BANCA D'ITALIA

EUROSISTEMA

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September 2012

Number 133

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THE IMPACT OF THE SOVEREIGN DEBT CRISIS ON THE ACTIVITY OF ITALIAN BANKS

by Ugo Albertazzi*, Tiziano Ropele*, Gabriele Sene* and Federico M. Signoretti♠

Abstract

We assess the effects of the sovereign debt crisis on Italian banks' activity using aggregate data on funding and loan rates, lending quantities and income statements for the period 1991-2011. We augment standard reduced-form equations for the variables of interest with the spread on 10-year sovereign bonds as an additional explanatory variable. We find that, even when controlling for the standard economic variables that influence bank activity, a rise in the spread is followed by an increase in the cost of wholesale and of certain forms of retail funding for banks and in the cost of credit to firms and households; the impact tends to be larger during periods of financial turmoil. An increase in the spread also has a direct negative effect on lending growth, beyond that implied by the rise in lending rates. Finally, we document a negative impact of the spread on banks' profitability, stronger for larger intermediaries.

JEL Classification: E44, E51, G21.
Keywords: sovereign spread, bank interest rates, bank lending.

Contents

* Banca d'Italia, Economic Outlook and Monetary Policy Department.
♠ Banca d'Italia, Financial Stability Unit.

1. Introduction

After increasing gradually up to 200 b.p. between 2010 and the first half of 2011, the spread between the yield on the 10-year Italian government bond and the corresponding German one (henceforth called the BTP-Bund spread) rapidly increased throughout the summer of 2011, reaching a peak of 550 b.p. in November (Fig. 1). The widening of the sovereign spread reflected the sovereign debt crisis which first affected Greece in the first months of 2010, then involved Ireland and Portugal and finally reached Italy and Spain, assuming a systemic dimension.

As shown by the sharp increase recorded by CDS spreads (Fig. 2), the tensions in the sovereign debt market were swiftly transmitted to Italian banks, affecting both the cost and the availability of funding – especially on wholesale markets. The link between sovereign and bank risk reflected a number of different channels, such as the high exposure of banks to domestic sovereign debt,[1] the role of government securities as collateral in secured transactions and the connections between sovereign and banks' credit ratings.[2] The deteriorating economic outlook put additional strains on bank funding conditions.

The tensions on the funding side translated into a tightening of credit standards in the second half of 2011, as reported by the banks contributing to the *Euro Area Bank Lending Survey* (Fig. 3). Initially, the tightening was implemented mainly by increasing the margins applied to new loans, in particular to the riskier ones; in the most acute phase of the crisis, in the last quarter of 2011, the availability of credit to the private sector was also curtailed.

In this paper we seek to quantify the effect of the sovereign debt market tensions – proxied by the level of the 10-year BTP-Bund spread[3] – on the cost of funding for Italian intermediaries, the cost and availability of lending to firms and households, and the main items of banks' income and loss statements. In particular, for all the variables that we are interested in, we estimate reduced-form equations in which the sovereign spread is added, as an explanatory

[1] In June 2011, holdings of domestic government securities by Italian banks amounted to 6.3 per cent of total assets. Although this figure had declined during the years prior to the financial crisis, probably as a reflection of an increasing diversification allowed by the adoption of the single currency, it was still higher than what was observed in the other main euro area countries. It is worth mentioning however that Italian banks have a negligible exposure to sovereign borrowers of the other euro area countries under stress (Bank of Italy, 2011)

[2] In particular, banks' ratings tend to be downgraded shortly after sovereign ratings, because, among other reasons, the sovereign rating normally represents a ceiling for the ratings assigned to all other domestic borrowers (Bank of Italy, 2011). Once a bank is downgraded, "threshold effects" – such as the exclusion of a bank's liabilities from the basket of securities that certain categories of investor, such as pension funds and insurance companies, are allowed to purchase – can further worsen its funding conditions.

[3] The spread between 10-year BTP and Bund is the most common gauge of the risk premium demanded by investors for Italian government securities. It is worth noting that the dynamics of this indicator tends to overestimate the impact of sovereign strains on the cost of funds for the Italian government, as it also reflects flight-to-quality effects which tend to reduce the yield on German government securities. We present below a number of exercises, based on alternative measures of sovereign risk, to check the robustness of our findings.

variable, to the standard determinants identified in the literature. Furthermore, in order to check for potential non-linear effects of the BTP-Bund spread on bank interest rates – in relation to the fact that the spread was basically zero throughout the 2000s – we also estimate equations in which the spread is interacted with dummy variables identifying two periods in which the level of the spread was high: the pre-EMU period (from 1991Q1 to 1997Q4) and the current sovereign debt crisis (since 2010Q2), on which our analysis will focus.

We draw on two data sources. One dataset contains quarterly aggregate information for the period 1991Q1-2011Q4, and includes previous episodes of tension on Italian sovereign debt, like those observed in 1992-93 and in 1995. This dataset permits an examination of the banks' cost of funding, average interest rates for loans to firms and households and the main items of banks' income and loss statement (net interest margin, other income and provisions), available on a quarterly basis. A second dataset, containing monthly information on bank lending and interest rates for a shorter period (January 2003 – December 2011), is used to assess the effects of the sovereign debt crisis on banks' activity with a finer sectorial breakdown. In particular, this dataset allows us to study separately loans of an amount up to €1 million, whose cost provides a measure of the interest rate paid by small and medium enterprises, and loans of a larger amount. Moreover, it permits a distinction to be made between fixed- and variable-rate loans to households for house purchase.

Italy is an especially good case for studying the effects of the sovereign risk on the banking sector. First, in Italy the causal relationship between the difficulties of the sovereign market and those of the banking sector during the current crisis is clear: unlike other European countries (Ireland and, to a large extent, Spain), problems originated in the public sector and then spilled over to the banking system.[4] This suggests that the sovereign spread can indeed be considered as an exogenous variable in our regressions. Second, the transmission of the tensions in the sovereign debt market to the banking sector is likely to be sizeable in Italy, due to the high level of public debt and to the heavy exposure of Italian banks to domestic sovereign bonds. Third, Italy experienced periods of tensions on its sovereign debt market also during the 1990s, which helps to identify the effects of the spread in the estimation.

Our analysis provides a number of results. *First*, variations of the BTP-Bund spread affect banks' funding cost rapidly and significantly: an increase in the spread is associated, at the latest with a one-quarter lag, with a sizeable rise of the remuneration on longer-term deposits, such as households' deposits with agreed maturity, as well as repurchase agreements and bonds.

[4] Italian banks withstood the first phase of the financial crisis better than many foreign competitors mainly thanks to their greater reliance on a traditional business model and sound supervision.

Such a relationship is strengthened during crises as opposed to "normal" times, suggesting the presence of a non-linearity. We instead find that the spread does not affect the return on overnight deposits, consistently with the sluggish adjustment of these yields to market conditions. *Second*, the BTP-Bund spread is found to exert a significant effect on the interest rate charged on loans to firms and on mortgages to households; we estimate that this effect largely reflects the increase of the marginal cost of funding – as proxied by the interest rate on term deposits. Also for loan rates, we find evidence of a non-linear transmission, as the effect of the spread is exacerbated during crises as opposed to normal times. The transmission is quantitatively larger than that observed on passive interest rates and occurs with a one-quarter lag. In a counterfactual exercise, where the spread is assumed to have remained constant at the level recorded in 2010Q1 (and all the other explanatory variables are assumed to have followed their actual development), we estimate that sovereign tensions contributed to increase interest rates on loans to firms and households by, respectively, 170 and 120 basis points. *Third*, changes in the BTP-Bund spread exert a significant direct effect on the dynamics of lending to both firms and households for house purchases, in addition to the indirect effect occurring through higher interest rates and the consequent lower demand for credit; in particular, we estimate that a 1 percentage point increase in the spread is directly associated with a 0.7 percentage point reduction of the annual growth rate on loans to firms. *Finally*, we find that tensions in the sovereign debt market have a significant negative impact on the profitability of the five largest Italian banking groups, affecting all the main items of the income and loss statement. For the Italian banking system as a whole, however, we find a negative effect only for loan-loss provisions, while we find a mildly positive relation for the net interest income and no effect on the other revenues; this finding is likely to reflect the lower importance of wholesale funding on the smaller intermediaries and the weaker responsiveness of their non-interest income to market conditions.

The rest of the paper is organized as follows. Section 2 briefly describes the different channels through which the sovereign debt crisis can affect banks' activity. Section 3 presents the analysis for banks' interest rates. Section 4 looks at the relationship between sovereign risk and lending volumes. Section 5 investigates the effects on the main items of banks' profit and loss statements. Section 6 draws conclusions.

2. The channels of transmission of sovereign risk to the banking sector

The tensions on sovereign debt, beyond influencing the general economic conditions of a country (through, for example, a fall in demand induced by fiscal adjustments or loss of confidence of households and firms) may also have more specific direct effects on the banking sector.

Following Panetta *et al.* (2011), González-Páramo (2011) and Holton *et al*. (2012), we can identify three main channels through which sovereign tensions may be transmitted to bank funding and credit supply conditions. First, a loss in the value of government bonds held in the portfolios of banks, through its effects on banks' income and possibly on their capital, can have an impact on a bank's funding ability and thus ignite a deleveraging process with a consequent reduction in credit supply (*balance sheet channel*). Second, given that government bonds in banks' portfolios are typically used as collateral in interbank transactions as well as in refinancing operations with central banks, the reduction in their value reduces banks' ability to borrow, and therefore to sustain credit supply (*liquidity channel*). A similar mechanism may operate when a bank's rating is downgraded following a reduction in sovereign rating, which is typically a ceiling for domestic private sector borrowers. As a consequence of the downgrading, the bank's liquidity position may be damaged for various reasons. For example, its liabilities may be excluded from the basket of securities that certain categories of investor, such as pension funds and insurance companies, are allowed to purchase, or it could receive calls for enhancing collateralization on ABS and covered bonds, or even lose the status of eligible counterparty for operations related to ABS. Third, the yield on sovereign debt may represent a benchmark for determining the cost of credit to the economy due to arbitrage-type mechanisms, given that government bonds are one of the most important investment opportunities available on the market (*price channel*). Moreover, the interest rate on bank deposits and bonds may also depend on the degree of solvency of the State, since this is perceived as the implicit guarantor of bank liabilities, and in particular of those not covered by an explicit private guarantee scheme[5].

All three channels imply that an increase in the yield of sovereign bonds can be expected to be associated with a rise in the cost of funding for national lenders and possibly a reduction in its availability, with repercussions on the cost and quantity of lending to the economy and on banks' profitability. The impact of the various channels may differ across banks' funding instruments, intermediaries with different characteristics or segments of the credit market. For instance, the *price channel* could be more important for bank bonds (which, unlike bank

[5] All Italian banks participate in a deposit insurance scheme: the bigger intermediaries are compulsorily members of the *Fondo Interbancario di Tutela dei Depositi*; "mutual banks" (*Banche Di Credito Cooperativo*) are members of a separate fund.

deposits, are not insured) and, among deposits, for longer-term ones, given that overnight deposits are primarily held for transaction purposes and exhibit rather sluggish remunerations. Mortgages may be expected to be less severely affected by the liquidity channel compared with corporate loans, as the former can be more easily pooled and used to guarantee ABS, which in turn can be sold to the market or used as collateral in refinancing operations with central banks.

According to the banks' answers to specific *ad hoc* questions introduced in the December round of the *Euro Area Bank Lending Survey*, concerning the fourth quarter of 2011, financing conditions of Italian intermediaries were markedly affected by the turmoil in the sovereign debt market; tensions were transmitted through all the three channels, and especially through the balance sheet channel (Fig. 4). Concerning the effects on credit supply, the banks declared that the business loans segment was the one most severely hit.

3. Bank interest rates

We start our analysis by examining to what extent banks change their interest rates in response to changes in the BTP-Bund spread. We first consider the interest rates paid on liabilities, i.e. the cost of different components of banks' funding, and then the interest rates charged on loans. Figures 5 and 6 show, respectively for passive and active rates, the time series of selected interest rates in Italy since 1990, together with the BTP-Bund spread and the monetary policy rate (for most of the time both passive and active interest rates shadow the latter). The figures show that, since the spring of 2010, marked interest rate increases were associated with the widening of the BTP-Bund spread.[6] On the liability side, large increases were observed for the interest rates on deposits with agreed maturity, repos and debt security yields, while interest rate on overnight deposits, which are typically less sensitive to market conditions, barely reacted to changes in the sovereign spread. As for lending rates, the cost of loans to firms and to households for house purchases increased in the second half of 2010 and, more markedly, in 2011; the cost of consumer credit increased very moderately and only in 2011.

In light of this preliminary descriptive inspection, we proceed with a formal econometric analysis to quantitatively assess the effect of the BTP-Bund spread.

3.1 The empirical methodology: an ARDL model

To assess the impact of the BTP-Bund spread on banking interest rates we use an autoregressive distributed lags (ARDL) model. Such an approach has been extensively used to

[6] Over the same period, money market interest rates did not show movements of comparable size: short-term rates increased slightly in 2010, following the April and July official rate increases by the ECB, and then declined in the last months of 2011, when the ECB cut official rates.

study the transmission of changes in monetary policy rate to the banking rates (Cottarelli and Kourelis, 1994; Favero et al., 1997; Marotta, 2010).[7] For the scope of our analysis we specify the following ARDL model, which is estimated via OLS[8]:

$$i_t^B = c + \sum_{j=1}^{p} \alpha_i \, i_{t-j}^B + \sum_{j=1}^{p} \alpha_i \, i_{t-j}^M + \sum_{k=0}^{r} \beta_k \, X_{t-k} + \gamma \, spread \; + \\ + \theta_1 \, D_{SovCrisis} \times spread \; + \theta_2 \, D_{SovCrisis} + \phi_1 \, D_{preEMU} \times spread_{t-1} + \phi_2 \, D_{preEMU} + \varepsilon_t \qquad (1)$$

where the dependent variable i^B is the bank interest rate (passive or active) under examination; i^M is the relevant (policy or market) interest rate (possibly at various maturities) for the bank interest rate considered; X is a vector of macroeconomic variables (such as GDP growth, unemployment rate, disposable income) used to control for economic activity and to proxy borrowers' creditworthiness. In addition to these explanatory variables, we include the variable *spread*, calculated as the difference between the 10-year yield on Italian BTP and that on German Bund minus the difference between the 10-year swap rate in Italy and Germany (Fig. 7)[9]. In the regressions, the variable *spread* is also interacted with two dummy variables, in order to check for potential additional (or differentiated) effects of this variable when it reaches high levels, as opposed to "normal" times (when it fluctuates at low levels): the dummy D_{preEMU} identifies the pre-EMU period, and takes value 1 from the beginning of the sample (1991Q1) until 1997Q4 and zero elsewhere;[10] $D_{SovCrisis}$ identifies the sovereign debt crisis, and takes value 1 from 2010Q2 until the end of the sample (2011Q4) and zero elsewhere.

The choice of both the lag structure and the appropriate market/monetary policy rate to be included in the various regressions is based on a simple correlation analysis (De Bondt, 2005) and also takes into account the goodness of fit, the statistical significance of the coefficients and the presence of autocorrelation in the residuals.

3.2 Cost of funding

One distinguishing feature of Italian intermediaries is their reliance on stable sources of funding, such as retail deposits and bonds placed with retail customers, whose cost is generally

[7] Also depending on the nature of the dataset available, other empirical approaches are possible. For example, Sørensen and Werner (2006) investigate the heterogeneity in the pass-through process of money market rates to bank interest rates across euro area countries with panel-econometric methods.

[8] Standard errors are computed with the Newey-West correction for heteroskedasticity and autocorrelation.

[9] As in Favero, Giavazzi and Spaventa (1997), we adopt this adjustment of the BTP-Bund spread in order to make sure that in the pre-EMU period our measure of sovereign risk is not contaminated by other factors that may affect the rates on long-term bonds (such as expectations of the future conduct of monetary policy, inflation differentials, etc.). A thorough robustness check, considering alternative measures of sovereign risk, confirms our main results (see Table A2 in the Appendix).

[10] During that period (1991Q1-1997Q4) the (non-adjusted) spread (as quarterly averages) was always above the maximum level 40 b.p.) reached between 1999Q1 and 2008Q2 (before the Lehman collapse); in 1998 the spread was always lower than 40 b.p..

insensitive to market volatility. In particular, overnight deposits – whose rates are typically very sluggish – amounted to almost two-thirds of the sum between total deposits and bonds at the end of 2011 (Bank of Italy, 2012). The composition of funding for Italian banks is likely to have helped to moderate the increase in the average interest rate on deposits recorded since the beginning of 2010. In fact, the increase mainly reflected the marked rise of the rates for deposits with agreed maturity, which displayed a strong correlation with the sovereign spread over the last two years (see Fig. 5).

Table 1 reports the results for banks' cost of funding. In particular, we consider separately yields on: households' overnight deposits (columns *i* and *ii*), households' deposits with agreed maturity[11] (column *iii* and *iv*), repurchase agreements (column *v* and *vi*) and bank bonds (column *vii* and *viii*).

For all of the instruments considered, we find that the coefficients for the standard explanatory variables are significant and show the expected sign. In particular, the remuneration is closely related to the money market interest rates (the rate on three-month interbank transactions for all the instruments considered and also the three-year swap rate for bank bonds). Moreover, the yields on all these instruments tend to show a significant degree of persistence, as indicated by the large coefficient on the lags of the dependent variable.

As for the BTP-Bund spread, we find that its impact is different for the various instruments considered. It does not appear to affect the return on overnight deposits: its coefficient is very small (column *i*) and does not become significant when we add the time dummies. Three factors may help to explain this finding: demand deposits are covered by the deposit insurance, which reduces the influence that changes in the level of the risk perceived on banks' liabilities may have on their remuneration; unlike other types of deposits, the financial duration of the demand deposits is nil, which further attenuates the risk-premium component of their returns; overnight deposits are primarily held for transaction purposes and their remuneration is therefore less reactive to market returns.[12]

The BTP-Bund spread plays however a relevant role when we consider the yields on the other funding instruments, for which we find a significant and sizeable effect, both when the spread alone is considered directly and when it is interacted with $D_{SovCrisis}$. The size of the estimated coefficients indicate that, in normal times and *ceteris paribus*, a temporary (i.e., lasting for one quarter) 100 b.p. increase in the spread is associated, within the same quarter, with a 34

[11] Time series for the returns on overnight deposits and deposits with agreed maturity held by other sectors are not available with a long time-span.

[12] Very similar findings are obtained for the overnight deposits held by non-financial corporations, which, at the end of 2011, represented approximately one-fifth of the total amount of the overnight deposits of Italian banks.

and 21 b.p. increase, respectively, in the interest rate paid on households' deposits with agreed maturity and repurchase agreements; such an effect has been bigger during the sovereign debt crisis, reaching around 40 b.p. for both instruments.[13] The effect is even larger for the remuneration banks pay on newly issued bonds and the funding component is more sensitive to market conditions: 70 b.p. in normal times and over 100 b.p. in the crisis. This latter finding provides empirical support for the relevance of the price channel reviewed in section 2.[14]

Table A1 in the Appendix presents analogous estimations conducted on monthly data, running from January 2003 to December 2011: the results are qualitatively similar, though the coefficients are somewhat smaller (which could reflect, at least in part, the fact that the shorter monthly sample does not include the sovereign tensions experienced in the early 1990s).

3.3 Interest rates on loans

Table 2 reports the estimation results for the interest rates applied on short-term loans to firms (columns *i* and *ii*), new loans to households for house purchases (columns *iii* and *iv*) and consumer credit and other households' loans (columns *v* and *vi*). For all these rates we find a positive and significant effect for the monetary policy rate and for the autoregressive component; we also include GDP growth, the unemployment rate and households' disposable income in the regressions as controls for the macroeconomic outlook and changes of borrowers' creditworthiness.[15]

Turning to the effect of the sovereign spread, which enters these regressions with one-quarter lag, and considering the specifications without the time dummies (columns *i*, *iii* and *v*), we find that the coefficients are positive, significant and equal to around 20 b.p. Once we consider the regressions with the time dummies (columns *ii*, *iv* and *vi*), the estimates for the interacted terms are larger (and more significant) than the ones found with the previous regressions, in particular for firms, while the coefficients for the direct terms do not become statistically significant. This result suggests the presence of "non-linear" effects in the

[13] The sum between the coefficients on BTP-Bund spread and that on its interaction with *Dummy sov_crisis*, equals 38 and 35 b.p., respectively, for households' deposits with agreed maturity and for repos.

[14] These bonds include both the securities placed with retail customers as well as those sold on the international financial markets.

[15] In the case of interest rates on loans, the official monetary policy rate (the official discount rate of the Bank of Italy until 1998Q4 and the minimum interest rate on ECB main refinancing operations since 1999Q1) is the short-term rate that yields the best fit. Results are analogous if we use alternative measures, such as the three-month Euribor or three-month e-MID.

pass-through of the spread, as the effect becomes quantitatively more sizeable during periods when the spread is high.[16]

Based on the size of the estimated coefficients, we can calculate that *during the sovereign debt crisis* the response of loan rates to a temporary 100 b.p. increase in the BTP-Bund spread was around 50 b.p. for firms and 30 b.p. for households' mortgages. In the case of a *permanent* increase of the sovereign spread, the pass-through after one year would be complete for loans to firms, while it would be 83 b.p. for mortgages, reflecting the higher persistence shown by the cost of these loans.[17]

As already pointed out, the spread between 10-year BTP and Bund could overestimate the impact of sovereign strains, as it may reflect flight-to-quality effects which tend to reduce the yield on German government securities. In order to check the robustness of our findings we run two exercises. First, we re-estimate the regressions for active interest rates considering different measures of the sovereign risk, namely: the adjusted BTP-Bund spread at shorter maturities and the corresponding unadjusted spread; the three-, five- and ten-year yield on BTP and on interest rate swaps (IRS); the spread between the BTP and the French government bonds (OAT) yield at different maturities.[18] Table A2 in the Appendix shows that our estimates are very robust.[19] In particular, the results are quantitatively similar, both when considering the specification without interaction terms and the interaction terms for the sovereign debt crisis period.

Second, we modify the benchmark model for the loan rates by including the level of the yield on the 10-year Bund and its interaction with the dummies for the two crisis periods (D_{preEMU} and $D_{SovCrisis}$) as additional explanatory variables. For loans to firms, the results (not reported) indicate that during the sovereign crisis the yield on 10-year Bunds is significant (although marginally) and with a positive coefficient. For loans to households it is not significant. This finding suggests that the transmission to loan rates of an increase in the sovereign spread may be somewhat smaller than the one estimated in the baseline specification if such increase reflects a reduction in the Bund yield rather than an increase in the BTP yield.

As a further robustness check we carry out our estimation exercises using the monthly dataset, which also allows us to analyse the pass-through of the sovereign spread at a finer

[16] It is interesting to note that while the size of the coefficient for the interacted term relative to the pre-EMU period is similar to the one observed in the sovereign debt crisis for mortgages, it is somewhat smaller for loans to firms; this finding probably reflects different structural conditions in the banking sector and more intense competition.

[17] The estimated autoregressive coefficient is 0.52 for loans to firms and 0.81 for household mortgages (see columns *ii* and *iv* in Table 2).

[18] The spread vis-à-vis French government bonds (OAT) provides a measure of sovereign risk which is likely to be less affected by the flight-to-quality phenomenon, whereby the demand for German Bunds increases due to the safe-haven status of these securities.

[19] The table reports only the estimated coefficients for the sovereign risk measure and its interactions with the pre-EMU and sovereign debt crisis dummy variables. The estimated coefficients on other explanatory variables are basically unchanged.

sectorial breakdown (Tables A3 and A4 in the Appendix). These results confirm the significant effect of the sovereign spread on lending rates, which has become stronger during the sovereign debt crisis. The pass-through is roughly similar for rates on small loans to firms (up to €1 million) and for larger ones (over €1 million). As for mortgages, the pass-through is significant and approximately of the same magnitude for variable-rate and for fixed-rate loans (though for the latter we find a significant coefficient for the direct effect but not for the interacted term).

The cost of lending during the sovereign debt crisis: a counterfactual exercise

In light of the results described above, we conducted a simple counterfactual exercise in order to see what would have happened to bank interest rates if the BTP-Bund spread had remained unchanged at the level observed in 2010Q1, i.e. at 70 b.p.. For this purpose, we rely on the estimated coefficients obtained using all the sample periods and we employ the observed time series for the main macroeconomic variables, namely unemployment rate, GDP growth and market rates.[20] The results indicate that, under the hypothetical scenario, the cost of lending to firms in 2011Q4 would have been about 170 b.p. lower than its actual value (Fig. 8), while the cost of new mortgages would have been about 120 b.p. lower. In both cases, half of the final effect is cumulated in the period 2010Q2 to 2011Q3, while the other half is attributable to just the fourth quarter of 2011, reflecting the large increase recorded by the BTP-Bund spread in the previous quarter (about 160 b.p., the largest quarterly increase in the sample period).

As already pointed out, part of the increase in the BTP-Bund spread is connected with flight-to-quality phenomena. Thus, we have performed an additional counterfactual exercise including in the specification the yield on the 10-year Bund and its interaction with the time dummy variables (see the robustness check above). In this case the counterfactual experiment is carried out holding unchanged the BTP-Bund spread as well as the yield on the 10-year German bond at their respective levels observed at the end of 2010Q1. The result shows that the cost of lending to firms in 2011Q4 would have been about 150 b.p. lower than its actual value. The somewhat smaller estimated impact of the sovereign tensions – with respect to the counterfactual based on the benchmark specification – reflects the reduction by around 110 b.p. of the Bund yield (which enters with a positive, though marginally significant, coefficient in the equation) occurred between 2010Q2 and the end of 2011.

[20] By using the observed time-series for the main macroeconomic variables, we do not take into account the fact that also these variables would probably have had a different path in the counterfactual scenario, affecting the measure of the counterfactual loan rate. Nonetheless, the size of the estimated coefficients indicate that such indirect effects are likely to be of a second-order magnitude. For instance, in the equation for short-term loans to firms, a percentage point reduction of the unemployment rate is associated with an implied reduction of the interest rate of about 5 b.p., everything else being equal.

An exercise with banks' costs of funding

According to the results of sections 3.2 and 3.3, the estimated pass-through of the BTP-Bund spread on the loan rates is stronger than that on banks' funding costs, if we average out the estimated effect on the various funding components; the stronger impact on loan rates mainly reflects the fact that the greatest contribution to the average cost of funding comes from overnight deposits, whose yield is not significantly affected by the BTP-Bund spread. This finding seems to suggest that banks price their new loans by taking into account their *marginal* cost of funding, which is much more reactive to changes in funding conditions, rather than their *average* cost of funding.

A simple way to check whether this notion is correct is adding a proxy for the marginal cost of funding to the regressions for rates on loans to firms and for rates for household mortgages. If our explanation is correct, we should find that the cost of funding crowds out the effect of the BTP-Bund spread. The marginal cost of funding is proxied by the yield on the component of the funding which are subject to a more frequent repricing, such as term deposits, and for which we have indeed found a stronger impact reactivity to the sovereign spread, compared to other forms, such as overnight deposits.

Indeed, when we add the marginal cost of funding to the firm rate equation, the BTP-Bund spread turns out not to be significant in the regression without the interaction terms (Table A5 in the Appendix, column *ii*) and the overall impact diminishes in the regression with the interaction terms (column *iii*).[21] In those regressions, the coefficient for the marginal cost of funding is positive and highly significant. For loans to households for house purchase the impact of the cost of funding is not statistically significant, but its inclusion in the regression eliminates the significance of the coefficient of both the BTP-Bund spread and the interaction between this term and the sovereign debt crisis dummy (columns *vi* and *viii*).

The above results confirm that the impact of the sovereign spread on loan rates stems to a large extent from the increase of the marginal cost of funding. As already mentioned, the remaining impact of the spread on loan rates might result from the increase in firms' riskiness associated with the deterioration of the economic outlook and with the reduction in banks' willingness to lend, which is consistent with survey evidence relating to the most acute phase of

[21] The sum between the coefficients on the BTP-Bund spread and that on its interaction with *Dummy sov_crisis*, equals 51 b.p. in the baseline regression (column *iii*), compared with 18 b.p. in the regression with the cost of funding (column *iv*).

the crisis, beyond what is captured by the macroeconomic indicators included in the regressions.[22]

4. Lending volumes

This section analyses the impact of sovereign risk on the amount of lending. An increase in the sovereign spread may reduce credit volumes via the *indirect* effect connected with the increase in the loan rates which, also depending on the coefficients of elasticity of demand and supply in the credit market, may in turn reduce the amount of credit in the economy in equilibrium. Moreover, spreads could also have a *direct* effect on loan quantities, to the extent that tensions in funding markets prompt banks to conduct an outright rationing of lending supply. For Italian banks, the *Bank Lending Survey* suggests that direct effects on lending volumes and indirect ones via cost of credit coexisted in the final part of 2011, reflecting the significant funding difficulties of intermediaries on wholesale financial markets. Understanding whether sovereign tensions directly reduced lending volumes at that time is important also for assessing the usefulness of the three-year refinancing operations launched by the Eurosystem in December 2011 and February 2012: by alleviating strains in banks' funding, these operations may have directly supported financing of the real economy beyond the indirect effect induced by the provision of cheap and very long-term funding.

In light of these considerations we explore the implications of the BTP-Bund spread on lending activity with the aim of distinguishing between the direct and the indirect effects. To this end, we specify two simple regressions, one for the 12-month growth rate of loans to firms and the other one for the 12-month growth rate of new loans to households for house purchases. The general specification is given by:

$$y_t^j = c + \alpha\, y_{t-1}^j + \beta\left(i_{t-1}^B - i_{t-1}^M\right) + \eta\, i_{t-1}^M + \sum_{k=0}^{q} \delta\, X_{t-k}^B + \gamma\, spread_{t-1} + \varepsilon_t \qquad (2)$$

In (2) the dependent variable y_t^j is the growth rate of lending to sector *j* in the corresponding quarter. The explanatory variables are the autoregressive term (y_{t-1}^j), the difference between the

[22] Moreover, to the extent that banks have suffered from rationing-type phenomena on their funding sources – such as those that arguably happened on selected wholesale funding markets in the most acute phase of the sovereign crisis – our measure of the marginal cost might underestimate their actual *shadow* cost of funding. In turn, also our estimate of the intensity of the transmission from funding costs to loan rate might be stronger than the one we estimate.

cost of credit (i^B) and the short-term market interest rate (i^M)[23], the BTP-Bund spread, and a number of macroeconomic controls (X_{t-k}), which include GDP growth, unemployment rate, firms' financial needs, household consumption expenditures, house price growth (for the exact specification of the equations for firm and household loans, see Table 3).

Table 3 shows that all macroeconomic determinants exhibit the expected sign and are statistically significant. In particular, the growth of lending to firms is positively associated with firms' financing needs (calculated as the ratio between the corporate sector's investments and gross operating profit), and nominal GDP growth, while it is negatively associated with the three-month interbank interest rate and the spread between the cost of lending and the three-month interbank interest rate. The growth of new loans for house purchases is positively related to house price growth, and negatively to the spread applied on new mortgages and to the level of short-term interest rates; the dynamics of these loans is also significantly related to business cycle conditions.[24] Most importantly for the purpose of our paper, we find a significant and negative effect stemming from the BTP-Bund spread on the growth of loans to both firms and households.[25] The impact of such an effect can be quantified in a reduction of 0.7 percentage points of the annual growth rate on loans for every 100 b.p. increase in the sovereign spread.[26]

Loan developments during the sovereign debt crisis: a counterfactual exercise

Similarly to what we presented in Section 3, a simple counterfactual exercise, in which the BTP-Bund spread is assumed to remain at the level observed in 2010Q1 (70 b.p., and everything else being equal), indicates that the BTP-Bund spread affected the amount of lending significantly only in the second half of 2011. In particular for 2011Q4 we can quantify this impact in a reduction of about 2 percentage points of the (annual) growth of loans to both firms and households, considering the direct effect as well as the effect through the cost of lending

[23] In particular, we use the three-month interbank interest rate on transactions conducted on the e-MID market; e-MID is a multilateral platform for interbank deposits in Europe. Intermediaries operating with e-MID are from about 30 countries, though a significant number are from Italy. The average interest rate on e-MID is therefore representative of the cost of interbank transactions specific to Italy.

[24] The specification adopted includes two controls for business cycle conditions. First, as expected, the growth of mortgages is positively related to that of GDP and consumption expenditure. Second, it is also positively influenced by the unemployment rate, possibly capturing some safe-haven effects related to house purchases.

[25] As for loan rates, we tried to include the interaction between the spread and the time dummies as explanatory variables also in these regressions. The results indicate that there are no significant non-linear *direct* effects of the spread on lending growth.

[26] It is important to remember that effect of the *spread* here only captures the *direct* effects on loan quantities, while the indirect effects connected with the increase in lending rates is captured, in the regression, through the coefficient on the loan interest rate.

(Fig. 9).[27] As shown by the decomposition in the figure, the largest part of this reduction can be attributed to the direct effect.

5. Income and loss statement

In the previous sections we have documented the impact of sovereign risk on banks' interest rates and lending volumes. In this section, we study the effect of the sovereign spread on the profitability of banks, analyzing separately the various components of banks' income statements: interest income, trading income and other revenues, loan-loss provisions.[28] The following comments apply as regards the expected effects.

The impact of the BTP-Bund spread on banks' net interest income is *a priori* ambiguous, also in light of the results that we found in sections 3 and 4. On the one hand, a rise in the BTP-Bund spread tends to reduce lending volume (through both direct and indirect effects) and to increase bank funding rates; both effects tend to compress the net interest margin. On the other hand, we have documented that banks increase loan rates in response to a rise in the spread and the increase is typically larger than the one in funding rates (in particular given the high incidence of demand deposits and, more generally, of retail funding for Italian banks); this mechanism may thus contribute to increasing the net interest income. The assessment of the overall effect of sovereign risk on the interest margin is therefore an empirical matter.

As regards non-interest income and other revenues, a depreciation of government bonds is likely to induce losses in proprietary trading; tensions could also possibly affect income from fees and commissions, for example, through a decline in trading volumes. In this respect, it is however important to bear in mind that only a small part of the government securities held by Italian banks are in the trading portfolio, for which changes in value directly affect the income statement;[29] most of the sovereign debt is instead included in the available-for-sale portfolio, whose changes in value do not have direct repercussions on the income statement.

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[27] The counterfactual series are obtained by adding back to the actual values of lending growth the contribution of the difference between the actual and the counterfactual BTP-Bund spread. The *direct* effect is calculated using the coefficient for the spread in the loan equation; the *indirect* or *price* effect is the contribution occurring via the effect of the spread on the loan rate and is thus calculated using the product between the coefficient of the spread in the equation for the loan rate and the coefficient of the loan rate in the equation for lending. This methodology does not take into account the autoregressive structure of the loan rate and credit growth; if this were included, the difference between actual lending growth and growth in the counterfactual exercise would be larger.

[28] We do not consider banks' operating costs as they mainly reflect structural factors and thus are likely to be unresponsive, at least in the short and medium term, to sovereign debt tensions.

[29] For the five largest banking groups, the share of domestic government securities held in the trading book at the end of 2011 was around one-quarter (Bank of Italy, 2012).

Finally, sovereign risk may also have a negative impact on banks' loan-loss provisions *beyond* the indirect effect connected with the deterioration of business cycle conditions and the ensuing worsening of credit quality.[30] For example, the increase in sovereign risk could worsen the financing position of firms or the scenario of future fiscal consolidation could depress the expected income of both households' and firms, weakening their debt repayment capacity.

For each of the above-mentioned components of banks' income statements we estimate the following OLS regression, on a quarterly dataset that runs from 1991Q3 to 2011Q4:

$$\log(y_t) = c + \sum_{i=1}^{P} \alpha_i \log(y_{t-1}) + \sum_{k=0}^{q} \beta_k X_{t-k} + \gamma\, spread_{t-1} + \varepsilon_t \qquad (3)$$

The baseline regression (3) generalizes the specification used in existing studies on the determinants of banks' profitability (see, for example, Demirgüç-Kunt and Huizinga, 1999; Casolaro and Gambacorta, 2005; Albertazzi and Gambacorta, 2009) in order to assess the role of sovereign risk for bank profitability. The set of explanatory variables (X_t) includes the stock market index and its volatility in addition to some of those used in the analysis of interest rates and credit, such as nominal GDP, unemployment rate, short- and long-term interest rates. As in the previous sections, the impact of the sovereign spread is evaluated by adding the 10-year BTP-Bund spread as an explanatory variable. All regressions include a set of dummy variables controlling for seasonal effects and outliers.

Table 4 shows the results. In column (*i*) we see that net interest income is positively affected by the nominal GDP, reflecting the increase in lending demand by the private sector in periods of higher economic activity. The interest margin also displays a positive relationship with the short-term interest rate, consistent with the faster reaction of loan rates, when compared with deposit rates, to changes in market rates. Also the long-term interest rates have a positive coefficient, probably reflecting the beneficial effect on income of an increase in the slope of the yield curve, connected with banks' maturity transformation activity.

The effect of the BTP-Bund spread is positive and highly significant, suggesting that the stronger reaction of the loan rates to changes in the spread more than offsets its impact on funding cost and lending volumes; this is consistent with the increase in the interest margin observed in 2011, concentrated in the second half of the year, in parallel to the increase in the sovereign spread. A breakdown of the data by bank size, however, reveals that the whole

[30] See Bofondi and Ropele (2011) for a comprehensive study of the macroeconomic determinants of banks' loan quality in Italy in the past 20 years.

increase was driven by the behaviour of smaller banks, for which the interest margin increased by 19 per cent, while banks belonging to the five biggest groups recorded a contraction of 6 per cent. We thus rerun our regression only for the first five groups, finding that the spread has a *negative* impact on interest margin (column *ii*), while all the other coefficients remain virtually unchanged. These findings can be explained by a higher impact of the sovereign debt tensions on the largest banks' funding costs, due to their greater reliance on wholesale funding sources, which were the instruments most affected by the crisis. The result for the five largest groups is also consistent with hard data on lending, which show that in 2011 loans decelerated more for these banks than for the rest of the system (Bank of Italy, 2012).

Columns (*iii*) and (*iv*) report the results for the non-interest income equation, for all banks and for the five largest groups only, respectively. In both samples, the coefficient of GDP is positive (though not statistically significant), reflecting the correlation between economic activity and the demand for banking services. Moreover, the effect of both the short- and long-term interest rates is negative, while the coefficient for the stock market index is positive (and highly significant). These results may reflect a negative correlation between trading income and asset prices; another possible interpretation is that, when interest rates are low, savers have more need of professional services provided by banks in order to manage their own portfolios, which increases income from fees and commissions.[31] As regards the effect of the BTP-Bund spread, we find a significant (negative) coefficient only when estimating the equation for the five largest groups, whose non-interest income is likely to be more responsive to financial market conditions.

Finally, the estimates for loan-loss provisions are shown in columns (*v*) and (*vi*); in this case, the results for the whole sample and for the five largest groups are very similar. As expected, loan-loss provisions are negatively related to GDP growth, while stock market volatility, which can be considered as a proxy of risk, has a positive effect (thus a negative effect on profitability). The BTP-Bund spread is also positively related to loan-loss provisions, suggesting the presence of a direct transmission between sovereign risk and private non-financial borrowers' risk.

[31] For a discussion, see Albertazzi and Gambacorta (2009).

6. Conclusions

We have presented a comprehensive analysis of the effects of sovereign debt tensions on banking activity in Italy, focusing in particular on the crisis of 2010-11. The empirical analysis is based on aggregate data for the cost of funding of Italian intermediaries, the cost of credit they extend, the dynamics of lending as well as the main items of their profit and loss statements.

Our findings indicate that sovereign debt tensions, as measured by the evolution of the BTP-Bund spread, exert significant effects on most of the variables considered. Among funding rates, the strongest impact is on time deposits, repurchase agreements and newly issued bonds, while we find no effect of the spread on the yield of overnight deposits, which account for the bulk of banks' deposits in Italy. The effect on rates on lending to both firms and households are statistically and economically significant and reflect to a large extent the increase in bank marginal cost of funding. The sovereign spread also affects lending volumes directly, beyond the indirect effect exerted through its impact on the cost of credit. Finally, we find that the spread has a negative effect on the profitability of the largest banking groups, unfavorably affecting all the main items of their income statements; when we consider the whole banking system, we find a negative impact only for loan-loss provisions.

There is evidence of non-linearity in the effects of the BTP-Bund spread on active and passive interest rates: the estimated pass-through increases during periods characterized by a high level of the spread, such as the pre-EMU period or the current sovereign debt crisis, roughly doubling for interest rates on loans. In particular, during the sovereign debt crisis, a temporary 100 b.p. increase in the sovereign spread in a given quarter is associated with an increase (at the latest in the following quarter) of around 40 b.p. for the yield of retail time deposits and repurchase agreements, and of around 100 b.p. for the bond yields; no pass-through is observed on the return on retail overnight deposits, consistently with the sluggish adjustment of these yields to market conditions. The pass-through to new loan interest rates is, respectively, around 50 and 30 b.p. for loans to firms and to households for house purchases, with a one-quarter lag. If we consider a permanent 100 b.p. increase in the spread, we estimate that the rise in the loan rate after one year would be of the same magnitude for new loans to firms and of 80 b.p. for household mortgages.

A counterfactual analysis suggests that, at the end of 2011, loan rates would have been at least 170 and 120 b.p. lower, respectively for firm loans and household mortgages, and lending growth (for both credit market segments) about 2 percentage points higher than what was actually observed, had the spread remained unchanged at the level of 2010Q1.

Although our results point to a strong transmission of the sovereign spread to the cost of credit, one should be cautious in drawing implications for financial stability resulting from a rise in the Italian sovereign spread. In this regard, the key variable is the private sector debt-service burden, i.e. the cost of repaying the debt – principal and interest – for firms and households. At the current juncture, several factors tend to dampen the effect of an increase in the cost of lending on this variable. First, by construction, our estimates of the pass-through of the BTP-Bund spread are conditional on the risk-free interest rates used in our specifications (alternatively, the Eonia, the 3-month Euribor or the monetary policy rate); these rates decreased during the crisis, reflecting flight-to-quality phenomena or monetary policy decisions, attenuating the overall impact of the tensions on loan rates. In particular, the 3-month Euribor, to which most Italian household mortgages are indexed, stood, in 2012, at historically low levels; this significantly contributes to reduce payments on existing mortgages for Italian households. A related consideration is that the estimated BTP-Bund spread coefficient itself may overestimate the impact of sovereign strains, as it neglects flight-to-quality effects which tend to reduce the yield on German government securities. Second, the level of indebtedness of Italian households and firms is low in the international comparison (Bank of Italy, 2012), which helps attenuating the negative impact of any interest rate rise on these sectors on aggregate. Third, our analysis refers to *new* businesses or short-term loans, while the overall effect of the sovereign spread on the debt-service burden largely depends on the interest rates on *outstanding* loans; for fixed rate loans that were priced before the beginning of the sovereign tensions there is, by definition, no transmission. The estimated increase in the cost of new credit would fully translate to an increase in the debt-service burden of firms and households only in the case of a permanent increase in the sovereign spread.

We can think of at least two immediate follow-ups to the analysis developed in this paper. First, a methodological limitation of our approach is to only concentrate on the direct effects of sovereign market stress on banks' activities, while ignoring its potential general equilibrium effects; in particular, sovereign tensions are likely to bring about a weakening in macroeconomic conditions which, in turn, affects bank balance sheet conditions and income. It would thus be interesting trying to endogenize these feedback effects by resorting to alternative econometric techniques, such as VAR. Second, another direction for possible future research would aim at pointing out potential heterogeneity across banks in the transmission of sovereign risk; this would require an analysis based on bank-level data, which could also be useful in order to disentangle the relative importance of the different transmission channels.

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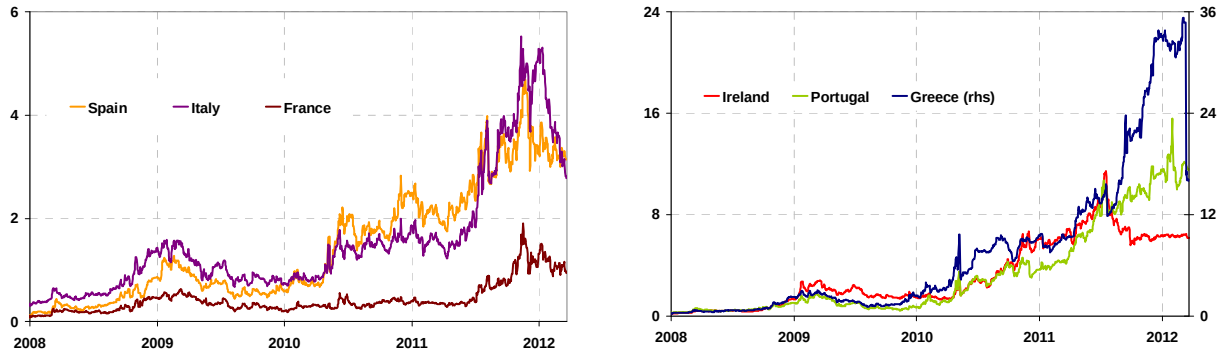
FIGURES AND TABLES

Figure 1

Sovereign spreads for selected euro area countries (1)

(*percentage points*)



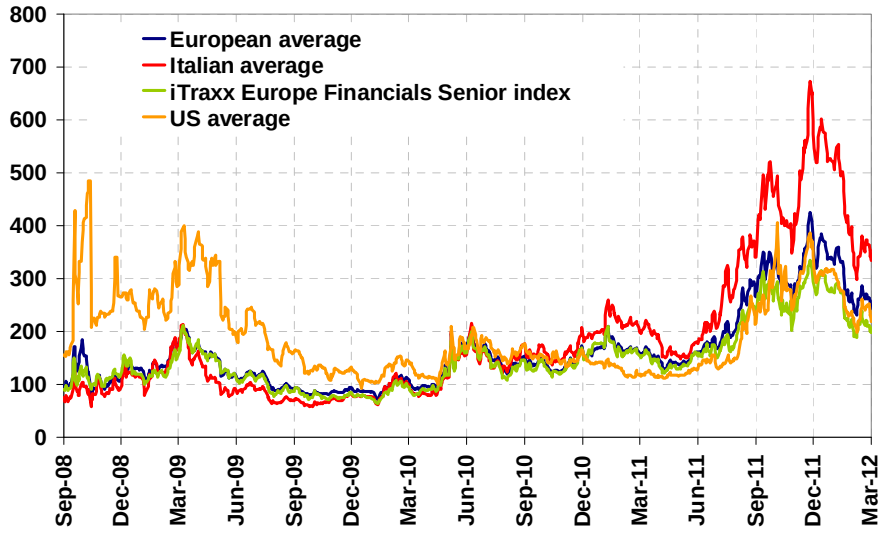
Source: Bloomberg.

(1) Spread on 10-year government bonds with respect to the corresponding German Bund.

Figure 2

Banks' CDS premia

(*basis points*)

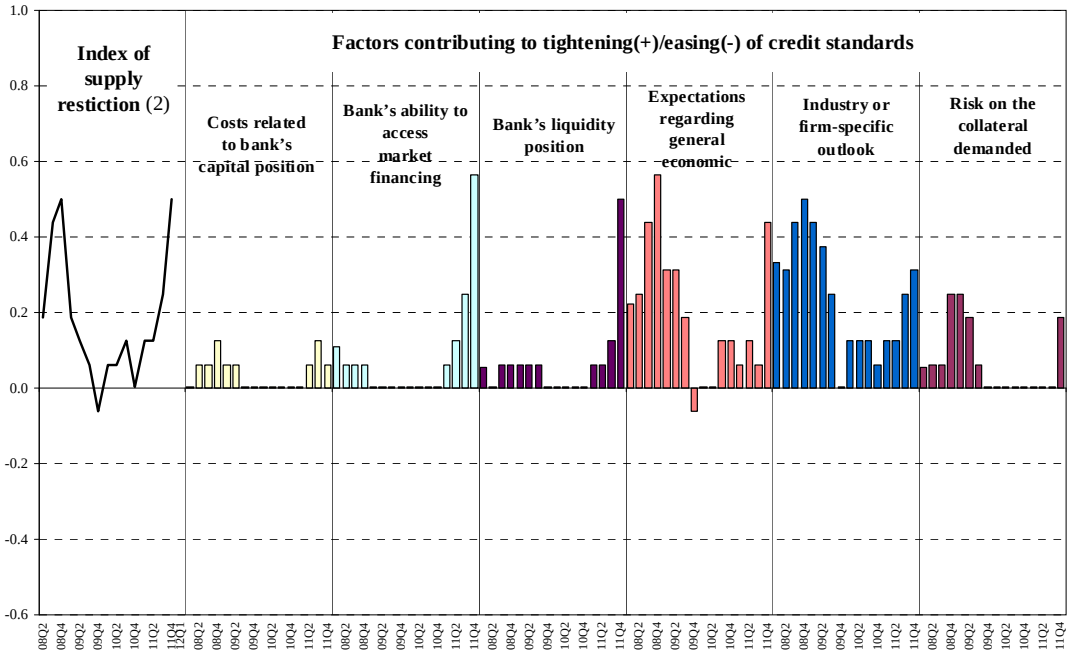


Source: Bloomberg.

Figure 3

Euro Area Bank Lending Survey: Italian panel (1)

(*diffusion indices*)



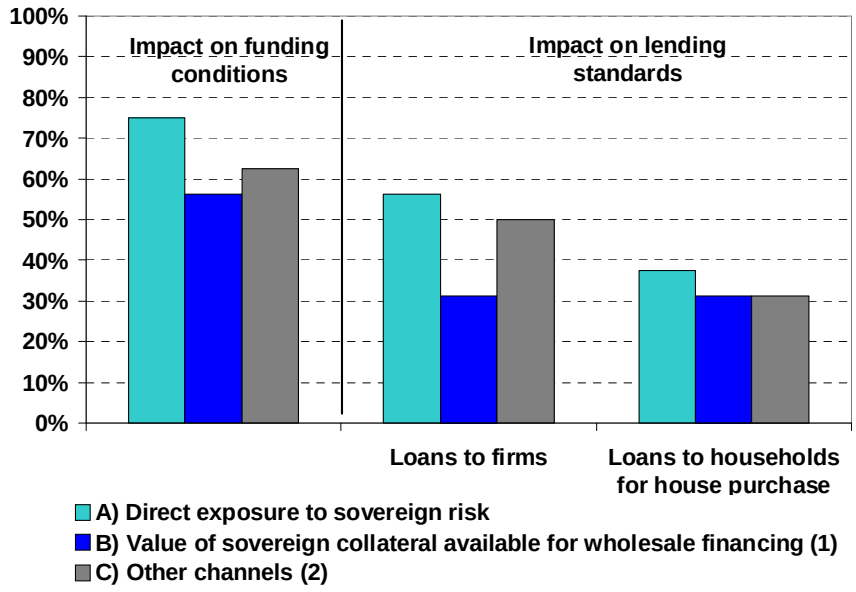
Source: Banca d'Italia.

(1) Positive values indicate supply restriction compared with the previous quarter. Diffusion indices are constructed on the basis of the following weighting scheme: 1 = tightened considerably, 0.5 = tightened somewhat, 0 = remained basically unchanged, -0.5 = eased somewhat, -1 = eased considerably. (2) Refers to the quarter ending at the time of the survey.

Figure 4

Transmission channels of the sovereign debt crisis on banks' funding conditions and lending standards, in 2011Q4

(*(+)/(–) = channel contributed to worsening/improving*)



Source: Banca d'Italia, Euro Area Bank Lending Survey (Italian panel).

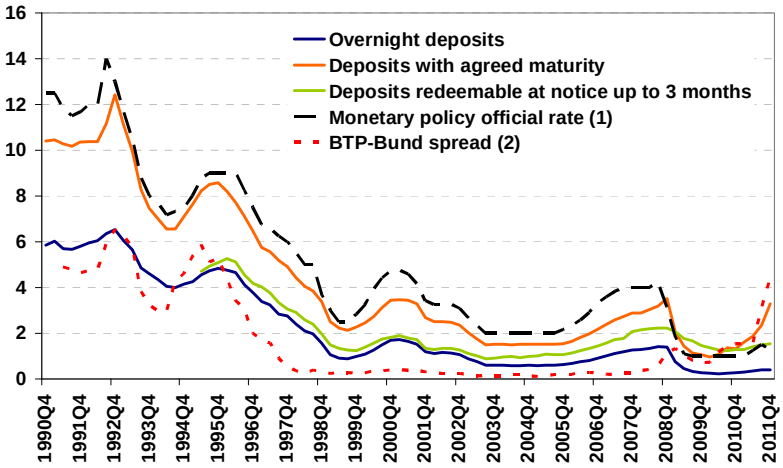
(1) For example, repos or secured transactions in derivatives. (2) For instance, any automatic rating downgrade affecting the bank following a sovereign downgrade or changes in the value of the domestic government's implicit guarantee, as well as spillover effects on other assets, including the loan book.

Figure 5

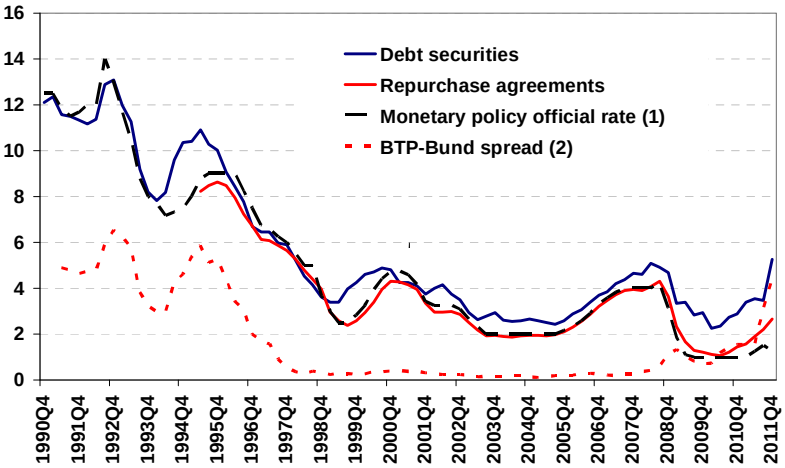
Banks' cost of funding: selected technical forms

(*percentage points; quarterly frequency*)

(a) Deposits held by households



(b) Other items



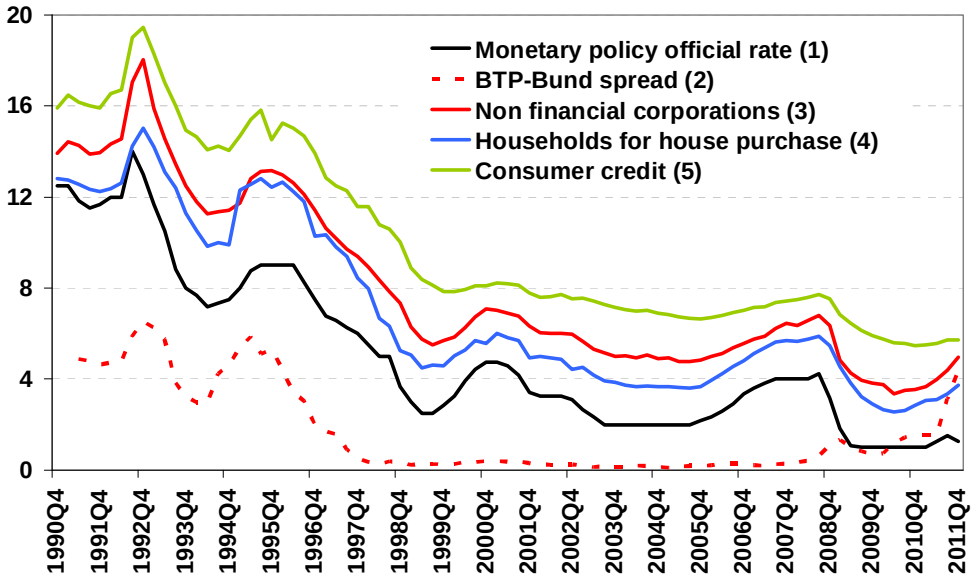
Source: Banca d'Italia.

(1) Until 1999Q4 official discount rate (TUS) set by Banca d'Italia; minimum/fixed bid rate on Eurosystem MROs thereafter. (2) Spread on 10-year government bonds with respect to the corresponding German Bund, corrected by the difference in the 10-year swap rate in Italy and Germany for the pre-EMU period.

Figure 6

Interest rates on loans

(*percentage points; quarterly frequency*)



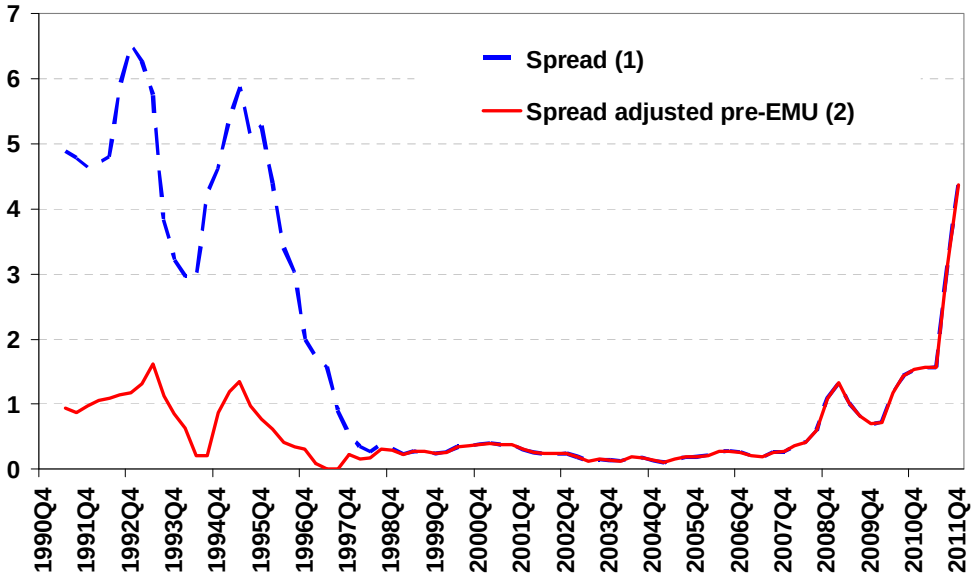
Source: Banca d'Italia

(1) Until 1999Q4 official discount rate (TUS) set by Banca d'Italia; minimum/fixed bid rate on Eurosystem MROs thereafter. (2) Spread on 10-year government bonds with respect to the corresponding German Bund, corrected by the difference in 10-year swap rate in Italy and Germany. (3) Average interest rate on outstanding loans in euro with maturity up to 1 year, including overdrafts. (4) Average interest rate on new loans to households for house purchases in euro, excluding overdrafts. (5) Average interest rate on outstanding loans in euro.

Figure 7

Italian 10-year sovereign spread

(*quarterly averages*; *percentage points*)



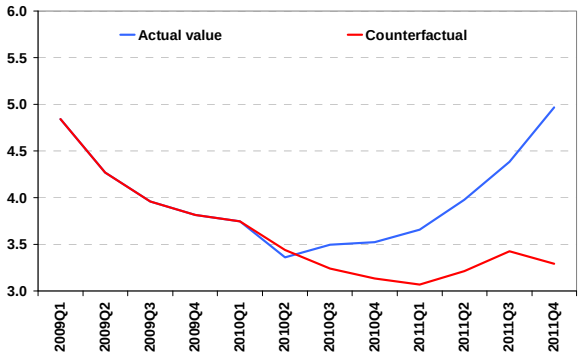
(1) Spread on 10-year government bonds with respect to the corresponding German Bund. (2) Spread corrected, for the pre-EMU period, with the difference between the Italian 10-year swap rate and the corresponding German rate for the pre-EMU period.

Figure 8

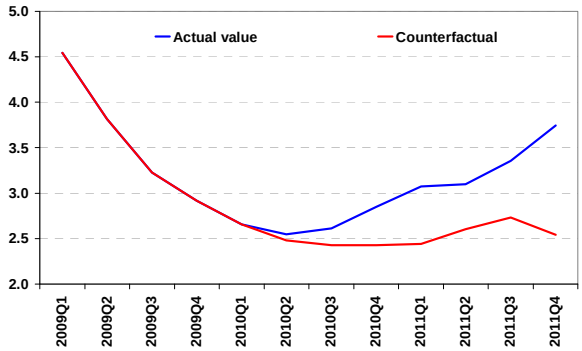
Counterfactual exercise: interest rates on loans

(*percentage points*)

(a) Non-financial corporations (1)



(b) Households for house purchases (2)



Source: Authors' calculations.

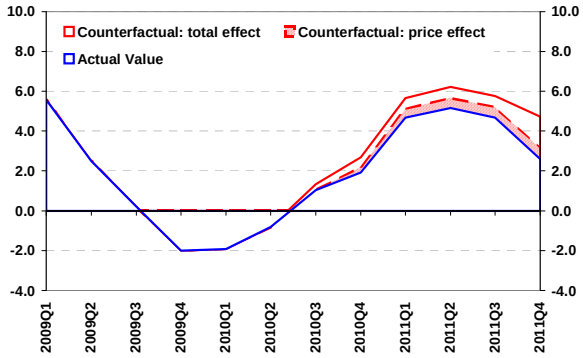
(1) Average interest rate on outstanding loans in euro with maturity up to 1 year, including overdrafts. (2) Average interest rate on new loans to households for house purchases in euro, excluding overdrafts.

Figure 9

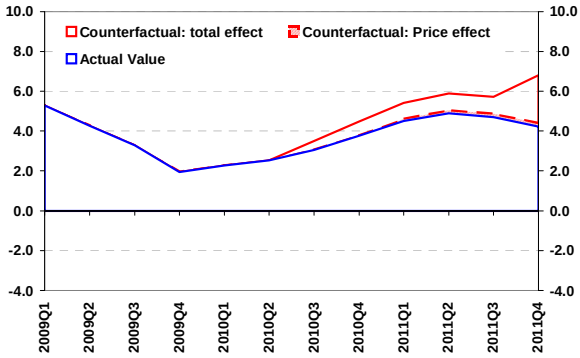
Counterfactual exercise: lending growth (1)

(*12-month percentage changes*)

(a) Non financial corporations



(b) Households for house purchase



Source: Authors' calculations.

(1) The counterfactual series are obtained by adding back to the actual values of lending growth the contribution of the difference between the actual and the counterfactual BTP-Bund spread. The direct effect is calculated using the coefficient for the spread in the loan equation; the indirect or price effect is the contribution occurring via the effect of the spread on the loan rate and is thus calculated using the product between the coefficient of the spread in the equation for the loan rate and the coefficient of the loan rate in the equation for lending. This methodology does not take into account the autoregressive structure of the loan rate and credit growth; if these were included, the difference between actual lending growth and growth in the counterfactual exercise would be larger.

Table 1

Results for funding rates

Explanatory variables	Households' deposits				Repurchase agreements		Bank bonds	
	overnight		with agreed maturity					
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Lagged dependent (t-1)	0.76 ***	0.64 ***	0.56 ***	0.41 ***	0.48 ***	0.28 **	0.34 *	0.48 ***
Short-term interest rate (t)	0.29 ***	0.24 ***	0.52 ***	0.42 ***	0.62 ***	0.58 ***	0.29 **	0.26 **
Short-term interest rate (t-1)	-0.17 ***	-0.10 *	-0.19 **	-0.01	-0.21	0.02	-0.12	-0.16 **
Medium-term interest rate (t)							0.56 ***	0.51 ***
Medium-term interest rate (t-1)							-0.19	-0.13
BTP-Bund spread (t)	0.04 ***	0.02	0.34 ***	0.17 **				
BTP-Bund spread (t) * Dummy sov_crisis		-0.02		0.21 **				
BTP-Bund spread (t) * Dummy pre_EMU		0.15		0.20				
BTP-Bund spread (t-1)					0.21 ***	0.14 *	0.71 ***	0.58 ***
BTP-Bund spread (t-1) * Dummy sov_crisis						0.21 ***		0.44 *
BTP-Bund spread (t-1) * Dummy pre_EMU						-0.36 **		-0.70 ***
Dummy sov_crisis		0.08 **		-0.02		-0.06		-0.48
Dummy pre_EMU		0.17 **		0.26 *		-0.01		0.22
Adjusted R-squared	0.996	0.996	0.996	0.996	0.996	0.997	0.987	0.993
Sample (adjusted)	1993Q3 - 2011Q4		1993Q3 - 2011Q4		1995Q3 - 2011Q4		1993Q3 - 2011Q4	
	BTP-Bund spread pass-through							
After 1 year (during sovereign crisis)	0.14	0.00	0.73	0.63	0.39	0.49	1.05	1.85
Long-run	0.18		0.77		0.42		1.07	

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest* rate is the 3-month interbank rate. *Medium-term interest rate* is the 3-year swap rate. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. The 1-year BTP-Bund spread pass-through is calculated assuming *Dummy sov_crisis* = 1.

Table 2

Results for loan rates

Explanatory variables	Loans to firms		Loans to households for house purchase		Consumer credit and other loans to households	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Lagged dependent (t-1)	0.67 ***	0.52 ***	0.85 ***	0.81 ***	0.92 ***	0.93 ***
Short-term interest rate (t)	0.78 ***	0.74 ***	0.57 ***	0.56 ***	0.71 ***	0.69 ***
Short-term interest rate (t-1)	-0.43 **	-0.27	-0.49 ***	-0.46 ***	-0.62 ***	-0.64 ***
Long-term interest rate (t)			0.05	0.03		
Unemployment rate (t)	0.03	0.05 *	-0.03	-0.02		
GDP, 12-month growth (t-1)	0.01	-0.02			0.04 *	0.05 **
GDP, 12-month growth (t-2)			0.03 *	0.03		
Disposable income, 12-month growth (t-1)					0.01 ***	0.01 **
BTP-Bund spread (t-1)	0.21 ***	-0.15	0.17 ***	-0.01	0.16 ***	0.36 *
BTP-Bund spread (t-1) * Dummy sov_crisis		0.66 ***		0.29 **		-0.22
BTP-Bund spread (t-1) * Dummy pre_EMU		0.51 ***		0.30 *		-0.04
Dummy sov_crisis		-0.78 ***		-0.33 ***		-0.02
Dummy pre_EMU		0.18		0.17		0.01
Adjusted R-squared	0.994	0.995	0.995	0.995	0.997	0.997
Sample (adjusted)	1991Q3-2011Q4		1991Q3-2011Q4		1991Q3-2011Q4	
	BTP-Bund spread pass-through					
After 1 year (during sovereign crisis)	0.51	0.97	0.53	0.83	0.57	0.50
Long-run	0.64		1.12		2.00	

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest rate* is the official monetary policy interest rate (the official discount rate of the Bank of Italy until 1998Q4 and the minimum interest rate on ECB main refinancing operations since 1999Q1). *Long-term interest rate* is the 10-year swap rate. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. The 1-year BTP-Bund spread pass-through is calculated assuming *Dummy sov_crisis* = 1.

Table 3

Results for lending growth

Explanatory variables	Loans to firms	Loans to households for house purchase
	(i)	(ii)
Lagged dependent (t-1)	0.821 ***	0.842 ***
Loan rate - short-term interest rate spread (t-1)	-0.010 ***	
Short-term interest rate (t-1)	0.000	
Loan rate - short-term interest rate spread (t-2)		-0.008 *
Short-term interest rate (t-2)		-0.005 ***
Firms' financing needs, 3-month change (t-3)	0.077 **	
GDP, 12-month growth (t)	0.002 **	
GDP, 12-month growth (t-4)		0.003 **
House prices, 12-month growth (t-8)		0.002 **
Unemployment rate (t)		0.011 ***
BTP-Bund spread (t-1)	-0.007 ***	-0.010 **
Adjusted R-squared	0.893	0.942
Sample (adjusted)	1991Q3-2011Q4	1991Q3-2011Q4

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest rate* is the e-MID interbank interest rate. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. *Firms' financing needs* is the ratio between the corporate sector's investments and gross operating profit.

Table 4

Results for banks' income statements

Explanatory variables	Net interest income		Non-interest income and other revenues		Loan-loss provisions	
	All banks	5 largest groups	All banks	5 largest groups	All banks	5 largest groups
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Lagged dependent (t-1)	-0.08	0.02	-0.11	0.00	0.29 ***	0.26 **
Lagged dependent (t-2)	0.42 ***	0.37 ***				
Short-term interest rate (t-1)	0.03 ***	0.03 ***	-0.06 **	-0.05 *		
Long-term interest rate, 3-month change (t)	0.03 ***	0.01	-0.24 ***	-0.23 ***	0.00	0.00
GDP (t-1)	0.68 ***	0.36 ***	0.51	0.18		
GDP, 3-month growth (t-1)					-0.09 **	-0.08 **
Unemployment rate (t-1)					0.03	0.03
Stock price index (t-1)			0.55 ***	0.61 ***		
Stock market volatility/100					0.06 *	0.08 **
BTP-Bund spread (t-1)	0.02 *	-0.04 ***	0.02	-0.02 ***	0.26 ***	0.25 ***
Adjusted R-squared	0.838	0.682	0.870	0.829	0.616	0.584
Sample (adjusted)	1991Q3-2011Q4		1991Q3-2011Q4		1991Q3-2011Q4	

Note. All regressions include a constant term, seasonal dummies and time dummies for outliers. *Short-term interest rate* is the e-MID interbank interest rate. *Long-term interest rate* is the yield on 10-year Italian government bonds. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. *Stock price* refers to the main Italian stock exchange index. *Stock market volatility* is calculated as the implicit standard deviation of the options on the *stock price*.

APPENDIX

Table A1

Results for funding rates (monthly data)

Explanatory variables	households' deposits				Yield on banks' bond	
	overnight		with agreed maturity			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
		memo: quarterly data		*memo: quarterly data*		*memo: quarterly data*
Lagged dependent (t-1)	0.78 ***	*0.64* ***	0.69 ***	*0.41* ***	0.48 ***	*0.48* ***
Short-term interest rate (t)	0.13 ***	*0.24* ***	0.21 ***	*0.42* ***	0.08	*0.26* **
Short-term interest rate (t-1)	-0.05	*-0.10* *	0.00	*-0.01*	0.02	*-0.16* **
Medium-term interest rate (t)					0.54 ***	*0.51* ***
Medium-term interest rate (t-1)					-0.19 **	*-0.13*
BTP-Bund spread (t)	0.00	*0.02*	0.09 *	*0.17* **		
BTP-Bund spread (t) * Dummy sov_crisis	-0.01	*-0.02*	0.11 **	*0.21* **		
BTP-Bund spread (t) * Dummy pre_EMU	0.07 *	*0.15*	0.11 *	*0.20*		
BTP-Bund spread (t-1)					0.55 ***	*0.58* ***
BTP-Bund spread (t-1) * Dummy sov_crisis					0.25	*0.44* *
BTP-Bund spread (t-1) * Dummy pre_EMU					-0.25 *	*-0.70* ***
Dummy sov_crisis	0.04 ***	*0.08* **	0.00	*-0.02*	-0.57 *	*-0.48*
Dummy pre_EMU	0.15 ***	*0.17* **	0.16 ***	*0.26* *	0.19 *	*0.22*
Adjusted R-squared	0.997	*0.996*	0.998	*0.996*	0.988	*0.993*
Sample (adjusted)	1993M4-2011M12		1993M4-2011M12		1993M4-2011M12	
	BTP-Bund spread pass-through					
After 1 year (during sovereign crisis)	0.00	*0.00*	0.63	*0.63*	1.53	*1.85*

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest* rate is the 3-month interbank rate. *Medium-term interest rate* is the 3-year swap rate. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. The 1-year BTP-Bund spread pass-through is calculated assuming *Dummy sov_crisis* = 1.

Table A2

Results for loan rates: alternative measures of sovereign tensions (quarterly data)

Alternative measures of sovereign risk (x)	Interest rate on loans to firms			Interest rate on loans to households for house purchase		
	Regression without interactions (column *i* of Table 2)	Regression with interactions (column *ii* of Table 2)		Regression without interactions (column *iii* of Table 2)	Regression with interactions (column *iv* of Table 2)	
	x(t-1)	x(t-1)	x(t-1) * dummy sov_crisis	x(t-1)	x(t-1)	x(t-1) * dummy sov_crisis
	(i)	(ii)	(iiii)	(iv)	(v)	(vi)
10-year BTP-Bund spread (*Baseline*)	**0.21** ***	**-0.15**	**0.66** ***	**0.17** ***	**-0.01**	**0.29** **
5-year BTP-Bund spread	0.21 ***	-0.14	0.57 ***	0.19 ***	0.16 *	0.09
3-year BTP-Bund spread	0.13	-0.01	0.41 **	0.09	0.03	0.22 *
10-year BTP yield	**0.08** *	**-0.06**	**0.67** ***	**0.08**	**-0.09**	**0.34** *
5-year BTP yield	0.15 ***	0.01	0.46 ***	0.11 *	-0.03	0.23 *
3-year BTP yield	0.14 ***	-0.04	0.45 ***	0.08	-0.08	0.28 ***
10-year BTP-IRS spread	**0.22** ***	**0.09**	**0.51** **	**0.16** ***	**-0.28**	**0.64** ***
5-year BTP-IRS spread	0.28 ***	0.05	0.48 **	0.20 **	0.03	0.28
3-year BTP-IRS spread	0.15	-0.01	0.46 **	0.08	-0.04	0.31 **
10-year BTP-OAT spread	**0.22** ***	**-0.16**	**0.76** ***	**0.18** **	**-0.13**	**0.48** *
5-year BTP-OAT spread	0.26 ***	-0.08	0.61 ***	0.20 ***	0.15	0.16
3-year BTP-OAT spread	0.14	-0.06	0.49 **	0.08	0.02	0.25
Not adjusted 10-year BTP-Bund spread	**0.11** ***	**-0.17**	**0.68** ***	**0.12** ***	**-0.10**	**0.39** **
Not adjusted 5-year BTP-Bund spread	0.13 ***	-0.15	0.58 ***	0.15 ***	0.15	0.11
Not adjusted 3-year BTP-Bund spread	0.10 ***	-0.10	0.50 ***	0.13 ***	-0.09	0.36 **

Note. The coefficients reported in the Table are obtained by re-estimating the equations in columns (*i*)-(*iv*) in Table 2 and substituting the 10-year BTP-Bund spread by the selected variables (all the remaining explanatory variables are kept unchanged). For the sake of comparison, the first row reports the coefficients for the baseline regression. *IRS* is the interest rate swap. *OAT* is the French sovereign bond.

Table A3

Results for loans rates to firms (monthly data)

Explanatory variables	Without interaction				With interaction			
	memo: quarterly data	All new loans	Loans up to €1 mil	Loans over €1 mil	*memo: quarterly data*	All new loans	Loans up to €1 mil	Loans over €1 mil
	(i)	(ii)	(iii)	(iv)	*(v)*	(vi)	(vii)	(viii)
Lagged dependent (t-1)	*0.67* ***	0.81 ***	0.74 ***	0.70 ***	*0.52* ***	0.70 ***	0.65 ***	0.64 ***
Short-term rate (t)	*0.78* ***	0.54 **	0.63 ***	0.59 *	*0.74* ***	0.37 *	0.48 ***	0.40 *
Short-term rate (t-1)	*-0.43* **	-0.37 *	-0.36 **	-0.30	*-0.27*	-0.11	-0.15 *	-0.09
Unemployment rate (t)	*0.03*	-0.01	0.03	-0.02	*0.05* *	-0.05	0.00	-0.07 *
GDP or Industrial production, 12-month growth (t-1)	*0.01*	0.01 **	0.00	0.01 **	*-0.02*	0.00	0.00	0.00
BTP-Bund spread (t-1)	*0.21* ***	0.09 ***	0.11 ***	0.12 ***	*-0.15*	-0.23 ***	-0.13 **	-0.19 **
BTP-Bund spread (t-1) * Dummy sov_crisis					*0.66* ***	0.39 ***	0.30 ***	0.37 ***
BTP-Bund spread (t-1) * Dummy pre_EMU					*0.51* ***			
Dummy sov_crisis					*-0.79* ***	-0.18 **	-0.16 **	-0.18
Dummy pre_EMU					*0.18*			
Adjusted R-squared	*0.994*	0.977	0.989	0.969	*0.995*	0.981	0.990	0.972
Sample (adjusted)	*1991Q3-2011Q4*	2003M2-2011M12			*1991Q3-2011Q4*	2003M2-2011M12		
	BTP-Bund spread pass-through							
After 1 year (during sovereign crisis)	0.51	0.44	0.42	0.39	0.97	0.40	0.41	0.41
Long-run	0.64	0.48	0.44	0.40				

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest rate* is the official monetary policy interest rate (the official discount rate of the Bank of Italy until 1998Q4 and the minimum interest rate on ECB main refinancing operations since 1999Q1). As a measure of economic activity, *GDP* is used for regressions with quarterly data, *industrial production* for regressions with monthly data. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. The 1-year BTP-Bund spread pass-through is calculated assuming *Dummy sov_crisis* = 1.

Table A4

Results for loan rates to households for house purchases (monthly data)

Explanatory variables	Without interaction					With interaction				
	memo: quarterly data	All new loans	Variable-rate loans	Fixed-rate loans	Variable-rate loans (extended sample)	*memo: quarterly data*	All new loans	Variable-rate loans	Fixed-rate loans	Variabl rate loa (extend sampl
	(i)	(ii)	(iii)	(iv)	(v)	*(vi)*	(vii)	(viii)	(ix)	(x)
Lagged dependent (t-1)	*0.85* ***	0.79 ***	0.80 ***	0.75 ***	0.89 ***	*0.81* ***	0.85 ***	0.73 ***	0.72 ***	0.89
Short-term interest rate (t)	*0.57* ***	0.37 ***	0.51 ***	0.16 ***	0.34 ***	*0.56* ***	0.22 ***	0.35 ***	0.21 ***	0.34
Short-term interest rate (t-1)	*-0.49* ***	-0.19 **	-0.31 ***	-0.16 ***	-0.23 ***	*-0.46* ***	-0.12 *	-0.11 **	-0.20 ***	-0.23
Long-term interest rate (t)	*0.05*			0.24 ***		*0.03*			0.25 ***	
Unemployment rate (t)	*-0.03*	-0.05 ***	-0.02	-0.07 ***	-0.02 **	*-0.02*	-0.08 ***	-0.06 ***	-0.06 **	-0.02
GDP 12-month growth (t-1) [(1)]	*0.03* *	0.002 **	0.005 ***	-0.002 **	0.005 ***	*0.03* *	0.001	0.001	-0.002	0.004
Sovereign spread (t-1)	*0.17* ***	0.07 ***	0.05 ***	0.10 ***	0.05 ***	*-0.01*	-0.11 ***	-0.15 ***	0.16 ***	0.02
Spread BTP-Bund (-1) * Dummy sov_crisis						*0.29* **	0.22 ***	0.26 ***	-0.07	0.07
Spread BTP-Bund (-1) * Dummy pre_EMU						*0.32* *				
Dummy sov_crisis						*-0.33* ***	-0.14 ***	-0.18 ***	0.06	-0.07
Dummy pre_EMU						*0.25*				
Adjusted R-squared	*0.995*	0.994	0.994	0.969	0.996	*0.995*	0.996	0.996	0.970	0.996
Sample (adjusted)	*1991Q3-2011Q4*	2003M2-2011M12			1995M2-2011M12	*1991Q3-2011Q4*	2003M2-2011M12			1995M 2011M
	BTP-Bund spread pass-through									
After 1 year (during sovereign crisis)	*0.53*	0.30	0.23	0.39	0.35	*0.83*	0.63	0.39	0.32	0.62
Long-run	*1.12*	0.32	0.25	0.40	0.47	*1.44*	0.74	0.40	0.32	0.82

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest rate* is the official monetary policy interest rate (the official discount rate of the Bank of Italy until 1998Q4 and the minimum interest rate on ECB main refinancing operations since 1999Q1). *Long-term interest rate* is the 10-year swap rate. As a measure of economic activity, *GDP* is used for regressions with quarterly data, *industrial production* for regressions with monthly data. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. The 1-year BTP-Bund spread pass-through is calculated assuming *Dummy sov_crisis* = 1.

Table A5

Results for loan rates with banks' marginal cost of funding (quarterly data)

Explanatory variables	Interest rate on loans to firms				Interest rate on loans to households for house purchase			
	Without interactions		With interactions		Without interactions		With interactions	
	Baseline	With cost of funding	*Baseline*	With cost of funding	*Baseline*	With cost of funding	*Baseline*	With cost of funding
	(i)	(ii)	*(iii)*	(iv)	*(v)*	(vi)	*(vii)*	(viii)
Lagged dependent (t-1)	*0.68* ***	0.56 ***	*0.52* ***	0.42 *	*0.85* ***	0.81 ***	*0.81* ***	0.72 ***
Short-term interest rate (t)	*0.78* ***	0.55 ***	*0.74* ***	0.50 ***	*0.57* ***	0.53 ***	*0.56* ***	0.54 ***
Short-term interest rate (t-1)	*-0.43* **	-0.40 **	*-0.27*	-0.27	*-0.49* ***	-0.48 ***	*-0.46* ***	-0.42 ***
Long-term interest rate (t)					*0.05*	0.14 **	*0.03*	0.09 *
Unemployment rate (t)	*0.03*	0.03	*0.05* *	0.06 *	*-0.03*	-0.01	*-0.02*	0.00
GDP, 12-month growth (t-1)	*0.01*	0.00	*-0.02*	-0.02				
GDP, 12-month growth (t-2)					*0.03* *	0.03 *	*0.03*	0.04 *
BTP-Bund spread (t-1)	*0.21* ***	-0.10	*-0.15*	-0.42 **	*0.17* ***	0.19	*-0.01*	0.10
BTP-Bund spread (t-1) * Dummy sov_crisis			*0.66* ***	0.60 ***			*0.29* **	0.25
BTP-Bund spread (t-1) * Dummy pre_EMU			*0.51* ***	0.52 ***			*0.30* *	0.41 *
Dummy sov_crisis			*-0.79* ***	-0.81 ***			*-0.33* ***	-0.43 **
Dummy pre_EMU			*0.18*	0.06			*0.17*	0.42
Marginal cost of funding (t)		0.38 **		0.40 **		0.01		-0.04
Adjusted R-squared	*0.994*	0.995	*0.995*	0.995	*0.995*	0.994	*0.995*	0.991
Sample	1991Q3-2011Q4		1991Q3-2011Q4		1991Q3-2011Q4		1991Q3-2011Q4	

Note. All regressions include a constant term and time dummies for outliers. *Short-term interest rate* is the official monetary policy interest rate (the official discount rate of the Bank of Italy until 1998Q4 and the minimum interest rate on ECB main refinancing operations since 1999Q1). *Long-term interest rate* is the 10-year swap rate. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany. *Marginal cost of funding* is the interest rate on households' term deposits. The BTP-Bund spread is calculated at the 10-year maturity and is corrected by the difference between the 10-year swap rate in Italy and Germany.