

SYNCHRONIZATION OF YIELD CURVES IN THE EURO AREA*

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First Draft
PRELIMINARY AND INCOMPLETE

Abstract

Using high frequency data we study the effects of European Monetary Union on French, German, Italian and Spanish bond markets. In particular we ask whether one can talk of a unified European government bond market and whether this has changed from before the inception of the ECB. The answer is yes on both counts. We also show that Italy and Spain have benefited a lot from having entered the monetary union as these countries' long-term interest rates have become much less volatile and much better anchored after the monetary union.

April 30, 2007

* We thank many people [list to be added] for help with the data and David Thippavong for research assistance. Gürkaynak's research was supported by a Lamfalussy Fellowship, sponsored by the European Central Bank. The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the European Central Bank, the Board of Governors of the Federal Reserve System or the management of the Federal Reserve Bank of San Francisco.

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I. Introduction

The effects of economic and monetary union in Europe have been much debated. Empirical research so far has been more on the impact of customs union. Canova (2006) finds that business cycles have not become more aligned, even after the monetary union, while Rogers (2002) finds that price dispersion has diminished. This paper is focused on the impact of monetary union and studies the evidence from the sovereign bond markets.

We study the effects of European Monetary Union (EMU) in two dimensions. The first is the unification of bond markets. Can one talk about a common European bond market or are there still separate sovereign bond markets? The second issue, even more interesting, is about the benefits of monetary union. Did countries like Italy and Spain enjoy lower volatility in financial markets and better anchoring of expectations? That is, did the Bundesbank credibility carry over to the monetary union in a way that benefited other countries?

If monetary union was effective in creating a single market, it should show up first in bond markets as all sovereign bonds are now in the same currency. In fact, if one is willing to assume a weak form of expectations hypothesis, a successful monetary union will force bond rates of member countries to converge as there is a single monetary authority setting a common short rate. While expectations hypothesis makes a very strong case, even without it in a common money market substitutable bonds in the same currency are tied by an arbitrage argument, up to sovereign risk premium, therefore a successful monetary union should lead to convergence in yields across countries.

We first study whether the sovereign bond markets in France, Germany, Italy and Spain have begun to behave like a single, unified market after the monetary union. We propose two types of tests. The more first is to look at the unconditional correlations between yields of different countries. It is hard to assert that even under a perfect union the yields will be the same as these are still different countries having different ratings and not even all the bonds of the same country always trade in the same way due to liquidity, specialness, etc. Perhaps surprisingly, we find very strong evidence of convergence, even though we use very high frequency data that is prone to market specific noise.

The other test is looking at conditional movements in the yields. In a single bond market, we expect bonds of different countries (at the same maturity) to respond similarly to the same impulse, even if there are differences in levels and bond and country specific noise. We use macroeconomic data surprises from the four countries, and the aggregate EU, UK and US surprises as the conditioning variables. Essentially this test asks whether, say, French and German yields have begun to respond similarly to a surprise increase in the IFO or US nonfarm payrolls.

To preview our findings, it seems that after the monetary union, if a variable is significantly affecting the yields in one country, it is also affecting the yields of other countries as well. This was not the case in the before the monetary union. Overall, we find striking evidence of convergence in bond markets across the four EMU members we study.

Having established convergence, we then turn to the benefits of this. A desired outcome at the time when EMU was conceived was having the countries with less well anchored expectations, and therefore more volatile financial markets, benefit

from a credible monetary policy making framework. We therefore was whether the volatility of long rates, in particular the one year forward rate ending in ten years time, has decreased over time.

Our tests are once again both unconditional and conditional. With our unconditional tests we show that the volatility of the long forward rate has decreased significantly in Italy and Spain and our factor analysis suggests that while all yield curve movements in these countries were level shifts, a slope factor is added in the post-EMU period. Testing for the responsiveness of the long forward rate to data surprises, we find once again that the long-term interest rates appear quite well anchored under monetary union.

Rest of the paper is organized as follows. Section II presents a brief history of EMU, emphasizing the key dates so that there is a proper historical frame within which it is possible to interpret the results. Section III briefly describes the data. Section IV contains the results of the tests of convergence and Section V presents the evidence on anchoring of long-term interest rates. Section VI is a general discussion of the findings. The final section concludes.

II. A Brief History of the EMU

To put the results of the empirical exercises reported below in the proper historical context, in this section we mention some of the key dates and events in the European Monetary Union, leading to the creation of the ECB and the introduction to the Euro, avoiding a length narrative on the history of the European Union.

A monetary union within the EU was agreed on in the Maastricht Treaty in February 1992. September 1992 witnessed the ERM (Exchange Rate Mechanism) crisis when several countries devalued their currencies and dropped out of the pegged exchange rate system. Our sample starts in 1993 to make sure the results are not driven by the very high volatility in the immediate aftermath of this event. In May 1998 the eligible countries for inclusion in the monetary union were announced. In 1 January 1999 the exchange rates for the countries entering the monetary union were irrevocably fixed and the euro currency was introduced. The cash change-over to the euro took place for the initial eleven member countries on 1 January 2002, completing monetary union.

Given this story, we use 1993-98 as our pre-ECB sample and 2002-2006 as the post-ECB sample. We start in 2002 to make sure that we are not capturing effects of the initial credibility building of the ECB, as argued by Goldberg and Klein (2006).

III. Data

This section presents a summary of data used in the paper. A detailed account of all data used is in the data appendix. The data used in the paper are yields and daily macroeconomic data surprises. Daily yield curves were available for Germany and Spain from the BIS and from the Bank of England for the UK. We estimated the yield curves for France and Italy using underlying bond market data from Bloomberg.¹ Because of the distribution of bond maturities available from Bloomberg, short-term (less than five years) yields for France and Italy are reliable only beginning in 1995,

¹ The estimated yield curves are of the extended Nelson-Siegel (Svensson) form. Details of the estimation technique follow the method used by Gürkaynak, Sack and Wright (2006) for the US.

while five year and longer rates for these countries and all yields for the remaining countries go back to 1993.

The macroeconomic data surprises are the realized values of data releases of the day, less their expected values, where the expectations are measured by surveys. The median value of the surveys conducted by Money Market Services (MMS) is our primary source of expectations; this is supplemented by the Bloomberg survey when MMS is unavailable. To make the units comparable across different releases we normalize all series by their historical standard deviations so that the unit of observation is a one standard deviation surprise. For example, on October 21 1998, the German IFO index was expected to come in at 97 but the released value was 94, we record this as a 2.58 standard deviation negative surprise as the historical standard deviation of the surprise in this data release is 1.16.

There are two issues about the macroeconomic data surprise series that should be mentioned. One is availability, most of the surprises for the Euro Area countries in our sample are available beginning in 1995 to 1997. Euro Area aggregates are usually available beginning in 1999. After the introduction of the Euro, some national series, in particular the monetary aggregate releases, disappear. Table X lists the data series we have used, their available dates and summary statistics.

The second issue about the macroeconomic data surprises is that, European bond prices often react little to European surprises, if at all, as we will show below.² For this reason, we include US and UK surprises in the data set as well. This has the added benefit that these series are often available for as long as our yield data are available. Note that using “foreign” surprises does not create a problem for our

² We discuss the possible reasons for this in section IV. b.

purposes. Being agnostic on why US surprises moves European yields, we only assert that if one country's yields are responding to a given data surprise, others' should as well if bond markets are not segmented.

IV. Convergence of Yields

Our first object of interest is whether yields of different maturities have converged across Euro Area countries. Given that “a high degree of sustainable convergence” was a prerequisite for entry into the monetary union, finding convergence in yields before the ECB came into existence is expected. Our interest is in the timing and extent of this. We first study the yields across countries unconditionally and then look at the conditional correlations, where the data surprises are the conditioning variables.

IV.a Unconditional Results

To study whether and when the government bond markets in Germany, France, Italy and Spain have integrated, we use daily bond prices. Using high frequency data is important for our purposes as even if there is market segmentation, one expects arbitrage opportunities to vanish over time. That is, finding convergence in financial markets using monthly data is easier than finding it with daily data.

Data from the daily yield curves we have obtained and estimated are summarized in Figure 1, the central figure of this section. The top left panel of this figure plots the two year yields at a daily frequency. The two year data for FR and IT begin in 1995 while the data for the other countries goes back to 1993. At the beginning of the sample period, the German two-year yields are the lowest, with the French yields

slightly above them. The Spanish and Italian two-year yields are five to six percentage points higher than the other two. The striking point is the speed and extent of the convergence of yields. The French and German yields have become identical by 1997 and Spanish and Italian ones have joined them by 1999. The lines for the four countries are indistinguishable from then on.

This is striking precisely because we are using daily data. There is not a single day after 1999 when the two-year yield on government notes was significantly different in one of the countries compared to the others. That is, the short term bond markets in these countries were unified to the extent that any deviations were arbitrated away on a daily basis.

To make sure that this convergence is due to the monetary union and is not an artifact of broader convergence in the yields of industrialized European countries, we include in the figure the two-year yield from the UK, an EU member that is not in the Euro Area. The UK two-year rate clearly stands out, suggesting that convergence in rates indeed happened because of the monetary union.

The top-right panel tells the same story using the five-year yields. The five-year yields are available for all countries going back to 1993 so this is a more complete picture but the results are the same. The bottom left panel is the ten-year yields which shows that there is slightly more variation in the long-term interest rates, in particular the Italian ten-year yield has been somewhat higher than the others in the near past but this difference is negligible compared to the differences before 1999.

A better way to look at the long term yields is to study the behavior of the long forward rates. We show the one-year yield ending in ten years from now in the final

panel of this figure.³ This panel suggests that convergence of the long forward rates took more time and that the Italian forward rate remains visibly above the others (probably due to concerns over credit quality). Despite this, the convergence in long forward rates is remarkable. Differences are now measured in basis points rather than percentage points.

Figure 1 shows the unification of the government bond markets and the accompanying convergence in yields visually. We present three kinds of statistical measures to quantify the extent of the convergence. First, we look at the correlations of yields of the same maturity between different countries for the pre-ECB (1993-1998) and for the post-ECB (2002-2006) samples. The results are reported in Table 2. The correlation coefficients shown below the diagonal are from the early sample, while those shown above the diagonal are those of the late sample. The correlation coefficients that are significantly larger than their counterparts in the other (early/late) sample at one percent are shown in boldface.

The pattern is the same across all maturities; the correlations between the yields of FR, GE, IT and SP have increased significantly after EMU—in fact almost all of these are .99—while the correlations of the yields of these countries with those of the UK have decreased. Almost all of the changes in correlation coefficients across samples are significant because with daily data we have very large numbers of observations in each sample, leading to very precise estimates. Note that the correlation coefficients are estimated over the sample for which data exists in all countries, effectively making the early sample for the two-year yield the 1995-1998 period.

³ The one year forward rate ending in ten years is the answer to the question “at what rate today would the financial market participants commit to lending at a one year maturity nine years from now?”

The second statistical method we use is principal components analysis. In Table 3, we report the percentage of total variation explained by the first two principal components. The factor loadings, not reported, show that the first factor loads evenly on all countries (the common factor) and the second factor differentiates Italy and Spain from France and Germany. In the early period the second factor explains a non-negligible part of the total variation in all maturities whereas in the late period the common factor explains about all of the variation.

Lastly, we show regression results of each countries yields' on the German yields of the same maturity in the two samples, shown in Table 4. The R^2 statistics of these regressions repeat the information in the correlations reported above. Rather than the R^2 statistics, the regression coefficients themselves are the objects of interest this time. The slope coefficients have become economically indistinguishable from unity across the four countries while the coefficients in the regressions involving UK have continued to have slopes of varying magnitudes. Consistent with convergence, the constants in the regressions have also shrunk towards zero from the pre-ECB to the post-ECB sample.

All in all, the results presented in this section show, visually and statistically, a very remarkable convergence in bond yields of the four largest Euro Area countries due to the monetary union. We next move to from the unconditional results to conditional ones and ask how the responses of the yields of different Euro Area countries to data surprises have changed from before monetary union to after it.

IV. b Conditional Results

The unconditional results presented above can be interpreted in two ways. One is that the bond markets of these countries reacted similarly to common fundamentals

but there was too much country specific idiosyncratic noise, the other interpretation is that there were no common fundamentals at all. To distinguish between these two, we condition on fundamental surprises, that is, surprises in macroeconomic data releases.

The regression equation we use is

$$\Delta y_t^{i,j} = \alpha^{i,j} + \sum_{k=1}^K \sum_{l=1}^{L_k} \beta_{l,k}^{i,j} Surprise_{l,k,t} + \varepsilon_t^{i,j},$$

where $\Delta y_t^{i,j}$ is the daily change in the yield of maturity j ($j=2, 5, 10$ years—the forward rate is studied in section V) of country i ($i=$ France, Germany, Italy and Spain). We have surprise data from five countries and the Euro Area ($k=$ France, Germany, Italy, Spain, UK, US and Euro Area) and there are L_k data series used from each of these, indexed by l ($l=$ CPI, Unemployment, etc.). We use the largest number of data surprises from the US as these are known to affect markets in Europe as well (Andersen et al., 2006). Note again that not all data releases were present in both samples.

The regression results are presented in Table 5. First thing to notice is the scarcity of significant coefficients, especially in the pre-ECB samples. In particular, almost none of the European releases matter. This is in line with the findings of Andersen et al. (2006) who document that US releases are the most important fundamental surprises for the European bond markets. Andersen et al. argue that at least part of the reason is the frequent leaks in European countries' data releases, that is, the surprises are not really surprises on the days of the data releases because the information gets out earlier.

For our purposes, the most important point in these tables is that there are no cases for yields of any maturity where all countries' yields respond to a given data release significantly. One could use this as a definition of market segmentation—the prices are not moved by the same fundamentals. It is worthwhile repeating that the inference we want to draw is not about the direction of the effect. Positive US surprises, for example, may increase or decrease yields in other countries and we do not take a stand on this. Our test is that if a fundamental surprise has an effect on the yields of one country, it should have the same effect on the yields of other countries if the bond markets are unified, regardless of the direction of the effect.

It is therefore clear that even under the ERM the European bond markets were segmented before the monetary union and this was not just due to country specific idiosyncratic noise. The strength of our unconditional results imply that bond markets of France, Germany, Italy and Spain were unified after the monetary union. The conditional results support this. Now we observe that the markets in these countries respond to data releases together, in the same direction. This is especially true for the major releases of US NAPM, nonfarm payrolls and the German IFO index.

It is still the case that few releases of European countries matter to bond markets and no Euro Area-wide surprise elicits any response. It is normal that the Euro Area-wide releases do not move markets, this is because each country release their component of the data before the aggregate is released and with known weights for each country, the aggregate is almost never a surprise.

We showed in this section that European monetary union did indeed achieve unification in Euro Area bond markets and that this unified market was not present

before the EMU. We showed this strong result using unconditional unconditional correlations, principal components analysis, bilateral regressions and also using conditional responses to surprises in macroeconomic data releases. Thus the monetary union has indeed fulfilled the Maastricht Treaty aim of convergence in interest rates and also has facilitated a common bond market.

We next turn to the benefit of entering into the monetary union for Italy and Spain.

V. Anchoring of Inflation Expectations and Long Rates

Bond markets are ideal for studying the anchoredness of inflation expectations as long-term bond prices reflect expectations of real interest rates and inflation for their maturity with the addition of a possibly time varying term premium. In particular, Gürkaynak, Sack and Swanson (2005) and Gürkaynak, Levin and Swanson (2006) show that almost all standard models imply that economies return to their steady states well within ten years, therefore the one year rate beginning ten years hence is

$$1F9 = \text{Expected steady state real rate} + \text{expected steady state inflation} + \text{term premium}$$

Using nominal and inflation indexed bonds GLS show that fluctuations in this forward rate in the US and UK are mostly attributable to expected inflation or the inflation risk premium. Thus studying the dynamics of the 1F9 forward rate provides information on the volatility of financial markets where this volatility is at least partly attributable to the perceived distribution of inflation outcomes in the far future.

We once again study the forward rates first unconditionally, then condition on data releases.

V.a Unconditional forward rates

Studying the simple summary statistics of the far forward rates of France, Germany, Italy and Spain turns out to be very instructive. Table 6 reports means and standard deviations of the forward rates in the pre- and post-ECB periods. While the fall in the means of these rates are impressive for Italy and Spain, our interest is in their variability. Remarkably, the variability of the forward rates in these countries begin at twice those of France and Germany in the pre-ECB period and become almost exactly as variable as the latter two countries' forward rates in the post-ECB period. While the forward rates of France and Germany become somewhat better anchored (less variable), the forward rates of Italy and Spain become much better anchored compared to the pre-ECB period. It seems these countries were right in wanting to join the Euro Area and indeed have benefited from it.

A more sophisticated way of making this point uses factor analysis once again. When yields of different maturities are decomposed into factors, one finds a level factor that moves yields of all maturities in the same direction and about as much, and a slope factor that rotates the yield curve. We ask how much of the variability in 2-10 year yields are explained by each of these factors in the four countries in the pre- and post-ECB periods. Table 7 presents the answers.

In the pre-ECB period France and Germany have both factors affecting the yields, with a large weight on the level factor as is the case in the US and UK as well. Strikingly, in this period Italy and Spain have only level factors, the first factor explains 99 percent of the variation in yields of all maturities. That is, almost all

movements in the yield curve were level shifts—any effects that changed the short-run outlook, changing the short-term interest rates were seen as permanent changes, affecting the long-end of the yield curve as much. This suggests a very low level of anchoring of long-term interest rates in Italy and Spain in the pre-ECB period.

In the post-ECB period, the weights of the level/slope factors for Italy and Spain begin to look like those of France and Germany. These countries also “gain” slope factors. (Statistical test of number of factors to be added.) Thus, not only did the variability of the long rates decreased significantly in Italy and Spain after the monetary union, they also became less tied to the short-term rates, implying lower pass through of shocks to expectations about interest rates in the far future. By this metric as well it appears that Italy and Spain gained much better anchored long-term interest rates by entering into the monetary union.

V.b Conditional Results

Another way of studying the anchoredness of the long rates is by looking at their responsiveness to surprises. Anchored expectations about the steady state will not change regardless of the surprise in the data release observed today, on the other hand, if inflation expectations are unanchored market participants will update their beliefs about steady state outcomes based on the state of the economy today, that is, surprises will matter. Following Gürkaynak, Sack and Swanson (2005), we look at the response of the forward rate to surprises to see whether the forward rates are conditionally too volatile. Table 8 reports the results of the analogous exercise to Table 5 regressions carried out for the forward rate.

Not very surprisingly, the results are not very strong either way. As was the case in Table 5, there were few surprises that mattered in the pre-ECB period to begin with, so it is hard to make a case that the forward rates have become conditionally more anchored. On the other hand, if inflation expectations are really unanchored then surprises should lead to level shifts in the yield curve, that is, releases that affect the two year yield should affect the long forward rate in the same direction. This is never the case for Italy and Spain in the post-ECB period, providing some more evidence for anchored expectations in this period.

As the statistical power of the conditional results is quite weak in answering the question we are posing, we do not dwell on these any further. However, we do note again that our unconditional results provide strong evidence of a remarkable improvement in the anchoring of expectations and therefore long-term interest rates in Italy and Spain in the post-ECB period and that the conditional evidence is consistent with this interpretation.

VI. Discussion

European monetary union has worked in creating a single bond market. While the process is still on going, we have shown that convergence has happened not only in levels but also in daily changes. Borrowing the Bundesbank credibility has also taken place in practice, with Italy and Spain achieving long rates that are as well anchored as those of Germany and France.

These results may also be read as providing some support for the expectations hypothesis. We have shown that yields of sovereign bonds of countries that share a common central bank have converged. This is consistent with expectations

hypothesis, as they now share an overnight rate and have the same expected overnight rate path, their yield curves have converged. An alternative reading may be that the EH fails exactly the same way for all of these countries now. That in itself would be a very strong sign of a unified market as it would imply that the marginal investor is the same for all four countries and the time varying term premium that comes out of her utility function is the same for securities of different sovereign issuers.

VII. Conclusions

EMU really created a single bond market. This is not only in terms of levels of bond yields, but also of correlations. One can really talk about a two year Euro Area yield; this was not the case in 1990s. Italy and Spain have benefited a lot from entering the EMU. Their long rates are much less volatile, much better anchored. This is a major success for the ECB. The plan of letting the rest of Europe benefit from the credibility of the Bundesbank has apparently worked.

Our results show that the asset market outcomes of the EMU plan has materialized. There is some evidence that the real sides of the Euro Area economies have not converged all that much. It then becomes interesting to study the implications of this. In particular, what does it say about optimal monetary policy in the Euro Area? Do we expect the financial side convergence to lead to real convergence? What does this say about globalization in general? We suggest these as further research areas.

References

(To be completed)

Data Appendix

(To be completed.)

Table 1. Availability of Surprise Data

(To be added.)

Table 2. Correlations of rates*A. Correlations of two-year yields*

	FR	GE	IT	SP	UK
FR	1.000	0.997	0.998	0.996	0.501
GE	0.930	1.000	0.997	0.997	0.469
IT	0.863	0.694	1.000	0.996	0.482
SP	0.908	0.762	0.990	1.000	0.502
UK	0.691	0.793	0.559	0.587	1.000

Sample sizes: 953\1228

B. Correlations of five-year yields

	FR	GE	IT	SP	UK
FR	1.000	0.998	0.997	0.997	0.678
GE	0.969	1.000	0.996	0.997	0.673
IT	0.945	0.905	1.000	0.994	0.659
SP	0.965	0.922	0.991	1.000	0.676
UK	0.845	0.841	0.785	0.797	1.000

Sample sizes: 1428\1228

C. Correlations of ten-year yields

	FR	GE	IT	SP	UK
FR	1.000	0.983	0.995	0.990	0.772
GE	0.981	1.000	0.991	0.977	0.787
IT	0.959	0.929	1.000	0.984	0.772
SP	0.966	0.940	0.995	1.000	0.727
UK	0.950	0.952	0.907	0.910	1.000

Sample sizes: 1428\1228

D. Correlations of long forward rates

	FR	GE	IT	SP	UK
FR	1.000	0.954	0.993	0.954	0.918
GE	0.980	1.000	0.954	0.921	0.866
IT	0.922	0.904	1.000	0.943	0.918
SP	0.926	0.892	0.950	1.000	0.860
UK	0.898	0.876	0.838	0.907	1.000

Sample sizes: 1428\1228

Notes: Entries below the diagonal are for the pre-ECB (1993-1998) sample, those above the diagonal are for the post-ECB (2002-2006) sample. Boldface entries are statistically significantly larger (at 1 percent) than their counterparts in the corresponding sample.

**Table 3. Principal Components Analysis
of Yields Across Countries**

Contribution of First Principal Component

	Two-Year Yield	Five-Year Yield	Ten-Year Yield	Forward Rate
Pre-ECB	0.895	0.962	0.971	0.947
Post-ECB	0.998	0.997	0.990	0.965

Table 4. Regressions of rates on German rates

		<i>A. Two-year yields</i>							
		FR	IT	SP	UK	FR	IT	SP	UK
GE		1.425*** (0.022)	2.498*** (0.073)	2.495*** (0.057)	0.628*** (0.015)	0.971*** (0.002)	0.969*** (0.002)	0.958*** (0.002)	0.345*** (0.014)
Constant		-1.524*** (0.089)	-3.297*** (0.315)	-4.129*** (0.245)	3.992*** (0.073)	0.015*** (0.006)	0.070*** (0.006)	0.063*** (0.006)	3.338*** (0.047)
Observations		953	953	953	953	1228	1228	1228	1228
R-squared		0.86	0.48	0.58	0.63	0.99	0.99	0.99	0.22
		<i>B. Five-year yields</i>							
		FR	IT	SP	UK	FR	IT	SP	UK
GE		1.170*** (0.005)	2.524*** (0.028)	2.386*** (0.022)	0.829*** (0.014)	1.004*** (0.002)	1.075*** (0.003)	1.053*** (0.002)	0.459*** (0.009)
Constant		-0.856*** (0.027)	-5.434*** (0.155)	-5.398*** (0.124)	2.443*** (0.079)	-0.059*** (0.006)	-0.209*** (0.012)	-0.191*** (0.006)	2.922*** (0.035)
Observations		1428	1428	1428	1428	1228	1228	1228	1228
R-squared		0.94	0.82	0.85	0.71	1.00	0.99	0.99	0.45
		<i>C. Ten-year yields</i>							
		FR	IT	SP	UK	FR	IT	SP	UK
GE		1.112*** (0.004)	2.456*** (0.025)	2.221*** (0.021)	1.091*** (0.009)	0.972*** (0.004)	0.997*** (0.004)	1.038*** (0.004)	0.444*** (0.007)
Constant		-0.523*** (0.023)	-6.109*** (0.149)	-5.295*** (0.130)	0.641*** (0.058)	0.248*** (0.017)	0.325*** (0.014)	0.003 (0.018)	2.850*** (0.029)
Observations		1428	1428	1428	1428	1228	1228	1228	1228
R-squared		0.96	0.86	0.88	0.91	0.97	0.98	0.95	0.62
		<i>D. Forward rates</i>							
		FR	IT	SP	UK	FR	IT	SP	UK
GE		1.000*** (0.005)	2.010*** (0.021)	1.641*** (0.015)	1.143*** (0.013)	0.990*** (0.009)	0.896*** (0.008)	1.018*** (0.009)	0.451*** (0.008)
Constant		0.292*** (0.031)	-4.695*** (0.151)	-2.576*** (0.104)	-0.288*** (0.085)	0.399*** (0.041)	1.109*** (0.039)	0.241*** (0.039)	2.590*** (0.038)
Observations		1428	1428	1428	1428	1228	1228	1228	1228
R-squared		0.96	0.82	0.80	0.77	0.91	0.91	0.85	0.75

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5A. Response of two-year yields to data surprises

	Before-ECB				After-ECB			
	FR	GE	IT	SP	FR	GE	IT	SP
US Capa. Util.	0.010 (0.007)	0.004 (0.006)	0.006 (0.010)	0.003 (0.008)	0.008* (0.005)	-0.007 (0.006)	0.009* (0.005)	-0.000 (0.006)
US Cons. Conf	0.013* (0.007)	0.005 (0.006)	0.016 (0.010)	0.014* (0.008)	0.011** (0.005)	0.010* (0.005)	0.011** (0.005)	0.007 (0.006)
US CPIX	0.009 (0.010)	0.001 (0.008)	-0.003 (0.014)	0.028** (0.011)	0.006 (0.006)	0.010 (0.006)	0.006 (0.006)	0.013* (0.007)
US GDP	-0.009 (0.010)	0.006 (0.008)	-0.021 (0.014)	0.005 (0.011)	0.021** (0.009)	-0.004 (0.010)	0.023** (0.009)	-0.000 (0.011)
US NAPM	0.006 (0.007)	-0.002 (0.005)	0.003 (0.009)	-0.001 (0.008)	0.017*** (0.005)	0.020*** (0.005)	0.016*** (0.005)	0.018*** (0.006)
US NonFarm Pay.	0.016** (0.006)	-0.003 (0.005)	-0.006 (0.009)	0.003 (0.007)	0.044*** (0.006)	0.017** (0.007)	0.042*** (0.006)	0.026*** (0.008)
US New Hom.	0.005 (0.009)	-0.003 (0.007)	0.005 (0.012)	0.007 (0.010)	-0.004 (0.004)	-0.002 (0.004)	-0.004 (0.004)	0.002 (0.005)
US Ret. Sales	0.033*** (0.012)	0.006 (0.009)	0.003 (0.016)	0.011 (0.013)	-0.000 (0.004)	-0.002 (0.005)	0.001 (0.004)	0.002 (0.005)
US Unemp.	-0.001 (0.008)	0.006 (0.006)	0.002 (0.010)	0.005 (0.009)	-0.004 (0.005)	0.002 (0.006)	-0.004 (0.005)	-0.006 (0.006)
UK Avg. Earnings	0.005 (0.009)	0.008 (0.007)	0.015 (0.012)	0.012 (0.010)	-0.007 (0.004)	-0.003 (0.005)	-0.006 (0.004)	-0.006 (0.006)
UK GDP	-0.008 (0.013)	-0.009 (0.010)	-0.031* (0.018)	-0.001 (0.015)	-0.005 (0.007)	-0.004 (0.008)	-0.004 (0.007)	-0.003 (0.008)
UK Man. Prod.	-0.002 (0.007)	0.004 (0.006)	-0.004 (0.010)	0.025*** (0.008)	0.009** (0.004)	0.007* (0.004)	0.010*** (0.004)	0.007 (0.005)
UK PPI	0.012 (0.008)	-0.002 (0.006)	-0.006 (0.010)	0.010 (0.009)	0.006 (0.004)	0.006 (0.005)	0.007* (0.004)	0.009* (0.005)
UK RPIX	-0.002 (0.008)	0.001 (0.006)	-0.016 (0.011)	-0.010 (0.009)	-0.003 (0.005)	0.001 (0.005)	-0.003 (0.005)	-0.003 (0.006)
UK Ret. Sales	0.005 (0.006)	-0.002 (0.005)	0.017** (0.009)	0.003 (0.007)	0.004 (0.004)	0.006 (0.005)	0.005 (0.004)	0.007 (0.005)
EA Bus. Climate	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.004 (0.005)	-0.001 (0.006)	-0.004 (0.005)	0.005 (0.006)
EA CPI	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.004 (0.005)	0.003 (0.006)	0.005 (0.005)	0.001 (0.006)
EA Ind. Prod.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.004 (0.005)	-0.002 (0.006)	-0.001 (0.005)	-0.005 (0.007)
EA Unemp.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.005)	0.000 (0.005)	0.001 (0.005)	0.005 (0.006)
GE CPI	0.020** (0.008)	0.007 (0.006)	0.017 (0.011)	0.019** (0.009)	0.005 (0.004)	0.003 (0.004)	0.005 (0.004)	0.006 (0.005)
GE IFO	0.011 (0.008)	0.009 (0.006)	0.007 (0.011)	0.015 (0.009)	0.016*** (0.005)	0.020*** (0.005)	0.014*** (0.005)	0.016*** (0.006)

GE Ind. Prod.	0.004 (0.006)	0.009** (0.004)	-0.004 (0.008)	-0.002 (0.006)	0.000 (0.005)	-0.005 (0.006)	0.001 (0.006)	-0.009 (0.007)
GE M3	0.005 (0.009)	0.012* (0.007)	0.009 (0.012)	0.007 (0.010)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
GE Man. Ord.	0.015** (0.007)	0.012** (0.006)	0.017* (0.010)	-0.000 (0.008)	0.005 (0.004)	-0.008 (0.005)	0.002 (0.005)	-0.007 (0.006)
GE Unemp.	-0.009 (0.006)	-0.005 (0.005)	-0.001 (0.009)	-0.007 (0.007)	0.000 (0.004)	-0.003 (0.004)	0.000 (0.004)	-0.006 (0.005)
FR Bus. Confid.	0.004 (0.010)	0.012 (0.008)	0.010 (0.014)	0.010 (0.012)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR CPI	-0.001 (0.006)	0.008 (0.005)	-0.004 (0.008)	-0.001 (0.007)	0.005 (0.005)	0.004 (0.006)	0.004 (0.005)	0.006 (0.007)
FR CPI(F)	-0.005 (0.007)	-0.007 (0.005)	-0.004 (0.009)	-0.005 (0.008)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR Ind. Prod.	-0.003 (0.006)	-0.003 (0.005)	-0.002 (0.008)	0.002 (0.006)	0.001 (0.005)	0.005 (0.006)	0.001 (0.005)	0.003 (0.007)
FR M3	0.006 (0.022)	-0.045*** (0.017)	-0.002 (0.029)	-0.027 (0.025)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR Unemp	-0.143** (0.069)	0.042 (0.054)	0.018 (0.093)	-0.028 (0.078)	-0.059 (0.071)	-0.051 (0.081)	-0.079 (0.073)	-0.092 (0.091)
IT CPI	-0.004 (0.009)	0.000 (0.007)	0.004 (0.012)	0.004 (0.010)	-0.004 (0.005)	-0.001 (0.006)	-0.001 (0.006)	-0.003 (0.007)
IT Ind. Prod.	-0.012 (0.009)	-0.011 (0.007)	-0.013 (0.012)	0.002 (0.010)	0.002 (0.006)	0.005 (0.007)	0.006 (0.006)	0.004 (0.008)
IT M2	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
IT Unemp.	-0.013 (0.014)	-0.010 (0.011)	-0.006 (0.019)	0.007 (0.016)	-0.002 (0.021)	0.006 (0.024)	0.007 (0.021)	0.001 (0.027)
SP CPI	0.007 (0.011)	-0.007 (0.009)	-0.003 (0.015)	0.005 (0.013)	0.011*** (0.004)	0.007 (0.005)	0.011** (0.004)	0.010* (0.005)
SP Unemp.	-0.006 (0.014)	-0.005 (0.011)	-0.001 (0.019)	-0.004 (0.016)	0.005 (0.012)	0.008 (0.014)	0.007 (0.013)	0.008 (0.016)
Sp Ret. Sales	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Constant	-0.003* (0.002)	-0.002 (0.001)	-0.010*** (0.002)	-0.008*** (0.002)	-0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.002)
Observations	699	699	699	699	902	902	902	902

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5B. Response of five-year yields to data surprises

	Before-ECB				After-ECB			
	FR	GE	IT	SP	FR	GE	IT	SP
US Capa. Util.	0.004 (0.006)	0.002 (0.005)	-0.106*** (0.012)	-0.034*** (0.009)	0.010* (0.006)	-0.009 (0.006)	0.009 (0.006)	-0.002 (0.007)
US Cons. Conf	0.005 (0.006)	0.005 (0.005)	0.006 (0.012)	0.010 (0.009)	0.012** (0.005)	0.008 (0.006)	0.012** (0.006)	0.009 (0.006)
US CPIX	0.009 (0.007)	-0.006 (0.007)	-0.005 (0.015)	0.002 (0.011)	0.007 (0.006)	0.010 (0.007)	0.007 (0.007)	0.013* (0.008)
US GDP	-0.004 (0.010)	0.001 (0.009)	-0.010 (0.019)	0.006 (0.014)	0.020** (0.010)	0.000 (0.011)	0.021* (0.011)	0.004 (0.012)
US NAPM	0.009 (0.007)	-0.000 (0.006)	0.004 (0.013)	0.002 (0.010)	0.019*** (0.005)	0.020*** (0.006)	0.022*** (0.006)	0.018*** (0.007)
US NonFarm Pay.	0.014** (0.006)	-0.009 (0.005)	-0.003 (0.012)	0.002 (0.009)	0.046*** (0.007)	0.017** (0.007)	0.051*** (0.007)	0.026*** (0.008)
US New Hom.	0.010 (0.007)	0.000 (0.006)	0.018 (0.014)	0.009 (0.010)	-0.003 (0.004)	-0.005 (0.004)	-0.003 (0.004)	-0.004 (0.005)
US Ret. Sales	0.024*** (0.008)	0.009 (0.007)	0.012 (0.016)	0.012 (0.012)	0.001 (0.005)	-0.001 (0.005)	-0.002 (0.005)	0.001 (0.006)
US Unemp.	0.017*** (0.006)	0.003 (0.005)	0.016 (0.012)	0.007 (0.009)	-0.003 (0.005)	0.001 (0.006)	-0.002 (0.006)	-0.004 (0.007)
UK Avg. Earnings	0.009 (0.007)	-0.001 (0.007)	0.021 (0.015)	0.011 (0.011)	-0.007 (0.005)	-0.001 (0.005)	-0.007 (0.005)	-0.004 (0.006)
UK GDP	0.006 (0.012)	-0.001 (0.010)	-0.013 (0.023)	0.002 (0.017)	-0.007 (0.007)	-0.007 (0.008)	-0.007 (0.008)	-0.004 (0.009)
UK Man. Prod.	0.003 (0.005)	0.002 (0.005)	-0.001 (0.011)	0.021*** (0.008)	0.009** (0.004)	0.007 (0.005)	0.009* (0.005)	0.005 (0.005)
UK PPI	0.005 (0.007)	0.004 (0.006)	0.005 (0.014)	0.001 (0.010)	0.006 (0.005)	0.007 (0.005)	0.005 (0.005)	0.010* (0.006)
UK RPIX	0.001 (0.006)	0.001 (0.005)	-0.010 (0.011)	-0.008 (0.008)	-0.006 (0.005)	-0.001 (0.006)	-0.007 (0.006)	-0.002 (0.006)
UK Ret. Sales	0.003 (0.006)	-0.001 (0.006)	0.013 (0.012)	0.007 (0.009)	0.004 (0.005)	0.006 (0.005)	0.001 (0.005)	0.006 (0.006)
EA Bus. Climate	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.006 (0.006)	0.000 (0.006)	-0.005 (0.006)	0.006 (0.007)
EA CPI	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.004 (0.006)	0.003 (0.006)	0.002 (0.006)	0.003 (0.007)
EA Ind. Prod.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.005 (0.006)	0.001 (0.006)	-0.002 (0.006)	-0.006 (0.007)
EA Unemp.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.002 (0.005)	-0.001 (0.006)	-0.001 (0.006)	0.004 (0.006)
GE CPI	0.010	0.003	0.014	0.008	0.005	0.003	0.005	0.004

	(0.008)	(0.007)	(0.016)	(0.012)	(0.004)	(0.005)	(0.005)	(0.005)
GE IFO	0.014*	0.006	0.006	0.003	0.014***	0.020***	0.015***	0.015**
	(0.009)	(0.008)	(0.017)	(0.013)	(0.005)	(0.005)	(0.005)	(0.006)
GE Ind. Prod.	0.006	0.007	-0.006	-0.006	0.000	-0.004	0.006	-0.006
	(0.005)	(0.005)	(0.010)	(0.008)	(0.006)	(0.007)	(0.007)	(0.007)
GE M3	0.005	0.037***	0.004	0.031***	0.000	0.000	0.000	0.000
	(0.006)	(0.005)	(0.012)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
GE Man. Ord.	0.014**	0.010*	0.012	0.003	0.007	-0.007	0.009	-0.007
	(0.006)	(0.005)	(0.012)	(0.009)	(0.005)	(0.005)	(0.005)	(0.006)
GE Unemp.	-0.008	-0.009	-0.007	-0.003	-0.000	-0.003	-0.001	-0.004
	(0.007)	(0.006)	(0.013)	(0.010)	(0.004)	(0.004)	(0.004)	(0.005)
FR Bus. Confid.	0.004	0.014	0.002	0.016	0.000	0.000	0.000	0.000
	(0.011)	(0.010)	(0.022)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)
FR CPI	-0.007	0.001	-0.011	-0.004	0.006	0.005	0.001	0.007
	(0.006)	(0.005)	(0.012)	(0.009)	(0.006)	(0.006)	(0.006)	(0.007)
FR CPI(F)	-0.007	-0.010	-0.006	-0.007	0.000	0.000	0.000	0.000
	(0.007)	(0.007)	(0.015)	(0.011)	(0.000)	(0.000)	(0.000)	(0.000)
FR Ind. Prod.	0.000	-0.003	-0.005	0.002	0.001	0.008	0.001	0.006
	(0.005)	(0.005)	(0.011)	(0.008)	(0.006)	(0.006)	(0.006)	(0.007)
FR M3	0.006	-0.008	0.107***	0.038*	0.000	0.000	0.000	0.000
	(0.014)	(0.013)	(0.028)	(0.021)	(0.000)	(0.000)	(0.000)	(0.000)
FR Unemp	-0.003	-0.005	0.000	-0.001	-0.071	-0.034	0.022	-0.062
	(0.004)	(0.003)	(0.008)	(0.006)	(0.079)	(0.085)	(0.086)	(0.096)
IT CPI	-0.003	0.002	-0.003	-0.003	-0.004	-0.002	-0.000	-0.004
	(0.009)	(0.008)	(0.018)	(0.013)	(0.006)	(0.006)	(0.006)	(0.007)
IT Ind. Prod.	-0.011	-0.013	-0.014	-0.003	0.006	0.009	0.014*	0.005
	(0.010)	(0.009)	(0.019)	(0.014)	(0.007)	(0.007)	(0.007)	(0.008)
IT M2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
IT Unemp.	-0.007	-0.008	-0.009	-0.000	-0.007	0.009	0.031	0.012
	(0.015)	(0.014)	(0.031)	(0.022)	(0.023)	(0.025)	(0.025)	(0.028)
SP CPI	0.005	-0.004	-0.000	0.001	0.011**	0.009*	0.008	0.010*
	(0.012)	(0.011)	(0.024)	(0.017)	(0.005)	(0.005)	(0.005)	(0.006)
SP Unemp.	-0.000	0.001	-0.002	0.008	0.006	0.014	0.008	0.007
	(0.015)	(0.014)	(0.030)	(0.022)	(0.014)	(0.015)	(0.015)	(0.017)
Sp Ret. Sales	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.001	-0.001	-0.006**	-0.008***	-0.001	-0.001	0.000	-0.001
	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	991	991	991	991	902	902	902	902

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5C. Response of ten-year yields to data surprises

	Before-ECB				After-ECB			
	FR	GE	IT	SP	FR	GE	IT	SP
US Capa. Util.	0.002 (0.006)	-0.000 (0.005)	-0.053*** (0.011)	-0.006 (0.008)	0.007 (0.005)	-0.009 (0.006)	0.006 (0.005)	-0.010 (0.007)
US Cons. Conf	0.006 (0.006)	0.005 (0.006)	0.007 (0.011)	0.013 (0.008)	0.008* (0.005)	0.006 (0.006)	0.007 (0.005)	0.008 (0.006)
US CPIX	0.006 (0.007)	-0.008 (0.007)	-0.001 (0.013)	0.009 (0.010)	0.007 (0.006)	0.008 (0.007)	0.008 (0.006)	-0.002 (0.008)
US GDP	-0.014 (0.009)	-0.002 (0.009)	0.009 (0.018)	0.003 (0.013)	0.014 (0.009)	0.001 (0.011)	0.013 (0.009)	0.006 (0.012)
US NAPM	0.007 (0.006)	-0.001 (0.006)	0.004 (0.012)	-0.001 (0.009)	0.013*** (0.005)	0.019*** (0.006)	0.015*** (0.005)	0.016** (0.007)
US NonFarm Pay.	0.011** (0.006)	-0.009* (0.006)	0.022** (0.011)	-0.000 (0.008)	0.035*** (0.006)	0.014* (0.007)	0.034*** (0.006)	0.006 (0.008)
US New Hom.	0.010 (0.006)	-0.001 (0.006)	0.013 (0.013)	0.023** (0.009)	-0.003 (0.004)	-0.006 (0.004)	-0.003 (0.004)	-0.009* (0.005)
US Ret. Sales	0.025*** (0.008)	0.009 (0.008)	0.026* (0.015)	0.011 (0.011)	0.001 (0.004)	0.000 (0.005)	0.001 (0.004)	0.002 (0.006)
US Unemp.	0.017*** (0.006)	0.001 (0.005)	0.007 (0.011)	0.006 (0.008)	0.000 (0.005)	0.003 (0.006)	0.000 (0.005)	-0.003 (0.007)
UK Avg. Earnings	0.004 (0.007)	-0.003 (0.007)	0.005 (0.014)	0.005 (0.010)	-0.004 (0.004)	-0.001 (0.005)	-0.004 (0.004)	0.002 (0.006)
UK GDP	0.009 (0.011)	0.005 (0.011)	-0.016 (0.022)	0.012 (0.016)	-0.005 (0.007)	-0.008 (0.008)	-0.006 (0.007)	-0.003 (0.009)
UK Man. Prod.	0.007 (0.005)	0.005 (0.005)	0.009 (0.010)	0.015** (0.007)	0.007* (0.004)	0.005 (0.005)	0.008** (0.004)	0.002 (0.005)
UK PPI	0.003 (0.006)	0.005 (0.006)	0.004 (0.013)	0.001 (0.009)	0.004 (0.004)	0.007 (0.005)	0.005 (0.004)	0.012** (0.006)
UK RPIX	0.002 (0.005)	0.001 (0.005)	-0.008 (0.011)	-0.004 (0.008)	-0.007 (0.005)	-0.002 (0.006)	-0.008* (0.005)	0.010* (0.006)
UK Ret. Sales	0.002 (0.006)	0.001 (0.006)	0.006 (0.011)	0.007 (0.009)	-0.000 (0.004)	0.004 (0.005)	-0.002 (0.004)	0.002 (0.006)
EA Bus. Climate	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.005 (0.005)	0.002 (0.006)	-0.004 (0.005)	0.005 (0.007)
EA CPI	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.003 (0.005)	0.002 (0.006)	0.003 (0.005)	0.004 (0.007)
EA Ind. Prod.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.004 (0.005)	0.001 (0.006)	-0.004 (0.005)	0.000 (0.007)
EA Unemp.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.002 (0.005)	-0.003 (0.006)	0.001 (0.005)	0.004 (0.007)
GE CPI	0.005	0.001	0.018	0.003	0.004	0.003	0.006	0.002

	(0.008)	(0.008)	(0.015)	(0.011)	(0.004)	(0.005)	(0.004)	(0.005)
GE IFO	0.015*	0.006	0.008	0.008	0.010**	0.018***	0.010**	0.009
	(0.008)	(0.008)	(0.016)	(0.012)	(0.004)	(0.006)	(0.005)	(0.006)
GE Ind. Prod.	-0.002	0.005	-0.011	-0.005	0.001	-0.003	0.002	-0.002
	(0.005)	(0.005)	(0.010)	(0.007)	(0.005)	(0.007)	(0.005)	(0.007)
GE M3	0.004	0.042***	-0.008	0.031***	0.000	0.000	0.000	0.000
	(0.006)	(0.006)	(0.011)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)
GE Man. Ord.	0.011**	0.011*	0.017	0.001	0.007	-0.005	0.009**	-0.004
	(0.006)	(0.006)	(0.011)	(0.008)	(0.004)	(0.005)	(0.005)	(0.006)
GE Unemp.	-0.006	-0.008	-0.007	-0.001	-0.000	-0.005	-0.001	-0.006
	(0.006)	(0.006)	(0.012)	(0.009)	(0.004)	(0.004)	(0.004)	(0.005)
FR Bus. Confid.	0.001	0.014	0.007	0.011	0.000	0.000	0.000	0.000
	(0.011)	(0.010)	(0.021)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)
FR CPI	-0.004	0.001	-0.015	0.001	0.006	0.004	0.003	0.004
	(0.006)	(0.006)	(0.011)	(0.008)	(0.005)	(0.006)	(0.005)	(0.007)
FR CPI(F)	-0.004	-0.008	-0.003	-0.005	0.000	0.000	0.000	0.000
	(0.007)	(0.007)	(0.013)	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)
FR Ind. Prod.	0.000	-0.004	-0.005	0.002	0.002	0.009	0.004	0.005
	(0.005)	(0.005)	(0.010)	(0.007)	(0.005)	(0.006)	(0.005)	(0.007)
FR M3	-0.002	-0.005	0.128***	0.034*	0.000	0.000	0.000	0.000
	(0.013)	(0.013)	(0.026)	(0.020)	(0.000)	(0.000)	(0.000)	(0.000)
FR Unemp	-0.002	-0.003	0.002	0.003	-0.043	-0.007	-0.049	-0.028
	(0.004)	(0.004)	(0.007)	(0.005)	(0.070)	(0.086)	(0.071)	(0.097)
IT CPI	-0.004	0.002	-0.000	-0.007	-0.004	-0.001	-0.004	-0.004
	(0.009)	(0.009)	(0.017)	(0.013)	(0.005)	(0.007)	(0.005)	(0.007)
IT Ind. Prod.	-0.013	-0.014	-0.007	-0.002	0.007	0.009	0.011*	0.008
	(0.009)	(0.009)	(0.018)	(0.013)	(0.006)	(0.007)	(0.006)	(0.008)
IT M2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
IT Unemp.	0.001	-0.002	-0.002	0.011	-0.012	0.011	0.006	0.020
	(0.014)	(0.014)	(0.028)	(0.021)	(0.021)	(0.025)	(0.021)	(0.028)
SP CPI	0.007	-0.003	0.008	0.002	0.008*	0.008	0.007	0.005
	(0.011)	(0.011)	(0.022)	(0.016)	(0.004)	(0.005)	(0.004)	(0.006)
SP Unemp.	0.015	0.003	0.010	0.009	0.005	0.011	0.006	0.003
	(0.014)	(0.014)	(0.028)	(0.021)	(0.012)	(0.015)	(0.013)	(0.017)
Sp Ret. Sales	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.000	-0.001	-0.005	-0.007***	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	991	991	991	991	902	902	902	902

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Summary Statistics of Forward Rates

	FR		GE		IT		SP	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Pre-ECB	7.218606	1.021949	6.927016	1.001564	9.23761	2.223079	8.776703	1.84016
Post-ECB	4.890603	0.647148	4.547657	0.6224579	5.178338	0.5859116	4.866209	0.6849675

Table 7. Principal Components Analysis of Yields within Countries

Contributions of first two principal components

	FR		GE		IT		SP	
	First PC	Second PC	First PC	Second PC	First PC	Second PC	First PC	Second PC
Pre-ECB	0.969	0.031	0.957	0.043	0.999	0.001	0.998	0.002
Post-ECB	0.912	0.087	0.950	0.050	0.928	0.071	0.924	0.074

Table 8. Response of long forward rates to data surprises

	Before-ECB				After-ECB			
	FR	GE	IT	SP	FR	GE	IT	SP
US Capa. Util.	-0.001 (0.007)	0.003 (0.009)	-0.001 (0.024)	0.029** (0.012)	0.003 (0.005)	-0.011 (0.009)	0.002 (0.006)	-0.020* (0.011)
US Cons. Conf	0.009 (0.007)	0.003 (0.009)	0.024 (0.025)	0.022* (0.012)	0.003 (0.005)	0.007 (0.009)	0.000 (0.006)	0.003 (0.010)
US CPIX	0.003 (0.009)	-0.008 (0.011)	0.007 (0.030)	0.026* (0.015)	0.008 (0.006)	-0.003 (0.011)	0.008 (0.007)	-0.024** (0.012)
US GDP	-0.026** (0.011)	-0.004 (0.014)	0.029 (0.040)	-0.003 (0.019)	0.005 (0.009)	0.000 (0.017)	0.004 (0.010)	0.005 (0.019)
US NAPM	0.002 (0.008)	-0.010 (0.010)	-0.014 (0.027)	-0.011 (0.013)	0.004 (0.005)	0.008 (0.009)	-0.001 (0.006)	0.012 (0.010)
US NonFarm Pay.	0.008 (0.007)	-0.025*** (0.009)	0.002 (0.025)	-0.009 (0.012)	0.020*** (0.006)	0.003 (0.011)	0.010 (0.007)	-0.023* (0.013)
US New Hom.	0.007 (0.008)	0.004 (0.010)	-0.034 (0.028)	0.038*** (0.014)	-0.005 (0.004)	-0.012* (0.007)	-0.003 (0.004)	-0.012 (0.007)
US Ret. Sales	0.025*** (0.009)	0.009 (0.012)	0.040 (0.033)	0.022 (0.016)	-0.000 (0.004)	0.011 (0.008)	0.007 (0.005)	0.003 (0.009)
US Unemp.	0.018** (0.007)	-0.006 (0.009)	-0.040* (0.024)	0.008 (0.012)	0.005 (0.005)	0.010 (0.009)	0.002 (0.006)	-0.001 (0.010)
UK Avg. Earnings	-0.003 (0.009)	-0.001 (0.011)	-0.013 (0.031)	0.015 (0.015)	-0.000 (0.004)	0.005 (0.008)	0.001 (0.005)	0.009 (0.009)
UK GDP	0.009 (0.014)	0.024 (0.017)	-0.027 (0.048)	0.036 (0.024)	-0.003 (0.007)	-0.011 (0.013)	-0.001 (0.008)	0.001 (0.014)
UK Man. Prod.	0.011* (0.006)	0.004 (0.008)	0.033 (0.022)	0.005 (0.011)	0.004 (0.004)	-0.007 (0.007)	0.008* (0.005)	0.000 (0.008)
UK PPI	-0.001 (0.008)	-0.007 (0.010)	0.004 (0.028)	-0.002 (0.014)	-0.001 (0.004)	0.011 (0.008)	0.003 (0.005)	0.013 (0.009)
UK RPIX	0.004 (0.007)	0.005 (0.008)	-0.017 (0.024)	0.003 (0.011)	-0.010** (0.005)	-0.005 (0.009)	-0.009* (0.005)	0.025*** (0.010)
UK Ret. Sales	-0.001 (0.007)	0.010 (0.009)	-0.005 (0.026)	0.007 (0.012)	-0.007* (0.004)	-0.003 (0.008)	-0.002 (0.005)	-0.003 (0.009)
EA Bus. Climate	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.003 (0.005)	-0.004 (0.010)	-0.004 (0.006)	0.006 (0.011)
EA CPI	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.005)	-0.001 (0.010)	0.005 (0.006)	0.002 (0.011)
EA Ind. Prod.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001 (0.005)	-0.002 (0.010)	-0.005 (0.006)	0.010 (0.011)
EA Unemp.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.005)	-0.017* (0.009)	0.007 (0.006)	0.005 (0.010)
GE CPI	-0.001 (0.010)	-0.000 (0.012)	0.039 (0.034)	-0.005 (0.017)	0.004 (0.004)	0.002 (0.007)	0.007 (0.005)	0.001 (0.008)

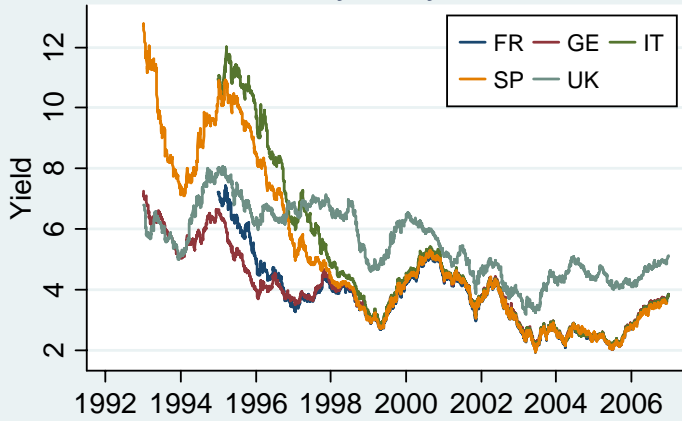
GE IFO	0.015 (0.010)	0.015 (0.012)	0.010 (0.036)	0.018 (0.017)	0.005 (0.004)	0.003 (0.009)	0.001 (0.005)	0.000 (0.010)
GE Ind. Prod.	-0.013** (0.006)	0.003 (0.008)	-0.012 (0.022)	-0.003 (0.010)	0.002 (0.005)	-0.003 (0.010)	-0.007 (0.006)	0.001 (0.012)
GE M3	-0.001 (0.007)	0.052*** (0.009)	-0.026 (0.025)	0.028** (0.012)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
GE Man. Ord.	0.006 (0.007)	0.003 (0.009)	0.039 (0.025)	-0.008 (0.012)	0.007 (0.004)	0.000 (0.009)	0.005 (0.005)	-0.001 (0.010)
GE Unemp.	-0.002 (0.008)	0.001 (0.010)	-0.005 (0.027)	-0.003 (0.013)	-0.000 (0.004)	-0.005 (0.007)	-0.001 (0.004)	-0.009 (0.008)
FR Bus. Confid.	-0.001 (0.013)	0.017 (0.016)	0.014 (0.047)	-0.000 (0.023)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR CPI	-0.002 (0.007)	-0.002 (0.009)	-0.019 (0.025)	0.006 (0.012)	0.005 (0.005)	0.009 (0.010)	0.008 (0.006)	0.002 (0.011)
FR CPI(F)	-0.002 (0.009)	-0.000 (0.011)	0.001 (0.030)	0.001 (0.015)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR Ind. Prod.	0.001 (0.006)	-0.007 (0.008)	-0.002 (0.022)	0.002 (0.011)	0.003 (0.005)	0.015 (0.010)	0.007 (0.006)	0.001 (0.011)
FR M3	-0.004 (0.017)	-0.014 (0.021)	0.148** (0.059)	-0.033 (0.028)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
FR Unemp	0.001 (0.005)	0.007 (0.006)	-0.005 (0.016)	0.001 (0.008)	-0.001 (0.070)	0.122 (0.135)	-0.172** (0.084)	0.007 (0.151)
IT CPI	-0.005 (0.011)	0.021 (0.013)	0.006 (0.038)	-0.009 (0.019)	-0.005 (0.005)	0.007 (0.010)	-0.010 (0.006)	-0.003 (0.011)
IT Ind. Prod.	-0.012 (0.011)	-0.016 (0.014)	0.004 (0.040)	0.003 (0.020)	0.006 (0.006)	0.033*** (0.012)	0.001 (0.007)	0.014 (0.013)
IT M2	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
IT Unemp.	0.012 (0.018)	0.028 (0.022)	0.001 (0.063)	0.030 (0.031)	-0.016 (0.021)	-0.010 (0.039)	-0.045* (0.024)	0.027 (0.044)
SP CPI	0.012 (0.014)	-0.006 (0.017)	0.021 (0.049)	0.003 (0.024)	0.005 (0.004)	-0.001 (0.008)	0.008 (0.005)	0.001 (0.009)
SP Unemp.	0.033* (0.018)	-0.017 (0.022)	0.027 (0.063)	0.015 (0.031)	0.002 (0.012)	-0.010 (0.024)	0.005 (0.015)	-0.004 (0.026)
Sp Ret. Sales	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Constant	0.001 (0.002)	-0.002 (0.002)	0.001 (0.007)	-0.007** (0.003)	-0.001 (0.001)	-0.002 (0.002)	-0.003* (0.001)	-0.002 (0.003)
Observations	991	991	991	991	902	902	902	902

Standard errors in parentheses

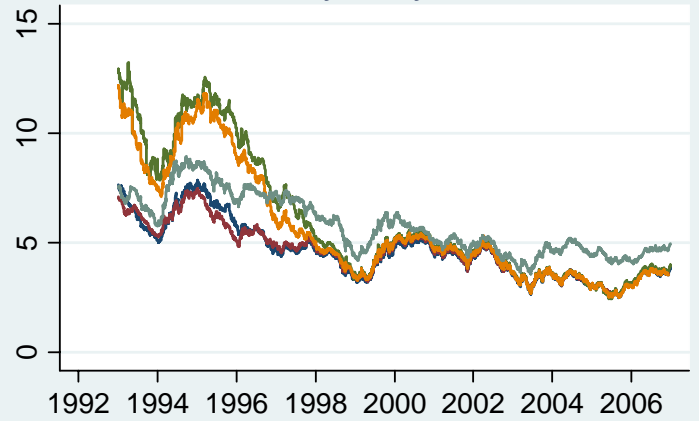
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1. Time Series of Constant Maturity Yields

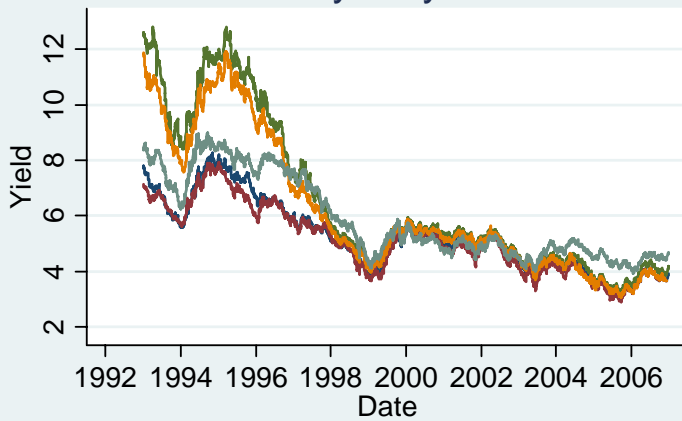
Two-year yields



Five-year yields



Ten-year yields



Long forward rates

