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The forecasting properties of survey-based wage-growth expectations☆

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ABSTRACT

We evaluate survey-based wage-growth expectations and find that they are neither unbiased nor efficient forecasts. Concerning out-of-sample forecast precision, survey participants generally perform worse than a constant forecast. Caution should accordingly be exercised when relying on these data for policymaking.

1. Introduction

Wage growth is widely considered an important determinant for inflation. For example, in the expectations-augmented Phillips-curve model, prices are often set as a markup over productivity-adjusted labour costs. It is also intuitive that nominal wages via their effects upon product prices may have a significant effect on consumer price inflation. Given this importance of wage growth for inflation, and the forward-looking nature of monetary policy making, wage-growth expectations are of much interest to central banks. However, for a central bank to be able to conduct good monetary policy, it is important that it has access to wage expectations that are of high quality. In this paper, we assess properties of an important measure of wage-growth expectations in Sweden.

More specifically, the survey-based wage-growth expectations provided by Prospera on behalf of Sveriges Riksbank are evaluated from a forecasting perspective. First, we test for bias and efficiency. Second, the predictive ability of the wage-growth expectations is investigated. Results suggest that the expectations are biased and not efficient. In addition, the forecast precision of the survey-based wage-growth expectations tends to be lower than that associated with a forecast that at all points in time says that wage growth will be 3.5%.

2. Data

Data on Swedish four-quarter-ended wage growth (in percent) from 1996Q1 to 2009Q2 are given in Fig. 1. Wage growth is hence calculated as $\tilde{w}_t = 100\left[\left(W_t - W_{t-4}\right)/W_{t-4}\right]$, where W_t is the wage at time t and W_{t-4} the wage four quarters earlier. The wage is measured over all sectors of the economy, exclusive of employers' fees but inclusive of wage drift. In the same figure, one-, two- and five-year ahead overall wage-growth expectations from the Prospera survey are shown. The wage-growth expectations are "forward rates"—that is, they measure four-quarter-ended wage growth in one, two and five years time.

The Prospera survey is conducted each quarter. In the survey, over 200 businesses and organisations are asked about their wage expectations.[2] They are asked the following questions:

"What wage development, measured as the percentage change, do you think there will be in Sweden

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[2] In the last survey in our sample, there were 216 respondents (30 employee organisations, 27 employer organisations, 80 manufacturing companies and 79 trade companies). The number of respondents in the survey is fairly stable and mainly changes due to mergers and bankruptcies—that is, respondents participate for a very long time.

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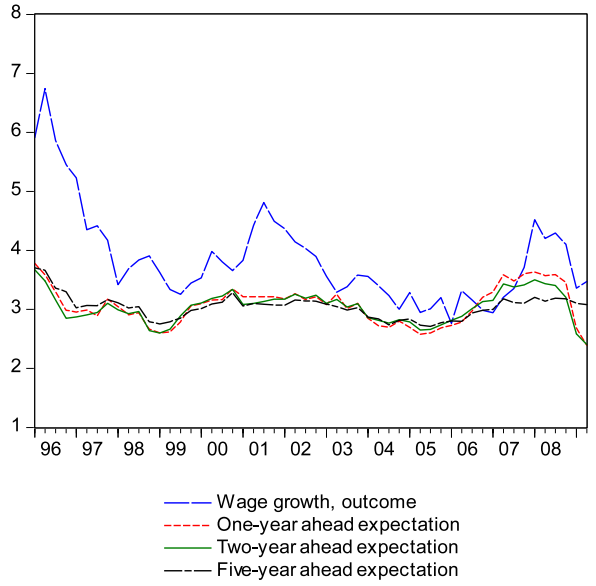

Fig. 1. Wage growth and overall wage-growth expectations.

- *this coming year, that is, from now and 12 months ahead. Include wage drift but exclude employers' fees.*
- *And what will the change be the second year, that is, from month 12 to month 24.*
- *And what will the change be the fifth year, that is, from month 48 to month 60".*

The results of the survey are aggregated into an overall measure and into four subcategories: employee organisations, employer organisations, manufacturing companies and trade companies.[3] Figs. 2–4 show one-, two- and five-year mean wage-growth expectations by subcategory.

It can be seen from Figs. 1–4 that wage-growth expectations appear to vary over time with the actual wage-growth and as would be expected, the expectations vary less the longer the horizon. It also seems reasonably clear that expectations under-predict actual wage growth.

3. Empirical analysis

Our empirical analysis is divided into two parts. First, we test for unbiasedness and efficiency. Such tests are fairly common in the literature aiming to evaluate expectations; see, for example, Mehra (2002) and Baghestani (2008). Second, the predictive ability of the wage-growth expectations is contrasted with that of a constant forecast. The comparison of forecast accuracy – while not as commonly conducted in the literature as tests for bias and efficiency – can be used to assess the properties of the expectations from another angle. For example, if the forecast precision of the expectations is lower than that of a simple alternative, one has to question how the expectations are formed – or measured – even if they pass tests for unbiasedness and efficiency.

3.1. Unbiasedness and efficiency

Table 1 reports the mean errors associated with the overall forecast and the four subcategories. All of the mean errors are located in the range 0.25–0.70, which must be considered fairly large. Having quantified the extent of the under-prediction, we ask whether this under-prediction constitutes a significant bias. This can be tested by running the regression

Table 1
Results from tests of bias.

	Mean error
1 year	
Overall	0.62**
Employee	0.36**
Employer	0.43**
Manufacturing	0.67**
Trade	0.70**
2 years	
Overall	0.60**
Employee	0.35*
Employer	0.48**
Manufacturing	0.63**
Trade	0.68**
5 years	
Overall	0.53**
Employee	0.25
Employer	0.58**
Manufacturing	0.58**
Trade	0.56**

Note: Regressions have 50, 46 and 34 observations at the one-, two- and five-year horizons.
* Indicate significance at the 5% level.
** Indicate significance at the 1% level.

Table 2
Results from estimation of Eq. (2).

	F
1 year	
Overall	5.67**
Employee	4.07**
Employer	5.21**
Manufacturing	4.64**
Trade	6.66**
2 years	
Overall	4.42**
Employee	4.72**
Employer	4.48**
Manufacturing	3.89**
Trade	4.70**
5 years	
Overall	7.51**
Employee	7.90**
Employer	6.79**
Manufacturing	7.41**
Trade	7.23**

Note: Entries are the test statistics from the *F*-test of all slope coefficients in Eq. (2) being zero. Regressions have 50, 46 and 34 observations at the one-, two- and five-year horizons.
* Indicate significance at the 5% level.
** Indicate significance at the 1% level.

$$\tilde{w}_{t+h} - \tilde{w}^{e}_{t+h|t} = \lambda + \omega_t, \tag{1}$$

where $\tilde{w}_{t+h}$ and $\tilde{w}^{e}_{t+h|t}$ are wage growth and wage-growth expectations respectively. The null hypothesis H_0:$\lambda = 0$ is then tested using a standard t-test.[4] As can be seen from Table 1, it is concluded that all expectations except the five-year ahead expectation for employee organisations are biased.

The literature on survey expectations tends to find evidence against unbiasedness; see, for example, Roberts (1997) and Mankiw et al. (2003). Biased forecasts constitute a violation of rational expectations under the assumption of a symmetric quadratic loss function. However, since we in reality never know the loss function of the forecasters, we do not make such a claim here.[5] In-

[3] Aggregation is done using the simple arithmetic mean so that each respondent receives the same weight.

[4] Newey–West standard errors are used to address the serial correlation in the residuals.

[5] Recall that biased forecasts can be rational, for example if the forecasters have asymmetric loss functions; see Elliott et al. (2008).

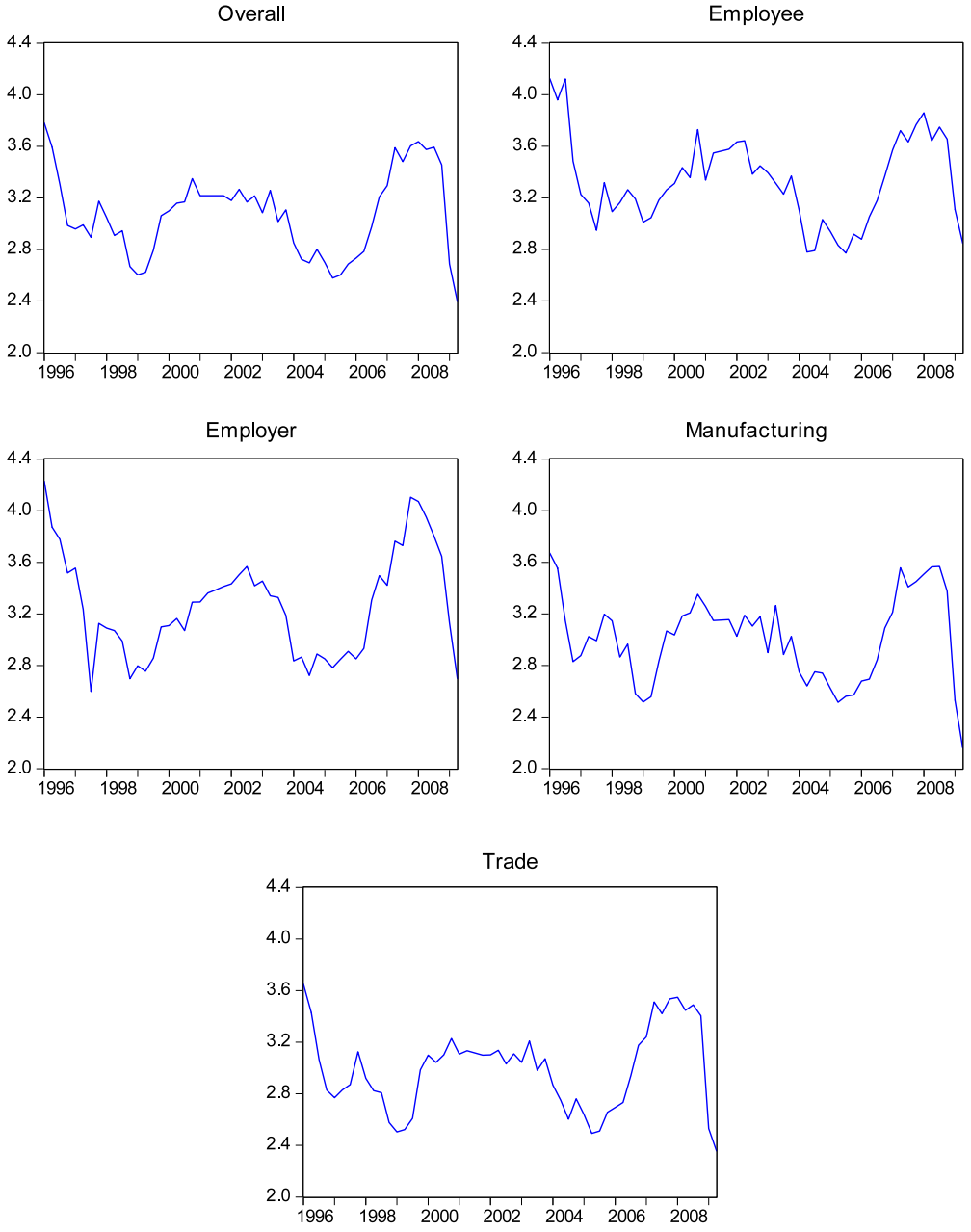

Fig. 2. One-year-ahead wage-growth expectations.

stead we note that this result should be considered a warning sign regarding the rationality of the formation of expectations.

Next, we test for efficient use of macroeconomic data when forming wage-growth expectations. Standard models suggest that the unemployment rate should be useful when predicting wage growth. A straightforward test of efficient use of data can therefore be based on the regression

$$\tilde{w}_{t+h} - \tilde{w}^{e}_{t+h|t} = \beta_0 + \beta_1 u_{t-1} + \beta_2 u_{t-2} + \beta_3 u_{t-3} + \beta_4 u_{t-4} + v_t, \quad (2)$$

where u_t is the unemployment rate at time t. The null hypothesis $H_0{:}\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ is tested using a standard F-test. Results are given in Table 2 and show that the wage-growth expectations for all categories at all horizons do not sufficiently take into account the unemployment rate when formed. Regarding the interpretation of our results, it can be noted that while bias – as noted above – is not necessarily a sign of lack of rationality, inefficient use of data is incompatible with rational expectations.

3.2. Forecast accuracy

As the last step in our assessment of the wage-growth expectations, we compare the forecasting precision of the Prospera survey expectations with that of a simple alternative forecast. The alternative forecast is a constant forecast of 3.5%, based on the assumption that nominal wages in equilibrium should grow by the sum of Sveriges Riksbank's inflation target and productivity growth. While the inflation target is clearly stated as two percent CPI inflation, a productivity growth of 1.5% per year is admittedly a more controversial assumption. However, this number can easily be motivated as reasonable, also in real time; see, for example, Pehkonen (1995) for an empirical study supporting the assumption. The results in Table 3 show that the constant forecast performs best at all horizons, except for the one-year horizon where employee organisations have a lower (root mean square error) RMSE.

Considering the forecast accuracy of different subcategories of respondents, Table 3 shows that employee organisations have a

Fig. 3. Two-year-ahead wage-growth expectations.

Table 3
RMSEs from different forecasts.

	1 year	2 years	5 years
Constant	0.568	0.491	0.551
Overall	0.747	0.806	0.733
Employee	0.533	0.643	0.594
Employer	0.653	0.749	0.777
Manufacturing	0.789	0.833	0.780
Trade	0.829	0.873	0.743

Note: 50, 46 and 34 forecasts are evaluated at the one-, two- and five-year horizons respectively.

lower RMSE at all horizons than other subcategories. This can probably partly be explained by the fact that wages in Sweden are largely determined in negotiations between employer organisations and employee organisations. It could thus be presumed that labour-market parties may have some unique knowledge about the future growth of wages and thus are better forecasters than other agents in the economy. This is to some extent confirmed since employer organisations also have lower RMSEs than other categories – employee organisations excluded – at the one- and two-year horizons. Still, the employee organisations stand out as substantially better than the other categories.

We test if the difference in forecasting precision is significant using a Diebold–Mariano test (Diebold and Mariano, 1995) under the assumption of a quadratic loss function. The null hypothesis is that the forecasting accuracy of the subcategory in question is equal to that of employee organisations. The results in Table 4 show that the null hypothesis is rejected in all cases at the five percent level. We hence conclude that the forecasting accuracy of employee organisations is significantly higher than that of the other subcategories.

Fig. 4. Five-year-ahead wage-growth expectations.

Table 4
Results from Diebold–Mariano test.

	1 year	2 years	5 years
Overall	−4.26**	−3.16**	−2.42*
Employer	−2.72**	−2.13*	−2.45**
Manufacturing	−4.46**	−3.27**	−2.53**
Trade	−4.33**	−3.49**	−2.66**

Note: The null hypothesis is that the forecasting accuracy of the subcategory in question is equal to that of employee organisations. 50, 46 and 34 observations are used at the one-, two- and five-year horizons respectively.
* Indicate significance at the 5% level.
** Indicate significance at the 1% level.

4. Conclusions

In this paper, we have evaluated survey-based wage-growth expectations in Sweden. Results show that the expectations are neither unbiased nor efficient forecasts. Evaluating out-of-sample forecasting performance, we find that the participants in the Prospera survey generally perform worse than a constant forecast which combines an inflation target of two percent with a productivity growth rate of 1.5%.

The fact that survey-based expectations studied in this paper have some questionable properties is by no means highly surprising and could, for example, be due to expectations being adaptive rather than rational.[6] It is, however, also possible that the established shortcomings are found because the data provide imperfect measures of the true wage-growth expectations. Survey-based measures of expectations are commonly criticised since the respondents have small incentives to give well thought answers;

[6] Jonsson and Österholm (forthcoming) found similar results for survey-based inflation expectations.

see, for example, Gürkaynak and Wolfers (2005). It is troublesome to policymakers and forecasters who rely on these expectations as input in their analysis if it is indeed the case that the Prospera survey fails to record the true wage-growth expectations in Sweden. Being aware of the potential shortcomings of the data is an important first step though and by taking the results presented in this paper into account, the worst pitfalls can hopefully be avoided.

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