A Note on Swedish Inflation and Inflation Expectations

Martin Flodén**

Stockholm University and CEPR

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Very preliminary. Comments most welcome!

Abstract

If actual inflation on average is lower than expected inflation, unemployment will most likely be unnecessarily high. As pointed out by Svensson (2012), the average Swedish inflation rate for the last 15 years has been clearly below its target while inflation expectations in the survey commissioned by the central bank have been close to the target. In this note, I show that inflation expectations have been lower in the survey conducted by the National Institute of Economic Research (*Konjunkturinstitutet*). The expectations from that survey are also more useful for predicting future inflation rates and wages. This indicates that the undershooting of the inflation target has not had a major impact on unemployment, at least not from standard Phillips curve mechanisms.

JEL: E24, E31, E50

Keywords: Monetary policy; Inflation expectations; Phillips curve

1 Introduction

In 1993, Sveriges Riksbank (the Swedish central bank) announced a 2 percent inflation target to apply from 1995. At the time, Sweden had a record of much higher inflation rates; the inflation rate averaged 7.5 percent both in 1981-1989 and in 1990-1992. The announced target therefore appeared unrealistically low to most observers. The Riksbank has however managed to bring inflation down to the target level, and also below it; the average inflation rate was just 1.5 percent in 1995-2011. This undershooting is clearly a failure for monetary policy.

Svensson (2012) has argued that undershooting the inflation target has not only been a problem in itself, but that it has also generated unnecessarily high unemployment. His argument is based on the observation that inflation expectations have been stable around the inflation target although inflation has repeatedly been lower than the target. I challenge that argument in this note. In particular, I demonstrate that there is little evidence that the relevant inflation expectations have been anchored above actual inflation.

**Department of Economics, Stockholm University, email: martin.floden@ne.su.se, web: people.su.se/~mflod.

2 Inflation and inflation expectations

Table 1 presents summary statistics on inflation and inflation expectations for 1997:I - 20012:II.[1] Two inflation measures are reported: the real time CPI inflation rate and the inflation rate according to CPIF. In both cases, the inflation rate is calculated as the percentage change over the previous 12 months. "Real time" refers to inflation rates as they were calculated at the time. The method for calculating the inflation rate was changed in January 2005, resulting in lower reported inflation rates for 1997-2004 (Sveriges Riksbank 2004). "CPIF" is the inflation rate with housing costs calculated for a constant interest rate. The table clearly confirms the statement that average inflation has been lower than the target during the last 15-year period. Most of the undershooting however dates back to the early parts of that period. During Stefan Ingves tenure as chairman, from January 2006, inflation has been closer to the target, but still too low.

Table 1 also reports five measures of one-year ahead inflation expectations from 1996:I-2011:II. Since 1996, Prospera (a private company, now TNS SIFO Prospera) has surveyed inflation expectations on behalf of the Riksbank. Their quarterly survey covers labor market organizations, purchasing managers, and money market participants. They currently approach 255 organizations. Of these 24 are employer organizations, 27 are employee organizations, 148 are purchasing managers from a random sample of firms with more than 200 employees (72 in trade companies and 76 in manufacturing), and 56 are participants on the Swedish fixed income market (TNS SIFO Prospera, 2012). The survey is conducted by telephone interviews, and has a response rate around 90 percent. According to this survey, inflation expectations have been close to the inflation target throughout the time period. Expectations in the subgroups of employer and employee organizations have been just slightly lower than the overall average.

Inflation expectations are also surveyed quarterly by the National Institute of Economic Research (*Konjunkturinstitutet*). Their business tendency survey covers around 6,000 firms in the business sector. The sample includes all Swedish firms with more than 100 employees, and a random sample of smaller firms, and responses are weighted by firm size. It is sent by electronically and by regular mail to upper management, and has a response rate around 60 percent. Their household tendency survey is conducted by telephone interviews with a random selection of 1,500 households between 16 and 84 years old. While households' inflation expectations have been close to the inflation target, businesses have had expectations that were substantially lower and closer to actual outcomes.

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[1] Following Svensson (2012), I focus on inflation data from the first quarter 1997. This is the first quarter that can be compared to the inflation expectations reported by Prospera since 1996:I.

Table 1: Summary statistics

	1997:I-2012:II	1997:I-2005:IV	2006:I-2012:II
Actual inflation			
CPI (real time), π	1.44	1.21	1.76
	(1.22)	(1.03)	(1.41)
CPIF, π^F	1.65	1.61	1.72
	(0.71)	(0.77)	(0.63)
Expected inflation			
Prospera, π^e_{pros}	1.94	1.92	1.97
	(0.57)	(0.45)	(0.72)
...employers	1.89	1.85	1.96
...employees	1.88	1.89	1.87
NIER businesses, π^e_{bus}	1.48	1.42	1.58
	(0.51)	(0.37)	(0.65)
NIER households, π^e_{hh}	1.93	1.73	2.2
	(0.56)	(0.47)	(0.57)
Wage inflation			
Wage index (blue collar), Δw	3.08	3.14	2.99
	(0.82)	(0.84)	(0.80)

Note: Inflation expectations refer to one-year ahead expectations one year earlier. Standard errors in parenthesis.

The statement that inflation expectations have been stable around 2 percent the last 15 years thus applies to expectations in Prospera's survey and in the National Institute's household survey, but not in their business survey. In the next, I will examine how useful the inflation expectations from the different surveys have been for predicting actual price and wage inflation.

A test of rational inflation expectations can be based on the regression

$$\pi_t = \alpha + \beta \pi^e_{s,t} + \varepsilon_t$$

where $\pi^e_{s,t}$ refers to expectations of date-t inflation formed at date s. If expectations are rational, this regression should result in estimated parameters $\alpha = 0$ and $\beta = 1$. Tables 2 and 3 report the results of such regressions. Estimates in the first column reject rationality for inflation expectations reported by Prospera.[2] The constant term is significantly different from zero, while the slope coefficient is estimated to be negative and statistically

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[2] I only report estimates based on the overall inflation expectations reported by Prospera. Estimates

different from unity. This applies both to regressions for the full time period in Table 2 and regressions based on the recent time period in Table 3, and the results confirm Jonsson and Österholm's (2012) rejection of rationality based on similar regressions for the time period 1997:I-2009:II.

Estimates based on inflation expectations from the National Institute's business survey are reported in column II. The estimated parameters are then close to zero and unity, respectively, and rationality cannot be rejected.

Estimates based on household expectations are reported in column III. The point estimates are now not close to $\alpha = 0$ or $\beta = 1$, but standard errors are large. The joint hypothesis $\alpha = 0$ and $\beta = 1$ can be rejected at the 10 percent level but not at the 5 percent level.

Tables 2 and 3 also shows that inflation expectations from the National Institute's business survey has the largest predictive power, both measured by the R^2 (i.e. predictions based on regression results) and by the root mean squared error (i.e. predictions based on reported expectations).

Table 2: Inflation expectations and outcomes 1997:I-2012:II

Dependent variable: π

	I	II	III	IV
constant	2.00	0.10	1.15	1.13
	(0.65)	(0.48)	(0.75)	(0.81)
π_{pros}^{e}	-0.29			-1.07
	(0.37)			(0.34)
π_{bus}^{e}		0.90		1.52
		(0.39)		(0.43)
π_{hh}^{e}			0.15	0.07
			(0.41)	(0.52)
n	62	62	62	62
R^2	0.02	0.14	0.00	0.31
RMSE	1.49	1.12	1.39	

Note: Newey-West standard errors (four lags). RMSE is the root mean square error.

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based on expectations of only employer or employee organizations are similar. Estimates with CPIF as the dependent variable are reported in the appendix.

Table 3: Inflation expectations and outcomes 2006:I-2012:II

Dependent variable: π

	I	II	III	IV
constant	2.85	0.63	2.20	2.64
	(0.88)	(0.57)	(1.11)	(1.34)
π^e_{pros}	−0.56			−0.99
	(0.50)			(0.38)
π^e_{bus}		0.72		1.72
		(0.47)		(0.42)
π^e_{hh}			−0.20	−0.75
			(0.54)	(0.80)
n	26	26	26	26
R^2	0.08	0.11	0.01	0.43
RMSE	1.73	1.33	1.59	

Note: See Table 2.

3 Inflation expectations and wages

The relevant question for understanding if low inflation has resulted in high unemployment is not which inflation expectations are most accurate, but which inflation expectations affect wage negotiations. Tables 4 and 5 report regressions with blue-collar wage inflation as the dependent variable. Regressions based on household expectations perform poorly and are not reported. In columns I and II, inflation expectations at $t - 4$ are the only explanatory variable for the change in nominal wages between $t-4$ and t. Columns III and IV also include lags of inflation expectations (because wage contracts may be longer than one year). Columns V and VI include other factors that may affect wage developments. In all cases, except columns V and VI in Table 5, the expectations from the National Institute's business survey are most useful for predicting future wage changes. The final columns in Table 5 use nine variables to explain 26 data points and is arguably overfitted. Expectations from Prospera then outperforms expectations from the National Institute in terms of explanatory power, but the expectations (including lagged expectations) are estimated with a negative sign, again casting doubt on the information captured in this survey.

Table 4: Inflation expectations and wage outcomes 1997:I-2012:II

Dependent variable: Δw_t

	I	II	III	IV	V	VI
$\pi^e_{pros,t-4}$	0.37		0.35		−0.22	
	(0.21)		(0.18)		(0.28)	
$\pi^e_{bus,t-4}$		0.65		0.71		0.78
		(0.22)		(0.23)		(0.23)
constant	Yes	Yes	Yes	Yes	Yes	Yes
π^e_{t-8}	No	No	Yes	Yes	Yes	Yes
π_{t-4} & π_{t-8}	No	No	No	No	Yes	Yes
u_{t-4} & u_{t-8}	No	No	No	No	Yes	Yes
γ_{t-4} & γ_{t-8}	No	No	No	No	Yes	Yes
n	62	62	58	58	58	58
R^2	0.07	0.16	0.09	0.25	0.29	0.43

Note: Newey-West standard errors (four lags). u denotes unemployment and γ denotes labor productivity growth.

Table 5: Inflation expectations and wage outcomes 2006:I-2012:II

Dependent variable: Δw_t

	I	II	III	IV	V	VI
$\pi^e_{pros,t-4}$	0.33		0.34		−0.71	
	(0.25)		(0.29)		(0.25)	
$\pi^e_{bus,t-4}$		0.55		0.55		0.08
		(0.27)		(0.28)		(0.25)
constant	Yes	Yes	Yes	Yes	Yes	Yes
π^e_{t-8}	No	No	Yes	Yes	Yes	Yes
π_{t-4} & π_{t-8}	No	No	No	No	Yes	Yes
u_{t-4} & u_{t-8}	No	No	No	No	Yes	Yes
γ_{t-4} & γ_{t-8}	No	No	No	No	Yes	Yes
n	26	26	26	26	26	26
R^2	0.09	0.20	0.09	0.20	0.80	0.77

Note: Newey-West standard errors (four lags). u denotes unemployment and γ denotes labor productivity growth.

4   Consequences for unemployment

As noted by Svensson (2012), common specifications of short-run Phillips curves imply that the long-run Phillips curve is

$$\bar{u} - u^* = \frac{\bar{\pi}^e - \bar{\pi}}{\gamma} \qquad (1)$$

where $\bar{u}$ is the average unemployment rate, u^* is the natural rate of unemployment, $\bar{\pi}^e$ is average expected inflation, $\bar{\pi}$ is average inflation, and γ is the slope of the Phillips curve. If expectations are correct on average, $\bar{\pi}^e = \bar{\pi}$ and consequently unemployment is on average on its natural level. But if inflation expectations are on average higher than actual inflation outcomes, unemployment will on average be higher than the natural level.

Based on Swedish data, Svensson estimates $\gamma = 0.76$. If inflation expectations were anchored at 2 percent and average inflation were 1.4 percent, we would get unemployment rate of $(2 - 1.4)/0.76 \approx 0.8$ percentage points higher than if inflation had hit the target. This is Svensson's main point. If we redo the calculation based on the average inflation expectations reported in Prospera's study and the average inflation rate 1997:I - 2012:II, the calculation results in an $(1.94 - 1.44)/0.76 = 0.66$ percentage points unnecessarily high unemployment rate. If the calculations instead are based on the expectations from the National Institute's business tendency survey, the unemployment consequences from low inflation are negligible as demonstrated in Table 6.

Table 6: Unnecessary unemployment from undershooting the inflation target

	Period	Expected infl. $\bar{\pi}^e$	Actual infl. $\bar{\pi}$	Unnec. unemp. $\bar{u} - u^*$
Svensson (2012)	97:I-11:IV	2	1.4	0.8
Prospera	97:I-12:II	1.94	1.44	0.66
NIER business	97:I-12:II	1.48	1.44	0.05
Prospera	06:I-12:II	1.97	1.76	0.30
NIER business	06:I-12:II	1.58	1.76	−0.24

Note: Unnecessary unemployment is calculated as $\bar{u} - u^*$ from eqn. (1) using $\gamma = 0.76$.

5   Concluding remarks

Inflation expectations in the National Institute's business survey have been much more accurate in predicting inflation than expectations in other surveys. Those expectations also appear to be more relevant for understanding future wage developments than other

expectations. Moreover, inflation expectations in the National Institute's business survey have on average been close to the average outcome of actual inflation – expectations averaged 1.48 percent in the last 15 years while actual inflation averaged 1.44 percent. During Stefan Ingves' tenure as chairman for Riksbank (from January 2006), inflation expectations in the National Institute's business survey has been *lower* than actual inflation outcomes. All this taken together suggests that the failure of the Riksbank to fulfill the inflation target has not surprised markets. In other words, there is little reason to suspect that the low inflation has resulted in unplanned increases in real wages, and therefore also little reason to suspect that average unemployment has become unnecessarily high as a result of the low inflation.

References

Jonsson, Thomas and Pär Österholm (2012), "The Properties of Survey-Based Inflation Expectations in Sweden", *Empirical Economics* 42, 79-94

Svensson, Lars E O (2012), "The Possible Unemployment Costs of Average Inflation below a Credible Target", manuscript, August 2012, Sveriges Riksbank

Sveriges Riksbank (2004), "Changes in Calculation Methods for the Inflation Rate", Inflation Report 2004/2

TNS SIFO Prospera (2012), "Inflation Expectations", Press Release, September 5, 2012

Data

When necessary, monthly data has been converted to quarterly by using the mid-month in the quarter.

CPI (π): 12-month real time CPI inflation (%). The method for calculating the inflation rate was changed in January 2005, resulting in lower reported inflation rates also for 1997-2004. The data used here for 1997-2004 is the data as it was calculated at the time (= "real time").

CPIF (π^F): 12-month CPI inflation (%) with fixed mortgage rates.

Inflation expectations are one-year ahead. "Prospera" (π^e_{pros}) is survey results of money market agents, social partners and purchasing managers conducted by TNS Sifo Prospera on behalf of the Riksbank (a missing value in 2002:III has been imputed). "NIER businesses" (π^e_{bus}) and "NIER households" (π^e_{hh}) are from the Economic Tendency Surveys of businesses and households conducted by the National Institute for Economic Research (excluding extreme household values).

Labor productivity growth (γ) is the percentage change in labor productivity of the total economy over the last four quarters. Source: OECD Economic Outlook 91, June 2012, based on variable PDTY.

The unemployment rate (u). Source: OECD Economic Outlook 91, June 2012, variable UNR.

Wage index (Δw): 12 month wage inflation for blue-collar workers in the private sector (source: Statistics Sweden).
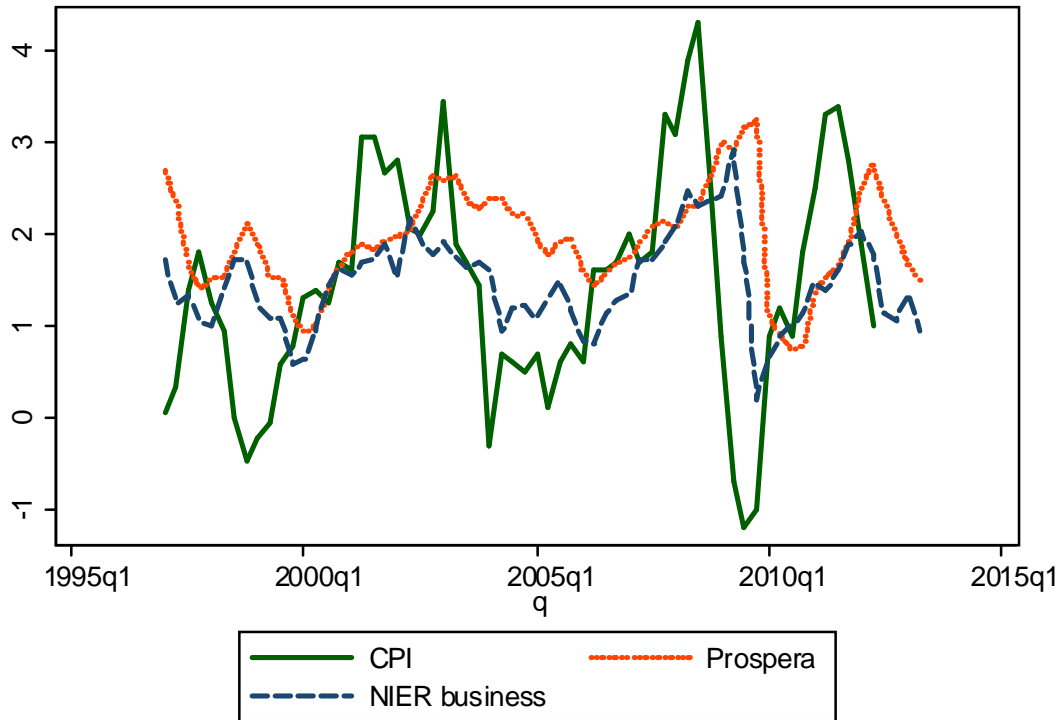
Figures

Figure 1: CPI inflation and inflation expectations from Prospera and the National Institute's business tendency survey.
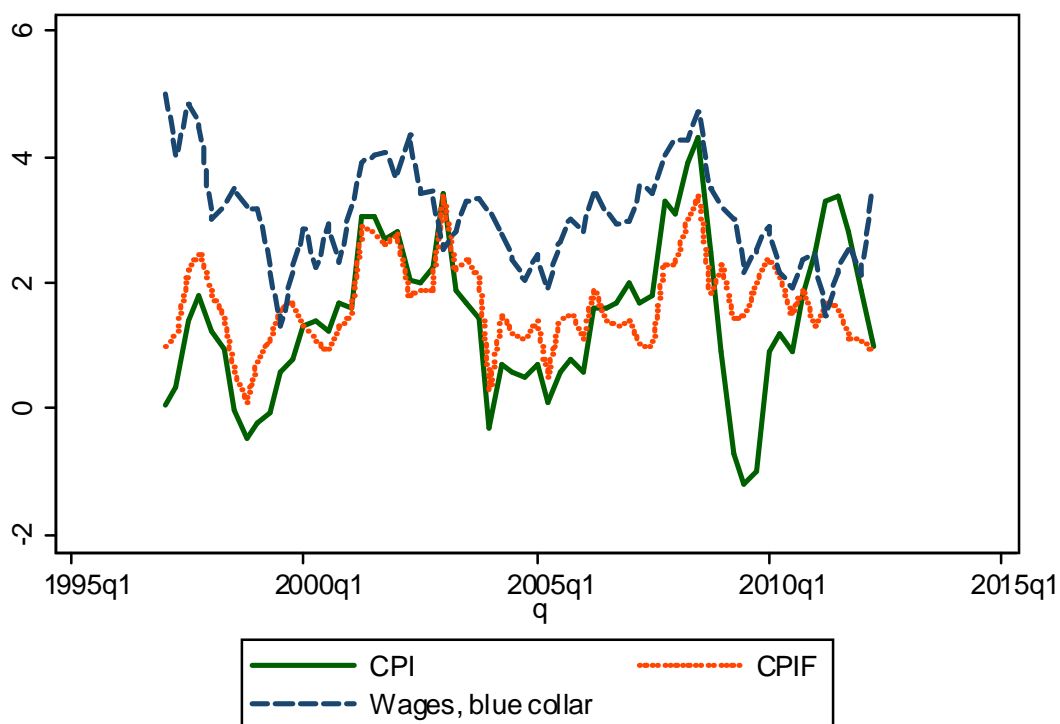
Figure 2: CPI and CPIF inflation, and change in nominal wage index for blue-collar workers.

Extra material

Table X1: Inflation expectations and outcomes 1997:I-2012:II

Dependent variable: π^F				
	I	II	III	IV
constant	1.46	1.24	1.56	1.37
	(0.30)	(0.35)	(0.40)	(0.36)
π^e_{pros}	0.10			0.03
	(0.16)			(0.18)
π^e_{bus}		0.28		0.37
		(0.25)		(0.33)
π^e_{hh}			0.05	-0.16
			(0.20)	(0.30)
n	62	62	62	62
R^2	0.01	0.04	0.00	0.05
RMSE	0.91	0.80	0.92	

Note: Newey-West standard errors (four lags).