Yield Spreads on EMU Government Bonds

Lorenzo Codogno, Carlo Favero, Alessandro Missale

Bank of America, London; IGIER, Università Bocconi and CEPR; Università di Milano
(third draft, March 31, 2003)

ABSTRACT

This paper provides evidence that yield differentials on Eurozone government bonds are mostly due to credit risk-related domestic and international factors, as opposed to liquidity factors. This contrasts with the common belief of markets and policymakers that traditional liquidity indicators, such as bid-ask spreads, trading volumes, and outstanding amounts, as well as the presence of liquid future contracts explain a substantial part of yield differentials since the start of Monetary Union. This has important policy implications. It means that additional policy steps to increase financial market integration by means of increased efficiency both in primary and secondary markets, although desirable, would not deliver a 'seamless bond' market in the Euro area. Our analysis suggests that yield differentials mainly reflect the market assessment about the creditworthiness of borrowers and that premiums are a function of international risk-related factors. Therefore, further convergence in fundamentals, and especially in debt-to-GDP ratios, would be required to reduce current yield differentials. The presence of yield differentials and their sensitivity to credit-related factors provides an incentive to fiscal discipline.

This paper expands the results of the research project for the EC Directorate-General for Economic and Financial Affairs: "The Decomposition of Observed Spreads in the Euro Area Government Bond Market" for which financial support from the European Commission is gratefully acknowledged. We thank the officials at the following institutions: Austrian Federal Financing Agency, Belgian Ministry of Finance, Bundesschuldenverwaltung, Dutch Agency of the Ministry of Finance, Finnish State Treasury, French Ministry of the Economy, Finances and Industry, Instituto de Gestão do Crédito Público of Portugal, Irish National Treasury Management Agency, Italian Ministry of the Treasury, Public Debt Management Office of Greece, Spanish Ministry of Economy and Finance, Bank of America, and ~~Euro~~MTS. None of the institutions mentioned above are responsible for the contents of this paper, which reflects our opinions only. We are indebted to Francesco Giavazzi, Giuseppe Bertola and two anonymous referees for valuable comments. Andrea Carriero provided outstanding research assistantship.

1. INTRODUCTION

The start of EMU in January 1999 eliminated exchange rate risk between the currencies of participating member States, thereby creating the conditions for a substantially more integrated public debt market in the Euro area. Despite the common denomination in ~~E~~euro, interest rates on bonds issued by different governments have not fully converged. Eurozone government~~Their~~ bonds are still viewed as imperfect substitutes either because of liquidity or because of different creditworthiness. Comparatively lower yields could reflect either better liquidity conditions of government bonds or a better credit standing of the sovereign issuer, or a combination of both.

The aim of this paper is to study the determinants of observed yield differentials in the Eurozone government bond markets. New evidence is provided on the relative importance of credit risk and liquidity by identifying the main factors that explain movements in yield differentials. Following Blanco (2001), we exploit the finding of the empirical literature on sovereign bond spreads of emerging markets, according to which spreads are sensitive to US risk factors and interest rates (see e.g. Arola and Cerisola 2001, Barnes and Cline 1997, Eichengreen and Mody 2000, Kamin and Von Kleist 1999).

Distinguishing between credit risk and liquidity components has important implications for policymaking and for financial markets. If yield spreads reflect differences in credit standings, it would mean that the Stability and Growth Pact and the European fiscal framework *per se* does not ensure the same perceived default risk for all the member s~~S~~tates. In other words, the market would perceive that fiscal consolidation is not yet complete~~d~~ and further convergence of debt ratios and in general credit worthiness would be~~is~~ needed in order to lower yields to German levels, which are currently the lowest among member States. Yield differentials would be important policy indicators, as they would signal market perception of fiscal vulnerability.

On the other hand, if yield spreads mainly reflect differences in liquidity of government bonds, then yield differentials would just be an indicator of the relative effectiveness of debt management policies in improving liquidity and of differences in market microstructures. Policy implications would then depend on the sources of liquidity premiums:

a) If yield differentials were explained by the size of the overall debt issued by a specific member State, such yield differentials would be structural. This would ~~and~~ likely ~~to~~ prevent further convergence ~~in yields~~.

b) If yield differentials reflected specific features regarding primary markets where bonds are issued, such as the auction mechanism or the issuance calendar, as well as issues related to primary and secondary market efficiency, ~~then~~ there would be scope for policy action to narrow differentials further. Domestic debt management aimed at minimising borrowing costs would eventually lead to a full convergence of yields through competitive improvements in the functioning of primary and secondary markets.

Finally, understanding the determinants of yield spreads is also crucial in assessing the prospects for the European bonds market. If bonds issued by different member s~~S~~tates continue to be perceived as imperfect substitutes, the goal of creating one market for the 'same bond' as large and liquid as the US bond market would be frustrated. However, whether this is a desirable aim depends on the reason for the segmentation. If yield differentials were explained by differences in liquidity, their elimination would certainly be a sign of higher efficiency. If, instead, yield differentials reflected different default risks across ~~S~~states, they would be useful indicators for an efficient allocation of funds and a deterrent for irresponsible fiscal policies~~y~~. And this may be considered as a more important goal than creating a market for the 'same bond'.

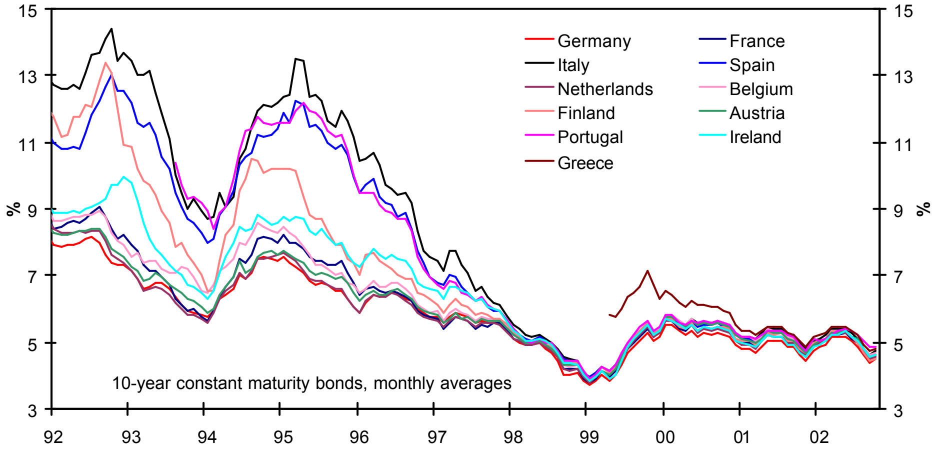
Market participants and member ~~S~~state debt managers appear to believe that EMU yield differentials are mostly due to liquidity factors. In order to reduce borrowing costs, debt managers have introduced substantial, sometimes costly, innovations that should have enhanced the liquidity of their bonds (see Favero, Missale and Piga 1999). Therefore, distinguishing between the credit risk component could also help in assessing the merits of such policies.

Section 2 provides ~~gives~~ some evidence on yield differentials in the Euro area. Section 3 lays out our strategy for modelling and analysing yield differentials before and after EMU. We present our empirical evidence based on monthly and daily data in sections 4 and 5. Section 6~~7~~ addresses the policy implications of our analysis and concludes.

2. YIELD DIFFERENTIALS IN THE EURO AREA

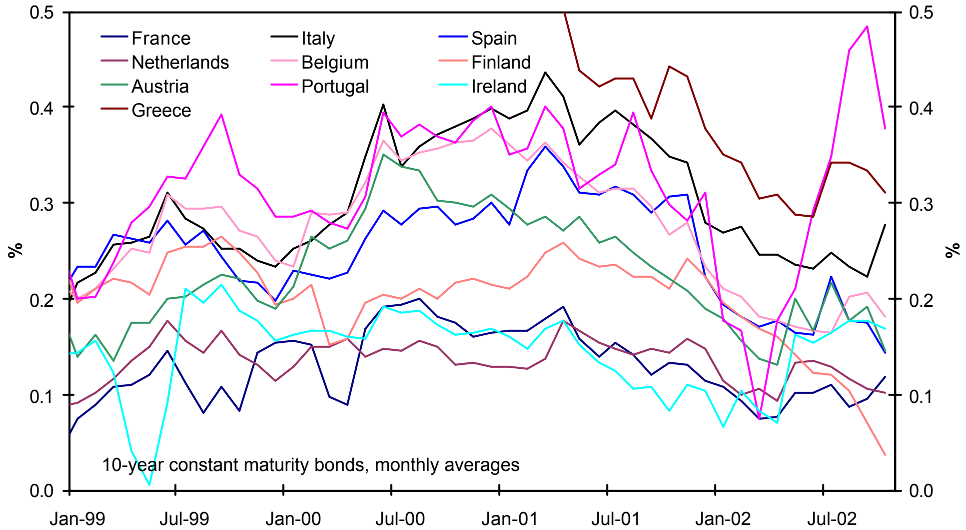
Interest rates on government bonds issued by EMU member States steadily converged in the 1990s as the introduction of the Euro approached. Figure 1 shows that the differences in 10-year yields had largely, but not completely, vanished by January 1999. Differentials are still positive pointing to non-trivial differences in credit and/or liquidity premiums. Over the period 1999-2002, the differences between 10-year government bond yields of Germany and the other EMU member States were~~have been~~ sizeable. They varied from an average of 14 basis points in the case of France and the Netherlands, up to 32 basis points in the case of Italy and Portugal. Table 1 presents average yield spreads for all EMU countries. Yield differentials for the EMU period are shown in Figure 2.

Figure 1. Government bond yields in the Euro area



Source: Datastream/Thomson Financial

Figure 2. Post-EMU Spreads of Euro area vs. German 10-year bond yields



Source: Datastream/Thomson Financial

Government bond yields are estimated by standard term structure techniques and refer to a bond with an hypothetical 10-year constant maturity, that is, the most actively traded maturity around which benchmark bonds are issued in the Eurozone government securities market. German bond yields are taken as the reference rates, since German bonds have maintained their benchmark status and have continued to display lower yields[1].

Table 1. Average 10-year government bond yield spread vs. Germany

Basis Points, Period Jan-1999/Dec-2002	AUS	BEL	FIN	FRA	GRE	IRE	ITA	NET	POR	SPA
Yield Differential	24.3	28.1	19.0	13.8	54.9	14.6	32.5	13.6	32.2	25.4

Source: Datastream/Thomson Financial

Before the introduction of the Euro, yield differentials within Europe were determined by four main factors: (i) expected exchange rate movements and exchange rate risk; (ii) different tax treatments and controls on capital movements; (iii) liquidity and; (iv) default (or credit) risk. Tax treatments were harmonised before Monetary Union, while controls on capital movements had been removed long before it. The start of EMU in January 1999 eliminated exchange rate risk between the currencies of participating member s~~S~~tates, thereby creating the conditions for a substantially more integrated public debt market in the Euro area. Despite the common denomination in e~~E~~uro, however, yields on bonds issued by ~~different~~ member s~~S~~tates have not fully converged. Eurozone government bonds are still viewed as imperfect substitutes, either because of liquidity or default risk, which are the two remaining factors explaining yield spreads.

Liquidity means that bonds can be traded immediately at low transaction costs and with minimum price changes, even in adverse market conditions. The more liquid the bond, the lower the yield required by investors to hold the bond. Liquidity may vary across sovereign issues depending on trading volumes, ~~as determined by~~ the amounts of bonds outstanding, the trading activity of market makers, and the efficiency of the secondary market. Nowadays bonds, especially in the 10-year maturity segment, are highly standardised products, but outstanding amounts vary considerably across sovereign borrowers depending on country and debt dimensions. Therefore, issuing policies may play an important role. Secondary market characteristics such as admission and trading rules or clearing and settlement procedures may equally be critical for liquidity, and especially the willingness of market makers to quote two-way prices and stand ready to satisfy buying and selling orders. The incentives to trade and invest in specific bonds may also depend on the availability of hedging and financing instruments, such as a liquid and efficient future contracts~~,~~ and of efficient repurchase agreement markets.

[1] For a detailed discussion on benchmark status see Dunne at al. (2002) "Defining Benchmark Status: An Application using Euro-Area Bonds"

Credit (or default) risk is the risk that the country may not honour, in part or in full, its obligations. Credit worthiness depends crucially on current and future stated and hidden debt, and debt sustainability. Debt sustainability depends on expected budget surpluses/deficits, as well as future economic activity and interest rates, which in turns are affected by domestic and international factors and policies. Since Monetary Union, member s~~S~~tates have lost the option of printing money to pay for their debts. Whereas the exchange risk has disappeared within EMU, credit risk may have become even more important. Moreover, fiscal rules such as the Stability and Growth Pact may change the market perception of default risk, and thus have an impact on interest rates (see, for example, Poterba and Reuben 2001).

3. MODELLING YIELD SPREADS BEFORE AND AFTER EMU

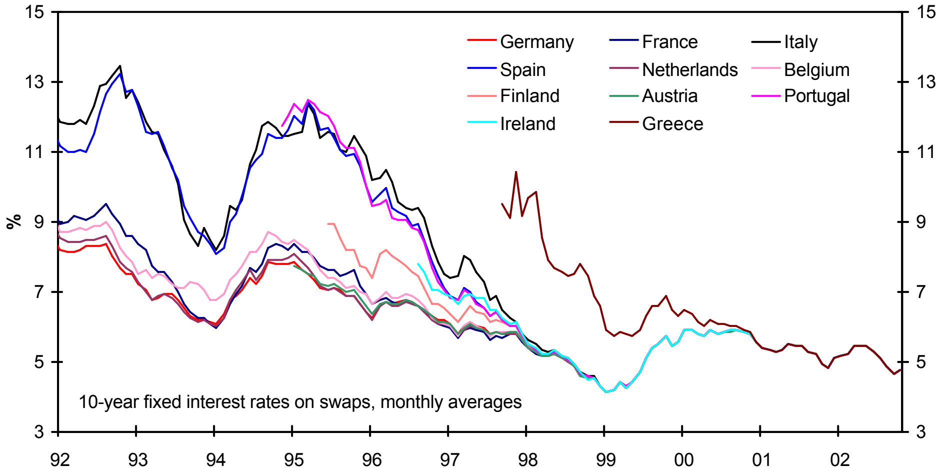
To the best of our knowledge, we do not know of any study that attempts to decompose the yield differentials in liquidity premium and default risk within the Euro area. As a matter of fact, some aspects of both credit risk and liquidity may not change over the period considered, and this may prevent the identification of the determinants of the constant in the model of yield differentials. Hence, the goal of our analysis is to identify the relative importance of liquidity and default premiums in explaining fluctuations, rather than levels~~,~~ of yield differentials. This is accomplished by estimating the impact of macroeconomic fundamentals and international factors on yield differentials, because liquidity factors should be, by their nature, local and not directly related to macroeconomic fundamentals. Moreover, we propose a solution to the identification problem based on the idea that the constant is not affected by domestic or international credit-risk factors.~~international risk-related factors, such as US interest rates, affect yield differentials because of differences in macroeconomic fundamentals as opposed to differences in liquidity.~~

The analysis is complicated by the fact that liquidity-related variables affect yields at high frequencies, while ~~economic fundamentals and~~ risk-related variables ~~affect bond yields~~ at lower frequencies, since they depend on economic fundamentals which are slow moving. As a consequence, many observations are needed to capture the effect of macroeconomic fundamentals and risk-related factors. The use of long series creates three problems. First, bond yield differentials, although available from the beginning of the 1990s, are affected by different factors in the pre-EMU and post-EMU sample. Second, macroeconomic fundamentals are only observed at low frequencies. Third, data on liquidity-related variables are only available for the year 2002. We plan to deal with these difficulties by looking at both monthly and daily data. We first focus on the effect of fundamentals by using monthly series, and then we look at the effect of liquidity factors by using~~with~~ daily data. Importantly, we make an attempt towards keeping consistency between our two specifications. We try to achieve such results by explicitly dealing with a number of relevant problems.

First, the sample of monthly data includes pre-EMU and post-EMU observations, and then requires the solution of the problem related to the impact of pre-EMU exchange rate fluctuations on yield spreads. We measure the component due to expected exchange rate fluctuations and exchange rate risk using the difference in 10-year fixed interest rates from the term structure estimated on swap contracts denominated in different currencies.

Interest rates on swaps are virtually free from the risk of default of sovereign issuers. Swap contracts are agreements to exchange a flow of interest payments at a fixed rate for one at a floating rate, usually the six-month LIBOR. The credit risk of swap contracts differs from that associated with a position in government bonds. An interest rate swap does not involve any principal to be potentially lost by any of the two counterparts in case of default of the other. The only cost generated by the default of one of the counterparts is that of re-building the future exchange of cash flows at current market conditions, which could be very different from the initial ones and thereby generate a loss (or a profit). The counterpart risk for swap rates denominated in different currencies should be the same, since the investment banks who deal in swaps operate in all markets relevant to us. Thus, the credit risk component of swap rates should net out in swap rate differentials. Indeed, Figure 3 shows that differentials between fixed interest rates on swaps converged towards zero as the probability of EMU increased from 1996 to 1999 and stayed constantly at zero thereafter. Table 2 shows summary statistics on yield spreads, which separates~~separating~~ the exchange risk components from the total yield differentials.

Figure 3. Fixed interest rate on interest rate swaps in the Euro area



Source: Datastream/Thomson Financial

Table 2. Asset swap spreads and swap differentials

	AUS	BEL	FIN	FRA	GRE	IRE	ITA	NET	POR	SPA
Sample June 1991- December 1995										
Total yield differential	n.a.	0.787	n.a.	0.536	n.a.	n.a.	4.821	0.107	n.a.	3.744
Relative asset swap spread	n.a.	0.199	n.a.	-0.053	n.a.	n.a.	0.966	0.005	n.a.	0.133
Swap differential	n.a.	0.588	n.a.	0.589	n.a.	n.a.	3.855	0.102	n.a.	3.610
Sample January 1996- December 1998										
Total yield differential	0.090	0.189	0.436	0.029	n.a.	n.a.	1.577	-0.027	1.107	1.180
Relative asset swap spread	0.094	0.147	0.022	0.061	n.a.	n.a.	0.246	0.008	0.192	0.200
Swap differential	-0.004	0.042	0.413	-0.031	n.a.	n.a.	1.331	-0.035	0.914	0.980
Sample January 1999- December 2002										
Total yield differential	0.243	0.281	0.190	0.138	0.549	0.146	0.325	0.136	0.322	0.254
Relative asset swap spread	0.243	0.281	0.190	0.138	0.469	0.146	0.325	0.136	0.322	0.254
Swap differential	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.000

Source: Datastream/Thomson Financial.

Hence, as in Favero et al. (1997), we measure the component of yield differentials not related to exchange rate factors as:

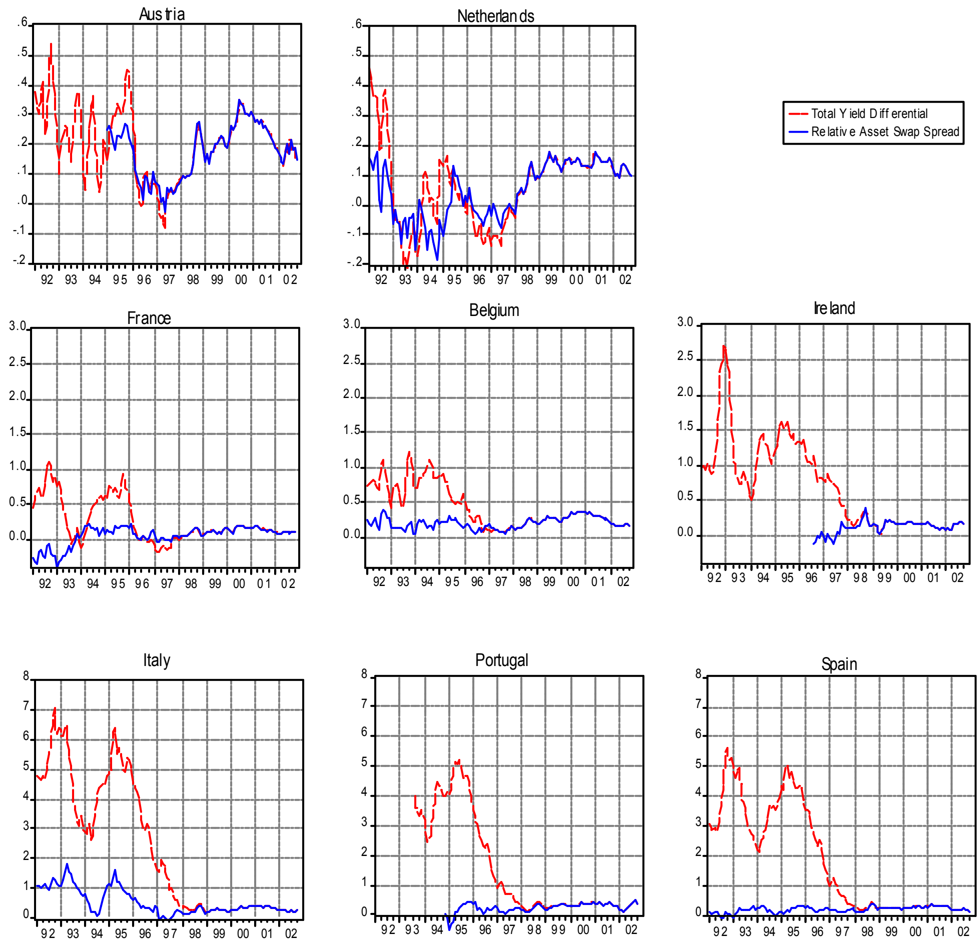
$$RAS^{i}_{t,T} = \left(R^{i}_{t,T} - R^{GER}_{t,T}\right) - \left(RSW^{i}_{t,T} - RSW^{GER}_{t,T}\right) \qquad [1]$$

Where $R^{i}_{t,T}$ is the yield-to-maturity of 10-year bonds issued by country i, $R^{GER}_{t,T}$ is the yield-to-maturity of 10-year bonds issued by Germany, $RSW^{i}_{t,T}$ is the 10-year fixed interest rate on swaps denominated in currency i, and $RSW^{GER}_{t,T}$ is the 10-year fixed interest rate on swaps denominated in Deutsche marks. It is worth noting that *RAS*, the relative asset swap, coincides with the yield differential in the EMU period.[2]

[2] As discussed by Favero et al. (1997) a direct measure of the default factor can be obtained by comparing the yields of bonds issued in the *same currency* by country *j* and by a different sovereign issuer. In this vein, Giovannini and Piga (1991) used the yield differential between two dollar-denominated bonds: one issued by the Republic of Italy and one, of roughly the same maturity, issued by the World Bank (or by the US Treasury). This measure is however unsatisfactory for both empirical and technical reasons. Just as supranational issues, the bonds issued by the Republic of Italy on the global or on the Euro-syndicated market are not very liquid, as they are held by long-term investors, including central banks, are not the object of short-term arbitrage trading, are intermittent in time and do not cover all relevant maturities. This factor is really crucial for international comparisons because when issues are sparse, term structure effects could contaminate the data. Furthermore, unlike domestic bonds, foreign issues, and especially issues in the "global" market, have legal guarantees for creditors (in the case of global issues in the United States, for instance, a US court is competent in the case of litigation).

We use *RAS* as the dependent variable in an empirical model aimed at identifying the relevance of liquidity and credit-related factors. Total yield differentials and relative asset swap spreads are presented in Figure 4.

Figure 4. Yield differentials and Relative Asset Swap spreads in the Euro area



Sources: Datastream/Thomson Financial and our calculations.

Figure 4 shows that, as observed by Favero et al. (1997) and Blanco (2002), the exchange rate factor did heavily affect yield differentials in the pre-EMU era. Relative asset swap spreads show a much more homogenous time -series behaviour. This is consistent with the hypothesis that filtering out the exchange rate factor from yield differentials might allow to sensibly pool data coming from the pre-1999 and the post-1999 regimes. We shall then implement the following empirical model on monthly data:

$$RAS_{t,t}^{i} = l\,RAS_{t,t-1}^{i} + (1-l)\left[(d_{i,t})(b_1 + b_2 Z_t) + b_3 Z_t\right] + (1-l)b_0 + u_{i,t} \qquad [2]$$

Where $RAS^{i}_{t,T}$ is the relative asset swap spread for country *i*, $d^{i}_{t,T}$ is the (log) deviation of country *i* debt-to-GDP ratio from Germany's debt-to-GDP ratio, and *Z* is a vector containing exogenous variables measuring or approximating risk premiums. Our baseline specification for *Z* includes ~~$\left(R_t^{US} - r_t^{US}\right)$, the slope of the US yield curve as measured by the difference between the yield-to-maturity of 10-year US government bonds and the 3-month interest rate on euro-Dollars,~~ $\left(R_t^{SP,US} - R_t^{US}\right)$, the spread between 10-year fixed interest rates on US swaps and the yield on 10-year US government bonds, and $\left(R_t^{C,US} - R_t^{US}\right)$, the spread between the yield on Moody's Seasoned AAA US corporate bonds and the yield on 10-year US government bonds.

The model, beside allowing for a slow dynamic adjustment to a long-term equilibrium value of *RAS*, explains relative asset swaps non-linearly in terms of exogenous, US-related factors which capture risk premiums (more specifically, ~~term premiums,~~ banking ~~sector risk premiums~~ and corporate sector risk premiums). We follow the empirical literature on sovereign bond spreads in emerging markets (e.g. Eichengreen and Mody 2000, Barnes and Cline 1997, Kamin and Von Kleist 1999) that considers the yield on US government bonds as a main source of international risk, but we add proxies of the credit risk in the corporate and banking sectors. Blanco (2001) ~~has~~ also used yields on US corporate bonds as a proxy for global credit risk in modelling yields on Euro-area government securities. Our choice of proxies is also consistent with the evidence produced by Arola and Cerisola (2001), who document that tightening of US monetary policy and increasing uncertainty on the future stance significantly widens bond spreads of emerging markets. The dependence of yield differentials on ~~EMU government bonds with~~ proxies for international risk would be consistent with the results by Dungey at al. (2000), who show~~present~~ strong evidence in favour of~~for~~ the presence of a common international~~world~~ factor in many yield differentials.

We enter the variables in *Z* both linearly and interacted with ~~is~~ the deviation of country *i* debt-to-GDP ratio from Germany's debt-to-GDP ratio. This interaction allows us to assess the risk-relevance of debt indicators. A significant interaction means that when global risk increases, all spreads increase ~~but~~ proportionally to fiscal fundamentals. Hence higher-debt countries are riskier from this perspective. Note that in our specification the effect of debt indicators becomes zero when country *i* fundamentals are in line with Germany's fundamentals. In line with this assumption, we identify the interaction term as capturing the credit risk.

We also allow for the variable in *Z* to enter linearly into the model to test the importance of international factors independently from debt ratios. The consideration of this linear term is necessary as international factors might affect the relative asset swap spread either because of 'structural' differences in liquidity or differences in non~~t~~-varying unobservable fundamentals, such as the reputation of the issuing governments.

Our specification has several advantages:

i) the introduction of the interaction between risk factors and debt indicators allows us to solve the identification problem between the level of the credit risk factor and the level of the liquidity factor. This solution of the identifications problem, which would not have been possible in linear models, is based on the testable hypothesis that international risk-related factors affect yield differentials because of differences in macroeconomic fundamentals, while they have a negligible effect when considered in isolation;

ii) parameter stability in the pre- and post-EMU periods~~correspondence with the beginning of EMU~~ is testable;

iii) the specification could easily be adapted into a model for daily data over the EMU sample, where direct measures of liquidity factors are available.

In fact, over the sample of daily observations for the year 2002 we can estimate the following model:

$$\left(R_t^i - R_t^{GER}\right) = l\left(R_{t-1}^i - R_{t-1}^{GER}\right) + (1-l)\left(b_1 + b_2 Z_t\right) + (1-l)\left(g + g_1 X_t\right) + u_{i,t} \qquad [3]$$

Model [3] is the equivalent on daily data of model [2]~~on monthly data~~. In this case, we model total yield differentials, which are equivalent to relative asset swaps as the fixed interest rates on swaps have fully converged. We consider macroeconomic and fiscal fundamentals as constant, take daily measures of ~~the US term structure of interest rates and~~the US variables measuring risk premiums (see [2]), and include the vector X liquidity-related proxies (see, for example, Fleming, 2001).

4. THE EVIDENCE FROM MONTHLY DATA

The use of monthly data allows us to evaluate the effect of macroeconomic fundamentals on credit risk at the cost of the unavailability of measures of liquidity. Following the discussion in the previous section we report in Table 3 the results from estimation of the following model:

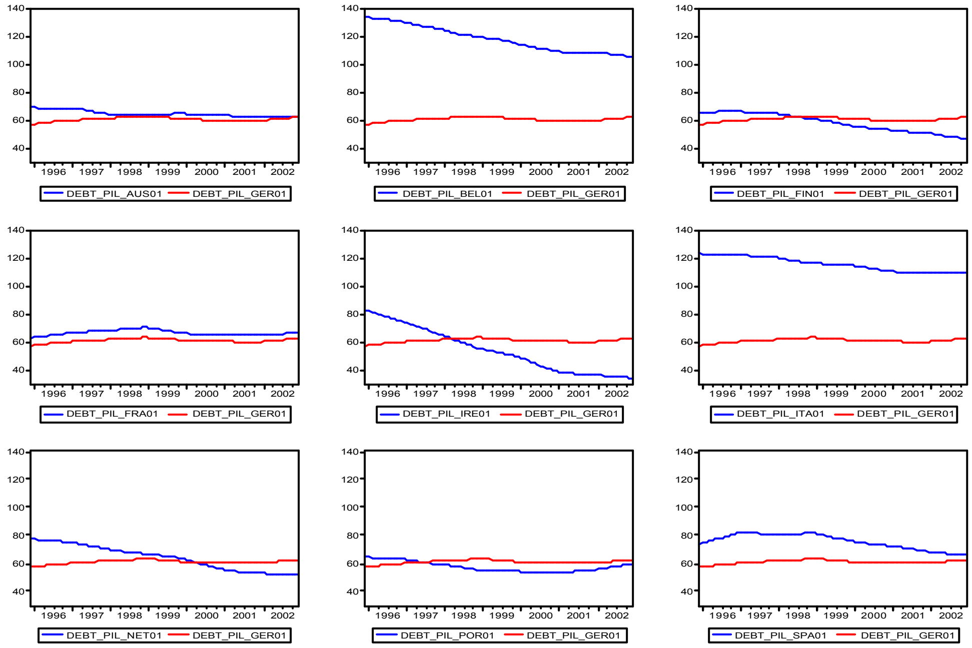
$$\begin{aligned} RAS_{t,t}^i = {} & l\, RAS_{t,t-1}^i + (1-l)\left(d_{i,t}\right)\left(b_1 + b_2\left(R_t^{SP,US} - R_t^{US}\right) + b_3\left(R_t^{C,US} - R_t^{US}\right)\right) \\ & + (1-l)\left[b_4\left(R_t^{SP,US} - R_t^{US}\right) + b_5\left(R_t^{C,US} - R_t^{US}\right)\right] + (1-l)\, b_0 + u_{i,t} \end{aligned} \qquad [4]$$

Where $RAS_{t,T}^i$ is the relative asset swap spread for country i, $d_{t,T}^i$ is the (log) deviation of country i debt to GDP ratio from Germany's debt-to-GDP ratio,

$\left(R_t^{SP,US} - R_t^{US}\right)$ is the spread between 10-year fixed interest rates on US swaps and the yield on 10-year US government bonds and $\left(R_t^{C,US} - R_t^{US}\right)$ is the spread between the yield on Moody's Seasoned AAA US corporate bonds and the yield on 10-year US government bonds[3]. The time -series behaviour of all regressors is reported in Figures 5 and 6. Table 3~~2~~ contains the most parsimonious specification for each country.

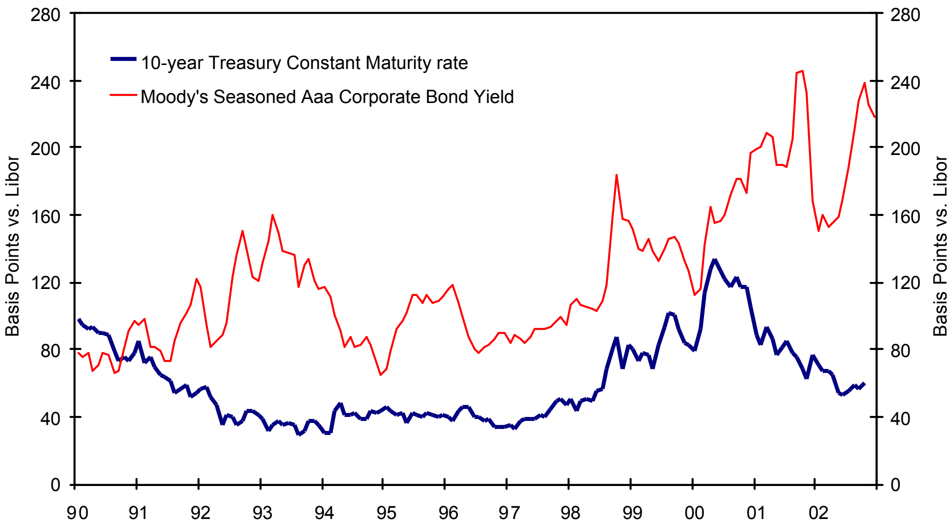
[3] We started from a more general specification for Z, including also the slope of the US yield curve as measured by the difference between the yield of 10-year US government bonds and a 3-month interest rate, and some measures of stock market volatility. We excluded these variables because they were never significant in addition to our proxies for corporate and banking sector risk.

Figure 5. Debt to GDP ratios in EMU countries and Germany



Sources: EU Commission, Datastream/Thomson Financial.

Figure 6. Exogenous measures of risk premium



Sources: US Federal Reserve St. Louis and Datastream/Thomson Financial.

Table 3. Model Estimates on monthly data (Estimation Method: SURE) [a]

	AUS	BEL	FIN	FRA	IRE	ITA	NET	POR	SPA
Sample	1995:12 2002:10	1995:12 2002:10	1997:01 2002:10	1995:12 2002:10	1996:09 2002:10	1995:12 2002:10	1995:12 2002:10	1995:12 2002:10	1995:12 2002:10
?	0.60 (0.067)	0.32 (0.083)	0.85 (0.044)	0.62 (0.051)	0.67 (0.067)	0.77 (0.036)	0.83 (0.062)	0.63 (0.062)	0.58 (0.058)
β_1	-0.87 (0.419)	-	-	-	-	-	-	-	-0.34 (0.112)
β_2	-	-	-	-	-	0.38 (0.187)	-	-	-
β_3	0.79 (0.436)	0.09 (0.030)	-	-	-	-	-	-	0.78 (0.111)
β_4	0.25 (0.035)	0.24 (0.021)	0.31 (0.146)	0.13 (0.029)	0.17 (0.061)	-	0.13 (0.058)	0.14 (0.062)	-
β_5	-	-	-	-	-	-	0.05 (0.035)	0.08 (0.037)	-
β_0	-0.01 (0.028)	-0.01 (0.029)	-0.10 (0.108)	0.01 (0.022)	0.001 (0.047)	0.10 (0.087)	-0.07 (0.051)	0.05 (0.052)	0.08 (0.029)
Chow Test P-value	0.38	0.16	0.29	0.70	0.00	0.84	0.10	0.70	0.94
SE of Regression	0.03	0.03	0.06	0.03	0.05	0.07	0.02	0.06	0.03
Mean Dep. Variable	0.17	0.22	0.12	0.10	0.12	0.28	0.08	0.26	0.23

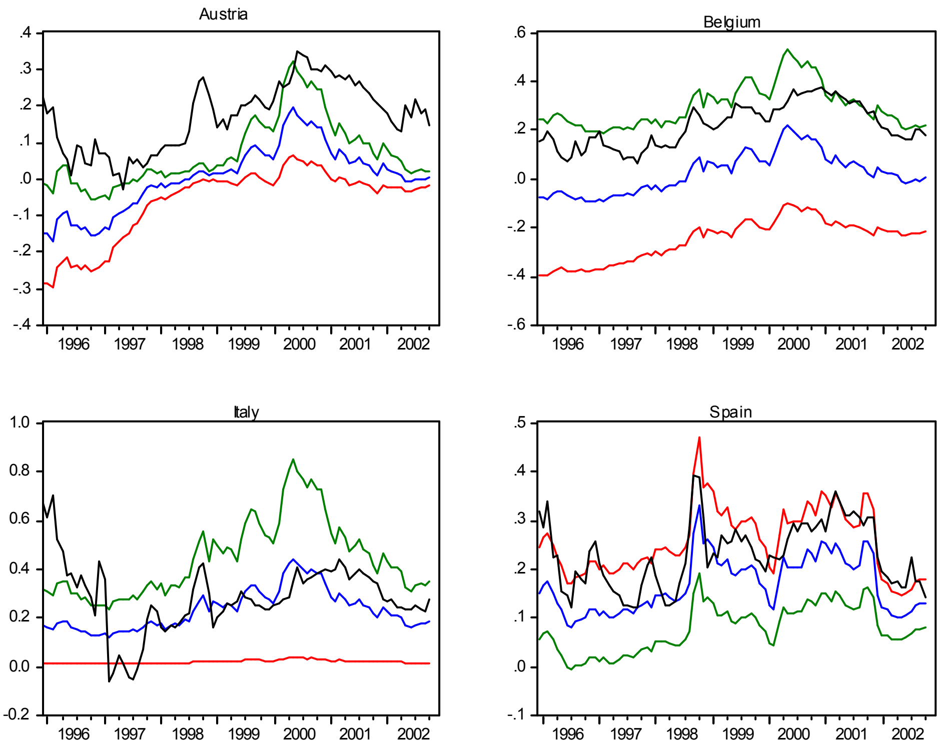
[a] SE within brackets
Source: Our calculations.

The risk related factors are significant in the ~~non-linear~~ specification which interacts debt-to-GDP differentials with international risk variables for Italy, Spain, Austria and Belgium~~,~~ T~~while t~~hey are not statistically different from zero for all other countries. Figure 7 allows us to assess the statistical and economic importance of the risk-related factors. This is done by plotting over time total yield differentials, our estimate for risk-related factors linked to fundamentals (default risk)~~our estimate for the share in total yield differentials that depends on the higher debt-to-GDP ratio, and that can thus be attributed to the credit risk premium~~ along with its 95 per cent confidence interval.

From Figure 7 it is clear that only in the case of Spain and Italy can a significant part of the total yield differential be attributed to the default risk factor, while in the case of

Belgium and Austria the significant response of yield differentials to risk variables does not map into a significant default risk factor.

Figure 7. Estimates of ~~the portion of~~ yield differentials attributable to default risk



Note: RAS is the black line; the blue line is the estimate of the portion due to default risk; the red and green lines are confidence intervals for the default risk component.
Sources: Our calculations.

However, the risk-related factors enter significantly in the specification for all countries if we include the linear specification~~when considered linearly~~. In particular, all European yield differentials (but Spain) react significantly to fluctuations in the US asset swap spread. The constant, which could capture residual liquidity-related factors, is never significant for all the countries we have considered.

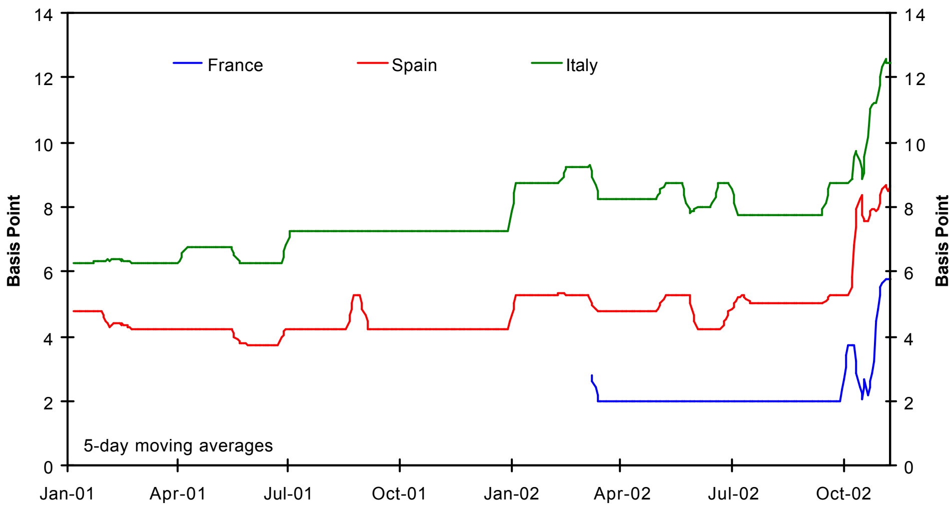
To sum up, the results from estimation on monthly data show that EU countries can be grouped according to their response to fluctuations in exogenous risk factors. On the one extreme are Italy and Spain, where we have evidence that fluctuations in yield differentials can be almost entirely attributed to fluctuations in default premiums related to domestic fundamentals. On the other extreme we have France, Finland, Ireland, the Netherlands and Portugal, where fluctuations in yield differentials respond to international exogenous risk-related factors, although~~but~~ independently from debt-to-GDP ratios. ~~In the case of Portugal market expectations about the first breach of the 3%~~

~~limit of the Growth and Stability Pact must have also played a role.~~ Belgium and Austria are an intermediate case in that their yield differentials do respond both linearly and in an interacted fashion~~non-linearly,~~ to international risk-related factors, but their interacted~~non-linear~~ response is neither as strong nor as statistically significant as that for~~ose of~~ Italy and Spain.

~~4.1.~~4.1. Assessing our evidence. What do credit default swaps tell us?

A credit default swap (CDS) is a derivative contract that allows the investor to hedge against the default of a borrower. The protection buyer agrees to make periodic payments (the swap spread or premium) over a predetermined number of years (the life of the contract) to the protection seller. This is in exchange for a payment in the event of default by a third party (the so-called reference entity, and in our case EMU member s~~S~~tates). The premium is set as a percentage of the total amount of protection bought, which is usually the notional amount of the government bond. Should a default event occur, the protection seller becomes liable for the difference between the face value of the debt obligation issued~~s~~ by the EMU government and its recovery value. Data for such contracts are available only from the start of 2001. Figure 8 reports the cost of hedging against default in basis points, derived from CDSs, ~~of hedging against default~~ for Spanish, Italian and French government bonds. This provides a market-based measure of the credit-risk premium. ~~The protection buyer has the right to sell the defaulted asset to the protection seller for its face value.~~ Pricing of credit risk in CDS spreads differ from asset swap spreads for at least two reasons: (i) there is an optionality feature in CDSs versus~~s.~~ asset swap spreads, as CDS spreads cannot decrease below zero while asset swap spreads may go deeply negative; and (ii) CDSs have an embedded delivery option, as~~do that~~ in case of default the protection buyer has the option to deliver a basket of bonds. Liquidity of credit default swaps has increased recently, but remains extremely low compared to volumes traded in the government bond market. Therefore, this information must be taken very cautiously. Still, CDS spreads could be considered as useful indicators of investors' perceptions of credit risk and their willingness to bear it. D~~Figure 8~~ evelopments in CDS spreads seem~~s~~ to broadly support our findings about the importance of credit factors in the case of Spain and Italy and their relative ranking~~s~~ (Figure 8).

Figure 8. Credit default swap differentials versus~~s.~~ Germany

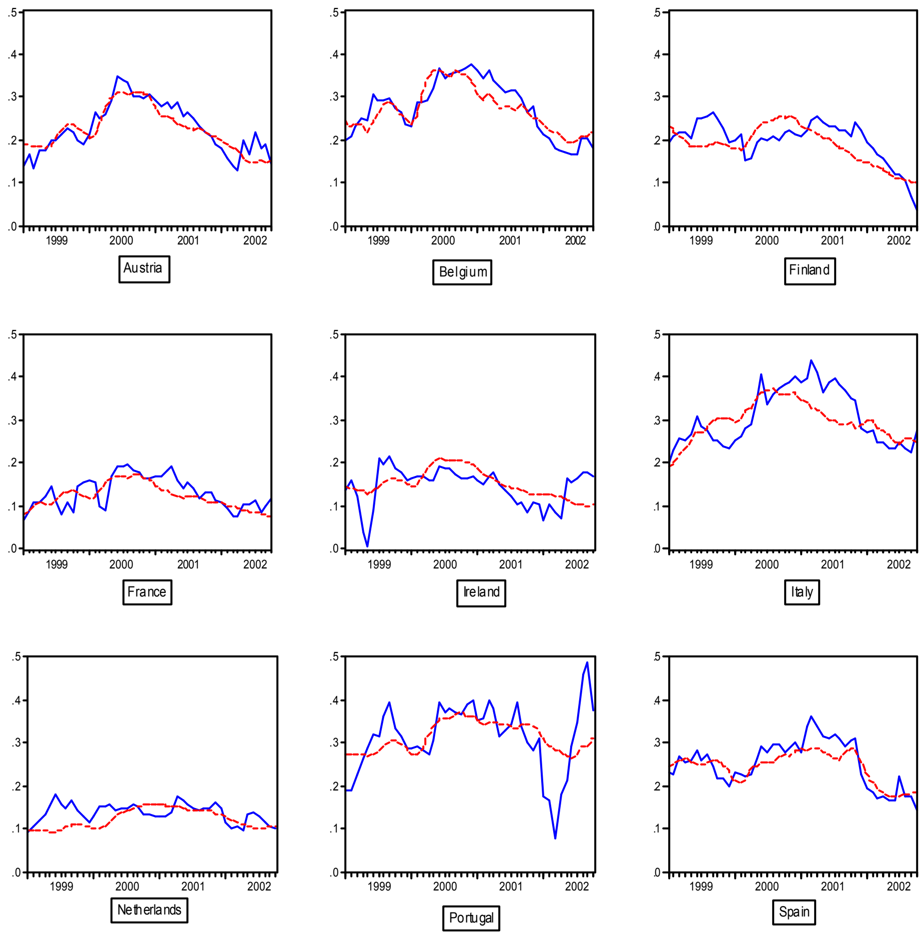


Sources: CreditTrade and our calculations.

4.~~2.~~4.2. Does EMU generate a structural break?

Investigating if EMU generated a structural break is very important to our objective of identifying the source of fluctuations of yield differentials. We do so by a direct test for parameters stability and by dynamic simulations of our model over the period 1999-2002. The test for structural stability ~~reported in Table 3~~ shows that the null hypothesis of no structural break in January 1999 cannot be rejected at the five per cent level for all countries in our sample, with the only exception of Ireland. The results from the dynamic simulation of our model over the period 1999-2002 are reported in Figure 9.

Figure 9. Actual and dynamically simulated yield differentials versus~~s.~~ Germany



Sources: Datastream/Thomson Financial and our calculations.

We do not introduce~~report~~ confidence intervals as the actual series always lies in the 95 per cent confidence intervals from the simulation after running stochastic simulations. Figure 9 ~~clearly~~ shows that yield differentials in the EMU area are very well predicted given the parameters estimated with pre-EMU data and the knowledge of the international risk factors. The only notable exception is the Portuguese yield differential in spring 2002. In fact, the behaviour of Portuguese yield differentials in 2002 constitutes an interesting case study. The evident spike in the Portuguese yield differentials was probably related to rumours that the EU Commission could have issued an 'early warning' for excessive deficit to Portugal. As a matter of fact, the rumors of an early warning on Germany and Portugal spread in January. But the Council refused to issue the~~is early~~ warning against Portugal (and Germany) on the 12^{nd} of February. This ended this discussion. Then after the election it turned out that the actual Portuguese deficit in 2001 might have been wrongly reported by the previous government and might have actually been higher than 3% of GDP. This would have directly triggered ~~no early warning, but~~ an excessive deficit procedure. On the 26th of June the Portuguese Prime Minister in Parliament ~~then~~ made a reference to an ECB document saying that the deficit ~~actually~~ was 3.9% of GDP. T~~But t~~he official deficit figure, which had to be released by a commission founded for that purpose under the leadership of the Bank of Portugal, was released only at a later date~~stated later~~. On the 26th of July the Portuguese government officially submitted the final deficit figure of 4.1% of GDP to the European Commission. Then, on the 16th of October~~.~~, the European Commission adopted a report and a recommendation arguing that the Council should declare Portugal to be in excessive deficit. That is what the ECOFIN Council~~ than~~ did on the 5th of November. Interestingly, ~~the fact that~~ the Portoguese spread appears to have been~~is~~ the only one in Europe affected by rumours of warnings, while also Germany and more recently France have experienced similar budget problems.~~ for Portugal and Germany clearly points out that the level of German yields was not affected by these rumours.~~

~~6.~~ 5. THE EVIDENCE FROM DAILY DATA

According to common belief in financial markets, liquidity has become the major priced element in spread valuation since the launch of the Monetary Union, but it is not fully clear what is meant by it. The econometric evidence of our baseline model points strongly towards the importance of international factors in determining fluctuations in yield spreads in the Euro area. Can liquidity-related factors increase the explanatory power of international factors?

To answer this question we must first find a set of variables related to liquidity. While there is no generally accepted definition of liquidity, according to the academic literature, there are four dimensions of liquidity (Gravelle (1999a,b):

1. immediacy – speed with which a trade of a given size at a given width is completed;
2. depth – maximum size of a trade for any given bid-ask spread;
3. width – bid-ask spread, the cost of providing liquidity; and
4. resiliency – how quickly price movements revert to “normal” levels after a large transaction and how quickly the imbalances in transaction flows dissipate.

Market breadth is also referred to as the market ability to absorb large buy/sell orders without large-scale price movements. All dimensions tend to interact, and there is no single measure of liquidity. It has been argued that, in the context of government bond securities, liquidity may be best thought of in terms of the cost of supplying immediacy. Liquidity is closely linked to secondary as well as primary market efficiency, i.e. having transparent issuing procedures with a high degree of predictability and a small number of large issues. Liquidity is influenced by the market structure as well as security-specific factors, i.e. the amount outstanding etc.

These four dimensions of liquidity are difficult to record directly, and therefore other measures are usually considered to gauge liquidity conditions. These are:

1. bid/ask spread;
2. trading volume;
3. turnover ratios (total trading volume divided by the stock of securities outstanding, i.e. the number of times the market "turns over" in the period);
4. trading intensity (number of transactions that take place over a set period).

To study liquidity effects we have available one year of daily observations of yields on benchmark bonds from EuroMTS data. In particular, in addition to the international factors considered in our monthly model, we have available for each benchmark bond[4] the ~~residual term to maturity, the~~ bid-ask spread~~,~~ and the trading volume. We have estimated the following model on a sample of one-year daily observations:

[5]

$$
\begin{aligned}
RAS_{t,t}^{i} = {} & l\,RAS_{t,t-1}^{i} + (1-l)\left[b_1\left(RMAT_t^{i} - RMAT_t^{GER}\right) + b_2\left(BASP_t^{i} - BASP_t^{GER}\right) + b_3\left(VOL_t^{i} - VOL_t^{GER}\right)\right] + \\
& + (1-l)\left(b_4\left(R_t^{SP,US} - R_t^{US}\right) + b_5\left(R_t^{C,US} - R_t^{US}\right)\right) + (1-l)\,b_0 + u_{i,t}
\end{aligned}
$$

Where $RAS_{t,T}^{i}$ is the relative asset swap spread for country *i*, $\left(R_t^{SP,US} - R_t^{US}\right)$ is the spread between 10-year fixed interest rates on US swaps and the yield on 10-year US government bonds and $\left(R_t^{C,US} - R_t^{US}\right)$ is the spread between the yield on Moody's Seasoned AAA US corporate bonds and the yield on 10-year US government bonds.

RMAT is the residual maturity of each bond, *BASP* is the bid-ask spread relative to each benchmark bond, and *VOL* is the trading volume on the Euro-MTS relative to each benchmark bond. The consideration of the remaining terms to maturity, *RMAT*, is made necessary by the use of data on benchmark bonds with different maturities, ~~(~~while for monthly estimates we could rely on the estimated yields for constant 10-year maturity bonds~~)~~. The estimation is limited to 2002 as January 2002 is the earliest period for which ~~Euro~~MTS could make the relevant data available to us.

The results from our estimation are reported in Table 4. They show that, once we control for the different maturities of the benchmarks, liquidity factors are significant in Austria, Finland, Ireland, the Netherlands, Portugal and Spain. ~~I~~international risk-related factors are significant in all countries with the only exception of Austria and

[4] Our data come from a snapshot of the market taken daily at 11 am. There are some recent interesting developments in the literature on how a benchmark should be defined (see, for example, Dunne et al.2002). We somewhat arbitrarily define benchmarks by considering the introduction of a new 10-year bond in the ~~Euro~~MTS market.

Spain~~Belgium.~~ ~~In fact,~~ Austria and Spain are~~is~~ the only two cases in which we observe statistical significance of liquidity related variables paired with no significance of international risk factors. ~~In the case of Belgium, none of the variables that we consider are significant, and we are not able to outperform a random walk model. In the case of Italy, Spain, Portugal and Ireland, no liquidity variable is significant. Finally, we observe that liquidity-related and risk-related factors are both significant for Finland and the Netherlands.~~

Table 4. Model estimates on daily data (Estimation Method: SURE) [a]

	AUS	BEL	FIN	FRA	IRE	ITA	NET	POR	SPA
Sample	15/1/2002 11/12/2002	15/1/2002 11/12/2002	15/1/2002 19/11/2002	15/1/2002 11/12/2002	12/7/2002 11/12/2002	15/1/2002 11/12/2002	15/1/2002 11/12/2002	15/1/2002 11/12/2002	15/1/2002 11/12/2002
?	0.94 (0.013)	0.96 (0.013)	0.66 (0.035)	0.85 (0.034)	0.87 (0.052)	0.88 (0.024)	0.05 (0.060)	0.94 (0.017)	0.98 (0.008)
β_1	0.12 (0.023)	0.04 (0.05)	0.05 (0.013)	-0.03 (0.024)	0.11 (0.066)	-0.08 (0.040)	0.01 (0.020)	0.13 (0.057)	0.11 (0.173)
β_2	0.04 (0.028)	0.06 (0.020)	0.04 (0.002)	0.03 (0.011)	-	-	0.07 (0.007)	0.13 (0.030)	-
β_3	0.01 (0.008)	-	0.09 (0.002)	-	0.01 (0.003)	-	-	0.013 (0.009)	0.03 (0.012)
β_4	-	-	-0.01 (0.004)	-	-	-	-0.01 (0.003)	-	-
β_5	-	0.20 (0.090)	0.16 (0.026)	0.09 (0.025)	0.14 (0.082)	0.22 (0.045)	0.18 (0.038)	0.19 (0.100)	-
β_0	-	-	-	0.03 (0.007)	-	0.07 (0.009)	-	-	-
SE of Regression	0.006	0.004	0.007	0.004	0.003	0.005	0.026	0.033	0.003
Mean Dep. Variable	0.175	0.202	0.173	0.077	0.233	0.192	0.117	0.215	0.191

[a] SE within brackets
Source: Our calculations.

~~**Table 4. Model estimates on daily data (Estimation Method: SURE)** [a]~~

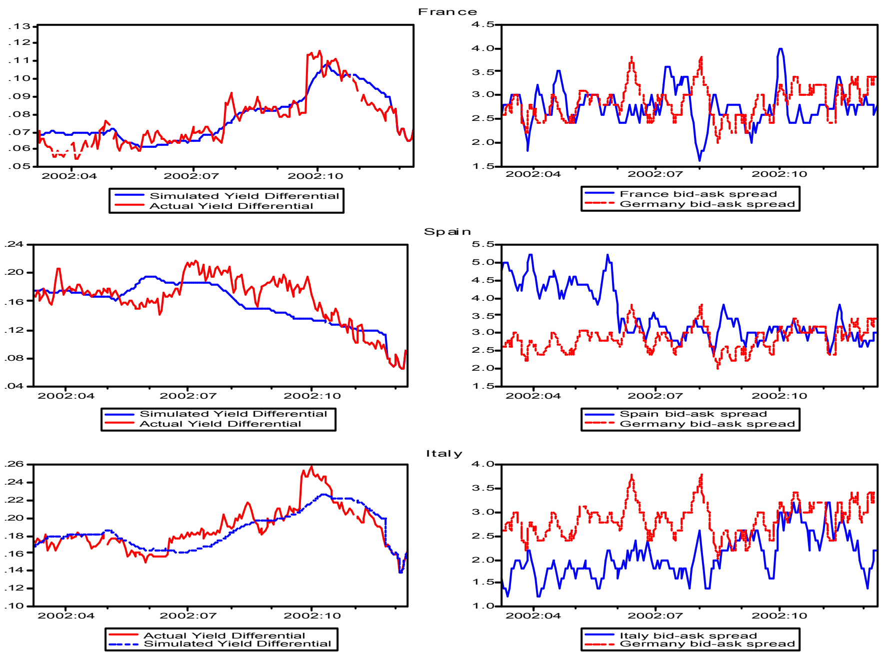
~~-~~	~~AUS~~	~~BEL~~	~~FIN~~	~~FRA~~	~~IRE~~	~~ITA~~	~~NET~~	~~POR~~	~~SPA~~
~~?~~	~~0.94~~ ~~(0.013)~~	~~0.96~~ ~~(0.013)~~	~~0.66~~ ~~(0.035)~~	~~0.85~~ ~~(0.034)~~	~~0.87~~ ~~(0.052)~~	~~0.88~~ ~~(0.024)~~	~~0.05~~ ~~(0.06)~~	~~0.94~~ ~~(0.017)~~	~~0.98~~ ~~(0.008)~~
~~β_0~~	~~0.12~~ ~~(0.023)~~	~~0.04~~ ~~(0.05)~~	~~0.05~~ ~~(0.013)~~	~~-0.03~~ ~~(0.024)~~	~~0.11~~ ~~(0.066)~~	~~-0.08~~ ~~(0.040)~~	~~0.015~~ ~~(0.02)~~	~~0.13~~ ~~(0.057)~~	~~0.11~~ ~~(0.173)~~
~~β_1~~	~~0.04~~ ~~(0.028)~~	~~0.06~~ ~~(0.02)~~	~~0.04~~ ~~(0.002)~~	~~0.034~~ ~~(0.011)~~	~~-~~	~~-~~	~~0.07~~ ~~(0.007)~~	~~0.13~~ ~~(0.03)~~	~~-~~
~~β_2~~	~~0.01~~ ~~(0.008)~~	~~-~~	~~0.009~~ ~~(0.002)~~	~~-~~	~~0.01~~ ~~(0.003)~~	~~-~~	~~-~~	~~0.013~~ ~~(0.009)~~	~~0.03~~ ~~(0.012)~~
~~β_3~~	~~-~~	~~-~~	~~-0.007~~ ~~(0.004)~~	~~-~~	~~-~~	~~-~~	~~-0.009~~ ~~(0.003)~~	~~-~~	~~-~~
~~β_4~~	~~-~~	~~0.20~~ ~~(0.09)~~	~~0.16~~ ~~(0.026)~~	~~0.086~~ ~~(0.025)~~	~~0.143~~ ~~(0.082)~~	~~0.22~~ ~~(0.045)~~	~~0.18~~ ~~(0.038)~~	~~0.19~~ ~~(0.10)~~	~~-~~
~~β_5~~	~~-~~	~~-~~ ~~-~~	~~-~~	~~0.03~~ ~~(0.007)~~	~~-~~	~~0.076~~ ~~(0.009)~~	~~-~~	~~-~~	~~-~~
~~SE of Regression~~	~~0.006~~	~~0.004~~	~~0.007~~	~~0.004~~	~~0.003~~	~~0.005~~	~~0.026~~	~~0.033~~	~~0.003~~
~~Mean Dep. Variable~~	~~0.175~~	~~0.202~~	~~0.173~~	~~0.077~~	~~0.233~~	~~0.192~~	~~0.117~~	~~0.215~~	~~0.191~~

~~* SE within brackets~~

Overall, the results from estimation at daily frequency confirm the indication given by our model on monthly data that liquidity is not the only determinant of yield differentials in the Euro area. Several countries~~Italy, and Portugal~~ show a strong dependence on international factors, which reflects current and past macroeconomic fundamentals. The dependence on international factors found in monthly data for~~ the case of~~ Spain disappears ~~is significantly weakened~~ when the shorter sample of daily data is considered and liquidity related factors are explicitly considered. It looks like ~~L~~liquidity is the main driver of yield differentials only in the case of Portugal.~~Austria, Finland and the Netherlands. France and Ireland are special cases, in that their (small) yield differentials relative to Germany depend on both international factors and liquidity.~~

As in the case of monthly data, we further evaluate our model by simulation. In Figure 10, we present dynamically simulated series from our model and actual series for France, Italy and Spain. The comparison between yields differentials and bid-ask spreads, as the main liquidity variable, seems to suggest that: (i) the default risk has been the dominant component in the case of Italy, (ii) the small fluctuations in yield differentials tend to reflect small fluctuations in credit risk in the case of France, and (iii) improved liquidity has been the dominant factor in explaining the reduction in Spanish-German yield differentials in the course of 2002.

Figure 10. Actual and dynamically simulated yield differentials vs. Germany



Sources: Datastream/Thomson Financial, MTS and our calculations.

5.1. ~~6.1.~~ Does the presence of a liquid futures market really matter~~count~~?

An important variable is missing from our analysis of liquidity factors in the previous section, a variable to which anecdotal evidence from market participants attributes a great importance: the presence of an efficient and liquid future contract[5].

A proper functioning of associated derivatives markets facilitates the active trading and management of interest rate risk. Where a well-developed futures market exists, market makers can manage their positions using futures, thereby enhancing their ability to carry out inventory-risk management in the cash market, which, in turn, promotes better liquidity. Trading activity in the futures market may also increase activity in the cash market due to arbitrage activity on the basis[6]. Equally, a well-developed futures market depends on a deep underlying cash market. This mutually reinforcing process results in

[5] We were unable to test for the presence of liquid and efficient repurchase agreement markets/facilities.

[6] There appear to be varying opinions on this issue. Some believe a liquid futures market can withdraw liquidity from the underlying cash market, as speculative trades would find trading in the futures market cheaper.

large liquid issues, which are deliverable into an actively traded futures contract, commanding a price premium. Besides, episodes of flight-to-quality may have heightened the importance of the basis risk in hedging non-German bond positions with Eurex contracts. In the Euro area the Bund futures contract has become predominant. German government bonds, which have become the de-facto benchmark in the 10-year sector, appear to command a sizeable premium versus other sovereign issues due to this 'derivative factor'. In principle, our evidence in favour of the importance of international factors might not be robust to the inclusion of the impact of future markets in our analysis. Therefore, we analysed the impact of the futures market by collecting data on volumes and open interest on all futures contracts on Eurozone government bonds and aggregate data according to the underlying government bond. Summary statistics are presented in Table 5[7].

Arguably, the lack of a liquid future contract in all EMU countries but Germany should command a liquidity yield premium on non-German bonds, depending on the size of the basis risk that investors are running by having an imperfect hedge. We have then constructed a variable defined as the one minus the ratio of the volume on futures on German government bonds to the volume on futures on French government bonds, and tested its significance in explaining the yield differential between French and German bonds. The coefficient on such variable turned out to be not significantly different from zero. Figure 11 shows that the correlation between yield differentials and differentials in the ratio of volume is very weak. In fact, yield differentials increased in the course of 2000 as the German futures market became more and more dominant, but they then decreased in the course of 2001 and 2002 when the German futures market became completely dominant. More importantly the coefficient measuring the exposure of the French-German yield differential to international factors is not affected by the inclusion in the model of our variable constructed using traded volumes in futures markets.

[7] Up to 1997, Liffe was the largest European futures exchange and the contracts on German and Italian 10-year government bonds were the most popular. Since mid-1998 however, trading activity has moved decidedly in favour of Eurex and Bund contracts. At the beginning of 1998, the combined volumes on Eurex and Liffe contracts on 10-year Bunds were much higher than the sum of all future contracts on other Eurozone government bonds. By the launch of the single European currency the Eurex contract on 10-year Bunds was already by far the dominant contract in Europe and its volume and open interest were constantly rising. While volumes and open interest of all other contracts were waning and in some cases eventually disappearing, the contract on Matif managed to post a surprising temporary comeback, gaining more than 35% of total market share by April 2000. This was the result of an initiative by the French banking federation to boost liquidity in the market. The leap in open interest in mid-2000 was also due to a change in the method of recording (from net to gross since May 23, 2000). Still, the revival of the French contract was remarkable and offers us a wonderful opportunity to estimate the impact on asset swap spreads.

Table 5. Liquidity of future contracts on 10-year Eurozone government bonds [a]

Volumes (€ 000)[b]	1998	1999	2000	2001	2002[c]
Eurex. Euro-Bund	176.0	509.5	581.1	681.9	762.9
Liffe. Bund	55.7	0	0	0	0
Matif. Euro-Notional	15.0	23.4	165.5	66.1	0
Liffe BTP	31.4	6.6	0	0	0
Mif. BTP	0.4	0.7	0	0	0
Meff. Bono	58.8	13.7	4.2	1.1	0.2
Germany	231.8	509.5	581.1	681.9	762.9
France	90.6	23.4	165.5	66.1	0
Italy	31.9	7.4	0	0	0
Spain	58.8	13.7	4.2	1.1	0.2

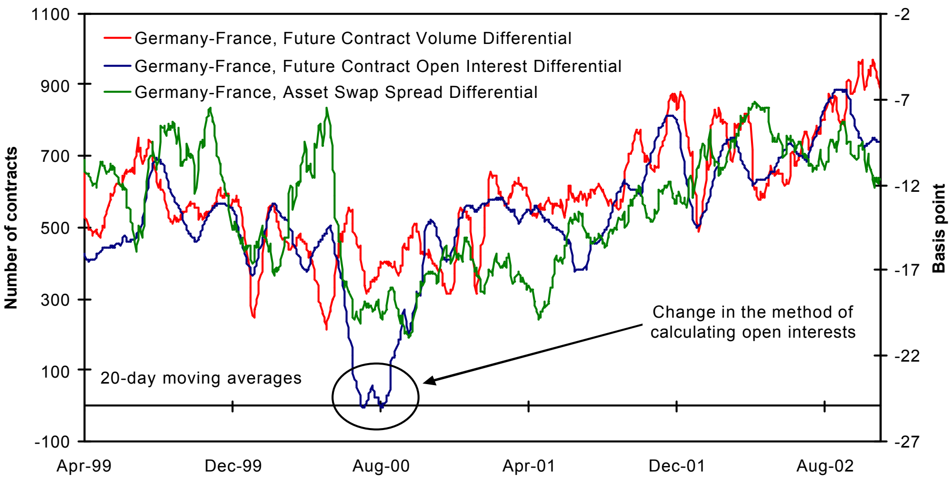
Open Interest (number of contracts)	1998	1999	2000	2001	2002
Eurex. Euro-Bund	339.4	570.4	669.3	676.8	729.1
Liffe. Bund	106.6	0	0	0	0
Matif. Euro-Notional	118.9	133.0	310.8	108.6	1.0
Liffe BTP	104.3	27.6	0.7	0	0
Mif. BTP	1.6	2.6	0.1	0	0
Meff. Bono	92.9	21.8	13.5	8.0	2.5
Germany	446.0	570.4	669.3	676.8	729.1
France	118.9	133.0	310.8	108.6	1.0
Italy	105.9	30.3	0.8	0	0
Spain	92.9	21.8	13.5	8.0	2.5

Notes:
[a] Other smaller contracts are not considered as volumes and open interests were negligible
[b] Non-euro denominated contracts are translated into euro at the fixed conversion rate
[c] Data up to October
Sources: Datastream/Thomson Financial and our calculations.

~~Arguably, the lack of a liquid future contract in all EMU countries but Germany should command a liquidity yield premium on non-German bonds, depending on the size of the basis risk that investors are running by having an imperfect hedge. We have then constructed a variable defined as the one minus the ratio of the volume on future on German government bonds to the volume on future on French government bonds, and tested its significance in explaining the yield differential between French and German bonds. The coefficient on such variable turned out to be not significantly different from zero. Figure 11 shows that the correlation between yield differentials and differentials in the ratio of volume is very weak. In fact, yield differentials increased in the course of 2000 as the German futures market become more and more dominant, but they then decreased in the course of 2001 and 2002 when the German futures market became completely dominant. More importantly the coefficient measuring the exposure of the French-German~~

~~yield differential to international factors is not affected by the inclusion in the model of our variable constructed using traded volumes in future markets.~~

Figure 11. Germany-France asset swap spread differentials and futures contracts



Sources: Datastream/Thomson Financial and our calculations.

~~7.~~6. CONCLUDING REMARKS

Our study suggests that yield differentials on Eurozone bonds are mostly due to credit risk and international factors as opposed to liquidity factors. This contrasts with the common belief of markets and policymakers that traditional liquidity indicators, such as bid-ask spreads, trading volumes, and outstanding amounts, as well as the presence of liquid futures contracts explain a substantial part of yield differentials since the start of Monetary Union.

In the case of Spain and Italy we find evidence that the effect of international factors is a function of the relevant~~ative~~ debt-to-GDP ratios with respect to Germany. Yield differentials for all the other countries are significantly affected by international risk factors, although linearly, and their impact is independent from the relevant~~ative~~ debt-to-GDP ratio.

Such evidence remains robust to the broadening of our analysis to include daily data on liquidity measures. Traditional liquidity indicators, such as bid-ask spreads and trading volumes, have little effect. Even when liquidity related variables are significant, as in the case of Austria, ~~France,~~ Finland, France, Ireland, ~~and~~ the Netherlands, Portugal and Spain, the main source of yield differentials appears to be the different sensitivity to common, credit risk-related~~,~~ international factors.

We cannot conclude that liquidity has not become irrelevant in the pricing of Eurozone bonds. ‘Structural’ liquidity factors could indeed explain the different sensitivities to international factors, although we have not been able to introduce any variable capturing this effect.

The results of our study have important policy implications. Yields on Eurozone government bonds have been increasingly correlated across issuers. This is a sign of enhanced integration that is explained by the common denomination in e~~E~~uro. However, additional policy steps to increase financial market integration by means of increased efficiency both in primary and secondary markets, although desirable, would not deliver a ‘seamless bond’ market in the Euro area.

The current setting of the Monetary Union leaves fiscal and budgetary policy mostly in the hands of national governments. This may result in substantial movements in the credit risk component of spreads. In fact, the risk of default, though small, remains the most important component explaining yield differentials among Eurozone government bonds. ~~As suggested by the recent experience of Portugal, 'excessive' budget deficits can produce substantial movements in the credit risk component of spreads.~~

Current yield differentials point to incomplete fiscal consolidation and to the need for further convergence of debt ratios. In this process, they can play an important role for policy as, although to a somewhat reduced extent compared to the pre-EMU period, they continue to work as a deterrent for irresponsible fiscal polic ies~~y~~.

Finally, there are international factors, largely beyond the control of Eurozone policymakers, which can sizeably affect spread movements. In this case, policymakers can only work at reducing domestic fundamental weaknesses, which make government bond yields vulnerable to international ~~trends~~ risk-related financial market developments.

~~8.~~5. REFERENCES

Arora V. and M. Cerisola (2001) "How Does U.S. Monetary Policy Influence Sovereign Spreads in Emerging Markets?", IMF-Staff-Papers 48(3): 474-98.

Barnes K. and W. Cline (1997) "Spreads and Risks in Emerging Markets Lending", Institute of International Finance, WP No.97-1.

Blanco R. (2001) "The Euro-Area Government Securities Market. Recent Developments and Implications for Market Functioning", Banco de Espana- Servicio de Estudios, documento de Trabajo 0120

Dungey M., V.L.Martin and A.P. Pagan(2000) "A Multivariate Latent Factor Decomposition of International Bond Yield Spreads" Journal of Applied Econometrics, 15, 697-715

Dunne P.G., M.J. Moore and R.Portes(2002) "Defining Benchmark Status: An Application Euro-Area Bonds" mimeo

Eichengreen B. and A. Mody, (2000) " What Explains Changing Spreads on Emerging Market Debt?" in Capital flows and the emerging economies: Theory, evidence, and controversies, S. Edwards ed., NBER Conference Report series. Chicago and London: University of Chicago Press, 2000; 107-34.

Favero C.A, Giavazzi F. and L. Spaventa (1997) "High Yields: The Spread on German Interest Rates", *The Economic Journal.*

Favero C.A., Missale A. and G. Piga (1999) "EMU and Public Debt Management: One Money One Debt?", *CEPR Policy Paper* No.3, December.

Fleming M.J. (2001) "Measuring Treasury Market Liquidity", paper available at www.newyorkfed.org/rmaghome/economist/fleming/fleming.html.

Fleming M.J. and E.M. Remolona (1999) "Price Formation and Liquidity in the U.S. Treasury Market: The Response to Public Information", *Journal of Finance*.

Gravelle T. (1999a) "Liquidity of the Government of Canada Securities Market: Stylized Facts and Some Market Microstructure Comparisons to the United States Treasury Market, *Bank of Canada Working Paper* No. 99-11.

Gravelle T. (1999b) "The Market Microstructure of Dealership Equity and Government Securities Markets: How They Differ" in *Market Liquidity: Research Findings and selected Policy Implications BIS-CGFS Study* No. 11, May.

Gravelle T. (1999c), "Markets for Government of Canada Securities in the 1990s: Liquidity and Cross-Country Comparisons," *Bank of Canada Review* (Autumn).

Kamin, S.B. and K. von Kleist (1999) " The Evolution and Determinants of Emerging Market Credit Spreads in the 1990s", Board of Governors of the Federal Reserve System, International Finance Discussion Paper: 653, November.

Kumar M.S. and A. Persaud (2001) "Pure Contagion and Investors' Shifting Risk Appetite: Analytical Issues and Empirical Evidence", *IMF Working Paper.*

Giovannini A. and G. Piga (1994), Understanding the high interest rate on Italian government securities, in Conti Hamaui and Scobie (eds.) "Bond markets, Treasury and Debt Management", Chapman and Hall, London

Goodhart C. and J.Lemmen(2001) "Credit risk and European Government Bond Markets: a Panel Data Econometric analysis" ,Eastern Economic Journal, Volume 25, Issue 1

Poterba J.M. and K.S. Rueben (2001) "Fiscal News, State Budget Rules, and Tax-Exempt Bond Yields" Journal of Urban Economics 50, 537-562