# Talking heads: The effects of ECB statements on the euro-dollar exchange rate

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**Abstract**

This paper studies the reaction of the conditional mean and volatility of the euro-dollar exchange rate to statements of ECB officials during the first years of EMU. We focus on statements on monetary policy and the (potential) strength of the euro. We find that the Bundesbank has dominated the news coverage. We conclude that ECB statements have mainly influenced volatility. In some cases there are effects of statements on the level of the euro-dollar rate. Efforts to talk up the euro have not been successful. There is also evidence of asymmetric reactions to news.

JEL-code: E50, F31
Key words: ECB, euro, foreign exchange, news approach

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# 1 Introduction

Currency markets are continuously flooded with information. In spite of intensive research, the adjustment of exchange rates to this stream of information is still not fully understood. Previous research on the reaction of exchange rates to new information has mainly focused on the effects of (scheduled) announcements of macroeconomic variables. Still, it is likely that the (expected) actions of a central bank also influence exchange rates, especially in the short run. The central bank may change interest rates and has the opportunity to intervene in foreign exchange markets. The use of these instruments may have important effects on the value of the currency. Central bankers may also try to affect exchange rates by their communications. There is, however, hardly any research explicitly analyzing the impact of statements by central bank officials, the studies by Tivegna (2001) and Fatum and Hutchison (2002) being exceptions.

This paper studies the effects of statements made by European Central Bank (ECB) officials on the level and volatility of the euro-dollar exchange rate for the period January 4, 1999 to May 17, 2002. This was a very turbulent period in which the depreciation of the euro was rather problematic for the ECB. Before its introduction the euro was widely expected to be a strong currency. Some even hoped (or feared) that the euro would compete with the dollar in its role as most important international currency (see Eijffinger and de Haan (2000) for a discussion)[1]. As the new currency was an important symbol for the EMU, its decline led some people even to question the overall success of the EMU. Apart from this image problem, the extensive depreciation of the euro was also a serious threat to price stability in the euro area (see de Haan, Eijffinger and Waller (forthcoming)). After some time, the ECB reacted by intervening in the foreign exchange market to support the euro. The success of these interventions is under debate[2]. Apart from interventions, the ECB has been very active to support the euro verbally ('talking up the currency'). As we will see, many ECB officials have publicly expressed the view that the euro was undervalued during the period under consideration.

The purpose of this paper is to investigate how central bankers' statements are related to daily exchange rate changes. We apply the so-called 'news' approach to test for effects of ECB statements. This approach rests on two assumptions (see e.g. de Grauwe, Dewachter and Embrechts (1993)): the exchange

[1] The exchange rate regime may also affect other financial markets. See, for instance, Cheung and Westermann (2001) who report that even though the introduction of the euro did not affect the relationship between German and US equity markets, the volatility of the German stock index has fallen significantly since the introduction of the euro.

[2] Whereas many observers question the effectiveness of interventions, Fatum and Hutchison (2002) claim that the first of the four interventions that they identify had some success. See Sarno and Taylor (2001) for a review of the literature on foreign exchange interventions. A recent study finding support for the effectiveness of interventions is Fatum and Hutchison (2003). See also Frenkel, Pierdzioch and Stadtmann (2001). According to the survey of Cheung and Chinn (2001), traders in currency markets belief that interventions increase volatility. At the same time, they do not consider central bank interventions very successful.

rate should be modeled as an asset price and expectations are formed rationally. These assumptions imply that only unexpected information or 'news' about fundamentals should change the exchange rate as all currently available information is already reflected in current prices. We use an EGARCH specification that allows us to test for effects on the mean as well as on volatility. Even though it has been found that 'news' is rapidly incorporated into exchange rates (see, e.g., Cheung and Chinn (2001) who find that currency traders believe that the bulk of the adjustment takes place even within just one minute after the release of new information), we use daily observations like Fatum and Hutchison (2002) and Galati and Ho (2001). This is justified, as we are mainly interested in the effectiveness of statements of ECB officials. If the effects of 'talking up the currency' can only be observed using higher frequency data, ECB statements cannot be considered a very powerful instrument to influence developments at the foreign exchange market.

We collected statements of various central bankers - including statements of officials of national central banks in the euro area - as reported by the Bloomberg News Service. We find that statements of Bundesbank officials outnumber those of other central bankers. Our results indicate that ECB statements have had a larger impact on volatility than on the level of the exchange rate. Efforts of the ECB to 'talk up' the currency have not been successful. Our results also indicate that there has been an asymmetric reaction to 'news': the market reacts differently to positive and negative 'news'.

The remainder of the paper is structured as follows. Section 2 discusses previous papers that study the relationship between 'news' and the exchange rate. Section 3 discusses our methodology and the data, while section 4 describes the statement data in detail. Section 5 presents the results. Section 6 offers some concluding comments.

# 2 The effect of news on the exchange rate: a selective survey

According to the efficient market hypothesis only unexpected information or 'news' should have an effect on the exchange rate. It is common to test for news effects by estimating a version of equation (1)[3]:

$$R_t = \alpha + \beta_1 X_t^e + \beta_2 X_t^n + \beta_3 Z_t + \epsilon_t \tag{1}$$

where $R_t$ denotes the exchange rate return, defined as first differences in the log of the exchange rate. $X_t^e$ is a matrix with expectations and $X_t^n$ is a matrix with news variables. $Z_t$ is a matrix with control variables[4].

Table 1 summarizes various papers studying the effect of news on exchange rates. We discuss the following: the choice of 'news', the manner in which

[3]The idea that 'news' - that is, innovations in certain variables - causes the bulk of movements in exchange rates has a history going at least as far back as Frenkel (1981).

[4] Rigobon and Sack (2002) and Evans and Lyons (2003) advocate the use of a new approach, based on state dependent heteroscedasticity.

news is measured, the econometric framework and the frequency at which the exchange rate is sampled. The following conclusions can be drawn:

- Most papers focus on scheduled macroeconomic announcements
- News is measured as the difference between realization and expectation or with dummies
- Most research uses either OLS or a GARCH specification
- Researchers have increasingly used high frequency data

The earliest papers in this field use ordinary least squares regressions and generally do not include control variables. Hakkio and Pearce (1985) study short-run responses of spot exchange rates to three categories of economic announcements: money growth, inflation and real activity. They use survey results to proxy the expected part of the announcements. Their exchange rate series has three observations per trading day. These authors find that the exchange rate reacts to unexpected changes in the money stock. Ito and Roley (1987) study reactions of the yen-dollar exchange rate to news from Japan and the U.S. They use intraday data (four observations per trading day). These authors find that the yen-dollar exchange rate was mainly driven by news from the U.S.

Improved data availability enabled researchers to use high frequency data in order to separate the effects of news from the other factors influencing the exchange rate. Another innovation was the use of dummies to quantify news. The papers of Ederington and Lee (1993) and Goodhart, Hall, Henry and Pesaran (1993) combine these two aspects. Ederington and Lee examine the impact of nineteen types of scheduled macroeconomic news announcements on the volatility of the dollar-German mark exchange rate. These authors use dummies that are equal to one when an announcement is made and zero otherwise. They find that the dollar-mark exchange rate is influenced by announcements on merchandise trade, employment, retail sales, the producer prices index and GNP. Goodhart et al. focuses on two particular events: a release of US trade figures and an interest rise in the UK. These authors conclude that these events significantly change the time-series behavior of the exchange rate.

The majority of the papers summarized in Table 1 focus on scheduled macroeconomic announcements. The papers by DeGenarro and Shrieves (1997), Tivegna (2001) and Fatum and Hutchison (2002) are exceptions. DeGenarro and Shrieves estimate the impact of market activity and news on the volatility of the yen-dollar exchange rate. They use quote arrival as a proxy for market activity and the number of news headlines in the Reuters news service as a proxy for news. They distinguish three categories: macroeconomic news, economic policy news and interest rate reports. The last two categories contain unscheduled news. They conclude that both private information and news are important determinants of exchange rate volatility.

Tivegna (2001)estimates a daily exchange rate model for both the German mark-dollar and the yen-dollar exchange rate. He distinguishes between scheduled (mostly quantitative) and non-scheduled (mostly qualitative) news items.

Table 1: Selected papers that test for news effects

| **Authors** | **News** | **How news is measured** | **Estimation** | **Frequency** |
|---|---|---|---|---|
| Hakkio and Pearce (1985) | Macroeconomic announcements | $X_t^n$-$X_t^e$ | OLS | Thrice daily |
| Ito and Roley (1987) | Macroeconomic announcements | $X_t^n$-$X_t^e$ | OLS | Four segments per day |
| Goodhart et al. (1993) | Two specific events | Dummies | OLS and GARCH-M | Continuous |
| Ederington and Lee (1993) | Scheduled macroeconomic announcements | Dummies | OLS | Five minute returns |
| DeGennaro and Shrieves(1997) | Macroeconomic news, economic policy news, interest rate reports | Number of news items | ARMA | Ten minute returns |
| Andersen and Bollerslev (1998) | Scheduled macroeconomic announcements | Dummies | Volatility modeling | Five minute returns |
| Almeida et al. (1998) | Macroeconomic announcements | $X_t^n$-$X_t^e$ | OLS | Five minute returns |
| Galati and Ho (2001) | Macroeconomic announcements | $X_t^n$-$X_t^e$ | ARMA | Daily |
| Tivegna (2001) | Macroeconomic announcements, events, opinions, statements | $X_t^n$-$X_t^e$ and dummies | Multivariate GARCH | Twice daily |
| Fatum and Hutchison (2002) | Statements and rumors on ECB intervention | Dummies | OLS | Daily |
| Andersen et al. (2003) | Macroeconomic announcements | $X_t^n$-$X_t^e$ and dummies | ARMA | Five minute returns |

Tivegna identifies the following five categories in the latter category: market information and opinion, qualitative economic or political events, qualitative descriptions of quantitative events, policy statements by leading politicians, ministers or central bankers and official interventions in the foreign exchange markets. He concludes that statements by policy makers are an important market mover for both exchange rates. The coefficients found for political and market news are, for example, much larger than those for news on US macroeconomic developments.

Andersen and Bollerslev (1998) bring together three important factors that influence the volatility of the German mark-dollar exchange rate. The first category are calendar effects, which can be split into intraday effects, weekly effects, holiday effects and time change effects. The second category are macroeconomic announcements. The final category are interdaily volatility dependencies or ARCH effects (see Hsieh (1988) Hsieh (1989)). One important conclusion is that the announcement effects are of secondary importance in explaining overall volatility. Announcements have significant effects shortly after they were made, but they explain less of the volatility than the other two factors. However, the effect of the announcements is large. Almeida, Goodhart and Payne (1998) support the conclusion of Andersen and Bollerslev. They study the reaction of the German mark-dollar exchange rate to macroeconomic announcements using high frequency data. The announcements refer to U.S. and German data. Almeida et al. conclude that after three hours most of the effect from the announcement has disappeared. The effects are dwarfed by other events at the lower frequencies.

The study by Andersen, Bollerslev, Diebold and Vega (2003) is similar to their above mentioned paper in scope and modeling approach. The focus of this paper is, however, on the mean and not on the volatility of the exchange rate. Andersen et al. characterize the conditional mean of the spot rate of the U.S. dollar against five other currencies. Their model allows news to affect the conditional mean as well as the conditional variance. They find that, in general, news has a statistically significant effect on the exchange rate. The adjustment of the conditional mean in reaction to news is very quick, whereas the adjustment in volatility is more gradual. There is also evidence that the sign of the news matters for the response. Negative surprises have greater impact than positive surprises.

Finally, Galati and Ho (2001) and Fatum and Hutchison (2002)study news effects for the euro-dollar exchange rate. Galati and Ho examine the impact of macroeconomic announcements. They investigate the relationship between scheduled macroeconomic news and the daily change in the euro-dollar rate, focusing on the impact of U.S. and European news announcements during the first 2 years of EMU. These authors conclude that the unexpected parts of macroeconomic news announcements can explain up till 10 of the variation in the euro-dollar rate. There is also evidence that the reaction to news is asymmetric: good news on the euro area has been ignored, while bad news has had an influence.

This result is in line with the argument of de Grauwe (2000) that given the

great uncertainty about equilibrium levels of exchange rates, short-run movements tend to be driven by technical and chartist analysis. Sustained movements in one direction or another then lead to a search for fundamentals that explain these developments (framing). When the exchange rate changes, a search starts for fundamentals that can explain the observed change. In this way, a self-enforcing process can evolve: a declining euro is seen as evidence that there are problems in the economy of the euro area. These problems then reinforce the downward movement of the euro. So in a way, the causality is reversed: it is not the news about fundamentals which drive the exchange rate, but the exchange rate determines the way the fundamentals are perceived.

Fatum and Hutchison (2002) study the effects of ECB intervention and intervention-related news on the euro-dollar exchange rate. These authors use a regression approach to determine which news variables have had effect on the euro and use an event study methodology to assess whether the ECB interventions have been successful. They use four categories of news: rumors of intervention by the ECB, statements by officials in support of the euro, statements by officials not supportive of the euro and reports of actual intervention. Rumors on intervention have a positive effect on the exchange rate and statements not supportive of the euro have a negative effect on the euro rate. Interestingly, there is an asymmetry between positive statements and negative statements: only the negative statements have persistent effects.

# 3 Methodology

## 3.1 Modeling strategy

It is well established that exchange rate series are I(1) processes[5]. Therefore, we take the usual approach to investigate the properties of the first differences in natural logs of the exchange rate series. Since we find evidence of clustered volatility in the euro-dollar series, we started using a GARCH (1,1) model. As results were not satisfying (nonnegativity constraints in the variance equation were violated) we use the EGARCH model proposed by Nelson (1991). Our model looks as follows:

$$R_t = \beta_0 + \sum_{i=1}^{n} + \beta_i R_{t-1} + \sum_{k=1}^{K} \sum_{i=-1}^{j} \beta_{ki} X^s_{k,t-1} + \beta_w D_w + \epsilon_t, \epsilon_t, N \sim (0, h_t) \quad (2)$$

$$ln\, h_t = \delta_0 + \delta_1 h_{t-1} + \delta_2 |\frac{\epsilon_{t-1}}{h_{t-1}}| + \delta_3 \frac{\epsilon_{t-1}}{h_{t-1}} + \sum_{k=1}^{K} \sum_{i=-1}^{j} \delta_{ki} X^s_{t-i} + \delta_w D_w \quad (3)$$

where $R_t$ represents the daily change in the natural logarithm of the exchange rate. Equation (2) has n autoregressive terms and dummies for weekdays, denoted as the matrix $D_w$, as control variables[6]. The error term has a zero mean

[5] Unit root tests for the sample period (available on request) confirm this hypothesis.

[6] We also estimated this model using interest differentials as additional control variables. This did not change our basic results significantly. Results are available on request.

and a conditional variance $h_t$. The weekday dummies also enter the variance equation (see Hsieh (1988) Hsieh (1989)). The matrix $X^s$ contains the dummies that represent the ECB statements. These dummies enter the mean as well as the variance equation. Starting with this general approach, we then proceed to eliminate irrelevant variables. This means dropping nonsignificant variables in order to reach a parsimonious model. We use the Akaike information criterion to determine the appropriate number of lags.

## 3.2 Organizing the statements to construct quantitative variables

We will now discuss the construction of the variables in $X^s$. This paper studies the effects of unexpected statements that are qualitative in nature. The literature suggests that dummy variables should be used in this case to measure news. The earlier papers used binary dummies for this purpose. These dummies can be used to test for effects whenever someone makes a statement. However, as Tivegna (2001) argues, this could incorrectly lead to nonsignificant results as the effects of statements with a positive and negative content may cancel out. Therefore, he uses ternary variables that record whether a statement has an expected positive, neutral or negative effect on the exchange rate. Galati and Ho (2001) follow a similar approach.

Our approach is to start with simple (0,1) occurrence dummies and then use dummies that control for the content of a statement. We do not completely follow the method suggested by Tivegna (2001), however. Firstly, the interpretation of the coefficients is not straightforward. Therefore, we prefer to construct three dummies for each category of statements. An additional benefit is that we can study whether there have been asymmetric reactions to 'news'. Secondly, assigning positive, neutral or negative values to statements on macro-economic variables is rather problematic. The statements are qualitative in nature and therefore difficult to interpret. Moreover, given the failure of empirical exchange rate models (cf. Meese and Rogoff (1983)), we lack a fundamental theory on how to categorise statements into positive, neutral and negative. We therefore start with a more neutral approach and record -where possible- whether the ECB official states that a macroeconomic variable, for example inflation, will go up, down or remain the same. In doing this, we are not limited to make controversial prior assumptions on the effects of statements. Fortunately, in some cases we are able to specify our priors as to the effect of the statement.

We record the following basic characteristics of each statement: the day on which the statement was made, the person who made the statement and the content of the statement. We identify eight different categories that we expect to be relevant for the exchange rate (see Table 2). There are two main categories: monetary policy and the euro. There are five subcategories in the monetary policy category. First of all, there are statements on interest rates in the euro area. The remaining subcategories relate to the two pillar strategy of the ECB. Firstly, there are statements on money growth in the euro area (first pillar). Secondly, there are statements on economic growth, inflation and the effects of

the euro on inflation (second pillar).

For statements in the first category, we record whether according to the statement a variable, say inflation, will go up, or down, or will remain stable. It seems difficult to judge a priori what the effect of a statement will be. Nevertheless, economic theory suggests a few possible outcomes. Suppose that an ECB official indicates a bias towards higher rates. What may happen then? There are three possibilities (see also Harris and Zabka (1995) for a good discussion): the statement may have an effect either through an investor channel, an inflation channel and a growth channel. For the first channel we would expect a positive relationship between rates and the exchange rate: higher rates makes buying European securities more attractive which will induce demand for euros. The second channel works through prices. If purchasing power parity is a good description of reality, higher rates will coincide with a fall in the euro. The last channel also predicts a negative relationship between rates and growth: higher interest rates hamper investments and thus hamper growth. Finally, note that we can generalize from this example on rates to the other four variables from the monetary policy category. Higher money growth may e.g. lead to higher rates etc.

Table 2: Categories of ECB Statements

| **Category:** | **Contains statements on:** |
|---|---|
| *(1) Monetary policy* | |
| Interest rates | ECB interest rates |
| M3 | Growth of money supply |
| Economic growth | Real GDP growth in the euro area |
| Inflation | Inflation in the euro area |
| Pass-through | How the euro exchange rate will effect inflation |
| *(2) The euro* | |
| Future value of euro | Expectations on the external value of the euro |
| No target versus inflation | The euro in the monetary policy strategy |
| Intervention | The possibility of intervention |

The second main category that we distinguish are statements on the euro. The first subcategory under this heading contains statements expressing beliefs on the future direction of the exchange rate. In section 4 we will show that most of the time under consideration the ECB expressed the view that the euro had potential to appreciate. The second subcategory contains statements trying to explain the position of the euro in the ECB monetary policy strategy. There have been many of these statements in the sample period as the ECB has intensively communicated about its monetary policy strategy in recent years[7]. Time

[7]Whether the ECB has been very successful in becoming transparent is another matter. See De Haan et al. (2003) for a detailed analysis of the transparency of the ECB.

and again, central bankers stressed that the external value of the euro was not an objective for monetary policy. Nevertheless, the extensive depreciation of the euro forced them to take the euro-dollar rate into account when making monetary policy decisions. This 'no target/inflation' problem may have led to confusion in currency markets. We characterize statements that stress the no target part as negative. We see statements that stress the possible effect on inflation as positive. Finally, there are statements on the possibility of intervention. During the period under consideration, there has been a lot of speculation on possible intervention. In a similar vein as Fatum and Hutchison (2003), we test how markets have reacted to this news. Statements that increase the possibility of intervention are expected to have a positive effect on the exchange rate, statements that deny possible intervention may have negative effects.

In order to see whether effects differ between (groups of) ECB officials, we construct dummies that for each day record whether or not a certain official made a statement on that day. In addition, we tried to construct variables that combine the results from these person dummies with those from the content of the statements. However, combining these two perspectives results in variables with very low variation and few datapoints (i.e. a lot of zeros out of a possible 880). Although this route is certainly very interesting, our dataset is not rich enough to explore it further.

Finally, note that there is a difference in the number of observations between the statements series and the exchange rate series. There is only one data point per day for the exchange rate series. However, there can be more than one statement per day. In addition, statements can be made during the weekend when trading activity is generally low. To synchronize the series, we add the statements made during the weekend to the scores for Monday. We also added up the different scores if we found more than one observations per trading day.

### 3.3 Data sources

The sample period ranges from January 4, 1999 until May 17, 2002. This amounts to a total of 881 trading days. The data set with ECB statements was collected from the Bloomberg News Service[8]. This was done by scanning the headlines for keywords like ECB or names of ECB officials. We selected some 930 news reports in which ECB statements are reported. The criterion for including a statement is that it has to refer to the entire euro area. Statements on developments in individual countries were not included. We focus on unexpected statements, because we expect to find the greatest effects in these cases. For this reason, the monthly press conferences are not included in our data set. The exchange rate and interest series are taken from Datastream. The exchange rates are New York noon spot rates (dollars per euro). This means that the cut off point for a trading day is 18.00 CET[9]. The interest rates we use are one-month inter-bank rates.

[8]We thank Het Financieele Dagblad for giving us the opportunity to use Bloomberg

[9]Except during two weeks per year when U.S. and European D.S.T. are not synchronized. The cut off point then is 19.00 C.E.T.

# 4 Description of the statement dummies

## 4.1 Central bankers

Table 3 displays the statements dummies for three groups of central bankers and some selected individuals. National central bank presidents made statements on 336 trading days compared to a figure of 256 for the Executive Board of the ECB. We find 82 statements for Bundesbank officials (excluding the president of the German central bank). For no other European central bank do we find such a large amount of statements by its officials.

Table 3: Statement dummies for central bankers

| | **Total number of statements** |
|---|---|
| *Groups* | |
| Executive Board | 256 |
| National Central Bank Presidents | 336 |
| Bundesbank officials(excluding president) | 82 |
| Total | 674 |
| | |
| *Individuals* | |
| Duisenberg | 92 |
| Bundesbank President | 179 |
| $Tietmeyer^a$ | 24 |
| $Welteke^b$ | 155 |
| Trichet | 95 |

*Note:* The numbers in this table show the number of trading days on which statements were made

a)04-01-1999 until 31-08-1999

b)01-09-1999 until 17-05-2002

Table 3 also shows that the Bundesbank president has made more comments that any other ECB official. We find statements by either Tietmeyer or Welteke for 179 trading days, compared to 92 for Duisenberg and 95 for Trichet. Together with the 82 statements of other Bundesbank officials, in terms of total number of statements the German central bank ranks even higher than the Executive Board of the ECB. There are two possible explanations for this. First, financial markets may still attach greater importance to the Bundesbank than to the ECB. The ECB is a new institution that has not yet established a firm reputation. The German central bank in contrast, is a venerable institution that has proven its capability in monetary policy-making over the years. Financial market do not yet know how to judge the new situation and still attach great importance to Bundesbank statements for this reason. However, this explanation assumes that Bloomberg selects news in such a way, that the statements of Bundesbank officials receive most attention. This seems rather unlikely. Since it

is Bloomberg's business to bring as much news as possible, we can safely assume that a bias in the news coverage does not exist.

Alternatively, it may be argued that the Bundesbank has not yet learnt to cope with its new role within the European System of Central Banks. For years, the Bundesbank has dominated monetary policy in Europe. All this has changed, however, and the Bundesbank had to step back in favor of the ECB. The fact that Bundesbank officials communicated so intensively to financial markets may reflect their difficulty in accepting this new situation.

## 4.2 Content of statements

Table 4 presents our data referring to the content of the ECB statements. The numbers in the table show the number of trading days on which statements of a particular category were made. For example, there were neutral statements on interest rates on 173 out of the 881 trading days. There were indications of higher rates on 36 trading days and indications of lower rates on 12 trading days.

Table 4: The content of the ECB statements

| | **Up** | **Neutral** | **Down** | **Total** |
|---|---|---|---|---|
| *Monetary policy* | | | | |
| Interest rates | 36 | 173 | 12 | 221 |
| M3 | 27 | 27 | 29 | 83 |
| Economic growth | 194 | 25 | 35 | 254 |
| Inflation | 79 | 111 | 90 | 280 |
| Pass-through | 51 | 39 | 10 | 100 |
| | **Positive** | **Neutral** | **Negative** | **Total** |
| *The euro* | | | | |
| Future value of euro | 172 | 6 | 2 | 180 |
| No target versus inflation | 112 | 24 | 42 | 178 |
| Intervention | 17 | 22 | 18 | 57 |

*Note:*The numbers in this table show the number of trading days on which particular statements were made. Totals for tables 3 and 4 do not add up, because a news item may refer to more than one category.

It follows from Table 4 that the number of statements on money growth is relatively small compared to those on the second pillar of the monetary policy strategy. The statements on growth are generally positive (i.e., indicating that the outlook for growth is good), whereas the statements on inflation are more balanced. One reason could be, that statements on inflation may sooner lead to speculation on interest rate changes. This may cause ECB officials to be more careful when talking about inflation. Finally, there are statements on the pass-through of the depreciation of the euro into higher inflation on 100 trading days. Most of these statements (51) indicate higher risks for inflation.

There are many statements referring to the second main category. Of special interest is the sub-category 'future value of the euro'. ECB officials made positive statements on the euro on 172 trading days. Only 2 statements were negative and 6 were neutral, reflecting the efforts of the ECB to 'talk up the euro'. The sub-category 'no target versus inflation' contains 178 statements. This large number of statements indicates that the ECB has made great efforts to explain the role of the euro in its monetary policy strategy. It is somewhat surprising that the majority of statements are positive. This may have led markets to believe there was some sort of target for the euro-dollar exchange rate. Finally, we recorded statements on (possible) intervention for 57 trading days. Of these statements 17 raised the probability of intervention, 22 were neutral and 18 lowered the probability of intervention by the ECB.

# 5 Results

## 5.1 Statements of central bankers

The best E-Garch specification we found for the euro-dollar series is reported in the first column of table 5. The weekday dummies in the mean equation were robustly nonsignificant, so they are not included in the remainder of the analysis. We also found that adding more than one autoregressive term in the mean equation was not necessary (on basis of the Akaike information criterion). In the variance equation we present results for an EGARCH(1,1) model. Adding more EGARCH terms did not add much to the model, so they also are not included. A robust result is the lower conditional variance on the Monday. The dummy for Friday is also significant, but the coefficient displays more variation between different specifications[10]. Next, we added dummies reflecting whether there was a statement by any ECB official or not. The second column of Table 5 presents the regression results. We do not find any significant effect of these statements for the mean of the exchange rate. However, there is a significant increase in volatility after the day the statement was made. Volatility is approximately 27% higher in these cases. Interestingly, this coincides with the findings of Cheung and Chinn (2000) for central bank interventions: currency traders believe that interventions mainly affect the volatility of exchange rates.

Do these conclusions hold for different groups of ECB officials as well? Our results indicate that for Executive Board members there is also evidence for an increase in volatility (column 3 of Table 5). The coefficient of the lagged value of the statement dummy is 0.21, indicating, once again, an increase in volatility of 27%. Statements by Bundesbank officials (excluding the president) have no effect on volatility, but there are temporary and off-setting effects on the mean (column 4 of Table 5). There is an appreciation of 0.17% on the trading day itself and a subsequent depreciation of 0.12% on the day thereafter. According to a Wald test, the total effect is not significantly different from zero.

[10] Given the exponential specification a coefficient in the variance equation that is smaller (larger) than zero indicates lower (higher) variance.

Table 5: Results for groups of ECB officials

| | (1) Benchmark (no dummies) | (2) All | (3) Executive Board | (4) Bundesbank officials (excl. President) |
|---|---|---|---|---|
| *Mean equation* | | | | |
| Constant | -0.00 | -0.00 | -0.00 | -0.00 |
| AR(1) | 0.03 | 0.03 | 0.03 | 0.04 |
| Statement dummies | - | - | - | 0.0016*** |
| Statement dummies (1st lag) | - | - | - | -0.0012* |
| *Variance equation* | | | | |
| Constant | -10.45*** | -8.47*** | -9.67*** | -10.15*** |
| Statement dummies | - | - | - | - |
| Statement dummies (1st lag) | - | 0.21* | 0.21* | - |
| $\delta_1$ | -0.05 | 0.16 | 0.01 | -0.04 |
| $\delta_2$ | -0.18* | -0.14 | -0.17* | -0.19* |
| $\delta_3$ | 0.01 | 0.01 | 0.01 | 0.00 |
| Monday | -0.50*** | -0.62*** | -0.56*** | -0.53*** |
| Friday | 0.27* | - | -0.27* | -0.27* |
| Adjusted $R^2$ | -0.01 | -0.01 | -0.01 | -0.00 |
| DW | 1.98 | 1.98 | 1.98 | 1.98 |

*Note:* This table shows EGARCH models for the euro-dollar exchange rate (equations 3 and 4 in the main text). In column (1) no statement dummies are included. In column (2) all statements by ECB officials are taken up. In column (3) only statements by members of the Executive Board are included, while in column (4) statements by officials of the German central bank (excl. the president of the Bundesbank) are shown. In all cases, only significant coefficients are shown. Bollerslev-Woolridge robust standard errors and covariance are used. */**/*** denotes significance at the 10/5/1 % level, respectively.

Table 6: Results for Duisenberg, Bundesbank President and Trichet

| | |
|---|---|
| *Mean equation* | |
| Constant | -0.00 |
| AR(1) | 0.03 |
| Duisenberg | -0.0012** |
| Bundesbank president | -0.0013** |
| Trichet | 0.0015** |
| *Variance equation* | |
| Constant | -8.39*** |
| $\delta_1$ | 0.15 |
| $\delta_2$ | -0.14 |
| $\delta_3$ | 0.01 |
| Monday | -0.69*** |
| Adjusted $R^2$ | 0.00 |
| DW | 1.98 |

*Note:* This table shows EGARCH models for the euro-dollar exchange rate (equations 3 and 4 in the main text). Only significant coefficients are shown. Bollerslev-Woolridge robust standard errors and covariance are used. */**/*** denotes significance at the 10/5/1 % level, respectively.

Next, we added occurrence dummies for all 18 members of the ECB Governing Council. Initially, we used all dummies in the estimation. We then proceeded to eliminate non-significant dummies. Not entirely unexpected, statements by Duisenberg, the Bundesbank president, and Trichet turn out to be of importance. Table 6 shows the results. After eliminating non-significant variables and using the AIC to determine the appropriate number of lags, we find the best specification only has statement dummies in the mean equation. Statements by Duisenberg and the Bundesbank president coincide with a depreciation of the euro. In contrast, statements by Trichet coincide with an appreciation.

## 5.2 Looking at content

We now turn to the content of the statements. As a first approach, we use occurrence dummies to test for effects of statements, independent of whether the statement was positive, neutral or negative. We analyze two cases. In the first regression we include dummies for statements on interest rates and the euro category (statements on the future direction of the exchange rate, statements trying to explain the position of the euro in the ECB monetary policy strategy, and statements on possible interventions; see bottom half of Table 2). In the second regression we have replaced the dummy for statements on interest rates by dummies for statements on the first and second pillar of the monetary policy strategy of the ECB (statements on money growth, inflation, and the pass-through of the euro depreciation in inflation). We present two regressions because of a possible simultaneity problem: statements on variables

like inflation and growth may influence the exchange rate as well as trigger statements on rates. By estimating two equations, we try to separate these effects. The results are reported in Table 7.

In the first regression, the dummy for statements on possible intervention is the only variable that is of importance in the mean equation (column 1 of Table 7). Interestingly, statements on possible intervention initially cause a depreciation of the euro. The next day, the exchange rate appreciates with the same amount. A Wald test confirms that the total effect over the two day period is not significantly different from zero. The coefficient of the dummy reflecting statements on the future potential of the euro is not significant in the mean equation. This leads us to conclude that the ECB has not been successful in 'talking up' the euro. However, statements on the future value of the euro have a significant effect in the variance equation. Volatility is 30% lower on the day that statements on the euro are made. However, the day after the statement was made volatility increases with 80%.

The results for our second regression are comparable to those of the first. The difference is that for intervention we now only find effects for the lagged value of the intervention dummy. This also means that over the two day period, the effect is significantly different from zero. This result is in line with the findings of Fatum and Hutchison (2002) on interventions. However, these authors have a dummy reflecting the presence of rumors on interventions, while our dummy refers to statements of ECB officials on interventions, which may not be the same. In addition, we find a small effect of statements on inflation (appreciation of 0.07%) and statements on pass-through of changes in the euro-dollar rate into inflation (depreciation of 0.21%). The coefficient of the dummy for statements on the future potential of the euro is significant in the variance equation. There is also evidence that statements on the trade-off between the euro as a target and inflation have led to lower volatility.

Finally, we have used dummies that control for the message contained in a statement. This allows us to make distinction between positive, neutral and negative statements. As before, we use two regressions. The results are shown in Table 8. The first column shows that there are effects from statements on interest rates and on the euro as a target versus inflation on the level of the exchange rate. Statements that indicate a rate rise are followed by a depreciation of 0.36% the next day. This negative reaction may be explained by the negative effect of an interest rate rise on economic growth. The results from the target versus inflation category are interesting. Statements we classify as neutral coincide with a small depreciation (0.16%). This may indicate that these types of statements have led to negative sentiments on currency markets. Negative statements in this category (stressing that the euro is not a target) coincide with an appreciation (0.13%).

In the variance equation we find that volatility was lower on days during which positive statements on the euro were made. However, the next day volatility was almost 70% higher. Both neutral and negative statements on the role of the euro in the ECB monetary policy strategy coincide with lower volatility. Statements raising the possibility of intervention lead to higher volatility

Table 7: Results using dummies for contents of statements

| | (1) | (2) |
|---|---|---|
| *Mean equation* | | |
| Constant | -0.00 | -0.00 |
| AR(1) | 0.02 | 0.03 |
| Inflation | - | 0.0007* |
| Pass-through | - | -0.0021*** |
| Intervention | -0.0016* | - |
| Intervention(1st lag) | 0.0016* | 0.0020* |
| *Variance equation* | | |
| Constant | -5.83*** | -6.89*** |
| Pass-through | - | 0.55*** |
| Future euro | -0.32** | -0.33** |
| Future euro (1st lag) | 0.52*** | 0.49*** |
| No target versus inflation | - | -0.28** |
| $\delta_1$ | 0.41** | 0.29* |
| $\delta_2$ | -0.13 | -0.17** |
| $\delta_3$ | 0.03 | 0.01 |
| Monday | -0.65*** | -0.57*** |
| Friday | - | -0.25* |
| Adjusted $R^2$ | -0.01 | -0.01 |
| DW | 1.98 | 1.98 |

*Note:* This table shows EGARCH models for the euro-dollar exchange rate (equations 3 and 4 in the main text). Column (1) reports the results for the specification with dummies for statements on interest rates and dummies for statements on the future direction of the exchange rate, statements trying to explain the position of the euro in the ECB monetary policy strategy, and statements on possible interventions. Column (2) reports the results if the dummy for statements on interest rates is replaced by dummies for statements on the two-pillar strategy of the euro (money growth, inflation, growth and pass-through of euro depreciation in inflation). Only significant coefficients are shown. Bollerslev-Woolridge robust standard errors and covariance are used. */**/*** denotes significance at the 10/5/1 % level, respectively.

during the day, as may be expected, while the next day volatility is lower. Neutral statements on intervention coincide with lower volatility, but the next day volatility shows a large increase.

In the second regression we find significant coefficients in the mean equation for M3 growth, inflation, pass-through and intervention. Higher money growth seems to have a negative effect on the exchange rate as it depreciates with 0.28%. Lower inflation produces positive effects: the euro appreciates by 0.14%. Neutral statements on pass-through coincide with a depreciation of 0.18%. Finally, merely talking about intervention can lead to results: the exchange rates appreciates with 0.25% after the day positive statements on intervention were made.

All variables from the monetary policy main category enter the variance equation. Statements on higher money growth and neutral statements on growth initially lead to lower volatility, whereas statements on inflation and pass-through initially lead to higher volatility. In the cases of growth and pass-through there is a contrary effect on the next day. The results for statements belonging to the euro category are similar to those from the first regression. One difference is that positive statements on intervention no longer lead to changes in volatility.

So overall, we find that an asymmetric reaction to 'news': the market reacts differently to positive and negative 'news'. This is in line with the findings by Galati and Ho (2001), Fatum and Hutchison (2002), and Andersen et al. (2003).

Table 8: Taking the message in the statements into account

| | (1) | (2) |
|---|---|---|
| *Mean equation* | | |
| Constant | -0.00 | -0.00** |
| AR(1) | 0.02 | 0.02 |
| Rates up (1st lag) | -0.0036*** | - |
| M3 up (1st lag) | - | -0.0028*** |
| Inflation down | - | 0.0014** |
| Pass-through neutral | - | -0.0018*** |
| No target versus inflation neutral | -0.0016** | - |
| No target versus inflation negative (1st lag) | 0.0013* | - |
| Intervention positive (1st lag) | - | 0.0025* |
| *Variance equation* | | |
| Constant | -4.64*** | -4.54*** |
| M3 up | - | -0.91*** |
| Growth neutral | - | -0.86*** |
| Growth neutral (1st lag) | - | 1.09*** |
| Inflation up | - | 0.47*** |
| Pass-through up | - | 0.65** |
| Pass-through up (1st lag) | - | -0.54** |
| Euro up | -0.37** | -0.41*** |
| Euro up (1st lag) | 0.46*** | 0.51*** |
| No target vs inflation neutral | -0.63*** | -0.86*** |
| No target vs inflation neutral (1st lag) | - | 0.63** |
| No target vs inflation negative | -0.52*** | - |
| Intervention positive | 0.75** | - |
| Intervention positive (1st lag) | -0.73* | - |
| Intervention neutral | -0.56** | -0.81*** |
| Intervention neutral (1st lag) | 1.13*** | 1.22*** |
| $\delta_1$ | 0.52*** | 0.54*** |
| $\delta_2$ | -0.18** | -0.16** |
| $\delta_3$ | 0.03 | -0.00 |
| Monday | -0.68*** | -0.79*** |
| Adjusted $R^2$ | -0.01 | -0.01 |
| DW | 1.94 | 1.99 |

*Note:* This table shows EGARCH models for the euro-dollar exchange rate (equations 3 and 4 in the main text). Column (1) reports the results for the specification with dummies for statements on interest rates and dummies for statements on the future direction of the exchange rate, statements trying to explain the position of the euro in the ECB monetary policy strategy, and statements on possible interventions. Column (2) reports the results if the dummy for statements on interest rates is replaced by dummies for statements on the two-pillar strategy of the euro (money growth, inflation, growth and pass-through of euro depreciation in inflation). Only the significant coefficients are shown. Bollerslev-Woolridge robust standard errors and covariance are used. */**/*** denotes significance at the 10/5/1 % level, respectively.

# 6 Conclusion

Our results suggest that effects of ECB statements on the level of the exchange rate are comparatively small. This is in line with the literature: effects of statements are dwarfed by other events. Moreover, effects are not persistent: statements rarely have significant effects over the two day period after the statement.

However, in the case of volatility, ECB statements have had considerable impact. Firstly, there is evidence that for the ECB officials as a group volatility increases after policy statements are made. Secondly, more statement dummies show up in the variance equation than in the mean equation. Thirdly, effects can be quite large. Our results indicate that volatility may easily double after ECB statements. In a sense, these results are quite logical. Statements bring news and will therefore induce a price adjustment. Our conclusion is that central banks should be careful with their comments, as in general volatility increases. The implication may be that, in order to secure this, communication should be more centralized. One way to achieve this would be for national central banks to step back and let the ECB president handle the communication to financial markets.

Efforts of the ECB to talk up the euro have been without result. Statements that were intended to bolster the external value of the euro did not coincide with appreciations. Clearly, there was no reason for the market to react to these statements. Importantly, these statements have led to higher volatility. As volatility increases uncertainty, the advice would be to the ECB not to use this particular strategy again in the future. In contrast, communication about intervention may have some effect on the level of the exchange rate. If a central bank wants to intervene, talking about it may be worthwhile considering.

We find evidence that certain statements on monetary policy have had influence on the level of the exchange rate. In most cases the results show a negative relationship between interest rates and the exchange rates and between inflation and the exchange rate. For example, indications of a rate rise lead to a depreciation on the day following the statement. This may be seen as evidence for either an inflation channel or a growth channel (see section 3.2). Finally, there is evidence of asymmetric reactions to news. Markets respond differently to positive or negative news from the same category.

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