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**The Bank's Risk Insurance and the EMU**

Enzo Dia

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Dipartimento di Economia Politica  
Università degli Studi di Milano - Bicocca  
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# The bank's risk insurance and the EMU\*

Enzo Dia<sup>†</sup>

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## Abstract

Banks provide insurance against interest rate shocks and real shocks. After the introduction of the common currency the credit system tends to take more of the risk of the private sector, reducing the overall risk of the economy and increasing the risk sharing among different countries and regions. The increased diversification that the introduction of the Euro has allowed, has increased the smoothing of interest rate shocks, but it has increased the incentive to smooth real shocks unevenly. The integration of the credit system, where the authority to regulate national banking system is transferred to the ECB, would change in a relevant way the reaction of the banking system to shocks. The model shows that asymmetries in the transmission of monetary policy would be reduced. On the other hand, a common market for banking activities might tend to amplify the asymmetric impact of real shocks.

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<sup>†</sup>Università degli studi di Milano Bicocca e University of Strathclyde. E mail: enzo.dia@unimib.it

# 1 Introduction

When the intermediation of the banking system takes place, banks select investment projects on the basis of their risk-return profile. The investment of specialized resources in the discovery and analysis of information reduces the overall risk of the economic system. Banks bear part of the entrepreneurial risk themselves; ultimately banks share the risk they undertake among the holders of their own liabilities: shareholders and depositors. The activity of the bank at the same time reduces the risk of the economic system, and distributes the risk to a vast set of agents. The crucial difference between a bank and a mutual fund is linked with the activity of lending by means of loans and borrowing by means of deposit liabilities. The peculiar information content of the contractual agreements based on relationship lending of these securities, contributes to a better selection of the projects, reducing the risk, given expected returns, that the whole economy undertakes. It is important to observe that the bank takes this entrepreneurial function only issuing different categories of loans. If the bank invests its portfolio of assets on bonds negotiated in the market, on which it has no peculiar information, it will work as a mutual fund, redistributing overall risk, not reducing it.

The composition of the portfolio of securities of credit intermediaries is fundamental in order to study the risk-taking and risk sharing activity of the financial sector. Changes in the relative share of government securities and market securities in the portfolio of banks, not only affect the risk profile of the credit institutions, but affect the overall level of risk of the economic system. The choice among different sets of market assets, such as bonds or different classes of loans, has the same kind of influence. In section two, a Markovitz type of mean variance portfolio model is derived for a banking intermediary. The model is used in the following chapter to analyze the effect of shocks on the portfolio, both interest rate shocks and real shocks, and to study how the credit sector in Europe has been affected by the introduction of the euro. The results of our model are consistent with the most recent empirical evidence and shed some light on the driving forces determining the behavior of banks. They show that in the event of a monetary policy shock that increases rates, banks tend to rely more on relationship lending. As a consequence they tend to smooth this kind of shocks. When a real shock hits the economy, affecting the entire structure of relative prices, the bank perceives it as credit quality shock, that increases default costs. In the case of real shocks, the degree of diversification among industrial sectors of the

assets of the bank plays a crucial role. Diversification in fact increases the opportunity cost for banks of intertemporal smoothing, increasing the cost of the insurance for those firms that are negatively affected by the shock. Banks that benefit from a widely diversified portfolio, create an internal capital market to allocate resources. When the shock hits the economy, they can choose to provide more liquidity to the firms positively affected by the shock, that have a lower expected default cost. As a consequence, they will provide insurance to the firms badly affected by the shock, only if they can afford to pay a higher average interest rate.

The development of the common currency has increased the availability of different private sector assets. At the same time it has pushed forward the privatization of entire industrial sectors, and has allowed the exploitation of large economies of scale in different sectors of the economy. Risk-sharing among European countries and regions has increased, because households and financial intermediaries hold now a more widely diversified portfolio. But the risk attitude of the credit sector is peculiar, and it has been affected in a counterintuitive way by the institutional transformations of the European economy. According to our model, the introduction of the common currency has caused the credit system to reduce the holding of state bonds in favor of market securities. As a consequence, banks have been pushed to take on more of the risk of the private sector, reducing the overall risk of the economy and increasing the risk sharing among different countries and regions. The last part of the work is a study of the effect of the eventual development of a common European banking system, subject to the same legislation and where the power to monitor and regulate the market is delegated to a common authority. The integration of the credit system would change in a relevant way the reaction of the banking system to shocks. The model shows that asymmetries in the transmission of monetary policy would be reduced, as the tendency to smooth monetary policy shocks would be increased. On the other hand a common market for banking might tend to amplify the asymmetric impact of real shocks.

## 2 The portfolio problem of the bank

Markovitz type of portfolio models are based on the assumption that returns and risks are exogenous, and the quantities of each security held represent the choice variable of the bank. In order to take into account the effect of information costs and default costs in the portfolio choice, we describe the problem of the bank as a two-stage process. We assume that the bank classifies different available groups of assets or liabilities in categories, on the basis of institutional properties and of the sector of activity of the counterpart. In the first stage, the bank evaluates the optimal amount of investment in information that is worth taking for every class of security that it might choose to hold. External information is available to any participant in the market at a relatively small cost, that we will consider to be part of the transaction cost necessary to purchase the security. on the contrary, certain categories of assets and liabilities, such as deposits and many classes of loans, are available to banks only. Relationship lending allows the bank to obtain internal information that is not available to the market in general, but in order to establish the relationship the bank has to bear an information cost.

Assuming the existence of a competitive market, where rates are set exogenously, the problem can be formulated as the optimal choice of loan quantity and investment in information.<sup>1</sup> Information affects the returns of the bank reducing expected default costs. The default probability can be formalized as a function of the information regarding the single loan and the quantity of the loan itself. The expected return of a loan is:

$$E[\pi] = r_L L - p(1 + r_L)L - FC - sz, \quad (1)$$

where  $r_L$  is the interest rate on loans,  $L$  is the quantity of the loan,  $FC$  is a fixed cost,  $sz$  is the cost of information and  $p$  is the subjective evaluation on part of the lender of the probability of default of the single loan.  $p$  is defined as

$$p = f(q, l) = f(z + a, L). \quad (2)$$

The parameter  $a$  represents the available stock of information, accumulated in previous periods through relationship lending,  $z$  is the amount of information that the bank can obtain in the short run, incurring in a cost that for simplicity is assumed to be linear and equal to  $sz$ . The investment in

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<sup>1</sup>As in Aigner and Sprengle [1].

information is worthwhile as long as the reduction of default cost that it produces is larger than the cost of the information. Under standard assumptions regarding the cost functions, there will be an optimal amount of investment in information  $z$ , and an optimal quantity of the single loan  $L$ , that minimizes the default cost. It is important to observe that the level of the default cost will crucially depend on the value of the stock  $a$ , that depends on the investment entertained in the past. The investment in information reduces the default cost of every single loan and the average default cost of a class of loans, given the exogenously determined possibility of diversification inside the particular class. It is the availability of internal information, obtained through relationship lending, that allows the bank to reduce the average cost of default, while the market cannot reduce default costs by means of the available external information. The bank accordingly classifies the securities under consideration in the portfolio problem, calculating an expected return for every security (and the corresponding expected variance), composed of three terms: the basic interest rate component, the transaction cost (that includes mainly the cost of obtaining and processing the information), and the default cost. Every class contains many different securities, but we will assume that the choice of the quantity of every security inside the class is fixed in the first stage. The degree of diversification inside a class is very important, but we assume that it depends on the peculiarities of the sector itself. For example we can imagine that as a policy the bank chooses to issues mortgages of amounts lying within a predefined range. The degree of diversification of the whole portfolio of mortgages is constant, and depends on market conditions at the moment of the first-stage decision. Mortgages are a class of loans that are diversified to a certain degree which is higher than the one for other types of loans, for example industrial loans, because the mortgages are issued in larger numbers of smaller loans than are loans to industrial firms. We will study the portfolio choice among different classes.

## 2.1 Portfolio theory and banks

The Markovitz portfolio approach has been applied to banks and other financial intermediaries, assuming banks to be risk averse agents that maximize a concave utility function where profits are the argument. Assuming all returns to be exogenous, the optimal portfolio of assets and liabilities is jointly determined. This work is based on the model developed by Hart and Jaffe [7]. The main result of the model is a separation theorem that shows that

the choice of the optimal composition of the portfolio (in terms of the relative size of asset shares) is independent from the choice of the optimal size of the portfolio itself. The other major results are some comparative static properties, that we use largely in this work. In order to establish the comparative static results, only a fairly general assumption regarding the utility function is required. The requirement is that the utility function exhibit non-increasing absolute risk aversion. This restriction is often considered to be acceptable in general, and seems very reasonable for a financial intermediary. The main flaw of the model is that under the assumption that interest rates on assets are higher than on liabilities, the bank might be willing to expand its portfolio indefinitely. This problem though can be solved, introducing the innovations proposed by Szegö [22].

The model of Hart and Jaffe assumes that there are no risk free assets and that net worth of the intermediary is a small part of its liabilities and can be set to 0 or considered as another liability. The bank chooses simultaneously the optimal quantity of both assets and liabilities; liabilities have a negative sign, assets a positive one. A portfolio is represented by the vector  $\mathbf{x}$ , with

$$\sum_{l=1}^{j+i} x_l = 0, \quad (3)$$

where the index  $j$  represent liabilities and  $i$  assets and the first  $j$  components are non positive while the last  $i$  are non negative. Assuming  $R_i$  to be a random variable that measures the real return of the security, the expected value of the real wealth of the bank is

$$E(W) = \sum_{l=1}^{j+i} x_l R_l. \quad (4)$$

The average return on every assets is assumed to exceed that on liabilities. The standard deviation of  $W$  is given by  $\sigma = (\mathbf{x}'\mathbf{S}\mathbf{x})^{\frac{1}{2}}$ , where

$$\mathbf{S} = \begin{bmatrix} \sigma_{11} & \cdot & \cdot & \cdot & \sigma_{1,j+i} \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ \sigma_{j+i,1} & \cdot & \cdot & \cdot & \sigma_{j+i,j+i} \end{bmatrix}$$

Imposing a restriction on the utility function, the Arrow-Pratt hypothesis of non-increasing absolute risk aversion, some interesting comparative static

result can be obtained.<sup>2</sup> The main results of their comparative static analysis are synthesized in the following theorems<sup>3</sup>:

1. If the expected return on one security rises, *ceteris paribus*, the quantity of the security held does not fall. If the quantity held is not zero, it will rise.
2. If the covariance of two securities rises, *ceteris paribus*, the product of the two quantities does not rise. If the product of two is different from 0 (if both securities are held in the portfolio) the product itself falls.
3. If the variance of any security rises, *ceteris paribus*, the absolute value of the quantity held will not rise. If the quantity held is not zero, it will fall.

The second result holds either if the two securities are both assets or both liabilities or if one of is an asset, the other a liability. The interpretation of the result is opposite, in the two cases. When the two assets have the same sign, the theorem states that an increase in the covariance determine a reduction in the quantity held of both, or if one of the two is increased, the reduction in the other one has be larger. On the other hand, when one of the securities is a liability, the other an asset, since they have opposite signs, the effect of the increase of the covariance on the quantities held is opposite. If the covariance increases, the quantity held of both securities is increased, or the quantity of one of the two is reduced, the quantity of the other is increased more than proportionately. The reason is that since the two securities have opposite sign, a stronger covariance is analogous to a higher negative correlation between two assets in the standard portfolio problem. So the bank is willing to increase the holding of the two, because it can hedge the asset buying the correlated liability or the other way round.

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<sup>2</sup>In order to rule out the possibility of the existence of riskless non-zero portfolios some assumption regarding  $S$  is required. The simplest possible is that  $S$  is positive definite, assumption that implies that no riskless security is part of the portfolio. A weaker assumption is sufficient, that implies that no two securities can be riskless:

$$\mathbf{x}'S\mathbf{x} > 0. \tag{5}$$

The other important assumption of the model is that there is not a positive and fixed net worth component of liabilities.

<sup>3</sup>Hart and Jaffe, 1973,[7] pp. 140.



## 2.2 Assets returns

### 2.2.1 Interest rate component

The definition of different risk categories is necessary in order to model the portfolio choice of a bank and its behavior towards risk. Our main aim is to evaluate different diversification policies. Accordingly we analyze the factors affecting single banks, leaving aside systemic risk due to the possibility of a bank run, that we will consider to be dealt with by public authorities. We do not consider a second factor that could be relevant. Different arrangements of the capital structure could possibly guarantee different levels of protection from the exposure to exogenous factors, but to focus on the main problem, we consider the capital structure of the bank to be irrelevant, at least in the first instance.

The set of risk factors affecting the balance sheet of the bank is assumed to be exogenous. We consider returns from the portfolio to depend on three distinct sets of factors: interest rates, default costs and transaction costs. Interest rates are assumed to be exogenous and to depend on a rate set by the central bank, whose variations determine a shift of the return of all assets. Different securities available to the banking firm are characterized by a different mark up (normally positive, negative in the case of deposits) with respect to the interest rate set by the central bank:

$$r_i = r_{cb}[1 + f(i)]; \quad (6)$$

the rate set by the central bank is assumed to behave as a random walk

$$r_{t+1}^{cb,e} = r_t^{cb} + \epsilon_t^{cb}. \quad (7)$$

Every asset return is subject as well to an idiosyncratic shock, that we assume to be white noise, so that

$$r_{t+1}^{i,e} = r_t^{cb}[1 + f(i)] + \epsilon_t^{cb} + \epsilon_t^i, \quad (8)$$

where the subscript  $e$  indicates the expected values.

The securities we are considering could be both assets and liabilities. The main difference in the problem of the bank is that they enter in the portfolio with an opposite sign. Since the basic portfolio model requires returns to be set exogenously, what we are implicitly assuming is that banks divide loans and deposits in classes, whose interest rates are set according to a fixed rule, as a mark up on the interest rate set by the central bank.

### 2.2.2 An expected default cost function

In every period, the bank has to forecast return and variance of its portfolio of loans. The problem we are considering here is the evaluation of those factors of risk that affect the probability of default of the loans that compose the portfolio. Our assumption is that on the basis of the stock of its private information, due to past and current investment, the bank makes its evaluation of the risk factors affecting every single loan.

The probability of default of single individual loans can be considered to be affected by idiosyncratic shocks, that we assume to behave as random walk with a drift. Formally

$$U_{it} = U_{it-1} + \mu_i + \epsilon_{it} = U_{i0} + \mu_i t + \sum_{k=1}^t \epsilon_k, \quad (9)$$

where  $U_{it}$  is the specific risk factor of the  $i^{th}$  loan, with  $i = 1 \dots n$ ;  $\mu$  is the drift factor, and  $\epsilon$  is the error term. The expected value is

$$E[U_{it}] = U_{i0} + \mu_i t, \quad (10)$$

the variance

$$Var[U_{it}] = t\sigma_\epsilon^2. \quad (11)$$

The risk for the portfolio of loans that define every class is a weighted average, with weights represented by the share of the  $i^{th}$  loan in the entire portfolio, that we will measure as  $h_i = \frac{L_i}{L}$ . The share of every loan inside a class is exogenous, because the optimal quantity of every loan is established in the first-stage process, together with the optimal investment in information. The probability of default of a class of loans is the following:

$$U_t = \sum_{i=1}^n h_i U_{it} = \sum_{i=1}^n h_i (U_{i0} + \mu_i t + \sum_{k=1}^t \epsilon_k), \quad (12)$$

its expected value is given by

$$E[U_t] = \sum_{i=1}^n h_i (U_{i0} + \mu_i t), \quad (13)$$

and its variance by

$$Var[U_t] = \sum_{i=1}^n h_i^2 t \sigma_\epsilon^2. \quad (14)$$

The last equation shows how the variance of the risk is affected by diversification. The value  $\sum_{i=1}^n h_i^2$  is in fact a standard measure of concentration and it is equal to 1 only when the entire portfolio is concentrated on a single loan.

Because of the existence of asymmetric information and uncertainty, variation of interest rates affect the probability of default of borrowers. In order to show the effects of interest rates on the default cost function of the bank, we introduce a function that shows the link between default probabilities and interest rates variations.<sup>4</sup> The function  $\alpha(LR)$  shows how the probability of default of the single borrower is increasing in the amount of the interest factor  $LR$ . It measures the sensibility of the default cost to variation in the interest rate factor and it is determined in the first-stage, because it depends on the stock of information. The higher the information, the lower the asymmetry in the information, the lower is the value of  $\alpha_i$ . The function is stochastic, because the bank estimates the sensibility of defaults to interest rates shocks with an error. Since we have to assume that the correlation  $\rho_{\alpha r_i}$  between the error in the estimate of the sensibility, and the random error in forecasting default costs is constant, the function  $\alpha$  is linear with respect to the interest rate factor. In order to apply the function to the entire portfolio of the bank, we have to derive a similar function defined on the entire portfolio of loans. We define  $\phi$  to be the weighted average of all the single individual functions  $\alpha_i$ , with weights given by the ratio  $h_i = \frac{L_i}{L}$ , that measures the weight of every single loan with respect to the entire portfolio. (From now on  $L$  will represent the entire portfolio of loans while  $L_i$  will indicate the single individual loan.) The function  $\phi$  is defined in the interval  $[0, 1]$ :

$$\phi = \sum_{i=1}^n h_i \alpha_i. \quad (15)$$

The value of  $\phi$  increases with  $\alpha_i$ , that is a positive function of the interest rate factor, and the value of the concentration  $h_i$ . Its value decreases with the current investment  $z$  in information, and the level of the stock previously accumulated,  $a$ .

$$\frac{\partial \phi}{\partial LR} = \alpha'_i(LR) h_i > 0$$

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<sup>4</sup>derived from Jaffee and Russell [14].

$$\begin{aligned}
\frac{\partial \phi^2}{\partial LR^2} &= \alpha_i''(LR)h_i < 0 \\
\frac{\partial \phi}{\partial h_i} &= \alpha_i > 0 \\
\frac{\partial \phi}{\partial z + a} &< 0,
\end{aligned} \tag{16}$$

where  $R = 1 + r_i$  is the interest factor.

It is now possible to summarize the risk factors in an expected default cost function. We express it as a negative return in per cent terms that can be simply subtracted from the exogenously given expected returns. In general this function is given by

$$D = E[LRp(D)], \tag{17}$$

where  $L$  is the amount of loans of the entire portfolio,  $p(D)$  is the subjective evaluation on part of the banker of probability of default. This equation simply states that a share  $p(D)$  of the loan portfolio will not be repaid. Considering the fact that in case of default both principal and interest are not repaid, the expected default cost function is

$$\begin{aligned}
E[D_{t+1}] &= E[LRp(D)] = \\
LE[R]E\left[\sum_{i=1}^n h_i(\alpha_i + U_{i0} + \mu_i t + \sum_{k=1}^t \epsilon_k)\right] &= \\
= L(1 + r_i)\left[\sum_{i=1}^n h_i(\alpha_i + U_{i0} + \mu_i t)\right]. &
\end{aligned} \tag{18}$$

As a consequence, we consider the expected per cent cost of default to be

$$d = (1 + r_i)\left[\sum_{i=1}^n h_i(\alpha_i + U_{i0} + \mu_i t)\right], \tag{19}$$

with a variance of

$$\begin{aligned}
\sigma_d^2 &= (1 + r_i)^2 \left\{ \sum_{i=1}^n h_i^2 (\sigma_\alpha^2 + t\sigma_\epsilon^2) \right\} + \\
+ \sigma_r^2 \left[ \sum_{i=1}^n h_i \alpha_i + \sum_{i=1}^n h_i (U_{i0} + \mu_i t) \right] &+ 2\rho_{r'_i \alpha} \sigma_{r'_i} \sigma_\alpha.
\end{aligned} \tag{20}$$

### 2.2.3 Transaction costs

Transaction costs are assumed to be different for every security. The term transaction cost is used in the wide sense and its meaning includes in particular the cost of the investment in information (search cost, such as advertising, promotions plus the cost of the evaluation of the reliability of the depositor or the borrower),  $z_i$ . The only fundamental assumption, in order to comply with the requirement of exogenous returns, is that the optimal transaction costs are proportional to the amount of the security acquired. This assumption is quite restrictive, since it rules out any economy of scale in the management of information. The meaning of the assumption and its acceptability varies considerably with the level of aggregation that we are considering. In the case of a widely diversified portfolio of assets, it means that the cost of the optimal information for a loan of a dollar and for a loan of a million dollar is the same fixed proportion of the loan, even if it is issued to the same person. And this seems hardly acceptable. But if we assume that every asset represents a particular contract issued to a selected set of customers pooled on the basis of some common characteristic, the story seems more reasonable. What we are now assuming is that, on average, the bank estimates the cost of information for that kind of loans, to be a fixed percentage of the loans.

From another perspective the model allows us to take into account the existence of economies of scope. Economies of scope would cause transaction costs of different assets to be correlated with each other. There might be two relevant sets of economies of scope: economies in acquisition of the information regarding the quality of loans, that would determine a correlation between certain categories of assets; and economies between some sets of assets and some sets of securities, as for example loans and deposits of firms.

## 2.3 Expected net returns and variance

We are now able to show expected net returns of the securities and their respective variance. Throughout this work we assume that financial markets are highly competitive and banks behave competitively in order to attract households deposits and to provide loans. Accordingly banks are considered to be price takers. This implies that they can choose the quantity of the liability that these services represent in their balance sheet, at a given cost, which is represented by the market interest rate plus a transaction cost. The expected return (cost) of any liability is composed of two terms, the interest

rate component and the transaction cost component:

$$r'_j = r_j + c_j, \quad (21)$$

where

$$r_j = r_{t+1}^{j,e} = r_t^{cb} + f(j) + \epsilon_t^{cb} + \epsilon_t^j, \quad (22)$$

and

$$c_j = c_{t+1}^{j,e} = c_t^j + \epsilon_t^{cj}. \quad (23)$$

Transaction costs are assumed to be forecasted with an error, in order to capture the effect of technological shocks that affect the financial markets. The respective variances, assuming different errors to be uncorrelated, are

$$\sigma_j^2 = \sigma_{\epsilon_{cb}}^2 + \sigma_{\epsilon_j}^2 + \sigma_{\epsilon_{cj}}^2. \quad (24)$$

The return on the asset represented by loans has three components, a positive component represented by the expected interest rate earned, minus the transaction cost expressed in percent terms, and minus the default cost of the loan. Formally <sup>5</sup>

$$r'_i = r_i - c_i - d_i, \quad (25)$$

where

$$r_i = r_{t+1}^{i,e} = r_t^{cb} + f(i) + \epsilon_t^{cb} + \epsilon_t^i, \quad (26)$$

$$d_i = (1 + r_i) \left[ \sum_{i=1}^n h_i (\alpha_i + U_{i0} + \mu_i t) \right], \quad (27)$$

and

$$c_i = c_{t+1}^{i,e} = c_t^i + \epsilon_t^{ci}. \quad (28)$$

The forecasted variance is

$$\sigma_i^2 = \sigma_{\epsilon_{cb}}^2 + \sigma_{\epsilon_i}^2 + \sigma_{\epsilon_{ci}}^2 + \sigma_{d_i}^2 + 2\rho_{cbdi}\sigma_{cb}\sigma_{d_i} + 2\rho_{idi}\sigma_i\sigma_{d_i}, \quad (29)$$

where

$$\begin{aligned} \sigma_{d_i}^2 &= (1 + r_i)^2 \left\{ \sum_{i=1}^n h_i^2 (\sigma_\alpha^2 + t\sigma_\epsilon^2) \right\} + \\ &+ (\sigma_{cb}^2 + \sigma_i^2) \left[ \sum_{i=1}^n h_i \alpha_i + \sum_{i=1}^n h_i (U_{i0} + \mu_i t) \right] + 2\rho_{cb\alpha}\sigma_{cb}\sigma_\alpha + 2\rho_{i\alpha}\sigma_i\sigma_\alpha. \end{aligned} \quad (30)$$

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<sup>5</sup>As in Kane and Malkiel [15].

It is important to remark that the degree of concentration is exogenously given for every class of security. That degree is the outcome of a prior choice of a standard composition for every class of securities. Every class is formally analogous to a mutual fund, whose degree of diversification depends on the peculiarities of the securities that compose it. For example we might assume a higher degree of diversification in the case of consumer credit than in the case of loans issued to firms.

## 2.4 The portfolio model

In order to evaluate how the introduction of a common monetary area affects the portfolio of banking intermediaries we concentrate our attention on the asset side of the portfolio, assuming the existence of a standard liability, deposits. The bank can choose among state bonds that we call gilts, and three assets issued to private firms: bonds, normal loans and commitment loans. Bonds are divided in two categories, high rating and junk bonds.

We assume the existence of two intermediaries that face the identical problem in two different states. Every bank can purchase gilts and bonds issued by any of the two countries, while it can issue loans only to firms of its own country. We assume that gilts have no default or transaction costs, while bonds have default cost but no transaction costs. Transaction costs on bonds are assumed to be the same in both countries, because the common market for financial services was fully developed long before the introduction of the common currency. The balance sheet of the bank operating in one of the two countries (France and Italy) includes on the asset side: gilts issued by the Italian State, gilts issued by the French State, bonds issued by French firms, bonds issued by Italian firms, loans and commitment loans issued in the home country.

Bonds could be both high risk and high yield junk bonds, or very safe assets issued by large corporations with high credit ratings; the assumption that we make is that the correlation between returns and default costs is higher in the case of bonds than in the case of loans. Loans have a lower correlation because the investment in internal information reduces the impact of the asymmetry of the information. It is important to consider that banks should not be willing to buy bonds more risky than the loans they can issue, because junk bonds would normally be dominated by loans. The interest premium on junk bonds is a market price for the risk of the borrower and it is strictly dependent on the information available to the market. But

banks can rely on a more detailed set of information, based on "internal information", using Fama's [5] terminology. Since they are better informed than the market, they choose to issue loans to a particular borrower only if they can obtain a higher return than that on the corresponding bond, if they consider the risk to be correctly priced by the market. Or otherwise they lend at the same interest rate, if they consider that the market overvalues the risk of the borrower. In both cases their superior information set allows banks to obtain better conditions than the market. As a consequence, junk bonds should always be dominated by loans.

This result is produced by the current and past investment in information, because if this was not the case, banking institutions could not survive in the market. We can therefore assume that the relevant alternative for the portfolio choice of a bank is normally represented by bonds with a lower risk and return that are a good substitute for gilts. But many European banks might have not invested heavily in information in the past, because the market was highly regulated, and most banks in many countries were state-owned. For these banks the cost of the current investment necessary to undertake the evaluation of the borrowers would be too high, and would offset, in the current period, the benefits given by the internal information. These banks could have an incentive to hold some junk bonds, in order to diversify their portfolio of assets with a high return. Therefore we assume the existence of two classes of banks: "good" banks that normally do not hold junk bonds, and "bad" banks that hold junk bonds because they have not invested in the past.

Commitment loans are the class of loans for which information problems of the bank are less severe and they are normally issued to the best and most reliable clients. Accordingly it seems natural to assume that the adverse selection and moral hazard problem as interest rates rise are less severe for this class of borrowers. The expected return on commitment loans has to be lower than on normal loans, because they are less risky. If this was not the case, then they would have both a higher return and a lower variance, dominating the other class of loans and the bank would never choose to hold normal loans in its portfolio. Since there is no reason to assume default cost or transaction costs to be higher for the most reliable class of borrowers (they will most likely be lower), the mark-up must be substantially lower. In other words, competition in the credit market would transmit the benefits of the increased information to the borrowers in terms of a lower interest rate on loans. The lower mark-up implies that an increase in the common



interest rate factor causes a lower increase of the rate of this class than of the rate of normal loans. Besides, the maturity of commitment loans is spanned over a longer period of time than that of normal loans. Both these factors imply that, issuing commitment loans rather than normal loans, the bank undertakes a higher degree of smoothing of the shocks that affect their borrowers.

The following vector shows the expected returns:

$$\mathbf{x}_i = \begin{bmatrix} r_{g_f} \\ r_{g_i} \\ r_{b_f} - d_{b_f} \\ r_{b_i} - d_{b_i} \\ r_l - c_l - d_l \\ r_c - c_c - d_c \\ r_{j_f} - d_{j_f} \\ r_{j_i} - d_{j_i} \\ -r_d - c_d \end{bmatrix}$$

We can now define the matrix of variance and covariance, assuming the following:

The costs of different types of loans are positively correlated with each other.

Interest rates are positively correlated with default costs.<sup>6</sup>

The correlation between interest rates and costs of loans is higher for junk bonds rather than normal bonds. It is higher for bonds rather than loans, and for normal loans rather than commitment loans. Formally,

$$\rho_{d_j r_j} > \rho_{d_b r_b} > \rho_{d_l r_l} > \rho_{d_c r_c}. \quad (31)$$

The variance of the returns on normal loans is higher than that of commitment loans. The variance of the returns on bonds is even lower, the variance of the returns on junk bonds is higher than the variance of the return on loans. The expected returns on commitment loans are lower than on normal loans. The expected returns of bonds are even

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<sup>6</sup>As in Jaffee and Russell [14], or Stiglitz and Weiss [21].

lower than the expected returns on commitment loans, the expected returns on junk bonds are higher than the returns on loans:

$$r'_b < r'_c < r'_l < r'_j \quad \sigma_b^2 < \sigma_c^2 < \sigma_l^2 < \sigma_j^2. \quad (32)$$

Gilts have lower return and lower variance than any other asset.

All the shocks are independent white noise.

The value of the function  $\alpha_i$  that shows the sensibility of default cost to interest rate is higher for bonds than for loans and for normal loans rather than commitment loans. The reason is that the value of the coefficient  $\alpha_i$  is a function of the available information;

$$\alpha_b > \alpha_l > \alpha_c. \quad (33)$$

The variance of the return of an asset, for example normal loans is:

$$\sigma_l^2 = \sigma_{\epsilon_{cb}}^2 + \sigma_{\epsilon_l}^2 + \sigma_{\epsilon_{cl}}^2 + \sigma_{dl}^2 + 2\rho_{cbd} \sigma_{cb} \sigma_{dl} + 2\rho_{ldl} \sigma_l \sigma_{dl}; \quad (34)$$

the variance of the return the only liability, deposits, is

$$\sigma_f^2 = \sigma_{\epsilon_{cb}}^2 + \sigma_{\epsilon_f}^2 + \sigma_{\epsilon_{cf}}^2. \quad (35)$$

For simplicity we will rule out the effects of the correlation among assets and deposits.

All the covariances are the same as in the following example, concerning the covariance between loans and commitment loans:

$$\sigma_{lc} = \rho_{lc} \sigma_l \sigma_c; \quad (36)$$

the correlation terms of the covariances can be expressed, as

$$\rho_{lc} = \rho_{d_l d_c} + \rho_{d_l r_c} + \rho_{d_c r_l} + \rho_{c_l c_c} + \rho_{r_l r_c}. \quad (37)$$

The matrix has zeros only in the row and the column of the liability, and we will not show it because it is not particularly illuminating.

## 2.5 The effect of shocks

When the banking system is the main source of finance for firms, the activity of banks is centered on the issuance of different kinds of loans, through the analysis of information regarding different borrowers and the quality of their projects. The entrepreneurial activity of the bank consists of the screening and selection of different projects on the basis of the evaluations of expected returns and risks that the available information permits. When a shock hits the economy, the impact is lower on information intense assets, such as loans, than on bonds priced in the market. And the bank is often willing to absorb part of the negative impact of the shock on firms, in order to preserve the value of the stock of information.

Traditional banking activity reduces the impact of shocks in two different ways. When a firm defaults on its debt, while a default on bonds triggers liquidation almost immediately, banks are more willing to renegotiate the terms of their loans. The superior information set that bank possess allows them to price the risk better than the market. In second place, banks can often be willing to smooth the impact of shocks on debtors. In this case they refrain from increasing the interest rate in proportion with the increase in the cost of their liabilities (in the case of an interest rate shock) or in proportion with the increase of default costs (in the case of a credit quality shock). Banks compensate the reduced income when the negative shock hits the economy with an opposite behavior when a positive shock favors the debtor. In this way they can obtain higher average returns and lower volatility of their returns. This behavior is favored by the possession of market power, otherwise firms could choose to borrow from a competitor in good periods, and the development of this kind of implicit contract could only be the outcome of the establishment of a strong long-term relationship.

The insurance provided by the credit system is very important for firms, but the cost that firms pay for this service is high. Banks in fact exploit their market power in order to maximize their profits. The spread between the rate on their liabilities and the rate on their assets can be very high and represents a heavy burden for liquidity constrained firms. The development of a large market for bonds changes the picture completely. Firms that are large enough to sustain the transaction costs (that include in particular the cost of conveying the relevant information to the market) can get access to the bond market. Banks that are willing to lend to large corporations have to offer them terms and conditions competitive with the bond market. On

the other hand, banks can still exploit their market power, charging higher rates to small firms.<sup>7</sup>

### 2.5.1 A monetary shock

We will first consider the effect of a perfectly anticipated monetary policy shock that affects positively all the returns, applying parts 1) and 3) of the theorem of section (2.1). Under our assumptions, the variation of interest rates *per se*, being proportional to each security, leaves the portfolio problem unchanged. But because of asymmetric information, default costs increase as the interest rates rise, partially offsetting the positive effect on the rates.<sup>8</sup> The key point to note is that default costs do not increase symmetrically, because commitment loans are extended exclusively to the best customers. As customers are screened and divided into two classes, the problems of asymmetric information affect normal loans to a much higher degree than commitment loans, causing the higher correlation among interest rates and costs of normal loans. The correlation is even higher in the case of bonds, and this is true for any category of bonds, because it is the investment in information that reduces the correlation. Since junk bonds are more risky than normal bonds, we can assume that the correlation is lower in the case of normal bonds than in the case of junk bonds.

The interest rate shock in itself increases proportionately the variance of different assets, shown in equation (34). But the effect of the correlation between interest rates and default costs clearly causes an asymmetric impact on different classes of assets. This implies a proportional shift of the optimal portfolio from bonds to loans and from loans to gilts. Since the effect is stronger for normal loans, the contraction is not proportional: the quantity of normal loans held will be reduced more than the quantity of commitment loans, the holding of bonds will be shrieked even more. The conclusion seems inescapable: the increase of interest rate will shift the portfolio of the bank. The bank will substitute gilts for loans, commitment loans for normal loans and loans in general for bonds.<sup>9</sup> As the shock hits the economy, banks

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<sup>7</sup>Empirical works show that in general banks benefit from market power in the market for loans, see for example Cosimano [4]

<sup>8</sup>When interest rates are sufficiently high and the increase in interest rates is of significant magnitude, the effect on default costs might overcome the effect on rates, as Stiglitz pointed out on many occasions. But we consider the "normal" case here.

<sup>9</sup>Berlin and Mester [2] provided some evidence in favor of the hypothesis of intertem-

tends to hold more state bonds rather than private sector assets. At the same time there is a tendency for the relationship between firms and banks to strengthen, banks reduce their holdings of bonds in favor of loans, and increase in particular the amount of commitment loans they hold.

We have assumed for simplicity that the increase in interest rates is symmetrical. If we relax this assumption, the results hold *a fortiori*. Competition in the credit sector is much weaker than in the stock market, where bonds are traded, because of the importance of inside information. Banks charge a mark up to their borrowers, but implicitly provide an insurance, not raising the rates proportionately when they go up, and not reducing them proportionately when they go down.<sup>10</sup> The most reliable customers benefit from a lower mark up, as a consequence the impact of the rise of the rate would be lower on the rates of commitment loans.

When interest rates go up, banks have a benefit because the returns on their assets grow, while firms are negatively affected by the higher cost of finance. The negative impact on firms is transmitted to banks as an increase in default costs. Using their superior information set, banks can reduce the negative indirect impact of the higher rates, providing insurance to firms. Spanning the increase of the rates over a longer period of time, banks provide a useful service to firms, because they smooth intertemporally the impact of shocks. As a compensation for the service provided they get higher average returns on their assets. Since most of the increase in the returns comes from a reduction of default costs, banks can provide this form of insurance because they can exploit the information in their posses, selecting the firms to which is profitable to provide insurance. The market cannot provide this service because it does not possess the necessary information to reduce the impact of the asymmetry of the information discriminating among firms.

### 2.5.2 A real shock

A negative real shock that hits the borrowers affects the cost structure of the bank in two different ways. The first and most obvious effect is an

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poral smoothing through the exploitation of long term relationships. According to their results "in general loan rate smoothing in response to a *credit risk* shock is not part of an optimal long term contract between a bank and its borrower, while loan rate smoothing in response to an *interest-rate shock* is". For a credit risk shock, only for the smallest subset of banks could a significant positive relation be found.

<sup>10</sup>See Fried and Howitt [6].

increase of the probability of default that reduces the expected return on loans. This time there is no reason to believe that the shock hits different categories of assets in a different way. As the shock hits the economy, all classes of debtors are affected, and costs are expected to increase in the same proportion. The higher correlation between default costs and interest rates of normal loans determines a tendency for a more than proportional reduction of the holding of normal loans rather than commitment loans. But this time the effect is much smaller than in the case of a monetary shock, because the asymmetry affects only the covariance terms of all the components of the variance of each asset. Accordingly, the first order effect is for the bank to reduce proportionately the holdings of both types of assets, as the appeal of safe bonds increases. The substitution between the two kinds of liabilities depends this time on a second order effect and in many instances it may turn out to be insignificant. Its importance depends on the segmentation of the market between the two categories of loans and it is likely to be significant only in the case of a very high correlation between the idiosyncratic component of the return and the default cost for normal loans and a very low one in the case of commitment loans.

The shock produces at the same time a strong effect on the demand for finance. A negative shock reduces the cash flow of firms and has a negative impact on their credit rating, as a consequence firms find increasingly difficult to obtain finance in the stock market. The demand for loans goes up and the higher demand produces an increase of the expected return on loans. Because of the higher expected return the bank might be willing to increase the share of loans in its portfolio.

The final effect on the composition of the portfolio depends on the relative strength of the two opposite effects of the shock on returns and variance of loans. If the negative effect on the return on loans due to the increase in default costs prevails, the bank will tend to increase the quantity held of safe assets, such as gilts or high rated bonds. If on the contrary the positive effect on the return of loans prevails (as it is the case when competition in the banking sector is limited), banks would benefit from the higher rates charged to borrowers, in order to exploit as much as possible their market power.

It is important to observe that under both scenarios the impact on firms would be negative. The choice to hold gilts and other safe bonds in the portfolio would reduce the supply of funds in the market, increasing the cost of finance in the moment when firms are cash-constrained. In the alternative scenario, banks would actually increase their loans, but because they can

exploit their market power, they raise the cost of finance for firms.

We have previously shown that when an interest rate shock hits the economy, banks might be willing to smooth the shock, because they have a superior information set regarding their customers, and they can price better than the market the different impact of the increase in the risk of default. Better information allows banks to concentrate the portfolio on borrowers that are affected less by the shock; the flight to quality brings banks in closer relationship with the best customers. When a negative real shock hits the economy, different firms are affected in different ways, and even in the case of the worse shocks, some industrial sectors might benefit when most of the others lose. The impact is different among different firms, among different industrial sectors and among different economic regions. On the contrary, there is no reason to believe that different categories of assets of the bank are affected differently. The reason is that banks cannot forecast the shock better than the market and they cannot price *ex ante* the eventuality of the shock, nor, even more importantly, the distributive effects of the shock. After the shock, some of the borrowers have been affected more, some other less. Many firms are liquidity constrained and their risk of default has gone up. In this situation the market for bonds dries up, because the higher uncertainty makes it very difficult for the market to price properly the risk, because a large scale lemon problem emerges. Banks possess internal information that allows them to partially overcome the lemon problem and have invested heavily in the past to build the relationships, so they are reluctant to cut the credit to their long term borrowers. For this reason, in general they might be more willing to absorb the shock than the market. But at the same time, their market power is increased notably, because the demand for finance is higher and the supply of bonds, the main substitutes of banking facilities, is drastically reduced. So banks face a strong incentive to exploit the market power, charging a higher price for the smoothing of the shock. Since the impact of a real shock is very different among different borrowers, it is very different among banks too. And geographical differentiation plays a key role. Small local banks often have a portfolio whose risk is concentrated on a few industrial sectors; these banks can be more willing to smooth the real shock, because if the shock hits many of their customers, they have no one else to lend to. They will charge firms for the insurance they provide, increasing the average cost of finance over a long period of time, but they can't exploit their market power in full. Banks whose portfolio is sufficiently diversified can be willing to use the information they possess in order to ex-

exploit their market power. In this case, they still smooth the shock, because in the absence of banks, credit would be rationed, but they charge a higher fee for the insurance provided.

In general, when an interest rate shock hits the economy, banks benefit from the shock and they have an incentive to provide insurance to firms against the shock, using the information that they possess (that is not available to the market) to select the customers to insure. When a real shock hits the economy both firms and banks are negatively affected. But since the business of banks is more diversified they are less risky than the average of industrial firms. Under these conditions, poorly diversified banks have an incentive to use the information at their disposal to provide insurance; better-diversified banks find more profitable to use the information to increase the efficiency in the allocation of capital. Larger banks might choose to create an internal capital market in order to exploit the continuous variations of the risk-return profile of assets of different regions.<sup>11</sup> Since the shock at the same time increases the demand for finance and reduces the availability of substitutes for banking services, the role of banks becomes crucial under these conditions. The available information allows banks to gain from arbitrages that are normally conducted by the market, and to exploit their market power lending to high-risk customers at very high rates. Diversification gives banks a wider set of opportunities, increasing the market price of the liquidity they provide.

The empirical results of Berlin and Mester [2] and [3] confirm these conclusions, showing that apparently only local banks tend to smooth real shocks.

## 2.6 Geographical diversification

The range of diversification of the portfolio is determined *a priori* by the relevant set of assets and liabilities. But the availability of a wide range of securities depends crucially on the technology to obtain and process the information and on the stock of information accumulated in the past. If relevant economies of scale are present in the information technology, large banks might have a competitive advantage in relation to the small ones. The technology would in this case grant the availability of a higher degree of diversification. In this framework, the dimension is relevant only to the

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<sup>11</sup>Houston and James [7] showed that this is an empirically relevant phenomenon in the US.



extent that large banks have exclusive access to certain assets (as loans to large corporations) that are precluded to the small ones. But a local bank that has developed across time a strong network of personal relationships can issue loans with a risk-return profile that is not always available to the large one. Large banks have a competitive advantage only if they are highly capitalized and at the same time they have invested heavily in the past to establish personal relationships at the local level. And it might be possible for diseconomies of scale to emerge in the management of the available information. (It can be very difficult for employees of large banking corporations, that are part of a bureaucratic system, to develop the mental attitude and the skills of the entrepreneur of a local bank.)

The crucial aspect of the problem is represented by the availability of alternative assets that are poorly correlated among each other. From this point of view a major factor seems to be represented by the range of possible geographical diversification. Different regions are in general characterized, both in Europe and in the US, by different productive structure and different business cycles. The extent of the possible diversification might crucially depend on the extent of the regulatory barriers that are imposed to the location of credit intermediaries. The empirical evidence available, as in Hughes et alia [9], shows that a larger geographical diversification improves expected returns and efficiency, without reducing the insolvency risk of banks. The availability of a wider range of risk-return combinations, while certainly beneficial for the bank, does not necessarily imply a reduction of the risk undertaken, as the authors stress. The equilibrium in the new possibility frontier might in fact involve higher expected returns and higher variance, the final outcome being dependent on the structure of preferences.

### **3 The bank's risk attitude and the EMU**

In continental Europe the importance of the stock markets as a source of finance for firms was relatively modest until the end of the eighties. The market for bonds issued by private firms was almost non-existent, and most firms were entirely dependent on banks to finance their investments. The only financial markets that were on a par with their American counterparts were the national markets for state bonds that had grown in order to finance the large debts accumulated by all European states. In many countries, a large number of industrial firms and banks were still owned by the state,

directly or indirectly.

The following decade has produced a revolution that has permanently transformed the industrial structures of most European countries, and radically changed their financial markets. The first major innovation was the reduction of the structural deficit and the stabilization of public debts, following the adoption of the Maastricht treaty and of the stability pact. After the major convulsions of 1992 and 1993 the markets for state bonds have seen a progressive stabilization, as the risk profile of most European countries has improved, and as a consequence of the process of convergence towards the monetary union.

The large programs of privatization undertaken have increased enormously the importance of stock markets, as they have attracted savers that were previously reluctant to invest in the stock market. The privatization of large industrial and banking firms has pushed the financial markets of the continent to adopt an Anglo-Saxon model of corporate governance, with the introduction of public companies whose shares are owned by a large number of investors. Overall the passage of the control of large sectors of the economy from the state to the private sector has increased the efficiency of the system, but it has increased as well the sensitivity of the economy to shocks, increasing, on average, the volatility of financial assets.

The introduction of the euro has pushed forward the development of a common European market for capital, thereby improving the allocation of capital. One of the main achievements has been the development of a eurobond market that is comparable with the market of the US. The development of a market for commercial paper denominated in euro has been a major change, since it has for the first time broken the dependence of European firms from banks. Firms can now choose among a large set of securities, such as shares, bonds and convertibles that compete with loans issued by banks. Banks on the other hand are now freer from political pressures, they can refuse the granting of loans to public and semi-public firms and can allocate capital efficiently. Traditional banking activity suffers from the competition of stock and bond markets, but at the same time banks get a larger share of their profits from the commissions earned through primary placements. The development of capital markets has allowed banks to resell many of the risks they undertake by means of securitization and the huge development of this market has represented another major change.

The introduction of the common currency has been the last step of this long process. The actual introduction of the euro and the establishment of

the ECB have brought some further changes in financial markets. The abolition of exchange rates has harmonized different national markets, establishing *de facto* the common market, because the country-specific risk has virtually disappeared in the twelve members of the EU. Besides European financial markets are now subject to the same monetary policy shocks, and the synchronization of the business cycles of most countries has increased in the last decade.

Some of the members of the Union have different economic structures among regions and relevant problems of regional asymmetries in economic development. Italy, Spain and Germany all have their own "mezzogiorno".<sup>12</sup> The virtual absence of flexibility in the wage structure and the reduced mobility of labor determine structural unemployment and the output gap. Imperfections in credit markets exacerbate the problems, reducing the availability of finance in underdeveloped regions and the risk-taking activity on the part of the banking system that normally shares the burden caused by adverse shocks to the economic system.

The development of a eurobond market competitive with the market of the US has increased the availability of finance for European firms. The establishment of the single currency has drastically accelerated the development of the European financial markets, reducing the dependence of the industrial system on the banking system. At the same time it has increased the range of assets available for both savers and intermediaries, increasing the possibilities of risk diversification. One of the major outcomes of the development of financial markets in the common currency area was the creation of a common market for risk, allowing the market to pool risks among different countries and increasing interregional risk sharing.<sup>13</sup>

## **3.1 Effects of the common currency on the portfolio**

### **3.1.1 State bonds and private sector securities**

The effect of the common currency on relative returns and volatility of gilts issued by different members of the Union is uncertain. The Maastricht treaty has produced a reduction of returns and variance on bonds issued by countries with a larger burden of debt. The treaty has not probably affected the cost of

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<sup>12</sup>For an early diagnosis of the problems of German reunification see Hughes Hallett and Mélitz [11] and Hughes Hallett and Ma [10].

<sup>13</sup>See Mélitz and Zumer [19]

the debt of the other countries much. Assuming that risk is efficiently priced in the bond market, the joint reduction of returns and variance should have not moved the efficient frontier in a relevant way.

The main effect of the introduction of a common currency has been a strong increase of the correlation among different gilts that are now denominated in the same currency. Interest rates are now influenced by a common monetary policy, bonds issued by different member states are now subject to a common shock. Fiscal policy constraints determined by Maastricht criteria and the stability pact have led to a further convergence of rates and risk profile, increasing the correlation even further. As a consequence, the idiosyncratic components of the interest rate on different gilts have converged too. The increase of the correlation among gilts has strongly increased their covariance, as benefits from diversification are drastically reduced. But at the same time the reduction of the standard deviation of every security has worked in the opposite direction. In our model, gilts issued by the French and Italian state, that were held in different proportions as separate components of the portfolio, are now virtually the same. Since returns and variance have converged, and the covariance has been affected in opposite directions, it is not possible to establish if the two separate state gilts had previously a larger or smaller share of the portfolio than they have now that they behave as a virtually identical asset.

The establishment of a common currency has had a different impact on private assets. Risk and return of loans and commitment loans are not directly affected by the disappearance of the exchange rate. The correlation among private sector assets has increased, but much less than in the case of state bonds. The increase in the correlation was entirely dependent on the disappearance of the exchange rate risk and the establishment of the common monetary policy. But in the case of the return of private assets, the idiosyncratic component is the most relevant, and it has not been affected in a uniform way. Besides, returns of market assets depend on default and transaction costs as well as on interest rates. Default costs are not likely to have been affected directly by the establishment of the common currency. Transaction costs might have been affected, because in the bond market some economies of scale might have been achieved with the introduction of the common currency. But this effect would have been an increase of the net return of all different classes of bonds, including state bonds.

In conclusion, it is not clear if and how the introduction of the euro *per se* has affected the distribution of the portfolio of banks between private sector

and state assets.

### 3.1.2 Bond markets and risk intermediation

Bonds issued by corporations can be both assets with a lower risk and lower return than loans (as in the case of most bonds issued by firms that have an investment grade rating) or with higher risk and return (such as junk bonds). The development of a large market for bonds issued by private firms has allowed the possibility of diversification among different assets issued by the private sector. The reduction of the covariance among these assets due to the increase in diversification causes a shift of the portfolio of banking intermediaries, in favor of private sector assets. But at the same time another factor works in the opposite direction: some bank customers can now issue junk bonds, reducing the demand (and the returns) of loans. The lower returns on loans increase the appeal of state gilts.

The availability of a wide range of bond gives firms a wider range of options to finance their investments, reducing the market power of banks. At the same time bonds provide banks, even small local banks, with the opportunity to diversify part of their asset portfolio, reducing their dependence on the traditional activity of issuing loans. This factor might reduce the willingness of banks to rely on the traditional activity, reducing the availability of finance for small firms that do not have access to financial markets. "Good" banks should only hold high rating bonds in their portfolio, as a substitute for gilts. But in the European banking sector "bad" banks had a relevant share of the market, because in many countries the banking sector was directly or indirectly under the control of the state until very recently (in Germany this is true even today). Overall many European banks might have decided to hold bonds in their portfolio of assets. Apparently this should not change the risk-taking activity of the banking sector, since holding bonds they still finance the private sector. But there is a crucial difference: when the bank keeps bonds in its portfolio, the risk is simply transferred from the shareholders of the firm to shareholders and depositors of the bank. When the bank issues loans to the private sector, it reduces the overall risk, because its entrepreneurial activity, the analysis of information, contributes to the selection of the best projects.

This tendency for a reduction in direct risk-taking activity on part of banks might have been more than compensated by the great development of the market for securitization that has occurred in recent years. Santomero

and Trester [20] have proved that "the risky asset portfolio held by the banking sector unambiguously increases as a result of the innovation considered." Their model shows that securitization allows banks to face better any eventual liquidity shock, so they can take more risky positions. The development of a market for securitized assets has pushed the banking system to take more risk.

The wider range of available alternatives for investment is likely to have increased the share of private assets in the portfolio of banks. The development of a market for bonds issued by private corporations has widely increased the range of financial instruments available. The process of privatization and deregulation has increased the efficiency and the risk-taking activity of large sectors of the economy that were previously under the control of the state. Besides, the development of a European market has allowed the exploitation of large economies of scale in many sectors producing many new opportunities for investment.<sup>14</sup> The wider range of activities due to the development of new industrial sectors, increases the possibilities of diversification. The increased diversification reduces the covariance among securities issued by the private sector, reducing the variance of classes of private assets, such as loans and bonds. A straightforward application of the comparative-static theorem developed in the previous chapter shows that the portfolio of banks should have substituted private sector assets for state bonds. The development of securitization has reinforced the process,<sup>15</sup> pushing banks to increase their risk-taking activity. As a consequence, the credit system should have undertaken a larger share of the risk of the private sector.

## 3.2 Shocks, portfolio allocation and the euro

### 3.2.1 Monetary policy shocks

Interest rate shocks change the optimal composition of the portfolio of financial operators, pushing the bank toward relationship lending, strengthening the link with the firms. This kind of reaction has been strengthened by the establishment of the common currency. Different European countries are now subject to a common shock, and financial intermediaries cannot reduce their exposure by means of geographical diversification. The disappearance

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<sup>14</sup>The debt of some European telecommunication companies is today of a size comparable to that of the small states members of the Union.

<sup>15</sup>As the model of Santomero and Trester shows.

of exchange rates and the establishment of a common monetary policy have reduced in a relevant way the possibilities of diversification among all kinds of assets traded in financial markets, bonds, gilts, stocks or other securities. In the new monetary regime, the correlation of the interest rate component of the returns of all different securities has increased, reducing the possibility of washing away the risk through diversification.

The concomitant development of the market for bonds and other securities, such as securitized loans, has not reduced the impact of interest rate shocks, because bonds are more subject to this kind of risk than loans. Banks can reduce the impact of interest rate shocks on default costs and on the variance of their portfolio only relying on informational intensive assets such as loans and especially commitment loans. After the introduction of the euro, intertemporal diversification has become more appealing. Because of the reduced possibility of geographical diversification, benefits associated with relationship lending, that bring about a reduction of the variance of the portfolio, have become more valuable. For example, the debt of firms operating in the telecommunication sector is now subject to the same interest rate shock. Banks cannot reduce much the risk of the shock diversifying their loans among different European operators. An increase in the rates due to a tougher monetary policy of the ECB would push banks toward loans, reducing the bond component of their portfolio. Italian banks would increase their loans to the Telecom Italia and French banks to France Telecom, reducing their holding of bonds of other operators, because by issuing loans they could monitor the debt from inside.<sup>16</sup>

The shift of the portfolio of the bank toward loans affects in a relevant way the risk attitude of the bank. The introduction of the euro has reduced the trade-off between the two kinds of diversification and banks are, according to the model, more willing to absorb shocks. Banks have to rely more on intertemporal diversification, and are more willing to smooth an interest rate shock in order to reduce the volatility of their portfolio.

The important conclusion is that asymmetries in the effects of monetary policy are reduced by the operation of the banking system.<sup>17</sup> The stronger the shock, the stronger the incentive for banks to rely on traditional activ-

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<sup>16</sup>In the model we have assumed that banks can issue loans only in their home country, but a bank operating across different countries would not be less exposed to interest rate shocks, because the shock is common.

<sup>17</sup>The problems of asymmetries in monetary policy are discussed in Hughes Hallett and Piscitelli [12]

ity where smoothing of the shock is part of the optimal (implicit) contract. Besides, the stronger is the adverse effect of the shock on firms, the stronger becomes the incentive for banks to rely on information-intense banking activity. The introduction of the common currency has reinforced this effect. The increase shock absorption of the financial system mitigates the impact of the interest rate shock, reducing the eventual asymmetry of the effects of monetary policy.

### **3.2.2 Real shocks**

Real shocks change relative prices causing the default of some of the firms that are negatively affected. Creditors of these firms suffer a credit quality shock; the returns of the banks that are exposed are reduced and the risk of their portfolio is increased at the same time. The main factors determining the shocks are technological developments, changes in tastes and preferences of individuals and variations in the availability of resources. In general, these factors do not seem to be affected in a straightforward way by the introduction of the common currency. The effect of the common currency on the symmetry of real shocks is an empirical issue that is quite open.

The main route for banks to reduce the impact of real shocks on their balance sheet is geographical diversification. Different economic regions have different productive structures and the same shock affects different firms in a different way. The lower the correlation of the impact of the shock on different regions, the higher the benefits of diversification. Our portfolio model showed that diversification increases the value of the market power, produced the monopoly that banks have on internal information. The higher the diversification and the market power of banks, the higher the cost for firms of the insurance provided against the shock. The introduction of the euro has pushed forward the consolidation in the credit market, as national central banks have been in favor of the creation of national champions. Many regional banks have disappeared and the market share of local banks has declined. The reduction of the market share of local and regional banks has increased the cost for firms of the intertemporal smoothing of shocks.

The development of the eurobond market has produced an increase in the availability and a reduction in the cost of finance for firms. But when a negative shock hits the economy, a large-scale lemon problem affects the market for bonds, and firms have to rely on banks in order to obtain liquidity. As a consequence, the negative impact of the shock is not mitigated by the



existence of the bond market. And the banking system would not tend to reduce the asymmetry of the impact of real shocks hitting the economy, because highly diversified banks smooth unevenly. The existence of a large market for securitized loans reinforces the process further on. Santomero and Trester showed in fact that the increase of the risk of the portfolio brought about by the availability of securitization makes banks more vulnerable to instability and default.<sup>18</sup> The increased sensitivity to default cost makes bank less willing to absorb shocks.

With the exception of small local banks, the banking system tends in general to amplify the asymmetric effect of real shocks. The main conclusion of this section is that the transformation of the financial sector brought about by the introduction of the common currency has worsened the problem. The process of privatization have increased the efficiency of the economic system, but it has at the same time increased the sensitivity of the economy to shocks. The development of securitization and of the bond market have increased the risk-taking of banks and reduced their margins in lending to large firms. Finally, the consolidation in the banking sector has reduced the role of regional banks and the relevance of the implicit insurance that they provide to firms.

### **3.2.3 A common market for banking activities?**

The institutional framework plays a crucial role in this story. The Maastricht treaty has left the regulation of the banking system to national central banks that have been particularly concerned with the protection of the national ownership of banks, and have restrained the access of foreign banks. The introduction of a common market for banking activities would have a strong impact. The segmentation of European national credit systems makes banks

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<sup>18</sup>”The results suggests that the risky asset portfolio held by the banking sector unambiguously increases as a result of the innovation considered. A reduction in illiquidity increases the banking sector’s willingness to provide risk capital for real sector investment. On the other hand, the existence of a market for bank loans does not in and of itself imply that banks will become more or less risky. Rather, there exists a trade-off between external shock risk, which is alleviated by increased asset liquidity, and the risk-taking by banks on the returns of their assets, which is encouraged by these market changes. Such innovation encourages credit risk-taking and increases insolvency risk . . . On the one hand, banks are providing increased resources for the development of real sector capital as a result of these changes. On the other hand, they are doing so by adding risk of default to their portfolio.”, Santomero and Trester [20], p. 36.

heavily subject to macroeconomic shocks at the national level. If banks could diversify to a large extent their loans portfolio among different European states (or among different European regions), the increased diversification of their portfolio would improve the stability of the credit system and the competition among large banks could be drastically increased.

Banks tend to smooth interest rate shocks. Under a more geographically integrated banking system, interest rate shocks would still be absorbed, as the incentives to smooth the shocks remains strong. The possibility of a larger diversification of loans reduces by itself the covariance among the assets in the portfolio, reducing the risk of default of loans. But interest rate risk cannot be completely washed away by diversification, because the shock is common to all countries. Anyway, because of differences in the industrial and financial structure among different countries and regions, the impact of the monetary policy shock is asymmetric. In this case diversification can sensibly reduce the risk of the portfolio of loans. Our analysis showed that an interest rate shock produces a shift of the portfolio from bonds to loans, increasing the risk absorption of the banking system. The possibility of higher diversification among loans would reduce the incentive to hold bonds and banks would become more willing to rely on the traditional activity, smoothing the impact of shocks. As a consequence, a more integrated banking sector should reduce the impact of asymmetric shocks, and it would be more robust to the same shocks than a decentralized one.<sup>19</sup> If the effect of interest rate shocks is symmetric among countries the development of an integrate credit system would not change the pattern of reaction of banks to this kind of shocks. In general, *the more asymmetric are the effects of monetary policy, the more important is the development of an integrated European banking system.*

The impact of real shocks is felt by the credit system as an increase in default that reduces net returns and increases the volatility of the portfolio. According to our analysis, most banks, and large banks in particular, have a strong incentive to smooth unevenly, increasing the cost of the smoothing in the regions hit negatively by the shock, and reducing the cost in the regions where the shock has a positive impact. The development of an inte-

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<sup>19</sup>Mc Pherson and Waller [16] made a comparative analysis of the responses to bank lending of the economies of US and Canada. They showed that in the US bank loans cause, in the Granger sense, regional income fluctuation and vice versa, while this effect cannot be detected for Canada. They attributed this diversity to existence of a nationwide banking sector with branches all around the country in Canada, while the banking sector is still very fragmented in the US.

grated European credit system would amplify the asymmetry in the impact of real shocks. The reason is that the increased diversification would increase even further the incentive to smooth selectively. As a consequence, *the more asymmetric are the effects of real shocks, the higher are the benefits from a decentralized banking system.* This outcome could be moderated only when the development of a common market would increase competition, reducing the market power of every bank. But the political choice of a period of transition during which central banks make sure that the ownership of the main banks is not under foreign control has already produced a strong increase in the concentration of the sector.

The establishment of an integrated European banking system, dominated by a few large players could drastically increase the problems of regional asymmetries in the effect of real shocks. Problems that could not be solved by any scheme of insurance that do not imply a relevant redistribution and would persist as long as the budget of the community would not be increased substantially.<sup>20</sup> The increase in competition caused by the establishment of an integrated market for banking activities would certainly be beneficial for the economic system as a whole. Benefits from diversification would be large as well, increasing the stability of the credit system and improving the efficiency in the allocation of capital, increasing the availability of finance in the most dynamic regions. But the cost represented by the procyclical activity of the credit system, that might exacerbate the impact of real shocks should not be underestimated.

## 4 Conclusion

Banks smooth the impact of shocks, providing insurance to firms, but they smooth monetary policy and real shocks in different ways. Interest rate shocks tend to push banks towards more informational intensive assets, such as commitment loans, strengthening the relationship between banks and firms. They provide liquidity on demand, not transmitting the increase of the interest rate in full. As a compensation for the insurance provided, they charge a higher average interest rate to firms. The reaction of banks to real shocks is affected by the degree of diversification of the portfolio of the banks. The higher the diversification of the portfolio, the higher the incentive to smooth the shock unevenly, increasing the cost of the smoothing for

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<sup>20</sup>See Mélitz and Vori [18] and Mélitz [17].

the firms that are badly affected by the shock, and reducing the cost for the firms that are positively affected.

A major change brought about by the introduction of the euro has been the development of financial markets in Europe. Large programs of privatization have increased the role of stock markets, the eurobond market has become competitive with the bond market of the US, and a large market for securitized assets has taken place. The outcome of the process was the adoption of an Anglo-Saxon model of corporate governance and the reduction of the role of banks as the main source of finance for industrial firms. The process has increased the possibilities of diversification among assets issued by the private sector, and the possibilities of diversification of the risk among different industrial sectors, reducing the appeal of state bonds. Banks had to become more market oriented and needed to increase their risk-taking activity. Firms have benefited from the increased competition in the financial markets, but when negative real shocks hit the economy, a large scale lemon problem emerges in the market for bonds. In these conditions, firms have to rely on banks, in order to obtain liquidity when cash-constrained. Since the portfolio of banks is now more widely diversified, the opportunity cost of providing insurance, smoothing the shock, has increased. As a consequence, the introduction of the common currency has reinforced the incentive to follow the previous pattern of reaction to shocks.

The introduction of the common currency has increased notably the risk insurance provided by the market. Households and financial intermediaries hold today a much more diversified portfolio, and the impact of idiosyncratic shocks is widely distributed. The increase in bank's risk-taking activity produces lower asymmetries in the effect of monetary policy, but it might, on the other hand, amplify regional asymmetries produced by real shocks. The further step in the process would be the creation of a common European credit market, transferring to the ECB the authority to regulate the market. The development of an integrated banking system would be beneficial because it would increase competition in financial markets and reinforce the stability of the credit system. Asymmetries in the effect of monetary policy would be reduced, but the asymmetric impact of real shocks might be amplified, exacerbating regional disparities. In order to mitigate the problem, competition within the banking system should be increased, and a policy of free entry for new local banks should be put forward.

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