BANCA D'ITALIA
EUROSISTEMA

Temi di discussione

(Working papers)

Short-term interest rate futures as monetary policy forecasts

by Giuseppe Ferrero and Andrea Nobili

June 2008

Number 681

SHORT-TERM INTEREST RATE FUTURES AS MONETARY POLICY FORECASTS

by Giuseppe Ferrero * and Andrea Nobili*

Abstract

The prices of futures contracts on short-term interest rates are commonly used by central banks to gauge market expectations concerning monetary policy decisions. Excess returns - the difference between futures rates and the realized rates - are positive, on average, and statistically significant, both in the euro area and in the United States. We find that these biases are significantly related to the business cycle only in the United States. Moreover, the sign and the significance of the estimated relationships with business cycle indicators are unstable over time. Breaking the excess returns down into risk premium and forecast error components, we find that risk premia are counter-cyclical in both areas. On the contrary, ex-post prediction errors, which represent the greater part of excess returns at longer horizons in both areas, are correlated with the business cycle (negatively) only in the United States.

JEL Classification: E43, E44, E52.

Keywords: futures rates, monetary policy, risk-premium.

Contents

* Bank of Italy, Economics, Research and International Relations.

1 Introduction

In order to infer market's expectations about the future course of monetary policy, Central Banks commonly use prices of financial assets and survey data. The former are available at high frequencies, but they also incorporate risk and term premia, which may distort their information content in terms of expected future interest rates, while the latter are likely not to be affected by premia but are available at a relatively low frequency. Both measures might be biased estimators of ex-post realized interest rates to the extent that they incorporate systematic forecast errors.

Recent studies for the United States have compared the information content of several financial instruments, finding that yield curves and futures contracts on short-term interest rates are good predictors of the future path of monetary policy decisions both in the short and medium term (Gürkaynak, Sack and Swanson, 2006; Piazzesi and Swanson, 2004). Nevertheless, another strand of the literature has provided evidence that ex-post excess returns, namely the differences between short-term interest rates implied in the price of Eurodollars futures and the ex-post realized spot rates, are, on average, positive and statistically significant (Krueger and Kuttner, 1996; Sack, 2002 and Durham, 2003). Recently, Piazzesi and Swanson (2004) have shown that this bias is time-varying, countercyclical and predictable by means of business cycle indicators. This finding suggests that policymakers should look at adjusted measures of futures rates in order to assess the efficacy of their communication more accurately.

We notice that the label "risk premia" is often used in the financial literature to refer to predictable excess returns on the short-term interest rate (Piazzesi and Swanson, 2004; Cochrane, 2006). This identification is consistent with the hypothesis that expectations are perfectly rational. In this case, in fact, prediction errors are orthogonal to the information set and the only predictable part of the excess return would be the risk premia.

In this paper we re-assess the predictive power of short-term interest rate futures by relaxing the assumption of perfect rationality for short-term interest rate expectations. If financial markets do not necessarily form their forecasts in a perfectly rational way, ex-post excess returns may incorporate two predictable components. One is the ex-ante risk premium, defined as the difference between the futures rates and the market expectation of future spot interest rates, which is required by investors when they buy or sell the financial contract. The other is the ex-post prediction error.

In this respect, we extend the analysis of Piazzesi and Swanson (2004) along two dimensions. First, we use futures contracts on short-term interest rates in euros and investigate the size and the magnitude of ex-post excess returns in the euro area, allowing a comparison with those in dollars. Second, we rely on professional forecast surveys in order to disentangle the risk premium and forecast error components of ex-post excess returns and to study their behavior over the business cycle.

Our empirical investigation reveals that euro-area ex-post excess returns are of the same sign and magnitude as those in the United States, but they do not appear to be significantly related to the business cycle. In addition, the relation between excess returns and business cycle appears to be unstable over time both in the US and in the euro area. This evidence is in contrast with the findings of the recent strand of the literature that studies term structure models, which suggests that the implied risk premia should be strongly affected by business cycle fluctuations.

We show that these puzzling results essentially depend on the common assumption that ex-post excess returns coincide entirely with risk premia. Our proposed empirical breakdown of ex-post excess returns suggests that risk premia are, on average, slightly larger in the United States than in the euro area, but they are significantly countercyclical in both areas. Interestingly, the predictive regressions involving risk premia and business cycle indicators are stable over time. By contrast, ex-post prediction errors, which represent the largest fraction of the whole excess return at longer horizons in both areas, are significantly and negatively related to the business cycle only in the United States.

We argue that our excess returns decomposition has important implications for central banks when they assess financial markets' expectation regarding the future path of monetary policy decisions. Even though interest rates futures adjusted for both components provide the best forecast of future spot interest rates, they no longer coincide with financial markets view. Policymakers should assess markets' expectations about future interest rates by looking at quoted futures rates adjusted by the premia component only, as the ex-post prediction error reflects part of the expectations formation process.

The remainder of the paper is organized as follows. In section 2 we describe the dataset used in the analysis. In section 3 we provide evidence on the size and predictability of ex-post excess returns on short-term interest rates in euros, allowing a comparison with the United States. In section 4 we decompose ex-post realized excess returns into risk premia and systematic prediction errors and investigate their relation with the business cycle. In section 5 we point out the main implications of our proposed breakdown for policymakers. Section 6 concludes.

2 The dataset

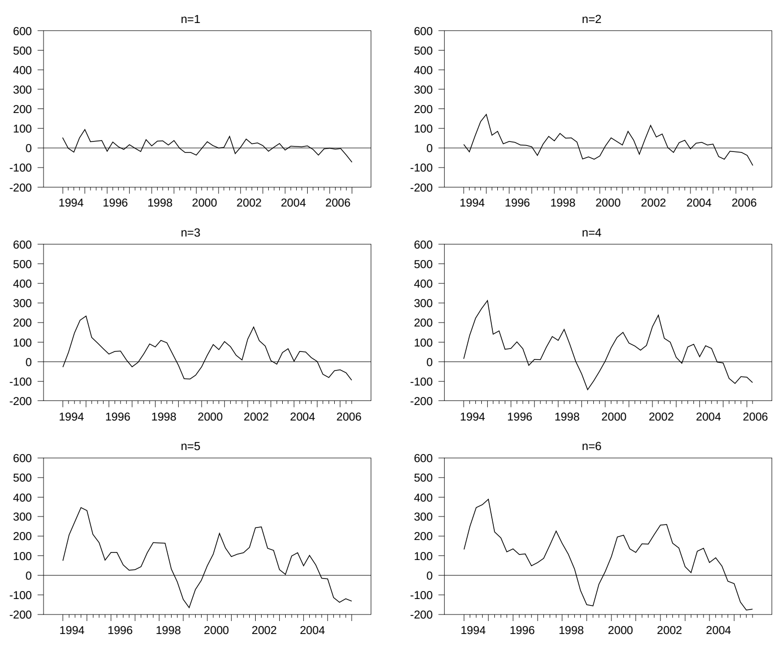
We define the ex-post excess return realized from holding the n-quarter-ahead contract to maturity as

$$x_{t+n}^{(n)} = f_t^{(n)} - r_{t+n} \tag{1}$$

where $f_t^{(n)}$ denotes the average of the futures contract rates quoted on the first ten days of the last month of quarter t for a contract expiring at the end of quarter $t+n$ and r_{t+n} is the corresponding realized spot interest rate prevailing on the day of expiration of the future contract.[1]

Regarding the euro area, we restrict our attention to futures contracts on short-term interest rates traded on the London International Financial Futures Exchange (LIFFE), which mature two business days prior to the third Wednesday of the delivery month. At each point in time we focus on the first 6 (unexpired) contracts.[2] The choice of the sample period, 1994-2007, reflects the limited availability of survey data used for the excess returns decomposition, which is the core of our analysis. In particular, for the pre-EMU period (1994q1-1998q4), we consider futures contracts linked to the British Bankers' Association offered rate (BBA LIBOR) for three-month Eurodeutschmark deposits. The idea is that the institutional features and anti-inflationary objective of the European Central Bank's monetary policy largely resemble those of the German Bundesdbank.[3] For the EMU period (1999q1-2007q1) we focus on contracts whose underlying asset is the European Banking Federations' Euribor Offered Rate (EBF Euribor) for three-month euro deposits. For the United States we compute the ex-post excess returns using futures contacts on three-month LIBOR Eurodollar deposit rates, which are quoted on the Chicago Mercantile Exchange.

Figure 1: Ex-post excess returns in the euro area



Notes. The sample period is 1992q1-2007q1. Ex-post excess returns are measured in basis points.

[1]Results do not change significantly using the futures contract rate quoted on the last trading day of quarter t.

[2]By far, the most actively traded futures contracts on three-month deposits are those with delivery in March, June, September and December.

[3]Buiter (1999) suggests that the ECB adheres to a "priestly" view of central banking in that it adopts "many of the procedures and practices of the old Bundesbank".

Figure 1 plots the time series of the ex-post realized excess returns on futures contracts in euros expiring up to 6 quarters ahead. Three basic features emerge. First, independently from the forecasting horizon, these returns are generally positive, suggesting that futures rates are, on average, higher than ex-post realized spot rates. Second, they increase with the forecast horizon, consistently with the view that agents demand larger term premia on contracts with longer expiration dates. Third, they move significantly over time (see also Piazzesi and Swanson, 2004).

3 Re-assessing ex-post excess returns

3.1 Constant excess returns

We start our analysis by checking whether futures contracts rates are unbiased predictors of spot short-term interest rates. To this end, we follow Piazzesi and Swanson (2004) and regress the computed ex-post excess returns on a constant term

$$x_{t+n}^{(n)} = \alpha^{(n)} + \epsilon_{t+n}^{(n)} \tag{2}$$

for the forecast horizons $n = 1, 2, 3, ..., 6$ quarters and test in each equation whether the estimated coefficients $\alpha^{(n)}$ are different from zero.

In the absence of arbitrage opportunities, this analysis is also considered a test of the validity of the (pure) rational expectations hypothesis, namely, that futures contracts rates are, on average, equal to the expected spot interest rates.[4] We notice that in the financial literature (Fama, 1984; Campbell and Shiller, 1991; Campbell, 1995) the validity of this hypothesis has also been tested by running predictive regressions of the type

$$r_{t+n}^{(n)} = \alpha^{(n)} + \beta^{(n)} f_t^{(n)} + \epsilon_{t+n}^{(n)} \tag{3}$$

and performing the joint test of the null hypothesis that $\alpha^{(n)} = 0$ (zero mean term premia) and $\beta^{(n)} = 1$ (no time-varying term premia).[5] However some drawbacks of this second approach have been recently stressed. First of all, standard errors in regressions of this type are typically large enough that the expectations hypothesis cannot be rejected, as regression tests are not powerful enough to distinguish between the expectations hypothesis and alternative hypothesis in a sample of the length considered here (Kim and Orphanides, 2005). Moreover, equation (3) may

[4] In the weaker version of the forward rate expectation hypothesis the constant term is allowed to be non-zero.

[5] Interestingly, Gürkaynak, Sack and Swanson (2006) find that the hypothesis that $\beta = 1$ cannot be rejected for a number of US market interest rates. This evidence, they say, suggests only that the time-varying excess returns are not correlated enough with the ex-post spot interest rates spreads to drive the estimated coefficients far from one. It does not rule out the possibility that they are correlated with other variables, such as business cycle indicators.

raise concerns regarding spurious correlation among variables, insofar as spot interest rates and futures contracts rates are non-stationary variables. Although the results could be strongly sample dependent, there is some evidence that various international nominal short and long-term interest rates may contain a unit root in the levels of the series (e.g. Rose, 1988; Rapach and Weber, 2004).[6]

Results for the estimated coefficients of equation (2) are summarized in Table 1, where standard errors are computed by means of the Newey-West heteroscedasticity and autocorrelation consistent procedure, in order to take into account the futures contracts overlapping. In the euro area the average ex-post realized excess returns are significantly positive over the sample period, ranging from about 10 basis points at the 1-quarter horizon to 100 basis points at the 6-quarter horizon.

Table 1: Constant excess returns

	Euro Area					
n	1	2	3	4	5	6
$\alpha^{(n)}$	8.4**	20.5**	37.7**	59.1**	80.7**	102.2**
	(4.4)	(9.8)	(16.8)	(23.3)	(28.9)	(32.9)
	United States					
$\alpha^{(n)}$	18.3**	33.3**	51.7**	73.6**	93.6**	112.2**
	(6.0)	(14.7)	(25.5)	(34.5)	(42.8)	(49.6)

Notes. The sample period is 1994q1-2007q1. Ex-post excess returns are measured in basis points. Predictive regressions are estimated by OLS. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent level.

A corresponding analysis for the United States suggests that ex-post excess returns in dollars have likewise been significantly positive and also slightly larger than those obtained for the euro area, ranging from about 20 basis points at the 1-quarter horizon to 110 basis points at the 6-quarter horizon.[7]

3.2 Time-varying excess returns

Relying on previous studies for the US Treasury market (Fama and Bliss, 1987; Cochrane and Piazzesi, 2002) and, more recently, for quoted futures rates (Piazzesi and Swanson, 2004) we assess whether the term structure of interest rates implied in

[6]In order to deal with nonstationary, the validity of the expectations hypothesis is usually tested by subtracting the current level of spot rates or first-differencing the variables in equation (3) (Gürkaynak, Sack and Swanson, 2006; Jongen, Verschoor and Wolff, 2005).

[7]In the sample period 1985q1-2005q4 Piazzesi and Swanson (2004) find that the average excess return ranges from 12 basis points at the 1-quarter horizon to 140 basis points at the 6-quarter horizon.

futures contracts in euros is also characterized by time-varying and predictable excess returns. The predictability of excess returns is explored by running the following regressions

$$x_{t+n}^{(n)} = \alpha^{(n)} + \beta^{(n)} z_t + \gamma^{(n)} f_t^{(n)} + \epsilon_{t+n}^{(n)} \tag{4}$$

which involve a business cycle indicator observable at time t, namely z_t, and the level of the futures rate itself. Under the assumption that excess returns can be interpreted as risk premia, their predictability using business cycle indicators finds theoretical foundation in standard asset pricing models (Cochrane, 2006), while the broader specification in (4), which includes the futures rate as an additional regressor, essentially relies on the recent strand of the financial literature that uses the affine structure to model the yield curve and the price of risk. These studies typically employ Gaussian affine term-structure models in which time-varying risk premia depend on two latent factors usually identified, respectively, with the level of the short-term interest rate and the slope of the yield curve. The significant relationship between the yield curve and observable state variables reflecting business cycle fluctuations have been amply documented in Ang and Piazzesi (2003), Ang, Dong and Piazzesi (2004), Ang, Piazzesi and Wei (2005), Hordal, Tristani and Vestin (2005), Rudebusch and Wu (2005) and Pericoli and Taboga (2006).[8]

Table 2: Time-varying excess returns.

	n=1		n=2		n=3		n=4		n=5		n=6	
Euro Area												
constant	8.4**	8.4**	20.5**	20.5**	37.7**	37.7**	59.1**	59.1**	80.7**	80.7**	102.2**	102.2**
	(3.8)	(4.1)	(8.1)	(8.7)	(13.0)	(14.0)	(16.3)	(17.3)	(18.5)	(19.2)	(19.8)	(20.2)
RGDP	-13.5**	...	-18.2	...	-20.0	...	-22.5	...	-22.5	...	-20.8	...
	(4.1)		(11.1)		(17.6)		(18.5)		(16.7)		(14.8)	
E(empl)	...	-4.7	...	-3.0	...	-2.8	...	-6.7	...	-10.7	...	-13.2
		(4.6)		(9.2)		(13.9)		(15.3)		(15.1)		(14.3)
future	16.7**	10.4**	32.6**	22.9**	52.2**	41.8**	79.0**	68.3**	100.9**	91.4**	115.9**	108.0**
	(4.9)	(4.6)	(13.0)	(9.6)	(17.5)	(12.7)	(17.5)	(13.7)	(16.7)	(14.4)	(16.8)	(15.8)
R^2	0.22	0.09	0.24	0.16	0.32	0.27	0.46	0.43	0.57	0.55	0.63	0.62
United States												
constant	18.3**	18.3**	33.3**	33.3**	51.7**	51.7**	73.6**	73.6**	93.6**	93.6**	112.2**	112.2**
	(5.6)	(5.7)	(12.9)	(12.9)	(21.4)	(19.2)	(28.0)	(21.8)	(33.4)	(22.8)	(37.3)	(24.2)
RGDP	-14.7*	...	-35.2**	...	-57.9**	...	-76.5**	...	-91.5**	...	-103.2**	...
	(8.2)		(14.1)		(20.8)		(25.7)		(30.5)		(32.9)	
E(empl)	...	-22.8**	...	-73.8**	...	-127.2**	...	-177.4**	...	-211.8**	...	-224.6**
		(10.6)		(23.0)		(28.9)		(27.2)		(24.6)		(24.9)
future	11.6*	22.8**	30.8**	74.5**	54.7**	131.2**	81.5**	189.5**	109.2**	234.9**	134.6**	261.5**
	(6.8)	(10.7)	(12.1)	(23.4)	(18.1)	(28.8)	(24.1)	(30.1)	(28.5)	(31.1)	(32.9)	(32.9)
R^2	0.06	0.04	0.12	0.19	0.18	0.33	0.24	0.48	0.31	0.61	0.37	0.66

Notes. The sample period is 1994q1-2007q1. RGDP is real GDP growth rate. E(empl) is employment expectations for the months ahead of the industrial survey by the European Commission. NFP is the growth rate of non-farm payrolls. Ex-post excess returns are measured in basis points. All predictive variables are standardized. Predictive regressions are estimated by OLS. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent confidence level.

[8] For a survey, see Diebold, Piazzesi and Rudebusch (2005).

Results for the euro area are reported in the top part of Table 2 and refer to two business cycle indicators. For each maturity, the first column shows the estimated coefficients obtained using the annual growth rate of real GDP, which is commonly considered the most natural proxy for the business cycle. As official real GDP data are released with a lag and frequently revised, there may be significant differences between the data used in the regression and the one available to market participants at the time contract prices were settled. To avoid this problem, we also perform real-time predictive regressions using alternative business cycle indicators. In particular, we use indices from the European Commission's survey of manufacturing industry, household consumption, construction and retail trade. In order to select a narrower set of variables from the large volume of available survey data, we performed a preliminary cross correlation analysis at business cycle frequencies between each of them and real GDP. Among the variables with greater contemporaneous correlation, we find that "employment expectations for the months ahead" in manufacturing industry has the best properties in terms of significance and goodness of fit in regression (4).[9] As the survey is available at monthly frequency, in our quarterly regressions we include the data for the second month of the quarter considered, in order to avoid the use of data not available when agents form their expectations. Moreover, in order to compare the results obtained with different variables and between the two areas, we normalize the regressors to have zero mean and unit variance. Excess returns in euros do not appear to be significantly related to the business cycle.

Table 2 allows us to compare the predictability of excess returns in euros and in dollars in the same sample period. For the United States we use as business cycle indicators, the annual growth of real GDP and the real-time year-on-year change in non-farm payrolls. In this case, our estimates confirm the results obtained by Piazzesi and Swanson (2004) for the sample period 1985-2005. The slope coefficients are, in general, highly significant and negative, and their size increases with the forecast horizon. However, some concerns may arise with these estimates.

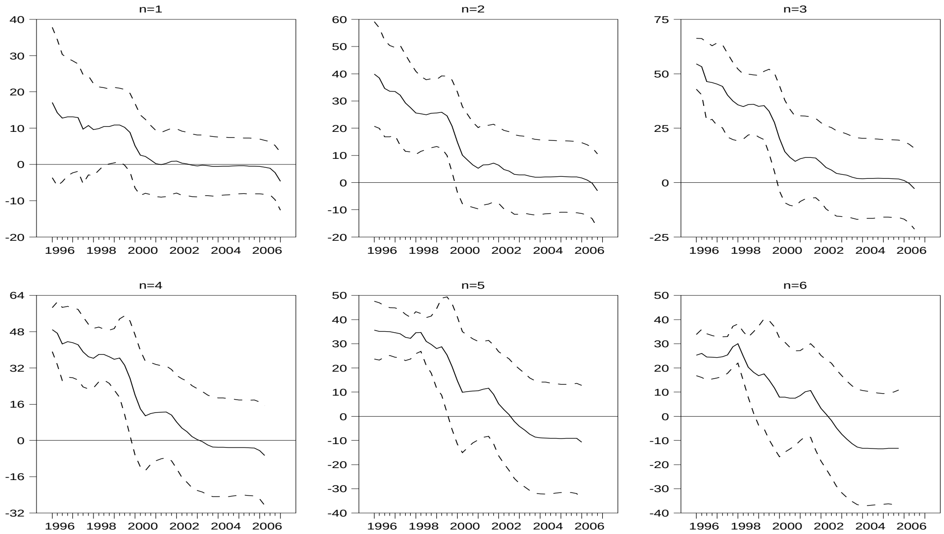
A first issue is the stability of the estimated coefficients. In Figure 2 we plot the recursive estimates of coefficients of the business cycle indicators used in equation (4). Interestingly, the coefficients decreased significantly over time both in the euro area and in the United States. In particular, we cannot exclude that the coefficients were positive in the period 1994-2000 and became negative afterwards. The CUSUM tests for overall stability of the estimated regressions show significant departures of the computed test-statistics from their expected value, thus providing evidence for the presence of parameter or variance instability in the predictive regressions (Figure

[9]The contemporaneous correlation of this variable with real GDP at business cycle frequencies is 0.7. We also run regressions including simultaneously two or more business cycle indicators and involving one or more estimated common factors obtained from a dynamic factor model based on all the considered business cycle indicators. Results in terms of goodness of fit are not better than those obtained with employment expectations. The results obtained with other survey data are available from the authors upon request.

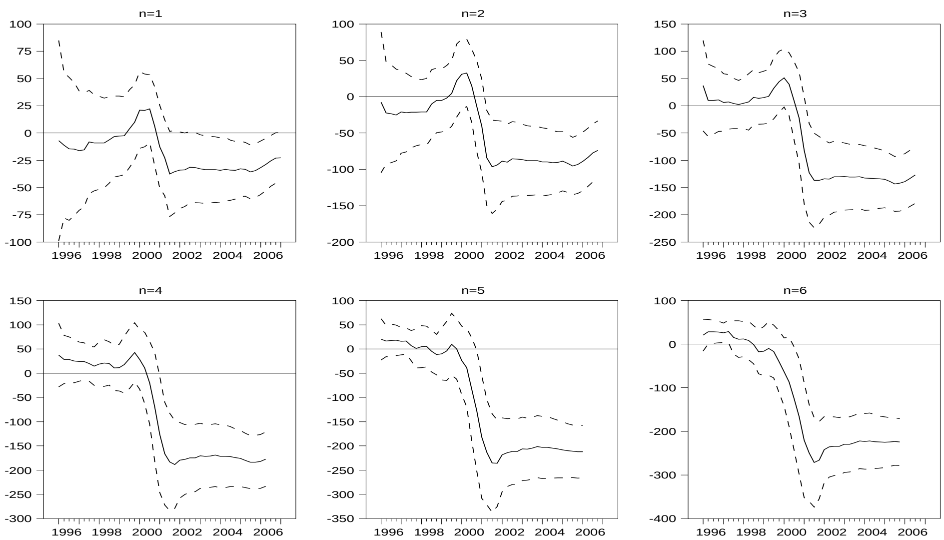
A1 in the appendix).

Figure 2: Recursive coefficients for the business cycle indicator

(Euro area)



(United States)



Notes. Recursive least squares estimates. The initial estimate is obtained using the sample 1994q1-1996q1. Employment expectations for the months ahead are used in predictive regressions for the euro area. Non-farm payrolls are used in predictive regressions for the United States. Dotted lines represent the two standard error bands around the estimated coefficients.

Another important concern is that excess returns may be non-stationary in the sample period. To the extent that the regressor variables are also non-stationary, the interpretation of the previous estimated predictive regressions may prove erroneous. In Table 3 we investigate the time series properties of the variables used in the predictive regressions by means of the modified Augmented-Dickey-Fuller test (DF-GLS) for unit root (Elliot, Rothenberg and Stock, 1996). [10]

Table 3: Unit root test.

	Euro area		United States	
	no trend	linear trend	no trend	linear trend
$x_t^{(1)}$	-3.687**	-5.188**	-2.734**	-3.057*
$x_t^{(2)}$	-3.106**	-3.677**	-2.828**	-3.103*
$x_t^{(3)}$	-3.014**	-3.620**	-1.735*	-2.041
$x_t^{(4)}$	-2.613**	-2.983**	-1.723*	-1.928
$x_t^{(5)}$	-2.726**	-3.067**	-1.591	-1.704
$x_t^{(6)}$	-2.573**	-2.960**	-1.382	-1.914
$f_t^{(1)}$	-1.395	-2.027	-1.639	-2.568
$f_t^{(2)}$	-1.671	-2.368	-1.271	-1.411
$f_t^{(3)}$	-1.446	-1.881	-1.385	-1.630
$f_t^{(4)}$	-1.536	-2.098	-1.477	-1.848
$f_t^{(5)}$	-1.580	-2.307	-1.568	-2.077
$f_t^{(6)}$	-1.520	-2.410	-1.634	-2.287
z_t	-1.180	-2.346	-1.807	-2.109

Notes. The sample period is 1994q1-2007q1. BCI is the business cycle indicator. DF-GLS is the t-statistic of the Augmented Dickey-Fuller test. The lag order p has been selected using a Schwarz Information Criterion with the maximum lag length of 8. ** denotes the rejection of the null hypothesis at the 5 per cent confidence level; * denotes the rejection of the null hypothesis at the 10 per cent level.

While excess returns in euros appear to be stationary at all maturities, for those in dollars we cannot reject the hypothesis that they contain a unit root, at least at horizons longer than two quarters. Strong evidence of non-stationarity is also found for future rates in both areas, while for the business cycle indicators the evidence is less clear-cut and needs to be treated with caution because of the relatively low power of tests in small samples. These findings suggest that the significant relation between excess returns and the business cycle in the United States may simply reflect a common long-run trend but not short-run co-movements among variables.[11]

To the extent that we interpret excess returns as proxies for risk premia, the results of the previous predictive regressions are puzzling. Why in the overall sample

[10]In order to discriminate whether the variables of interest are stationary around a deterministic trend, we also show the results by including in the test regression both the constant term and a linear trend.

[11]We have also estimated the predictive regressions using techniques that take into account the non stationarity of time series, such as Dynamic OLS (e.g. Stock and Watson, 1993), Fully Modified Least Squares (e.g. Phillips and Hansen, 1990) and the Vector Error Correction Model (e.g. Johansen, 1991, 1995). We find the long-run relationships between excess returns and predictive variables to be significant at horizons longer than one quarter.

do risk premia behave so differently in the two areas? Why has the relation between the business cycle and the risk premia changed over time?

4 Understanding excess returns: a decomposition

First of all, we argue that the previously estimated regressions provide correct measures of the risk premia only under the crucial assumption that agents' expectations are formed in a perfectly rational way, so that prediction errors are orthogonal to the information set and the only predictable part of the excess return is the risk premium.

However, the financial literature suggests that deviations from strong rationality can arise for different reasons: (i) prices reflect information to the point where the marginal benefits of acting on information do not exceed the marginal cost (Fama, 1991); (ii) agents may rationally process only a limited amount of information because of capacity constraints (Sims, 2003); (iii) even if forecasts are formed rationally, allowing for large interest rate movement with small probability, the forecast will appear biased when judged ex post (the so called "peso problem"; (Bekaert, Hodrick and Marshall, 2001); (iv) agents in the market form expectations by learning from past experience (Timmermann, 1993) or they are subject to irrational exuberance (Shiller, 2000).

There is growing empirical evidence, based mainly on survey data, that the perfect rationality assumption is violated for expectations on many macroeconomic and financial variables and for many industrialized countries, including the United States and members of the EMU (e.g. Froot, 1989; Gourinchans and Tornell, 2004; Jongen, Verschoor and Wolff, 2005; Bacchetta, Mertens and van Wincoop, 2006).

Under the hypothesis that market's expectations are not necessarily formed in a perfectly rational way, ex-post excess returns realized from holding the n-quarter ahead futures contract to maturity can embody two predictable components.

$$x_{t+n}^{(n)} = \theta_t^{(n)} + \sigma_{t+n}^{(n)} \tag{5}$$

where

$$\theta_t^{(n)} = f_t^{(n)} - E(i_{t+n}|I_t) \tag{6}$$

and

$$\sigma_{t+n}^{(n)} = E\left(i_{t+n}|I_t\right) - i_{t+n}. \tag{7}$$

The first component, $\theta_t^{(n)}$, is the ex-ante risk premium, defined as the difference between the futures rates and the market expectation of future spot interest rates, conditional on the information set available to the agents at time t. The second one, $\sigma_{t+n}^{(n)}$, is the ex-post prediction error made by market participants in forecasting future spot rates and is measured as the difference between the conditional expectation on future rate and the ex-post realized spot rate. As in absence of perfect rationality this second component may be, at least in the short-run, systematically different from zero, ex-post excess returns can differ substantially from risk premia.

As a proxy for the market's expectations, $E(i_{t+n}|I_t)$, we consider the mean of short-term interest rates forecasts from the Consensus Forecast survey. This survey has the advantage of providing a long time series on a quarterly basis regarding expectations on future short-term interest rates at horizons up to eight quarters ahead.

The use of survey forecasts may raise concerns for several reasons. The most important one in our context is that, in principle, survey respondents may just use the unadjusted futures contract rates in order to provide their own forecasts on future spot short-term interest rates. In this case, the forecast would also incorporate the premia component and the ex-post forecast error would be observationally equivalent to the original excess return. Since most of the respondents to the Consensus Forecast survey are professional forecasters who work for institutions operating in the financial markets, even though they may differ from people operating directly in the market, it is likely that they share their information. Therefore, it seems reasonable to assume that respondents to the survey are able to separate the premium component from the forecast component. This hypotheses is also supported by evidence presented by Kim and Orphanides (2005) for the United States that shows that survey expectations on short-term interest rates based on Blue Chip Financial Forecast incorporates the premium correction.

The estimates of the average value of the two components are obtained by running the regressions[12]

$$\sigma_{t+n}^{(n)} = \alpha_{\sigma}^{(n)} + \epsilon_{t+n}^{(n)} \tag{8}$$

$$\theta_t^{(n)} = \alpha_{\theta}^{(n)} + \eta_t^{(n)}. \tag{9}$$

Results are reported in Table 4. The estimates show that in the euro area average risk premia are significant at all forecast horizons and smaller than the corresponding systematic forecast errors, at horizons longer than 2 quarters. In particular, the ex-ante risk premium ranges from about 10 to 35 basis points, while the systematic prediction error is between -5 and 70 basis points (see also Figure A2 in the Appendix). The former component accounts for more than 60 per cent of the overall predictable excess returns at the 2-quarter horizon, for about 50 per cent at 3-quarter horizon and for about 40 per cent at longer horizons.

[12]Consensus Economics receives the answers of the survey the first Friday of the last month of the quarter in which it publishes the results of the survey. Since the risk premia are computed using the averages of the market prices of futures contracts quoted on the first ten trading days of the month in which the quarterly Consensus Forecast Survey is published, the information sets of respondents to the Consensus survey and market operators should not be significantly different. In order to verify that the information sets of market participants are not too different, the predictive regressions have been also estimated using spot data from various days on either sides of the first

Table 4: Excess returns decomposition.

	Euro Area					
n	1	2	3	4	5	6
$\theta^{(n)}$	9.1**	13.6**	17.7**	24.5**	30.4**	34.2**
	(2.3)	(4.5)	(6.3)	(8.2)	(9.5)	(10.6)
$\sigma^{(n)}$	-0.7	6.9	19.9	34.6	50.3**	68.0**
	(4.4)	(9.8)	(16.1)	(21.4)	(25.6)	(29.5)
	United States					
$\theta^{(n)}$	12.2**	17.6**	25.1**	32.2**	37.9**	42.0**
	(3.8)	(5.4)	(6.6)	(7.2)	(8.4)	(9.0)
$\sigma^{(n)}$	6.0	15.7	26.6*	41.5**	55.7**	70.2**
	(5.4)	(10.0)	(14.8)	(18.6)	(22.0)	(24.8)
Estimated coefficients for risk premia (tbill3m-LIBOR3m)						
$\phi^{(n)}$	28.6**	28.7**	28.6**	28.3**	28.1**	28.1**
	(2.6)	(2.7)	(2.7)	(2.7)	(2.8)	(2.8)
$\gamma^{(n)}$	10.9**	11.1**	11.3**	11.7**	11.9**	12.2**
	(2.0)	(2.1)	(2.1)	(2.2)	(2.2)	(2.3)

Notes. The sample period is 1994q1-2007q1. $\theta_1^{(n)}$ and $\sigma_1^{(n)}$ refer to the sub-sample period 1994q1-1998q4; $\theta_2^{(n)}$ and $\sigma_2^{(n)}$ refer to the sub-sample period 1999q1-2007q1. Ex-ante risk premia and ex-post forecast errors are measured in basis points. Predictive regressions are estimated by OLS. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent confidence level.

For the United States, the Consensus Forecast survey reports expectations on the 3-months Treasury Bill rate, which may differ from 3-months LIBOR because of the existence of different premia (Campbell and Shiller, 1991; Cochrane and Piazzesi, 2002). Therefore, the ex-ante risk premium in dollars, $\widehat{\alpha}_\sigma^{(n)}$, is obtained by adjusting the Consensus Economics forecast for an estimated time-varying premium

$$PR_t \equiv i_t - tb_t = \phi + \tau x_t + e_t, \tag{10}$$

where i_t is the money market rate (3-months LIBOR) and tb_t is the 3-month Treasury Bill rate.[13] In Table 5 we report the results of the non-linear least squares joint estimation of the two different premia

$$\theta_t^{(n)} \equiv f_t^{(n)} - E_t\left[tb_{t+n}\right] - PR_t = \alpha_\sigma^{(n)} + \epsilon_{t+n}^{(n)} \tag{11}$$

Friday of the last month of the quarter. The results are robust to this modification.

[13] We use the same premium at all forecast horizons, assuming that $E_t\left[PR_{t+n}\right] = PR_t$ for $n = 1, ..., 6$.

$$PR_t = \phi^{(n)} + \tau^{(n)} x_t + e_t^{(n)} \tag{12}$$

Average risk premia in dollars, $\theta_t^{(n)}$, range between 10 and 40 basis points; they account for about 50 per cent of the overall excess return at the 2-quarter and 3-quarter horizons and for about 40 per cent at longer horizons. Systematic prediction errors started to increase significantly in 2000 (see Figure A3 in the Appendix), when the Federal Reserve stopped announcing its expected future policy stance ("policy bias"), and returned to the lowest level in 2003, when the FOMC reintroduced a direct indication about its future inclinations, suggesting that the systematic error may be strongly related to the communication strategy of the central bank.

Table 5: Time-varying risk premia.

	n=1		n=2		n=3		n=4		n=5		n=6	
Euro Area												
constant	9.1**	9.1**	13.6**	13.6**	17.7**	17.7**	24.5**	24.5**	30.4**	30.4**	34.2**	34.2**
	(1.9)	(1.9)	(3.3)	(2.9)	(4.3)	(3.9)	(5.4)	(5.0)	(5.6)	(5.1)	(4.3)	(5.9)
RGDP	-2.0	...	-4.6	...	-8.0*	...	-12.4**	...	-14.5**	...	-13.7**	...
	(1.9)		(3.8)		(4.4)		(5.4)		(5.8)		(5.8)	
E(empl)	...	-3.6*	...	-8.4**	...	-11.4**	...	-15.2**	...	-17.0**	...	-17.8**
		(2.0)		(3.5)		(4.0)		(4.5)		(4.9)		(4.9)
future	7.7**	7.6**	16.0**	15.6**	23.5**	21.8**	32.3**	28.8**	38.6**	34.2**	41.0**	37.1**
	(2.3)	(2.0)	(4.3)	(3.3)	(5.1)	(3.6)	(6.1)	(4.1)	(6.1)	(3.9)	(6.6)	(4.4)
R^2	0.14	0.18	0.31	0.40	0.42	0.51	0.48	0.56	0.56	0.63	0.57	0.64
United States												
constant	12.2**	12.2**	17.6**	17.6**	25.1**	25.1**	32.2**	32.2**	37.9**	37.9**	42.0**	42.0**
	(3.9)	(3.9)	(5.4)	(5.4)	(6.3)	(6.0)	(6.3)	(5.8)	(6.7)	(5.9)	(6.6)	(5.7)
RGDP	-4.7	...	-13.1**	...	-20.8**	...	-23.5**	...	-28.0**	...	-26.0**	...
	(4.8)		(6.6)		(7.6)		(7.5)		(7.8)		(7.5)	
NFP	...	-10.0	...	-27.7**	...	-44.7**	...	-49.8**	...	-56.0**	...	-52.4**
		(7.8)		(10.4)		(11.1)		(10.3)		(9.7)		(8.8)
future	10.1**	13.5*	21.4**	34.6**	32.9**	55.7**	41.2**	66.6**	52.2**	78.8**	58.9**	82.8**
	(4.3)	(7.6)	(6.0)	(10.0)	(6.8)	(10.6)	(6.9)	(9.9)	(7.0)	(9.2)	(6.7)	(8.3)
R^2	0.28	0.26	0.24	0.27	0.31	0.39	0.43	0.53	0.52	0.64	0.62	0.73

Notes. The sample period is 1994q1-2007q1. Ex-ante risk premia measured in basis points. Predictive regressions are estimated by OLS. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent level.

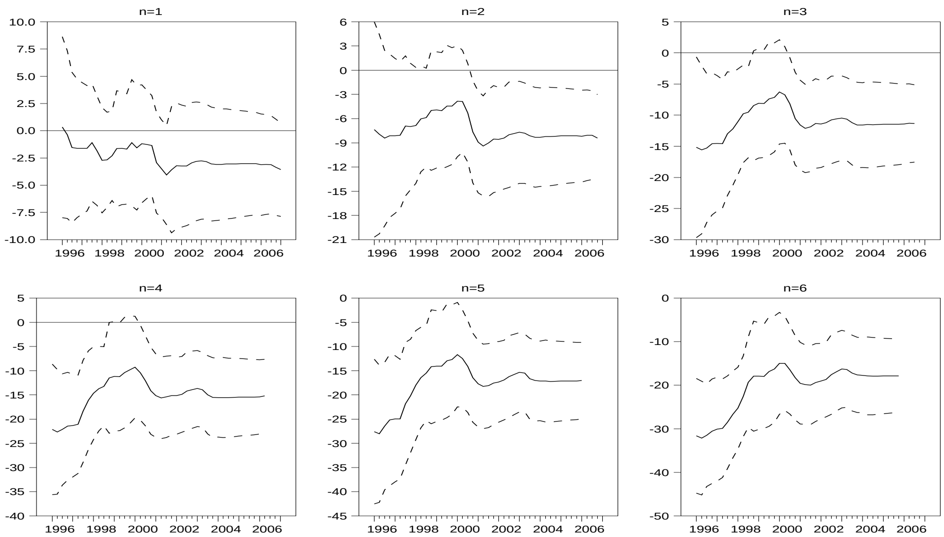
In order to investigate the business cycle properties and the predictability of the two different components $\theta_t^{(n)}$ and $\sigma_{t+n}^{(n)}$ we report in Table 5 the results obtained from the following regressions for both the euro area and the United States

$$\sigma_{t+n}^{(n)} = \alpha_\sigma^{(n)} + \beta_\sigma^{(n)} z_t + \gamma_\sigma^{(n)} f_t^{(n)} + \epsilon_{t+n}^{(n)} \tag{13}$$

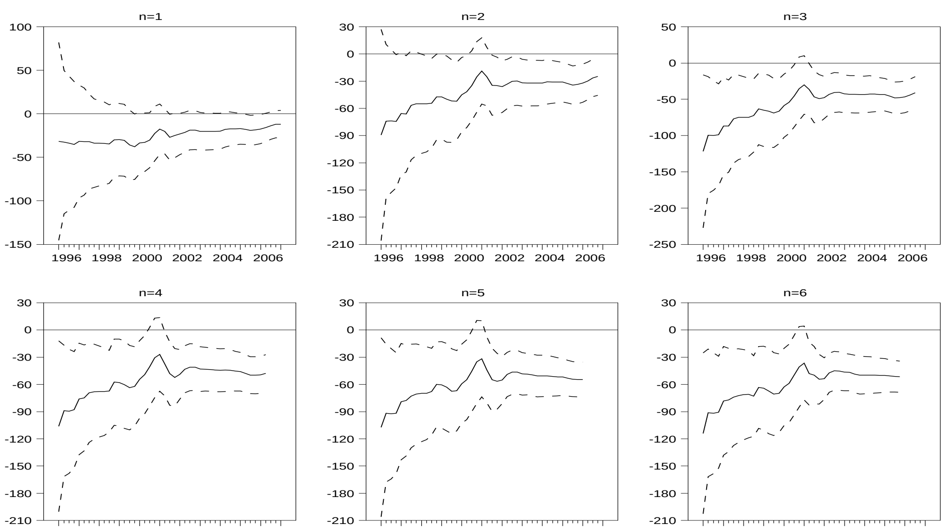
$$\theta_t^{(n)} = \alpha_\theta^{(n)} + \beta_\theta^{(n)} z_t + \gamma_\theta^{(n)} f_t^{(n)} + \eta_t^{(n)}. \tag{14}$$

Figure 3: Recursive coefficients for the business cycle indicator in risk premia regressions

(Euro area)



(United States)



Notes: Recursive least squares estimates. The first estimate is obtained using the sample 1994q1-1996q1. Employment expectations for the months ahead and Non-farm payrolls are used respectively in predictive regressions for the euro area and for the United States. Dotted lines represent the two standard error bands around the estimated coefficients.

In both areas risk premia vary significantly along the business cycle. The coefficients of the business cycle indicators are negative at all horizons and highly significant, and their magnitude increases with the forecast horizon. In periods of faster growth risk premia in the euro area may range between 10 basis points (for the 1-quarter horizon) and 40 points (for the 6-quarter horizon); in periods of slower (or negative) growth they are between 20 and 80 basis points. In the United States risk premia tend to vary slightly more along the business cycle, ranging from 10 to 25 basis points in periods of faster growth and from 25 to 95 basis points in periods of slower (or negative) growth.

The recursive estimates of the risk-premia equation (Figure 3) and the corresponding CUSUM tests (Figure A4 in the Appendix) suggest that the sign and the significance of the estimated relationships between risk premia and the business cycle (and, more in general, of the estimated regression) are stable over time in both areas. Moreover, as shown in Table A1 in the Appendix, unit root tests suggest that risk premia are stationary at all horizons considered.

As a robustness check for the euro area we consider the shorter sample period 1999q1-2007q3 (Table 6). The estimates suggest that with stage 3 of the EMU the risk premia have diminished in the euro area but have still remained statistically significant at all forecast horizons. Moreover, the coefficients of employment expectations are negative and highly significant at horizons beyond 1 quarter and they are of the same magnitude of those obtained in the overall sample.

Table 6: Time-varying risk premia in the euro area after the start of stage 3 of EMU

n	1	2	3	4	5	6
constant	6.3**	6.5*	8.1*	10.8**	12.1**	12.4*
	(2.2)	(3.4)	(4.4)	(5.4)	(5.8)	(6.6)
E(empl)	-5.3	-9.4*	-14.0**	-18.9**	-19.7**	-17.0**
	(4.1)	(5.4)	(6.6)	(7.7)	(8.2)	(7.2)
future	8.1**	12.4**	18.0**	23.3**	27.2**	27.7**
	(3.9)	(3.9)	(5.0)	(5.6)	(6.5)	(5.8)
R^2	0.08	0.13	0.23	0.33	0.39	0.40

Notes. The sample period is 1999q1-2007q3. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent level.

The predictability of ex-post prediction errors along the business cycle is assessed in Table 7.

The estimated relationships between forecast errors and business cycle indicators largely resemble those of total excess returns. In the euro area employment expectations are not significantly correlated with forecast errors, while in the United States the estimated coefficients are significantly negative at all horizons.[14]

A theoretical analysis of the reasons behind the presence of forecast errors that are predictable and significantly countercyclical only in the United States lies be-

[14] Bacchetta et al. (2006) analyze excess returns and forecast errors in the foreign exchange market and find that, in general, the predictability of the two measures are strictly related, in the sense that a variable that is successfully used in predicting expectation errors is also helpful for predicting the total excess returns.

Table 7: Time-varying forecast errors.

	n=1		n=2		n=3		n=4		n=5		n=6	
Euro Area												
constant	-0.7	-0.7	6.9	6.9	19.9	19.9	34.6*	34.6*	50.3**	50.3**	68.0**	68.0**
	(4.3)	(4.7)	(9.7)	(10.3)	(14.9)	(15.6)	(18.8)	(19.5)	(21.2)	(21.7)	(23.6)	(24.0)
RGDP	-11.5**	...	-13.5	...	-12.0	...	-10.1	...	-8.1	...	-7.1	...
	(4.4)		(12.6)		(19.6)		(21.6)		(20.5)		(19.1)	
E(empl)	...	-1.1	...	5.4	...	8.5	...	8.5	...	6.3	...	4.6
		(5.1)		(10.1)		(15.1)		(16.9)		(17.3)		(17.6)
future	9.0*	2.7	16.5	7.3	28.7	20.0	46.7**	39.5**	62.4**	57.2**	74.9**	70.9**
	(4.9)	(3.7)	(13.5)	(8.8)	(19.0)	(12.7)	(20.2)	(14.5)	(19.9)	(16.1)	(20.4)	(18.0)
R^2	0.08	-0.03	0.04	0.00	0.07	0.07	0.17	0.17	0.28	0.28	0.34	0.33
United States												
constant	6.1	6.1	15.7*	15.7*	26.6*	26.6*	41.5**	41.5**	55.7**	55.7**	70.2**	70.2**
	(5.2)	(5.2)	(9.5)	(9.2)	(14.0)	(13.4)	(17.3)	(15.8)	(20.1)	(17.6)	(22.0)	(18.9)
RGDP	-10.2	...	-25.0**	...	-37.5**	...	-53.5**	...	-62.7**	...	-74.0**	...
	(6.5)		(12.2)		(17.6)		(21.4)		(24.2)		(22.0)	
NFP	...	-16.9	...	-57.2**	...	-88.0**	...	-131.4**	...	-155.2**	...	-169.5**
		(11.3)		(20.4)		(28.1)		(31.1)		(31.6)		(31.2)
future	1.9	13.9	13.9	52.5**	22.4	81.8**	41.1*	127.4**	55.4**	155.4**	69.6**	175.4**
	(6.3)	(11.3)	(12.1)	(20.4)	(17.4)	(28.1)	(21.2)	(31.1)	(23.9)	(31.4)	(25.0)	(30.7)
R^2	0.25	0.15	0.17	0.17	0.16	0.21	0.18	0.30	0.20	0.39	0.25	0.45

Notes. The sample period is 1994q1-2007q1. Ex-post forecast errors are measured in basis points. Predictive regressions are estimated by OLS. Newey-West standard errors are reported in parentheses. * denotes significance at the 10 per cent confidence level. ** denotes significance at the 5 per cent level.

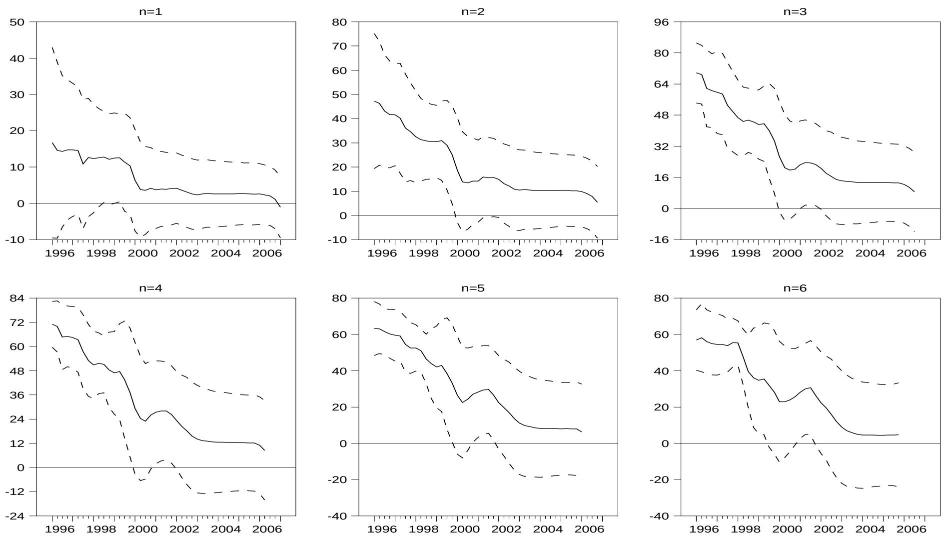
yond the scope of this paper. However, it should be noticed that in the presence of structural changes, economic agents may need time to learn about the new environment: in the early stages of this process, previously held beliefs could lead to biased predictions. To the extent that learning behaviors converge to rational expectations, the prediction bias would be a temporary phenomena (see for example Evans and Honkapohja, 2001). Therefore, it is not surprising that in the sample analyzed here the properties of the ex-post prediction error are different in the two areas and change over time. Figure 4 reports the recursive estimates of the coefficients of the business cycle indicator used in equation (13) and shows that they have significantly decreased over time both in the euro area and in the United States, thus suggesting that the instability observed in the estimates of total excess return reflects the instability of the estimates of the ex-post systematic error (see also Figure A3 in the Appendix).

5 Out-of sample forecasts accuracy

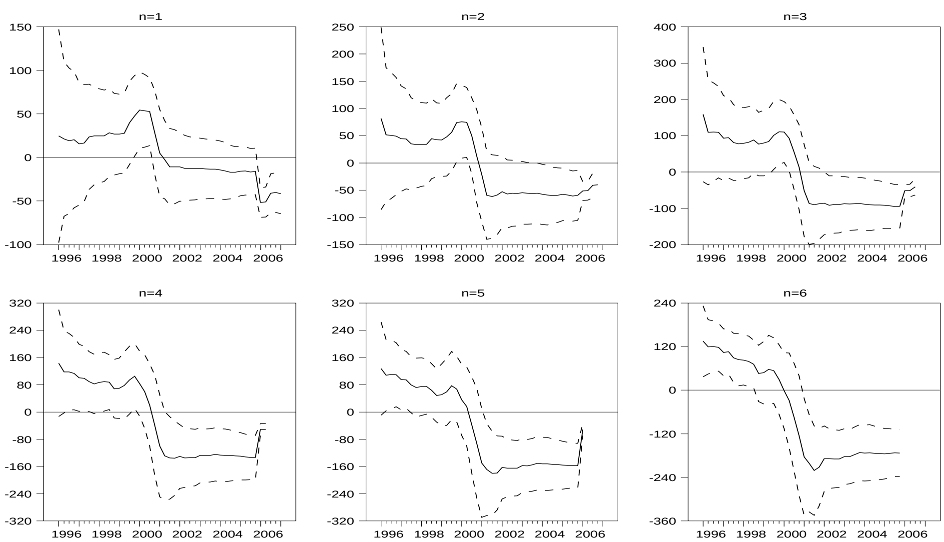
Insofar as risk premia and forecast errors are predictable by means of business cycle indicators, it is interesting to investigate whether gains are achieved in out-of-sample forecast accuracy for short-term interest rates by using adjusted futures rates.

Figure 4: Recursive coefficients for the business cycle indicator in the ex-post forecast regressions

(Euro area)



(United States)



Notes: Recursive least squares estimates. The first estimate is obtained using the sample 1994q1-1996q1. Employment expectations for the months ahead are used in predictive regressions for the euro area. Non-farm payrolls are used in predictive regressions for the United States. Dotted lines represent the two standard error bands around the estimated coefficients.

The design of the experiment is based on rolling endpoint regressions. An initial estimate of risk premia at different horizons is obtained using the sample period 1994:1-1996:4; we use the estimate to compute a set of out-of-sample forecasts for future interest rates up to 6 quarters, as follows

$$i^f_{t+n} = f^{(n)}_t - E_t(\widehat{x}^{(n)}_{t+n}). \tag{15}$$

We then add a new observation and repeat the forecasting exercise, until the end of the sample period. Overall we collect a set of 58 out-of-sample predictions at each forecast horizon. In Table 8 we report the mean error (ME) and the root-mean-squared errors (RMSE) for (i) futures rates adjusted for time-varying risk premia, (ii) constant adjusted futures rates and (iii) futures rates adjusted for time-varying total excess return. We perform a Diebold-Mariano test to check whether the errors obtained under the adjusted predictions are significantly different from their counterparts obtained with unadjusted futures rates.

Table 8: Out-of-sample forecasts for short-term interest rates: summary statistics.

	n=1		n=2		n=3		n=4		n=5		n=6	
	ME	RMSE	ME	RMSE	ME	RMSE	ME	RMSE	ME	RMSE	ME	RMSE
Euro Area												
random walk	-3.6	32.5	-7.8	54.5	-13.6	73.1	-19.4	90.0	-24.8	102.6	-30.1	112.4
Consensus	1.6	29.7	5.8	49.5	19.2	72.2	36.0	93.3	53.3	110.8	73.2	128.4
unadjusted	9.6	25.9	23.4	51.4	42.3	80.6	66.3	113.4	92.5	141.5	118.2	165.5
constant-adj.	-10.0	23.4	-20.1	45.4	-30.7	68.9	-43.2	94.1	-52.6	112.0	-59.2	122.4
risk-premia adj.	3.2	21.6	9.2	40.5	22.9	61.3	40.6	83.3	53.6	99.0	70.6	113.4
excess returns-adj.	-2.1	22.3	-4.8	44.3	-5.9	65.3	2.1	79.1	11.5	85.4	20.7	89.1
United States												
random walk	1.5	49.5	2.4	85.4	0.2	116.4	-2.9	146.0	-6.2	172.6	-11.0	194.7
Consensus	9.5	36.7	19.6	68.8	30.9	101.5	47.3	131.2	63.5	156.2	79.8	176.6
unadjusted	11.2	39.7	27.3	77.1	46.0	115.9	68.9	154.3	91.0	188.7	112.5	217.3
constant-adj.	1.7	36.9	1.5	72.6	3.4	109.9	2.0	146.4	3.4	178.3	9.4	203.3
risk-premia adj.	1.7	37.4	12.4	72.7	28.1	103.1	48.0	135.0	69.4	161.3	90.6	182.1
excess returns-adj.	-0.4	41.7	2.1	71.7	12.2	98.1	16.9	113.0	19.9	120.4	23.2	128.9

Notes. ME in the Mean Error; RMSE is the root-mean-squared error. Forecast errors are measured in basis points. Employment expectations for the months ahead are used in predictive regressions for the euro area. Non-farm payrolls are used in predictive regressions for the United States.

Unadjusted futures rates perform relatively poorly in both areas. In the euro area the RMSE of the predictions obtained with the unadjusted futures rates are larger than those obtained from a random walk model at all horizons beyond 3 quarters and those obtained from Consensus Forecast survey at all horizons beyond 1 quarter. Futures rates adjusted for a constant excess return already produce lower RMSEs at all forecast horizons, even if the gains in forecast accuracy are small and often not significant (RMSE is reduced by about 10 to 25 per cent with respect to that obtained with unadjusted future). Adjusting futures rates for the time-varying risk premia further improves our predictions (by about 10 per cent compared with those obtained with constant-unadjusted futures). Finally, adjusting for the time-varying excess return reduces the RMSE with respect to that obtained adjusting only for the risk premia by about 5 to 25 per cent at horizons longer than 3 quarters; however, at shorter horizons there are no significant improvements, thus confirming that in the sample analyzed here the forecast errors are not predictable by means of business cycle indicators and are on average not significant at shorter horizons.

For the United States, adjusting for the time-varying excess returns improves our forecasts by up to 40 per cent with respect to unadjusted futures rates, while futures rates adjusted only for the risk premia determine RMSEs between 10 and 40 per cent larger than those obtained adjusting for the total excess return at horizons longer than 1 quarter. In this case, prediction errors are significant and predictable by means of business cycle indicators.

These results have important implications for central banks. Even if futures rates adjusted for both risk premia and systematic prediction errors are the best predictors of future monetary policy decisions, they no longer coincide with financial markets' expectations. Therefore, for a correct assessment of the financial markets' view about future policy decisions, policymakers should use quoted futures rates adjusted only for risk premia, as systematic forecast errors represent part of agents' expectations formation process. At the same time, the spread between risk-adjusted futures rates and spot interest rates can be considered an ex-post measure of the efficacy of monetary authorities' communication.

6 Conclusions

In this paper we show that the prices of futures contracts on three-month interest rates are biased forecasts of future short-term interest rates. We also find evidence of large and time-varying excess returns on three-month interest rates futures in the euro area, in line with the results obtained by Piazzesi and Swanson (2004) for the United States. However, unlike those in dollars, ex-post excess returns in euros do not appear to be significantly related to business cycle indicators, while in both areas the sign and the significance of the estimated relationships between excess returns and the business cycle is unstable over time.

We show that ex-post excess returns can be divided into two components. The first is the effective ex-ante risk premium demanded by investors when they buy or sell the financial contract. The second is an ex-post systematic forecast error.

The empirical analysis reveals that the risk premia are slightly larger in the United States than in the euro area on the overall sample and, interestingly, they are significantly countercyclical in both areas. Moreover, the sign and the significance of the estimated relationships between risk premia and the business cycle turn out to be stable over time.

Finally we find that the instability observed in the estimates of total excess returns in both areas and the lack of a significative relationship between that variable and business cycle indicators in the euro area are determined by the instability of the estimates of the ex-post systematic error component.

The policy implication of our findings is that even though future rates adjusted for both components are better forecasts of future monetary policy actions, in assessing markets' view about future policy decisions, it is better to use futures rates adjusted only by risk premia, as systematic forecast errors are part of agents' expectations.

Appendix: Tables and figures

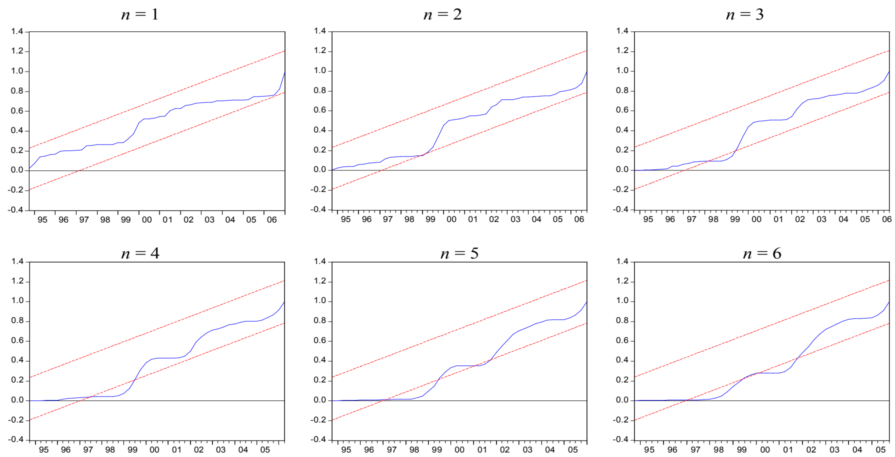
Table A1: Unit root test for risk premia

	Euro area		United States	
	no trend	linear trend	no trend	linear trend
$\theta_t^{(1)}$	-6.449**	-7.595**	-3.139**	-4.339**
$\theta_t^{(2)}$	-3.791**	-4.948**	-2.924**	-4.297**
$\theta_t^{(3)}$	-2.729**	-4.267**	-2.422**	-3.980**
$\theta_t^{(4)}$	-2.765**	-4.063**	-2.394**	-3.884**
$\theta_t^{(5)}$	-2.586**	-4.286**	-2.331**	-3.763**
$\theta_t^{(6)}$	-2.228**	-3.973**	-2.435**	-4.109**

Notes. The sample period is 1994q1-2007q1. DF-GLS is the t-statistic of the Augmented Dickey-Fuller (ADF) test, which includes in the test regression deterministic variables and p lagged difference terms of the dependent variable. The lag order p has been selected using a Schwarz Information Criterion (BIC) with the maximum lag length of 8. ** denotes the rejection of the null hypothesis at the 5 per cent confidence level; * denotes the rejection of the null hypothesis at the 10 per cent confidence level.

Figure A1: CUSUM test of instability for excess returns regressions

(Euro area)



(United States)

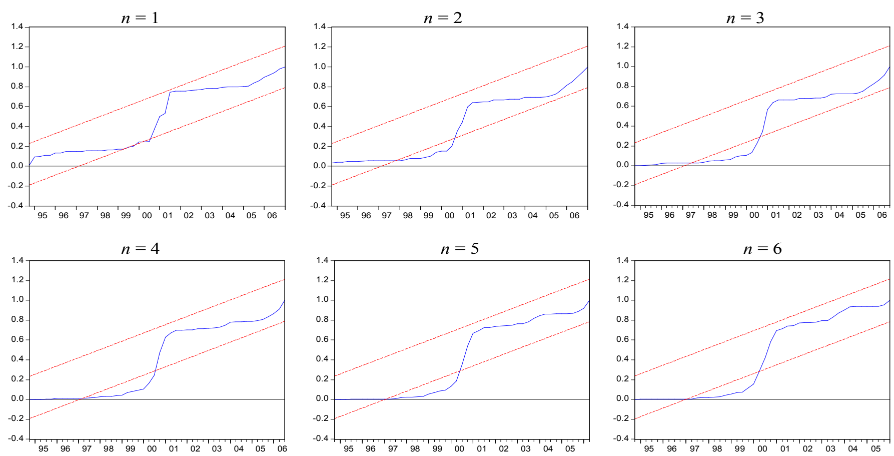
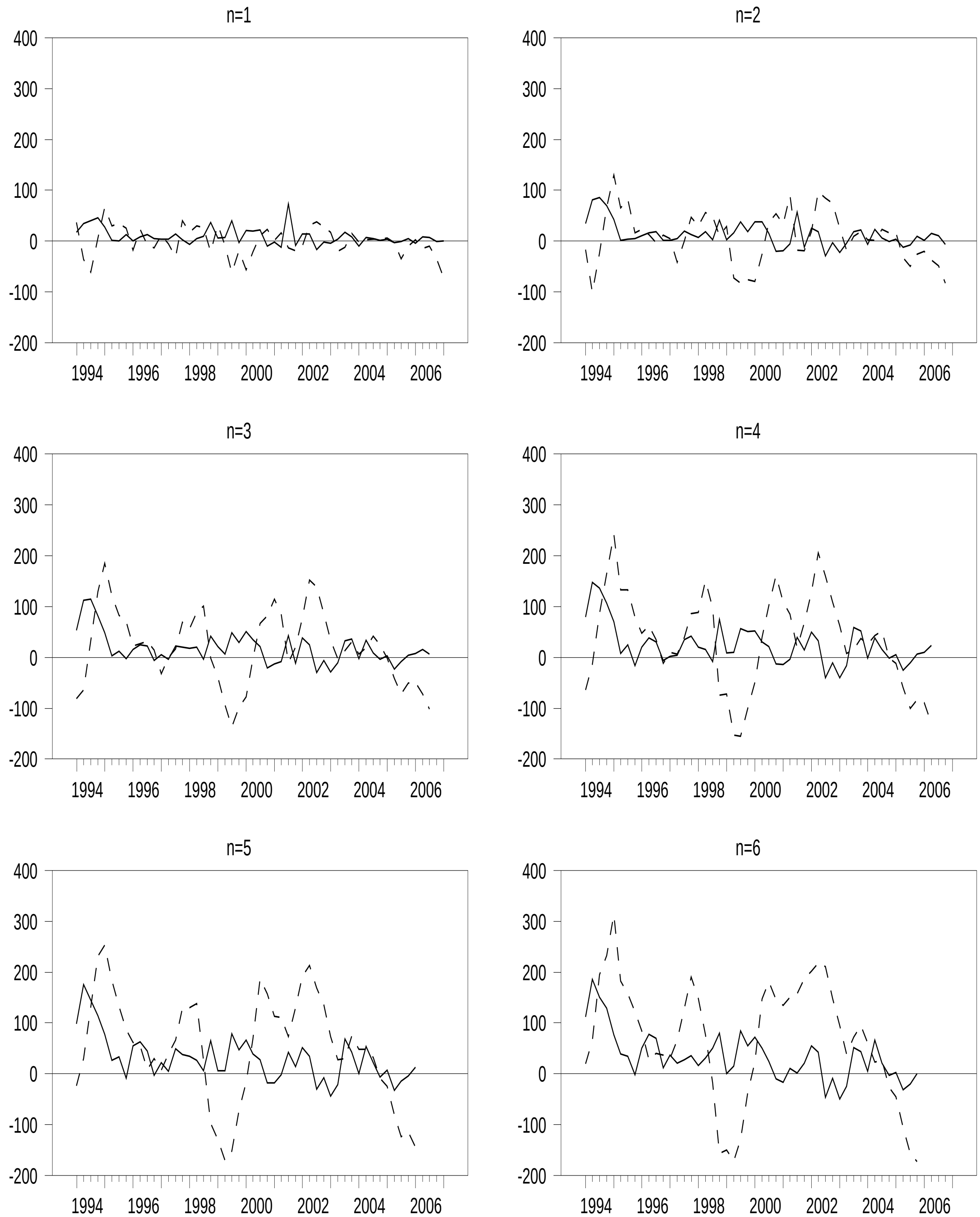
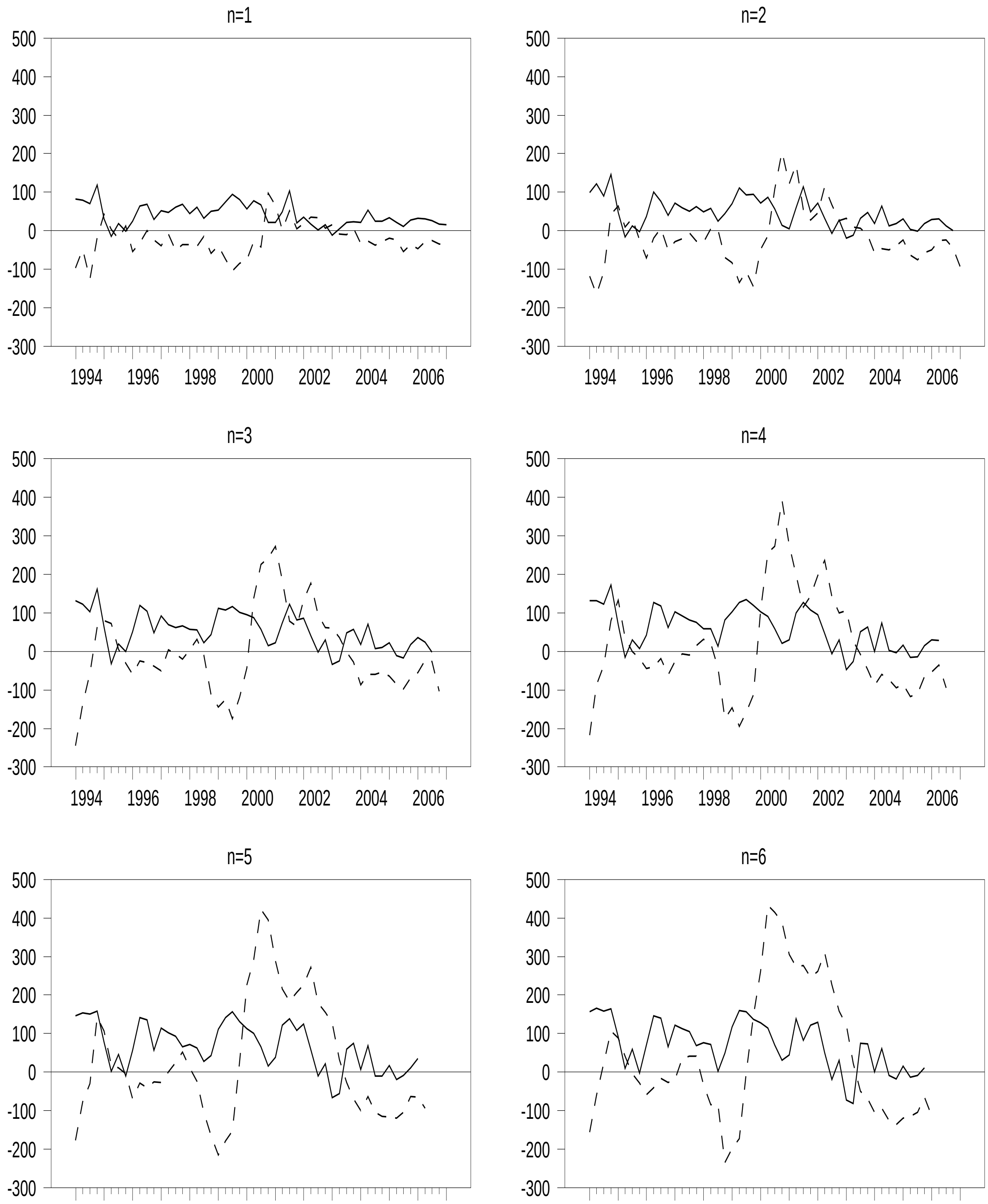


Figure A2: Risk premia and forecast errors in the euro area



—- risk premia — — — forecast errors

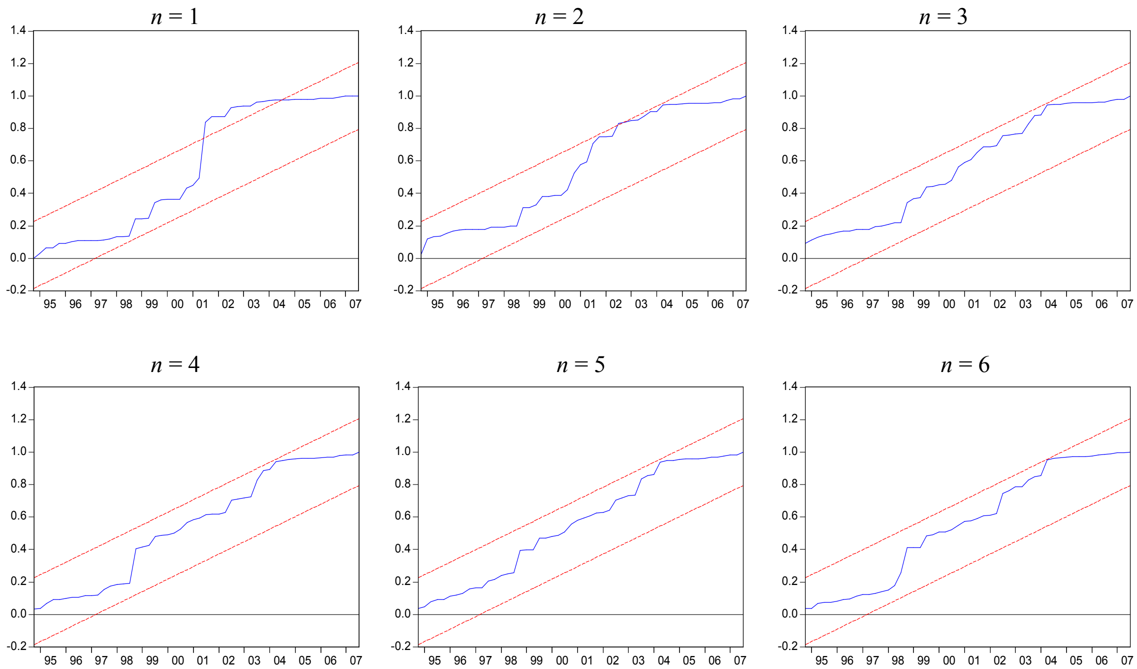
Figure A3: Risk premia and forecast errors in the United States



—- risk premia − − − forecast errors

Figure A4: CUSUM test of instability for risk premia regressions

(Euro area)



(United States)

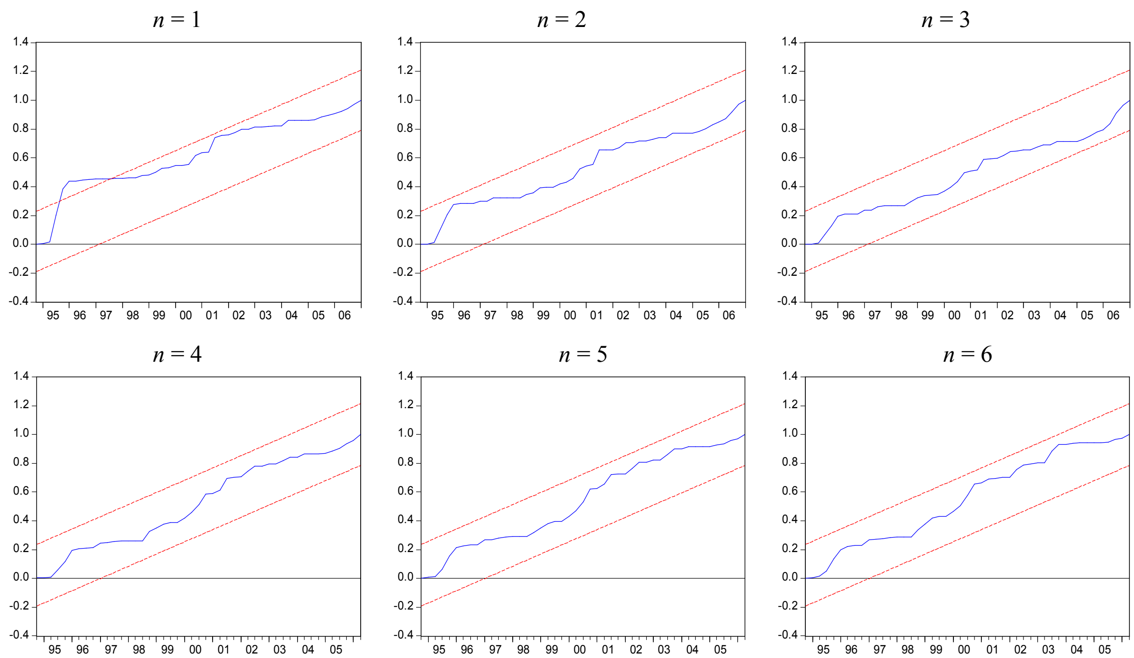
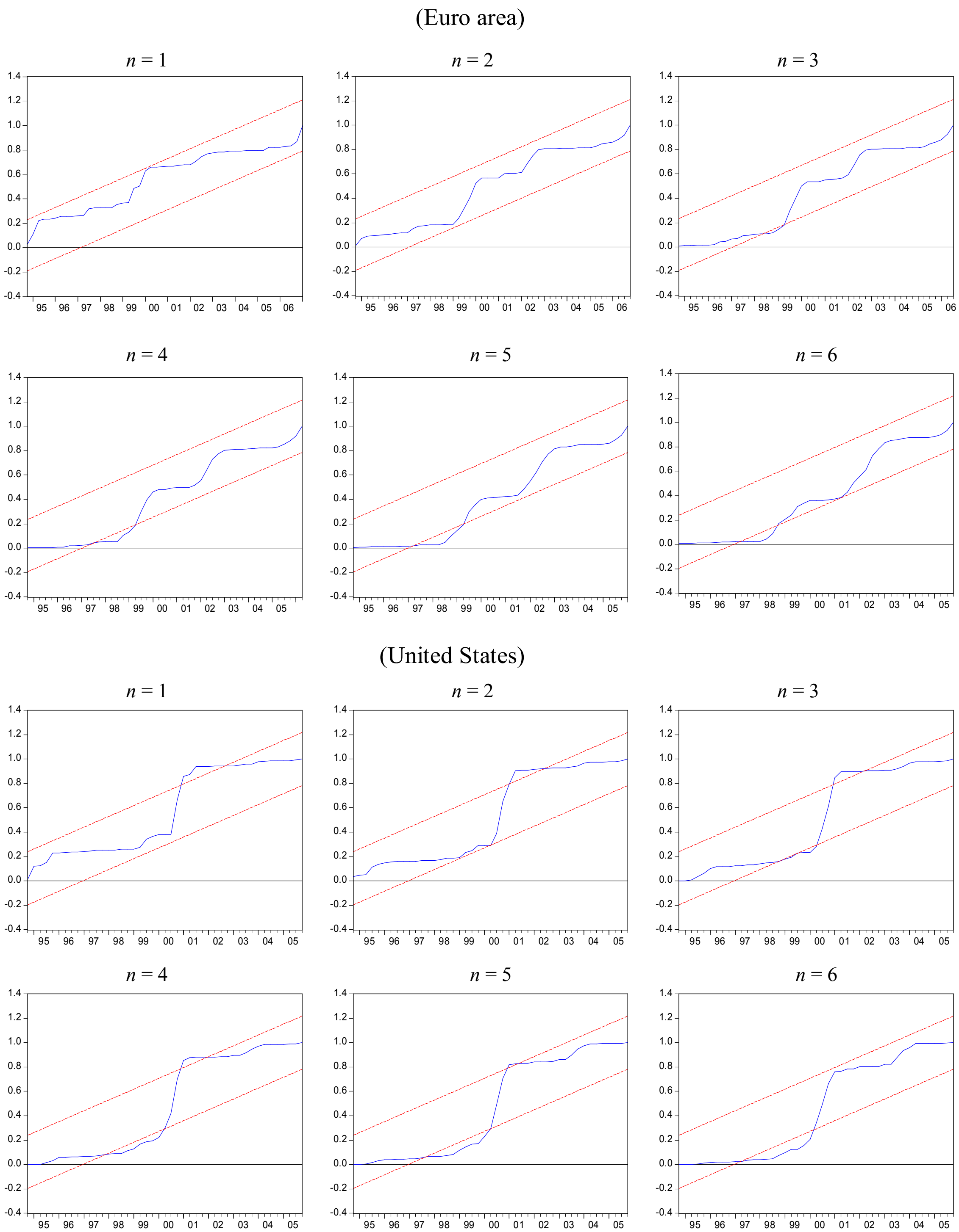


Figure A5: CUSUM test of instability for forecast errors regressions



References

[1] Ang, A., S. Dong and M. Piazzesi (2004), "No-Arbitrage Taylor Rules", mimeo, Columbia University.

[2] Ang, A. and M. Piazzesi (2003), "A No-Arbitrage Vector Autoregression of Term Structure Dynamics with Macroeconomic and Latent Variables", *Journal of Monetary Economics*, Vol. 50, pp. 745-787.

[3] Ang, A., M. Piazzesi and M. Wei (2005), "What Does the Yield Curve Tell us about GDP Growth?", forthcoming in *Journal of Econometrics*.

[4] Bacchetta, P., E. Mertens and E. van Wincoop (2006), "Predictability in Financial Markets: What Do Survey Expectations Tell Us?", CEPR Discussion Paper Series, No. 5770.

[5] Bekaert, G., R. J. Hodrick and Marshall, D. A. (2001), "Peso problem explanations for term structure anomalies", *Journal of Monetary Economics*, Vol. 48, No. 2, pp. 241-270.

[6] Buiter, W., H. (1999), "Six Months in the Life of the Euro; What Have We Learnt?", *Tijdschrift voor Politieke Economie*, Vol. 21(4), pp. 4-25.

[7] Campbell, J., Y, (1995), "Some Lessons from the Yield Curve", *Journal of Economic Perspectives*, Vol. 9, No. 3, pp. 129-52.

[8] Campbell, J., Y. and R., J. Shiller (1991), "Yield Spreads and Interest Rate Movements: A Birds Eye View", *Review of Economic Studies*, Vol. 58, pp. 495-514.

[9] Cochrane, J., H. (2006), "Financial Markets and the Real Economy", Graduate School of Business, Univeristy of Chicago.

[10] Cochrane, John H. and Monika Piazzesi (2002), "The Fed and Interest Rates: A High-frequency Identification", *American Economic Review*, Vol. 92, pp. 90-95.

[11] Diebold, X. F., M. Piazzesi and G. D. Rudebusch (2005), "Modelling Bond Yields in Finance and Macroeconomics", forthcoming in *American Economic Review, Papers and Proceedings*.

[12] Durham, B. (2003), "Estimates of the Term Premium on Near-Dated Federal Funds Futures Contracts", Federal Reserve Board, FED Working Paper, No. 19.

[13] Elliott, G., Rothenberg, T., J. and J., H. Stock (1996), "Efficient Tests for an Autoregressive Unit Root", *Econometrica*, Vol. 64, No. 4, pp. 813-836.

[14] Evans, G. and S. Honkapohja (2001), ", *Learning and Expectations in Macroeconomics*, Princeton University Press.

[15] Fama, Eugene F., (1984) "The Information in the Term Structure", *Journal of Financial Economics*, vol. 13, No. 4, pp. 509-528.

[16] Fama, Eugene F, 1991. "Efficient Capital Markets: II", *Journal of Finance*, Vol. 46, No. 5, pp. 1575-617.

[17] Fama, Eugene F. and Robert R. Bliss (1987). "The information in long-maturity forward rates", *American Economic Review*, Vol. 77, No., 4, pp. 680-692.

[18] Froot, K. A. (1989), "New Hope for the Expectations Hypothesis of the Term Structure of Interest Rates", *Journal of Finance*, Vol. 44, No. 2, pp. 283-305.

[19] Gourinchas, P. and A. Tornell (2004), "Exchange Rate Puzzles and Distorted Beliefs", *Journal of International Economics*, Vol. 64, pp. 303-333.

[20] Gürkaynak, R. S., Sack B. and E. Swanson (2006), "Market-Based Measures of Monetary Policy Expectations", Federal Reserve Bank of San Francisco, Working Paper Series, No. 2006-04.

[21] Hördal, P., O. Tristani and D. Vestin (2005), "A Joint Econometric Model of Macroeconomic and Term Structure Dynamics", forthcoming in *Journal of Econometrics*.

[22] Johansen, S. (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, Vol. 59, pp. 1551-1580.

[23] Johansen, S. (1995), "A Statistical Analysis of Cointegration for I(2) Variables", *Econometric Theory*, Vol. 11, pp. 25-59.

[24] Jongen, R., W. F. C. Verschoor and C. C. Wolff (2005), "Time Variation in Term Premia: International Evidence", CEPR Discussion Paper Series, No. 4959.

[25] Kim, D. H. and Orphanides, A. (2005), "Term Structure Estimation with Survey Data on Interest Rate Forecasts", Federal Reserve Board, Finance and Economics Discussion Series.

[26] Krueger, J. T. and Kuttner, K. N. (1996), "The Fed Funds Futures Rate as a Predictor of Federal Reserve Policy", *Journal of Futures Markets*, Vol. 16, No. 8, pp. 865-8 79.

[27] Pericoli, M. and M. Taboga (2006), “Canonical term-structure models with observable factors and the dynamics of bond risk premiums”, Banca d’Italia, Temi di Discussione, No. 580.

[28] Phillips, P.,C.,B. and B.,E. Hansen (1990), “Statistical inference in instrumental variables regression with I-1 processes”, *Review of Economic Studies*, Vol. 57, pp. 99125.

[29] Piazzesi, M. and E. Swanson (2004), “Futures Prices as Risk-Adjusted Forecasts of Monetary Policy”, NBER Working Paper, No. 10547.

[30] Rapach, D. E. and C. E. Weber (2004), “Are Real Interest Rates Really Nonstationary? New Evidence from Tests with Good Size and Power”, *Journal of Macroeconomics*, Vol. 26, No. 3, pp. 409-430.

[31] Rose, A. K. (1988), “Is the Real Interest Rate Stable?”, *Journal of Finance*, Vol. 43, No. 5, pp. 1095-1112.

[32] Rudebusch, G. and T. Wu (2004), “A Macro-finance Model of the Term Structure, Monetary Policy, and the Economy.”, Proceedings, Federal Reserve Bank of San Francisco, Issue March.

[33] Sack, B. (2002), “Extracting the Expected Path of Monetary Policy from Futures Rates”, Federal Reserve Board, Finance and Economics Discussion Series, No. 56.

[34] Shiller, R., J. (2000), “*Irrational Exuberance*”, Princeton University Press.

[35] Sims, C., A. (2003), “Implications of rational inattention“*Journal of Monetary Economics*”, Vol. 50(3), pp. 665-690, April.

[36] Stock, J., H. and M., W. Watson (1993), “A simple estimator of cointegrating vectors in higher order integrated systems”, *Econometrica*, Vol. 61, pp. 783820.

[37] Timmermann, A. (1993), “How learning in financial markets generates excess volatility and predictability in stock prices”, *Quarterly Journal of Economics*, Vol. 108, pp. 11351145.

RECENTLY PUBLISHED "TEMI" (*)

N. 643 – *The producer service sector in Italy: Long-term growth and its local determinants*, by Valter Di Giacinto and Giacinto Micucci (September 2007).

N. 644 – *Aggregazioni bancarie e specializzazione nel credito alle PMI: peculiarità per area geografica*, by Enrico Beretta and Silvia Del Prete (November 2007).

N. 645 – *Costs and benefits of creditor concentration: An empirical approach*, by Amanda Carmignani and Massimo Omiccioli (November 2007).

N. 646 – *Does the underground economy hold back financial deepening? Evidence from the Italian credit market*, by Giorgio Gobbi and Roberta Zizza (November 2007).

N. 647 – *Optimal monetary policy under low trend inflation*, by Guido Ascari and Tiziano Ropele (November 2007).

N. 648 – *Indici di bilancio e rendimenti di borsa: un'analisi per le banche italiane*, by Angela Romagnoli (November 2007).

N. 649 – *Bank profitability and taxation,* by Ugo Albertazzi and Leonardo Gambacorta (November 2007).

N. 650 – *Modelling bank lending in the euro area: A non-linear approach,* by Leonardo Gambacorta and Carlotta Rossi (November 2007).

N. 651 – *Revisiting poverty and welfare dominance,* by Gian Maria Tomat (November 2007).

N. 652 – *The general equilibrium effects of fiscal policy: Estimates for the euro area,* by Lorenzo Forni, Libero Monteforte and Luca Sessa (November 2007).

N. 653 – *Securitisation and the bank lending channel,* by Yener Altunbas, Leonardo Gambacorta and David Marqués (November 2007).

N. 654 – *The cyclical response of fiscal policies in the euro area. Why do results of empirical research differ so strongly?*, by Roberto Golinelli and Sandro Momigliano (January 2008).

N. 655 – *What's behind "inflation perceptions"? A survey-based analysis of Italian consumers*, by Paolo Del Giovane, Silvia Fabiani and Roberto Sabbatini (January 2008).

N. 656 – *The effects of fiscal policy in Italy: Evidence from a VAR model*, by Raffaela Giordano, Sandro Momigliano, Stefano Neri and Roberto Perotti (January 2008).

N. 657 – *Excess money growth and inflation dynamics*, by Barbara Roffia and Andrea Zaghini (January 2008).

N. 658 – *R&D and market structure in a horizontal differentiation framework*, by Davide Fantino (January 2008).

N. 659 – *Housing market spillovers: Evidence from an estimated DSGE model*, by Matteo Iacoviello and Stefano Neri (January 2008).

N. 660 – *Real exchange rate volatility and disconnect: An empirical investigation*, by Riccardo Cristadoro, Andrea Gerali, Stefano Neri and Massimiliano Pisani (April 2008).

N. 661 – *The effect of investment tax credit: Evidence from an atypical programme in Italy*, by Raffaello Bronzini, Guido de Blasio, Guido Pellegrini and Alessandro Scognamiglio (April 2008).

N. 662 – *Accounting for sampling design in the SHIW*, by Ivan Faiella (April 2008).

N. 663 – *Delayed privatization*, by Bernardo Bortolotti and Paolo Pinotti (April 2008).

N. 664 – *Portfolio selection with mononotone mean-variance preferences*, by Fabio Maccheroni, Massimo Marinacci, Aldo Rustichini and Marco Taboga (April 2008).

N. 665 – *Directed matching with endogenous Markov probability: Clients or competitors?*, by Emanuela Ciapanna (April 2008).

N. 666 – *What are borders made of? An analysis of barriers to European banking integration*, by Massimiliano Affinito and Matteo Piazza (April 2008).

N. 667 – *Innovation driven sectoral shocks and aggregate city cycles*, by Andrea R. Lamorgese (April 2008).

N. 668 – *On applying synthetic indices of multidimensional well-being: Health and income inequalities in selected EU countries*, by Andrea Brandolini (April 2008).

N. 669 – *Values, inequality and happiness*, by Claudia Biancotti and Giovanni D'Alessio (April 2008).

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi di struttura economica e finanziaria – Divisione Biblioteca e Archivio storico – Via Nazionale, 91 – 00184 Rome – (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

2005

L. DEDOLA and F. LIPPI, *The monetary transmission mechanism: Evidence from the industries of 5 OECD countries,* European Economic Review, 2005, Vol. 49, 6, pp. 1543-1569, **TD No. 389 (December 2000)**.

D. Jr. MARCHETTI and F. NUCCI, *Price stickiness and the contractionary effects of technology shocks*. European Economic Review, Vol. 49, 5, pp. 1137-1164, **TD No. 392 (February 2001)**.

G. CORSETTI, M. PERICOLI and M. SBRACIA, *Some contagion, some interdependence: More pitfalls in tests of financial contagion,* Journal of International Money and Finance, Vol. 24, 8, pp. 1177-1199, **TD No. 408 (June 2001)**.

GUISO L., L. PISTAFERRI and F. SCHIVARDI, *Insurance within the firm*. Journal of Political Economy, Vol. 113, 5, pp. 1054-1087, **TD No. 414** (**August 2001**)

R. CRISTADORO, M. FORNI, L. REICHLIN and G. VERONESE, *A core inflation indicator for the euro area,* Journal of Money, Credit, and Banking, Vol. 37, 3, pp. 539-560, **TD No. 435 (December 2001)**.

F. ALTISSIMO, E. GAIOTTI and A. LOCARNO, *Is money informative? Evidence from a large model used for policy analysis,* Economic & Financial Modelling, Vol. 22, 2, pp. 285-304, **TD No. 445 (July 2002)**.

G. DE BLASIO and S. DI ADDARIO, *Do workers benefit from industrial agglomeration?* Journal of regional Science, Vol. 45, (4), pp. 797-827, **TD No. 453 (October 2002).**

G. DE BLASIO and S. DI ADDARIO, *Salari, imprenditorialità e mobilità nei distretti industriali italiani,* in L. F. Signorini, M. Omiccioli (eds.), *Economie locali e competizione globale: il localismo industriale italiano di fronte a nuove sfide*, Bologna, il Mulino, **TD No. 453 (October 2002).**

R. TORRINI, *Cross-country differences in self-employment rates: The role of institutions*, Labour Economics, Vol. 12, 5, pp. 661-683, **TD No. 459 (December 2002)**.

A. CUKIERMAN and F. LIPPI, *Endogenous monetary policy with unobserved potential output,* Journal of Economic Dynamics and Control, Vol. 29, 11, pp. 1951-1983, **TD No. 493 (June 2004)**.

M. OMICCIOLI, *Il credito commerciale: problemi e teorie*, in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia,* Bologna, Il Mulino, **TD No. 494 (June 2004)**.

L. CANNARI, S. CHIRI and M. OMICCIOLI, *Condizioni di pagamento e differenziazione della clientela,* in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 495 (June 2004)**.

P. FINALDI RUSSO and L. LEVA, *Il debito commerciale in Italia: quanto contano le motivazioni finanziarie?,* in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 496 (June 2004)**.

A. CARMIGNANI, *Funzionamento della giustizia civile e struttura finanziaria delle imprese: il ruolo del credito commerciale,* in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 497 (June 2004)**.

G. DE BLASIO, *Credito commerciale e politica monetaria: una verifica basata sull'investimento in scorte,* in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia,* Bologna, Il Mulino, **TD No. 498 (June 2004)**.

G. DE BLASIO, *Does trade credit substitute bank credit? Evidence from firm-level data.* Economic notes, Vol. 34, 1, pp. 85-112, **TD No. 498 (June 2004).**

A. DI CESARE, *Estimating expectations of shocks using option prices,* The ICFAI Journal of Derivatives Markets, Vol. 2, 1, pp. 42-53, **TD No. 506 (July 2004).**

M. BENVENUTI and M. GALLO, *Il ricorso al "factoring" da parte delle imprese italiane,* in L. Cannari, S. Chiri e M. Omiccioli (eds.), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 518 (October 2004)**.

L. CASOLARO and L. GAMBACORTA, *Redditività bancaria e ciclo economico,* Bancaria, Vol. 61, 3, pp. 19-27, **TD No. 519 (October 2004)**.

F. PANETTA, F. SCHIVARDI and M. SHUM, *Do mergers improve information? Evidence from the loan market*, CEPR Discussion Paper, 4961, **TD No. 521 (October 2004)**.

P. DEL GIOVANE and R. SABBATINI, *La divergenza tra inflazione rilevata e percepita in Italia,* in P. Del Giovane, F. Lippi e R. Sabbatini (eds.), *L'euro e l'inflazione: percezioni, fatti e analisi*, Bologna, Il Mulino, **TD No. 532 (December 2004).**

R. TORRINI, *Quota dei profitti e redditività del capitale in Italia: un tentativo di interpretazione*, Politica economica, Vol. 21, 1, pp. 7-41, **TD No. 551 (June 2005)**.

M. OMICCIOLI, *Il credito commerciale come "collateral"*, in L. Cannari, S. Chiri, M. Omiccioli (eds.), Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia, Bologna, il Mulino, **TD No. 553 (June 2005)**.

L. CASOLARO, L. GAMBACORTA and L. GUISO, *Regulation, formal and informal enforcement and the development of the household loan market. Lessons from Italy*, in Bertola G., Grant C. and Disney R. (eds.) The Economics of Consumer Credit: European Experience and Lessons from the US, Boston, MIT Press, **TD No. 560 (September 2005)**.

S. DI ADDARIO and E. PATACCHINI, *Lavorare in una grande città paga, ma poco*, in Brucchi Luchino (ed.), *Per un'analisi critica del mercato del lavoro*, Bologna , Il Mulino, **TD No. 570 (January 2006)**.

P. ANGELINI and F. LIPPI, *Did inflation really soar after the euro changeover? Indirect evidence from ATM withdrawals,* CEPR Discussion Paper, 4950, **TD No. 581 (March 2006)**.

S. FEDERICO, *Internazionalizzazione produttiva, distretti industriali e investimenti diretti all'estero,* in L. F. Signorini, M. Omiccioli (eds.), *Economie locali e competizione globale: il localismo industriale italiano di fronte a nuove sfide*, Bologna, il Mulino, **TD No. 592 (October 2002).**

S. DI ADDARIO, *Job search in thick markets: Evidence from Italy*, Oxford Discussion Paper 235, Department of Economics Series, **TD No. 605 (December 2006)**.

2006

F. BUSETTI, *Tests of seasonal integration and cointegration in multivariate unobserved component models,* Journal of Applied Econometrics, Vol. 21, 4, pp. 419-438, **TD No. 476 (June 2003).**

C. BIANCOTTI, *A polarization of inequality? The distribution of national Gini coefficients 1970-1996*, Journal of Economic Inequality, Vol. 4, 1, pp. 1-32, **TD No. 487 (March 2004)**.

L. CANNARI and S. CHIRI, *La bilancia dei pagamenti di parte corrente Nord-Sud (1998-2000),* in L. Cannari, F. Panetta (a cura di), Il sistema finanziario e il Mezzogiorno: squilibri strutturali e divari finanziari, Bari, Cacucci, **TD No. 490 (March 2004).**

M. BOFONDI and G. GOBBI, *Information barriers to entry into credit markets,* Review of Finance, Vol. 10, 1, pp. 39-67, **TD No. 509 (July 2004).**

FUCHS W. and LIPPI F., *Monetary union with voluntary participation,* Review of Economic Studies, Vol. 73, pp. 437-457 **TD No. 512 (July 2004).**

GAIOTTI E. and A. SECCHI, *Is there a cost channel of monetary transmission? An investigation into the pricing behaviour of 2000 firms*, Journal of Money, Credit and Banking, Vol. 38, 8, pp. 2013-2038 **TD No. 525 (December 2004)**.

A. BRANDOLINI, P. CIPOLLONE and E. VIVIANO, *Does the ILO definition capture all unemployment?,* Journal of the European Economic Association, Vol. 4, 1, pp. 153-179, **TD No. 529 (December 2004)**.

A. BRANDOLINI, L. CANNARI, G. D'ALESSIO and I. FAIELLA, *Household wealth distribution in Italy in the 1990s,* in E. N. Wolff (ed.) International Perspectives on Household Wealth, Cheltenham, Edward Elgar, **TD No. 530 (December 2004)**.

P. DEL GIOVANE and R. SABBATINI, *Perceived and measured inflation after the launch of the Euro: Explaining the gap in Italy,* Giornale degli economisti e annali di economia, Vol. 65, 2 , pp. 155-192, **TD No. 532 (December 2004).**

M. CARUSO, *Monetary policy impulses, local output and the transmission mechanism*, Giornale degli economisti e annali di economia, Vol. 65, 1, pp. 1-30, **TD No. 537 (December 2004).**

A. NOBILI, *Assessing the predictive power of financial spreads in the euro area: does parameters instability matter?,* Empirical Economics, Vol. 31, 1, pp. 177-195, **TD No. 544 (February 2005)**.

L. GUISO and M. PAIELLA, *The role of risk aversion in predicting individual behavior, In P. A. Chiappori e C. Gollier (eds.) Competitive Failures in Insurance Markets: Theory and Policy Implications, Monaco, CESifo*, **TD No. 546 (February 2005).**

G. M. TOMAT, *Prices product differentiation and quality measurement: A comparison between hedonic and matched model methods*, Research in Economics, Vol. 60, 1, pp. 54-68, **TD No. 547 (February 2005)**.

F. LOTTI, E. SANTARELLI and M. VIVARELLI, *Gibrat's law in a medium-technology industry: Empirical evidence for Italy*, in E. Santarelli (ed.), Entrepreneurship, Growth, and Innovation: the Dynamics of Firms and Industries, New York, Springer, **TD No. 555 (June 2005).**

F. BUSETTI, S. FABIANI and A. HARVEY, *Convergence of prices and rates of inflation*, Oxford Bulletin of Economics and Statistics, Vol. 68, 1, pp. 863-878, **TD No. 575 (February 2006).**

M. CARUSO, *Stock market fluctuations and money demand in Italy, 1913 - 2003*, Economic Notes, Vol. 35, 1, pp. 1-47, **TD No. 576 (February 2006)**.

S. IRANZO, F. SCHIVARDI and E. TOSETTI, *Skill dispersion and productivity: An analysis with matched data*, CEPR Discussion Paper, 5539, **TD No. 577 (February 2006).**

R. BRONZINI and G. DE BLASIO, *Evaluating the impact of investment incentives: The case of Italy's Law 488/92.* Journal of Urban Economics, Vol. 60, 2, pp. 327-349, **TD No. 582 (March 2006).**

R. BRONZINI and G. DE BLASIO, *Una valutazione degli incentivi pubblici agli investimenti*, Rivista Italiana degli Economisti , Vol. 11, 3, pp. 331-362, **TD No. 582 (March 2006).**

A. DI CESARE, *Do market-based indicators anticipate rating agencies? Evidence for international banks*, Economic Notes, Vol. 35, pp. 121-150, **TD No. 593 (May 2006).**

L. DEDOLA and S. NERI, *What does a technology shock do? A VAR analysis with model-based sign restrictions*, Journal of Monetary Economics, Vol. 54, 2, pp. 512-549, **TD No. 607 (December 2006)**.

R. GOLINELLI and S. MOMIGLIANO, *Real-time determinants of fiscal policies in the euro area*, Journal of Policy Modeling, Vol. 28, 9, pp. 943-964, **TD No. 609 (December 2006).**

P. ANGELINI, S. GERLACH, G. GRANDE, A. LEVY, F. PANETTA, R. PERLI,S. RAMASWAMY, M. SCATIGNA and P. YESIN, *The recent behaviour of financial market volatility*, BIS Papers, 29, **QEF No. 2 (August 2006)**.

2007

L. CASOLARO. and G. GOBBI, *Information technology and productivity changes in the banking industry*, Economic Notes, Vol. 36, 1, pp. 43-76, **TD No. 489 (March 2004)**.

M. PAIELLA, *Does wealth affect consumption? Evidence for Italy*, Journal of Macroeconomics, Vol. 29, 1, pp. 189-205, **TD No. 510 (July 2004).**

F. LIPPI. and S. NERI, *Information variables for monetary policy in a small structural model of the euro area*, Journal of Monetary Economics, Vol. 54, 4, pp. 1256-1270, **TD No. 511 (July 2004)**.

A. ANZUINI and A. LEVY, *Monetary policy shocks in the new EU members: A VAR approach*, Applied Economics, Vol. 39, 9, pp. 1147-1161, **TD No. 514 (July 2004)**.

R. BRONZINI, *FDI Inflows, agglomeration and host country firms' size: Evidence from Italy*, Regional Studies, Vol. 41, 7, pp. 963-978, **TD No. 526 (December 2004).**

L. MONTEFORTE, *Aggregation bias in macro models: Does it matter for the euro area?*, Economic Modelling, 24, pp. 236-261, **TD No. 534 (December 2004)**.

A. DALMAZZO and G. DE BLASIO, *Production and consumption externalities of human capital: An empirical study for Italy*, Journal of Population Economics, Vol. 20, 2, pp. 359-382, **TD No. 554 (June 2005).**

M. BUGAMELLI and R. TEDESCHI, *Le strategie di prezzo delle imprese esportatrici italiane,* Politica Economica, v. 3, pp. 321-350, **TD No. 563 (November 2005)**.

L. GAMBACORTA and S. IANNOTTI, *Are there asymmetries in the response of bank interest rates to monetary shocks?*, Applied Economics, v. 39, 19, pp. 2503-2517, **TD No. 566 (November 2005).**

S. DI ADDARIO and E. PATACCHINI, *Wages and the city. Evidence from Italy*, Development Studies Working Papers 231, Centro Studi Luca d'Agliano, **TD No. 570 (January 2006)**.

P. ANGELINI and F. LIPPI, *Did prices really soar after the euro cash changeover? Evidence from ATM withdrawals*, International Journal of Central Banking, Vol. 3, 4, pp. 1-22, **TD No. 581 (March 2006)**.

A. LOCARNO, *Imperfect knowledge, adaptive learning and the bias against activist monetary policies*, International Journal of Central Banking, v. 3, 3, pp. 47-85, **TD No. 590 (May 2006)**.

F. LOTTI and J. MARCUCCI, *Revisiting the empirical evidence on firms' money demand*, Journal of Economics and Business, Vol. 59, 1, pp. 51-73, **TD No. 595 (May 2006)**.

P. CIPOLLONE and A. ROSOLIA, *Social interactions in high school: Lessons from an earthquake*, American Economic Review, Vol. 97, 3, pp. 948-965, **TD No. 596 (September 2006).**

A. BRANDOLINI, *Measurement of income distribution in supranational entities: The case of the European Union*, in S. P. Jenkins e J. Micklewright (eds.), Inequality and Poverty Re-examined, Oxford, Oxford University Press, **TD No. 623 (April 2007).**

M. PAIELLA, *The foregone gains of incomplete portfolios,* Review of Financial Studies, Vol. 20, 5, pp. 1623-1646, **TD No. 625 (April 2007).**

K. BEHRENS, A. R. LAMORGESE, G.I.P. OTTAVIANO and T. TABUCHI, *Changes in transport and non transport costs: local vs. global impacts in a spatial network*, Regional Science and Urban Economics, Vol. 37, 6, pp. 625-648, **TD No. 628 (April 2007).**

G. ASCARI and T. ROPELE, *Optimal monetary policy under low trend inflation*, Journal of Monetary Economics, v. 54, 8, pp. 2568-2583, **TD No. 647 (November 2007).**

R. GIORDANO, S. MOMIGLIANO, S. NERI and R. PEROTTI, *The Effects of Fiscal Policy in Italy: Evidence from a VAR Model*, European Journal of Political Economy, Vol. 23, 3, pp. 707-733, **TD No. 656 (December 2007).**

2008

S. MOMIGLIANO, J. Henry and P. Hernández de Cos, *The impact of government budget on prices: Evidence from macroeconometric models*, Journal of Policy Modelling, v. 30, 1, pp. 123-143 **TD No. 523 (October 2004).**

P. ANGELINI and A. Generale, *On the evolution of firm size distributions*, American Economic Review, v. 98, 1, pp. 426-438, **TD No. 549 (June 2005).**

P. DEL GIOVANE, S. FABIANI and R. SABATINI, *What's behind "inflation perceptions"? A survey-based analysis of Italian consumers, i*n P. Del Giovane e R. Sabbatini (eds.), *The Euro Inflation and Consumers' Perceptions. Lessons from Italy*, Berlin-Heidelberg, Springer, **TD No. 655 (January 2008).**

FORTHCOMING

S. SIVIERO and D. TERLIZZESE, *Macroeconomic forecasting: Debunking a few old wives' tales,* Journal of Business Cycle Measurement and Analysis, **TD No. 395 (February 2001)**.

P. ANGELINI, *Liquidity and announcement effects in the euro area*, Giornale degli economisti e annali di economia, **TD No. 451 (October 2002).**

S. MAGRI, *Italian households' debt: The participation to the debt market and the size of the loan*, Empirical Economics, **TD No. 454 (October 2002)**.

P. ANGELINI, P. DEL GIOVANE, S. SIVIERO and D. TERLIZZESE, *Monetary policy in a monetary union: What role for regional information?*, International Journal of Central Banking, **TD No. 457 (December 2002)**.

L. MONTEFORTE and S. SIVIERO, *The Economic Consequences of Euro Area Modelling Shortcuts*, Applied Economics, **TD No. 458 (December 2002).**

L. GUISO and M. PAIELLA,, *Risk aversion, wealth and background risk*, Journal of the European Economic Association, **TD No. 483 (September 2003).**

G. FERRERO, *Monetary policy, learning and the speed of convergence*, Journal of Economic Dynamics and Control, **TD No. 499 (June 2004).**

F. SCHIVARDI e R. TORRINI, *Identifying the effects of firing restrictions through size-contingent Differences in regulation*, Labour Economics, **TD No. 504 (giugno 2004)**.

C. BIANCOTTI, G. D'ALESSIO and A. NERI, *Measurement errors in the Bank of Italy's survey of household income and wealth*, Review of Income and Wealth, **TD No. 520 (October 2004)**.

D. Jr. MARCHETTI and F. Nucci, *Pricing behavior and the response of hours to productivity shocks*, Journal of Money Credit and Banking, **TD No. 524 (December 2004).**

L. GAMBACORTA, *How do banks set interest rates?,* European Economic Review, **TD No. 542 (February 2005).**

R. FELICI and M. PAGNINI,, *Distance, bank heterogeneity and entry in local banking markets*, The Journal of Industrial Economics, **TD No. 557 (June 2005).**

M. BUGAMELLI and R. TEDESCHI, *Le strategie di prezzo delle imprese esportatrici italiane*, Politica Economica, **TD No. 563 (November 2005).**

S. DI ADDARIO and E. PATACCHINI, *Wages and the city. Evidence from Italy*, Labour Economics, **TD No. 570 (January 2006)**.

M. BUGAMELLI and A. ROSOLIA, *Produttività e concorrenza estera*, Rivista di politica economica, **TD No. 578 (February 2006).**

PERICOLI M. and M. TABOGA, *Canonical term-structure models with observable factors and the dynamics of bond risk premia*, **TD No. 580 (February 2006).**

E. VIVIANO, *Entry regulations and labour market outcomes. Evidence from the Italian retail trade sector*, Labour Economics, **TD No. 594 (May 2006)**.

S. FEDERICO and G. A. MINERVA, *Outward FDI and local employment growth in Italy*, Review of World Economics, Journal of Money, Credit and Banking, **TD No. 613 (February 2007).**

F. BUSETTI and A. HARVEY, *Testing for trend*, Econometric Theory **TD No. 614 (February 2007).**

V. CESTARI, P. DEL GIOVANE and C. ROSSI-ARNAUD, *Memory for Prices and the Euro Cash Changeover: An Analysis for Cinema Prices in Italy*, In P. Del Giovane e R. Sabbatini (eds.), The Euro Inflation and Consumers' Perceptions. Lessons from Italy, Berlin-Heidelberg, Springer, **TD No. 619 (February 2007).**

B. ROFFIA and A. ZAGHINI, *Excess money growth and inflation dynamics*, International Finance, **TD No. 629 (June 2007)**.

M. DEL GATTO, GIANMARCO I. P. OTTAVIANO and M. PAGNINI, *Openness to trade and industry cost dispersion: Evidence from a panel of Italian firms*, Journal of Regional Science, **TD No. 635 (June 2007)**.

A. CIARLONE, P. PISELLI and G. TREBESCHI, *Emerging Markets' Spreads and Global Financial Conditions*, Journal of International Financial Markets, Institutions & Money, **TD No. 637 (June 2007).**

S. MAGRI, *The financing of small innovative firms: The Italian case*, Economics of Innovation and New Technology, **TD No. 640 (September 2007)**.