation expectations	Constant	Constant	Constant	Constant	Firms	Firms	Labour Market	Labour Market	Firms	Firms	Labour Market	Labour Market
Estimation technique	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
β_0	5.59*** (1.33)	3.52*** (0.87)	3.41*** (1.24)	3.47*** (1.06)	1.11 (1.06)	1.52 (1.06)	-1.98 (1.29)	-0.27 (1.24)	2.98* (1.76)	3.15** (1.35)	3.50* (1.75)	3.94*** (1.37)
\bar{u}_{t-1}	-0.58*** (0.19)	-0.26** (0.11)	-0.24 (0.18)	-0.25* (0.15)	-0.13 (0.13)	-0.17 (0.12)	0.00 (0.12)	-0.08 (0.08)	-0.19 (0.20)	-0.22 (0.15)	-0.23 (0.21)	-0.27* (0.15)
$u_t - u_{t-4}$	-0.56** (0.21)	0.04 (0.14)	0.19 (0.23)	0.05 (0.24)	0.20 (0.23)	0.02 (0.23)	-0.10 (0.18)	-0.14 (0.25)	0.25 (0.23)	0.07 (0.23)	0.24 (0.23)	0.08 (0.22)
$repo_{t-1} - repo_{t-5}$	---	---	0.69*** (0.20)	-0.01 (0.17)	0.42 (0.28)	-0.30 (0.20)	0.02 (0.16)	-0.46* (0.20)	0.72*** (0.21)	-0.02 (0.18)	0.73** (0.21)	-0.02 (0.16)
$\pi_{t+4 t}^e$	---	---	---	---	0.98** (0.44)	0.86** (0.35)	1.76*** (0.34)	1.20*** (0.27)	---	---	---	---
$\pi_{t t-4}^e$	---	---	---	---	---	---	---	---	0.08 (0.34)	0.07 (0.33)	-0.10 (0.24)	-0.20 (0.24)
Adjusted R^2	0.43	0.23	0.61	0.22	0.71	0.35	0.80	0.42	0.60	0.26	0.60	0.19

Notes:

- a. ***, ** and * denote statistically significant values at the 1 per cent, 5 per cent and 10 per cent level respectively.
- b. Standard errors are estimated using Newey West's robust standard errors.
- c. The main parameter of interest is the long-run parameter for unemployment, which is highlighted in grey.

Once inflation expectations, the repo rate or both are included in the model, the significant long-term relationship between inflation and unemployment disappears. Inflation expectations are significant in the New Keynesian Phillips curve and the parameter estimate is close to its theoretical value of 1. Inflation expectations are not significant in the Neoclassical Phillips curve. But the insignificance of the inflation expectations does not affect the long-term relationship between unemployment and inflation: it remains insignificant. Excluding the repo rate from the model does not alter the overall conclusion: there is no stable long-term non-vertical relationship between unemployment and inflation once inflation expectations are included in the model.

Overall, the models are relatively poor representations of the economy. The adjusted R^2 for CPIF inflation is between 0.04 and 0.06 for quarterly inflation and 0.19 and 0.42 for annual inflation. Adjusted R^2 is higher for CPI inflation due to the correlation between the mortgage interest rate and unemployment, i.e. adjusted R^2 is higher because the model captures both the Phillips curve effect and the Riksbank's reaction function to changes in unemployment.

To sum up, we find no empirical support for a stable long-term relationship between unemployment and inflation once inflation expectations are included in the Phillips curve model. As seen in Table 4, which summarizes the results, there is only a statistically significant relationship between unemployment and inflation when inflation expectations are assumed to be constant. Overall, our estimates of various versions of the Phillips curve show that Svensson's claim that monetary policy has contributed to 38 000 more unemployed is not robust. It is based on the incorrect assumption of constant inflation expectations, incorrect in the sense that actual expectations have not been constant. Thus, the evidence suggests that the original version of the Phillips curve has not returned, at least not in Sweden.¹⁹

Table 4: Summary of the long-term relationship between unemployment and inflation

Model	Constant inflation expectations		New Keynesian Phillips curve		Neoclassical Phillips curve	
	Quarterly	Annual	Annual	Labor organisations	Annual	Labor organisations
Inflation rate						
Inflation expectations	None	None	Firms	Labor organisations	Firms	Labor organisations
CPI	Yes	Yes	No	No	No	No
CPIF	Yes	Yes	No	No	No	No

Note: Yes denotes a significant long-term correlation between unemployment and inflation at the 5% significance level. No denotes an insignificant long-term correlation between unemployment and inflation at the 5% significance level.

¹⁹ This result is consistent with other studies of the original Phillips curve for Sweden for monetary regimes other than the recent period of inflation targeting. See for example Jonung and Wadensjö (1980).

4.2 Inflation expectations and expectations error

We showed in the previous section that we cannot assume that inflation expectations are constant and that these expectations should be included in the Phillips curve model. In this section, we analyse different groups' inflation expectations and expectations error as well as different estimates of the unemployment gap in more detail. Inflation expectations should exceed inflation and the unemployment gap should be positive if Svensson's analysis is correct.

We can reconfigure the Phillips curve model in equation (1) so that we have the “expectations gap” or the expectations error, i.e. the deviation between inflation and expected inflation, on the left hand side and the unemployment gap on the right hand side:

$$\pi_t - \pi_t^e = -\gamma(u_t - u_t^*) + \varepsilon_t. \quad (10)$$

In the Neoclassical model, the expectations gap is the difference between current inflation and expected inflation in the preceding period in our case four quarters before ($\pi_t - \pi_{t-4}^e$). In the New Keynesian model, the expectations gap is given as the difference between current inflation and expected future inflation ($\pi_t - \pi_{t+4|t}^e$).

Svensson assumes that current inflation expectations π_t^e are equal to the 2 per cent central value. With this assumption, the average expectations gap is negative, as seen in Table 1. This means that the average unemployment gap must be positive, i.e. average actual unemployment has been higher than actual unemployment if we assume that ε_t is on average zero.

The expectations gap for the Neoclassical Phillips curve is shown in Table 5 and for the New Keynesian Phillips curve in Table 6. The expectations gap is estimated for two periods: 1997-2011, the period Svensson (2013a) studies, and 1997-2008, the period before the financial crisis.²⁰ A minus sign means that actual inflation is lower than expected inflation and a plus sign indicates that actual inflation is higher than expected inflation.

²⁰ As the questions about inflation expectations are constructed in different ways, we compare employer and employee organisations' and businesses' inflation expectations with CPI and CPIF inflation and households' expected inflation with their perceived inflation.

Table 5. The expectations gap under the Neoclassical Phillips curve

	Employer organisations	Labour organisations	Firms	Households
<i>1997Q4 to 2011Q4</i>				
(1) CPI	-0.4	-0.4	0.0	---
(2) CPIF	-0.1	0.0	+0.3	---
(3) Perceived inflation	---	---	---	+0.1
<i>1997Q4 to 2008Q3</i>				
(1) CPI	-0.3	-0.3	+0.1	---
(2) CPIF	0.0	0.0	+0.4	---
(3) Perceived inflation	---	---	---	0.0

Note: A negative (positive) expectations gap implies that unemployment has been higher (lower) than the equilibrium.

The expectations gap measured by CPI inflation is negative when we look at employer and employee organisations' inflation expectations, regardless of the model and time period. The expectations gap is negative because these groups have misjudged the future repo rate and its impact on the cost of housing.²¹ With respect to CPIF inflation, the expectations gap is between -0.2 and 0.0 for the two groups, depending on the time period.

Based on the inflation expectations of businesses, the expectations gap is 0.0 for CPI inflation and +0.4 for CPIF inflation. The result indicates that average unemployment has been *below* equilibrium unemployment on average. Households' expectations gap is between -0.2 and +0.1, i.e. both positive and negative but very close to zero.

Available data on inflation expectations do not provide any clear answer to the question of whether the expectations error is negative, zero or positive.²² However, the gap is very small. The compilation in the tables shows that Svensson's conclusion is not robust. His result that the expectations error is negative is highly dubious when we use data on inflation expectations.

²¹ This is evident from the correlation between these two groups' forecast errors for CPI inflation and for the repo rate, which is 0.9.

²² Flodén (2012) finds that business expectations are the most reliable measure for explaining nominal wage growth. Which inflation expectations – for example those of the business sector or those of the public – that are the most relevant to use in empirical work depends on the issue to be addressed.

Table 6. The expectations gap under the New Keynesian Phillips curve

	Employer organisations	Labour organisations	Firms	Households
<i>1997Q4 to 2011Q4</i>				
(1) CPI	-0.5	-0.4	0.0	---
(2) CPIF	-0.1	-0.1	+0.3	---
(3) Perceived inflation	---	---	---	0.0
<i>1997Q4 to 2008Q3</i>				
(1) CPI	-0.5	-0.5	0.0	---
(2) CPIF	-0.2	-0.2	+0.3	---
(3) Perceived inflation	---	---	---	-0.2

Note: A negative (positive) expectations gap implies that unemployment has been higher (lower) than the equilibrium rate of unemployment.

One of Svensson's key arguments is that the negative expectations error, assuming constant inflation expectations, has caused wages to increase too rapidly. This claim is not supported by the real unit labour cost data. The average yearly change in the real unit labour cost is negative, -0.3 per cent for the full period (1997Q4 to 2011Q4) and -0.2 per cent for the period before the financial crisis (1997Q4 to 2008Q3). The average change in the real unit labour cost supports our conclusion that inflation expectations have adjusted to changes in inflation and that real wages have not increased too fast as suggested by Svensson's analysis.

Instead of examining the expectations gap or error, the left hand side of equation (10), we can analyse the unemployment gap, i.e. the difference between actual unemployment and equilibrium unemployment, the right side of equation (10). If the gap is negative, unemployment has been lower than equilibrium unemployment. If the gap is positive, unemployment has been higher. As the expectations gap of the Phillips curve was small, we expect that the unemployment gap will also be small.

All estimates of equilibrium unemployment are notoriously uncertain. According to the Riksbank, it lies within the interval 5-7.5 per cent. As the estimates are uncertain, we use six different measurements of equilibrium unemployment in our calculations: NIER and the OECD measurements and four estimates from the Riksbank; see Table 4. In his study, Svensson (2013a) uses measure number (3) in Table 7.

Table 7. The unemployment gap with different measures of equilibrium unemployment

	1997Q4 - 2011Q4	1997Q4 - 2008Q3
(1) NIER	+0.3	0.0
(2) OECD	-0.1	-0.4
(3) Riksbank	+0.2	-0.1
(4) Riksbank - UC	+0.1	-0.1
(5) Riksbank -UC Trend	-0.4	-0.4
(6) Riksbank - SVAR	+0.9	+0.5
Average	+0.2	-0.1

Note: A negative (positive) sign shows that unemployment has been lower (higher) than the equilibrium.

There is considerable uncertainty in the estimate of equilibrium unemployment. The average unemployment gap lies within the interval of -0.4 and +0.9 percentage points, depending on the measure of equilibrium unemployment we use and the period analysed. If we consider the first three unemployment gaps in Table 7 – NIER's, the OECD's and the estimate from the Riksbank that Svensson has chosen – the unemployment gap is between -0.1 and +0.3 for the entire period 1997-2011. For the period preceding the financial crisis, the average gap is between -0.4 and 0.0. Here registered unemployment has been lower than equilibrium unemployment according to these measures. When we take an average of all these unemployment gaps, the gap is +0.2 for 1997-2011 and -0.1 for the period preceding the financial crisis.

Taken together, these figures demonstrate that it is impossible unambiguously to say that the average unemployment gap has been positive or negative from 1997 to 2011. They show, however, that the deviations from equilibrium are small. They usually lie within the interval of -0.2 and +0.2. We thus do not find any support for Svensson's view that the unemployment gap has been as large as +0.8 percentage points.

Svensson (2012, 2013a) maintains that the Riksbank has overestimated equilibrium unemployment by 0.75 percentage points. The basis for his argument is that the average expectations gap is negative if inflation expectations are assumed to be constant over time. However, as the average unemployment gap is near zero, Svensson draws the conclusion that the Riksbank has overestimated equilibrium unemployment. This assumption is necessary to enable his model and assumption on constant inflation expectations to be combined within one consistent framework. Thus, in practice Svensson is forced to reject not only the Riksbank's estimates of equilibrium unemployment, but also those of the OECD and NIER, which largely coincide with the measures of the Riksbank.

We do not find any support in our estimates that the Riksbank has overestimated equilibrium unemployment when we use actual data on inflation expectations. Instead, our results show that both the average expectations gap and the average unemployment gap have been near

zero. From these numbers, we conclude that Svensson (2012, 2013a) relies too heavily on his assumption of constant inflation expectations in his critique of the Riksbank.

4.3. How useful is the Phillips curve for monetary policy evaluation?

We studied the robustness of the original Phillips curve in the previous two sections by focusing on the assumptions and the econometrics adopted by Svensson. We argued that the approach by Svensson is insufficient. He adopts too simple a theoretical model and econometric method to analyse causation. The correlation he finds between inflation and unemployment begs the issue of cause and effect. It is not possible unambiguously to interpret his result to imply that monetary policy has contributed to creating higher unemployment. Drawing conclusions with sufficient certainty on the effects of the Riksbank's monetary policy requires models with additional variables and more advanced estimation methods than those employed by Svensson.

Our conclusion from Sections 4.1 and 4.2 is that we cannot determine with certainty whether monetary policy has been too tight, too expansionary or hit the mark using the Phillips curve. Our conclusion is supported by Söderström and Vredin (2013). Using the Riksbank's Ramses model, they reached the following conclusion on the issue of whether monetary policy has contributed to long-term employment effects: "the honest answer is that we simply do not know, not even when we use the best scientific methods available and even if we accept one of these calculations, it does not necessarily mean that monetary policy could have been conducted in a better way when the decisions were actually made".

The European Central Bank (ECB, 2014) has surveyed and criticised the use of Phillips curves in monetary policy analysis and decision-making. A major objection is that uncertainty relating to both model specification and the measuring of slack in the economy reduces the reliability and thus the usefulness of the Phillips curve. Similarly, Jürgen Stark from the ECB stresses that reduced form models such as the Phillips curve short-circuit the workings of a complex economy (Fuhrer et al, 2009). Our estimates of various versions of the Phillips curve for Sweden are in line with these remarks.

Another type of warning against using a Phillips curve approach for evaluating monetary policy stems from Goodhart's law.²³ According to this "law", any statistical correlation between a few economic variables will disappear once policy makers try to exploit the correlation for policy purposes (see, for example, Chrystal and Mizen, 2003). In other words, the correlation between unemployment and inflation is likely to disappear if the Riksbank tries to reduce unemployment by increasing inflation – even if there was ex ante evidence of a stable long-run non-vertical Phillips curve.

²³ Goodhart's law is basically a version of the Lucas critique applied to monetary policy.

5. The inflation target in a broader perspective

5.1. Monetary policy and unemployment in a globalised world

How much economic policy autonomy does Sweden have in influencing the domestic business cycle and thus employment? To what extent can monetary policy mitigate external shocks such as that in 2009, when Sweden's exports of goods fell by 18 per cent? Could this loss in exports be rapidly replaced by higher domestic consumption and investment using a lower interest rate? A substantial part of the decline in growth since the financial crisis erupted can be attributed to slower export growth. Between 2010 and 2013, real private consumption grew by an average of 2.3 per cent a year, close to the average growth rate of 2.8 per cent between 1995 and 2007. Real export growth, however, declined from an average of 7.4 per cent a year between 1995 and 2007 to an average of 4.5 per cent a year between 2010 and 2013.

To illustrate the Swedish business cycle's international dependence, we estimate a simple model where Swedish unemployment is set as a function of unemployment in the United States and the euro area. As a comparison, we estimate the same model for Australia and Canada. As Sweden, Australia and Canada are relatively small economies compared with the United States and the euro area, it is reasonable to assume that these countries do not influence the business cycle in the United States or the euro area. The model we estimate is the following one:

$$\Delta u_{jt} = \alpha_i + \sum_{j=0}^4 \Delta u_{t-j}^{USA} \beta_{ij+1} + \sum_{j=0}^4 \Delta u_{t-j}^{euroarea} \beta_{ij+6} + \varepsilon_{it}, \quad (11)$$

where Δu is the change in the unemployment ratio, i stands for Sweden, Australia or Canada, and t is the time period. We estimate the model for the period 1997 Q4 to 2013 Q4. The results are summarised in Table 8.

According to the model, external shocks explain between 59 and 61 per cent of the variation in the unemployment rate. For Australia, the share of the variation explained by the United States and the euro area is lower. But this is probably because Australian exports are more dependent on the Chinese economy than on the American and European economies. A large share of Australian exports goes to China, not least raw materials. The high international dependence for the Swedish and Canadian economies demonstrates how difficult it is for a small open economy like Sweden to avoid a sharp international downturn. There is certainly room for an expansionary monetary policy, but we should not overestimate its possibilities.

What does this tell us about Svensson's criticism of the Riksbank, where he focuses on monetary policy's effects on employment? Svensson does not take Sweden's position as a small, open economy, heavily dependent on external economic influences affecting exports, imports and the financial markets, sufficiently into account. Implicitly, Svensson has used a model for a closed economy, which is too simplistic.

Table 8. Estimated unemployment model

	Sweden	Australia	Canada
α_i	-0.02 (0.04)	-0.05** (0.02)	-0.05** (0.02)
Δu_t^{USA}	0.12 (0.13)	0.30*** (0.08)	0.44*** (0.12)
Δu_{t-1}^{USA}	0.10 (0.09)	0.15 (0.09)	0.16* (0.09)
Δu_{t-2}^{USA}	0.05 (0.14)	-0.17** (0.07)	-0.01 (0.11)
Δu_{t-3}^{USA}	-0.10 (0.14)	-0.16 (0.08)	-0.11 (0.12)
Δu_{t-4}^{USA}	-0.23** (0.11)	-0.06 (0.09)	-0.11 (0.08)
$\Delta u_t^{euroarea}$	0.32*** (0.118)	0.16 (0.10)	0.23** (0.11)
$\Delta u_{t-1}^{euroarea}$	0.38*** (0.08)	0.10** (0.05)	0.03 (0.06)
$\Delta u_{t-2}^{euroarea}$	0.27*** (0.07)	0.12* (0.07)	0.16** (0.06)
$\Delta u_{t-3}^{euroarea}$	0.29*** (0.07)	0.07 (0.06)	-0.06 (0.05)
$\Delta u_{t-4}^{euroarea}$	-0.04 (0.11)	-0.05 (0.09)	-0.06 (0.09)
Adjusted R^2	0.590	0.396	0.605

Note: ***, ** and * denote statistically significant values at the 1 per cent, 5 per cent and 10 per cent levels respectively. Standard errors are estimated using Newey Wests robust standard errors.

What does Sweden's international dependence imply? We see three messages about monetary policy here.

First, the Riksbank has only limited ability to use monetary policy to mitigate the negative employment effects of external economic developments that hit Sweden's economy. This ability is particularly limited in the event of a large negative external shock, like the global financial and debt crisis in 2007 and 2008, when interest rates were already low. Second, responsibility for employment should rest primarily on the social partners and other economic policies, not on the Riksbank. Third, when evaluating the inflation target policy, we should take external shocks and developments into account.

5.2. How many objectives should the Riksbank have?

The global financial crisis has revealed a fundamental conflict between financial stability and inflation targeting. This conflict arises when the central bank stabilises inflation based on a consumer price index and simultaneously allows a rapid rise in asset prices. Developments in

the United States before, during and after the financial crisis can serve as an example of this trade-off (see e.g. Borio, 2012; Leijonhufvud, 2007).

Financial stability is a necessary precondition for inflation stability (or monetary stability). With respect to Sweden, we are of the opinion that the Riksbank must have financial stability as its primary objective in order to pursue an inflation target. The first objective is a precondition for the second one. This insight is evident from the Riksbank Act describing the Riksbank's tasks. The Riksbank is given the task of promoting a safe and efficient payments system while maintaining price stability.

Each financial crisis has forced the Riksbank and the Government to intervene and support the financial system as lenders of last resort. The Riksbank has a monopoly on producing central bank money, which is key to the resolution of financial crises. The history of financial crises indicates that the Riksbank must have financial stability as its most important objective, even though other institutions may also be assigned the task of promoting financial stability.

When Svensson focuses on unemployment in his criticism of monetary policy, he shifts the focus from inflation to employment as a Riksbank objective. Indirectly, he introduces a third objective for the Riksbank, namely high employment. Even though employment is intended to be a secondary monetary policy objective, subject to the primary objective of price stability within the framework of a flexible inflation target policy, there is a substantial risk that employment will once again loom as a key monetary policy objective. There would thus be three objectives – a difficult situation to manage and a clear risk of conflicts and inconsistencies between the objectives.

Swedish economic policy history provides an important insight about the objective of monetary policy. When the primary objective of Swedish stabilisation policy was full employment, the social partners were able to achieve high nominal wage increases, knowing that the economic policies of the Government and the Riksbank would create the inflation required to make full employment possible. The years of accommodation policy in the 1970s and 1980s illustrate the vicious circle of price and wage increases that emerged when the Riksbank had to pursue a policy of full employment that pushed up inflation.

A key lesson from the accommodation policy and from financial crises is that the Riksbank should focus on nominal factors such as inflation and money/credit, not on real factors such as employment and unemployment. The divorce between monetary policy and employment policy occurred when inflation was made the primary economic policy objective around 1990. One reason for making the Riksbank independent was that it could be given a clearly defined objective – and be made responsible for it. The Riksbank's independence could be threatened in the long run if it were to be involved in employment policy.²⁴

5.3. What does the long-term perspective say about the inflation target?

²⁴ According to Orphanides (2013), monetary policy in many countries is currently under threat by being burdened with too many objectives.

Svensson takes a short-term perspective, as he only examines the time after 1995. It is valuable to supplement this short-term perspective with a longer one. In other words, we should compare the outcome of the years with the inflation target policy with the outcomes of other monetary policy regimes.

There is a unique data source that can be exploited for this purpose, namely data on Swedish collective agreements that cover the whole economy. According to Fregert and Jonung (2008), the characteristics of the central collective agreements make it possible to compare different monetary regimes. They demonstrate that the length and content of the collective agreements reflect the employers' and employees' expectations about future macroeconomic developments. When the social partners expect high and volatile inflation, the length of wage agreements will be short and vice versa. The length of the wage agreements is thus an indicator of the state of inflation expectations.

The pattern for the period 1908-2008 shows two periods with long collective agreements: the gold standard before World War I and the inflation target policy after 1995. The other stabilisation policy regimes are associated with greater macroeconomic uncertainty. The inflation target policy after 1995 is the only period in modern times with a long stretch of consistent three-year agreements.

We would like to emphasise that the three-year agreements have survived the global financial crisis that hit the Swedish economy in 2008-2010. The social partners concluded a special agreement, the crisis agreement, to handle this shock in the short term. But the long-term agreement remained in force, i.e. the partners did not blame domestic monetary and fiscal policy for the crisis.

Table 8 illustrates CPI inflation and GDP per capita growth during five different monetary policy regimes – the gold standard 1873-1913, the interwar years 1920-1938, Bretton Woods 1951-1973, the accommodation policy regime 1974-1992 and the inflation targeting regime 1995-2013. Based on Table 8, we can conclude that the inflation and growth outcomes during the inflation targeting policy have been relatively favourable, combining high growth with low inflation, particularly when compared to the accommodation policy of the 1970s and the 1980s.

When we look beyond the recent years of inflation targeting policy and compare this regime with other monetary policy regimes in Sweden in the twentieth century, the Riksbank's inflation targeting stands out as successful – at least thus far.

Table 9. Average annual CPI inflation and GDP per capita growth during four monetary policy regimes

	CPI inflation	GDP / capita
Gold standard, 1873-1913	0.4	1.8
Interwar years, 1920-1938	-2.3	3.0
Bretton Woods, 1951-1973	4.7	2.9
Accommodation policy, 1974-1992	8.4	1.3
Inflation target, 1995-2013	1.4	2.1

Furthermore, Sweden's macroeconomic performance under the inflation targeting regime has been strong. GDP has increased in real terms by 55 per cent between 1995 and 2013, comparable with growth in the United States and the United Kingdom, but higher than growth in Germany or the euro area as a whole. Real wages have grown by on average by 1.9 per cent a year. Exports as a share of GDP have grown from 36 per cent in 1994 to peak at 53 per cent in 2008. These numbers compare favourably to those of other countries. During the period of inflation targeting, Sweden has carried out a substantial fiscal consolidation and introduced a fiscal framework. The inflation targeting regime has been supported by the fiscal regime and vice versa.²⁵

On the negative side, however, there has been a prolonged increase in real house prices – 144 per cent between 1995 and 2012. This rise is unprecedented in recent times and a possible sign of financial imbalances.

6. Conclusions

Svensson's critique of the Riksbank has revitalised the monetary policy debate in Sweden. In this report, we have examined his arguments and found a number of objections to his analysis. Our critique of Svensson, however, must not be interpreted as an unqualified endorsement of the Riksbank's monetary policy.²⁶

We see two main weaknesses in Svensson's criticism of the Riksbank's inflation targeting.

²⁵ On the role of the fiscal regime, see Jonung (2014).

²⁶ In fact, the difference between Svensson's and the Riksbank's interest rate paths is so small that it is doubtful that the difference can have any significant macroeconomic consequences. As a rule, the difference varies between 0.25 and 0.50 percentage points. Furthermore, when Svensson was a member of the Riksbank's Executive Board, he supported the majority view of the Board on several occasions, including the strongly criticised interest rate rise in September 2008, shortly before the Lehman crash.

First, Svensson's interpretation of the inflation target is too narrow. He sets the target equal to the central value of 2 per cent inflation and generally uses only one inflation measure, namely CPI, when assessing whether the Riksbank has met the inflation target. This is not consistent with the Riksbank's implementation of the inflation target policy in its documents. The ambition is to be "*reasonably close*" to the central value over a few years, but "*inevitable fluctuations around the central value*" make the Riksbank accept that inflation may deviate slightly from the central value. The Riksbank also consciously chooses to let inflation deviate from the central value on certain occasions, for example, in connection with the financial crisis, in the hope that this will result in a more favourable economic outcome in the long term.

Thus, CPIF is a better inflation measure when evaluating monetary policy. CPIF, which is also used by the Riksbank in monetary policy decisions, shows that the policy has been very close to the central value. Another inflation measure, the households' perceived inflation, is even slightly above the 2 per cent central value. The deviation from the target is very small by these measures – just a few tenths of a percentage point. Furthermore, average CPI inflation is within the tolerance band of ± 1 percentage point, which was part of the definition of the inflation target up to 2010. Thus, inflation, according to all three inflation measures, is within the tolerance band. The Riksbank has hit its target with a high precision.

We would like to emphasise the importance of households' perceived inflation. Perceived inflation is a good measure of how well the Riksbank has met the target and how well the Riksbank – by way of the perceived rate of inflation – has influenced inflation expectations. Measured by perceived inflation, the Riksbank has been successful. It has met the target almost exactly.

Second, and this is our main objection, Svensson's claim of the existence of a stable long-run non-vertical Phillips curve, which leads to his conclusion that the Riksbank's policy has resulted in about 38 000 fewer employed each year – and even more in recent years – is based on the unrealistic and unnecessary assumption that public inflation expectations have been constant at 2 per cent. Since data on the expectations are available, we see no reason for using an assumption that is not needed in the econometric work.

Assuming constant inflation expectations implies that Svensson adopts the specification behind the original Phillip curve as set out by Phillips (1958) – a model that has been highly criticised for not taking inflation expectations into account. This is Friedman's basic objection (1968) as specified in the expectations-augmented Phillips curve, implying a vertical long-run Phillips curve.

Data on inflation expectations clearly demonstrate that the Riksbank has *not* anchored expectations at the central value. Moreover, Svensson's employment effect disappears when actual data on the inflation expectations are included in the model. In other words, his results are not robust. Svensson's conclusions are too strong given how sensitive the estimates are to changes in the model. In short, there is no stable long-run non-vertical Phillips curve in Sweden. The Friedman/Phelps version of the Phillips curve stands out as more accurate for Sweden than the original specification used by Svensson.

In addition to these main objections to Svensson's criticism of the Riksbank, we would like to bring out three perspectives that Svensson does not consider.

First, the Phillips curve is too simple a model for assessing the effects of the Riksbank's policy on employment. For this, a more sophisticated model is needed that at least includes wages, exchange rates and external economic influences. We show that in a deep global crisis, like the current one, unemployment in Sweden is primarily determined by international unemployment, that is, by international business cycle developments. We illustrate this by a simple estimate where about 60 per cent of the variations in Swedish unemployment can be explained by unemployment in the United States and the euro area. Thus, the Riksbank has not much scope to influence Swedish unemployment via monetary policy. We are therefore sceptical of Svensson's inclination to hold the Riksbank responsible for employment losses.

Second, under the Swedish Riksbank Act, the Riksbank has two objectives: to promote a safe and efficient payments system, that is, financial stability, and to maintain price stability. Discussing the employment effects of monetary policy in addition to these objectives shifts the focus from the inflation target to employment. The experience from the accommodation policy during the 1970s and the 1980s indicates that the Riksbank should not focus on employment but on nominal factors such as inflation and credit growth. Otherwise, there is a risk of overburdening monetary policy with too many goals.

Third, Svensson has a short-term perspective. In his econometrics, he is mainly looking at the years 1997-2011. If we compare the Riksbank's inflation target policy with other monetary policy regimes over the past 100 years, the Riksbank has clearly been successful in the past fifteen years. Sweden has not had such stable and low inflation combined with high economic growth since the pre-World War I gold standard.

All in all, Svensson has initiated a valuable debate about Swedish monetary policy. A closer examination shows that his conclusions do not hold. Most importantly, his claim of establishing a stable long-run non-vertical Phillips curve that can be exploited for monetary policy purpose is not supported by the data.

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Appendix 1. Data Sources

Time series	Data source
<i>Inflation</i>	
CPI	Andersson, Palmqvist and Österholm (2012) and Statistics Sweden.
CPIF	Andersson, Palmqvist and Österholm (2012) and Statistics Sweden.
Perceived inflation	NIER
United States CPI	Thomson Reuters Datastream. Code: USCONPRCE
Euro area HICP	Thomson Reuters Datastream. Code: EMCPHARMF
<i>Expected inflation</i>	
Employers' and labour organisations' expectations	TNS Sifo Prospera http://www.prospera.se/
Households' expectations	NIER
Firms' expectations	Inflation report 2003:4 and Monetary policy report, October 2013
<i>Equilibrium Unemployment</i>	
NIER	NIER 2013
The Riksbank	Monetary policy report October 2010
UC, UC-trend and SVAR estimates of the Riksbank	Monetary policy report, July 2012
OECD	OECD.stat
<i>Unemployment</i>	
Unemployment, Sweden, old method	Monetary policy report, July 2012
Unemployment, Sweden, new method	Monetary policy report, February 2013
Unemployment, euro area	Thomson Reuters Datastream. Code: EKESUNEMO
Unemployment, USA	Thomson Reuters Datastream. Code: USUN%TOTQ
Unemployment, Australia	Thomson Reuters Datastream. Code: AUUN%TOTQ
Unemployment, Canada	Thomson Reuters Datastream. Code: CNUN%TOTQ
GDP / capita	1873-1992. Schön L and O Krantz (2012). 1993-2013. Statistics Sweden
<i>Real unit labour cost</i>	
Real unit labour cost.	Thomson Reuters Datastream. Code: SDESF2W8h

Note: Monthly data has been converted to quarterly by taking the average over the monthly observations.