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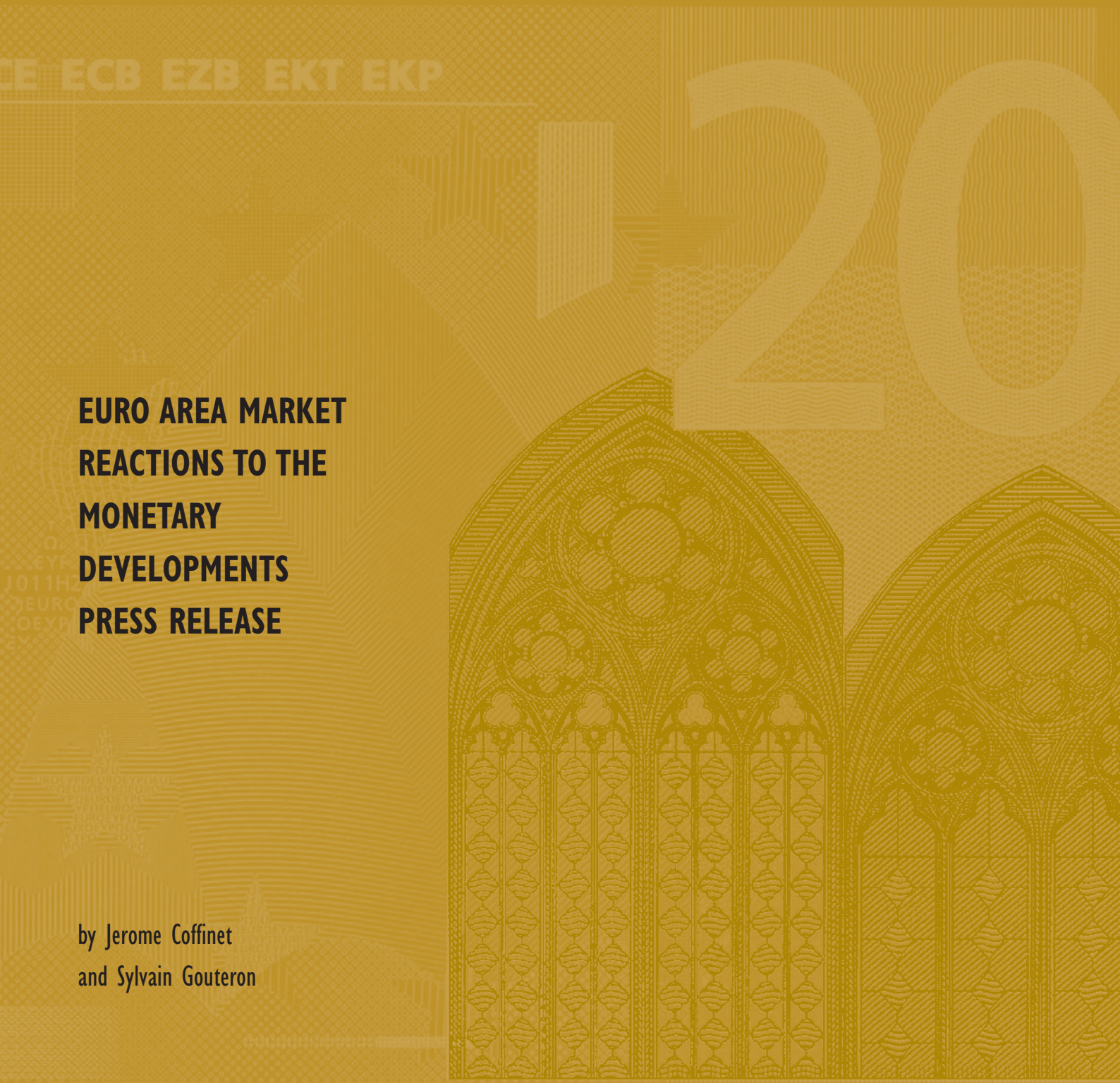
WORKING PAPER SERIES
NO 792 / AUGUST 2007



EURO AREA MARKET REACTIONS TO THE MONETARY DEVELOPMENTS PRESS RELEASE

by Jerome Coffinet
and Sylvain Gouteron

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In 2007 all ECB publications feature a motif taken from the €20 banknote.

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1 We are grateful for useful discussions with and suggestions from Huw Pill, Thomas Westermann, Laurent Clerc, Julian Von Landesberger, Magnus Andersson and an anonymous referee. We would also like to thank participants from an internal presentation at the ECB for useful comments. Lastly we thank Vincent Brousseau, Michael Ehrmann, and again, Magnus Andersson, for providing us with the intraday datasets used. The views expressed in this paper do not necessarily reflect those of the Banque de France neither those of the European Central Bank.

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ISSN 1561-0810 (print)
ISSN 1725-2806 (online)

CONTENTS

Abstract

Using intra-day data, we assess the impact of the press release on euro area monetary data on the different segments of the euro area yield curve. For this purpose, we estimate a relation between the "news" or "surprise" in the released data for annual M3 growth and the move in the interest rates for a time-window surrounding the press release.

We find that the publication of monetary data has a statistically significant impact on interest rates with maturities ranging from 1 to 10 years, with the largest effect on the 1-2 year segment. Turning to the short end of the yield curve, since mid-2001 rates with maturities up to 6 months do not react much to the monetary developments press release.

Our results suggest that market participants may look through short-term movements of annual M3 growth and focus instead on the trend rate of monetary expansion over the medium term when gauging the policy relevant signals.

Keywords: high-frequency data, macroeconomic announcements, money growth

JEL classification: E43, E44, E52, E58

Non-technical summary

Do financial markets react to news on M3 growth? Investigating this question is likely to provide additional insights about the credibility of the ECB monetary policy strategy, which assigns a prominent role for money. It can also shed new light on the assessment by market operators of the long-run relationship between money and prices.

In this paper, the reaction of the yield curve to the M3 press release is assessed by using high-frequency intraday data, which makes it possible to investigate return developments within a narrow time-window surrounding the press release and thus, to prevent other news released on the same day from blurring the market reaction. Assuming that financial markets are efficient, only the unexpected component of M3 growth has been considered. In order to avoid deriving interest rates from national assets, interest rates were taken from the euro area swap market, with maturities ranging from two weeks to ten years. The sample period spans the period November 2000 to November 2006.

While several studies have analyzed the impact of money data releases on financial markets, we do not know any of them which have carried out such an assessment for the whole euro area yield curve using intraday data. The reason is probably related to the fact that money growth was usually not the main concern of those studies, but only one indicator among others. This is all the more understandable as news' on money growth have usually been found to be less market-moving than other kinds of news' like, for instance, those related to output developments.

The measurement of the market reaction is constructed as the change in swap interest rates between 9:55am and 10:15am, in order to surround the M3 news, which occurs at the end of every month at 10:00am. A time window of 20 minutes is indeed considered short enough to avoid any contamination by other events but long enough to allow market participants to digest the new information and update prices. Nevertheless, different time windows, from 9:55-10:05 up to 9:55-10:25 with incremental steps of five minutes, have also been tested. In the same vein, two alternative measures of news have been constructed, using on the one hand the *mean* forecast of M3 reported by market participants in the Bloomberg surveys, and on the other hand the *median* forecast. Moreover, we have cross-checked the results obtained from swap interest rates with those gathered from futures on German bonds.

In the short-end of the yield curve, the results tend to confirm the common view: the impact of the monetary news is not statistically significant on maturities up to 1 year, which can be explained by the fact that many observers have failed to detect any relationship between the growth rate of M3 and the subsequent ECB monetary policy decisions. One can also argue that the ECB itself, in the definition of its strategy, has always emphasized a medium to longer term horizon concerning the possible effects of money growth on prices. In this respect, the year 2001 can be considered as a breakdown in the perception by the market operators of the ECB monetary policy strategy. From this date, the market operators seem to have taken into account the fact that ECB did not mechanically react to the month-on-month developments in money growth, but focused its attention on the underlying trend.

Turning to the 1 to 5 year maturities, the impact of money news on interest rates appears as both statistically significant and strong. On 1 and 2 year maturities, it even turns out to be broadly comparable to that of the IFO surprises, one of the best leading indicators of the euro area growth, known as being strongly market-moving. However, a rolling regression - whose robustness is checked with a space-state representation of the model - reveals that the impact of M3 has faded over time. The decline was especially sharp during the period of financial market uncertainty (end-2001 to mid-2003) but since then, the statistical significance of the regression parameters has picked up. This outcome could indicate that market operators are fully aware of the cross-checking done by the ECB between economic analysis and monetary analysis and more generally, that the reaction of the ECB to money growth is considered as conditional to the economic environment.

Lastly, concerning the long end of the yield curve, the impact of M3 surprises is still significant, but dampened in comparison with that of the 1-5 year segment. This result can appear as paradoxical, insofar as the relationship between money and prices is particularly relevant in a long run. However, two strands of explanation can be put forward. First, considering the literature, it is quite usual to find a dampened impact of economic news on the long end of the yield curve, as the bulk of the market transactions is on the 1-5 year segment. Second, the very low volatility of past inflation outturns has contributed to anchor the inflation expectations at long horizons. This achievement has probably plaid down, for the longest maturities, the marginal information contained in M3.

I. Introduction

The market operators react to any news which is likely to change their economic forecasts. In this respect, they also should react to monetary news', which give information on future price developments. The impact of monetary news is expected to be particularly significant on the nominal interest rates, as at least two effects can be invoked.

First, the market operators should think that monetary growth is informative about the future monetary policy stance, as monetary analysis is one of the two pillars of the ECB monetary policy. Its strategy explicitly assigns a 'prominent role' for money and even signals it by the announcement of a reference value for the growth of M3. Therefore, the short end of the yield curve might be affected by the monetary news'.

Second, the long-run relationship between money and prices is one of the central tenets of economic theory and has been confirmed by an impressive number of empirical studies. Therefore, monetary news' are expected to have an impact on the medium and long parts of the yield curve.

However, the relationship between money and prices is complex. In this respect, the 'two-pillar' approach of the ECB monetary policy strategy has often been questioned. Its implementation has raised the issue of the choice of the aggregate, as well as that of the magnitude and time lags of the impact of a monetary expansion on prices. As a matter of fact, many observers have failed to detect any relationship between the growth rate of M3 and the ECB monetary policy decisions. Yet, we do not know any economic study whose central topic is the impact of monetary news on the whole yield curve, although it might give insights about the credibility of the ECB monetary policy strategy vis-à-vis the market operators.

In that respect, some caveats should however be pointed out. First, in no way the ECB monetary policy strategy implies that the ECB should react mechanically to monetary news'. Actually, monetary news' are analyzed in the background of a general assessment of the economic and financial situation and therefore, the reactions of interest rates to monetary news' are conditioned by other economic events. Second, the credibility of the ECB does not lie on its sole monetary policy strategy. It also depends on other factors, for instance its past results in terms of inflation. Consequently, a non-reaction of the yield curve to a monetary surprise would not necessarily mean that the credibility of the ECB monetary policy strategy is weak. It would be the case only if this was systematic.

The assessment of the market reaction to monetary news' is carried out with an intraday data set of yield curve from two weeks to ten years. The use of intraday data makes it possible to surround press release on monetary developments with a narrow window and thus, to prevent other news' released on the same day from blurring the market reactions. An obvious drawback of this approach is that only the immediate market reaction is captured. If markets take longer to digest the information, some part of the overall impact will be missed. However, since financial assets are priced in a forward-looking manner, in principle only the marginal information contained in the data release (i.e. the "news" or "surprise" element) should cause revisions to what is currently assessed, thereby immediately affecting prices. Hence it is the unexpected

component of the data release that is relevant. As IFO index is sometimes released exactly at the same time that the monetary data, the assessment of the impact of the monetary data on the interest rates is controlled by IFO. The monetary news' are measured as the difference between actual M3 growth and expectations given by Bloomberg.

A similar analysis is carried out by Andersson et al. (2006) on the 7-10 year segment of the yield curve. The novelty of the exercise presented here is to extend this analysis to a broader spectrum of interest rate maturities. Moreover, the dataset is somewhat different, since interest rate data are derived from the interest rate swap market rather than from the German bond market. The sample period spans the period November 2000 to November 2006. Whereas our findings are broadly in line with those of Andersson et al. (2006) concerning the long end of the yield curve – namely a poorly significant impact of M3 news on the interest rates, we exhibit an opposite result concerning the medium part of the yield curve. On the 1-5 years segment of the yield curve, the impact of the monetary news is both quite strong and statistically significant.

The paper is structured in five parts: Section 2 briefly reviews the literature on the use of market intraday data to assess the market reaction to news. Section 3 elaborates on the data and the econometric methodology used in the study. Section 4 presents the main results, Section 5 proposes some interpretations and Section 6 concludes.

II. Related studies

To assess the impact of macroeconomic news on financial market, the recent literature has analysed high frequency financial data. By investigating changes in financial prices within a narrow time window surrounding an announcement, the impact of that announcement can be easily disentangled from the effects of other data releases on the same day. Consequently, the number of studies using such a technique is large and spans across asset classes and types of data releases[3].

Balduzzi et al. (2001) are the first to deal with the impact of *monetary* news on financial markets. Testing the effects of 26 data releases on the intra-day price of US Treasury bonds (a three-month bill, a two-year note, a 10 year-note and a 30-year note), they find a statistical significance for 17 of them, including the monetary aggregate M2. The news' are measured in terms of a standardised surprise, i.e. the difference between the actual and the expected figures, divided by the standard deviation of the series. Goldberg & Leonard (2003), as well as Andersen et al. (2005) have carried out the same kind of exercise on the German bond market, but their dataset does not include money.

Ehrmann and Fratzcher (2002) study the impact of monetary news *on the European market*, but they use daily data only. To justify their choice, they argue that the official release time of announcements during the day are not always the same as the actual release time. Moreover, some announcements can be 'leaked' some time before the official release time. With a dataset containing several major macroeconomic

[3] Examples include: Fleming et al. (1997); Balduzzi et al. (2001); Faust et al. (2002); Goldberg et al. (2003); Bentzen et al. (2004); Andersen et al. (2005); Gürkayanak et al. (2005), Andersson et al. (2006).

announcements, they find a significant effect of M3 releases for Germany from 1998 to 2002 and for the Euro area from 1999 to 2002, especially at the end of the sample. Moreover, they exhibit two interesting similarities with the American market: first, a decreasing effect of surprises across maturities (as, among others, Fleming and Remolona, 1997) and second, an effect of announcements which may depend on the position within the monetary cycle (as Andersen et al., 2005).

Andersson et al. (2006) use *intraday* data to deal with the impact of monetary news on euro area financial markets. The authors explore the impact of several major macroeconomic releases – including M3 – on German long-term bond futures, with an intraday dataset spanning 1999-2005. The effect of M3 news on the long-term German bond prices is found poorly significant, conversely to that of IFO, often released at the same time.

In the literature, the estimations are usually carried out either with OLS and corrected by the Newey-West procedure to take into account both autocorrelation and heteroskedasticity of the residuals, or with the double least squares procedure. The results related to the impact of monetary news on financial markets are scarcely commented, which can be explained by the fact that this impact is usually not the main concern of the studies, money being only one index among others.

At a first look, we tend to consider the poor significance of money on German bond prices as surprising, insofar as M3 news should give information on future inflation and, therefore, influence bond prices. The long-run relationship between money has been confirmed by an impressive record of empirical studies; the most recent evidence is given by Greiber and Neuman (2004), Bruggeman et al. (2005), Assenmacher-Wesche and Gerlach (2006). Moreover, related to the impact of monetary news on the markets, Gerlach (2004) pointed out that inflation expectations are likely to be determined by actual money growth even more than by past inflation rates.

However, one possible interpretation of the finding of Andersson et al. (2006) is that the credibility of the ECB in safeguarding price stability on a long term is high, as illustrated by the very low historical volatility of the inflation expectations at 10 years, whatever the way they are measured (inflation linked bonds or Consensus Forecasts). Consequently, the market operators might not pay attention to the long-term content in information of M3, knowing that in the long run, the ECB will counteract the consequences of a temporary excess liquidity. Things could turn out different on the medium segment of the yield curve, especially if M3 growth is perceived as containing information on the future path of the key interest rates. This is why our purpose is to assess the impact of M3 news on the whole yield curve. Obviously, if the absence of reaction is confirmed on the whole yield curve, it would probably mean that the market operators assess the content in information of money as poor, whatever the strategy of the ECB.

Whereas Andersson et al. (2006) use a dataset consisting of five-minute prices of long-term German Bond futures contracts, which is quite classical given the high liquidity of the German future market, other studies dealing with the whole yield curve tend to prefer data derived from the swap market, as described by Brousseau (2002) and used, for instance, by Brand et al. (2006). We have used the same dataset, which presents a good homogeneity from the shorter end of the yield curve up to the longer end and which does

not depend on national underlying assets. As Brand et al. (2006) have done, it is possible to extract from it forward rates, in order to measure directly the expectations. However, it would have increased the effects of the measurement errors, as a forward rate is constructed from two spot rates. Moreover, we would have to choose a maturity for the forward, in addition to the horizon of the expectation. As this choice would have been somewhat subjective, on the sake of simplicity, we have preferred to keep the spot rates, which are also influenced by expectations.

Lastly, an obvious drawback to mention with the use of intraday data is that only the immediate market reaction is captured. If markets take longer to digest the information, some part of the overall impact will be missed. Conversely, asset prices may 'overshoot' in their reaction to news, as shown for instance by Andersen et al. (2003). Lastly, one has to consider the possible leaks and the possible lags between the official time of announcements and the actual time, as mentioned by Ehrmann and Fratzscher (2002). However, as far as M3 is considered, there is no evidence of leak and it is a matter of fact that the M3 press release has always been reported by the market news agencies between 10:00 and 10:02. Moreover, even in the presence of 'overshooting' – that we also highlight, we think that the advantages of intraday data remain strong enough to prefer them to daily data.

III. Data and methodology

The intraday interest rate dataset consists of real time quotes of swap rates from Reuters, observed at five minute intervals. As a measure of the yield curve, we give preference to swap rates rather than deposits and bonds because the swap market is more liquid than deposit and bonds' ones. Furthermore, swap rates offer a good homogeneity across maturities and are not linked with underlying national assets. As mentioned above, on the sake of simplicity we directly work on the yield curve rather than on forward rates. The maturities of the swaps are 2 weeks, 1, 2, 3 and 6 months, 1, 2, 5 and 10 years. The variable legs are made of Eonia for the 2-weeks to 6-month swaps, 3-month Euribor for the 1-year swap and 6-month Euribor for the 1-year to 10-year swaps. Consequently, the quotations are not strictly comparable to those of zero-coupon rates, as the duration of the swaps is slightly inferior to their maturity.

The data are unsmoothed, but have been filtered for mispriced quotes according to the algorithm developed by Brousseau (2002)[4]. The analysis is based on a sample from November 2000 through November 2006. Intra-day financial data before November 2000 are deemed not to be of sufficient quality to be exploited in this study.

The press release on monetary developments is issued at the end of every month, at 10:00 CET. A measurement of the market reaction has been constructed as the change in interest rates between 9:55am

[4] Given that the swap market is an Over-The-Counter market, the dataset is not built on the basis of *transactions* (as for futures market) but on the basis of *quotations*. Therefore, there can be numerous and huge transactions without new quotation or conversely, quotations without transaction. That is the reason why, in order to improve the quality of the observations, the dataset is built with a filter which rejects irrelevant quotations from the market or new quotations which are the same as the last observation (which can happen when two different banks display the same quotations). In the same vein, few recorded observations do not prove a lack of liquidity, and the number of observations can not be directly compared to the number of trades on an organized market such as futures on Euribor or German bonds.

and 10:15am, in order to surround this event. Following the existing literature, a time window of 20 minutes is considered short enough to avoid any contamination by other events but long enough to allow market participants to digest the new information and update prices. To check this assertion, we have also tested different time windows, which span from 9:55-10:05 up to 9:55-10:25 with an incremental step of five minutes. Except the German IFO index of business confidence, only very few major macro-economic data of the euro area are released at this time on the same day as that of the monetary data. As IFO is, on occasion, also released at 10am on the same day, the exercise presented below controls for the impact of its announcement[5]. Table A1 of the appendix recapitulates the M3 and IFO release dates over the whole sample.

As financial assets are priced in a forward-looking manner, only the marginal information contained in the data release should influence prices. Hence, it is the unexpected component of the data release that is relevant. The "news" or "surprise" element provided by the press release on monetary developments (noted ΔM) is constructed as the difference between the M3 growth outturn (noted A_M) and the mean forecast of M3 reported in the regular Bloomberg survey of market participants[6] (noted E_M):

$$\Delta M = A_M - E_M$$

To check the robustness of the exercise, a surprise has also been constructed with the median forecast. The median forecast is usually the same as the mean forecast, being liable to differ from it only by 0.1 percentage point in one third of the cases. As shown below, the choice between mean and median has no impact on the results.

Obviously, one caveat of these measurements is that the information given by the press release is not limited to the M3 growth, but also includes the developments of the components and counterparts of M3. To address this criticism, one can argue that except M3, the only other aggregate for which expectation is available is credit to the private sector, and only since 2004. Moreover, when reading the questions of the Press Conference following the Governing Council, one notes that out of the somewhat 80 questions referring to M3 since 1999, only about 10 referred to the credit to the private sector. More surprising, no question on credit has ever been asked without being associated with money growth[7]. Therefore, one can assume that when reading the press release, the market operators mainly look for the figure of M3 growth. The information contained in IFO release (noted ΔIFO) has been calculated in the same way as that

[5] Only few major macro-economic news are released at 10:00 CET. Apart from M3 and the German IFO, they are the Euro Area Purchasing Managers' Indexes – issued between the 1st and the 6nd of each month –, the German Unemployment– also released in the beginning of the month - and, only from 2005, some Italian data, especially the Industrial Producer Price Index, the Retail Trade Turnover and Foreign Trade. In our data set, the Italian Retail Trade Turnover was released on four occasions on the same time as IFO (23/02/05, 30/03/05, 24/11/05, 25/01/06) while data on Italian Foreign trade once (16/12/05). Their impacts have not been controlled because they were assessed as much less market-moving that the German IFO. Italian Producer Price Index was released on the same time as M3 on five occasions (30/03/05, 28/07/05, 29/11/05, 29/12/05, 28/04/06) but in every case, the move of the market is not significant and the impact of the released data very implausible. This is confirmed by the literature, including Andersson et al. (2006) who find no statistical significant impact of the Italian Industrial Price Index. Lastly, we have to mention that on 2006, the 28th of March, the first set of aggregates of the Italian National Account has been released at the same time as both IFO and M3. On this day, the move on the market was strong, but commented by the market operators and journalists as caused by the big surprise in the IFO index release (2.6, i.e. more than two standard deviations). Consequently, on the time window 9:55-10:15, M3 press release has been controlled only by the German IFO index release.

[6] Actually, the 'market participants' who are interviewed by Bloomberg are usually analysts in large investment as well as retail banks. About half of the respondents are from German banks.

[7] In the Press Conference of 7/12/2006, one question was asked without explicit reference to money growth, but our sample ends in November 2006.

contained in the M3 release, the expectation given by Bloomberg (noted E_{IFO}) being subtracted from the actual outcome (noted A_{IFO}).

As shown on chart 1 and 2, 'M3 surprises' and 'IFO surprises' have the desirable properties to be used as explanatory variables: they are equally distributed over the sample and exhibit a broadly constant variance. A simple mean test shows that they are slightly biased in the case of M3 (see appendix, table A2) but uncorrelated (see appendix, tables A3 and A4)[8].

Another characteristic of the 'M3 surprise' series is to be correlated with the variations of the 'actual M3' series (see chart 3). In other word, as shown in chart 1, market participants' forecasts are broadly similar to a random walk, i.e. forecast unchanged annual M3 growth. This can be explained by the absence of available information about the future developments in M3.

Chart 1
M3 Surprises
(*mean expectations, percentage points)*

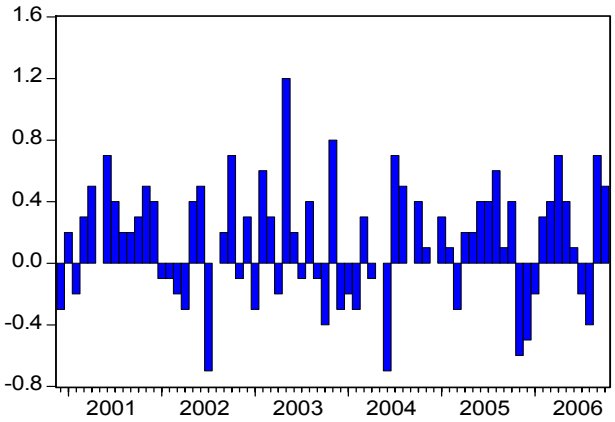
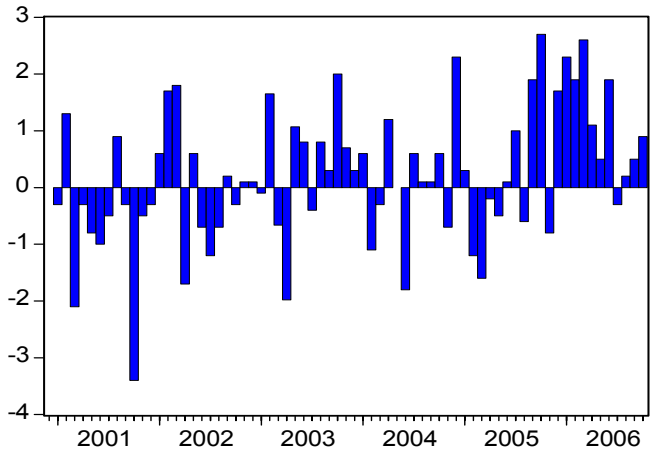


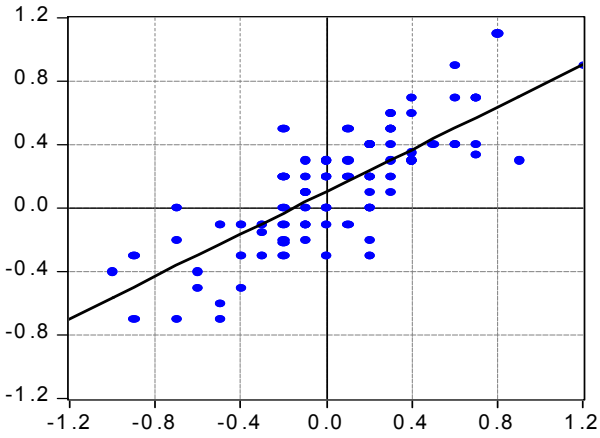
Chart 2
IFO Surprises

(*mean expectations, percentages points)*



[8] Andersson et al. (2006) also find bias expectations for M3 growth. However, they find β=0.77 when carrying equation 4 of their Working Paper (Actual M3=c+β.Expected M3+ε), while we find β=0.96, which is in line with the estimates of Ehrmann and Fratzscher (2002).

Chart 3
M3 Changes *(horizontal axis)*
and M3 Surprises *(vertical axis)*



Note: some points have exactly the same coordinates and thereby, are superposed

The dataset used for the analysis consists of those days when the M3 and/or IFO data are published (with ΔIFO=0 on days when M3 alone is published and ΔM=0 on days when the IFO alone is published). Furthermore, the model includes a number of control variables. An assessment of the impact of these data releases on market interest rates is thus conducted using the following regression:

$$\Delta i_{T,t} = \rho.\Delta i_{T,t^*} + \alpha.\Delta M_t + \beta.\Delta IFO_t + \alpha_1.\Delta M_{t-1} + \beta_1.\Delta IFO_{t-1} + \gamma.Vol + \delta.Direction + \varphi.Friday + c + \varepsilon_t \quad \textit{(equation 1)},$$

where:

- $\Delta i_{T,t}$ denotes the variable of interest, i.e. the interest rate change surrounding the data releases at the date t for the swap with maturity T. One may argue that the relevant variable is not $\Delta i_{T,t}$ *per se*, but another measure which would permit to take scale effects into account, for instance the coefficient of variation $\Delta i_{T,t}/i_{T,t,}$. Our central scenario, based on $\Delta i_{T,t,}$ is motivated by two reasons: first, it makes the interpretation of the results easier, given that we can quantify the impact of a news on the interest rates in terms of 'basis points'; second, a robustness analysis carried out in the next section shows that the results are not significantly different when using a coefficient of variation;

- ΔM_t and ΔIFO_t are the main explanatory variables, i.e. surprises in M3 growth and in the IFO index respectively at the date t; ΔM_{t-1} and ΔIFO_{t-1} are the surprises of the previous month. Assuming that market are efficient, no lagged variables should be taken into account, as all the news available before 9:55, in particular previous surprises and swap rate movements, should have been integrated in the current swap rates. However, lagged values are sometimes significant in the literature (see for instance Andersson et al. (2006)); thus we have included them in our specification. As well, we have included the lagged endogenous variable $\Delta i_{T,t^*}$, which denotes the change in interest rates over the time window which ends at 9:55 and which is of the same length as that of $\Delta i_{T,t}$.

- *Vol* is a proxy for the market volatility at the time of the release. It is computed as the standard deviation of 5-minute quotations over the time window 9:30-9:55;

- *Direction* is a dummy capturing whether the surprise in the previous month went in the same direction as that of the current month. This explanatory variable would be supported by an adaptative reaction of the agents – market operators as well as the ECB – who would pay all the more attention to monetary developments that the surprises went successively in the same direction;

- *Friday* is a dummy variable taking into account calendar effects, that is, given the frequency of data, end of week effects[9];

- *c* is a constant. As one would expect in the absence of deterministic trends in interest rates, it turns out to be statistically insignificant and therefore has been removed from the regression.

Ordinary least squares are used, with the t-statistics corrected for slight heteroskedasticity and autocorrelation in the residuals using the Newey-West procedure.

IV. Main results

IV.1. Central scenario

For our central scenario, i.e. a time window spanning 9:55am – 10:15am with news' built with mean expectations, several explanatory variables prove to be statistically non-significant:

- As expected, the constant of the equation 1 is null (see the Wald tests in appendix, table A5) and therefore, has been removed from equation 1 for the subsequent estimates;

- The volatility, the Friday and Direction dummies are not statistically significant (see table 1 below);

- At the noticeable exception of the 10 year interest rates, the lagged values of ΔM_t and ΔIFO_t are also not statistically significant. As for the 10 year rates, the impact of the money news is slightly revised upward and thereby, the broad picture of a significant effect of M3 press release on financial markets is not modified (see Table 1). Furthermore, when removing the variables one by one, keeping in the right-side of equation 1 only ΔM_t, ΔIFO_t and ΔIFO_{t-1}, the t-value of ΔIFO_{t-1} proves to be below 2. As well, the lagged endogenous variable $\Delta i_{T,t^*}$ proves to be statistically non significant.

[9] Other day-of-the-week effects have been tested. None has been found statistically significant. We present here the results of the most significant day of the week dummy variables, which is Friday.

Table 1

Impact of M3 on the yield curve *(in percentage points)*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.005	0.006	0.009	0.012	0.013	0.013	0.009
Lagged endogenous variable (coeff ρ)	-0.197	0.010	-0.062	-0.313	-0.534	-0.257	-0.213	-0.297	0.006
($\Delta i_{T,t}$ t-stat)*	1.78	0.19	0.25	1.43	1.90	1.52	1.15	1.63	0.03
M3 Surprise Elasticity (coeff α)	-0.002	-0.001	0.002	0.005	0.007	**0.015**	**0.013**	**0.012**	**0.006**
(M3 t-stat)	0.86	0.33	1.10	1.65	1.98	3.62	4.36	4.41	3.31
IFO Surprise Elasticity (coeff β)	0.000	0.000	**0.001**	**0.002**	**0.003**	**0.005**	**0.007**	**0.008**	**0.005**
(IFO t-stat)	0.19	0.23	2.26	2.98	4.83	5.05	6.76	6.20	5.43
Lagged M3 Surprise Elasticity (coeff α_1)	0.002	0.001	0.000	0.001	0.000	0.000	0.003	0.003	0.004
(M3 t-stat)	1.05	0.64	0.08	0.77	0.01	0.02	1.23	0.85	1.46
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	**-0.002**
(IFO t-stat)	0.18	0.92	0.56	1.08	1.55	1.80	1.93	1.63	2.07
Volatility Elasticity (coeff γ)	0.000	0.000	-0.001	0.000	0.001	0.001	0.002	0.001	0.001
(t-stat)	0.81	0.03	1.08	0.44	0.70	0.53	0.77	0.66	0.60
Direction Elasticity (coeff δ)	**0.003**	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
(t-stat)	2.56	0.76	1.62	0.69	0.44	0.23	0.24	0.58	0.54
Friday Elasticity (coeff φ)	0.001	0.000	0.001	0.000	0.000	0.000	-0.001	-0.001	0.000
(t-stat)	1.20	0.15	1.25	0.05	0.42	0.23	0.58	0.40	0.30
R^2	0.08	0.04	0.06	0.13	0.22	0.25	0.29	0.28	0.24

Therefore, we re-estimate equation 2 as follows:

$$\Delta i_{T,t} = \alpha.\Delta M_t + \beta.\Delta IFO_t + \varepsilon_t \qquad \textit{(equation 2)}$$

Our results show that the publication of M3 data has a statistically significant impact on interest rates with maturities from 1 to 10 years (see table 2 below). By contrast, M3 surprises have no statistically significant effect on short-term rates (i.e. with a maturity less than one year).

Table 2

Impact of M3 on the yield curve *(in percentage points)*

	1 month	3 months	6 months	1 year	2 years	5 years	10 years
S.D. of dependent variable	0.004	0.006	0.009	0.012	0.013	0.013	0.009
M3 Surprise Elasticity (coeff α)	0	0.0045	0.0057	**0.0150**	**0.0123**	**0.0102**	**0.0052**
(M3 t-stat)	*(0)*	*(1.69)*	*(1.65)*	*(3.33)*	*(3.83)*	*(3.62)*	*(2.91)*
IFO Surprise Elasticity (coeff β)	0	**0.0015**	**0.0031**	**0.0043**	**0.0069**	**0.0073**	**0.0048**
(IFO t-stat)	*(0)*	*(2.69)*	*(4.79)*	*(4.58)*	*(6.53)*	*(5.76)*	*(4.96)*
R^2	0	0.09	0.14	0.23	0.28	0.28	0.23

Note: The standard deviation of M3 surprises is about 0.4pp and that of IFO surprises is about 1.2 point. Bold indicates statistical significance at the 5% level.

In terms of the economic significance or magnitude of these effects, *prima facie* the impact of M3 surprises on market interest rates appears rather modest. An M3 surprise of 0.4pp (one standard deviation) implies an

interest rate change ranging from 0.2bp (for the 10-year maturity) to 0.5bp (for the 1- and 2-year maturities).

However, the impact of M3 surprises on interest rates is broadly comparable to that of the IFO surprises, at least at the 1 and 2 year maturities. Moreover, although these regressions explain, at best, only about one-third of the variance of the interest rate change in the time window considered (cf. R^2 figures), their performance in this respect is broadly comparable to other estimates in the literature (Balduzzi et al., 2001).

An interesting feature of these results is the absence of significant reaction of maturities inferior to one year. Conversely, the maximum impact is noted for the medium segment of the yield curve, i.e. 1-5 years, which is in line with the results of Fleming and Remolona (1999). On the long end of the yield curve, the impact is dampened but still significant. Therefore, these results are broadly in compliance with the long-run relationship between money and prices, even if the segment which is the most affected, i.e. the 1-5 years, is somewhat shorter than expected.

In the appendix, tables A11 to A15 show that the estimations are also robust to the type of measurement of the expectations: replacing the mean expectation by the median expectation when building the 'M3 surprises' let the results unchanged.

IV.2. Changing the time-window

The same exercises carried out with different time windows do not alter the results (see tables A16 to A20 in the appendix). Even on the window 9:55-10:05, the impact of the press release is statistically significant. This impact (coefficient α) rises with the length of the time window and reaches a maximum at 10:10 or 10:15, depending on the observed maturity. After 10:15, there is a stabilisation or, on occasion, a slight dampening which reflects an initial 'overshooting' of the market operators. Surprisingly, this overshooting is more pronounced for M3 than for IFO. An explanation could be that the market operators need more time to analyze the content in information of the M3 press release, more complex and richer in information than that of the IFO press release. This is consistent with an effect of the IFO release which is also more immediate than that of the M3 press release, as illustrated by the move in the window 9:55-10:05 which are for IFO, close to the equilibrium (see table 3 below).

Table 3

Impact of M3 and IFO on 1Y interest rate, with time windows starting at 9:55 and ending at different time *(in percentage points)*

	10:05	10:10	10:15	10:20	10:25
S.D. of 1 Year interest rate	0.009	0.0011	0.012	0.012	0.015
M3 Surprise Elasticity (coeff α)	0.0095	0.0138	0.00150	0.0136	0.0135
(M3 t-stat)	*(2.80)*	*(3.28)*	*(3.23)*	*(2.98)*	*(2.81)*
IFO Surprise Elasticity (coeff β)	0.0041	0.0041	0.0043	0.0042	0.0052
(IFO t-stat)	*(6.04)*	*(4.18)*	*(4.58)*	*(4.16)*	*(3.90)*
R^2	0.23	0.20	0.23	0.18	0.17

IV.3. Taking the relative variation of the endogenous variable

Lastly, as mentioned in the previous part, one might think that the relevant endogenous variable is not the *absolute* variation of swap rates but the *relative* variation in order to take into account possible scale effects. Actually, when replacing the absolute variation $\Delta i_{T,t}$ by the relative variation $\Delta i_{T,t}/i_{T,t}$, the results are broadly unchanged and the statistical significance of the exogenous variables is not affected (see tables A21 to A25 in the appendix).

These significant results notwithstanding, in the case of the M3 surprises, rolling regressions suggest that the proportion of the interest rate variance that is explained has tended to diminish over time, implying that the way in which the market interprets the news in the M3 press release has evolved since 2000. Further analysis of this issue is pursued in the next section.

IV.4. Checking the dataset

As mentioned above, the dataset we used – interest rates swap – has been chosen because it is the only one to present such homogeneity from 1-month to 10 years. The fact that the biggest moves are concentrated in the sub-sample December 2000 – September 2001 is fully consistent with the results of Brand et al. (2006), who used the same dataset. However, one can argue that for precise maturities, such as 3 months or 10 years, the liquidity of the interest-rate swap market is weaker than that of other markets, especially the future markets. The liquidity of the 'swap' dataset has still dramatically increased over the sample, as shown in appendix (see tables A26 and A27).

Furthermore, in order to cross-check the results we obtained with the 'swap' dataset, equation 2 has been carried out for 2, 5 and 10 years, with an alternative intra-day dataset, the Eurex futures on German bonds. As shown in appendix (see table A28), the results are extremely close to those we obtained with the 'swap dataset', confirming them fully. The variation over time, which is presented below (in section V) also holds true with the alternative dataset. (see charts 7 and 9 for results with our dataset, and charts A4 for results with the alternative one).

V. Interpretation

V.1. The short end of the yield curve: 1-6 month rates

The time series of changes in short-term interest rates during the time window 9:55-10:15 the days when monetary data are published is shown in chart 4 below. The standard deviations of the changes, computed over the whole sample, are represented by the grey bands. Consistent with the results in Table 1, it is apparent that – especially from the summer of 2001 – the dispersion of the changes has declined. Short-term rates do not react to the M3 press release, or do so to only a very modest extent. The last substantial reaction occurred in June 2001. This assessment is confirmed by a rolling-regression which was carried out

with a 1-year window[10] on the 6-month maturity[11], whose results are shown in chart 5 below (the date of the horizontal axis indicates the end of the 1 year sub-sample).

Chart 4
Changes in 1, 3 and 6 month interest rates
(in percentages; standard deviations are in grey)

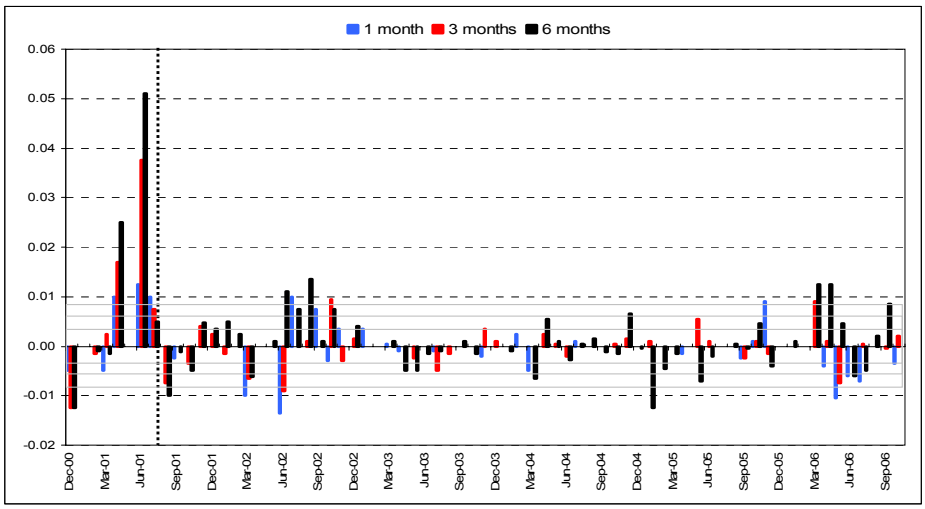
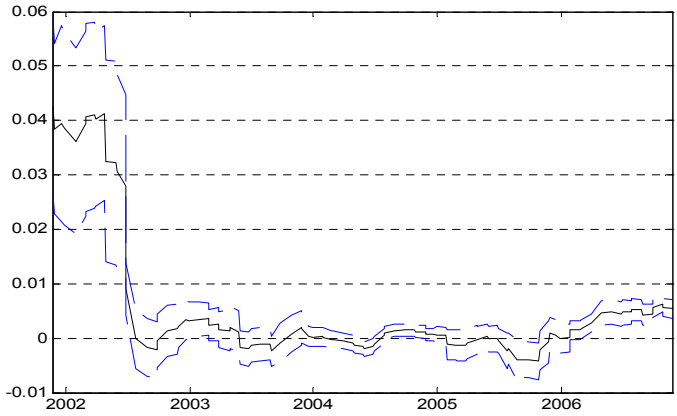


Chart 5
Elasticity of 6M-rates to M3 press release
(with confidence interval of 2 standard deviations)



From the outset, in the presentation of its monetary policy strategy, the ECB has always emphasized that there would be no mechanical reaction of key ECB interest rates to developments in headline annual M3 growth (or its deviations from the reference value). In other words, the month-to-month "news" in the monetary developments press release should not be expected to trigger interest rate changes. Indeed, on a substantive level, it is the "low frequency" (or persistent) movements in monetary growth that contain the

[10] There is no consensus in the literature how to gauge accurately the time varying feature of macro and monetary policy announcements. Some authors use regression analysis in a rolling window (Ehrmann and Fratszcher 2002), whereas others prefer to divide the sample in several ad-hoc sub-samples (Andersson et al., 2006). In the present study, we use a rolling regression with a 1-year window. The coefficients are estimated with the same methodology as in Part III.

[11] The results of the rolling regression on the 1 year-maturity is shown in Appendix (see charts A1).

information that is relevant for a medium-term oriented monetary policy. Therefore, the "news" in one month M3 data should not be used to determine the timing of interest rate decisions – and therefore should not be expected to lead to large market reactions in short-term rates.

The evidence in Table 1 and Chart 4 suggests that, after a learning process, this message has been well understood by the market. Moreover, a clear break in the responsiveness of short-term rates to M3 surprises took place in spring 2001. It is thus worth recalling the events of that time in greater detail.

In April 2001, a +0.5pp surprise in M3 growth was recorded (with annual M3 growth already at 5%). This significant positive M3 surprise led to a rise in short-term rates, reflecting diminishing market expectations of a cut in key ECB interest rates at the May 2001 Governing Council meeting. Yet, notwithstanding stronger M3 growth than the market had expected, key ECB rates were indeed cut on 11 May 2001. On that occasion, the Introductory Statement explained that headline M3 growth was distorted by non-euro area resident holdings (an argument subsequently repeated in the Monthly Bulletin and M3 press release). Further large positive surprises in M3 growth (0.7pp and 0.4pp respectively) occurred in June and July 2001 (with actual M3 growth rising well above the reference value). Such surprises again dampened market expectations of a rate cut. Nonetheless, key interest rates were reduced further by the Governing Council on 30 August 2006, with the Introductory Statement explaining that *"recent increases in M3 growth may be transitory, and, hence, do not necessarily have implications for price stability in the medium term."*

After this experience, our results suggest that the markets have better understood the ECB's approach to interpreting monetary developments and therefore short-term interest rates became unresponsive to the month-to-month news in the M3 press release. This learning process was supported by the ECB's communication, especially after identification of a growing impact of portfolio shifts on headline M3 growth from mid-2001 (for example, in November 2001, the Introductory Statement argued: "*This rise* [in monetary growth] *seems to be associated with the heightened financial market uncertainty after the terrorist attacks on 11 September"*). The clarification of the ECB's monetary policy strategy on 8 May 2003 underscored this message.

Lastly, from 2006 the use of 'code words' in the Press Conference following the Governing Council – more precisely, the use of words that the market operators interpret as signals of a future rise in key interest rates – has also could anchored the expectations and underplayed for the market the weight of the monetary developments. However, this phenomenon could occur only at the very end of the sample.

V.2. The medium-term segment of the yield curve: 1-5 year rates

M3 surprises have a statistically significant impact on interest rates at 1- to 5-year maturities, with the magnitude of the impact decreasing with maturity (see Table 1). Looking at the time series of interest rate changes during the time window in which the monetary data are published, rates with 1- to 5-year maturities exhibit a different pattern to money market rates. Even after 2001, 1-5 year interest rates still respond to M3 surprises, especially during summer 2002 and, albeit to a lesser extent, in the first half of 2006 (see Chart 5, where the shaded area again represents the standard deviation of the changes).

However, the strong reaction of March 2006 is not due to M3 but to a strong IFO surprise (2.6, i.e. more than two standard deviations). The rolling regression presented chart 6 (the date in the horizontal axis indicates the end of the 1 year sub-sample) suggests that the reaction of interest rates to M3 surprises has not been statistically significant since mid-2001, in spite of a slight recovery from 2006[12]. One way of reconciling these two pieces of evidence is to take the view that the bivariate relationship between M3 surprises and interest rate changes at these maturities is non-linear and, more specifically, conditional on the other economic events[13].

Chart 6
Changes in 1, 2 and 5 years interest rates
(in percentages; standard deviations are in grey)

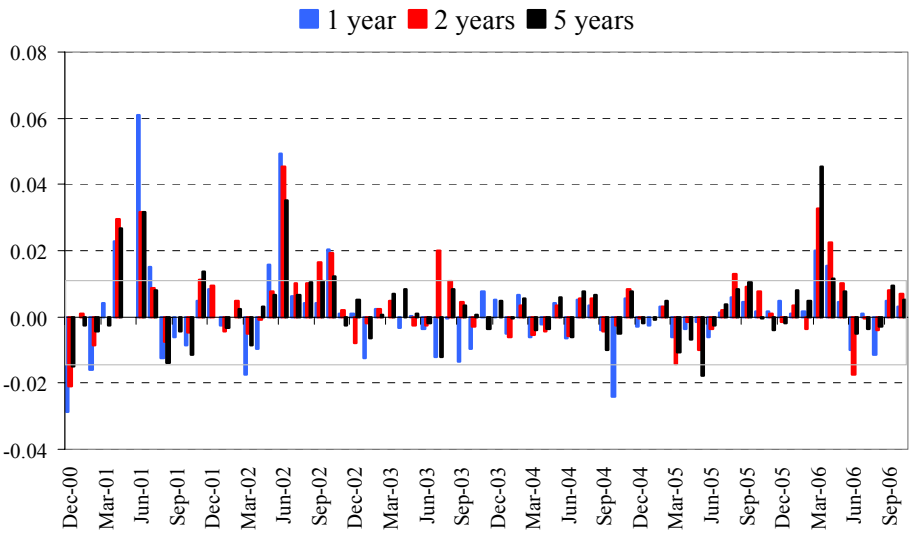
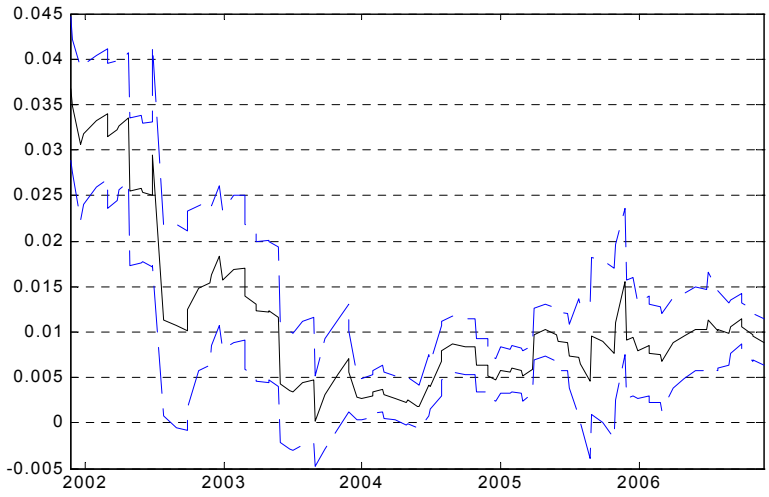


Chart 7
Elasticity of 2Y-rates to M3 press release
(with confidence interval of 2 standard deviations)



[12] The same rolling regression with the alternative dataset is furnished in Appendix (see charts A4).

[13] For instance, Hautsch and Hess find that 'bad' news creates more uncertainty among traders than 'good' news (asymmetric impact). Andersen et al. (2005) show that equity markets react differently to the same news depending on the state of the US economy. Hautsch and Hess find that 'bad' news creates more uncertainty among traders than 'good' news, leading to an asymmetric impact.

For example, the large increases in 1-, 2- and 5-year interest rates in May 2002 appear consistent with the large positive M3 surprise of 0.5pp (and an annual M3 growth rate of 7.8%). Yet, in July 2002 the large negative M3 surprise of -0.7pp triggered no reverse reaction in rates. This apparently asymmetric reaction of interest rates to M3 surprises could be explained by the Introductory Statement at the June 2002 press conference, where the Governing Council expressed a more marked concern than usual about excess liquidity (*While […]there was some normalisation in the development of M3 in early 2002, this* ***trend*** *towards moderation has recently been interrupted)*. From July 2002, by emphasising the *stock* of liquidity rather than monetary *growth* in its communication (*"it is a matter of concern that there is significantly more liquidity available in the euro area than would be needed to finance sustainable, non-inflationary economic growth"*), the Governing Council implicitly signalled that the "news" in the press release was of less importance that cumulative signal given by monetary developments over a longer period.

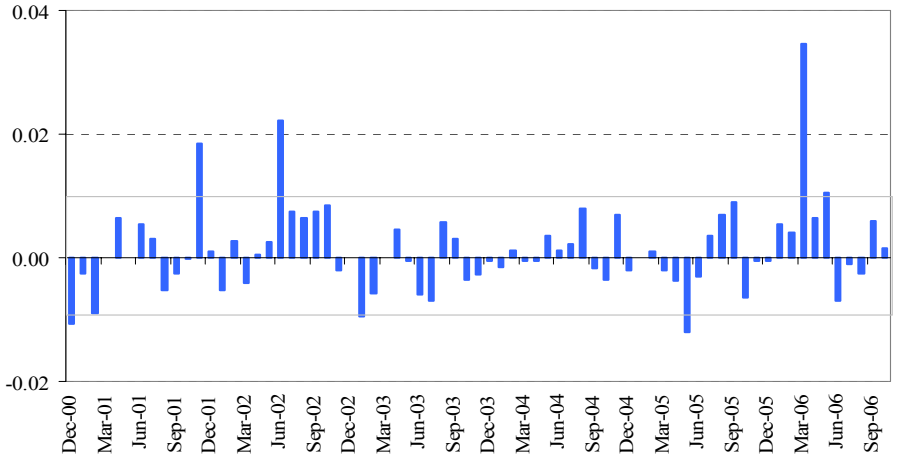
These results illustrate a number of important points. First, interest rates at 1-5 year maturities do appear to react to M3 surprises. Hence the news in the monetary developments press release is interpreted by market participants as having implications for monetary policy decisions, but at medium rather than shorter horizons. Second, the way the markets interpret the news in monetary developments is contingent on how the ECB communicates its own monetary analysis and its broader assessment of the economic situation and outlook for monetary policy. For example, by focusing on stocks rather than growth rates, the ECB inevitably plays down the importance of the news in the latest press release. Third, over time the ECB has increasingly emphasized that it is the lower frequency signal in money that is most relevant for interest rate decisions. By construction, this low frequency component is persistent in nature – it does not change much on a month-to-month basis and thus the "news" in the latest press release – defined as the surprise in headline annual M3 growth – is of less relevance (and will thus have less impact on market rates). In principle, given the ECB's approach, one should try to construct the "news" in the latest press release about the low frequency trend rate of monetary expansion (which is not directly observable and may be quite different to the surprise in headline M3 growth). Overall, with these interpretations in mind, one would expect the relationship between M3 surprises and market rates to be episodic rather than systematic – becoming of greater importance when turning points in the underlying trend rate of monetary expansion may be being reached. Such a view is consistent with the empirical evidence shown here.

V.3. The long-term segment of the yield curve: 10 year rates

M3 surprises have a statistically significant impact on 10 year the interest rate, although the magnitude of the reaction is smaller as that of the 1-5 year rates (see Table 2). Broadly speaking, the pattern of responses over time is similar (see charts 8 and 9)[14].

[14] To cross-check this pattern, a rolling regression with the alternative dataset is furnished in Appendix (see charts A4).

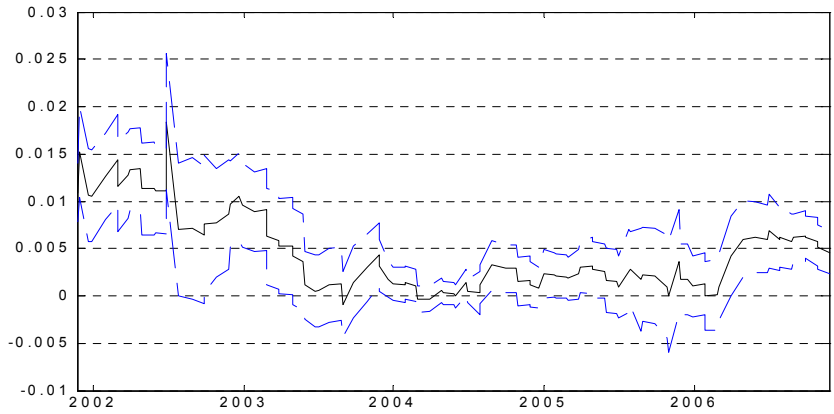
Chart 8
Changes in 10 years interest rates
(in percentages; standard deviations are in grey)



Note: the magnitude of the reaction on March 2006, the 30th, is not due to M3 but to a very strong surprise in the IFO data.

The dampened responses of 10-year rates to M3 surprises – and more generally, the fading response over maturities - suggests that market participants are confident that the ECB will react to the information in money in a manner that stabilises longer-term inflation expectations and secures price stability over the medium term. In this respect, it has to be borne in mind that while the ECB has sometimes been criticized for a *level* of actual and expected inflations slightly above the threshold of 2% - the objective of the ECB is to be below in a medium-term -, the *volatility* of both actual annual growth rate of inflation in average on one year and expected annual growth rate of inflation in a long-run (10 years) is extremely low, much lower for instance than the volatility of actual growth or of the expected potential growth. Therefore, it is logical to observe only a slight impact of the M3 press release on the long-term maturities.

Chart 9
Elasticity of 10Y-rates to M3 press release
(with confidence interval of 2 standard deviations)



Of course, this interpretation should be taken with a grain of caution, since the impact of all macro-economic news' tend to fade on the long end of the yield curve, as shown for instance by Fleming and Remolona (1997), Balduzzi et al. (2001). The traditional explanation is that the longer the maturity, the higher the uncertainty. But we also think that in the case of most macro-economic news, the credibility of the authorities might play a role.

V.4. Re-estimation of the elasticity of market rates to M3 and IFO press releases using a space-state representation

One could argue that the rolling-regression is not the best way to detect time variation, for instance because the results depend on the selected window. If we carry out the same exercise with an 18-months window, as in Ehrmann and Fratzcher (2002), the shape of the curve remains the same, with confidence interval bands merely less volatile. In order to check again the robustness of these results, we re-write the model using a space-state representation, in order to estimate time-varying elasticities of swap rates to M3 and IFO press releases.

The space-state form of the model is as follows, where (3) is the measurement equation and (4) is the corresponding transition equation:

$$\Delta i_t = G_t \begin{pmatrix} \Delta M_t \\ \Delta IFO_t \end{pmatrix} + \varepsilon_t \ , \qquad \textit{(equation 3)}$$

$$G_t = G_{t-1} + \upsilon_t \ , \qquad \textit{(equation 4)}$$

with ε_t and υ_t denoting vectors of mean zero and Gaussian disturbances respectively. The unobserved state vector is assumed to move over time as a first-order vector autoregression. The results are presented in the Appendix (charts A2) are in line with these of the rolling regression (charts A3). They clearly show that there is a time variation of the parameters as found, among others, by Ehrmann and Fratzscher (2002) and Andersen et al. (2005). The aim of this space-state representation is no more than considering an alternative measurement of time-varying coefficients. This is the reason why we only present a graphical output of this exercise.

The recursive estimation of time coefficients using a Kalman filter do not exhibit different pattern of the elasticities of swap rates to M3 press release. In particular, the time-varying elasticity of 2Y-rates to M3 news seems to decrease with respect to time and exhibits a slight recovery over the very recent period.

VI. Conclusion

The empirical exercise conducted in this study suggests that the "surprise" component of the monetary developments press release prompts a response in money market interest rates, but only on the medium and possibly longer maturities. On the 1-2 year segment, the amplitude of the reaction is even comparable to that of IFO. As for the longer maturities, one can reasonably argue that if the market operators believe in an appropriate reaction of the ECB to the economic developments, they have few reasons to revise their inflation expectations on such horizon. That would explain the dampened impact on the long-end of the yield curve.

This sheds a new light on the view, held by some critics of the ECB, that the monetary analysis would be a purely rhetorical exercise which would not influence actual interest rate decisions. Actually, our results tend to show the opposite: the credibility of the ECB in terms of monetary analysis remains strong: its constant message has been to emphasize on the low frequency signal contained in monetary developments about the outlook for price stability over the medium to longer term. Viewed in this light, one would not expect the month-to-month "news" in headline M3 growth to have much influence on short-term rates.

However, one could argue that the impact of M3 news on the interest rates has declined over time, even on the medium-term maturities. In this respect, it should be born in mind that:

(a) the relevant "news" in the monetary developments press release concerns the implications of the new data for the ECB's own assessment of the underlying (low frequency) rate of monetary expansion. The relationship between this (unobservable) surprise (of relevance to policy decisions) and the (observable) surprise in headline annual M3 growth may be complex; a window time of 15 minutes – or even more - might be not enough to analyze all the content in information such as the press release on monetary developments.

(b) the bivariate relationship between M3 surprises and market expectations of policy rates is likely to be episodic rather than systematic, since it will depend on the economic context and the ECB's approach to communication at the time. In this respect, there is a field for new researches, namely in the direction of non-linear econometrics. One could also try to improve the regression by adding possible omitted variable, such as market expectations and, more precisely, a measure of the uncertainty about the future path of interest rates.

Overall, the empirical results presented here are consistent with the view that, after a learning period that lasted through the middle of 2001, market participants have come to better understand the nature of the ECB's approach to monetary analysis and its likely implications for the course of monetary policy.

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Appendix

Table A1: M3 and IFO release dates

M3	IFO	M3	IFO	M3	IFO	M3	IFO
	15/12/2000	26/04/2002			18/12/2003	31/05/2005	
29/12/2000			27/05/2002	30/12/2003			27/06/2005
	22/01/2001	31/05/2002			27/01/2004	28/06/2005	
26/01/2001			25/06/2002	29/01/2004			26/07/2005
	21/02/2001	27/06/2002			24/02/2004	28/07/2005	
28/02/2001		25/07/2002	25/07/2002	26/02/2004			25/08/2005
	21/03/2001	28/08/2002	28/08/2002	26/03/2004	26/03/2004	26/08/2005	
28/03/2001			25/09/2002		26/04/2004	27/09/2005	27/09/2005
	23/04/2001	26/09/2002		29/04/2004			25/10/2005
30/04/2001		28/10/2002	28/10/2002		25/05/2004	28/10/2005	
	22/05/2001		26/11/2002	28/05/2004			24/11/2005
30/05/2001		28/11/2002			25/06/2004	29/11/2005	
	22/06/2001		18/12/2002	28/06/2004			16/12/2005
29/06/2001		30/12/2002			27/07/2004	29/12/2005	
	23/07/2001	28/01/2003	28/01/2003	28/07/2004			25/01/2006
26/07/2001			25/02/2003	26/08/2004	26/08/2004	27/01/2006	
	22/08/2001	27/02/2003		27/09/2004	27/09/2004		23/02/2006
28/08/2001			26/03/2003		25/10/2004	27/02/2006	
	21/09/2001	28/03/2003		28/10/2004		28/03/2006	28/03/2006
27/09/2001			28/04/2003		25/11/2004	28/04/2006	28/04/2006
	19/10/2001	29/04/2003		26/11/2004		30/05/2006	30/05/2006
26/10/2001			26/05/2003		17/12/2004		27/06/2006
	21/11/2001	28/05/2003		30/12/2004		29/06/2006	
27/11/2001			25/06/2003		26/01/2005		26/07/2006
	17/12/2001	30/06/2003		28/01/2005		28/07/2006	
28/12/2001		28/07/2003	28/07/2003		23/02/2005		24/08/2006
28/01/2002	28/01/2002		26/08/2003	25/02/2005		28/08/2006	
	26/02/2002	28/08/2003			23/03/2005		26/09/2006
27/02/2002		25/09/2003	25/09/2003	30/03/2005		27/09/2006	
	26/03/2002	28/10/2003	28/10/2003		25/04/2005		25/10/2006
28/03/2002			25/11/2003	27/04/2005		27/10/2006	
	25/04/2002	27/11/2003			25/05/2005		23/11/2006

Table A2: Mean Test on the 'News'

Null Hypothesis: mean = 0

	Standard Deviation	Mean	t-statistic	Probability
Surprises in M3, constructed with the mean expectation	0.38	0.14	3.15	0.002
Surprises in M3, constructed with the median expectation	0.38	0.15	3.21	0.002
Surprises in IFO, constructed with the mean expectation	1.19	0.19	1.35	0.17
Surprises in IFO, constructed with the median expectation	1.18	0.18	1.27	0.20

Tables A3-A4: Autocorrelation test (Ljung-Box) on the 'News'

Null Hypothesis: no autocorrelation up to order k

Surprises in M3, constructed with the mean expectation					Surprises in M3, constructed with the median expectation				
Order k	AC	PAC	Q-Stat	Prob.	Order k	AC	PAC	Q-Stat	Prob.
1	-0.02	-0.02	0.027	0.87	1	-0.05	-0.05	0.157	0.69
2	-0.08	-0.08	0.476	0.78	2	-0.07	-0.07	0.539	0.76
3	-0.03	-0.04	0.551	0.90	3	-0.03	-0.04	0.601	0.90
4	-0.14	-0.15	2.162	0.70	4	-0.17	-0.18	2.754	0.60
5	-0.10	-0.11	2.877	0.71	5	-0.09	-0.12	3.427	0.63
6	0.11	0.08	3.832	0.69	6	0.13	0.10	4.838	0.57
12	-0.07	-0.16	11.833	0.45	12	-0.05	-0.14	14.90	0.25

Surprises in IFO, constructed with the mean expectation					Surprises in IFO, constructed with the median expectation				
Order k	AC	PAC	Q-Stat	Prob.	Order k	AC	PAC	Q-Stat	Prob.
1	0.17	0.17	2.079	0.15	1	0.16	0.16	1.829	0.18
2	0.05	0.02	2.281	0.32	2	0.03	0.01	1.895	0.39
3	0.25	0.25	7.218	0.07	3	0.24	0.24	6.092	0.11
4	0.04	-0.05	7.314	0.12	4	0.03	-0.05	6.155	0.19
5	0.04	0.03	7.419	0.19	5	0.03	0.03	6.207	0.29
6	0.14	0.07	8.969	0.18	6	0.13	0.07	7.450	0.28
12	0.03	-0.03	12.742	0.39	12	0.026	-0.048	11.198	0.512

Tables A5: Wald test of the constant in equation 1

Null Hypothesis: the constant is equal to zero

	2 weeks	1 month	2 months	3 months	6 months	1 year	2 years	5 years	10 years
Estimate of the constant	-0.0004	0.001	-0.001	0.0003	0.0007	0.0009	0.0017	0.0015	0.0009
F-statistic	0.61	0.0001	1.15	0.18	0.45	0.26	0.56	0.40	0.33
Probability	0.43	0.90	0.28	0.67	0.50	0.60	0.45	0.53	0.56

Tables A6-A10: M3 surprises built with *mean* expectations

9:55-10:05 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.004	0.004	0.003	0.006	0.007	0.009	0.010	0.011	0.008
Lagged endogenous variable (coeff ρ)	0.071	-0.010	-0.129	-0.097	**-0.560**	-0.229	-0.155	-0.216	0.036
($\Delta i_{T,t^*}$ t-stat)	1.25	0.17	1.16	1.25	2.53	1.70	0.72	1.10	0.17
M3 Surprise Elasticity (coeff α)	-0.001	0.000	0.001	0.002	0.005	**0.008**	**0.007**	**0.010**	**0.004**
(M3 t-stat)	1.02	0.04	0.78	1.57	1.88	2.67	2.51	3.37	2.24
IFO Surprise Elasticity (coeff β)	-0.001	0.000	0.000	**0.002**	**0.002**	**0.004**	**0.006**	**0.006**	**0.004**
(IFO t-stat)	1.38	0.60	1.50	2.36	3.95	6.22	6.79	5.55	5.45
Lagged M3 Surprise Elasticity (coeff α_1)	0.001	0.000	0.000	0.001	0.000	0.001	0.003	0.001	0.003
(M3 t-stat)	1.10	0.06	0.14	0.75	0.21	0.57	1.24	0.30	1.14
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
(IFO t-stat)	0.97	1.37	1.20	0.80	1.42	1.00	1.34	0.93	1.72
Volatility Elasticity (coeff γ)	0.000	0.000	**-0.001**	0.000	0.001	0.002	0.001	0.002	0.001
(t-stat)	0.57	0.75	2.16	0.57	0.91	1.45	0.36	0.81	0.99
Direction Elasticity (coeff δ)	0.001	-0.001	-0.001	-0.002	-0.001	0.000	0.000	-0.001	-0.001
(t-stat)	1.60	0.77	0.62	1.44	0.40	0.02	0.04	0.49	0.86
Friday Elasticity (coeff φ)	0.001	0.001	**0.001**	0.000	0.000	-0.001	0.000	0.000	0.000
(t-stat)	1.11	1.04	2.70	0.41	0.09	0.75	0.28	0.07	0.15
R^2	0.01	0.04	0.05	0.07	0.24	0.25	0.26	0.21	0.24

9:55-10:10 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.006	0.004	0.003	0.006	0.008	0.012	0.012	0.013	0.009
Lagged endogenous variable (coeff ρ)	-0.213	0.062	0.004	-0.347	**-0.558**	-0.316	-0.178	-0.256	0.038
($\Delta i_{T,t^*}$ t-stat)	1.49	1.07	0.03	1.49	2.20	1.90	0.99	1.49	0.18
M3 Surprise Elasticity (coeff α)	-0.003	-0.002	0.002	0.003	0.006	**0.014**	**0.015**	**0.012**	**0.007**
(M3 t-stat)	1.43	1.19	1.53	1.64	1.92	3.67	5.03	4.08	3.74
IFO Surprise Elasticity (coeff β)	0.000	0.000	0.001	**0.002**	**0.004**	**0.005**	**0.007**	**0.007**	**0.005**
(IFO t-stat)	0.57	0.66	1.86	2.71	4.79	4.79	6.71	6.05	5.05
Lagged M3 Surprise Elasticity (coeff α_1)	0.003	0.001	-0.001	0.001	0.000	-0.001	0.003	0.001	0.003
(M3 t-stat)	1.73	0.84	0.94	0.92	0.38	0.23	1.16	0.43	1.04
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	0.000	0.000	0.000	-0.002	**-0.003**	-0.002	-0.001	**-0.001**
(IFO t-stat)	0.11	0.70	0.78	0.70	1.86	2.03	1.71	1.39	2.02
Volatility Elasticity (coeff γ)	0.000	0.000	**-0.001**	0.000	0.000	0.002	0.001	0.001	0.001
(t-stat)	0.44	0.18	2.45	0.13	0.48	1.13	0.65	0.66	0.65
Direction Elasticity (coeff δ)	0.002	0.000	-0.001	-0.001	-0.001	0.000	-0.001	-0.002	-0.002
(t-stat)	1.93	0.40	0.53	0.72	0.45	0.08	0.22	0.90	1.07
Friday Elasticity (coeff φ)	0.000	0.000	**0.001**	0.000	0.000	-0.001	0.000	-0.001	0.000
(t-stat)	0.66	0.23	2.07	0.33	0.40	0.70	0.02	0.30	0.31
R^2	0.08	0.01	0.03	0.14	0.30	0.25	0.31	0.28	0.26

9:55-10:15 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.005	0.006	0.009	0.012	0.013	0.013	0.009
Lagged endogenous variable (coeff ρ)	-0.197	0.010	-0.062	-0.313	-0.534	-0.257	-0.213	-0.297	0.006
($\Delta i_{T,t^*}$ t-stat)	1.78	0.19	0.25	1.43	1.90	1.52	1.15	1.63	0.03
M3 Surprise Elasticity (coeff α)	-0.002	-0.001	0.002	0.005	0.007	**0.015**	**0.013**	**0.012**	**0.006**
(M3 t-stat)	0.86	0.33	1.10	1.65	1.98	3.62	4.36	4.41	3.31
IFO Surprise Elasticity (coeff β)	0.000	0.000	**0.001**	**0.002**	**0.003**	**0.005**	**0.007**	**0.008**	**0.005**
(IFO t-stat)	0.19	0.23	2.26	2.98	4.83	5.05	6.76	6.20	5.43
Lagged M3 Surprise Elasticity (coeff α_1)	0.002	0.001	0.000	0.001	0.000	0.000	0.003	0.003	0.004
(M3 t-stat)	1.05	0.64	0.08	0.77	0.01	0.02	1.23	0.85	1.46
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	**-0.002**
(IFO t-stat)	0.18	0.92	0.56	1.08	1.55	1.80	1.93	1.63	2.07
Volatility Elasticity (coeff γ)	0.000	0.000	-0.001	0.000	0.001	0.001	0.002	0.001	0.001
(t-stat)	0.81	0.03	1.08	0.44	0.70	0.53	0.77	0.66	0.60
Direction Elasticity (coeff δ)	**0.003**	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
(t-stat)	2.56	0.76	1.62	0.69	0.44	0.23	0.24	0.58	0.54
Friday Elasticity (coeff φ)	0.001	0.000	0.001	0.000	0.000	0.000	-0.001	-0.001	0.000
(t-stat)	1.20	0.15	1.25	0.05	0.42	0.23	0.58	0.40	0.30
R^2	0.08	0.04	0.06	0.13	0.22	0.25	0.29	0.28	0.24

9:55-10:20 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.005	0.006	0.007	0.008	0.012	0.014	0.014	0.010
Lagged endogenous variable (coeff ρ)	**-0.280**	0.081	-0.061	-0.308	-0.440	-0.194	-0.201	-0.229	0.072
($\Delta i_{T,t^*}$ t-stat)	2.98	1.74	0.24	1.41	1.82	1.14	0.81	1.03	0.31
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.003	0.004	**0.007**	**0.013**	**0.012**	**0.011**	**0.006**
(M3 t-stat)	0.67	0.53	1.25	1.56	2.15	3.10	3.07	3.76	2.65
IFO Surprise Elasticity (coeff β)	0.000	0.000	**0.002**	**0.002**	**0.004**	**0.004**	**0.007**	**0.007**	**0.005**
(IFO t-stat)	0.00	0.44	2.07	3.09	4.41	4.30	6.54	5.63	5.57
Lagged M3 Surprise Elasticity (coeff α_1)	0.002	0.001	0.000	0.001	0.000	0.000	0.003	0.003	0.004
(M3 t-stat)	1.17	0.62	0.01	0.52	0.07	0.05	1.10	0.80	1.57
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	-0.001	-0.001	-0.001	-0.002	-0.002	**-0.003**	-0.002	-0.001
(IFO t-stat)	0.64	1.04	1.09	1.30	1.69	1.33	2.52	1.78	1.66
Volatility Elasticity (coeff γ)	-0.001	0.000	-0.001	0.001	0.001	0.002	0.001	0.002	0.001
(t-stat)	1.78	0.22	0.81	0.59	0.90	1.15	0.53	0.69	0.70
Direction Elasticity (coeff δ)	**0.003**	-0.001	-0.003	-0.001	-0.002	-0.001	0.000	-0.001	-0.001
(t-stat)	2.80	1.02	1.61	0.40	0.93	0.20	0.12	0.43	0.40
Friday Elasticity (coeff φ)	0.001	0.000	0.001	-0.001	-0.001	-0.001	0.000	-0.001	-0.001
(t-stat)	1.21	0.15	1.07	0.43	1.00	0.80	0.15	0.61	0.45
R^2	0.13	0.00	0.06	0.11	0.23	0.17	0.25	0.24	0.23

9:55-10:25 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.006	0.005	0.006	0.009	0.008	0.015	0.015	0.014	0.011
Lagged endogenous variable (coeff ρ)	**-0.282**	0.068	-0.107	-0.243	-0.135	**-0.402**	-0.187	-0.260	0.135
($\Delta i_{T,t}$ t-stat)*	2.67	1.36	0.39	1.07	1.08	1.97	0.78	1.14	0.58
M3 Surprise Elasticity (coeff α)	-0.001	0.000	0.003	0.004	0.005	**0.014**	**0.013**	**0.010**	**0.004**
(M3 t-stat)	0.28	0.09	1.17	1.25	1.87	3.07	3.42	3.22	1.85
IFO Surprise Elasticity (coeff β)	0.000	0.000	**0.001**	**0.003**	**0.003**	**0.006**	**0.007**	**0.007**	**0.005**
(IFO t-stat)	0.36	1.09	2.31	3.47	3.99	4.67	5.91	5.54	5.30
Lagged M3 Surprise Elasticity (coeff α_1)	0.001	0.000	0.000	0.001	0.000	0.003	0.005	0.004	0.005
(M3 t-stat)	0.29	0.10	0.29	0.43	0.20	0.83	1.40	1.08	1.93
Lagged IFO Surprise Elasticity (coeff β_1)	0.000	-0.001	-0.001	-0.001	-0.001	-0.003	-0.003	-0.002	-0.001
(IFO t-stat)	0.53	0.88	1.21	1.31	1.16	1.86	1.98	1.85	1.44
Volatility Elasticity (coeff γ)	-0.001	-0.001	0.000	0.000	0.001	0.002	0.002	0.002	0.001
(t-stat)	1.41	0.92	0.22	0.18	0.61	1.18	0.66	0.85	0.67
Direction Elasticity (coeff δ)	**0.004**	-0.001	0.000	-0.001	-0.001	-0.002	0.000	-0.001	-0.001
(t-stat)	3.04	0.53	0.02	0.41	0.69	0.42	0.13	0.33	0.32
Friday Elasticity (coeff φ)	0.000	0.001	0.000	0.000	-0.001	-0.003	-0.001	-0.002	-0.001
(t-stat)	0.35	0.97	0.32	0.23	0.41	1.56	0.36	0.76	0.34
R^2	0.09	0.02	0.01	0.07	0.09	0.20	0.24	0.22	0.18

Tables A11-A15: M3 surprises built with *median* expectations (equation 2)

9:55-10:05 *median expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.004	0.004	0.003	0.006	0.007	0.009	0.010	0.011	0.008
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0008	0.0020	0.0041	**0.0091**	**0.0078**	**0.0093**	**0.0041**
(M3 t-stat)	-0.38	-0.12	0.86	1.94	1.76	2.67	2.37	2.98	2.16
IFO Surprise Elasticity (coeff β)	-0.001	0.001	0.0003	**0.0017**	**0.0020**	**0.0041**	**0.0057**	**0.0056**	**0.0045**
(IFO t-stat)	-1.20	0.60	1.26	2.03	3.39	6.00	6.31	5.07	4.96
R^2	0.02	0.01	0.01	0.09	0.10	0.22	0.26	0.21	0.23

9:55-10:10 *median expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.003	0.006	0.008	0.012	0.012	0.013	0.009
M3 Surprise Elasticity (coeff α)	-0.003	-0.002	0.0014	0.0037	0.0042	**0.0137**	**0.0148**	**0.0108**	**0.0070**
(M3 t-stat)	-1.10	-1.54	1.28	1.88	1.37	3.28	4.36	3.30	3.70
IFO Surprise Elasticity (coeff β)	-0.001	0.0004	0.0006	**0.0012**	**0.0034**	**0.0041**	**0.0066**	**0.0071**	**0.0048**
(IFO t-stat)	-1.01	0.83	1.41	2.26	4.22	4.21	6.51	5.56	4.67
R^2	0.03	0.03	0.03	0.07	0.19	0.21	0.31	0.29	0.25

9:55-10:15 *median expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.005	0.006	0.009	0.012	0.013	0.013	0.009
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0008	0.0044	0.0056	**0.0148**	**0.0122**	**0.0099**	**0.0051**
(M3 t-stat)	-0.55	-0.56	0.50	1.66	1.62	3.37	3.91	3.53	3.00
IFO Surprise Elasticity (coeff β)	-0.001	0.001	0.0013	0.0016	0.0031	0.0043	0.0069	0.0073	0.0048
(IFO t-stat)	-0.69	0.28	1.93	**2.68**	**4.78**	**4.62**	**6.54**	**5.64**	**4.95**
R^2	0.01	0.01	0.05	0.08	0.14	0.23	0.28	0.28	0.23

9:55-10:20 *median expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.005	0.006	0.007	0.009	0.012	0.014	0.014	0.010
M3 Surprise Elasticity (coeff α)	-0.002	-0.001	0.0014	0.0040	0.0046	**0.0135**	**0.0113**	**0.0095**	**0.0059**
(M3 t-stat)	-0.62	-0.71	0.63	1.50	1.71	3.02	2.54	3.11	2.83
IFO Surprise Elasticity (coeff β)	-0.001	0.0004	0.0015	**0.0019**	**0.0036**	**0.0043**	**0.0073**	**0.0072**	**0.0053**
(IFO t-stat)	-0.83	0.79	1.78	2.71	4.10	4.19	6.19	5.07	4.97
R^2	0.01	0.02	0.06	0.09	0.17	0.18	0.24	0.25	0.23

9:55-10:25 *median expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.006	0.006	0.006	0.009	0.008	0.015	0.015	0.014	0.011
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0028	0.0042	0.0045	**0.0136**	**0.0133**	**0.0086**	0.0047
(M3 t-stat)	-0.34	-0.22	1.07	1.22	1.53	2.90	2.97	2.58	1.96
IFO Surprise Elasticity (coeff β)	-0.001	0.0007	0.0013	**0.0024**	**0.0027**	**0.0052**	**0.0072**	**0.0070**	**0.0052**
(IFO t-stat)	-0.49	1.36	1.96	3.32	3.99	3.91	5.77	4.99	4.83
R^2	0.01	0.01	0.05	0.08	0.12	0.17	0.23	0.21	0.18

Tables A16-A20: M3 surprises built with *mean* expectations

9:55-10:05 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.004	0.004	0.003	0.006	0.007	0.009	0.010	0.011	0.008
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0007	0.0020	0.0042	**0.0095**	**0.0080**	**0.0097**	**0.0044**
(M3 t-stat)	-0.30	-0.18	0.79	1.88	1.73	2.80	2.33	3.06	2.16
IFO Surprise Elasticity (coeff β)	-0.001	0.0002	0.0003	**0.0017**	**0.0019**	**0.0041**	**0.0057**	**0.0056**	**0.0045**
(IFO t-stat)	-1.20	0.60	1.25	2.02	3.39	6.04	6.39	5.14	5.01
R^2	0.01	0.01	0.01	0.09	0.10	0.23	0.26	0.21	0.23

9:55-10:10 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.003	0.006	0.008	0.012	0.012	0.013	0.009
M3 Surprise Elasticity (coeff α)	-0.003	-0.002	0.001	0.0037	0.0042	**0.0138**	**0.0150**	**0.0111**	**0.0070**
(M3 t-stat)	-1.06	-1.40	1.29	1.88	1.38	3.28	4.39	3.36	3.46
IFO Surprise Elasticity (coeff β)	-0.001	0.001	0.0006	**0.0012**	**0.0034**	**0.0041**	**0.0066**	**0.0071**	**0.0048**
(IFO t-stat)	-1.00	0.83	1.40	2.26	4.21	4.18	6.56	5.60	4.71
R^2	0.03	0.02	0.03	0.07	0.18	0.20	0.31	0.29	0.25

9:55-10:15 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.004	0.005	0.006	0.009	0.012	0.013	0.013	0.009
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0008	0.0045	0.0057	**0.0150**	**0.0123**	**0.0102**	**0.0052**
(M3 t-stat)	*-0.54*	*-0.50*	*0.45*	*1.68*	*1.64*	*3.33*	*3.83*	*3.62*	*2.91*
IFO Surprise Elasticity (coeff β)	-0.001	0.001	0.0013	**0.0015**	**0.0031**	**0.0043**	**0.0069**	**0.0073**	**0.0048**
(IFO t-stat)	-0.68	0.28	1.93	2.69	4.79	4.58	6.55	5.67	4.96
R^2	0.01	0.01	0.05	0.09	0.14	0.23	0.28	0.28	0.23

9:55-10:20 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.005	0.005	0.006	0.007	0.009	0.012	0.014	0.014	0.010
M3 Surprise Elasticity (coeff α)	-0.002	-0.001	0.0014	0.0041	0.0046	**0.0136**	**0.0114**	**0.0096**	**0.0058**
(M3 t-stat)	-0.66	-0.69	0.63	1.52	1.67	2.98	2.53	3.12	2.64
IFO Surprise Elasticity (coeff β)	-0.001	0.0004	0.0015	**0.0019**	**0.0036**	**0.0042**	**0.0073**	**0.0071**	**0.0053**
(IFO t-stat)	-0.82	0.80	1.78	2.71	4.10	4.16	6.22	5.09	4.99
R^2	0.01	0.01	0.05	0.08	0.17	0.18	0.23	0.24	0.22

9:55-10:25 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.006	0.006	0.006	0.009	0.008	0.015	0.015	0.014	0.011
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0026	0.0041	0.0044	**0.0135**	**0.0133**	**0.0085**	0.0045
(M3 t-stat)	-0.37	-0.20	0.99	1.18	1.48	**2.81**	**2.90**	**2.55**	1.80
IFO Surprise Elasticity (coeff β)	-0.000	0.0007	0.0013	**0.0024**	**0.0027**	**0.0052**	**0.0072**	**0.0070**	**0.0052**
(IFO t-stat)	-0.48	1.360	1.96	3.33	3.98	3.90	5.79	5.01	4.84
R^2	0.01	0.01	0.04	0.07	0.12	0.17	0.2305	0.21	0.17

Tables A21-A25: M3 surprises built with *mean* expectations and *relative* variation of swap rates

9:55-10:05 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.0013	0.0012	0.0009	0.0020	0.0019	0.0027	0.0030	0.0028	0.0019
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0002	0.0005	0.0010	**0.0027**	**0.0020**	**0.0023**	**0.0011**
(M3 t-stat)	-0.55	-0.15	0.87	1.10	1.36	2.78	2.15	3.27	2.42
IFO Surprise Elasticity (coeff β)	-0.001	0.0001	0.0001	0.0006	**0.0006**	**0.0013**	**0.0018**	**0.0015**	**0.0011**
(IFO t-stat)	-1.10	0.93	1.10	1.76	3.34	7.61	7.63	5.43	5.14
R^2	0.00	-0.01	-0.02	0.08	0.08	0.21	0.28	0.22	0.24

9:55-10:10 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.0018	0.0012	0.0010	0.0017	0.0022	0.0036	0.0035	0.0033	0.0021
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0005	0.0010	0.0010	**0.0041**	**0.0042**	**0.0027**	**0.0017**
(M3 t-stat)	-1.31	-1.78	1.64	1.93	1.19	3.84	5.18	3.61	3.55
IFO Surprise Elasticity (coeff β)	-0.001	0.0001	0.0002	**0.0004**	**0.0011**	**0.0013**	**0.0020**	**0.0020**	**0.0012**
(IFO t-stat)	-0.80	0.86	1.29	2.18	4.82	3.97	7.71	6.28	5.00
R^2	0.06	0.02	0.00	0.05	0.21	0.21	0.35	0.31	0.27

9:55-10:15 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.0017	0.0013	0.0015	0.0017	0.0025	0.0035	0.0037	0.0034	0.0022
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0001	0.0012	0.0014	**0.0045**	**0.0035**	**0.0025**	**0.0012**
(M3 t-stat)	-0.87	-0.96	0.25	1.80	1.53	3.85	4.15	3.85	3.15
IFO Surprise Elasticity (coeff β)	0.0001	0.0001	0.0004	**0.0005**	**0.0010**	**0.0014**	**0.0022**	**0.0020**	**0.0012**
(IFO t-stat)	-0.25	0.44	1.96	2.73	5.42	4.78	7.55	6.49	5.36
R^2	0.00	0.00	0.03	0.09	0.16	0.25	0.32	0.30	0.26

9:55-10:20 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.0018	0.0015	0.0018	0.0020	0.0024	0.0038	0.0041	0.0035	0.0024
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0003	0.0011	0.0011	**0.0040**	**0.0031**	**0.0024**	**0.0013**
(M3 t-stat)	-1.00	-1.25	0.48	1.58	1.49	3.26	2.78	3.32	2.64
IFO Surprise Elasticity (coeff β)	-0.001	0.0002	0.0005	**0.0006**	**0.0012**	**0.0014**	**0.0023**	**0.0020**	**0.0014**
(IFO t-stat)	-0.35	0.92	1.80	**2.66**	**4.77**	**4.27**	**7.27**	**5.70**	**5.31**
R^2	0.02	0.02	0.03	0.07	0.19	0.18	0.29	0.27	0.25

9:55-10:25 *mean expectations*

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.0020	0.0016	0.0018	0.0023	0.0024	0.0044	0.0042	0.0036	0.0026
M3 Surprise Elasticity (coeff α)	-0.001	-0.001	0.0006	0.0010	0.0010	**0.0038**	**0.0036**	**0.0021**	0.0010
(M3 t-stat)	-0.70	-0.72	0.92	1.06	1.16	2.93	3.09	2.66	1.82
IFO Surprise Elasticity (coeff β)	0.0001	0.0002	**0.0004**	**0.0008**	**0.0009**	**0.0017**	**0.0023**	**0.0020**	**0.0013**
(IFO t-stat)	-0.07	1.56	2.18	3.46	4.63	4.26	6.92	5.67	5.31
R^2	-0.01	0.00	0.03	0.09	0.12	0.17	0.27	0.24	0.21

Table A26: descriptive statistics of the swap interest rate data over the whole sample

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	87.6	290.1	275.2	410.1	687.0	1166.2	2661.4	2526.9	3203.6
Average minimum by tick	0.46	1.01	1.02	1.01	0.23	1.47	1.62	2.44	1.97
Average maximum by tick	15.5	5.36	6.65	9.94	81.31	14.53	7.56	5.90	5.97

Table A27: descriptive statistics of the swap interest rate data over time

28/11/2000-03/08/2002

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	17.9	43.2	71.7	119.3	244.4	530.2	811.6	863.1	851.5
Average minimum by tick	1.3	3.0	2.9	3.1	2.7	2.6	2.4	3.7	3.5
Average maximum by tick	15.5	5.4	5.1	9.0	9.7	5.3	5.4	5.9	6.0

04/08/2002-04/01/2003

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	285.0	466.5	576.3	630.7	1038.6	1997.4	3030.3	3404.9	3656.2
Average minimum by tick	0.5	2.5	2.6	2.6	2.4	2.4	1.6	3.3	4.2
Average maximum by tick	4.2	4.7	4.8	4.9	4.1	4.0	4.3	4.8	5.2

06/01/2003-24/05/2003

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	460.0	954.4	480.9	1255.2	872.1	1486.6	3081.3	3706.9	4416.8
Average minimum by tick	2.1	1.7	2.0	1.7	1.8	1.9	2.2	2.8	3.8
Average maximum by tick	4.6	5.0	6.7	3.0	3.8	3.0	3.3	4.2	4.6

26/05/2003-25/10/2003

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	261.2	570.4	595.7	372.1	616.6	1298.8	3324.9	3937.4	4634.3
Average minimum by tick	2.0	1.7	1.8	1.8	1.6	1.5	1.9	2.7	3.5
Average maximum by tick	2.6	2.8	2.6	9.5	17.1	2.8	4.0	4.3	4.6

26/10/2003-03/04/2004

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	41.4	93.3	146.8	201.9	490.6	1217.2	2703.1	2309.6	3072.3
Average minimum by tick	1.9	1.8	1.7	1.8	1.4	1.9	1.9	3.1	4.0
Average maximum by tick	3.0	2.6	2.4	7.8	16.4	14.5	3.5	4.0	4.6

17/04/2004-13/11/2004

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	70.6	139.7	156.3	223.5	321.3	899.3	2664.9	2349.9	2678.0
Average minimum by tick	2.0	1.0	1.0	1.0	0.2	2.0	2.3	2.4	3.9
Average maximum by tick	2.2	2.1	2.1	9.6	10.9	9.4	3.3	3.9	4.6

14/11/2004-24/04/2005

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	19.5	168.9	207.6	264.4	389.4	814.1	2159.7	2073.9	2428.9
Average minimum by tick	2.0	2.0	2.0	2.0	2.0	2.2	2.3	2.9	2.0
Average maximum by tick	2.2	2.2	2.1	2.2	2.2	2.5	2.8	3.5	4.2

25/04/2005-01/10/2005

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	13.9	558.9	501.0	556.2	837.9	921.7	2682.5	2494.8	3494.9
Average minimum by tick	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.6	3.1
Average maximum by tick	2.1	2.1	2.1	2.2	81.3	2.4	2.9	3.0	3.6

02/10/2005-31/12/2005

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	27.4	359.0	515.9	772.3	1570.3	1551.9	4642.1	3461.8	5505.3
Average minimum by tick	2.0	2.1	2.1	2.1	2.1	2.3	2.0	2.8	3.2
Average maximum by tick	2.4	3.3	2.4	3.5	2.6	2.9	3.1	3.4	3.7

01/01/2006-11/06/2006

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	23.9	442.5	337.4	701.9	1429.5	1641.2	4055.4	3344.9	5169.1
Average minimum by tick	2.3	2.1	2.2	2.1	2.5	2.7	2.8	3.1	3.4
Average maximum by tick	2.8	2.9	2.9	9.9	3.3	3.5	4.0	4.0	4.3

11/06/2006-16/12/2006

	2 W	1 M	2 M	3 M	6 M	1 Y	2 Y	5 Y	10 Y
Average daily number of quotes	25.5	346.5	266.2	602.5	1475.3	2420.1	5643.4	4951.0	6764.9
Average minimum by tick	2.0	2.8	2.2	2.8	3.0	3.3	3.5	3.4	2.8
Average maximum by tick	3.7	3.6	3.6	8.5	3.8	4.0	4.0	4.4	4.9

Table A28: comparison of the results obtained from swap interest rates and with that of rates extracted from German bond futures

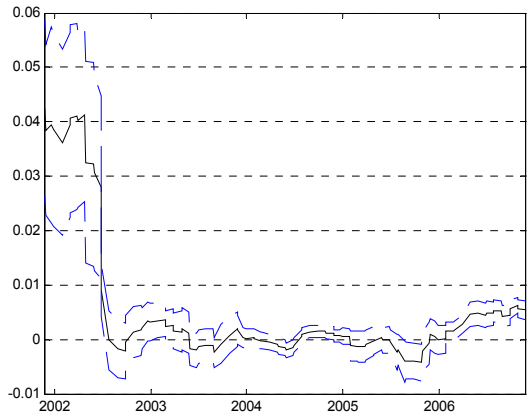
Central scenario (9:55-10:15 *mean expectations*)

	Swap interest rates			German bond futures		
	2 Y	5 Y	10 Y	2 Y	5 Y	10 Y
S.D. of dependent variable	0.013	0.013	0.009	0,013	0,013	0,009
M3 Surprise Elasticity (coeff α)	**0.0123**	**0.0102**	**0.0052**	**0,0150**	**0,0120**	**0,0075**
(M3 t-stat)	*3.83*	*3.62*	*2.91*	2,80	2,69	3,16
IFO Surprise Elasticity (coeff β)	**0.0069**	**0.0073**	**0.0048**	**0,0073**	**0,0068**	**0,0052**
(IFO t-stat)	6.55	5.67	4.96	6,70	5,81	5,12
R^2	0.28	0.28	0.23	0,30	0,30	0,26

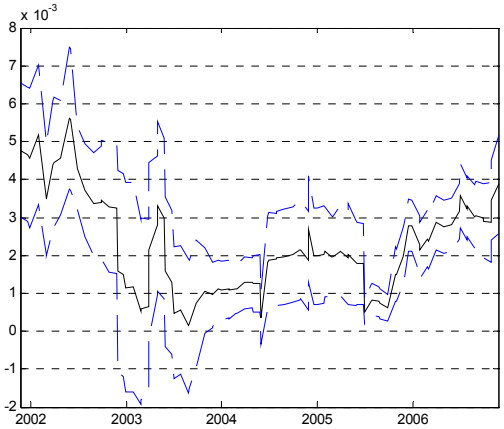
Charts A1: Rolling regression on the coefficient of IFO and M3

9:55-10:15 *mean expectations*

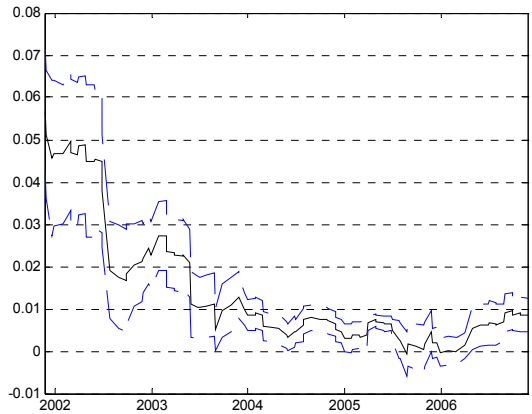
M3 – 6 months



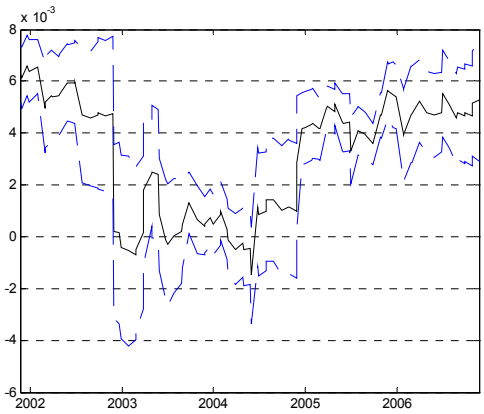
IFO – 6 months



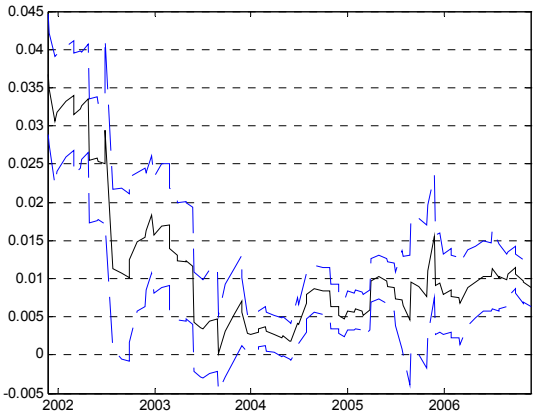
M3 – 1 year



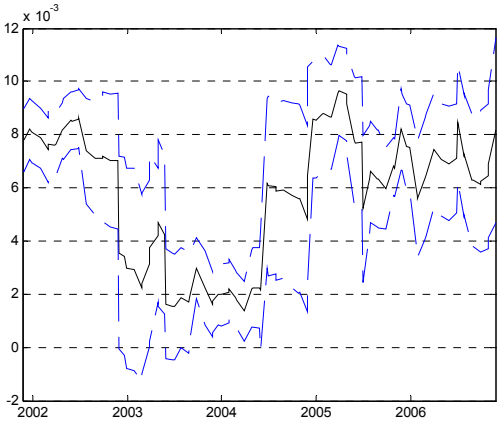
IFO – 1 year



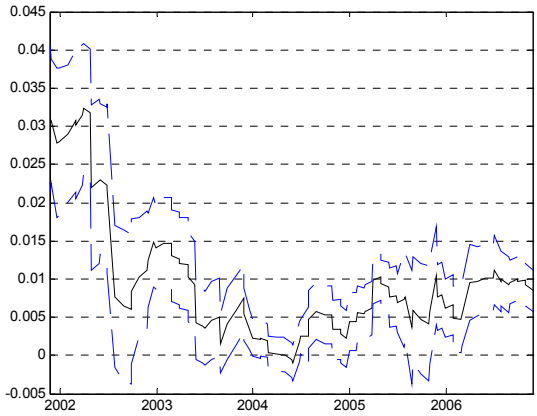
M3 – 2 years



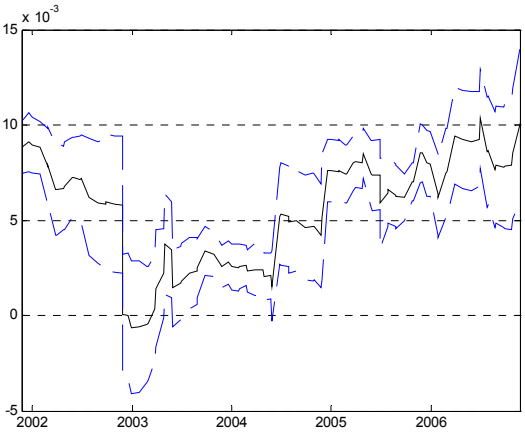
IFO – 2 years



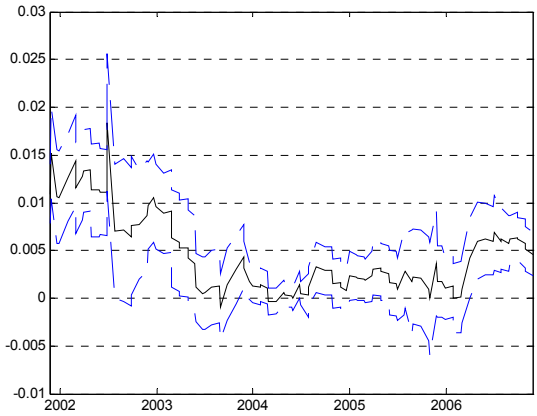
M3 – 5 years



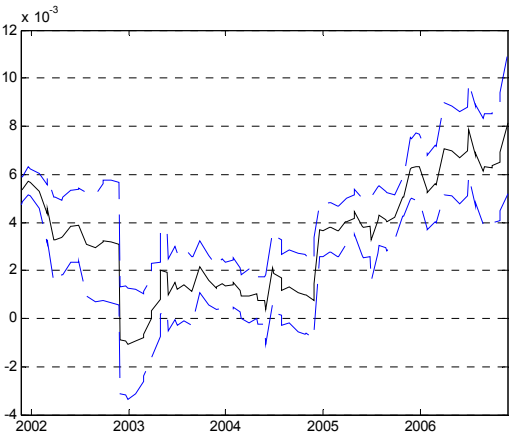
IFO – 5 years



M3 – 10 years



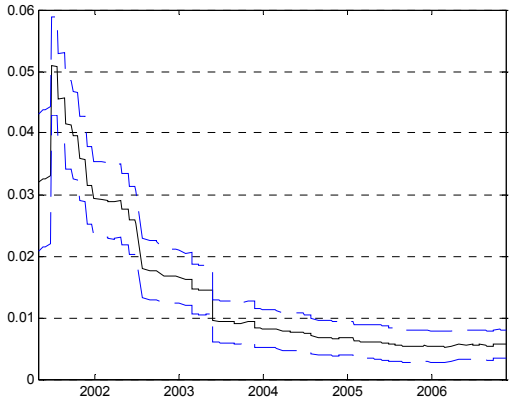
IFO – 10 years



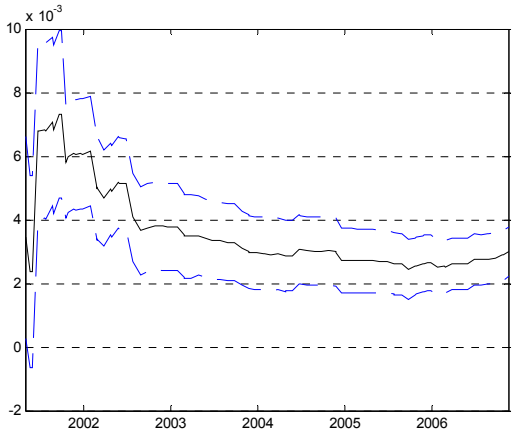
Charts A2: Estimation of time-varying coefficients (equation 3 and equation 4)

9:55-10:15 *mean expectations*

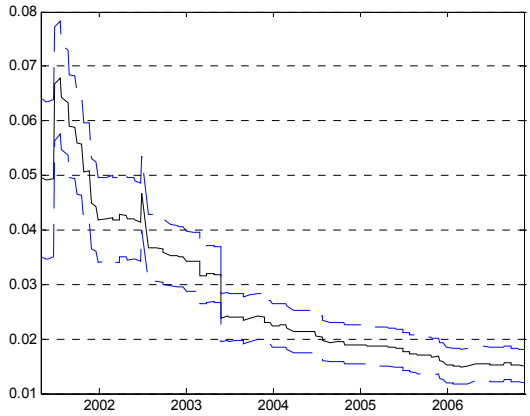
M3 – 6 months



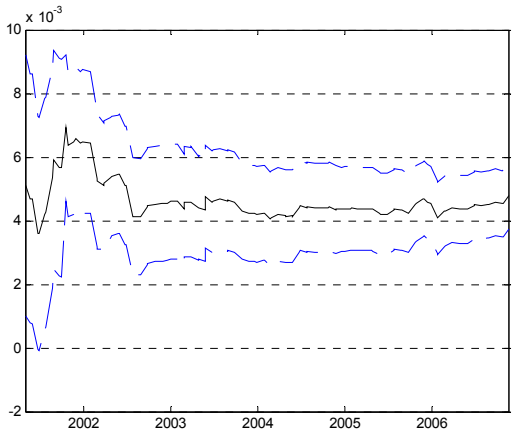
IFO – 6 months



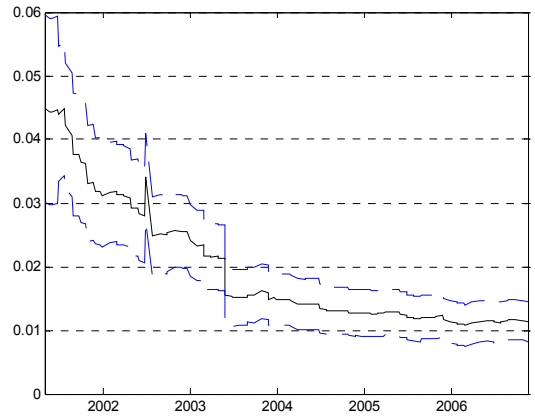
M3 – 1 year



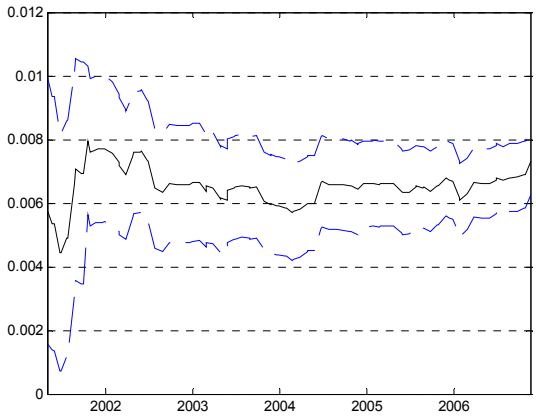
IFO – 1 year



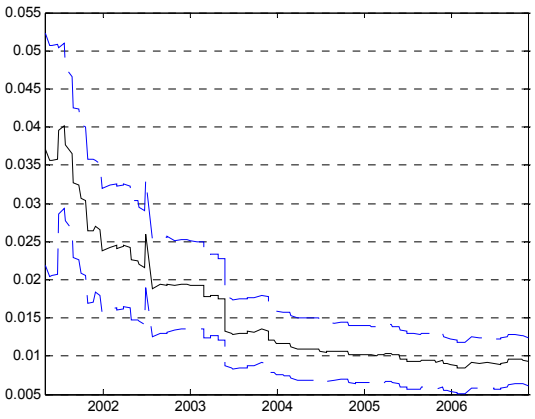
M3 – 2 years



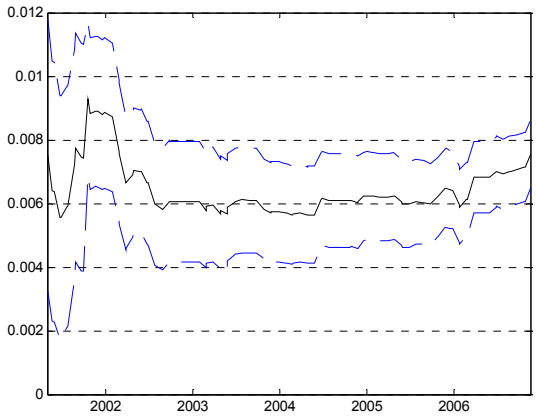
IFO – 2 years



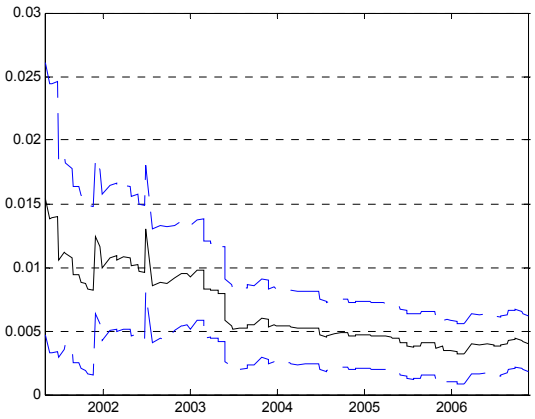
M3 – 5 years



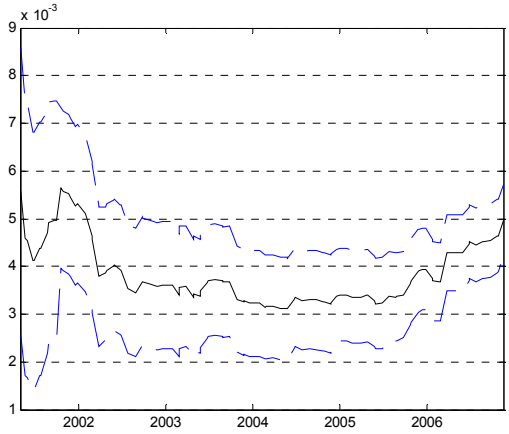
IFO – 5 years



M3 – 10 years



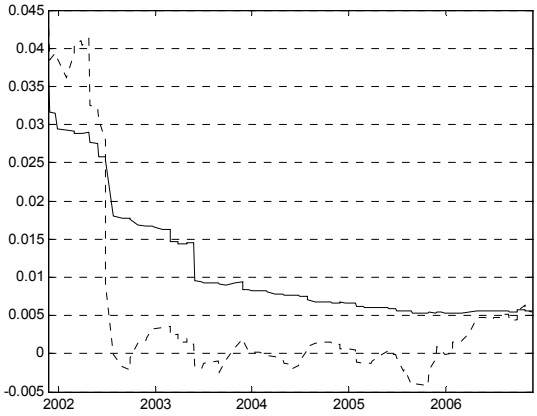
IFO – 10 years



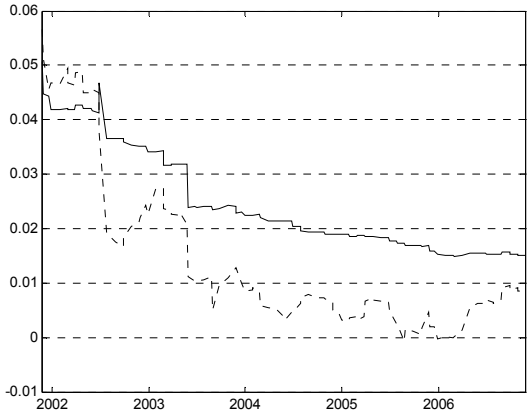
Charts A3: Comparison of rolling regression and time-varying coefficients

9:55-10:15 *mean expectations*

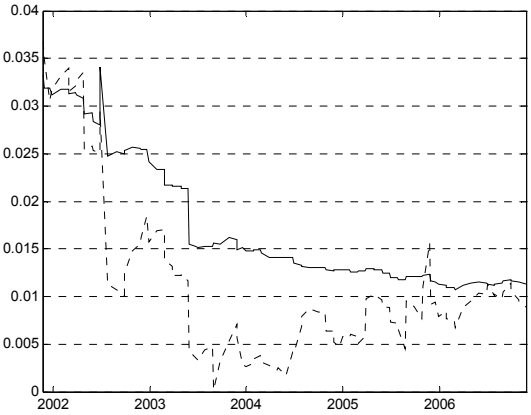
M3 – 6 months



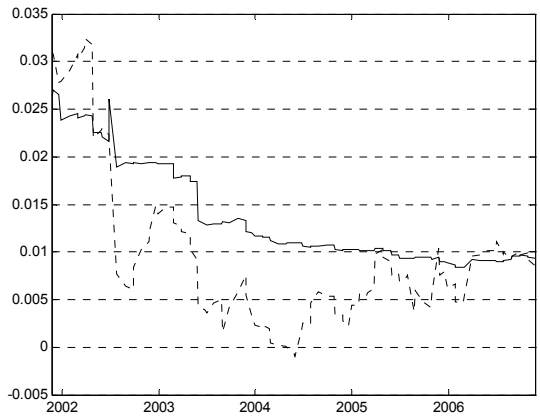
M3 – 1 year



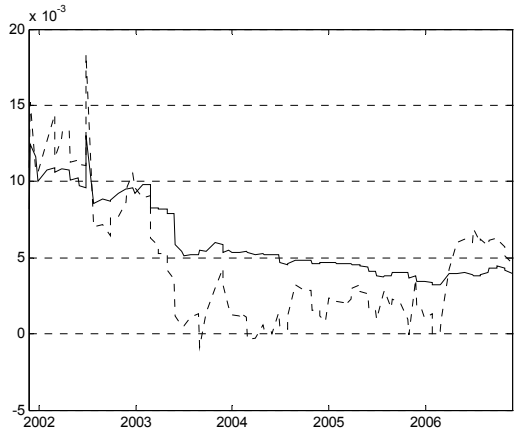
M3 – 2 years



M3 – 5 years



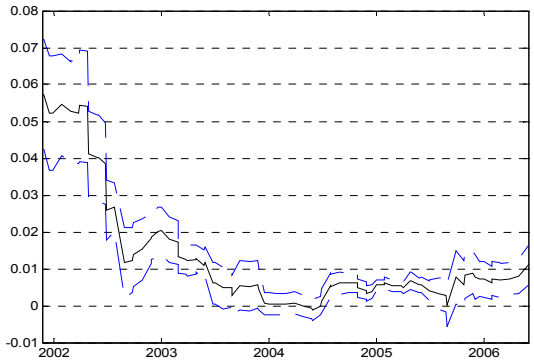
M3 – 10 years



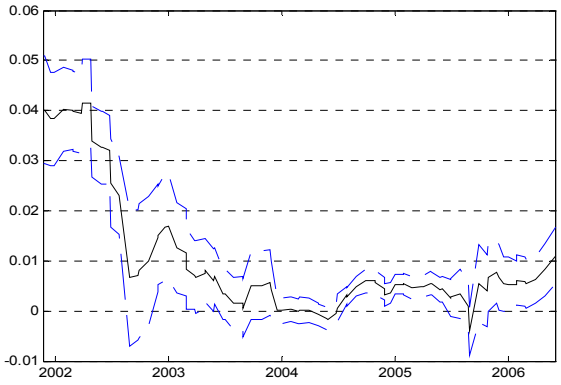
Charts A4: Rolling regression with an alternative dataset

9:55-10:15 *mean expectations*

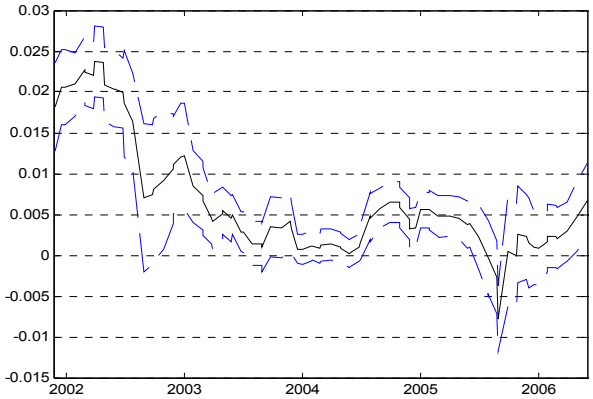
M3 – 2 years



M3 – 5 years



M3 – 10 years



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