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**Article**

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# Discussion

of

“Swiss Monetary Policy 2000–2009” by Hans Genberg and Stefan Gerlach

## The Performance of SNB Inflation Forecasts from 2000 to 2009: A Proposal to Evaluate Conditional Inflation Forecasts

MARCEL R. SAVIOZ and MAJA GANARIN<sup>a</sup>

### 1. Introduction

Hans Genberg and Stefan Gerlach (hereafter GG) provide a very nice description of the Swiss National Bank’s operating experience with the New Monetary Policy Framework (hereafter NMPF) for the period 2000 to 2009. Although we agree with most of the results of their paper, we have the feeling that the role of the inflation forecast has not been fully appreciated. This comment will thus focus on GG’s understanding of the role of the inflation forecast in the NMPF and present complementary material on this topic. The main contribution of this comment is a performance evaluation of the SNB’s conditional inflation forecast and the proposition of a method to assess such *conditional* forecasts. In our view, which may differ from GG’s, the forecasting performance of the SNB’s inflation forecasts is quite satisfactory and these forecasts matter for policy decisions.

Our comment is structured as follows: In the second part, we summarise the main contents of GG’s paper<sup>1</sup> and single out the following two results<sup>2</sup> which relate to the inflation forecast: (R3) states that the inflation forecast is not a good statistic of the SNB’s view of the future inflation. (R4) states that the SNB does not react primarily to its published inflation forecast. We then complement GG’s results with two points (R3’) and (R4’) of our own, which shed another

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1 This comment mainly relates to GG’s paper as it was presented at the conference and to newly estimated empirical results which were kindly made available to us by the authors. It was updated in line with the latest revisions to the paper.

2 For ease of exposition, we have chosen to refer to (some of) the authors’ results as (R1)–(R4).

light onto the *forecasting performance* and the *relevance* of the inflation forecast. In the third part, we restate the main characteristics of the inflation forecast and explain why (R3) and (R4) are rather tautological in nature whereas (R3') and (R4') can be substantiated, as is shown in Parts 4 and 5, by evidence. While Part 4 shows that the inflation forecasts are a good indicator of the future danger of inflation and deflation (R3'), Part 5 provides evidence that the information contained in the inflation forecast is relevant for interest rate decisions (R4'). The last part concludes.

## 2. Content of Hans Genberg and Stefan Gerlach's Paper

GG's paper on Swiss Monetary Policy from 2000 to 2009 contains four main sections besides the introduction, conclusion and an analysis of monetary policy during the financial crisis.

Section 2 of GG's paper discusses whether the monetary policy framework of the SNB is identical with "inflation targeting". The authors underline two elements of flexibility built into the NMPF: The definition of price stability as a range (inflation lower than 2%), and the lack of a commitment to bring inflation back into this range within a specific time period.

Section 3 starts with an exposition of the "nature of the inflation forecasts". GG then examine the link between the inflation forecasts and the interest rate decisions by way of a narrative analysis and show that this link is very loose. In establishing this loose relationship, GG compare the *current* inflation forecast for inflation in three years with the *current* interest rate decision, as is evident from this quote: "Three-year-ahead inflation forecasts have frequently been greater than the 2% limit without leading to changes in the policy rate". In this comment, however, we will instead compare the inflation forecast three years ahead with the move in the interest rate occurring over these three upcoming years (see Part 4). Furthermore, GG show that variables other than the *current* inflation forecast explain *current* policy changes. They suggest that this may be especially the case whenever the inflation forecast indicates that price stability is not at risk. In contrast, we will argue in this comment that the information contained in *past* inflation forecasts has explanatory power for the interest rate decision (see Part 5). This holds irrespective of whether predicted inflation is above 2% or not.

The last two sections (Sections 4 and 5) of GG's paper complement and confirm the findings of the narrative analysis with the help of estimated reaction functions of the SNB. GG find, among other things, the following results: (R1) a change in the determinants of the three-month Libor with the introduction of

the NMPF; (R2) the importance of variables other than predicted inflation (e.g. economic activity, realised inflation, exchange rate, euro area interest rates) for the determination of the interest rate; (R3) “[...] the [inflation] forecast is not a good summary statistic of the SNB’s view of the likely future inflation rate”; and (R4) “[...] the SNB does not react primarily to its published inflation forecast [...]”.<sup>3</sup> The first two points can be regarded as uncontroversial. We do, however, object to the interpretation of the two remaining results: Our discontent is not that we disagree with GG but rather that we find that these two results are almost tautological (see Part 3). A slight modification of the way the authors phrase the questions concerning the *performance* of the inflation forecasts and their *relevance* for the interest rate decision results in further insights, namely (R3’) and (R4’). These insights provide, in our view, a more complete understanding of the role of the inflation forecast and the way the NMPF worked over the 2000–2009 period. In order to develop points (R3’) and (R4’) in more detail, one has to work out the characteristics of the inflation forecast.

### 3. The Characteristics of the Inflation Forecast

Three characteristics of the NMPF’s inflation forecast are worth mentioning here. First, because of rather long lags in the transmission of monetary policy impulses, the inflation forecast covers a horizon of three years. As common knowledge goes, monetary impulses take six quarters to be transmitted to the real economy and another six quarters to affect inflation in Switzerland.<sup>4</sup> Second, the inflation forecast is conditional on an unchanged monetary policy (defined as a constant interest rate).<sup>5</sup> The inflation forecast thus shows the *future danger*<sup>6</sup> of inflation or

3 This last quote was also found in the slides of GG’s presentation of the paper at the conference.

4 One explanation for this rather slow transmission of monetary policy to the economy are rents, which are institutionally linked to interest rates in Switzerland. Impulse response functions show that a restrictive monetary policy is followed initially by an *increase* of rents and inflation.

5 For economists an unchanged monetary policy is equivalent to an interest rate path evolving as expected (or according to a rule). For the wider public – and the journalists commenting on monetary policy – an unchanged monetary policy is synonym to an interest rate which does not change with respect to the previous period. Conditioning on a constant interest rate thus considerably facilitates the communication through press releases. It should, however, be noted that the computation of inflation forecasts conditional on an unchanged interest rate path raises non-trivial methodological issues.

6 In press releases, the term “inflation pressure” is used for “inflation danger”.

deflation, which would materialise if monetary policy became – as rooted to the spot by some magic – suddenly inactive and which, ideally, should never materialise if monetary policy remains active. There are two reasons why communicating future *dangers* of inflation or deflation (instead of future inflation) might be advantageous. First, the relationship between inflation dangers and interest rates is evident even in an environment of low and stable inflation. This aspect matters for a central bank facing the task of maintaining price stability rather than to bring inflation nearer to a target. Second, this relationship can be illustrated with a single chart and can thus be included in a press release which facilitates communication.<sup>7</sup> In contrast, the publication of a long-run unconditional inflation forecast would pose the following problem: the unconditional forecast of inflation would have been more or less flat<sup>8</sup> during the last decade. Therefore, it might not be apparent to the public why an increase or decrease of the interest rate is necessary at all; that is, the fact that inflation stays more or less flat only due to changing interest rates might be overlooked. The third characteristic is that the inflation forecast is a communication device. Rather than *justifying* the current monetary policy decision, the forecast attempts to convey information on the future likely development of monetary policy. The forecast published on the day of a monetary policy decision is therefore conditional on the interest rate prevailing *after* the decision (the newly set interest rate). Hence, no contemporaneous relationship between the newly set interest rate and the inflation forecast conditioned on the newly set interest rate is to be expected.

Note that the SNB inflation forecast is not the appropriate tool to justify and motivate the current interest rate decision for two reasons. First, it would have been more adequate to publish the forecast conditional on the interest rate prevailing *before* the decision is taken if justification of the decision would have been

7 Monetary policy decisions are announced with a press release. Note that for (scheduled) monetary policy decisions, the graph of the inflation forecast is included in every press release or the accompanying speech of the Chairman of the Governing Board forwarded to the press. This is important because it is the information in the press release which the press agencies transmit almost in real time to financial markets. To our knowledge, no other central bank publishes a chart of the inflation forecast in the press release, and only a small number of central banks publish their forecasts in tables. The Monetary Policy Report, which is much richer in information on the current state of the economy, is published with a delay after the monetary policy decision. This delay has been shortened from four weeks to one and a half weeks recently.

8 Let us remember that since 1994 headline inflation was – with the exceptions of 2008 Q1 – 2008 Q3 and 2009 – always between zero and two percent. These recent exceptional episodes can mainly be attributed to the evolution of the oil price.

the primary motivation to publish an inflation forecast.<sup>9</sup> But even then, an inflation forecast conditional on the interest rate before the decision is not a good tool to legitimate the monetary policy decision for a rather subtle second reason: Under normal circumstances, the inflation forecast only shows an inflation danger *in a distant future*. What is the reason for this farsightedness? The reason is that, under normal circumstances, the conditional inflation forecast is almost identical to an unconditional inflation forecast for forecast horizons up to one or even one and a half years in the future and therefore conveys no information on short-run inflation dangers and imminent interest rate changes.<sup>10</sup> This, in turn, is due to the fact that for these short-run forecast horizons (i) inflation can hardly be influenced by *current* monetary policy because of the lags in transmission (and thus depends more on the recent interest rate history than on the current interest rate), and (ii) past interest rates should have been set, under normal circumstances, in such a way that inflation in the present and the near future lies within the band defining price stability.<sup>11</sup> Virtue is self enforcing: If monetary policy is already adequate, the use of a conditional forecast leads to farsightedness and draws attention to the long-run danger of inflation (deflation). Let us put things the other way round: An inflation forecast conditional on the interest rate before the monetary policy decision is taken, can only show an imminent inflation danger if the current interest rate is already inadequate. That is, only in this special case in which monetary policy is "behind the curve" should a link between inflation forecasts and a current change in interest rates be detectable.

- 9 Let us illustrate the point with a clear cut example: If a drastic increase in the interest rate, which dampens future inflation massively, is decided, the forecast conditioned on this new interest rate may show an inflation within the range of price stability over the whole forecast horizon. The necessity to increase the interest rate is thus not visible any more in the forecast conditional on the new interest rate. By contrast, the forecast conditional on the interest rate before the drastic increase would have shown an "inflation danger".
- 10 Another way to state the point is to say that the assumption of a constant interest rate is usually realistic in the short run, that is, not far away from the unconditional interest rate forecast, and thus the unconditional and conditional inflation forecasts are very similar for the first half of the forecast horizon. The conditional inflation forecast thus gives no signal of imminent inflation danger in normal circumstances. Under these circumstances, past monetary policy should have been such that the current three-month Libor rate (which would be the interest rate used to condition the forecast) should be roughly equal to the unconditional interest rate forecast in the near future.
- 11 In the case of a supply shock, e.g. an increase in the oil price, the inflation forecast may diverge from price stability in the near future. Since the unconditional and conditional inflation forecasts are then roughly similar in the near future, this shows that the conditional inflation forecast does not give a signal of an "imminent inflation danger". A supply side shock (oil, productivity) can be recognized by the U or inverted U shape of the conditional inflation forecast.

Conversely, in normal circumstances, no strong link between the inflation forecast (be it conditional on the interest rate before or after the decision) and the current interest rate change should be expected.

Figures 1 and 2 illustrate these characteristics of the inflation forecast. Figure 1 shows the inflation forecast published in the press release in 2004 Q3, which announced the decision to raise the interest rate by 25 basis points to 0.75%. The comparison of the new inflation forecast with the old one published in 2004 Q2 shows that the danger of inflation was merely dampened by the interest rate hike: The new inflation forecast still exceeds 2%. Thus, further interest rate hikes are to be expected within the next three years to bring *predicted* inflation within the range of price stability.<sup>12</sup> Figure 2 illustrates, by way of a hypothetical example, that the total number of interest rate hikes which will ultimately be required to restore price stability is indeterminate.<sup>13</sup> If the interest rates are raised early, moderate interest rate hikes, up to say 2.75% will suffice. In contrast, if the hikes are delayed, the interest rate steps required will be more pronounced leading to a substantially higher interest rate of say 7%. The reason is that early (delayed) interest rate hikes have more (less) time to transmit their effects onto inflation. The interest rate time paths shown in Figure 2 all bring predicted inflation within the range of price stability.<sup>14</sup> The ultimate required interest rate level, however, differs depending on whether action is taken early or late. The publication of a conditional inflation forecast allows to communicate the danger of inflation (or deflation) and conveys a sense of the required adjustment of interest rates without the need to be specific on how exactly this adjustment will take place in the future.

12 The inflation forecast (computed in 2004 Q3) conditional on the interest rate prevailing before the decision was taken – 0.50% in the example – is not published. It is therefore impossible to say how monetary policy reacted to the inflation forecast of 2004 Q3. Prolonging the forecast published one quarter earlier in 2004 Q2, inferring so to speak a forecast for the 13 quarter horizon, one may suppose that the inflation forecast conditional on 0.50% may have shown inflation to be higher than 3.5% at the end of the forecast horizon. This supposition, however, rests on the assumption that no fundamentally new information emerged between 2004 Q2 and 2004 Q3.

13 Roth, in his 2007 speech at the University of Fribourg, points out, as mentioned in GG as well, that no unique path for the interest rate is defined if price stability is defined in terms of a band rather than a single value.

14 If the total effect of an interest rate change on inflation (at the end of the forecast horizon) depends on (i) the size of the interest rate step, and (ii) on the duration thereof, then interest rate time paths with equal surface below the curve have equal total effects on inflation at the end of the forecast horizon. This is the case for the three hypothetical interest rate time paths in Figure 2.

Figure 1

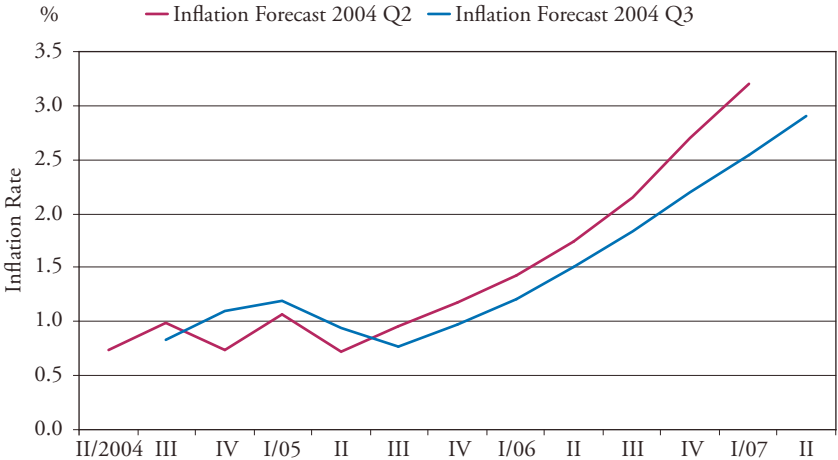
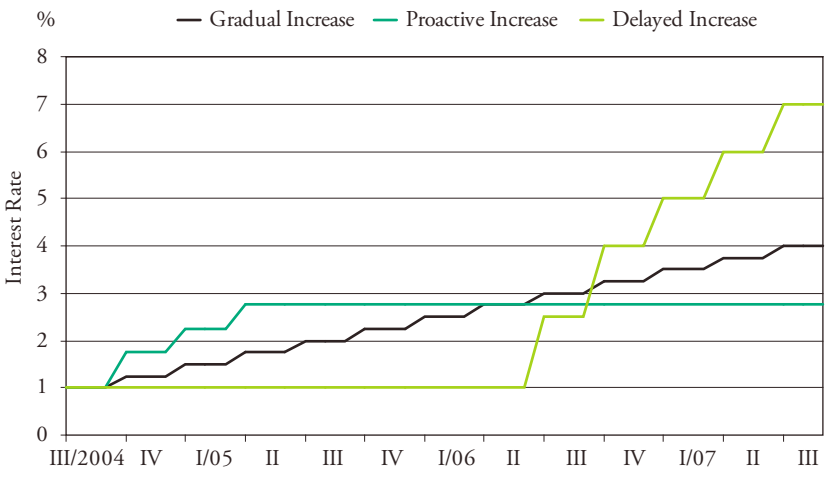


Figure 2





We will now, in the light of these characteristics of the inflation forecast, reconsider results (R3) and (R4) and state our points (R3') and (R4') more precisely. The inflation forecast cannot be a good statistic of the SNB's view of the likely *future inflation rate* almost by definition of a *conditional* forecast (R3). This is true because the inflation forecast is often conditional on an unrealistic interest rate path.<sup>15</sup> We thus agree with (R3); however, we will contend, in the next part, that even if the inflation forecast cannot be expected to be a good predictor of *inflation*, it is a good indicator of *future dangers of inflation* (R3').

A similar caveat applies to the second mentioned result (R4): It is natural that the SNB does not react primarily to its published inflation forecast. This statement is true because the inflation forecast published in the press release announcing a monetary policy decision is conditional on the *new* interest rate. As has been stated before, no contemporaneous link between the inflation forecast and the newly set interest rate should therefore be expected for this first reason. Even if inflation forecasts conditional on the interest rate *before* the monetary policy decision were published, there is no reason to expect the SNB to primarily react to it for the following second reason: The conditional forecast will, under usual circumstances, show inflation (deflation) dangers for a distant future and an infinite number of interest rate time paths are imaginable to react to these dangers (remember Figure 2). Therefore, the only thing it says is that the interest rate must be increased (decreased) at a certain point in time within the forecast horizon. When exactly and by how much is an open question. Thus, this conditional forecast will also imply almost nothing for the current interest rate change. We thus agree with (R4), which states that interest rates are not likely to react to *current* inflation forecasts but will argue that they react to (information contained in) *past* inflation forecasts (R4').

#### 4. Predictive Power of the SNB Inflation Forecast

This part shows that the conditional inflation forecasts are good predictors of future dangers of inflation and deflation. The quality of conditional forecasts is not straightforward to assess. How can we judge whether the inflation forecast is a good statistic of future *dangers* of inflation or deflation? First of all, except for short forecast horizons, it is not fair to simply compare realised inflation

15 The more the interest rate time path on which the conditional inflation forecasts are based deviates from the unconditional interest rate time path, the more unrealistic we judge it to be.

rates with the corresponding inflation forecasts which are conditional on an often unrealistic interest rate.<sup>16</sup> However, if conditional inflation forecasts really signal dangers of inflation or deflation, the SNB is expected to alter interest rates in response to these dangers. Hence, to judge forecast performance, the future realised interest rate time path can be compared with the expected or predicted interest rate time path implied by the inflation forecast. To this end, the predictions concerning inflation or deflation dangers are converted into predictions relating to the future level of interest rates.

The assessment of conditional inflation forecasts involves three steps: In a first step, the inflation (deflation) danger has to be measured. The difference of predicted inflation from price stability may be such a metric. But other measures may come to mind. The steepness of the inflation forecast may indicate whether the inflation danger is imminent or not.<sup>17</sup> Secondly, this "measure of danger" has to be converted into a predicted future move of interest rates. To this end, advantage is taken of the historical regularities between the size of a predicted inflation (deflation) danger and the subsequent realised increases (decreases) in interest rates which were necessary to prevent these dangers from materialising. Third, the predicted increase in interest rates over the forecast horizon has to be compared with the realised increase in interest rates. This enables us to judge the accuracy of the forecasts.<sup>18</sup>

There are two reasons why an evaluation procedure of conditional inflation forecasts is only possible to a limited extent. First, the quality of forecasts spanning a long time horizon, such as three years, is affected by shocks occurring within the forecast horizon. Can a forecaster be expected to anticipate events, such as, e.g., 9/11 or Lehman Brothers' failure, which depressed the inflation outlook after his forecast had already been produced? The second reason is that, as has been made explicit in the preceding part and illustrated in Figure 2, there is no simple relationship between an inflation (deflation) danger and the ultimate level of interest rate required to control it. The validation procedure therefore

16 In Section 3.1, GG note that the SNB's conditional forecast performs less well than the unconditional forecast for the one year ahead horizon (see Figure 4 in GG's paper). When the accuracy of the conditional inflation forecast is measured by comparing predicted conditional inflation with realised inflation this is always unfavorable for conditional forecasts because they are not conditioned on the best prediction for the future interest rate path.

17 The (weighted) sum of the deviations of predicted inflation from the middle of the band defining price stability is a further measure of inflation danger.

18 Note that the validation procedure of conditional forecasts hinges on the methods used (i) to measure the inflation danger signalled by the inflation forecast, and (ii) to convert this measure into a predicted interest rate change.

rests – arbitrarily – on an average interest rate response to an inflation (deflation) danger.

Let us illustrate the three steps with the inflation forecast of September 2004 as an example. First, predicted inflation for the end of the forecast horizon was 2.9% conditional on an unchanged interest rate of 0.75%. The deviation from the band defining price stability, 0.9% to 2.9%, can be used as a measure of the inflation danger. Second, if we were to use an arbitrary rule of thumb, for example that an increase in the interest rate of 25bps is required to reduce inflation at the end of the 12-quarter forecast horizon by 0.25 percentage points, the predicted interest rate hike will also be 0.9% to 2.9% and the level of the interest rate 1.65% to 3.65%. Third, this predicted interest rate increase can be compared to the actual realised move in the interest rates over the forecast horizon. It happened that the interest rate rose from 0.75% in 2004 Q3 (time of the forecast) to 2.5% in 2007 Q2 (end of the forecast horizon). Incidentally, this is almost exactly the middle of the predicted range of 1.65% to 3.65%.

Rather than relying on an arbitrary rule of thumb, past regularities between predicted inflation dangers and the change in the interest rate over the forecast horizon can be exploited. Table 1 illustrates these regularities.<sup>19</sup> The dependent variable of the regression in column 1 is the change of the three-month Libor over the forecast horizon (12 quarters). One explanatory variable is the inflation danger, measured as the difference between the predicted inflation and the middle of the band defining price stability.<sup>20</sup> A second explanatory variable controls for the three-month Libor on which the forecasts are conditioned. Since the coefficient of inflation turned out to be almost zero, we did not introduce it as a further control variable. We would like to emphasise that the adjusted R-Square is high, which shows that the conditional inflation forecasts are a good predictor of interest rate changes.<sup>21</sup>

19 The sample used in the empirical analysis ends in 2008 Q2 (as in GG's paper). Data is on a quarterly basis.

20 Because of this definition of the "inflation danger" it is irrelevant whether we use "inflation danger" or "conditional predicted inflation" as explanatory variable. Only the constant term of the regression is affected by the choice of either explanatory variable.

21 The error terms are auto-correlated because the forecasts are overlapping, and therefore, corrected standard errors have to be used. The coefficients are significant. We suspect that the variables are not stationary and do not attach much significance to the high level of significance of the *t*-statistics. Given the small number of observations, we did not make any attempts to test whether the variables are stationary and whether they contain a cointegrating relation. We rather focus on the predictive power of the equation.

The estimated coefficient of the three-month Libor on which the forecast is conditioned is nearly minus one. Because this variable is almost equal to the three-month Libor at the time the forecast is made, it may cancel out of the equation. Column 2 therefore shows the estimation of a simplified equation. The dependent variable is the level of the three-month Libor (rather than the three-month Libor change over the forecast horizon) at the end of the forecast horizon. Since the three-month Libor drops out as a control variable, the only remaining explanatory variables are a constant and the inflation forecast. The adjusted R-Square of this second equation is high as well, showing that the inflation forecast is a good predictor of the interest rate. Note, however, that both equations predict a somewhat low level of the three-month Libor when predicted inflation lies within the level of price stability. This does not bother us too much because the postulated link between inflation (deflation) dangers and interest rates breaks down in this case.

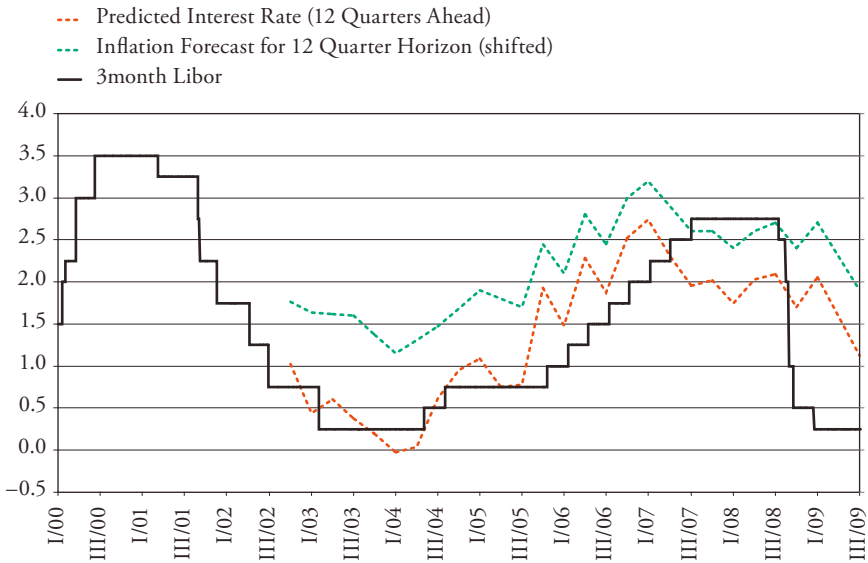
**Table 1: Information Content of Inflation Forecasts**

Dependent Variable	Change in Libor over forecast horizon	3mth Libor
Forecast Horizon in Quarters	12	–
Sample	2002q3–2008q2	2002q3–2008q2
Observations	24	24
Independent Variables		
Constant	–1.06* [–1.98]	–1.62*** [–4.01]
Conditional Libor at Time of Forecast	–1.1*** [–11.19]	
Conditional Inflation Forecast	1.2*** [4.86]	1.39*** [5.94]
Adj. R <sup>2</sup>	0.93	0.72

*Notes:* T-statistics in brackets. \*\*\*/\*\*/\* denote the significance level at 1/ 5/ 10 percent respectively. Newey-West HAC Standard Errors and Covariance.

A figure is better than thousand words. Figure 3 shows the realised three-month Libor (black line) and the predicted inflation shifted forward by 12 quarters (green line). The red line shows the three years ahead predicted interest rate. To calculate this interest rate, the equation of column 1 of Table 1 and the predicted

Figure 3



inflation was used. Given the long time horizon covered by the forecasts, the comovement between the actual value and the predicted value of the interest rate is remarkable. The normalisation of the interest rate starting in 2004 Q2 was predicted three years in advance. A “plateau” in the interest rate in 2007 Q3 was foreseen, although at a somewhat lower level. The sharp decrease in the interest rate at the end of 2008 following the failure of Lehman Brothers was not predicted. Instead a slow decrease of the interest rate was expected. Given the well known difficulties to forecast interest rates over long time horizons these forecasts are quite satisfying. The inflation forecasts gave a quite accurate and forward looking picture of inflation (deflation) dangers and the ensuing reaction of monetary policy to financial markets and the broader public.

The comparison of our Figure 3 with GG’s Figure 5 illustrates our difference in interpretation of the SNB’s inflation forecasts very well. GG compare the interest rate change with the inflation forecast computed at the same time and examine whether the forecasts published at time  $t$  provide a *justification* of the monetary policy decision at time  $t$ . We compare the inflation predicted at time  $t$  for time  $t+k$  with the corresponding *future* interest rates at time  $t+k$  and thus focus on the role of the inflation forecast as a communication device.

## 5. Are the Inflation Forecasts Relevant for Monetary Policy?

This part shows that (information contained in) inflation forecasts are (is) relevant for interest rate decisions. We will contend that present *changes* in the interest rate are related to *past* inflation forecasts. The estimates of the reaction function in GG’s paper show that many variables (inflation, economic activity, exchange rate, etc.) influence interest rate setting. In fact, if price stability is the ultimate goal of monetary policy, any variable influencing inflation should enter the reaction function. If the inflation forecast is not only a signal about future interest rate decision (as examined in Part 4), but also a relevant information basis for decision taking, it should contain information on these determinants of the interest rate change.

The decision making process of the Governing Board is supported with a wealth of information made available to them. The conditional inflation forecast represents only one piece of information from this broad information basis. Nevertheless, the conditional forecast gives long run inflation perspectives, which makes it particularly useful because it structures the discussion leading to the monetary policy decision and allows weighting the importance of the various pieces of information in the rich information set.

We will now provide empirical evidence that the information contained in the inflation forecast matters for policy decisions. The finding that past inflation forecasts incorporate information also contained in the (contemporaneous) determinants of the interest rate decision would lend support to our claim. To this end, we include the inflation forecast for the 12-quarter horizon as well as an inflation forecast steepness indicator<sup>22</sup> as additional explanatory variables in the reaction function estimated by GG in order to show that this decreases the level of significance of some other explanatory variables (inflation, economic activity, exchange rate, and so on). Economic activity, for example, could become less significant

22 We are thankful to Luigi Buttiglione for having pointed out at the conference that market participants do not only consider the inflation value at the end of the forecast horizon, but do also compute steepness indicators of the inflation forecast in order to predict the behaviour of the SNB. The steepness of the curve gives an indication of the “urgency” of required future interest rate moves. For example, if the forecast is flat in the first part of the forecast horizon and steep in the second part, there is less urgency to raise interest rates immediately than if the time path of the forecast would have been the other way round, i.e. steep in the first part and flat in the second part. The steepness indicator allows us to present a stronger empirical evidence in Table 2 than we were able to do at the conference. There, we included the forecast published three years ago and we did lose 11 observations. Here, we introduce the forecast published one and half years ago and lose 5 observations.

if the past inflation forecast is a predictor of this variable. Note that we do not expect inflation forecast variables to be significantly different from zero because this would mean that *past* inflation forecasts contain information not included in the *contemporaneous* determinants of the change in interest rates.

GG make a similar analysis in the new Section 5.7 of the last version of their paper (see their Table 4). There, they take into account that the (unpublished) inflation forecast *before* the monetary policy decision is taken should be included in the reaction functions, whereas the conference version of the paper included the (published) inflation forecast conditional on the interest rate *after* the decision in a similar exercise. Indeed, a comparison of the reaction function without the inflation forecast (column 1 in their Table 2) with the estimates in which the *current* inflation forecast is included (columns 4, 5, 6 in their Table 4) shows some more or less pronounced loss of significance of most explanatory variables. In spite of this improvement, GG do, in our view, still not fully appreciate the role of the inflation forecast, perceiving it mainly as a justification device. As we explained above, even if the inflation forecast conditional on the interest rate *before* the interest rate decision is used, an *immediate mechanical* reaction of the interest rate can only be expected if monetary policy is “behind the curve”. In normal circumstances, the conditional inflation forecast signals inflation dangers lying in a distant future and hence, the current interest rates may but need not react. We will therefore include *past* inflation forecasts in the reaction function to show our point.<sup>23</sup>

Table 2 shows the results of including *past* inflation forecast variables as additional explanatory regressors in GG’s reaction function of the SNB. The first column reproduces GG’s preferred specification.<sup>24</sup> Column 4 is the reaction function with the consumer sentiment, in place of the leading indicator, as economic activity variable. In the conference version of the paper, economic activity was proxied by “consumer sentiment” rather than the “leading indicator” variable. Columns 2 and 5 are estimates of the reaction function with a smaller sample 2001 Q1 – 2008 Q2. The estimated coefficients do not vary much, although the effective nominal exchange rate and the lagged Euro Area interest rate are not significant anymore in the specification with the leading indicator variable.

23 Because GG understand the publication of the inflation forecast as a justification device of the interest rate decisions they are confronted with the econometric problem of inferring the inflation forecast conditional on the interest rate before the monetary policy decision. We are not confronted with the above mentioned econometric problem because we include past conditional inflation forecasts in the equation.

24 Table 3, Column 5 of GG’s paper.

Columns 3 and 6 include information of the forecast published almost one and half years before the interest rate decision is taken.<sup>25</sup> To be precise, the regression includes the 12-quarter ahead inflation forecast published 5 quarters ago as well as the difference between the 12-quarter and 6-quarter inflation forecasts published 5 quarters ago in the reaction function.<sup>26</sup> This involves a loss of four observations. A comparison of columns 2 and 3 (and 5 and 6) leads to three results: First, the economic activity variable loses its significance irrespective of whether it is proxied by the leading indicator or the consumer sentiment. This is entirely due to the inclusion of the inflation forecast variables and is not a consequence of the smaller sample. This means that the information contained in the contemporaneous economic activity variable is already present in the inflation forecast variables produced approximately one and a half years ago. Second, in general, the degree of significance does not decrease for other determinants of the interest rate changes included in GG's reaction function. The inflation forecast is thus not a *summary* statistic<sup>27</sup> of the change in interest rates; some information which is relevant for the interest rate decision is not included in it. It should be noted, however, that there is no reason to expect this summary-property to hold for any conditional forecast used as a communication device and thus neither for the particular forecast published one and a half years ago. Third, the forecast variables are significantly different from zero. This means that they contain information that matters for the interest rate decision which is not included in GG's reaction function. This is quite surprising given that the inflation forecast is one and a half years old and suggests that the specification of GG's reaction function may still be improved.

25 On the one hand, including inflation forecasts of a more recent past is not possible because the conditional inflation forecast becomes indistinguishable from an unconditional inflation forecast and thus does no more contain information on the danger of inflation and on future interest rate changes. On the other hand, including inflation forecasts of a more distant past involves a loss of too many observations.

26 The SNB forecast has a horizon of twelve quarters. The forecast for the first quarter is a nowcast, though.

27 This statement differs from the statement in (R3). There, the summary property is relative to the likely *future* inflation rate. Here, the summary property is relative to the interest rate change.



## 6. Conclusion

The present comment was intended as a complement rather than a criticism of the paper of Hans Genberg and Stefan Gerlach. First, we agree that the conditional inflation forecast is, by definition, not informative about future *inflation*. But we show, by proposing a method to evaluate the performance of conditional inflation forecasts, that the conditional forecast is informative about *inflation (deflation) dangers* and predicts future interest rates. Given the known difficulties of forecasting interest rate movements spanning long forecast horizons, we even think that the information given by the SNB's conditional inflation forecasts about future interest rates is quite remarkable. Second, we agree that the inflation forecast published is not a determinant of the *contemporaneous* interest rate change and hence “[...] the SNB does not react primarily to its published inflation forecast [...]”. Indeed, this is unlikely because the inflation forecast published in the press release is conditional on the *new* interest rate announced and the current conditional inflation forecast does not give a strong signal about current interest rate changes in normal circumstances. But we show that interest rate decisions are related to (information contained in) *past* inflation forecasts. These forecasts, conditional on a past level of interest rates, show inflation (deflation) dangers existing before the monetary policy decisions to offset them were taken. In this sense, it is safe to say that the SNB reacts to inflation and deflation signals contained in the inflation forecasts published in the past.

The publication of a *conditional* inflation forecast, which conveys information on potential inflation or deflation threats and likely future interest rate moves, makes the publication of an interest rate forecast redundant. This is, besides the two elements of the NMPF's flexibility mentioned by the authors, a third element of flexibility because the central bank does not have to be explicit on the future interest rate *time path* and is not committed by its views on it. The authors are right to underline that flexibility may have costs; for example, in terms of expectations which might have been “[...] less well anchored to a low-inflation equilibrium than they otherwise would be”. We showed, however, that the inflation forecast gives very early and quite accurate information on “dangers of inflation and deflation” and on the level of future interest rates. Furthermore, we showed that the SNB reacted in a *systematic way* to these signals of danger emitted in the past. So, there is empirical evidence that the SNB's inflation forecast says what the three-month Libor interest rate will do and that the three-month-Libor interest rate does what the SNB's inflation forecast said. This behaviour seems to have been sufficient to anchor inflation expectations and inflation around 1% for the period between 2000 and 2009 without having unnecessarily sacrificed flexibility.

As a final point, it should be noted that the publication of a *conditional* inflation forecast is well suited for a monetary policy framework designed not only to *restore* but also to *maintain* price stability. It is a definite advantage of a conditional inflation forecast to make monetary policy transparent even when inflation lies permanently in the range of price stability because it conveys information on potential inflation (deflation) dangers rather than on inflation (deflation).

Table 2: Estimated Reaction Functions

Dependent Variable	Change in Libor					
	I	II	III	IV	V	VI
Regressions Sample	2000q1– 2008q2	2001q1– 2008q2	2001q1– 2008q2	2000q1– 2008q2	2001q1– 2008q2	2001q1– 2008q2
Observations	34	30	30	34	30	30
Independent Variables						
Lagged Interest Rate	−0.33*** [−3.45]	−0.24** [−2.42]	−0.28** [−2.52]	−0.60*** [−5.39]	−0.55*** [−3.93]	−0.32** [−2.26]
Leading Indicator	0.06*** [4.22]	0.07*** [4.72]	0.01 [0.54]			
Consumer Sentiment				0.01*** [4.69]	0.01*** [3.85]	0.00 [0.26]
Inflation	0.14*** [3.04]	0.11** [2.13]	0.11** [2.21]	0.15*** [3.43]	0.14** [2.31]	0.10** [2.17]
Effective Nom. Exchange Rate	−0.03*** [−3.75]	−0.02 [−1.55]	−0.05*** [−3.34]	−0.04*** [−4.72]	−0.03** [−2.14]	−0.06*** [−4.03]
Change in Euro Area Interest Rate	0.41*** [3.39]	0.34** [2.68]	0.40*** [3.59]	0.50*** [4.89]	0.49*** [4.09]	0.42*** [4.19]
Lagged Euro Area Interest Rate	0.17* [1.76]	0.12 [1.36]	0.20* [1.79]	0.25** [2.71]	0.23** [2.16]	0.23** [2.14]
Inflation Forecast 12 Quarter Horizon (Lag 5)			−0.34** [−2.23]			−0.35** [−2.12]
Inflation Forecast Difference (12Q – 6Q, Lag 5)			0.37*** [3.04]			0.39*** [3.33]
Adj. R <sup>2</sup>	0.82	0.78	0.83	0.83	0.74	0.83

Notes: T-statistics in brackets. \*\*\*/\*\*/\* denote the significance level at 1/ 5/ 10 percent respectively.