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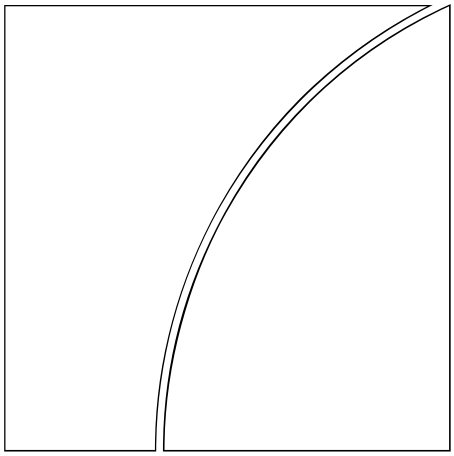

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Macroeconomic news and the euro/dollar exchange rate

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Abstract

This paper investigates to what extent daily movements in the euro/dollar rate were driven by news about the macroeconomic situation in the United States and the euro area during the first two years of EMU.

We examine whether market participants reacted to news in different ways depending on whether the news came from the United States or from the euro area, and whether the news was good or bad. Furthermore, we investigate whether traders' reaction to news has changed over time.

We find that macroeconomic news has a statistically significant correlation with daily movements of the euro against the dollar. However, this relationship exhibits considerable time variation. There are indications of asymmetric response, but to different extents at different times. Our results also provide evidence that the market seemed to ignore good news and remain fixated on bad news from the euro area, as often claimed in market commentaries, but only for some time.

JEL Classification Numbers: F31
Keywords: exchange rates, news

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1. Introduction[1]

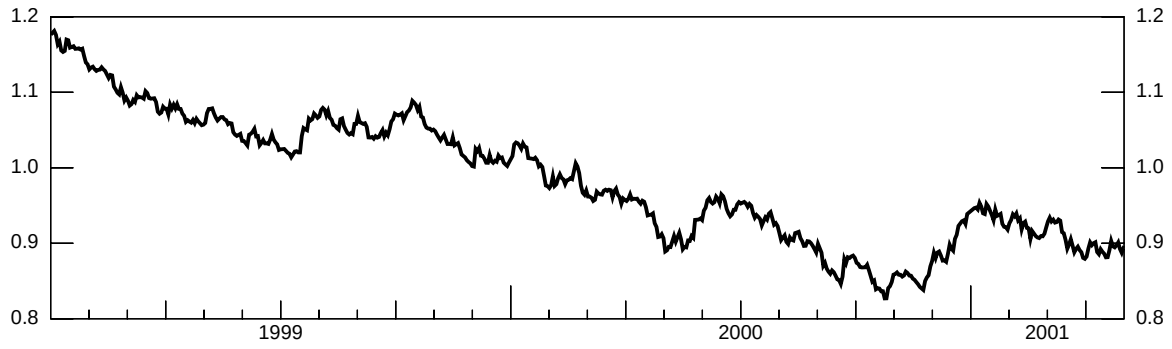
This paper investigates the influence of macroeconomic news on the daily movements of the euro against the dollar in the first two years of EMU.

The protracted weakness of the single European currency (Graph 1) sparked a discussion on "Why is the euro so weak?" over much of 1999 and 2000. There were frequent commentaries in the financial press suggesting that the European currency seemed to exhibit a disregard or asymmetric response towards news from the euro area. Our analysis can be seen as a more rigorous evaluation of this claim.

A number of recent papers have analysed the determinants of the euro's exchange rate, but mostly using long-run equilibrium models.[2] Given the limited amount of time series data, little work has been done with a medium-term horizon.[3] While the financial press has closely followed the response of the euro to various macroeconomic indicators on a daily basis, relatively little work has yet been done to measure this response. An empirical analysis that focuses on the impact of macroeconomic announcements at a daily horizon is, therefore, a logical starting point. "Data watching" has long been known to be an important part of the daily routine of foreign exchange traders, and from a practical point of view, good quality data for macroeconomic announcements are readily available.

Graph 1

The dollar/euro exchange rate, 1999–2001



New York noon series, in dollars per euro. Daily data, 1 January 1999 to 30 April 2001.

We build our investigation upon a regression analysis framework often used in the literature, but with a few new twists. Besides taking the conventional approach of regressing exchange rate movements on individual announcements separately, we also explore alternative ways of representing the occurrences of news. In doing so, we can test whether the euro/dollar rate has exhibited any asymmetric responses to news from the United States versus news from the euro area, and to positive versus negative news. Furthermore, we use rolling regressions to examine how the relationship between news and the euro/dollar exchange rate has evolved over time. Our focus on *asymmetry* and *time variation* constitutes two key elements of interest in this case study of the euro's behaviour since the beginning of EMU.

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[1] Many thanks to Marian Micu for his excellent research assistance and to Claudio Borio, Philip Lowe and Eli Remolona for comments.

[2] See, for example, Alberola et al (1999), Borowski and Couharde (2000), Chinn and Alquist (2000), Clostermann and Schnatz (2000) and Duval (2000). These studies generally found that the euro was undervalued, but the results vary substantially.

[3] The IMF *World Economic Outlook* (May 2001) reports a preliminary analysis, focusing on the medium-term trends in the current account, capital flows, long- and short-term interest rate differentials, and current and prospective growth. Koen et al (2001) review medium-term factors use econometric to test long-run relationships.

Our analysis obtains three major results. First, macroeconomic news has a statistically significant correlation with daily movements of the euro against the dollar. Second, there is some asymmetry in the response of the exchange rate to news, along geographical lines (US versus euro area news) and according to the nature of the news (good versus bad news). Third, there is considerable time variation, revealing interesting intricacies in the evolution of the relationship between news and the euro/dollar exchange rate over time.

The first result supports our use of news about macroeconomic indicators as a factor relevant to the daily movements of the euro/dollar rate and is consistent with the findings of earlier works on news and exchange rates. The second and third results substantiate the claim by market analysts that the euro responded asymmetrically to news. In particular, our rolling regressions can indeed detect a fading of the influence of positive euro area news towards the end of 1999, even though economic conditions did not deteriorate. The fact that good news from the euro area somehow lost its influence may be an indication that psychological factors were at work. Perhaps a negative sentiment towards the euro or the euro area became entrenched after a disappointing first year of EMU. Or perhaps near-term economic developments (as embodied by macroeconomic announcements) became at some point dominated by the relative medium-term outlook, which has been in favour of the United States. Last but certainly not least, the considerable time variation detected clearly suggests that any relationship that may exist between news and the exchange rate may be short-term at best. This observation offers a partial explanation of why much of the previous work using long samples of daily data fails to obtain significant results.

The rest of the paper is organised as follows. The next section reviews the literature on news and the exchange rate and explains where our analysis fits into the literature. Section 3 provides a description of the data as well as the definition and the alternative measurements of "news" we use in our analysis. Section 4 presents the methodology and results. Section 5 concludes.

2. Literature review

The literature on the impact of news on exchange rates is based on the idea that if foreign exchange markets are efficient, all anticipated relevant information should be incorporated in current exchange rates. Unexpected exchange rate changes at time *t* can therefore only be caused by the arrival of unanticipated relevant information ("news") between the time the expectations were formed and time *t*. The empirical literature has followed two main approaches to modelling news and testing its impact on exchange rates. The first models "news" as time series innovations in the relevant macroeconomic variables. The second approach takes "news" as the difference between the actual and expected values of macroeconomic announcements, where expectations are based on survey data.

News as innovations

The first approach used either time series models or regression analysis to derive measures of "news" from innovations in interest rates or other macroeconomic variables. Frenkel (1981) estimated the impact of news about short-term interest rates on dollar/sterling, dollar/French franc and dollar/Deutsche mark exchange rates over the period 1973-1979. He generated expected interest rates by using an autoregressive process. The results suggested only weak evidence for the role of news. For the same exchange rates and sample period, Edwards (1982) tested the effect of news within a monetary model with flexible prices. Similarly to Frenkel (1981), he characterised news about unanticipated money supply, income and interest rates by the difference between actual values and an autoregressive representation. Edward's evidence is supportive of a significant effect of news. MacDonald (1983) estimated a monetary model for a number of exchange rates vis-à-vis the dollar for the period 1973-79. News was measured as residuals of regressions of money supplies on income, interest rates, inflation, the current account and the budget deficit. His results were puzzling, as most coefficients, and in particular lagged news, were statistically significant but had the wrong sign. Using a similar framework, Copeland (1984) found that news influenced the dollar/sterling exchange rate. Bomhoff and Korteweg (1983) used an empirical framework that allows time-variant coefficients to test the impact of news about money supply, income and the oil price on several exchange rates for the period 1973-79. They used quarterly data and found evidence that news was statistically significant in a number of cases. They also found that news influence exchange rates with long lags. Branson

(1983) tested the effect of news about money supply, the current account and prices within a portfolio balance approach. He modelled news using a vector autoregressive (VAR) model and found some supportive evidence for the role of news.

More recent work that looked at innovations from VAR models includes the papers by Eichenbaum and Evans (1993) and Grilli and Roubini (1993), who used these models to identify unanticipated monetary policy decisions and study their dynamic impact on the exchange rate. They presented the interesting finding that unanticipated monetary contractions do lead to an appreciation of the domestic currency, but that this effect is delayed in time and reaches its maximum effect after about two years. Clarida and Gali (1994) used a VAR model that decomposes exchange rate variations into nominal and real shocks and found evidence consistent with the sticky price model.

Data announcements

Studies using the first approach are generally appealing because they are based on relatively simple and intuitive models and provide interesting results.[4] However, their determination of "news" about macroeconomic variables through statistical or econometric models suffers from various problems. First, they assume that market participants know the parameters of the statistical process from the start of the sample period.[5] Second, the models are estimated with monthly or quarterly data, which does not allow the arrival of new information to be captured in an accurate fashion, especially since researchers have typically measured news with data that incorporated later revisions.

These problems are overcome by a second strand of the literature, which uses official announcements of macroeconomic variables and expectations about these values collected from surveys, such as those conducted by Money Market Services, to derive measures of news. Empirical studies that have followed this approach have generally provided evidence that news has statistically significant effects on exchange rates, although the magnitude of these effects and the fit of the regression equations are generally low. Moreover, the statistical significance of these effects diminishes quickly as time elapses after the data announcement. There is also evidence that the influence of news on exchange rates changes over time.

Engel and Frankel (1984) tested the impact of news about money supply announcements on the dollar/mark rate and found evidence of a positive and statistically significant effect. These results are confirmed in papers by Hakkio and Pearce (1985), Ito and Roley (1987), Hardouvelis (1988), Hogan et al (1991) and Hogan and Melvin (1994), who also found evidence that the dollar responded in a statistically significant fashion to news about the US trade balance. MacDonald and Torrance (1988), who looked at the behaviour of interest rates and the exchange rate in the United Kingdom around unanticipated monetary announcements, found that they change significantly after these announcements. Harris and Zabka (1995) and Edison (1997) analysed the behaviour of the dollar/mark and dollar/yen rates in the 1980s and mid-1990s and found that news about non-farm payrolls in the United States has a positive and statistically significant, albeit economically very small, effect on the dollar. This strand of the literature generally found little evidence of a significant effect on the exchange rate of macro announcements about variables other than money supply, non-farm payrolls and the trade balance. More recently, Tivegna and Ciofi (2000) used daily data to investigate the effect of news on the dollar/mark and dollar/yen exchange rates in different trading zones during the period 1995-97. They distinguished news about macroeconomic data releases and about public statements by policymakers. They found evidence of a statistically significant average impact of public statements on both exchange rates. Surprises about some US macro announcements, in particular non-farm payrolls, also turned out to have a statistically significant influence. By contrast, there was little evidence that news about German or Japanese macroeconomic variables mattered.

One now commonly held view is that although macro announcements may influence exchange rates significantly, this influence is discernible only with intra day data sampled at high frequencies. In recent years, the literature has therefore increasingly looked at intra day data, which allow a more precise

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[4] Only a few attempts have been made to test the ability of these models to forecast future exchange rate movements. The results are not always encouraging. Wolff (1988), for example, used a monetary model that included news effects, and found that it did not improve on a naive random walk model in forecasting future exchange rate movements.

[5] See Frankel and Rose (1995)

determination of the timing of news arrivals. Earlier studies on intra day data have focused mainly on the impact of major events, such as the Plaza Accord on changes in the level of exchange rates. Mills and Taylor (1989), for instance, used hourly data on the dollar/sterling and mark/sterling exchange rates, and analysed their behaviour around the 1985 Plaza Accord and the 1987 election in the United Kingdom. They showed that both events had a major impact on the two exchange rates. More recently, Almeida et al (1998) investigated the effect of news about US and German fundamentals on the dollar/mark rate using data sampled at five-minute intervals over the period 1 January 1992 to 31 December 1994. They found evidence of a significant effect of news, in particular about US employment and trade balance figures. Consistent with the literature that used daily data, positive news about the US cycle was found to be associated with a dollar appreciation. Another key result of the paper is that the effect of news was statistically significant only up to two hours after the announcement. The noteworthy exceptions were US non-farm payrolls and consumer confidence, which turned out to have a significant effect even 12 hours after the announcements. Almeida et al also found evidence that the effects of news varied over time. In contrast with US news, German news appeared to have little influence on the dollar/mark rate, even within a horizon of only a few minutes.

While the financial press and market commentary have closely followed the response of the euro to economic news, little work has yet been done on measuring the influence of news on the euro/dollar rate. A recent paper by Prast and De Vor (2000) tried to test whether "cognitive dissonance" can explain movements of the euro/dollar rate during 1999 and 2000. Cognitive psychology theory defines cognitive dissonance as a situation in which an individual, when confronted with contradictory opinions, information or beliefs, devises a subconscious psychological mechanism to minimise the conflict in perceptions. The authors motivated their study with commentary in the press according to which foreign exchange market participants have shown a biased reaction to news about the euro area: traders would buy dollars in response to good news from the United States, but would not act correspondingly in response to good news from the euro area. The authors tested this hypothesis by regressing daily changes in the euro/dollar rate on news about economic variables in the United States and the euro area, and on variables capturing political news in the two economies.[6] They reported results suggesting some asymmetry in the response to political news but failed to find evidence of an asymmetric reaction to news about economic fundamentals.

In this paper, we investigate to what extent daily movements in the euro/dollar rate were driven by news about the macroeconomic situation in the United States and the euro area. We examine whether market participants reacted to news in different ways depending on whether it came from the United States or from the euro area, and whether it was good or bad. This analysis can also help address the question of whether the euro's behaviour was affected by cognitive dissonance. Furthermore, since the literature has documented some substantial time variation in the response of exchange rates to news, we also extend our analysis along the time dimension by estimating rolling regressions over three-month windows. The literature has often found that the effect of news on asset prices is very imprecisely estimated with daily data over long samples. The use of rolling samples allows us to improve the precision of estimation.

3. Data

Exchange rate

We study the daily movements of the euro against the dollar between the launch of EMU in January 1999 and December 2000 (Graph 1). The exchange rate we used is taken at noon in New York, quoted in dollars per euro. The daily change in the New York noon rate is an appropriate time frame for capturing the *overall* impact of news about *both* European and US announcements, which occur on specific calendar days but at different points in time during the day, typically in the morning local time. The exchange rate enters the regressions as daily log differences.

[6] Political news includes statements by policymakers as well as events such as the Kosovo crisis.

Macroeconomic announcements

A variety of macroeconomic announcements have been used in the literature. Our selection of macroeconomic announcements for the United States includes those typically used in the literature and closely watched by participants in the euro/dollar market. The choice of macroeconomic indicators for the euro is less straightforward. Euro area-wide indicators of economic activity are published since 1999 but for most variables, survey data on market forecasts became available only in 2001. This seems consistent with market commentary suggesting that forex traders were not focusing on announcements of euro area wide indicators during the first two years of EMU. The only variable for which survey data are available since January 1999 is the euro area Producer Price Index.

In addition to the euro area PPI, we used four German series and one French series to capture news about the euro area economy. This in part reflects the bigger economic weight of Germany (and, to a lesser extent, France) in the euro area. It also seems to be the result of traders, especially those outside Europe, not having followed macroeconomic developments in other European countries before 1999. When we used comparable variables for other EMU countries in our regressions, their coefficients were not significant (both statistically and economically). This is consistent with market commentary arguing that foreign exchange traders have focused mostly on German data.[7]

A brief description of the US and euro area macroeconomic announcements chosen for this exercise is shown in Table 1. The data on macroeconomic announcements are taken from Bloomberg.

Table 1
Macroeconomic announcements

United States	**Unit**	**Ranking[1]**
Change in non-farm payrolls	000's	1
Unemployment rate	Percentage	2
Employment cost index	Percentage change, q/q	3
Durable goods orders	Percentage change, m/m	6
NAPM manufacturing	Index	4
NAPM non-manufacturing	Index	5
Advance retail sales	Percentage change, m/m	7
Industrial production	Percentage change, m/m	8
Consumer price index	Percentage change, m/m	9
Euro area	**Unit**	**Ranking[1]**
Ifo index	Index	1
Unemployment rate, Germany	Percentage	3
Industrial production, Germany	Percentage change, m/m	2
Consumer price index, Germany	Percentage change, m/m	5
Producer price index, EU 11	Percentage change, m/m	6
INSEE industrial trends	Percentage of net positive responses	4

[1] Priority ranking used in the definition of the aggregate news variables.

[7] In markets outside Europe, traders who are now following the euro typically traded mostly marks in the past, and therefore have tended to continue to concentrate on monitoring the German economy.

Definition and alternative measurements of "news"

There are many possible definitions of "news". For the purpose of our analysis, we define "news" as "surprises", measured by the difference between the actual values of macroeconomic variables and the market's forecasts. Following an approach familiar in the literature, we use the median of survey data to measure market expectations. Using methods commonly employed in the literature, we find evidence that these forecasts are consistent with the hypothesis of rational expectations.[8] Table 2 presents the sample statistics of the measured surprises associated with the chosen macroeconomic announcements.

Table 2

Sample statistics

US surprises	Mean	St error	Min	Max	Positive news (%)[1]
Change in non-farm payrolls	0.0000	0.0002	-0.0018	0.0013	48
Unemployment rate	0.0000	0.0002	-0.0020	0.0020	50
Employment cost index	0.0000	0.0003	-0.0040	0.0040	29
Durable goods orders	0.0002	0.0068	-0.0590	0.1030	65
NAPM manufacturing	-0.0076	0.3826	-3.3000	3.3000	37
NAPM non-manufacturing	0.0091	0.6616	-6.0000	6.5000	58
Advance retail sales	0.0000	0.0007	-0.0070	0.0060	54
Industrial production	0.0000	0.0006	-0.0040	0.0070	48
Consumer price index	0.0000	0.0002	-0.0030	0.0030	28
Euro area surprises	**Mean**	**St error**	**Min**	**Max**	**Positive news (%)[1]**
Ifo index	-0.0096	0.2218	-2.4000	2.1000	40
Unemployment rate, Germany	-0.0002	0.0069	-0.1010	0.0960	39
Industrial production, Germany	-0.0001	0.0035	-0.0350	0.0290	44
Consumer price index, Germany	0.0002	0.0019	-0.0030	0.0250	60
Producer price index, EU 11	0.0004	0.0047	-0.0120	0.0570	79
INSEE industrial trends	0.0511	1.3966	-9.0000	20.0000	50

[1] Number of positive surprises as a percentage of non-zero surprises.

Besides allowing the impact to depend on the *magnitude* of news, we also consider how the *occurrence* of news per se affects the exchange rate. We capture occurrence by translating the original vectors of surprises of the various announcements (later denoted by X_k in equation (1)) into vectors of signed dummies (denoted by D_k in equation (2)). The dummy variables take the value one if the surprise is positive, minus one if the surprise is negative, and zero otherwise.[9]

Furthermore, apart from looking at individual announcements separately, we explore two other ways of presenting the occurrence of news. The first categorises the occurrence of news by geography, distinguishing news from the United States and that from the euro area. This categorisation allows us to test later in equation (3) whether market participants reacted in an

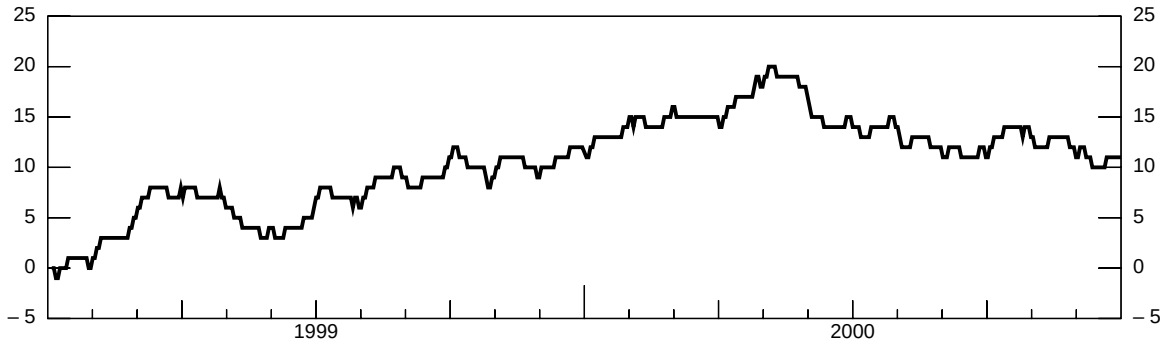
[8] Since both actual and forecast announcements are stationary, these tests are based on OLS. The detailed results are not reported here but are available on request from the authors.

[9] We also experimented with a finer partitioning of the discrete news variables, by distinguishing small and large surprises and using different thresholds to define large surprises. Following this approach, we reached the same conclusions obtained with dichotomous dummy variables. The detailed results are available on request from the authors.

Graph 2

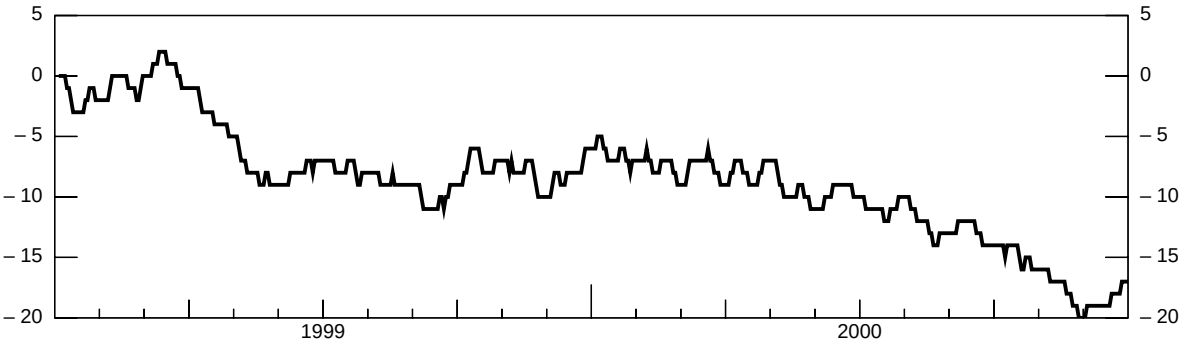
Cumulative occurrence of news, 1999-2000

In the United States



Based on the variable D^{US}. An increase (decrease) in the cumulative index indicates the occurrence of positive (negative) macroeconomic news in the United States.

In the euro area



Based on the variable D^{EU}. An increase (decrease) in the cumulative index indicates the occurrence of positive (negative) macroeconomic news in the euro area.

asymmetric fashion to news about the states of the two economies.[10] We sort and aggregate the vectors of the signed dummies (D_k) described above into one signed vector for the United States (denoted by D^{US}) and one for the euro area (denoted by D^{EU}). The US (euro area) variable takes the value one on a day in which there is a positive surprise about the United States (the euro area), minus

[10] This approach of using "aggregate" news variables is based on a view that, over a period of time, what matters to exchange rate movements may not be the individual announcements per se, but rather what these announcements represent in aggregate: that is, the state of the two economies. Moreover, from a technical point of view, building a more "compact" representation of news such as this is appropriate for our later implementation of rolling regressions.

one if there is a negative surprise, and zero otherwise. This aggregation rule is straightforward except for the unemployment and inflation indicators.

In the case of unemployment, "positive" news (ie higher than expected unemployment) has the opposite economic connotation of "positive" news about other indicators that suggest higher economic activity. Thus, observed surprises about unemployment rates are aggregated with reversed signs. For inflation, "positive" surprises can be a priori aggregated either with the original or the reversed signs, depending on whether higher than expected inflation is associated with higher or lower economic activity. We chose the second alternative. In cases where there is more than one announcement for an economy on a given day, the announcement that is traditionally considered to be the more important by traders is taken.[11]

The second way we present the occurrence of news is an extension of the first. We distinguish news occurrences not only by geographical origin, but also by their nature: "good" versus "bad" news. Admittedly, there are many possible ways of defining "good" and "bad". Given our definition of the geographic variables above, we define good (bad) news as the occurrence of a positive (negative) surprise. We take the geographic variables D^{US} and D^{EU} described above and derive from them two "good news" variables ($D^{US,G}$ for the United States and $D^{EU,G}$ for the euro area), which take the value one on a particular day if good news occurs in the relevant geographic area and zero otherwise, and two "bad news" variables ($D^{US,B}$ and $D^{EU,B}$), which take the value one if bad news occurs and zero otherwise. This categorisation is later used in equation (4), which allows for the possibility of a four-way asymmetry in the effect of news on the exchange rate.

Graph 2 plots the cumulative occurrences of news in the United States and the euro area over the sample period. An increase (decrease) in the cumulative index indicates the arrival of positive (negative) news regarding the state of the economy on that day. The graph reveals that surprises about macroeconomic conditions in the euro area followed different trends during our sample period. Noteworthy is the dominance of bad news in the euro area in April and May 1999. Also noteworthy is the period of relative stability in the euro area between the second half of 1999 and April 2000. From May 2000, however, bad news began to overtake good news, both in the euro area and in the United States.

4. Methodology and results

General framework: four dimensions of the influence of news

We build our analysis upon a familiar empirical framework in the literature, based on the idea that if markets are efficient, expectations about upcoming macroeconomic announcements should have been priced in. Consequently, only the unanticipated components ("news" or "surprises") of these announcements drive exchange rate movements. We estimate equations of the following basic form:

$$\Delta \ln S_t = \alpha + Z_t + \mathrm{B}(L) X_t + \varepsilon_t \tag{0}$$

where S_t is the exchange rate, quoted in dollars per euro, on date t. X_t is a $K \times 1$ "news vector", each element of which contains a measure of the unexpected component of the *kth* macroeconomic announcement at time t. All news variables enter the regressions contemporaneously and with five lags to capture the dynamic response of the exchange rate to the arrival of news. α is a constant and Z_t is a vector of additional explanatory variables, which, in our analysis, include four lags of the dependent variable plus a fifth lag in levels, as well as weekday dummies (Monday to Thursday) capturing day-of-the-week effects. The equations are estimated with daily data over the sample period 1 January 1999 to 31 December 2000 using the White correction for heteroskedasticity.

[11] See Table 1, third column, for the priority ranking of the announcements.

We explore the relationship between news and the euro/dollar exchange rate along four different dimensions. We begin with the conventional approach of estimating the impact of individual macroeconomic announcements on daily exchange rate movements. We then build upon this first approach by using the aggregate news variables described in Section 3 instead of the individual announcements. We estimate, in turn, whether news from the United States and that from the euro area exert an asymmetric influence on the euro/dollar exchange rate, and whether good and bad news from the two regions affect the exchange rate to different extents. Finally, we run rolling regressions to look at the evolution of the relationship between news and the exchange rate over time.

Individual announcements

First, we examine the effect of macroeconomic announcements in general by estimating equation (1):

$$\text{(1)} \qquad \Delta \ln S_t = \alpha + Z_t + \sum_{k=1}^{K} \sum_{j=0}^{5} \beta_{k,t-j} X_{k,t-j} + \varepsilon_t$$

where $X_{k,t}$ is the "surprise" on the k^{th} macroeconomic announcement at date t. The coefficients of X_k measure the impact of news about each announcement, allowing for this impact to depend on the magnitude of the surprise. As a variation, we re-estimate equation (1), replacing X_k with the "occurrence" dummies D_k as defined in Section 3:

$$\text{(2)} \qquad \Delta \ln S_t = \alpha + Z_t + \sum_{k=1}^{K} \sum_{j=0}^{5} \beta_{k,t-j} D_{k,t-j} + \varepsilon_t$$

The idea here is to test whether the occurrence of news per se has any influence on the exchange rate, independently of the magnitude of the surprise.

The results of the full-sample estimation of equations (1) and (2) are summarised in Tables 3 and 4, respectively. Each table reports the adjusted R^2 (a measure of overall fit), the contemporaneous coefficients of each news variable, the sum of contemporaneous and lagged coefficients, and their respective t-statistics and p-values.

Tables 3 and 4 highlight several interesting results. First, macroeconomic news, defined as surprises about macroeconomic data releases, can explain part of the daily movements of the euro against the dollar during the first two years of EMU.[12] Using the specification of equation (1), news about economic fundamentals can explain about 10% of daily euro/dollar movements. The fit of the occurrence of news in equation (2) is about 4%.

Second, the regressions identify two indicators of economic activity that are closely watched by market participants – the NAPM manufacturing index for the United States and the Ifo index for Germany – as contemporaneously statistically significant. Moreover, surprises about inflation are also statistically significant, consistent with the findings of the literature.[13]

[12] This result is line with Harris and Zabka (1995), Edison (1997), Tivegna and Ciofi (2000) and others who found evidence of a significant impact of surprises about macroeconomic announcements on the dollar/mark rate. The overall fit of exchange rate regressions using daily data is typically not high.

[13] Andersen and Bollerslev (2000), for example, found a significant impact on dollar/mark volatility.

Table 3

Estimates of the effect of news on the dollar/euro exchange rate
Equation (1), full sample

	Lag	Coefficient	t-stat	Sign level	Lag	Coefficient	t-stat	Sign level
US Non-farm payrolls	0	0.9905	0.48	0.63	0 to 5	-0.5612	-0.14	0.89
US unemployment rate	0	0.2327	0.26	0.79	0 to 5	-1.5393	-0.54	0.59
US employment cost index	0	0.3593	0.35	0.73	0 to 5	-3.3842	-1.87	0.06
Durable goods orders US	0	-0.0738	-1.75	0.08	0 to 5	-0.2137	-2.14	0.03
NAPM manufacturing	0	-0.0018	-2.08	0.04	0 to 5	-0.0026	-1.39	0.16
NAPM non-manufacturing	0	0.0000	0.04	0.97	0 to 5	-0.0003	-0.30	0.76
US advance retail sales	0	-0.1139	-0.34	0.74	0 to 5	-1.5579	-1.56	0.12
US industrial production	0	-0.6403	-1.47	0.14	0 to 5	-0.1121	-0.08	0.94
CPI US	0	1.5358	1.96	0.05	0 to 5	-1.0878	-0.43	0.66
Ifo index	0	0.0055	4.17	0.00	0 to 5	0.0083	2.61	0.01
Unemployment rate, Germany	0	-0.0123	-0.38	0.71	0 to 5	-0.0506	-0.62	0.53
Industrial production, Germany	0	0.0063	0.06	0.95	0 to 5	-0.0192	-0.10	0.92
INSEE industrial trends	0	-0.0001	-0.59	0.55	0 to 5	-0.0002	-0.46	0.65
CPI Germany	0	-0.4392	-4.06	0.00	0 to 5	-0.8123	-2.16	0.03
PPI EU 11	0	-0.1387	-2.47	0.01	0 to 5	-0.1267	-0.97	0.33

The dependent variable enters the regression equation in log difference form. The news variables enter in the original form X_k. Adjusted $R^2 = 0.10$.

Third, statistically significant contemporaneous coefficients and sums of coefficients generally have signs that are consistent with economic intuition. For the selected announcements that are measures of economic activity, positive surprises indicate stronger than expected activity in the relevant country and are conjectured to be supportive of that country's currency. Since the exchange rate is quoted in dollars per euro, the coefficients on US (euro area) announcements are expected to be negative (positive). The coefficients on unemployment rates should have the opposite sign. We also find that higher than expected inflation is associated with a depreciation of the currency.

Next, we turn our attention to US news and euro area news *in aggregate*. We want to test whether there is any geographical asymmetry in the influence of news on the daily movements of the euro against the dollar. Since the exchange rate is the relative price of two currencies, in principle, news from both economic areas should matter, especially for two major currencies. However, news from each area may not carry the same weight.[14] Indeed, as analysts pondered "Why is the euro so weak?" over much of 1999 and 2000, there were frequent commentaries in the financial press suggesting that the European currency seemed to exhibit a puzzling reaction to news from the euro area. One possible explanation for this behaviour is that there may have been certain entrenched views about the euro and aspects of the euro zone economy (compared to the US economy), as suggested in the analysis of "cognitive dissonance" in Prast and De Vor (2000).

[14] For example, the literature has found evidence that news from the United States, but not that from Germany, had a statistically significant impact on the dollar/mark rate. See, for example, Edison (1997) and Tivegna and Ciofi (2000).

Table 4

Estimates of the effect of news on the dollar/euro exchange rate
Equation (2), full sample

	Lag	Coefficient	t-stat	Sign level	Lag	Coefficient	t-stat	Sign level
US non-farm payrolls	0	-0.0008	-0.52	0.60	0 to 5	0.0007	0.19	0.85
US unemployment rate	0	0.0009	0.81	0.42	0 to 5	-0.0004	-0.12	0.90
US employment cost index	0	0.0016	0.59	0.55	0 to 5	-0.0104	-1.84	0.07
Durable goods orders US	0	-0.0008	-0.41	0.68	0 to 5	-0.0036	-0.96	0.34
NAPM manufacturing	0	-0.0029	-1.80	0.07	0 to 5	-0.0026	-0.65	0.52
NAPM non-manufacturing	0	-0.0006	-0.33	0.74	0 to 5	-0.0027	-0.74	0.46
US advance retail sales	0	0.0000	0.03	0.98	0 to 5	-0.0045	-1.35	0.18
US industrial production	0	0.0004	0.27	0.79	0 to 5	-0.0013	-0.33	0.74
CPI US	0	0.0054	3.38	0.00	0 to 5	-0.0003	-0.12	0.90
Ifo index	0	0.0053	3.51	0.00	0 to 5	0.0076	2.08	0.04
Unemployment rate, Germany	0	-0.0006	-0.37	0.71	0 to 5	-0.0020	-0.51	0.61
Industrial production, Germany	0	0.0013	1.25	0.21	0 to 5	0.0013	0.48	0.63
INSEE industrial trends	0	-0.0018	-1.12	0.26	0 to 5	-0.0024	-0.61	0.54
CPI Germany	0	-0.0023	-1.23	0.22	0 to 5	-0.0016	-0.32	0.75
PPI EU 11	0	0.0015	0.62	0.54	0 to 5	-0.0011	-1.27	0.20

The dependent variable enters the regression equation in log difference form. The news variables enter in the signed occurrence dummy form D_k. Adjusted $R^2 = 0.04$.

To estimate the influence of news in aggregate and to test for geographical asymmetry, we modify our basic equation by substituting the surprises about the individual announcements with the geographic "occurrence" variables D^{US} and D^{EU} as described in Section 3:

$$\Delta \ln S_t = \alpha + Z_t + \sum_{j=0}^{5} \beta_{t-j} D_{t-j}^{US} + \sum_{j=0}^{5} \delta_{t-j} D_{t-j}^{EU} + \varepsilon_t \quad (3)$$

where D^{US} (D^{EU}) takes the value one if there is a positive surprise on a macroeconomic data release in the United States (euro area), minus one if there is a negative surprise, and zero otherwise.

The full-sample results of the estimation of equation (3) are presented in Table 5. Since the coefficients on individual macroeconomic surprises are now constrained to be equal within each geographical region, the overall fit of (3) is understandably lower than that in the less constrained equation (2). Neither US news nor euro area news is statistically significant over the full sample. These results are unchanged even if we refine the news variables in equation (3) by differentiating between large and small surprises[15] or by including in D^{US} and D^{EU} only those macroeconomic announcements that are significant in equations (1) and (2).

[15] This is implemented by allowing D^{US} and D^{EU} to take the values -2, -1, 0, 1 and 2.

Table 5

Estimates of the effect of news on the dollar/euro exchange rate
Equation (3), full sample

	Lag	Coefficient	t-stat	Sign level	Lag	Coefficient	t-stat	Sign level
US news	0	-0.6816	-0.93	0.35	0 to 5	-2.5459	-1.61	0.11
Euro area news	0	0.8656	1.29	0.20	0 to 5	1.6650	1.08	0.28
Wald tests	**Null hypothesis**			**Sign**	**Null hypothesis**			**Sign**
	$\beta_t^{US} = -\beta_t^{EU}$			0.85	$\sum_{j=0}^{5}\beta_{t-j}^{US} = -\sum_{j=0}^{5}\beta_{t-j}^{EU}$			0.64

The dependent variable enters the regression equation in log difference form. News variables enter as signed occurrence dummies. Adjusted $R^2 = 0.04$.

A formal test of the sum of the contemporaneous coefficients on D^{US} and D^{EU} cannot reject the hypothesis that US news and euro area news exert a *symmetric* influence on the exchange rate. However, one should note that this test result does not necessarily mean that asymmetry does not exist whatsoever, since the wide standard errors of the coefficient estimates in equation (3) make it difficult to reject the hypothesis of symmetry. However, it is possible that the purported asymmetry prevailed only over selected periods of time within the full sample. This conjecture will be verified in our rolling regression analysis.

Aggregate news: asymmetries between good and bad news

So far, we have assumed that the exchange rate reacts to positive and negative news symmetrically, ie in opposite directions but with the same magnitude. Just as there may be asymmetries along geographic lines, there may also be asymmetries according to the nature of the news. We therefore expand upon equation (3) and consider the possibility of a four-way asymmetry: good news versus bad news, in the United States versus in the euro area. We modify the basic equation to yield:

$$(4) \qquad \Delta \ln S_t = \alpha + Z_t + \sum_{j=0}^{5}\beta_{t-j}^{G} D_{t-j}^{US,G} + \sum_{j=0}^{5}\beta_{t-j}^{B} D_{t-j}^{US,B} + \sum_{j=0}^{5}\delta_{t-j}^{G} D_{t-j}^{EU,G} + \sum_{j=0}^{5}\delta_{t-j}^{B} D_{t-j}^{EU,B} + \varepsilon_t$$

where $D^{US,G}$, $D^{US,B}$, $D^{EU,G}$ and $D^{EU.B}$ are the unsigned occurrence variables as defined in Section 3. The superscript G denotes good (positive) news, while the superscript B denotes bad (negative) news. [16]

The full-sample results of the estimation of equation (4) are presented in Table 6. As in equation (3), aggregated news variables are not statistically significant over the full sample.[17] Again, formal testing cannot reject the hypothesis of symmetric response in various pairs of contemporaneous coefficients. Caveats made earlier against the interpretation of formal testing continue to apply.

[16] An alternative way to test for asymmetry in good versus bad news consists in interacting each individual macroeconomic announcement in equations (1) and (2) with a good news dummy (one if the news is positive, zero otherwise) and with a bad news dummy (one if the news is negative, zero otherwise), as in Edison (1997). In doing so, we allow the response to each piece of good news to be different from that to bad news. While the results of these augmented specifications appear to support the idea of asymmetry, we prefer not to focus on them because of the very few observations on each interaction variable in our sample period.

[17] These results still hold when we estimate variations of equation (4) by differentiating between large and small surprises or by constructing aggregate news variables using those macroeconomic announcements that are significant in equations (1) and (2).

Table 6

Estimates of the effect of news on the dollar/euro exchange rate
Equation (4), full sample

	lag	coefficient	t-stat	sign level	lag	coefficient	t-stat	sign level
US good news	0	-0.7576	-0.71	0.47	0 to 5	-0.7265	-0.31	0.76
US bad news	0	1.1355	0.93	0.35	0 to 5	5.0350	1.79	0.07
Euro area good news	0	0.2744	0.24	0.81	0 to 5	-1.0700	-0.39	0.70
Euro area bad news	0	-1.0572	-1.10	0.27	0 to 5	-3.5050	-1.33	0.18
Wald tests	**Null hypothesis**			**Sign**	**Null hypothesis**			**Sign**
	$\beta_t^{US,G} = -\beta_t^{US,B}$			0.82	$\sum_{j=0}^{5} \beta_{t-j}^{US,G} = -\sum_{j=0}^{5} \beta_{t-j}^{US,B}$			0.28
	$\beta_t^{US,G} = -\beta_t^{EU,G}$			0.77	$\sum_{j=0}^{5} \beta_{t-j}^{US,G} = -\sum_{j=0}^{5} \beta_{t-j}^{EU,G}$			0.60
	$\beta_t^{US,B} = -\beta_t^{EU,B}$			0.95	$\sum_{j=0}^{5} \beta_{t-j}^{US,B} = -\sum_{j=0}^{5} \beta_{t-j}^{EU,B}$			0.68
	$\beta_t^{EU,G} = -\beta_t^{EU,B}$			0.62	$\sum_{j=0}^{5} \beta_{t-j}^{EU,G} = -\sum_{j=0}^{5} \beta_{t-j}^{EU,B}$			0.29

The dependent variable enters the regression equation in log difference form. News variables enter as unsigned occurrence dummies. Adjusted $R^2 = 0.06$.

Time variation

A number of studies on the relationship between news and exchange rates have found evidence of substantial time variation in this relationship. The wide standard errors of the coefficient estimates in equations (3) and (4), the low adjusted R^2 and the inability to reject the hypothesis of symmetric response to news in the full sample may be due to the presence of parameter instability over time. Simply re-estimating equations (3) and (4) using shorter subsamples not only improves the overall fit but also identifies different variables as contemporaneously significant across subsamples.[18] Formally testing for parameter instability in the two equations yields multiple break points over the sample period.[19]

To address the issue of time variation and to extract richer results from our data, we extend our analysis along the time dimension. We re-estimate equations (3) and (4) on a rolling basis, using samples of 120 business days, and plot the regression coefficients over time. Owing to the necessarily smaller sample size in rolling regressions, we can apply this technique only to equations with few right-hand-side variables. Apart from this technical reason, we choose to focus on these two equations also because, in the context of our case study here, the time variation in the euro's response to US and euro area news in aggregate is of more relevance to us than the time-variation in the response to particular announcements per se.

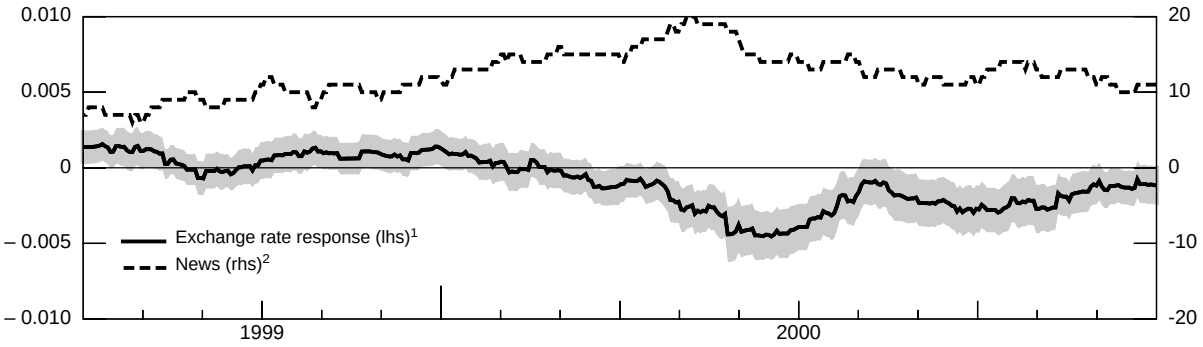
[18] Results available from the authors upon request.

[19] We used a CUSUM-squared test. Results are available upon request. We also checked whether the dollar/mark rate prior to EMU and the euro/dollar rate reacted in a significantly different way to macroeconomic news. Using the usual parameter stability tests, we did not detect any clear evidence supporting such a hypothesis.

Graph 3

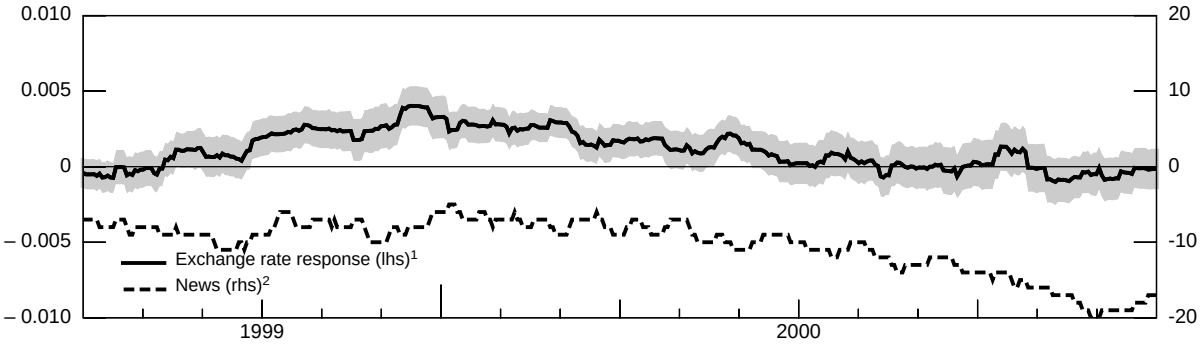
Contemporaneous influence of news: equation (3)

News from the United States



[1] Contemporaneous coefficient on the signed news variable D^{US} in equation (3). A positive coefficient indicates that the occurrence of a positive (negative) surprise in the United States is associated with a strengthening (weakening) of the euro against the dollar. Economic intuition predicts a negative coefficient. The shaded area is the ± 1% standard deviation confidence band. [2] Cumulative number of positive and negative surprises in the United States.

News from the euro area



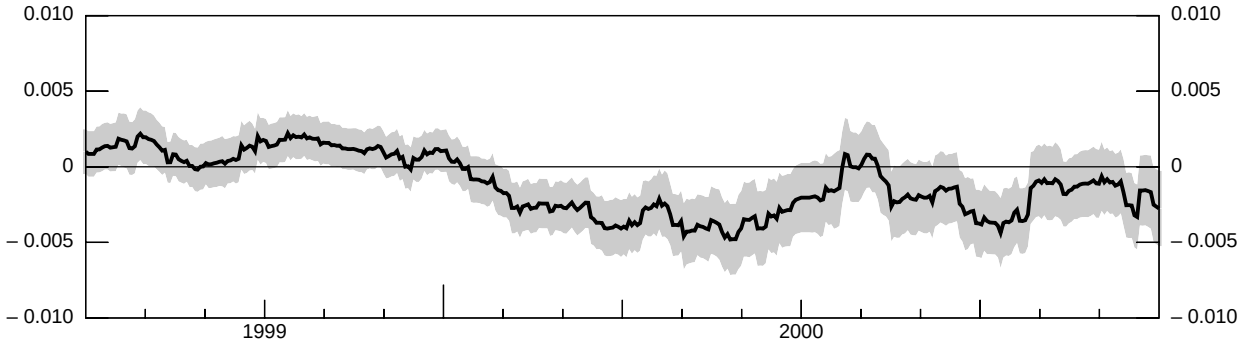
[1] Contemporaneous coefficient on the signed news variable D^{EU} in equation (3). A positive coefficient indicates that the occurrence of a positive (negative) surprise in the euro area is associated with a strengthening (weakening) of the euro against the dollar, consistent with economic intuition. The shaded area is the ± 1% standard deviation confidence band. [2] Cumulative number of positive and negative surprises in the euro area.

Graphs 3 and 4 present the contemporaneous coefficients in the rolling versions of equations (3) and (4), respectively. Since rolling samples of 120 business days are used, each point estimate on the graphs refers to the period of approximately six calendar months before. This is why the graphs begin at June 1999. The two panels in Graph 3 illustrate how the *overall contemporaneous influence* of US news and euro area news varies over time, against the background of the evolution of the occurrence of news in the two regions. Graph 4 provides more details on the *relative importance* of good and bad news in each region.

Graph 4

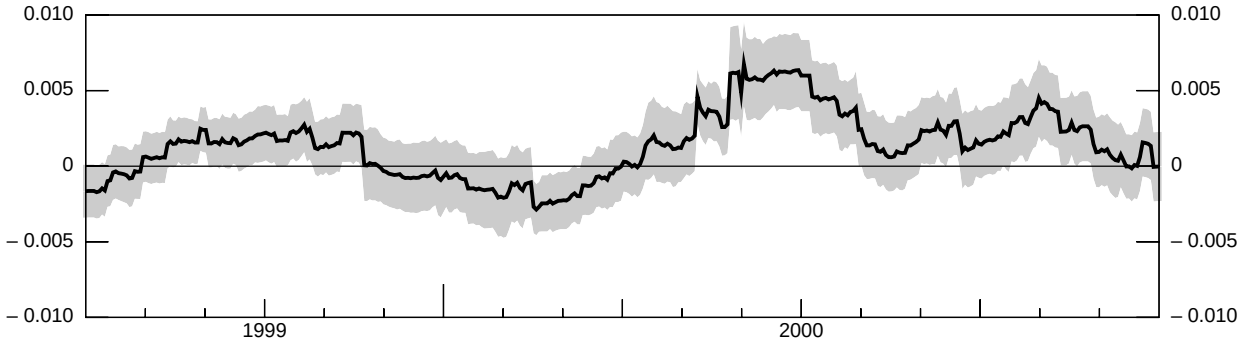
Contemporaneous influence of news: equation (4)

US good news



Contemporaneous coefficient on the unsigned news variable $D^{US,G}$ in equation (4). A positive coefficient indicates that the occurrence of a "good" surprise in the United States is associated with a strengthening of the euro against the dollar. Economic intuition predicts a negative coefficient. The shaded area is the ± 1% standard deviation confidence band.

US bad news

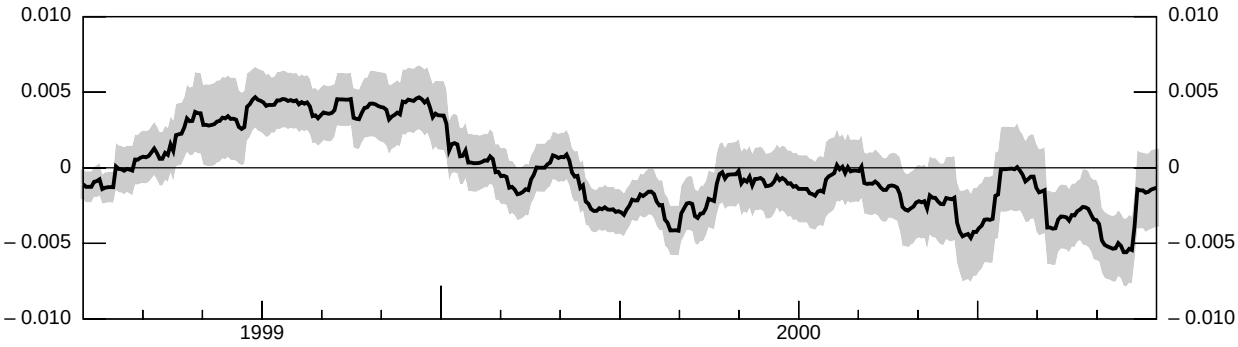


Contemporaneous coefficient on the unsigned news variable $D^{US,B}$ in equation (4). A positive coefficient indicates that the occurrence of a "bad" surprise in the United States is associated with a strengthening of the euro against the dollar, consistent with economic intuition. The shaded area is the ± 1% standard deviation confidence band.

Graph 4 (continued)

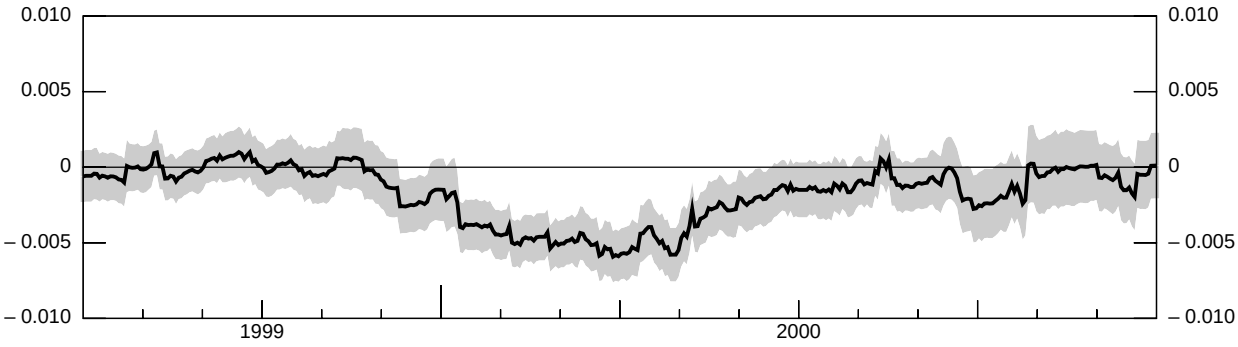
Contemporaneous influence of news: equation (4)

Euro area good news



Contemporaneous coefficient on the unsigned news variable $D^{EU,G}$ in equation (4). A positive coefficient indicates that the occurrence of a "good" surprise in the euro area is associated with a strengthening of the euro against the dollar, consistent with economic intuition. The shaded area is the ± 1% standard deviation confidence band.

Euro bad news



Contemporaneous coefficient on the unsigned news variable $D^{EU,B}$ in equation (4). A positive coefficient indicates that the occurrence of a "bad" surprise in the euro area is associated with a strengthening of the euro against the dollar. Economic intuition predicts a negative coefficient. The shaded area is the ± 1% standard deviation confidence band.

A few general observations are in order. First, Graph 3 shows that there is indeed substantial time variation in the relationship between the euro/dollar rate and news from the two regions. The changes in the magnitudes and signs of the coefficients over time help explain why regressions over long samples tend to yield unspectacular results.[20] Second, the coefficients on US news and euro area

[20] The changing direction of the response of asset prices to macroeconomic news has been documented recently for bond markets (Furfine (2001)).

news are far from being mirror images of each other, indicating the possibility of asymmetry. Third, decomposing each region's news according to its nature (Graph 4) reveals that both good and bad news exerts considerable influence on the exchange rate, but not always to the same extent or at the same time – yet another indication of asymmetry and the intricacies of the relationship between macroeconomic news and the exchange rate.

More specifically, regards the evolution of the influence of euro area news on the euro/dollar exchange rate, Graph 3 (bottom panel) clearly shows that it was not always the case that the euro did not respond to news from Europe. In particular, in the second half of 1999 and the first half of 2000, the overall influence of euro area news was in fact statistically significant, with both good and bad news given due attention (Graph 4, last two panels). This "awareness" of euro area news came at a time when news in Europe became less unequivocally bad and more mixed, as evidenced by the end to the rapid decline in the cumulative news index for the euro area around mid-1999. Closer inspection (Graph 4, last two panels) also reveals that the influence of euro area news in the second half of 1999 was attributable mainly to the influence of good news. By contrast, in the first half of 2000, forex market participants seemed to ignore positive news and reacted only to bad news on the euro area economy, as often claimed in market commentaries. The latter observation is consistent with the fact that, despite the improved performance of the euro zone economy in early 2000, the single currency continued its protracted decline. The statistically significant influence of euro area news had faded completely by mid-2000. By this time, negative surprises about macro announcements were dominating in European markets, as seen in the decline of the cumulative news index, which had been flat for several months.

One interpretation of these results is that, after a disappointing start in 1999, high hopes and optimism about EMU turned into pessimism or even an entrenched negative sentiment towards both the euro zone economy and its currency between end-1999 and mid-2000 , thus leading the market to respond only to news that validates this sentiment. Related to this is the possibility that news about current or near-term economic conditions may have been overpowered by views regarding longer-term economic prospects, which have tended to favour the United States. This conjecture is consistent with data on productivity differentials between the two economies, and with the robust net portfolio and foreign direct investment flows from Europe to the United States (BIS (2001)).

5. Conclusions

In this paper, we investigate to what extent daily movements in the euro/dollar rate were driven by news about the macroeconomic situation in the United States and the euro area in 1999–2000. We also examine whether market participants reacted to news in different ways depending on whether the news came from the United States or from the euro area, and whether the news was good or bad. Furthermore, we extend our analysis along the time dimension by estimating rolling regressions.

We find that macroeconomic news has an appreciable correlation with daily movements of the euro against the dollar. However, this relationship exhibits considerable time variation. There are indications of asymmetries in the response of the exchange rate to news, but to different extents at different times. Our rolling regression results also provide some evidence that during particular periods, the market seemed to ignore good news and remain fixated on bad news from the euro area, as often suggested by market commentary.

As mentioned in the Introduction, this particular approach to analysing the driving forces behind daily movements of the euro is only a starting point. The analysis of the impact of news over the intra day horizon is an obvious area for future work. There is also scope for broadening the set of news to include events such as public statements or political events.[21]

[21] For an analysis of the impact of announcements of cross-border mergers and acquisitions, see Fender and Galati (2001).

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