Bank of Finland Research Discussion Papers
24 • 2018

Sami Oinonen–Maritta Paloviita–Matti Viren

Effects of monetary policy decisions on professional forecasters' expectations and expectations uncertainty

Bank of Finland
Research

Bank of Finland Research Discussion Papers
Editor-in-Chief Esa Jokivuolle

Bank of Finland Research Discussion Paper 24/2018
20 November 2018

Sami Oinonen–Maritta Paloviita–Matti Viren

Effects of monetary policy decisions on professional forecasters' expectations and expectations uncertainty

ISBN 978-952-323-249-5, online
ISSN 1456-6184, online

Bank of Finland
Research Unit

PO Box 160
FIN-00101 Helsinki

Phone: +358 9 1831

Email: research@bof.fi
Website: www.suomenpankki.fi/en/research/research-unit/

Sami Oinonen[a], Maritta Paloviita[a] and Matti Viren[a,b]

Effects of monetary policy decisions on professional forecasters' expectations and expectations uncertainty

Abstract

In this paper, we examine how professional forecasters' expectations and expectation uncertainty have reacted to the ECB's interest rate decisions and non-conventional monetary policy measures during the period 1999-2017. The analysis makes use of a conventional dif-in-dif type set up with different time series tools. The results indicate that expectations have been sensitive to policy actions, but all forecasters' reactions do not seem to follow the basic predictions of a standard New Keynesian model. Also the relationship between inflation and output forecasts does not seem to follow a Phillips curve type relationship. Moreover, short- and long term reactions to policy are often weakly related and of different sign. Interestingly, subjective forecast uncertainty measures are very sensitive to policy measures. Thus, there seems to be much heterogeneity in forecasters' reactions to most policy decisions. All uncertainty measures, including long-term inflation uncertainty, have increased over time. This has to be taken into account when considering the anchoring of inflation expectations to the inflation target.

Key words: Expectations, ECB, Uncertainty, Unconventional monetary policy

JEL Code: E32, G02

(a) Bank of Finland, Monetary Policy and Research Department, (b) University of Turku, School of Economics. Useful comments from Mika Kortelainen, Jarmo Kontulainen and Xuguang S. Sheng are gratefully acknowledged. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland or the Eurosystem.

1. Introduction

It is generally agreed that current and future macroeconomic developments are largely determined by expectations. For macroeconomists, it is crucial to know how expectations are formed and how they depend on macroeconomic news. From the monetary policy point of view, a deep understanding how monetary policy decisions affect expectations is even more important, as monetary policy transmission mechanism is crucial for expectations management and monetary policy credibility. A priori, there is no reason why expectations should react to policy decision, if policy is pursued according to a rule which is fully understood and anticipated by the general public. Thus, only apparent deviations from the rule should show up in expectations. At least they should show up in perceived uncertainty on future developments; unanticipated policy actions should obviously increase uncertainty. The financial crisis and recent low inflation regime emphasized the need to analyze reactions of expectations to monetary policy decisions, as the standard interest rate policy approached its effective lower bound and new unconventional monetary policy measures were introduced.

In interpreting the reactions of expectations to monetary policy decisions we face big problem due to the possibility that information sets of the central bank and the general public are different. Therefore, an announcement of policy action can be interpret not only to reflect (future) policy objections but also the central bank's new macroeconomic forecast. Thus, interest rate decrease can be assessed to reflect worsening economic outlook and lower inflation, which may lead to decreasing inflation expectations. By contrast, if interest rate decrease is interpreted to reflect more accommodative monetary policy in the future, inflation expectations may increase.

In addition to conventional monetary policy measures, we need to analyze how unconventional monetary policy measures and particularly forward guidance are related to expectations formation. Following literature (see e.g. Campbell 2013, Andrade et al. 2015 and Coenen et al. 2017), forward guidance can be characterized in two alternative ways. Odyssean forward guidance represents a strong pre-commitment to future monetary policy, while the Delphic forward guidance, which is determined by forecasted policy instruments, is subject to revisions as a response to new information. Incomplete information whether forward guidance is Odyssean or Delphic complicates expectations formation of the private sector.

One simple way to assess how monetary policy actions are related to expectations is to compare the MRO rate with the one-year interest rate swap rate. Figure 1 shows that these two variables are highly correlated, which indicates that in general interest rate decisions are anticipated by financial market

participants.[1] However, there are several deviations between these two series (for example in 2010-2012), indicating the (magnitude of) monetary policy decisions have been largely unanticipated.

Reactions of expectations and expectations uncertainty to monetary policy decision are likely to vary over time and across forecasters. Using micro level survey data, we are able to assess whether and how monetary policy decisions affect individual expectations. Expected inflation and expected real GDP growth may change as a response to monetary policy decisions. Micro level survey data allow us to analyze also how forecasters' disagreement and their views about forecast uncertainty are related. Forecast disagreement reflects dispersion of individual views (in the sense of different point forecasts), while subjective forecast uncertainty variables measure how confident individual forecasters are in forming their expectations (this in the sense of standard deviation of probability distributions at the individual level). Very dispersed point forecasts do not necessarily mean that individual forecasters are very puzzled about future economic developments.

The impact of monetary policy decision on long term inflation expectations is closely related to monetary policy credibility and management of inflation expectations. Under credible monetary policy, long term inflation expectations are firmly anchored to the price stability objective of the central bank and therefore, the impact of regular monetary policy announcements should be expected to fade away in the long term. This fact provides a simple way testing policy credibility just by scrutinizing how long-term inflation expectations depend on macro shocks (see e.g. Demertzis et al. 2012) in general and on monetary policy action in particular. This issue is not main research question in our analysis but because we do also examine the behavior long-term inflation expectations we cannot avoid focusing on the credibility issue.

Obviously, our study is also related to the research on the impact of macro news on expectations (Beechey et al. 2011; Galati et al. 2011; Gurkaynak et al. 2010). Papers examining anchoring of inflation expectations are also closely linked to our study (e.g. Nautz and Strohsal 2015; Lyziak and Paloviita 2017).

There are also some studies dealing with the question of how investor sentiment responds to monetary policy decisions. Kurov (2010) finds that unexpected US monetary policy decisions have an effect on investor sentiment, and this effect depends on equity market conditions. Also Lutz (2015) reports substantial changes in US investor sentiment due to unanticipated conventional or unconventional monetary policy decisions. In their study of nine euro area countries, Galariotis et al. (2018) find positive effect on investor sentiment with conventional policy measures and negative effect with

[1] The correlation coefficient between the two time series is 0.94 in Figure 1.

unconventional policy measures. They show that these effects are different in core and peripheral countries. As a rule, these studies focus only on investor sentiment without paying any attention to sentiment uncertainty.

The impact of monetary policy decision on expectations may be different in different time episodes. Especially, the financial crisis may have changed the way private sector expectations react to monetary policy actions. Within our framework of empirical analysis, we can also consider this issue. Hence, our analysis is closely linked to the study by Scharnagl and Stapf (2015), who use a time-varying event study framework to examine how monetary policy announcements affect medium and long run inflation expectations in the euro area. By examining full distribution of option implied expectations, they find that in the middle of the sovereign debt crisis the effects of monetary policy announcements on inflation expectations decreased across all horizons. They also report that euro area inflation expectations are firmly anchored, while market participants have recently become more concerned about future price developments.

Needless to say, some other relevant studies have been published in this field. Jarocinski and Karadi (2018) use a structural VAR framework to analyze monetary policy shocks in the US and euro area. They separate monetary policy shocks from central bank information shocks in order to analyze the high-frequency co-movements of stock prices and future interest rates. They consider narrow windows around policy announcements. Consistent with our findings, they show that the impacts of monetary policy announcements vary a lot and they do no follow a standard theoretical model (for example, higher interest rates do not necessarily lead to lower stock prices).

The European Survey of Professional Forecasters (to be abbreviated as ECB SPF) has been analyzed quite extensively on both the aggregated level (e.g. Tsenova 2012; Andrade and Le Bihan 2013) and on the micro level (Dovern and Kenny 2017, Lopez-Peres 2016a, 2016b; Abel et al. 2016; Oinonen and Paloviita 2017). Individual responses of other surveys have also been examined by some authors. For example, Boneva et al. (2016) report that quantitative easing in the UK has a significantly positive impact on price and wage inflation expectations of manufacturing firms. The impact of forward guidance is insignificantly positive. However, none of these studies share the same object as the current study in analyzing the correspondence between policy changes and expectations.

Our study is organized as follows. Our data and empirical framework are described in section 2 and empirical results are reported in section 3. Concluding remarks are provided in section 4.

2. Data and empirical framework

2.1 Data

We analyze micro level survey responses in the ECB SPF in the period 1999Q1 – 2017Q4. In addition to one year ahead and 4-5 years ahead point forecasts for the HICP inflation rate and real GDP growth, we examine corresponding forecast disagreement measures (standard deviation of point forecasts) and subjective forecast uncertainty series based on individual probability distributions (histograms).

Our aim is to assess whether and how forecasters' expectations and expectations uncertainty respond to the ECB's decisions of conventional and unconventional monetary policy measures listed in Appendix 1. Since 1999Q1, 41 policy rates changes[2] and starting from 2009Q3, 13 unconventional monetary policy measures (for example, forward guidance, asset purchase decisions and changes in full allotment fixed-rate tender procedure) have been announced. Regarding conventional monetary policy actions, our focus is on policy changes: policy rates increase or decrease. Of course a "no change in policy rates" is also a policy decision, but technically it is hard to identify the effects of these decisions using our data. The problem arises because of different sampling frequencies: policy decisions are made once a month (or once in every six week) while the ECB SPF is conducted quarterly. Thus, we might have a quarter with two "no change" decisions and one "change" decision. It is hard to see how to take into account the effect all possible variations of the Governing Council's decisions on expectations. The relatively small number of policy decisions does not make the task easier. What we can do is to present a detailed list of the dates of all interest rate (and unconventional policy) decisions and the deadline dates of ECB SPF survey (see Appendix 1, second table). Given these data we can try to scrutinize if the menu of decisions does make any difference e.g. by looking only at the decisions that are made just prior to the ECB SPF deadline. Obviously, the omission of "no change" decision creates some sort of sample selection problem, although we mainly analyze individual policy decisions independently of each other.

The scrutiny of data suggests that from the point of view of changes in expectations, interest rate (cum the unconventional policy measure) decisions make a difference. Thus, we see that expectations and expectation uncertainty change very little in quarters with no policy changes. Thus, for instance, with short-term inflation expectations, the standard deviation of the change in mean point forecasts is 0.175 % in quarters with interest rates changes and 0.125 % in quarters with no change in policy rates. The behavior of forecast uncertainty may be seen from the respective Figures 5 and 6.

[2] Since some of the monetary policy decisions has made during the same quarter, our analysis contains 32 policy rate changes.

As said, our focus is only on those survey rounds, which have been conducted soon after policy-change-monetary policy decisions, which all are listed in Appendix 1. In order to make reasonable analysis, we need to pay special attention to the timing of the Governing Council meetings and the dates when the ECB SPF is conducted. Monetary policy decisions are announced in press conferences right after the Government Council meetings. Until 2014, the press conferences were held in the last week of every month and thereafter once in every six week, whereas the ECB SPF survey is conducted in the first month of every quarter and published in the mid-month of the same quarter.[3] Appendix 1 shows how policy decisions and the survey rounds are linked together: the first column refers to the date of the Governing Council meeting, the second column to the deadline for survey response. The rest of the columns indicate to which monetary policy decisions they are linked.

In the empirical analysis, the estimating equations use dummy variables, which are constructed using ± 12 quarter time windows around policy decisions listed in Appendix 1 (we construct 45 dummy variables all together). All dummy variables are set equal to one in the quarter when the survey in question is conducted and zero otherwise: the survey quarter itself is not included in these time windows.[4]

2.2 Empirical framework

Using our micro level panel data, we estimate simple models, in which changes in expectations or expectations uncertainty are explained by dummy variables in the following way:

$$\Delta x^{f}_{jt} = \alpha_i + \beta_i D_{it} + \mu_{it} \qquad (1)$$

In equation (1), Δx^{f}_{jt} refers to the changes in forecaster's j inflation or real GDP expectations (π_{jt} or g_{jt}), or changes in corresponding forecast uncertainties ($u\pi_{jt}$ or ug_{jt}). The subscript i denotes monetary policy decision and D_i's denote the corresponding dummies. Our focus is on the estimated β_i parameters, which reveal whether and how professionals change their expectations as a response to individual policy actions of the ECB. Here, we mainly consider short term expectations, which seem more informative, but we do also examine long term forecasts in order to evaluate the above-mentioned credibility issues. Fortunately, we have micro panel data also for long term expectations.

[3] More precisely, until 2002Q1 the survey was conducted during the second month of the quarter and published on the third month and during 2002Q2-2014Q4 the survey was conducted in the end of first month and published in the middle of second month. Since 2014Q4 the survey has been conducted in the beginning of the first month and published in the end of the same month.

[4] Fortunately, there are no decisions that would have occurred in the middle of this submission window. On average, the time lag between monetary policy announcement and the survey conduct is 3 weeks (see Appendix 1 for more details).

The panel least estimation results for equation (1) are reported in Table 1 (policy rate changes) and in Table 2 (unconventional monetary policy measures). Only the signs of the estimated β parameters and their p-values are shown (the estimates of β are, however, shown later in Appendix 2 together with the corresponding MRO rates). A set of scatter diagrams in Figure 2 relate interest rate changes to changes in point forecasts measured either by the estimated β parameters (1st column) or by the average changes in point forecasts (2nd column). Corresponding scatter diagrams for real GDP growth forecasts are shown in Figure 3. The relationship between the level of policy interest rate and the (micro level) point forecasts are shown in Figure 4. Figures 5 and 6 show how conventional and unconventional policy measures are linked to inflation and output growth uncertainty.

Our focus is not only on "reaction" or "no reaction" of expectations to policy actions, but also on the signs and magnitudes of these reactions. In order to infer whether the estimated β_i parameters are reasonable, we compare their signs with the direction of the monetary policy decision (interest rate increase or decrease, displayed in column 2 of Table 1). Although the Neo-Fisherians may disagree, we expect a decrease in inflation and output growth forecasts when interest rates increase, and vice versa when the rates are decreased. Unconventional policy measures are assumed to stimulate economic activity and hence the signs are interpreted accordingly. As for uncertainty, we cannot really assume any a priori sign for the parameter β_i.

In order to assess whether the estimation results based on all survey responses are "representative" for all forecasters, we run quantile regressions with 10 % and 90 % tails for short term forecasts and forecast uncertainties (reported in Tables 3 and 4). Using quantile regressions, we are able to assess whether the panel least squares results based on all survey responses are dominated by certain segments of forecasters. Finally, in Table 5 we analyze how monetary policy decisions and forecast uncertainties are related.

The qualitative nature of results shows up in the figures of Appendix 2. There, the dummy coefficients are graphed so that they can be compared with each other (short vs. long and point estimates vs. corresponding uncertainties) and with the level of policy rate. Relationship between short and long term expectations are illustrated in Appendix 3. Both average subjective forecast uncertainties and standard deviation of point forecasts are reported in Appendix 4.

3. Evaluation of the results

3.1 How monetary policy decisions affect point forecasts?

Interest rate changes have a clear impact on short term point forecasts, as reported in Table 1 and Appendix 2. Roughly two thirds of the estimated β parameters are statistically significant at the 5 per cent level for both inflation and output growth forecasts. There is quite a lot of heterogeneity across the estimated β parameters and roughly three fourth of the significant inflation coefficients and two third of the significant output growth coefficients have signs that we expect. For long-run inflation forecasts, the same story applies, but the number of significant and correctly signed β parameters is clearly lower in the case of long run output growth forecasts.

While Table 1 indicates that long term inflation expectations have not been fully insensitive to monetary policy decisions, the estimated β parameters are very small as shown in Appendix 2. Naturally, long run output growth expectations can well change along with policy action without a violation of the policy credibility axiom. They may, however, be also related to forecasters' views about labor market slack and structural reforms in the labor market which in turn may affect future inflation developments.

Our estimation results are somewhat different for unconventional monetary policy measures (see Table 2). While the aim of the unconventional monetary policy actions is to maintain an accommodative stance of monetary policy, only about half of the estimated β parameters for short and long term inflation forecasts are positive, but only about half of them are significant. Even less positive β parameters are obtained in the case of short and long term output growth forecasts. The estimation results in Table 2 seem to reflect the ECB communication challenges with unconventional monetary policy measures.

Figures 2 and 3 show a puzzling positive relationship between interest rate changes and changes in both inflation and output growth forecasts, although the outcome partly reflects some outliers. However, it is hard to interpret this observed pattern at least from the point of view of a standard New Keynesian model. It is even more difficult to interpret the level form results in Figure 4. In the case of short term inflation expectations, one may interpret the relationship as a Fisher equation but in this context the interpretation does not really make sense. But the scatter for long term inflation expectations, in Figure 4, is even more confusing. If we exclude the zero-lower-bound observations, it looks like that the long term relationship is clearly negative. In the case of output growth we do find a positive relationship, i.e. when the policy rate is high, forecasters expect higher growth rate. This sounds like an inverted Taylor rule, but it is difficult to figure out how forecasters end up with

this kind of outcome. Notice, however, the huge heterogeneity of observations. The relationship long run output growth expectations and the policy rate makes perhaps more sense: forecasters assume that in the long run monetary policy has no effect of growth. Thus, forecasters do not seem to think that higher (nominal) rates are an obstacle for long-term growth.

Finally, a brief comment on the quantile regression coefficients merits note (see Table 3). With inflation, we find rather small differences between upper and lower tails but with output growth it seems that certain differences exist, e.g. for the pre Lehman period 12 out of 32 coefficients are significant and correctly signed for the lowest 10 % while for the highest 90 % the corresponding number is only 5! A similar pattern can be found with unconventional monetary policy measures (for both inflation and output growth). Overall, in all cases there is clearly more significant and correct sign coefficients in lower than upper tail. Thus, there seems to be some important heterogeneity among forecasters, which also shows up in the uncertainty measures, which are discussed in the next section.

Figure A4 in the Appendix compares forecast disagreement (dispersion of point forecasts) and uncertainty (average of individual standard deviations). The dispersion of point forecasts, which is customarily used as the indicator of forecast uncertainty seems to be roughly constant over time except for the aftermath of the financial crisis 2008-2009. The average of subjective uncertainties does however point to another direction: it has increased over time (in other words, it is not stationary). The financial crisis does not show up as a single peak in the series but rather as some sort of level shift. This may be interpreted in many ways: for instance as an increased heterogeneity of beliefs or increased awareness of large macro shocks or increased ambiguity in terms of future policies (see Lahiri and Sheng (2010) for reasons of differences between these two indicators).[5] Unfortunately, we cannot say why the differences emerge, partly because we have no background information of the forecasters.

3.2 The impact of monetary policy decisions on forecast uncertainty

Contrary to point forecasts, it is not a priori clear how forecast uncertainty should respond to monetary policy decisions. Table 1 indicates that changes in the policy rate have clear impact on forecast uncertainty, but this impact depends on time horizon and forecasted variable. Both in the case of short term inflation and output growth uncertainty, about 80 per cent of the estimated β parameters are statistically significant. However, only less than half of the interest rate changes have reduced

[5] In the US, (according to the US SPF) the time series look quite different suggesting that the dispersion has not increased but rather decreased, at least during the period of nonstandard monetary policy operations. See Andrade et al. (2015).

forecast uncertainty. The results are somewhat different for long term forecast uncertainty, as only half of the inflation uncertainty responses and one third of the output growth responses are statistically significant. Typically, long term inflation uncertainty increases and long term output growth uncertainty decreases as a response to interest rate change. Figures 5 and 6 indicate that the dispersion of uncertainty assessment changes as a response to policy decisions. Especially, output growth uncertainty (Figure 6) reacts almost always to monetary policy announcements (here we have added an additional dummy for the revelation of Greek statistical error in 2010Q1).

Estimation results with a simple dummy regression (Table 5) confirm this pattern. A model in which all dummies are included into the estimating equation fits into the data very well so that one can clearly reject the hypothesis that all coefficients are equal to zero. How to interpret this? The most obvious interpretation is that the different forecaster interpret the policy decisions quite differently. Some expect an increase in rates, some no change and some a decrease. Those who have expected a "different" decision are obviously more or less puzzled with the outcome. Some may understand the outcome, some other not. And all that shows in the dispersion of uncertainty measures. Even though the effect on forecast values (point estimates) could be small, the policy measures still have behavioral consequences that have thus far not recognized.

3.3 Comparison of short and long term effects and inflation and output growth effects

Next, we compare the effects of monetary policy decisions on short and long term expectations. We also compare responses of the two variables. First, we compare short and long term point forecasts. The blue bars in figures of Appendix 2 confirm that monetary policy decisions clearly affect short term point forecasts. Especially, after the Lehman Brothers collapse, short term inflation expectations clearly decreased in 2008Q4, 2009Q1 and 2009Q2 as a response to three interest rate decreases and the same is true also in 2011Q4 after CBPP2 announcement. It is interesting to note that short term growth expectations worsened clearly in 2008Q3 after the announcement of interest rate increase. Even stronger decrease in output growth expectations were measured in 2008Q4 and 2009Q1 after the two interest rate decreases. After several accommodative interest rate changes increasing output growth expectations is observed in 2009Q3. Part of this reaction is due to CBPP + 1 year LTRO decisions that were announced at the same time.

Long term inflation expectations have been less sensitive to ECB monetary policy actions in quantitative terms, which would support the view that expectations are anchored to the ECB's inflation target (Figure A2). One has to keep in mind that the change of expectations, however small, are statistically significant. Also long term growth expectations (Figure A5) have responded only

marginally (again in quantitative terms) to monetary policy decisions. Reactions of short and long inflation expectations to policy rate changes seem to be positively correlated, but the correlation is far from perfect. With inflation the coefficient of correlation is 0.54 and with output growth 0.60. It also turns out that short and long-term inflation forecasts are positively correlated (Appendix 3). Not much, but still significantly. The same is true with output growth forecasts, but that is a different matter from the point of view of inflation anchoring proposition[6].

What also makes us suspect the idea that long-term inflation expectations are firmly anchored is the fact that according to Appendix 4 the average subjective forecast uncertainty increased permanently after the onset of the financial crisis (although the dispersion of point forecasts increased only temporarily). One may think that if the long-term inflation forecasts become more uncertain, it is difficult to argue that the inflation target is then equally unanimously accepted as before. Thus, developments with long-term inflation seem to reflect general tendencies of increased uncertainty.

Next, we turn to forecast uncertainties, i.e. red bars in figures of Appendix 2. Again, we find some interesting responses of expectations to both directions. The biggest increase in short term inflation uncertainty is shows up after interest rate decrease in 2009Q1 - at the same time, however, there was a clear decrease of short term inflation expectations. After the next interest rate decrease in 2019Q2, these two variables moved to the same direction, as both short term inflation expectations and short term inflation uncertainty decreased clearly. In 2010Q3, after the SMP announcement, short term inflation uncertainty decreased substantially, but the opposite is true for long term inflation uncertainty after the Draghi's speech "whatever it takes" and OMT program announcement in 2012Q4. The biggest decrease in short term output growth uncertainty took place in 2016Q2 after interest rate decrease and announcement to increase EAPP asset purchases. Responses of long term output growth uncertainties to interest rate decreases in 2009 were large to both directions.

Next, we compare reactions of expectations and corresponding expectations uncertainties to individual monetary policy actions (i.e. we compare red and blue bars in Appendix 2). Correlation between the two variables is typically very low or even negative. Low correlations reflect the fact that increasing disagreement across forecasters about point forecasts does not necessarily lead to increasing forecast uncertainties. Thus, in spite of highly dispersed point forecasts, forecasters may be very confident in their views.

Since the impact of individual monetary policy announcements on forecast uncertainties of the two variables are quite different, correlation between the respective dummy coefficients is slightly

[6] One might interpret the results as evidence for adaptive expectations (or learning).

negative (about -0.2) both in the case of short and term forecasting. A negative correlation coefficient between the estimated dummy coefficients for short term output growth point estimate and respective forecast uncertainty (-0.24) is reasonable: if policy action is assumed to boost economic growth, one might think that it reduces forecast uncertainty (the probability of economic crises will diminish).

On the contrary, one might think that higher inflation increases inflation uncertainty e.g. due to loss of external balance. However, the estimated dummy coefficients do not systematically follow that rule; in the case of short term forecasting, the correlation between the respective dummy coefficients is negative, -0.13, even though it is far from being significant. For conventional and unconventional policy decisions and long term inflation forecasting, the correlation coefficients between the estimated β parameters for point forecasts and respective uncertainties are clearly positive. However, none of the correlations is statistically significant. These ambiguous results may be related to the special features of the financial crisis. In the onset of the crisis, in 2008, inflation and output forecasts were drastically reduced, but at the same time forecast uncertainty – for obvious reasons – increased. After the acute crisis (and also during the sovereign debt crisis in 2009 - 2010), inflation and output growth forecasts were revised upwards but economic uncertainty did not vanish. At that time, the estimated dummy coefficients for forecast uncertainties are typically associated with positive signs.

4. Concluding remarks

Our analysis with the ECB SPF panel data indicates that the impact of monetary policy decisions on professional forecasters' expectations and expectations uncertainty does not seem to follow a simple pattern of a text-book macroeconomic theory. Instead, the effects of policy decisions on forecasters' inflation and output growth expectations vary across time, across forecast horizons and across individuals. We find that expectations – even long term expectations – are sensitive to both policy rate changes and unconventional monetary policy measures and the same is true with the subjective forecast uncertainty measures. As a rule, the dispersion of subjective forecast uncertainty measures increase with policy changes presumably reflecting the fact that all forecasters do not agree with the ECB policy assessments.

All in all, our analyses suggest that heterogeneous expectations can be one of the reasons why the actual policy reactions deviate from some model-based projections. To find out whether this is indeed true we would need analysis which could exploit information on both expectations and past actions of individuals.

References

Abel, J., Rich, R., Song, J., and Tracy, J. (2016). The measurement and behavior of uncertainty: Evidence from the ECB Survey of Professional Forecasters. *Journal of Applied Econometrics*, 31, 553–550.

Andrade, P., and Le Bihan, H. (2013). Inattentive professional forecasters. *Journal of Monetary Economics*, 60(8), 967–982.

Andrade, P., Gaballo, G., Mengus, E. and Mojon, B. (2015) Forward guidance and heterogeneous beliefs. Bank of France. Document de travail n° 573. https://www.banque-france.fr/sites/default/files/medias/documents/document-de-travail_573_2015.pdf

Beechey, M. J., Johannsen, B. K. and Levin, A. T. (2011) Are Long-Run Inflation Expectations Anchored More Firmly in the Euro Area than in the United States? *American Economic Journal: Macroecnomics,* Vol. 3, No 2, 104-129.

Boneva, L., Cloyne, J., Weale, M. and Wieladek, T. (2016) The Effect of Unconventional Monetary Policy on Inflation Expectations: Evidence from Firms in the United Kingdom. *International Journal of Central Banking,* Vol. 12, No 3, 161-195.

Campell, J. (2013) Odyssean forward guidance in monetary policy: a primer. *Economic Perspectives,* 37 (4), Federal Reserve Bank of Chicago.

Coenen, G., Ehrmann, M., Gaballo, G. Hoffmann, P. Nakov, A. St. Nardelli, Persson, E. and Strasser, G. (2017) Communication of monetary policy in unconventional times. *ECB Working Paper* 2080.

Demertzis, M., Marcellino, M., Viegi, N. 2012. A Credibility Proxy: Tracking US Monetary Developments, The B.E. Journal of Macroeconomics, 12(1), 1-36.

Dovern, J and Kenny, G. (2017) The long-terms distribution of expected inflation in the euro area: what has changed since the great recession. *ECB Working Paper* 1999.

Galariotis, E., Makrichorit, P. and Spyros, S. (2018) The impact of conventional and unconventional monetary policy on expectations and sentiment. *Journal of Banking and Finance* 86, 1-20.

Galati, G., Poelhekke, S. and Zhou, C. (2011) Did the Crisis Affect Inflation Expectations? *International Journal of Central Banking,* Vol. 7, No 1, 167-207.

Gürkaynak, S., Swanson, E. and Levin, A (2010) Does Inflation Targeting Anchor Long-Run Inflation Expectations? Evidence from the U.S., UK and Sweden. *Journal of European Economics Association,* Vol. 8, No 6, 1208-1242.

Jarocinski, M. and Karadi, P. (2018) Deconstructing monetary policy surprises: the role of informations shocks. *ECB Working Paper* 2133.

Kurov, A. (2010) Investor sentiment and the stock market's reaction to monetary policy. *Journal of Banking and Finance* 34(1), 139-143.

Lahiri, K and X. Sheng (2010) Measuring forecast uncertainty by disagreement: The missing link. *Journal of Econometrics* 25(4), 514-538.

López-Pérez, V. (2016a). Macroeconomic forecast uncertainty in the euro area. *Equilibrium: Quarterly Journal of Economics and Economic Policy*, 11(1), 9–41.

López-Pérez, V. (2016b). Does uncertainty affect non-response to the European Central Bank's Survey of Professional Forecasters? *Economics: The Open-Access, Open-Assessment E-Journal,* 10(25), 1–46.

Lutz, C. (2015) The impact of conventional and unconventional monetary policy on investor sentiment. *Journal of Banking and Finance* 61, 89-105.

Łyziak, T., and Paloviita, M. (2017), Anchoring of inflation expectations in the euro area: Recent evidence based on survey data. *European Journal Political Economy*, 46, 52-73.

Nautz, D., Strohsal, T., 2015. Are US inflation expectations re-anchored? *Economics Letters*. 127, 6-9.

Oinonen, S. and Paloviita, M. (2017), How Informative are Aggregated Inflation Expectations? Evidence from the ECB Survey of Professional Forecasters? *Journal of Business Cycle Research,* 13(2), 139-163.

Scharnagl, M. and Stapf, J. (2015) Inflation, deflation, and uncertainty: What drives euro-area option-implied inflation expectations, and are they still anchored in the sovereign debt crisis? *Economic Modelling,* 48, 248-269.

Tsenova, T. (2012). Are long-term inflation expectations well-anchored? Evidence from the Euro Area and the United States. *Bulletin of Economic Research*, 1–18.

Table 1 The impacts of policy rate changes on expectations and expectations uncertainty

	MRO	Deposit rate	Lending rate	π_S	π_{SU}	π_L	π_{LU}	g_S	g_{SU}	g_L	g_{LU}
1999Q2	-0,50	-0,50	-1,00	0,05				0,05	0,05		
2000Q1	0,75	0,75	0,75	0,10	-0,05			0,05	0,10		
2000Q2	0,50	0,50	0,50		-0,05			0,05	-0,05		
2000Q3	0,50	0,50	0,50	0,10	0,05				0,05		
2000Q4	0,50	0,50	0,50		0,05			-0,05	-0,05		
2001Q3	-0,25	-0,25	-0,25		0,05	0,05	0,05	-0,05	0,05	-0,10	-0,05
2001Q4	-0,75	-0,75	-0,75	-0,05	-0,05		0,05	-0,05	0,05		
2002Q1	-0,50	-0,50	-0,50	0,05	-		-0,05	0,05	-0,05		
2003Q1	-0,50	-0,50	-0,50	-0,05	-	0,05	0,05	-0,10	-0,05	0,05	0,10
2003Q2	-0,25	-0,25	-0,25	-0,05	-	-0,05	-0,05	-0,05	-0,05		
2003Q3	-0,50	-0,50	-0,50	-0,05	-0,05	0,05	-0,05	-0,10	0,05	-	-
2006Q1	0,25	0,25	0,25	0,05	-0,05	0,05	-	0,05	0,05	0,05	-0,05
2006Q2	0,25	0,25	0,25	0,05	-	0,05		0,05	-0,05		-
2006Q3	0,50	0,50	0,50	-0,05	-0,05	-0,05	-	-	-0,05		-
2006Q4	0,25	0,25	0,25	-	0,05	-0,05		-	0,05	0,05	-
2007Q1	0,25	0,25	0,25		-0,05	0,05	0,05	+	-0,05	0,05	
2007Q2	0,25	0,25	0,25	-0,05	-0,05	0,05	-0,05		-0,05	0,05	0,05
2007Q3	0,25	0,25	0,25		-0,05		-	0,05		0,05	-0,05
2008Q3	0,25	0,75	0,25	0,05	-0,10	0,05	0,05	-0,05	0,05		-
2008Q4	-0,50	-0,50	-1,00	-0,05	0,05	-	0,05	-0,05	0,05		0,05
2009Q1	-1,75	-1,75	-1,75	-0,05	0,05	-0,05	0,10	-0,05	-	-0,05	
2009Q2	-0,75	-0,75	-0,75	-0,05	-0,05	-0,05	-0,05	-	0,05	-0,10	0,05
2009Q3	-0,25	0	-0,50	0,10	0,05	-0,05	0,10	0,05	-0,05		-0,05
2011Q2	0,25	0,25	0,25	0,05	0,05	0,05	0,05		-	-	-0,10
2011Q3	0,25	0,25	0,25			0,05	-	-	0,05	-0,05	-
2012Q1	-0,50	-0,50	-0,50	0,10	0,05	-0,05	-	-0,05	0,05	-0,05	-
2012Q3	-0,25	-0,25	-0,25	-	-0,05	-0,05	-0,05	-0,05	0,05	-0,05	-
2013Q3	-0,25	0	-0,50	-	-0,05	-	-	0,05			-
2014Q1	-0,25	0	-0,25	-0,05	0,05	-0,05		0,05	0,05	0,05	-0,05
2014Q3	-0,10	-0,10	-0,35	-0,05	-		+	-	+	-	-0,10
2014Q4	-0,10	-0,10	-0,10	-0,05	-0,10	-0,05	0,10	-0,05	0,05	-0,05	0,05
2016Q2	-0,05	-0,2	-0,05	-0,10	0,05	0,05	0,05	-0,05	-0,05	-0,05	-
# sign.				23	25	21	17	23	27	15	12

Note: Numbers are p-values of the coefficients of the individual dummy variables from equation 1. The last row displays the total number of significant t-values for 32 regressions. When all dummies were included at the same time to the regression for all forecast variables (and for the whole sample period), the respective F-statistic exceeded the 5 per cent critical value only in the case of π_S and g_S.

Table 2 The impacts of unconventional monetary policy measures on expectations and expectations uncertainty

period	change	**inflation forecasts**				**output growth forecasts**			
		π_S	π_{SU}	π_L	π_{LU}	g_S	g_{SU}	g_L	g_{LU}
2009 q3	CBPP + 1 year LTRO	0,10	0,05	-0,05	0,10	0,05	-0,05		-0,05
2010 q3	SMP		-0,05		-0,10		-0,05	-0,05	-0,05
2011 q4	CBPP2	-0,05		0,05	0,05	-0,05	0,05	-	0,05
2012 q1	3 year LTRO	0,10	0,05	-0,05	-	-0,05	-0,05	-0,05	-
2012 q4	Draghi & OMT	0,05	-	0,05	0,05	-		-	0,05
2013 q3	Forward guidance	-	-0,05	-	-	0,05			-
2014 q3	TLTRO	-0,05	-			-		-	-0,10
2014 q4	CBPP3 + ABSPP	-0,05		-	0,05	-0,05	-	-0,05	
2015 q2	EAPP: PSPP	0,05	0,10		0,05		0,05	0,05	-
2016 q2	EAPP: 60 → 80	-0,10	0,05	0,05	0,05	-0,05	-0,05	-0,05	-
2017 q2	EAPP: 80 → 60 & CSPP	0,05		-	0,10			0,05	-0,05
all sig.		9	6	5	8	6	6	6	6

Note: Notation is the same as in Table 1. In 2012Q4 and 2017Q2 two measures took place in the same quarter.

Table 3 Quantile regressions for interest rate changes

period	change	short-term inflation forecasts			short-term output growth forecasts		
		OLS	QR 0.10	QR 0.90	OLS	QR 0.10	QR 0.90
1999Q2	1	0,05	0,05	0,05	0,05	0,05	
2000Q1	2	0,10	0,05	+	0,05	0,05	-
2000Q2	3				0,05	0,05	
2000Q3	4	0,10				0,05	-
2000Q4	5				-0,05		-0,05
2001Q3	6		-		-0,05	-0,05	-0,05
2001Q4	7	-0,05	-0,05	-	-0,05	-0,05	-0,05
2002Q1	8	0,05			0,05	0,05	0,10
2003Q1	9	-0,05	-	-0,05	-0,10		-
2003Q2	10	-0,05	-0,05	-0,05	-0,05	-	-0,05
2003Q3	11	-0,05	-	-	-0,10	-	
2006Q1	12	0,05	0,05		0,05	0,05	0,05
2006Q2	13	0,05		0,05	0,05	0,05	0,05
2006Q3	14	-0,05		-0,05	-	0,05	-0,05
2006Q4	15	-	0,05	-0,05	-	0,05	-
2007Q1	16		0,05	-0,05		0,05	-0,05
2007Q2	17	-0,05	-	-0,05		0,05	-0,05
2007Q3	18		0,05	-0,05	0,05	0,05	-
2008Q3	19	0,05	0,05	0,05	-0,05	-	-0,05
2008Q4	20	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05
2009Q1	21	-0,05	-0,05	-	-0,05	-0,05	-0,05
2009Q2	22	-0,05	-0,05	-	-	-0,05	
2009Q3	23	0,10	-0,05		0,05	0,05	0,05
2011Q2	24	0,05	0,05	0,05		0,05	-0,05
2011Q3	25		0,05	-0,10	-	0,05	-0,05
2012Q1	26	0,10		-	-0,05	-0,05	-0,05
2012Q3	27	-	-	-	-0,05	-	-0,05
2013Q3	28	-	0,05	-0,05	0,05	0,05	
2014Q1	29	-0,05		-0,05	0,05	0,10	
2014Q3	30	-0,05		-	-	0,05	-0,05
2014Q4	31	-0,05		-	-0,05	-	-0,05
2016Q2	32	-0,10	-	+	-0,05	-	-0,05
all sig.		23	16	15	23	24	21

Note: QR 0.10 (QR 0.90) denotes the p-value of the regression of coefficient of the respective dummy variables in a quantile regression form the 10 % (90 %) tail.

Table 4 Quantile regressions for unconventional monetary policy measures

period	change	short-term inflation forecasts			short-term output growth forecasts		
		OLS	QR 0.10	QR 0.90	OLS	QR 0.10	QR 0.90
2009 q3	CBPP + 1 year LTRO	0,10	-0,05		0,05	0,05	0,05
2010 q3	SMP		0,05	-		0,05	-0,05
2011 q4	CBPP2	-0,05		-0,05	-0,05	-0,05	-0,05
2012 q1	3 year LTRO	0,10		-	-0,05	-0,05	-0,05
2012 q4	Draghi & OMT	0,05	0,05		-	0,10	
2013 q3	Forward guidance	-	0,05	-0,05	0,05	0,05	
2014 q3	TLTRO	-0,05		-	-	0,05	-0,05
2014 q4	CBPP3 + ABSPP	-0,05			-0,05	-	-0,05
2015 q2	EAPP: PSPP	0,05	0,05	0,05		0,05	0,05
2016 q2	EAPP: 60 →80	-0,10	-		-0,05	-	-0,05
2017 q2	EAPP: 80→60 & CSPP	0,05	0,05	0,05		0,05	-0,05
all sig.		9	6	4	6	9	9

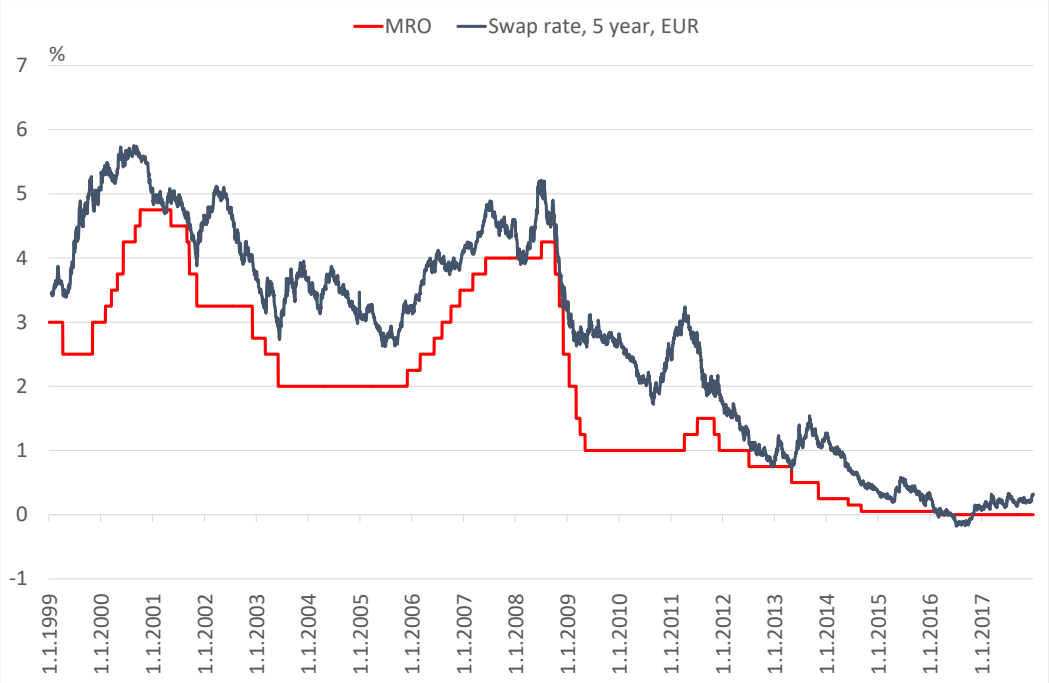
Note: Notation is the same as in Table 2. In 2012Q4 and 2017Q2 two measures took place in the same quarter.

Table 5 Uncertainty dispersion and the policy dummies

	π_{SU}	π_{LU}	g_{SU}	g_{LU}
	Conventional monetary policy measures			
F	97,40	31,70	54,20	79,77
P	0,000	0,000	0,000	0,000
	Unconventional monetary policy measures			
F	9,21	25,89	20,02	37,75
p	0,000	0,000	0,000	0,000
	All dummies			
F	122,85	43,48	57,09	89,52
P	0,000	0,000	0,000	0,000

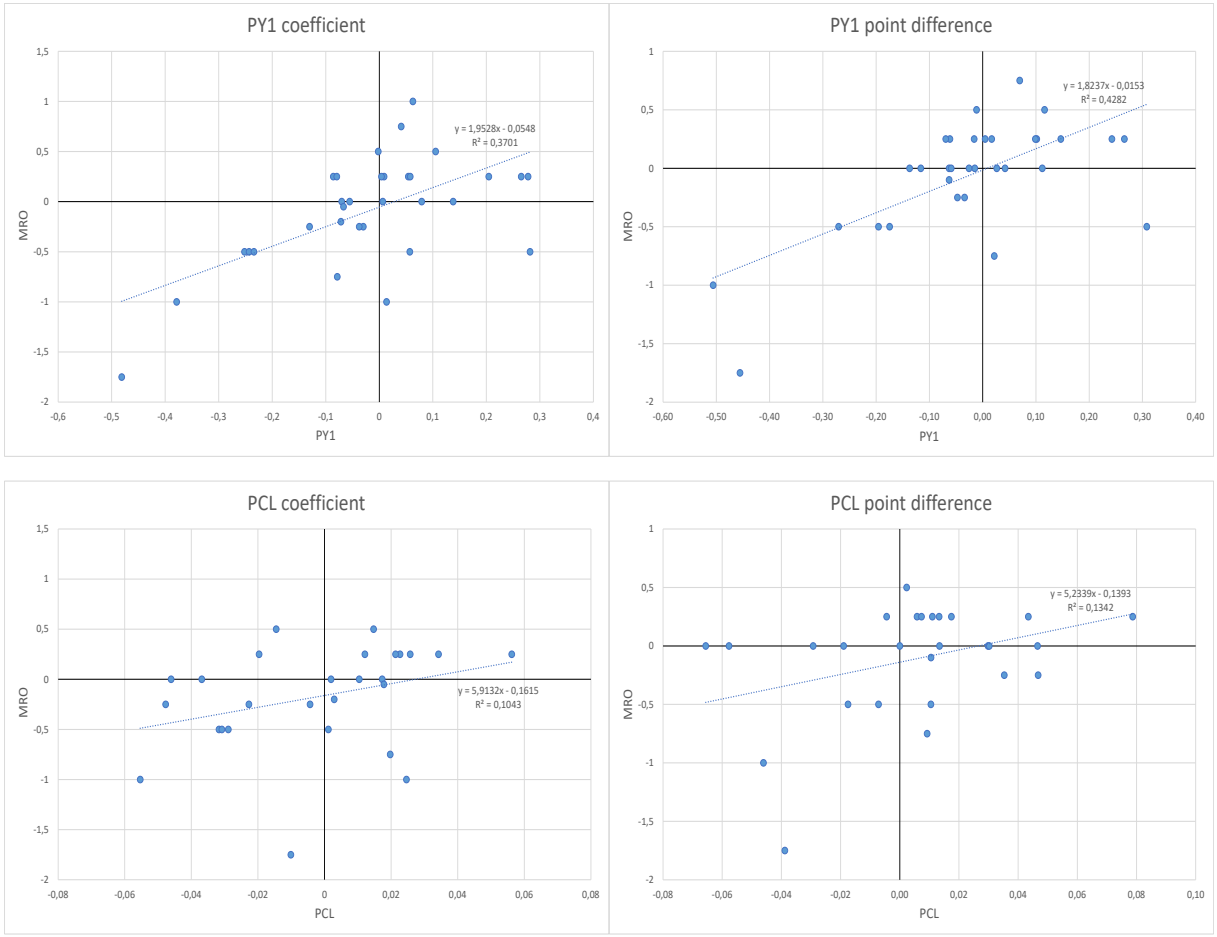
Note: Numbers indicate the F-test values (and respective p-values) for the coefficient restriction that all 32/11/45 coefficients of the dummy variables are equal to zero. With the last set of statistics (for "all dummies"), the set of dummy variables also include a dummy for 2010Q1 (revelation of Greek statistical "error).

Figure 1 MRO rate and one-year swap rate



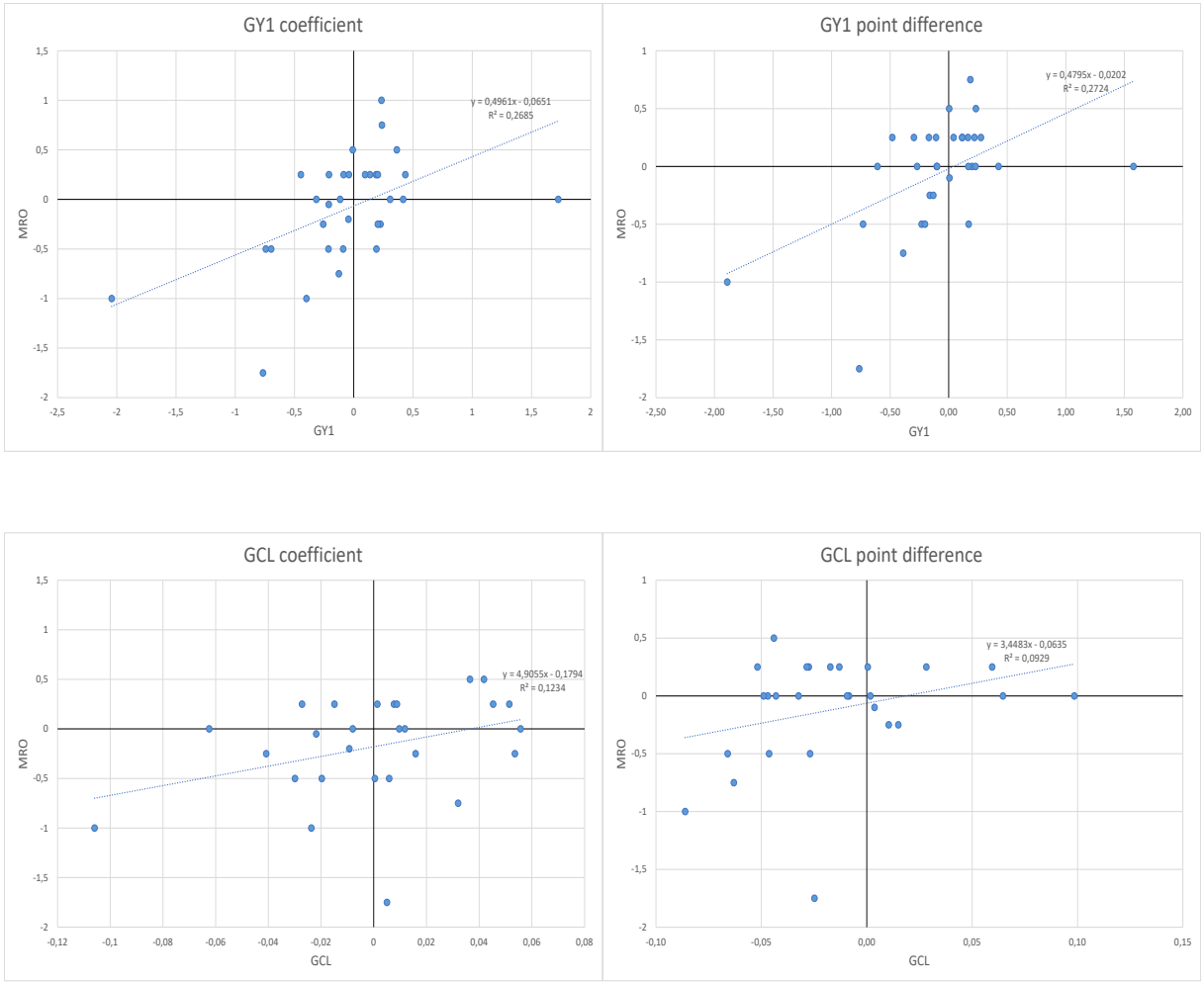
Note: Correlation between the two series is 0.938.

Figure 2 Relationship between interest rate changes and expectations



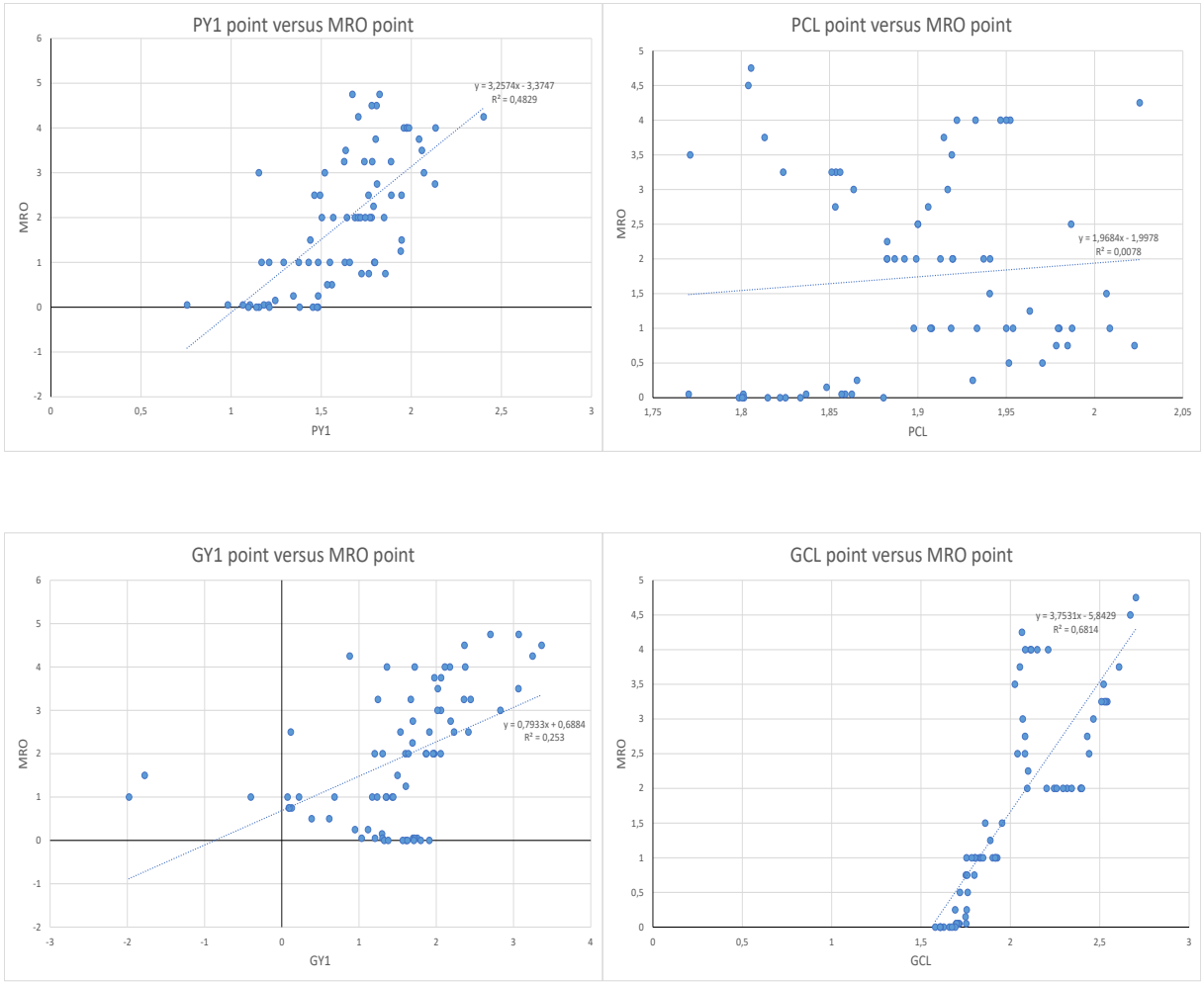
Note: PY1 (PCL) denotes short-run (long-run) inflation forecasts, MRO change in the main ECB policy rate. PY1 coefficient denotes the coefficient estimate of dummy in equation (1) while "PY1 point difference" denotes an average of first (backward) differences in forecast values. Similar notation applies to output growth (GY1 and GCL) in Figure 3.

Figure 3 Relationship between interest rate changes and growth expectations



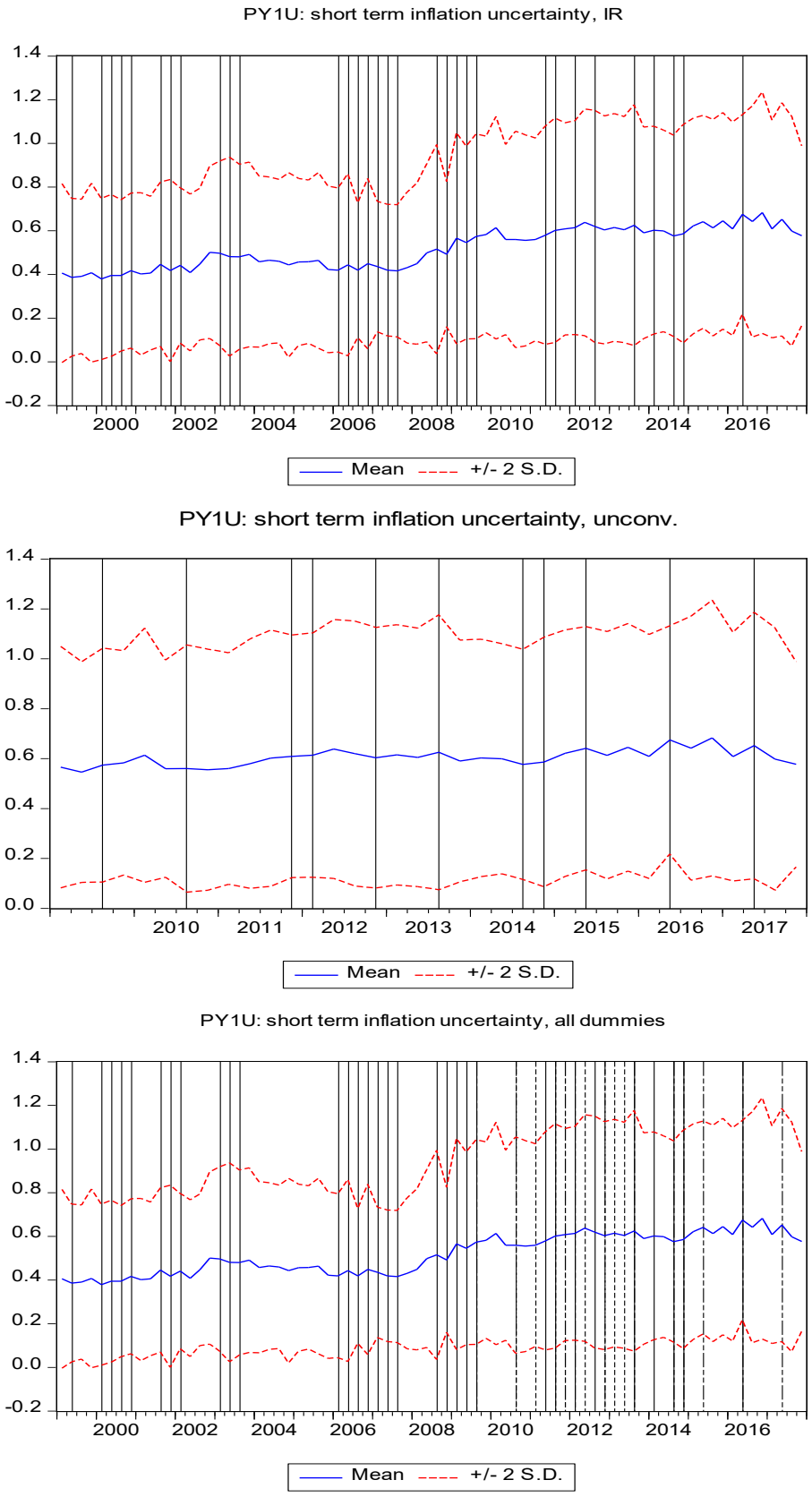
Note: See note for Figure 2.

Figure 4 Relationship between the interest rate and inflation/output growth expectations



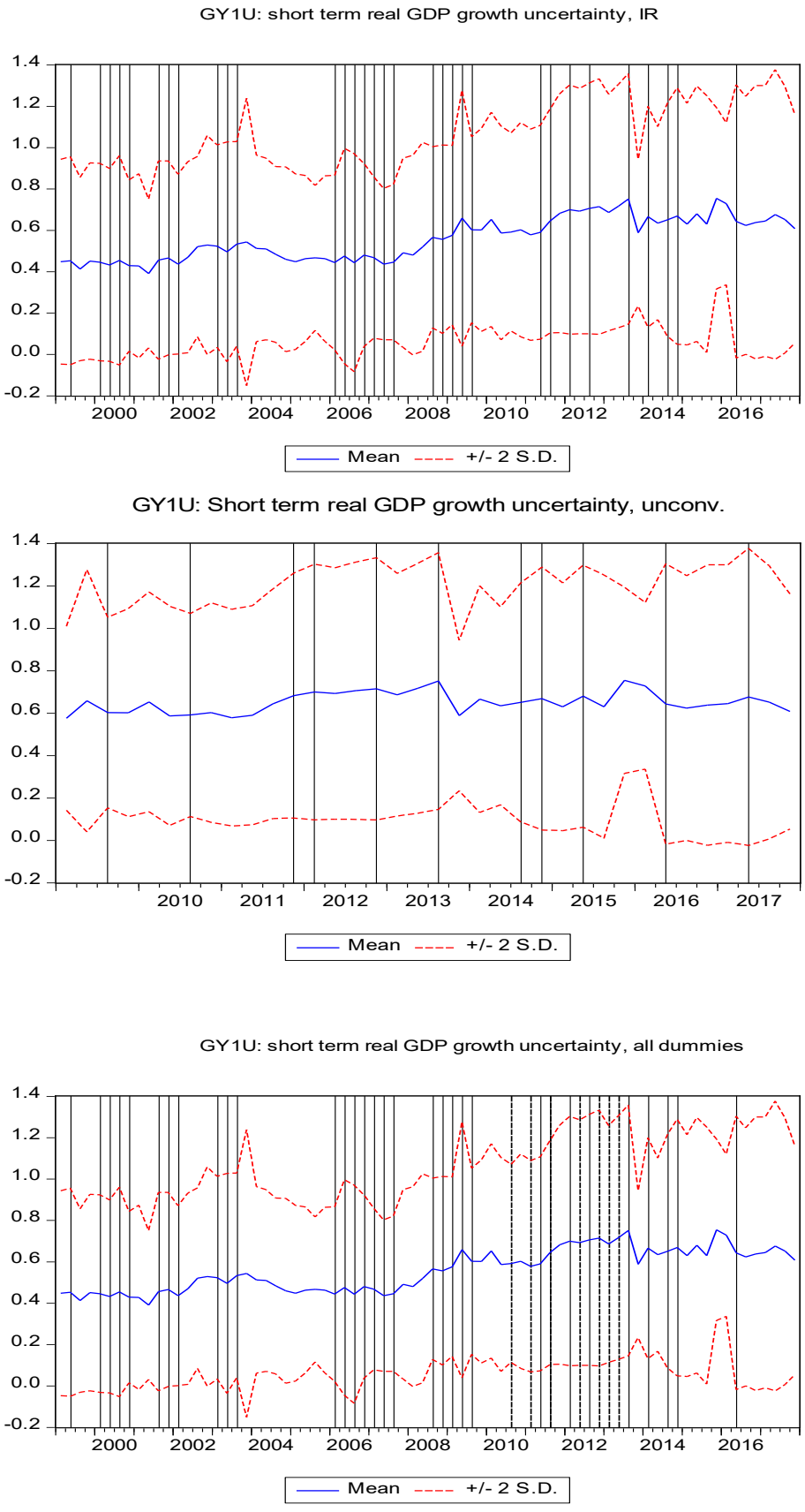
Note: In this figure both the policy rate and the forecast values are in levels. Otherwise notation is the same as in Figure 2.

Figure 5 Policy measures and inflation uncertainty



Note: Solid line indicates the mean of individual standard deviations and the dotted lines the respective confidence interval (dispersion).

Figure 6 Policy measures and output growth uncertainty



Appendix 1 Details of the data

g_S, π_S	short term real GDP growth and inflation expectations (one year ahead), that are obtained from the responses to the ECB questionnaire.
g_{SU}, π_{SU}	corresponding individual uncertainties measured by computing the standard deviation from distribution (histogram) that the respondents provide for each to the forecast in the questionnaire.
g_L, π_L	long-term real GDP growth and inflation expectations (4-5 years ahead)
g_{LU}, π_{LU}	corresponding long-terms individual uncertainties (computed in the same way as the short-term counterparts).

Sample period is 1999Q1 – 2017Q4. Our panel data include 119 forecasters altogether, but panel composition changes over time. In one quarter, there are roughly 60 forecasters. The total number of observations is our panel setting is 10472.

Policy (change) decision dates and deadlines for submitting the survey answers

GC Meeting date	deadlines to reply	Policy rate	Deposit rate	Lending rate	Unconventional MP
7.1.1999	12.2.				
4.3.1999					
8.4.1999		3 -> 2,5	2 -> 1,5	4,5 -> 3,5	
22.4.1999	3.5.				
6.5.1999					
20.5.1999					
2.6.1999					
17.6.1999					
15.7.1999					
29.7.1999	7.8.				
26.8.1999					
9.9.1999					
23.9.1999					
7.10.1999					
21.10.1999	3.11.				
4.11.1999		3	2	4	
18.11.1999					
2.12.1999					
15.12.1999					
5.1.2000					
20.1.2000					
3.2.2000	9.2.	3,25	2,25	4,25	
17.2.2000					
2.3.2000					
16.3.2000		3,5	2,5	4,5	
30.3.2000					
13.4.2000					
27.4.2000	5.5.	3,75	2,75	4,75	
11.5.2000					
25.5.2000					
8.6.2000		4,25	3,25	5,25	
21.6.2000					
6.7.2000					
20.7.2000					
3.8.2000	4.8.				
31.8.2000		4,5	3,5	5,5	
14.9.2000					
5.10.2000		4,75	3,75	5,75	
19.10.2000					
2.11.2000	2.11.				
16.11.2000					
30.11.2000					
14.12.2000					
4.1.2001					
18.1.2001					
1.2.2001	1.2.				
15.2.2001					
1.3.2001					
15.3.2001					
29.3.2001					
11.4.2001					
26.4.2001	3.5.				
10.5.2001		4,5	3,5	5,5	
23.5.2001					
7.6.2001					
21.6.2001					
5.7.2001					
19.7.2001					
2.8.2001	3.8.				
30.8.2001		4,25	3,25	5,25	

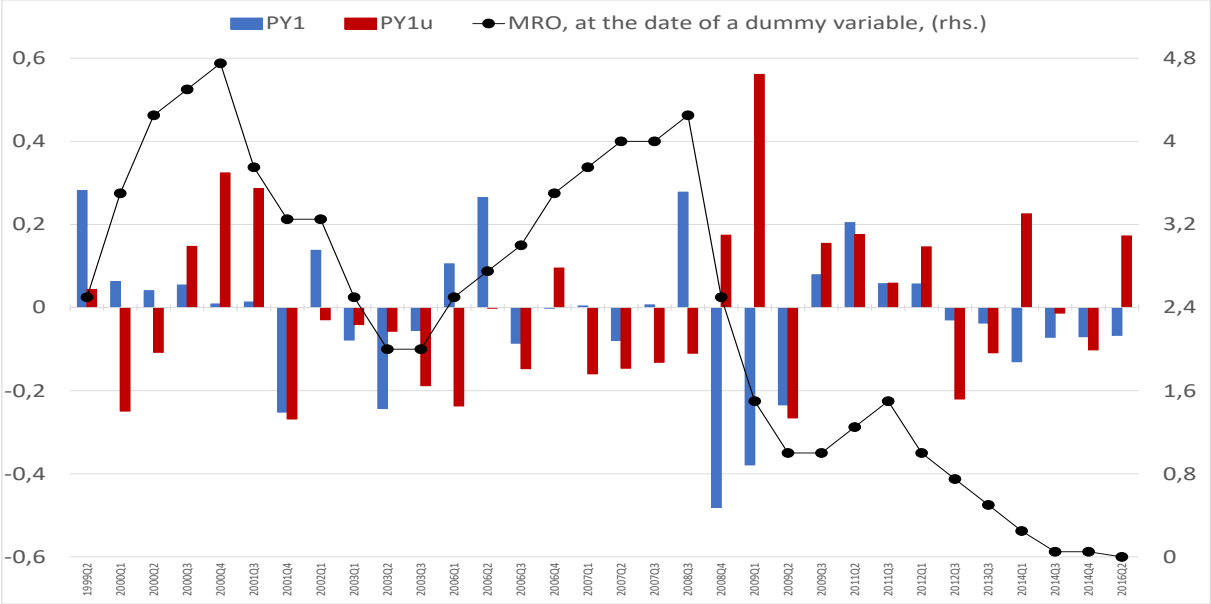
13.9.2001				
17.9.2001		3,75	2,75	4,75
27.9.2001				
11.10.2001				
25.10.2001	29.10.			
8.11.2001		3,25	2,25	4,25
6.12.2001				
3.1.2002	4.2.			
7.2.2002				
7.3.2002				
4.4.2002	22.4.			
2.5.2002				
6.6.2002				
4.7.2002	22.7.			
1.8.2002				
12.9.2002				
10.10.2002	23.10.			
7.11.2002				
5.12.2002		2,75	1,75	3,75
9.1.2003	27.1.			
6.2.2003				
6.3.2003		2,5	1,5	3,5
3.4.2003	24.4.			
8.5.2003				
5.6.2003		2	1	3
10.7.2003	23.7.			
31.7.2003				
4.9.2003				
2.10.2003	28.10.			
6.11.2003				
4.12.2003				
8.1.2004	28.1.			
5.2.2004				
4.3.2004				
1.4.2004	26.4.			
6.5.2004				
3.6.2004				
1.7.2004	26.7.			
5.8.2004				
2.9.2004				
7.10.2004	21.10.			
4.11.2004				
2.12.2004				
13.1.2005	26.1.			
3.2.2005				
3.3.2005				
7.4.2005	22.4.			
4.5.2005				
2.6.2005				
7.7.2005	22.7.			
4.8.2005				
1.9.2005				
6.10.2005	24.10.			
3.11.2005				
1.12.2005		2,25	1,25	3,25
12.1.2006	23.1.			
2.2.2006				
2.3.2006		2,5	1,5	3,5
6.4.2006	26.4.			
4.5.2006				
8.6.2006		2,75	1,75	3,75
6.7.2006	22.7.			
3.8.2006		3	2	4
31.8.2006				

5.10.2006	20.10.	3,25	2,25	4,25	
2.11.2006					
7.12.2006		3,5	2,5	4,5	
11.1.2007	24.1.				
8.2.2007					
8.3.2007		3,75	2,75	4,75	
12.4.2007	23.4.				
10.5.2007					
6.6.2007		4	3	5	
5.7.2007	18.7.				
2.8.2007					
6.9.2007					
4.10.2007	18.10.				
8.11.2007					
6.12.2007					
10.1.2008	18.1.				
7.2.2008					
6.3.2008					
10.4.2008	18.4.				
8.5.2008					
5.6.2008					
3.7.2008	18.7.	4,25	3,75	5,25	
7.8.2008					
4.9.2008					
2.10.2008					
8.10.2008	17.10.	3,75	3,25	4,25	
6.11.2008		3,25	2,75	3,75	
4.12.2008		2,5	2	3	
15.1.2009	20.1.	2	1	3	
5.2.2009					
5.3.2009		1,5	0,5	2,5	
2.4.2009	20.4.	1,25	0,25	2,25	
7.5.2009		1	0,25	1,75	CBPP+ 1y LTRO
4.6.2009					
2.7.2009	17.7.				
6.8.2009					
3.9.2009					
8.10.2009	19.10.				
5.11.2009					
3.12.2009					
14.1.2010	19.1.				
4.2.2010					
4.3.2010					
8.4.2010	20.4.				
6.5.2010					
9.5.2010					SMP
10.6.2010					
8.7.2010	19.7.				
5.8.2010					
2.9.2010					
7.10.2010	19.10.				
4.11.2010					
2.12.2010					
13.1.2011	18.1.				
3.2.2011					
3.3.2011					
7.4.2011	19.4.	1,25	0,5	2	
5.5.2011					
9.6.2011					
7.7.2011	19.7.	1,5	0,75	2,25	
4.8.2011					
8.9.2011					
6.10.2011	18.10.				CBPP2
3.11.2011		1,25	0,5	2	

8.12.2011		1	0,25	1,75	3 year LTRO
12.1.2012	20.1.				
9.2.2012					
8.3.2012					
4.4.2012	19.4.				
3.5.2012					
6.6.2012					
5.7.2012	19.7.	0,75	0	1,5	
26.7.2012					Draghi ”Whatever it takes”
2.8.2012					
6.9.2012					OMT program
4.10.2012	22.10.				
8.11.2012					
6.12.2012					
10.1.2013	22.1.				
7.2.2013					
7.3.2013					
4.4.2013	19.4.				
2.5.2013		0,5	0	1	
6.6.2013					
4.7.2013	19.7.				Forward guidance
1.8.2013					
5.9.2013					
2.10.2013	22.10.				
7.11.2013		0,25	0	0,75	
5.12.2013					
9.1.2014	24.1.				
6.2.2014					
6.3.2014					
3.4.2014	25.4.				
8.5.2014					
5.6.2014		0,15	-0,1	0,4	TLTRO
3.7.2014	24.7.				
7.8.2014					
4.9.2014		0,05	-0,2	0,3	CBPP3 + ABSPP
2.10.2014	23.10.				
6.11.2014					
4.12.2014	13.1.				
22.1.2015					EAPP: PSPP
5.3.2015	7.4.				
15.4.2015					
3.6.2015	6.7.				
16.7.2015					
3.9.2015	6.10.				
22.10.2015					
3.12.2015	11.1.				
21.1.2016					
10.3.2016	6.4.	0	-0,4	0,25	EAPP: asset purchase 60→ 80 Bil €
21.4.2016					
2.6.2016	6.7.				
21.7.2016					
8.9.2016	6.10.				
20.10.2016					
8.12.2016	10.1.				
19.1.2017					EAPP: asset purchase 80→ 60 Bil €
9.3.2017	7.4.				
10.3.2017					EAPP: CSPP program
27.4.2017					
8.6.2017	7.7.				
20.7.2017					
7.9.2017	6.10.				

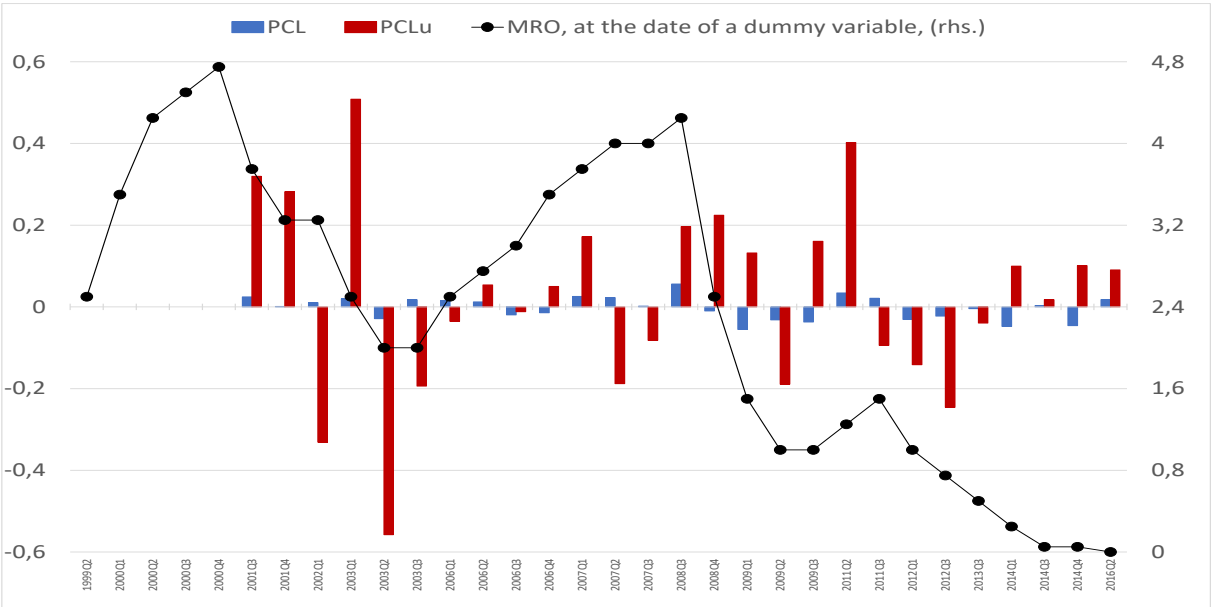
Appendix 2: Dummy coefficients for point forecasts of inflation and output growth and respective uncertainties

A1 Interest rate decisions: short-run inflation with the repo rate



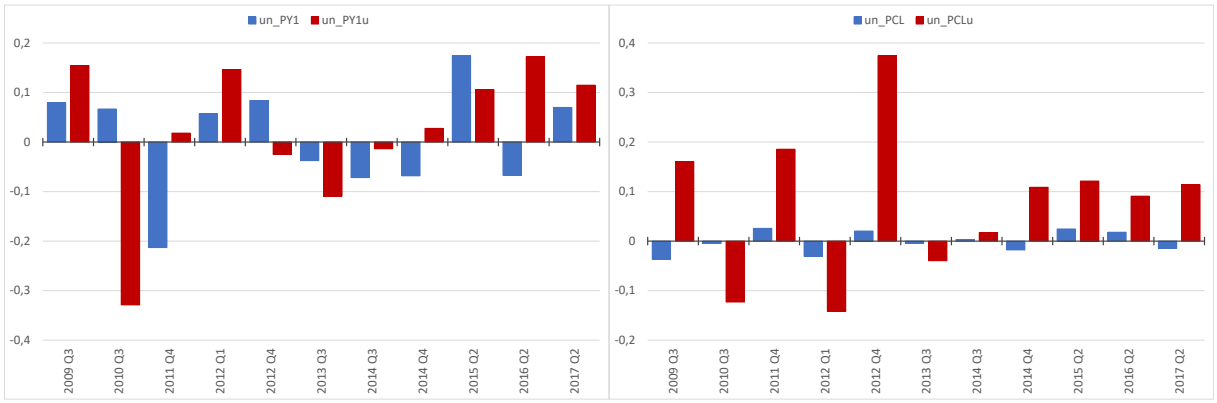
r(PY1,PY1u) = -0.13, r(PY1,PYL) = 0.54*, r(PY1u,PYLu) = 0.34*, r(PY1,GY1) = 0.55*, r(PY1u,GY1u)) = -0.16
(* significant at the 5 per cent level). Here u denotes the subjective forecast uncertainty measure, 1 denotes short-run measure and L the corresponding long-run counterpart. P denotes inflation and g output growth. In the case of uncertainty measures, the coefficient values have been multiplied by 10.

A2 Interest rate decisions: long-run inflation with the repo rate



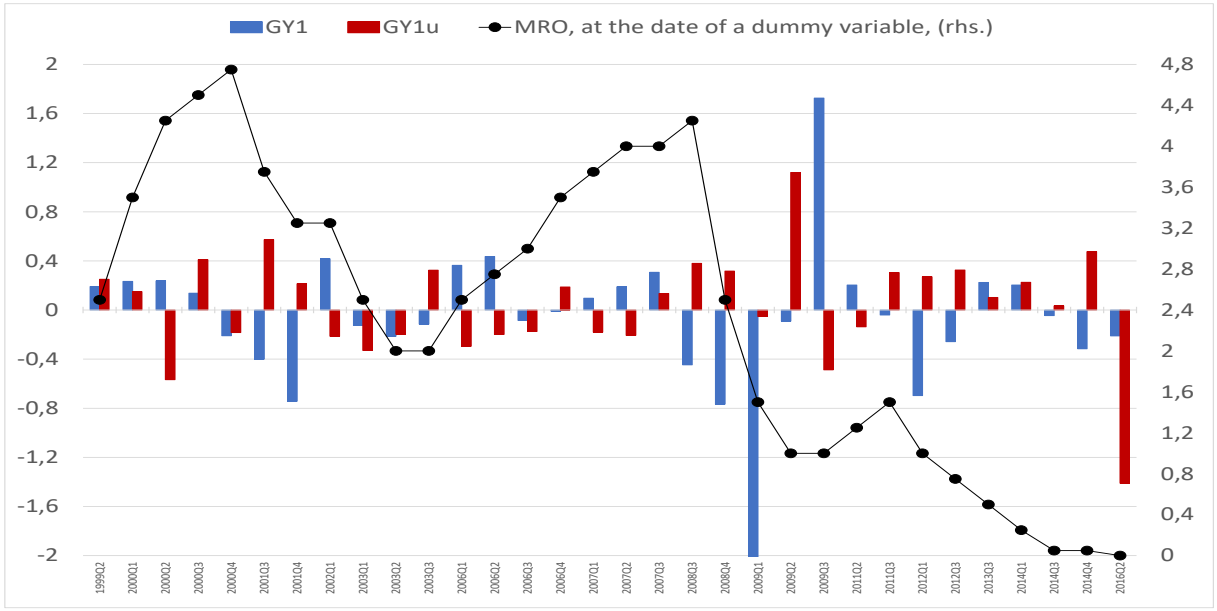
r(PCL,PCLu) = 0.26, r(PCL,GCL) = 0.35* , r(PCLu,GCLu)) =- 0.18

A3 Non-standard MP decisions: inflation; short and long-run



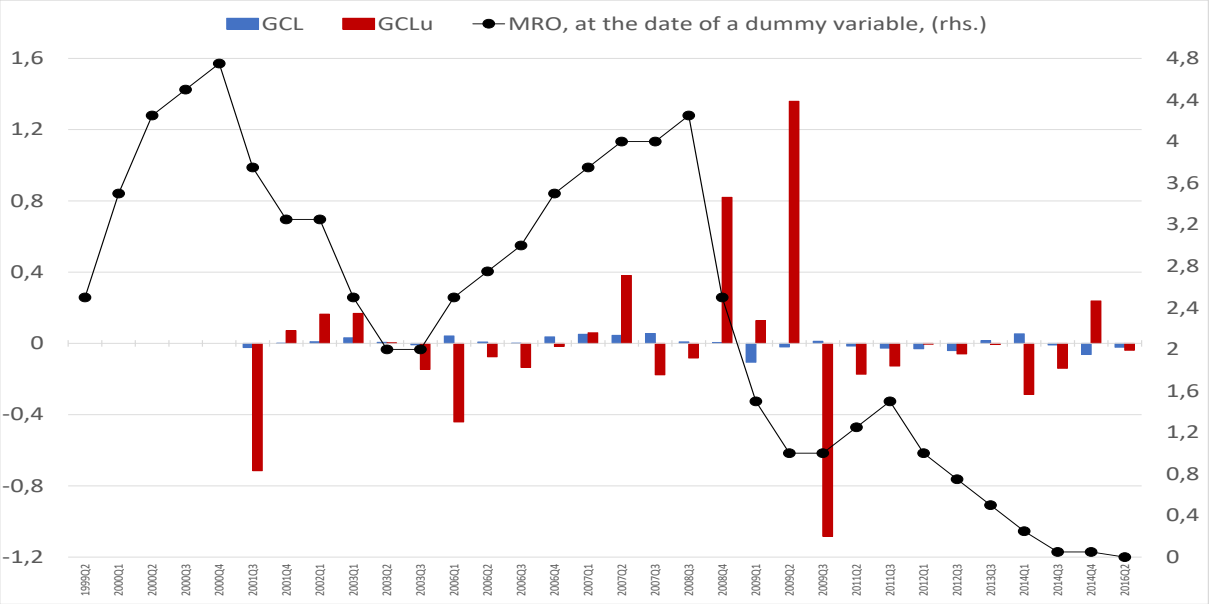
r(PY1,PY1u) = 0.06, r(PY1,PCL) = - 0.22, r(PY1u,PCLu) = 0.31, r(PY1,GY1) = 0.48 , r(PY1u,GY1u)) = -0.16, r(PYL,PCLu) = 0.43, r(PCL,GCL) = 0.14 , r(PCLu,GCLu)) = 0.44. un_X denotes subjective forecast uncertainty in terms of the forecast of variable X (average of individual forecaster's standard deviation assigned to the forecast of X).

A4 Interest rate decisions: short-run output growth with the repo rate



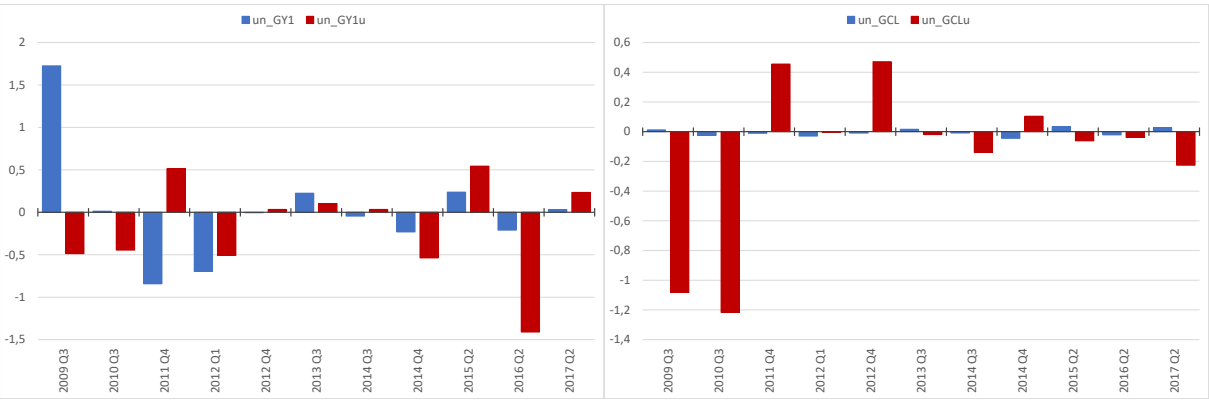
r(GY1,GY1u) = -0.24, r(GY1,GCL) = 0.60*, r(GY1u,GCLu) = 0.37*

A5 Interest rate decisions: long-run output growth with the repo rate



r(GCL,GCLu) = -0.13

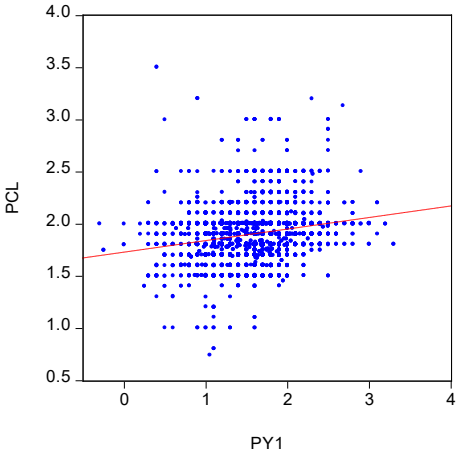
A6 Non-standard MP decisions: short- and long-run output growth



r(r(GY1,GY1u) = -0.08, r(GY1,GcL) = 0.48, r(GY1u,GcLu) = 0.30, GlL,GcLu) = -0.10

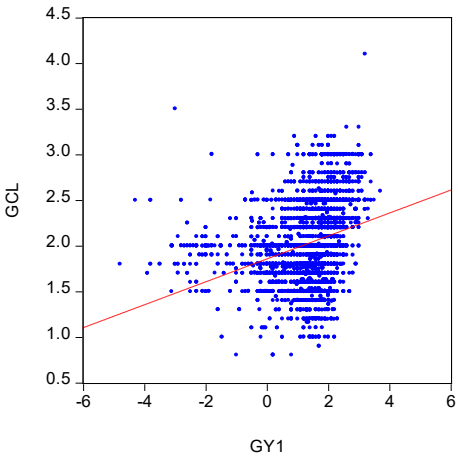
Appendix 3 The relationship between short and long-term expectations

Inflation



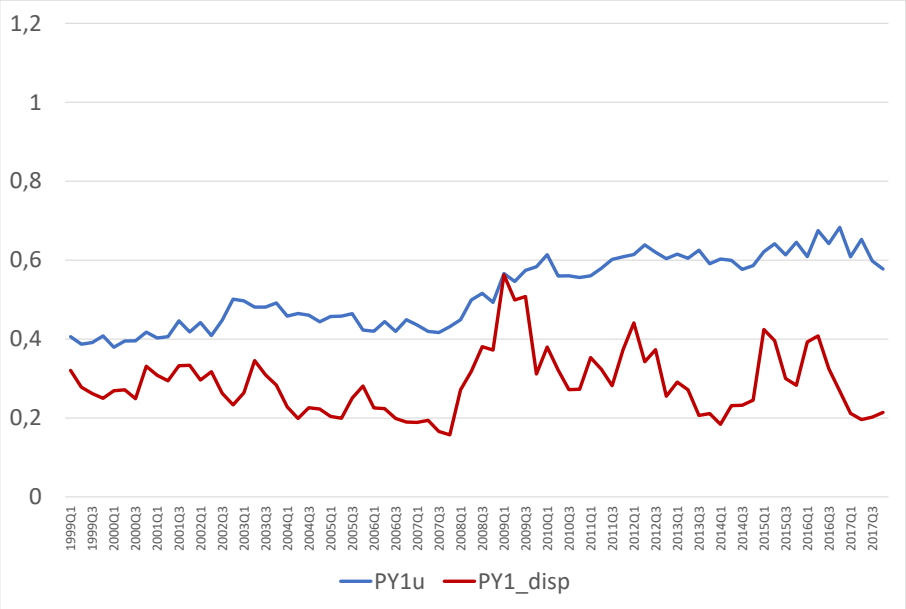
R^2 = 0. 047 (0.000), β = 0.110 (12.04).Y1 denotes “short” and CL “long”.

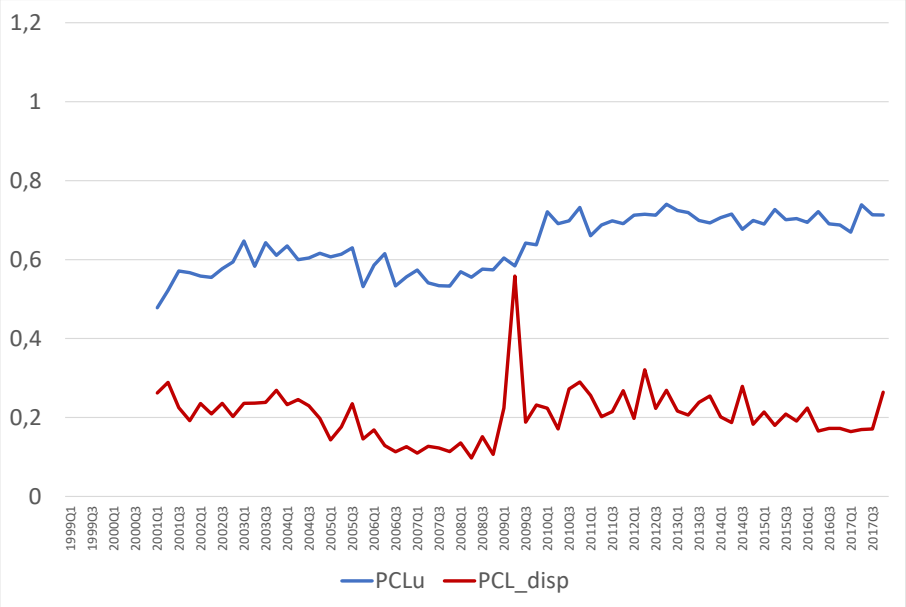
Output growth

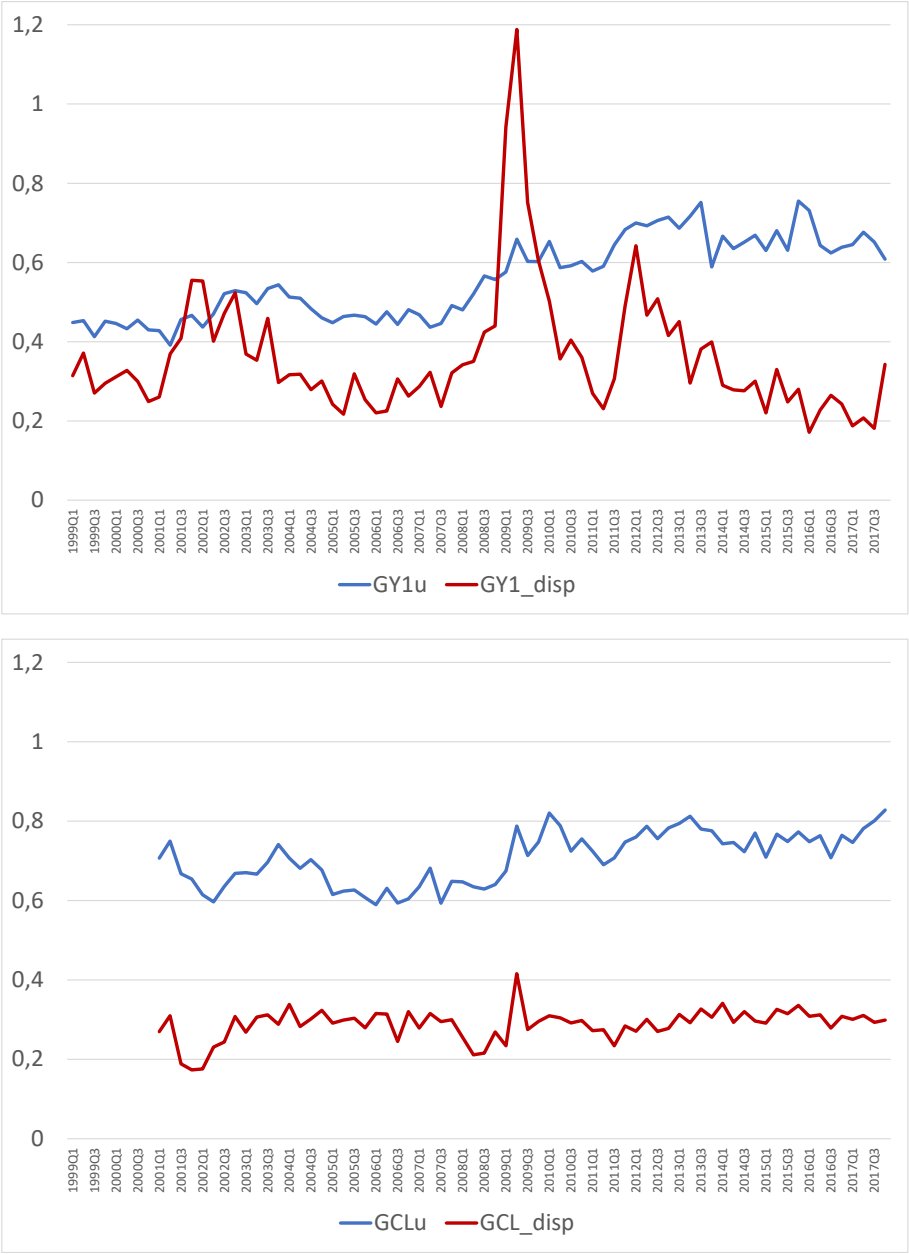


R^2 = 0. 083 (0.000), β = 0.125 (16.04)

Appendix 4 The average of individual subjective forecast uncertainty and the standard deviation of point forecast







Note: Notation is the same as in Appendix 2. PY1 (PCL) denotes short-term (long-term) inflation expectations and GY1 (GCL) corresponding measures for output growth. "u" denotes the average of individual subjective forecast uncertainties and "disp" standard deviation of point forecast.

Bank of Finland Research Discussion Papers 2018

ISSN 1456-6184, online

1/2018 Matthijs Lof – Jos van Bommel
Asymmetric information and the distribution of trading volume
ISBN 978-952-323-206-8, online

2/2018 Marcella Lucchetta – Michele Moretto – Bruno M. Parigi
Systematic risk, bank moral hazard, and bailouts
ISBN 978-952-323-209-9, online

3/2018 Ernesto Pasten – Raphael Schoenle – Michael Weber
Price rigidities and the granular origins of aggregate fluctuations
ISBN 978-952-323-211-2, online

4/2018 Jinill Kim – Francisco Ruge-Murcia
Extreme events and optimal monetary policy
ISBN 978-952-323-212-9, online

5/2018 Seppo Honkapohja – Kaushik Mitra
Price level targeting with evolving credibility
ISBN 978-952-323-213-6, online

6/2018 Guido Ascari – Anna Florio – Alessandro Gobbi
High trend inflation and passive monetary detours
ISBN 978-952-323-218-1, online

7/2018 Gonçalo Faria – Fabio Verona
The equity risk premium and the low frequency of the term spread
ISBN 978-952-323-219-8, online

8/2018 Mikael Juselius – Előd Takáts
The enduring link between demography and inflation
ISBN 978-952-323-220-4, online

9/2018 Jonathan Benchimol – Lahcen Bounader
Optimal monetary policy under bounded rationality
ISBN 978-952-323-222-8, online

10/2018 Mathias Drehmann – Mikael Juselius – Anton Korinek
Going with the flows. New borrowing, debt service and the transmission of credit booms
ISBN 978-952-323-224-2, online

11/2018 Kim Ristolainen
Getting better? The effect of the single supervisory mechanism on banks' loan loss reporting and loan loss reserves
ISBN 978-952-323-231-0, online

12/2018 Juho Anttila
Measuring the effects of conventional and unconventional monetary policy in the euro area
ISBN 978-952-323-232-7, online

13/2018 Esa Jokivuolle – Radu Tunaru – Davide Vioto
Testing the systemic risk differences in banks
ISBN 978-952-323-234-1, online

14/2018 Christiane Baumeister – James D. Hamilton
Inference in structural vector auto regressions when the identifying assumptions are not fully believed: Re-evaluating the role of monetary policy in economic fluctuations
ISBN 978-952-323-235-8, online

15/2018 Janne Tukiainen – Tuomas Takalo – Topi Hulkkonen
Relative age effects in political selection
ISBN 978-952-323-238-9, online

16/2018 Thomas Gehrig – Maria Chiara Iannino
Did the Basel process of capital regulation enhance the resiliency of European Banks?
ISBN 978-952-323-240-2, online

17/2018 Gene Ambrocio – Iftekhar Hasan
Private information and lender discretion across time and institutions
ISBN 978-952-323-241-9, online

18/2018 Manthos D. Delis – Iftekhar Hasan – Steven Ongena
Democratic development and credit "Democracy doesn`t come Cheap" But at least credit to its corporations will be
ISBN 978-952-323-242-6, online

19/2018 Yota Deli – Manthos D. Delis – Iftekhar Hasan – Liuling Liu
Enforcement of banking regulation and the cost of borrowing
ISBN 978-952-323-243-3, online

20/2018 Klaus Kultti – Tuomas Takalo – Oskari Vähämaa
Intermediation in a directed search model
ISBN 978-952-323-244-0, online

21/2018 Nigel McClung
The power of forward guidance and the fiscal theory of the price level
ISBN 978-952-323-246-4, online

22/2018 Adam Gulan
Paradise lost? A brief history of DSGE macroeconomics
ISBN 978-952-323-247-1, online

23/2018 Eleonora Granziera and Tatevik Sekhposyan
Predicting relative forecasting performance: An empirical investigation
ISBN 978-952-323-248-8, online

24/2018 Sami Oinonen–Maritta Paloviita–Matti Viren
Effects of monetary policy decisions on professional forecasters' expectations and expectations uncertainty
ISBN 978-952-323-249-5, online