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Testing for Imperfect Competition on EU Deposit and Loan Markets with Bresnahan's Market Power Model

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I. Introduction

In recent years, numerous developments have affected the markets where banks operate: deregulation, liberalisation, globalisation and various technological innovations. Each of these developments has influenced the competitive conditions of banks. Adding to this, monetary and financial integration in Europe, including the introduction of the euro, has contributed to a further increase of foreign competition in the region. As banks' market power affects their profitability, competitive conduct also has an impact on the soundness and stability of the financial sector. Healthy competition and a sound market structure are also important for social welfare, implying as they do low prices, low interest rates and adequate lending to consumers and firms, in particular small and medium-sized enterprises. Market imperfections would cause allocative inefficiency and so detract from the prosperity which society derives from banking services. Of course, it should be kept in mind that competitive conditions differ across product and geographical markets and are also subject to continuous changes over time. Finally, the competitive structure of financial markets has major implications for the effectiveness of certain instruments of monetary power, such as the discount rate and required cash reserves. The effects of monetary policy on financial prices and quantities depend crucially on the extent to which individual banks are in a position to exploit credit demand and deposit supply functions (Swank, 1994). Remarkably enough, given the vital importance of competition for social welfare and policy making, the economic literature provides only limited information about competitive conduct in the European banking markets. Apart from measurement problems – compe-

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tition cannot be observed directly – a lack of sufficient data also impedes a clear view on bank market structure, especially outside the US. Therefore, various measurement approaches are needed to squeeze the limited data sources dry.

The literature on the measurement of competition among banks may be divided into two major streams: structural and non-structural approaches. The *structural approach* to the measurement of competition embraces the Structure-Conduct-Performance paradigm (*SCP*) and the efficiency hypothesis, as well as a number of formal approaches with roots in Industrial Organisation theory (Bikker and Haaf, 2002[b]). The two former models investigate, respectively, whether a highly concentrated market causes collusive behaviour among the larger banks resulting in superior market performance or, conversely, whether it is the efficiency of larger banks that enhances their performance. In reaction to the theoretical and empirical deficiencies of the structural models (Bikker and Haaf, 2002[b]), non-structural models for the measurement of competition were developed, namely the Iwata model (Iwata, 1974), the Bresnahan model[2] and the Panzar-Rosse model (Panzar and Rosse, 1987). These New Empirical Industrial Organisation approaches test competitive conduct and the use of market power, and stress the analysis of banks' competitive conduct in the absence of structural measures.

The Iwata model has hardly been used empirically, an exception being Shaffer and DiSalvo (1994), who apply it to a two-bank market. The Panzar and Rosse (PR) model has proven to be a useful tool for observing competition. This model is based on the comparative static properties of the reduced-form bank revenue equation. The PR model uses data for individual banks, which tend to be available in ample quantities, allowing fairly precise estimations of competition (Bikker and Haaf, 2002[a]). A disadvantage of the PR approach is its assumption that banks provide one banking product only. Hence, it does not allow us to distinguish between different product or geographical markets, which by the way would also be hampered by a lack of required data, *e.g.* bank-level interest rates and production figures. This is precisely where Bresnahan's model can play a supplementary role, as it allows the investigation of submarkets, due both to its nature and to its data requirements. On the other hand, Bresnahan's model uses macroeconomic data, which limits its possibilities, because these data are made available on an annual basis only.

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2 See *Bresnahan* (1982) and *Lau* (1982). This technique is elaborated further in *Bresnahan* (1989).

The present article applies Bresnahan's model to two submarkets, deposits and loans, in nine countries of the European Union (EU). For each submarket, we apply the model to all countries together as well as to each of the nine individual countries. This survey is unique in this body of literature in that it compares market power for so many countries. The deposit market reflects banks' competitive conditions with respect to funding and hence mirrors their activities on the liabilities side of the balance sheet. The product or service considered here is the supply of deposit facilities. This retail market is interesting as it is by nature localised, so that the number of competing banks tends to be limited, except for the more recently mushroomed Internet banks. The introduction of Internet banking may have increased competition in this market. On the other hand, it should be noted that the Internet is an alternative for part of the customers only. The loan market refers to the main (traditional) activity of banks, lending, which is representative of the assets side of the balance sheet. The lending market has mainly a nation-wide or international dimension, assuming that only smaller amounts are involved in lending to (local) small and medium-sized enterprises. These markets may be assumed to be fairly competitive, as banks in this business usually face many foreign competitors. Given the data requirements of Bresnahan's model, the choice for deposits and loans is also determined by the availability of the pivotal prices on these markets: the deposit and lending rates.

This article has been organised as follows. Section II sets out the theoretical structure of the Bresnahan model and its empirical application to the deposit and loan markets. Section III describes the data and estimation methods used and presents the estimation results for both markets in the whole EU region, as well as in each of the nine EU countries separately. Finally, a comparison is made to other studies employing Bresnahan's model or related approaches. Section IV contains a summary and conclusions.

II. The Bresnahan Model

In order to seek to determine the degree of market power of the *average* bank in the short run, Bresnahan (1982) and Lau (1982) developed an Industrial Organisations type of model of profit maximising oligopoly banks. The Bresnahan model we will use is based on the intermediation paradigm of a bank, as in Shaffer (1989, 1993), who furthermore assumes that banks produce only one product and use several input factors.[3] As proposed by Shaffer, our cost functions are based on factor input prices. Taking for granted that factor inputs are not the same for loans and deposits, our Bresnahan model separates the costs of banking activities, *i.e.* it ignores the interdependence of cost functions for the two products. We estimate the demand and supply relations separately for the deposit and loan markets, assuming that banks try to maximise profits at the product level rather than taking advantage of possible cross-subsidisation between products. This section begins by describing the general theoretical structure of the Bresnahan model, as used by Shaffer, and then differentiates to empirical models for the deposit and loan markets, respectively.

1. Theoretical Structure of the Bresnahan Model

Assuming n banks in the industry supplying a homogeneous product, the profit function of the average bank i takes the form:

$$\Pi_i = px_i - c_i\left(x_i, EX_{S_i}\right) - F_i \tag{1}$$

where Π_i is profit, x_i is the volume of output, p is the output price, c_i are the variable costs, EX_{S_i} are exogenous variables affecting the marginal costs, but not the industry demand function, and F_i are the fixed costs of bank i. In the loan market, the output price p can be defined as the difference between the lending rate and the rate of risk free investment (such as government bonds). An alternative would be to assume that p is equal to the lending rate and to include the funding rate as a cost factor. In the deposit market, the output price p is the difference between the risk free rate and the deposit rate, hence the discount banks receive when they fund with deposits instead of other types of funding. Banks face a downward sloping market demand function, the inverse of which is defined as:

$$p = f(X, EX_D) = f(x_1 + x_2 + \ldots + x_n, EX_D) \tag{2}$$

where EX_D is a vector of exogenous variables affecting industry demand but not marginal costs. The first order condition for profit maximising of bank i yields:

[3] Alternatively, *Suominen* (1994) and *Swank* (1995) employ two-product models (deposits and loans) and assume the interdependence of product demand and marginal cost functions, but neither of them employs cost functions including factor input prices.

(3) $$\frac{d\Pi_i}{dx_i} = p + f'(X, EX_D)\frac{dX}{dx_i}x_i - c_i'\left(x_i, EX_{S_i}\right) = 0$$

Taking averages over all banks produces:

$$p + f'(X, EX_D)\frac{dX}{dx_i}\frac{1}{n}X - \Sigma_i c_i'\left(x_i, EX_{S_i}\right)/n = 0$$

so that:

(4) $$p = -\lambda f'(X, EX_D)X + \Sigma_i c_i'\left(x_i, EX_{S_i}\right)/n$$

where $\lambda = (dX/dx_i)\Big/n = \left(1 + d\sum_{i\neq j} x_j\Big/dx_i\right)\Big/n$. Thus, λ is a function of the conjectural variation of the average firm in the market. The conjectural variation of firms is defined as the change in output of all remaining firms anticipated by firm i in response to an initial change in its own output. For the average bank in a *perfectly competitive* market, the restriction $\lambda = 0$ holds, as, in a competitive equilibrium, price equals marginal cost. Since prices are assumed to be exogenous to the firm in a perfectly competitive market, an increase in output by one firm must lead to an analogous decrease in output by the remaining firms, in line with equation (4). The *Cournot equilibrium* describes noncooperative optimisation where agents who mutually influence each other act without explicit cooperation. Unter that type of equilibrium, the conjectural variation $(d\sum_{i\neq j} x_j\Big/dx_i)$ for firm i would equal zero. The Cournot model assumes that a firm does not expect retaliation from other firms in response to changes in its own output, so that $\lambda = 1/n$.[4] Under *perfect collusion,* an increase in output by one of the colluders leads to a proportional increase in output by all other colluders, yielding $\lambda = \left(1 + d\sum_{i\neq j} x_j\Big/dx_i\right)\Big/n = (1 + (X - x_i)/x_i)/n = X/x_i n = 1, \forall i$. Hence, under normal conditions, the λ parameter takes values between zero and unity. The λ parameter in Bresnahan's model plays a role similar to that of the H parameter in the PR approach, where $H < 0$ points to monopoly, $0 < H < 1$ indicates monopolistic competition and $H = 1$ reflects perfect competition.

As mentioned above, we apply the Bresnahan model to the two most prominent submarkets of the banking industry: the loan and deposit

[4] The assumptions underlying the Cournot oligopoly theory according to *Hause* (1977) are: homogeneous products, n firms with strictly increasing marginal cost functions (which need not be identical), independent (nonco-operative) behaviour of firms to maximise their own profits, no entry, and industry demand is strictly decreasing.

markets. To assess the degree of market power, we simultaneously estimate market quantity and price curves, obtaining the value of λ which indicates the degree of competition.

2. *Empirical Equations for the Deposit and Loan Markets*

For the empirical model of the deposit market, the theoretical demand function (2) is redefined as a linear aggregate demand function for deposit *facilities* offered to non-banks and reads:

$$DEP = \alpha_0 + \alpha_1 r_{dep} + \alpha_2 EX_D + \alpha_3 EX_D r_{dep} + \varepsilon \tag{5}$$

where DEP is the real value of total deposits, r_{dep} is the market deposit rate[5], EX_D are exogenous variables affecting industry demand for deposits but not marginal costs, such as disposable income, unemployment, the number of bank branches[6] and interest rates for alternative investment (*i.e.* the money market rate and the government bond rate) and ε is the error term. Equation (5) should also include one or more cross-terms between the deposit rate and at least one of the exogenous variables determining demand for deposit facilities (on the identifiability of the λ parameter, see below). The time subscripts in equation (5) and later equations are deleted for convenience.

The marginal cost function for bank $i - c'\left(x_i, EX_{S_i}\right)$ in equation (3) – is defined as:

$$MC_i = \beta_0 + \beta_1 DEP_i + \beta_2 EX_{S_i} + \nu_i \tag{6}$$

where EX_S are exogenous variables influencing the supply of deposits (costs of input factors for the production of deposits, for instance, wages) and ν is the error term. Re-arranging the aggregate demand function (5) yields the price function as:

$$r_{dep} = \frac{1}{\alpha_1 + \alpha_3 EX_D}\left[DEP - \alpha_0 - \alpha_2 EX_D - \varepsilon\right] \tag{7}$$

which, multiplied by the deposits of bank i yields its total revenue as:

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5 As suggested above, an alternative would be to define the price as the difference between the risk-free (or money market) rate and the deposit rate. In our empirical application, the alternative model would be equivalent to the current model, because alternative rates (such as the money market rate) are also included as an explanatory variable.

6 Data on branches were unavailable for our empirical analysis.

(8) $$TR_i = \frac{1}{\alpha_1 + \alpha_3 EX_D}[DEP - \alpha_0 - \alpha_2 EX_D - \varepsilon]DEP_i$$

and, derived with respect to the deposits at bank i, its marginal revenues:

(9) $$\begin{aligned} MR_i = \frac{dTR_i}{dDEP_i} &= \frac{1}{\alpha_1 + \alpha_3 EX_D}[DEP - \alpha_0 - \alpha_2 EX_D - \varepsilon] \\ &+ \frac{1}{\alpha_1 + \alpha_3 EX_D}\frac{dDEP}{dDEP_i}DEP_i = r_{dep} + \frac{\lambda n}{\alpha_1 + \alpha_3 EX_D}DEP_i \end{aligned}$$

where λ is defined as below equation (4). Market equilibrium requires the equality of marginal revenues and marginal costs, so that for each bank:

(10) $$r_{dep} + \frac{\lambda n}{\alpha_1 + \alpha_3 EX_D}DEP_i = \beta_0 + \beta_1 DEP_i + \beta_2 EX_{S_i} + \nu_i$$

The equilibrium price equation for deposit *facilities* by the banks, *i.e.* the deposit rate, follows from taking averages:

(11) $$r_{dep} = -\lambda \frac{DEP}{\alpha_1 + \alpha_3 EX_D} + \beta_0 + \beta_1^* DEP + \beta_2^* EX_S + \nu$$

where $\beta_1^* = \beta_1/n, \beta_2^* = \beta_2/n$ and $EX_S = \Sigma_i EX_{S_i}$. In order to determine λ, the degree of competition of the average bank in the deposit markets of the countries considered, the quantity[7] and price equations, (5) and (11), respectively, must be estimated simultaneously, as the parameters α_1 and α_3 occur in both equations. Lau (1982) and Bresnahan (1982) show that, whereas both the demand (α) and supply (β) parameters are identified, the λ parameter is identifiable only if the demand function includes the endogenous interest rate (or 'price') and a cross-term with one of the explanatory (other) variables and this interest rate.[8] In other words, λ is identified only, if the assumptions $\alpha_1 \neq 0$ and $\alpha_3 \neq 0$ both hold. Note that α_1 is expected to be positive, so the first term of the right-hand side of equation (11) is λ times a *markdown*. This implies a *lower* deposit rate in the case of no or limited competition, as seems plausible.

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7 The equilibrium version of the demand equation for Deposits, that is equation (5) after substitution of the equilibrium price r_{dep} from equation (11).

8 This is obvious from equation (11): if $\alpha_3 = 0, \lambda$ and β_1 are indistinguishable from each other.

Note that, in principle, equations (5) and (11) can generate an estimate of competition, even where the corresponding market is facing competition from financial institutions not included in the national samples, such as non-banks, traditional foreign banks and Internet banks. After all, even where competition from other banks is limited, banks are unable to widen the margin between price (or interest rate) and costs when competition from non-banks is heavy or even is only a serious potential threat.

In a similar manner, the aggregate demand (or quantity) function for *loans* by households and banks can be defined as:

$$LOANS = \alpha_0 + \alpha_1 r_{lend} + \alpha_2 EX_D + \alpha_3 EX_D r_{lend} + \varepsilon \tag{12}$$

where real $LOANS$ are explained by r_{lend}, the lending rate, by EX_D, exogenous variables influencing the demand for loans, such as income, unemployment, the number of bank branches, the share of labour in total value added and the utilisation rate of capital, and by ε, the error term. Again, the equation should contain at least one cross-term consisting of the lending rate and one of the other variables determining demand for loans facilities in order for the λ parameter to be identified. On the analogy of the price equation for deposits presented above, the price relationship for loans may be derived as:

$$r_{lend} = -\lambda \frac{LOANS}{\alpha_1 + \alpha_3 EX_D} + \beta_0 + \beta_1 LOANS + \beta_2 EX_S + \nu \tag{13}$$

The simultaneous estimation of equations (12) and (13) generate the value of λ, provided this parameter is identified. Note that α_1 is expected to be negative, thus the first term of the right-hand side of equation (13) is λ times a *markup*. This means a *higher* lending rate in the case of no or limited competition, as seems plausible.

III. Estimation Results

The empirical Bresnahan model, developed above, has been applied to the deposit and loan markets of nine EU countries: Belgium, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden and the UK, both separately and jointly. The choice of the countries is based on availability of data.[9] For practical reasons, we assume here that national markets correspond with the national borders. We do realise that this need not always be the case, as foreign banks and Internet banks may affect domestic competitive conditions. The models are based on time series of quarterly data from a variety of databases and institutions: the International Financial Statistics (*IFS*), the Bank of International Settlements (*BIS*), the Organisation of Economic Co-operation and Development (*OECD*), Data Stream (*DS*), the Dutch Central Planning Bureau (*CPB*), the Statistics Netherlands (*CBS*) and several central banks, see Appendix 3.

For a number of countries and variables, the availability of the required data and the length of the series are limited. In many cases, there is a trade-off between quality (series without breaks) and quantity (longer series). Special attention is paid to the German data with respect to the German unification. The time series used for our estimations cover both the pre- and the post-unification period. Data for the Western states have been available until 1990; as from 1991, both data for the Western states and aggregate data for the entire country are available. We used the data covering the entire country after 1990 and adjusted the data for the period preceding unification. For real deposits, gross domestic product (gdp) and unemployment we did not have overlapping data at our disposal, hence we exploited dummies to take account of the (imprecise or unknown) adjustments.

The data constraints, furthermore, hamper complete consistency in the definition of the underlying market across countries: deposit and loan volumes are available for the *banking* market in all countries except Belgium, where a broader definition of the market, *i.e.* one accounting for all credit institutions, is applied. The variables deposits, gdp, loans and wage rate are expressed in real terms in order to avoid interference from inflation. For the all-countries sample, all volumes are expressed in 'Deutsche Marks' whereas, in the individual country estimations, these variables are in the countries' own currencies.[10]

The quantity and price equations form a simultaneous system, as each equation includes the endogenous variable of the other equation as explanatory variable. Therefore, the equations have been estimated by the 2SLS method.[11] Account of the cross-equation restrictions has been

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9 For the other EU countries, we could not find data for all essential model variables. In particular, appropriate lending rates are unavailable for a number of countries.

10 Volumes are expressed in billions of "Deutsche Marks". Inflation and interest rates are in percentages.

11 We use EViews 4.0, which employs the Marquardt algorithm for non-linear estimation. Everywhere, all potential exogenous explanatory variables have been included as instrumental variables.

taken by estimating the price equation conditional on the estimated values of α_1 and α_3 in the quantity equation. Because of the existence of these cross-equation restrictions, a system estimator such as 3SLS or FIML would be a more efficient – but also a more complicated – alternative (Toolsema, 2002).

All equations for all countries and the EU region contain all explanatory variables occurring in the theoretical model. For the quantity equations, real deposits and real loans, we consider two cross-terms throughout, consisting of the price (deposit or lending rate) and one of the other explanatory variables.[12] We need at least one cross-term, whereas inclusion of all cross-terms would be excessive and could cause multicollinearity. Hence, the choice of two cross-terms takes an intermediate position. In some equations, there is the choice between money market and government rates[13] and also an option to include other explanatory variables. In every case, the choice is based primarily on national economic and institutional circumstances, *e.g.* characteristics of the money and capital markets. Where a choice is arbitrary, we seek to find significant values for α_1 and α_3, which is a *conditio sine qua non* for our analysis, or to reduce autocorrelation. Seasonal dummies are included only, when one or more of the equation variables have a seasonal pattern and are maintained, when the dummies appear to be jointly significant.

Initial estimation has revealed that the error terms of some equations exhibit serial correlation, as indicated by the Durbin-Watson (DW) or Durbin's h test, and Breusch-Godfrey's Lagrange Multiplier (LM) test. Autocorrelation may leads to overestimating of the coefficients' t-values and hence to wrong inferences (Kennedy, 1998). This feature has been dealt with either through inclusion in the model of the lagged dependent variable as an explanatory variable, a so-called Koyck lag (Theil, 1971), or through inclusion of an autoregressive term in the error. A Koyck lag model assumes that the actual dependent variable adjusts gradually over time to its assumed model value (Nerlove, 1958, discusses various possible underlying adjustment processes).[14] Going by the DW or Durbin's h test, and the Breusch-Godfrey LM test, the autocorrelation problem has been solved in a number of cases. In all cases, we calculate the Newey and West correction for heteroscedasticity and autocorrelation-consistent covariances, which correct the t-values of the coefficients for any possi-

12 An exception is the EU-wide real deposit equation.

13 Inclusion of both rates would cause multicollinearity.

14 Besides, this model structure, like autocorrelation, may indicate that at least one explanatory variable with lasting effects has been omitted.

ble remaining heteroscedasticity and autocorrelation. This prevents us from making wrong inferences from these t-values, *e.g.* regarding significance (Greene, 2000).

1. The Market for Deposit Facilities

Quantity equation (5) determines the volume of deposits in terms of its price (the deposit rate) and exogenous variables from the demand function, such as the money market rate or the government debt rate, the volume of gdp, unemployment and inflation. Deposits are defined as the sum of time deposits and savings, whereas *real* deposits are deflated by the available price index. The coefficient of the deposit rate should have a positive sign, since a higher return on deposits makes deposits more attractive. The return on government debt and the money market rate are the prices of two substitutes for deposits. They have negative coefficients, because the opportunity cost of holding money in deposit increases with the price of any of the substitutes. Real gdp proxies income or wealth and should reflect the positive relationship between income and the propensity to save, or between wealth and investment. The coefficient of unemployment will be positive if the increased probability of facing unemployment encourages savings, but can also be negative, if dis-saving supplements a decline in incomes in the case of unemployment. Hence, *a priori* predictions about its sign cannot be made. A similar conclusion can be drawn for nonemployment, which would be an alternative to the unemployment variable (Blanchard, 2000, pp. 106 *ff.*). Nonemployment also takes into account the effect of the prudential motives people living on benefits may have for saving money. The impact of inflation on the demand for deposits, too, can swing either way. The direct effect of inflation on deposits is negative, the argument being that higher inflation increases consumers' propensity to spend money now rather than to engage in long-term investments. However, if the deposit rate (almost) fully compensates for inflation, the effect on deposits can also be positive, due to money illusion. The signs of cross-term coefficients are fairly unpredictable, as they reflect non-linear effects.[15] We have no *a priori* ideas either about the signs of country dummy coefficients or, in many cases, time trend coefficients, when and where they

[15] Note that the signs of cross-terms are difficult to assess, as they consist of two terms, price or interest rate and demand factor. Furthermore, the respective demand factor occurs twice, separately and multiplied by the price. The sign of both coefficients should be judged coherently.

Table 1

Expected Coefficient Signs of the Determinants of the Various Models

	deposits	deposit rate	loans	lending rate
lagged endogenous	+	+	+	+
deposit rate	+			+
gdp, real	+		+	
government rate	–	+		+
money market rate	–	+		+
consumer confidence	+			
unemployment	i		–	
nonemployment	i			
inflation	i	+	i	+
cross-terms	i		i	
time trend	i	i	i	i
country dummies	i	i	i	i
intercept	i	i	i	i
markdown/up ($-\lambda$)		–		–
deposits		–		
wages, real		–		+
loan growth		+		
lending rate			–	
labour share			i	
utilisation grade			+	
loans, real		+		+

Note: i stands for *a priori* indeterminacy.

occur. Table 1 recapitulates the expected signs of the coefficients of the deposit model and also presents the coefficient signs for the other models to be discussed below.

Price equation (11) determines the deposit rate as a function of the volume of deposits, the main input price 'wage rate', other exogenous variables, such as inflation and the markup function (*i.e.* output divided by the first derivative of the demand function with respect to r_{dep}. The coefficient of the markup, $-\lambda$, is the measure of deposit market competition, which we set out to find. For the coefficient of the volume of deposits, we expect a negative sign, because banks will pay a lower rate on deposits the more deposits they have already attracted. The coefficient of wages of bank employees should also be negative, as a higher input price has a negative impact on the deposit rate. Consumers need to be compensated for inflation by the deposit rate. Therefore, its coefficient is expected to be positive.

A few other explanatory variables which do not directly follow from the theoretical framework above have also been considered, such as alternative interest rates, which act as a reference for the bank's deposit rate, and loan growth or real loans, which reflects the need for the bank to acquire funding. These variables do not really conflict with the theoretical model for in fact taking deposits is not the sole funding instrument of the bank.[16] The alternative interest rates, the money market or government rate, are related to alternative investment possibilities for the private sector and can not be ignored. Therefore, we expect positive signs. Higher than normal loan level or loan growth may encourage the bank to raise its deposit rate, in order to increase funding. Again, positive signs would be plausible.

EU-wide Results

The complete estimation results for deposit markets in the nine EU countries combined, as well as in each of these nine EU countries separately, are presented in Appendix 1. We first discuss the EU-wide estimation results of the *real deposit* equation, see Table 1.1 in this Appendix. This cross-section and time series – or panel data – regression is based on the sample with the highest informational content, namely 774 observations. At the same time, such a model is restrictive, since identical coefficients are assumed for each variable and for all countries involved. In order to deal with possible autocorrelation, we included the lagged dependent variable and an autoregressive term in the error. The coefficient of the lagged dependent variable has been set at 0.95 to avoid a higher and less plausible value. The estimation results of this equation are conditional on this interference. Such a high Koyck lag value points to a slow adjustment process, reflecting that 'real deposits' is a stock variable. Furthermore, it indicates that deposit saving is, in part, based on certain consistent behavioural patterns (such as conservative saving

[16] Alternatives are the interbank market (deposits) and the capital market (bills, bonds and shares).

behaviour, price insensitivity, irresponsiveness to alternative investment opportunities), which is not picked up fully by the included explanatory variables. Besides, 'real deposits' also include long-term time deposits, which are in part fixed by definition. The autocorrelation tests indicate that the resulting errors are free of serial correlation.

All demand variables have significant coefficients with the right signs.[17] The cross-term is also significant. Together with the coefficient of the deposit rate, this coefficient is important, as it constitutes the markdown variable in the deposit rate equation. Adding nonemployment to this equation would yield a insignificant coefficient. Substitution of unemployment by nonemployment would result in a lower level of significance.[18] Five country dummy coefficients show a significant deviation from the Dutch deposits level,[19] indicating a higher (Belgium, France, Spain and the UK) or lower (Sweden) savings level, after taking the other variables into account. This outcome reflects differences across countries and suggests that country-specific estimates might add new insights. The country dummies are jointly significant, as shown by the F-test in the bottom of Table 1.1. A second F-test reveals that the whole equation is also jointly significant. We conclude that these estimation results make a good basis to construct the markdown variable, as required in the second equation.

Table 1.2 in Appendix 1 presents the EU-wide estimates of the *deposit rate* equation. As the autocorrelation tests show mixed results which indicates possible serial correlation in the errors, we have to rely on t-values, based on Newey and West's autocorrelation consistent covariances. This equation also includes a lagged dependent variable, but its coefficient indicates a relatively quick adjustment process. The major explanatory variable is the government rate with a long-term coefficient of $0.423/(1-0.342) = 0.642$. This is a plausible outcome: the deposit rate is approximately two-thirds of the government rate. Other marginal cost or supply variables have hardly any effect. In the centre of our interest is the coefficient λ of the markdown, representing the banks' (use of) market power in offering deposit facilities. This coefficient is highly significant, indicating, in principle, absence of fully perfect competition

17 By significant (or very significant) we mean, in this article, at the 95% (or 99%) level of confidence.

18 We found similar results for the single-country estimates, except for the UK where nonemployment was a better explanatory variable, see Table 1.1.a in Appendix 1.

19 The intercept estimates the Dutch deposit level, after taking the other variables into account.

and use of at least some market power, but its value is small. Actually, λ is so small that the observed use of market power is virtually negligible. Apparently, the EU deposit markets are characterised by a high degree of competition. However, this conclusion may hold true only for the national or local markets. The fact is that we also observe differences in the level of the deposit rates across the EU countries, as four country dummy coefficients are significant. Probably, during this pre-euro period under investigation, cross-border competition on the EU deposit markets has been limited. Under a Cournot equilibrium, λ is assumed to be equal to the reciprocal of the total EU number of banks ($\lambda = 1/n$), see above.[20] A test on $\lambda = 1/n$ makes clear that a Cournot equilibrium must be rejected. Actually, a test does not make much sense (on the EU level), now we have observed that the EU deposit market is at least segmented into national submarkets.

Single-country Results

Table 2 summarises the estimated values of λ for deposit markets in the nine countries under consideration. The table furthermore indicates the number of observations for each estimation exercise and the respective sample periods. The values for λ in Cournot equilibrium ($\lambda = 1/n$, for n banks) are calculated for 1987 and 1997 on the basis of the number of banks obtained from the OECD (1999). By the way, the figures make clear that, over this period, the number of banks has declined considerably, by around 25 %, illustrating the current and recent process of consolidation in most EU countries.

Apart from the deposit rate, at least one cross-term variable proved significant in the *real deposits* equation for each country, see Table 1.1 in Appendix 1. An exception is Belgium, where neither the deposit rate coefficient nor the cross-term coefficients are significant. For that reason we do not estimate a deposit rate equation for that country, unable as we are to determine a useful 'markdown'. The main demand variable real gdp is significant with the right sign in all countries. Also the government rate coefficient has the right sign wherever it is significant. The sign of the unemployment coefficient differs across countries, as expected. For the UK, nonemployment was a good alternative for unemployment. The tests do not indicate – significant – autocorrelation problems in any of the countries considered. The degree of fit – the adjusted

20 The Cournot model assumes that a firm does not expect retaliation from other firms in response to changes in its own output.

Table 2

Market Power and Summary of the Estimates of the Deposit Rate Model

	No. of observations	Estimation period	λ^a	t-value	No. of banks (1987)	$1/n$	No. of banks (1997)	$1/n$
'EU wide'	774	varying[b]	0.000002	***5.2	7,346	0.0001	5,646	0.0002
Belgium	–	–	–	–	120	0.0083	131	0.0076
France	109	1971:2–98:2	0.000106	1.3	2,021	0.0005	1,288	0.0008
Germany	84	1978:1–98:4	0.000627	**2.2	4,089	0.0002	3,284	0.0003
Italy	64	1983:1–98:4	0.000314	0.7	391	0.0026	255	0.0039
Netherlands	83	1978:2–98:4	0.000023	0.7	170	0.0059	169	0.0059
Portugal	80	1978:1–97:4	–0.000139[a]	1.6	29	0.0345	44	0.0227
Spain	82	1978:3–97:4	0.000504	**2.6	333	0.0030	307	0.0033
Sweden	110	1971:3–98:4	0.009889	1.3	144	0.0069	124	0.0081
UK	90	1976:3–98:4	0.000001	0.7	49	0.0204	44	0.0227

Note: See Tables 1.1 and 1.2 in Appendix 1.

[a] A negative value for λ indicates the existence of a supra-negative market condition. This is a non-equilibrium situation in which bank output exceeds a competitive level and prices are too low, so that over time output in these markets will fall and prices will rise; [b] By country.

R^2 – is satisfactory. Hence, these estimation results constitute a good basis to construct the markdown variable, as needed in the second equation.

For most countries, the *deposit rate* equation is rather plain in the sense that the number of explanatory variables is low, see Table 1.2 in Appendix 1. Apart from, in a number of countries, the lagged dependent variable, either the government rate or the money market rate is the main significant variable. In a few countries, the input price 'real wages' is also significant. In these cases all signs are in line with expectations. The tests on autocorrelation do not indicate any problem in any country except Sweden, where we rely on Newey and West's autocorrelation consistent covariances. The degree of fit is very satisfactory with levels above 94 % for all countries.

Somewhat disappointingly, the major output of the two deposit market model equations, the degree of competition λ, is significantly only for Germany and Spain, see also Table 2. For the other countries this indicates, in principle, absence of the use of market power, *i.e.* perfect competition. Note that we should keep in mind that, since the perfect competition hypothesis ($\lambda = 0$) is the null hypothesis, the approach favours this hypothesis: a 95 % level of significance is required to reject perfect competition. For that reason we do not 'accept' perfect competition (where λ does not deviate from zero) but consider both perfect competition and some kind of oligopoly with high competition (including Cournot equilibrium) as conceivable. Furthermore, we cannot exclude the possibility that the Bresnahan approach might not be sensitive enough to measure market power accurately, given the limited number of available observations on the country level and the possibility of trend breaks during the lengthy observation periods. For Germany and Spain, we find at least nonperfect competition, but the use of market power is limited.

In the case of a Cournot equilibrium, we assume $\lambda = 1/n$. In that respect, we note that the relevant number of banks, n, is not always known exactly. For instance, there is a substantial difference between the number of banks with a banking licence and the number of actually active banks. For Spain the value of λ is significantly below that of Cournot equilibrium, so we can reject the latter. For the other countries, it is less easy to draw a conclusion, although values of λ and $1/n$ make Cournot less likely in Italy, the Netherlands, Portugal and the UK. For Germany, the value of λ appears to be somewhat higher than $1/n$, but we cannot reject the hypothesis of a Cournot equilibrium. The Swedish value of λ is even equal to $1/n$, as under Cournot, but given the t-value of λ, it is again impossible to reject *e.g.* perfect competition. Possibly, banks in Germany and Sweden (and in some of the other countries) do not expect retaliation from other banks as response to changes in their own deposit facilities output, as the Cournot model assumes. Under reservation for possible insensitivity of the Bresnahan approach, we draw the conclusion that the markets for deposit facilities in the EU countries considered are most probably highly competitive, as we found for the EU-wide sample.

2. *The Markets for Loans*

The second market we investigate employing the Bresnahan model is the loan market. Quantity equation (12) determines the volume of real loans. The variable loans is negatively related to its price, the lending rate, and positively related to increasing investment activity as indicated by a higher real gdp income and a higher capital utilisation rate. Unemployment may be another indicator of economic activity or sentiment, which in addition reflects structural disequilibrium. Its coefficient is expected to be negative. A high profit income share (or a low labour income share) indicates high profits and favourable expectations of future profits. This indicates attractive investment opportunities and, by implication, increasing demand for new loans. On the other hand, if profits are high, new investment activities may also be financed internally, weakening the demand for loans. All in all, we have no way of knowing the sign of the coefficients of the labour share in advance. The propensity of economic agents to take out loans is encouraged when – expected – inflation is higher, so that the real value of funds decreases. Conversely, however, the lending rate might also rise on account of inflation, cancelling out the effects. So the sign of the inflation coefficient is indeterminate. The expected signs are summarised in Table 1.

Price relationship (13) determines the lending rate by real loans, input items such as wages and the deposit rate, as well as other exogenous variables such as the money market rate, the government rate, inflation and the markup: output divided by the first derivative of the demand function with respect to r_{lend}. The coefficient of the latter, $-\lambda$, is the crucial variable in our analysis, the measure of competitive conduct on the loans market. As the value of λ is expected to fall in the range of 0 to 1, $-\lambda$ will be negative. Banks are expected to translate the risk associated with a larger loan portfolio into a higher lending rate. Likewise, increasing costs related to the provision of loans, namely higher wages, and higher costs of funding increase the operating costs of banks and will probably be reflected in higher lending rates. The money-market rate and the rate on government debt were included in the price relation as a comparative measure for product pricing, and are expected to exert a positive influence on the lending rate. In fact, they also reflect funding cost, such as costs related to interbank and capital market borrowing. Finally, banks will take account of real losses associated with higher inflation by adjusting their lending rate accordingly. Hence, all coefficients are expected to be positive, be it that we anticipate a negative sign for $-\lambda$.

EU-wide Results

The complete estimation results for loan markets in the region of nine EU countries, as well as in each of these nine EU countries separately, are presented in Appendix 2. We first discuss the EU-wide estimation results of the *real loans* equation, see Table 2.1 in this Appendix. In order to prevent possible autocorrelation, we included the lagged endogenous variable with a coefficient of 0.95, which was fixed to avoid a higher and less plausible value. Other estimation results of this equation are conditional on this interference. This high Koyck lag value points to a slow adjustment process, which is obvious, as 'real loans' is a stock variable. The loans have diverging terms, in some cases up to ten years and more. The loan volume of a country may also depend on certain consistent behavioural or omitted variables, which are not picked up fully by the included explanatory variables. The autocorrelation tests indicate that the errors are free of serial correlation.

All major demand variables have significant coefficients with the right signs. The two cross-term coefficients are also significant, which is important as, together with the coefficient of the lending rate, they constitute the markup variable in the lending rate equation. Five country dummy coefficients show a significant deviation from the Dutch loans level, indicating a higher (Portugal and Spain) or lower (France, Italy and Sweden) lending level, after taking the other variables into account. These differences across countries suggest that country-specific estimates would be worthwhile. Both the country dummies and the whole equation are jointly significant, as shown by the F-tests in the bottom of Table 2.1.

Table 2.2 in Appendix 2 presents the EU-wide estimates of the *lending rate* equation. The test statistics indicate absence of autocorrelation. This equation does not include a lagged dependent variable. Apparently, the lending rate adjusts within one quarter. The major explanatory variable is the government rate with a coefficient of 0.964. Real loans is the only other marginal cost or supply variable with a significant coefficient. The crucial result is the parameter λ of the markup, measuring the use of market power of EU banks in offering loans. This coefficient is significantly pointing to rejection of perfect competition on the EU lending markets. The value of λ is larger than $1/n$, as in the Cournot equilibrium, but the latter can not be rejected. Significant country dummy coefficients indicate differences in the level of the lending rates across the EU countries. This underlines the conclusion above of less than perfect competition in the EU. Obviously, during this pre-euro period under investigation, cross-border competition on the EU loan markets has been limited.

Single-country Results

Table 3 summarises the estimated values of λ for loans markets in the nine individual countries. Apart from the lending rate, at least one cross-term variable proved significant in the *real loans* equation for all countries, see Table 1.1 in Appendix 1. An exception is the UK in the sense that its lending rate coefficient is significant at the 94% level of confidence only, instead of the 95% level. Nevertheless, we assume that for this country also a meaningful 'markup' may be constructed. The major demand variables, real gdp and unemployment, are significant with the right sign in most countries. The respective tests do not reveal significant autocorrelation in any of the countries considered.

Apart from the lagged dependent variable, one or more interest rates – the deposit or funding rate, on the one hand, and the government or money market rate as market rates on the other – are the main significant variables in the *lending rate* equation, see Table 2.2 in Appendix 2. In a number of countries, the quantity real loans and the input price 'real wages' are also significant, with signs in line with expectations. Mixed evidence regarding autocorrelation occurs for the UK only, where we rely on t-values, based on Newey and West's autocorrelation-consistent covariances. The degree of fit is high with R-squares above 95% for all countries, except Sweden (92%).

The essential output of the two loan market equations, the degree of competition λ, is significantly in not less than five countries: Germany, Portugal, Spain, Sweden and the UK, see also Table 3. For the other

Table 3

Market Power and Summary of the Estimates of the Lending Rate Model

	No. of observations	Period	λ	t-value	Inverse of no. of banks ($1/n$)	
					1987	*1997*
'EU-wide'	718	varying[a]	0.000429	**2.5	0.0001	0.0002
Belgium	75	1980:1–98:3	0.000064	1.4	0.0083	0.0076
France	81	1978:2–98:2	0.000002	0.2	0.0005	0.0008
Germany	84	1978:1–98:4	0.000000	**2.7	0.0002	0.0003
Italy	64	1983:3–98:4	0.000147	0.5	0.0026	0.0039
Netherlands	83	1978:2–98:4	0.000000	0.1	0.0059	0.0059
Portugal	79	1978:2–97:4	0.001128	**2.2	0.0345	0.0227
Spain	82	1978:3–98:4	0.000000	**2.5	0.0030	0.0033
Sweden	76	1980:1–98:4	0.000492	**2.3	0.0069	0.0081
UK	87	1976:3–98:1	0.020572	**2.4	0.0204	0.0227

[a] By country.

countries, in principle, this suggests the absence of use of market power, *i.e.* perfect competition or in any case a high degree of competition.[21] In Germany, Portugal, Spain, Sweden and the UK we find nonperfect competition, but with limited use of market power only. For Germany, Portugal, Spain and Sweden, the value of λ appears to be significantly smaller than according to the λ value in Cournot equilibrium ($\lambda = 1/n$), so we reject this equilibrium for these countries. For the UK, λ appears to be equal to $1/n$, so that we cannot reject Cournot equilibrium. Apparently, banks in the UK do not expect retaliation from other banks as response to changes in their own lending output. For the other countries, a Cournot equilibrium is less likely. Under certain reservation, we draw the conclusion that the loans markets in the EU countries investigated are most probably highly (but not always perfect) competitive, as we found also for the EU-wide sample.

21 Note, once again, that the employed approach is favourable for the perfect competition hypothesis, as it is the null hypothesis.

3. Earlier Applications of Bresnahan in the Literature

The few existing empirical applications of the Bresnahan model to the banking industry are difficult to compare with our results.[22] The model has been estimated by Shaffer (1989, 1993) for, respectively, the US loan markets and for the Canadian banking industry. In both cases, values of λ were found to be not significantly different from zero, implying perfect competition or Cournot oligopoly. Zardkoohi and Fraser (1998) use the model to test whether geographical deregulation in the US had affected the market structure in the individual states. Perfect competition was found in most states, but imperfect competition in the others. Ribon and Yosha (1999) investigated the highly concentrated Israeli banking market and found significant – but declining – market power in both the deposit and loan markets.

As far as we were able to find out, only three studies have applied the Bresnahan method to European banks, namely Suominen (1994) to the Finish banking deposit and loan markets, Swank (1995) to the Dutch mortgage and savings deposit markets and Toolsema (2002) to the Dutch revolving consumer credit market. Suominen finds estimates for λ, which are not significantly different from zero for the years until 1985, with regulated interest rates, and values of λ indicating the use of market power after the deregulation of the loan market. Swank used a dynamic version of the Bresnahan model for the mortgage and savings deposit markets during the years 1955–90. He detects that both markets under consideration were significantly more oligopolistic than under Cournot equilibrium. However, the degree of market power on the mortgage market falls sharply over time, being close to zero in the years we investigate in this study. This is in line with the view that deregulation over time has contributed to less oligopoly. In Swank's study, the market power parameter on the deposit market remains close to zero, although rising slightly over time, owing to the increasing concentration of (deposit taking) banks. However, in more recent years, many new suppliers of deposit services have entered the Dutch market. Toolsema (2002) employs monthly data of the consumer credit market over 1993–99. Non of the various specifications she tries provide significant values for λ. So, she concludes that Dutch banks do not use market power on the consumer credit market.

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[22] Bresnahan's model has also been applied to other industries, *e.g. Alexander* (1988), *Graddy* (1994), *Genesove* and *Mullin* (1998), *Wolfram* (1998) and *Steen* and *Salvanes* (1999).

Our results from the Bresnahan model can be compared with results from the P-R approach. Bikker and Groeneveld (2000) and Bikker and Haaf (2002[a]) found for most European countries that the entire banking market was characterised by monopolistic competition and for a few countries, they even observed perfect competition. The same conclusion applies to submarkets of small, medium-sized and large banks. Bikker and Groeneveld (2000) also investigated the EU market as a whole, with monopolistic competition as result. Similar outcome have been found by other authors (for an overview, see Table 4 in Bikker and Haaf, 2002[a]). According to the Bresnahan model, for the deposit and loan sub markets competition appears to be at least that heavy. Possibly, due to the limited available data sets and the longer estimation periods, with raising risks of trend breaks, the Bresnahan model has more difficulties in distinguishing between perfect competition and oligopoly or monopolistic competition than the P-R- approach.

IV. Conclusions

Application of Bresnahan's market power model indicates a high degree of competition on both the deposit and loan markets in the nine EU countries under consideration, both apart and jointly. The hypothesis of perfect competition ($\lambda = 0$; no markup on the lending rate or no markdown for the deposit rate) can be rejected for the deposit market of the 'entire' EU, for the deposit markets of Germany and Spain and for the lending markets of Germany, Portugal, Spain, Sweden and the UK. Nevertheless, these markets are characterised by high competition, as the use or abuse of market power is very limited. In the other country-market combinations, where we cannot reject perfect competition, we conclude that competition is high, leaving open the question of whether these markets face perfect competition or a kind of oligopoly with competition fairly close to that. This assessment of highly competitive banking markets in EU countries for deposit facilities and loans is in line with the results of the P-R model, which also indicates (at least) the existence of monopolistic competition for almost all European countries and cannot reject perfect competition in some countries.

For the deposit markets of the entire EU and Spain, and the loan markets of Germany, Portugal Spain and Sweden, we can reject the hypothesis of a Cournot equilibrium ($\lambda = 1/n$). Also in a number of other country-market combinations, such equilibrium is less likely. An exception is the loan market in the UK, where we cannot reject Cournot equilibrium.

Apparently, banks in the UK do not expect retaliation from other banks in response to changes in their own lending output. Further, Cournot equilibrium is conceivable in the deposit markets of Germany and Sweden.

It should be kept in mind that the estimation results reflect the average market structure and competitive conditions over the last two decades. The general feeling is that competition has increased over time. That suggests that – keeping other caveats aside – our estimation results form an underbound of the current competitive situation.

With respect to both social welfare and monetary policy, these results are rather comforting. A high level of competition implies that banks contribute substantially to prosperity of the society and suggests that new policy to boost banking market competition may not be a top priority. A high level of competition also means that banks have limited latitude to respond to monetary policy, which makes the monetary instruments more successful in producing the intended effects on intermediate and ultimate target variables.

Of course, in this article, only deposit and loan markets are considered, so that other submarkets may have less favourable competitive conditions. Moreover, the situation found locally may deviate from our national analysis. In particular, this might be the case for lending to small and medium-sized enterprises. The other side of perfect competition is that in the absence of market power, banks do not profit from excess margins on prices and, hence, that their profits may be more vulnerable to shocks from intensive competition. Under perfect competition, banks and their supervisors need to be more alert and forward-looking in order to maintain financial stability.

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Appendix 1
Estimation Results of the Bresnahan Models for Deposit Markets

Table 1.1

Empirical Results for the Real Deposits Equation

	'EU-wide'		Belgium		France		Germany		Italy	
	coeff.	*t-value*[a]	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	13.248	****4.2*	–0.050	*0.1*	–0.116	***1.5*	0.446	****3.1*	12.449	****8.5*
deposits, lagged	0.950	–			0.900	–				
deposit rate	1.994	****4.1*	–0.002	*0.0*	0.038	***2.0*	0.043	***2.3*	0.177	****5.1*
gdp, real	0.096	****3.7*	1.359	****3.5*	0.265	****3.3*	0.639	****5.3*	0.748	****2.6*
money market rate					–0.002	****3.6*				
government rate	–1.172	****2.8*	–0.031	****4.1*			–0.017	****2.8*	–0.010	*1.1*
unemployment	–1.117	***2.4*	–0.010	****3.0*	0.002	*1.1*	0.012	****6.9*	0.014	**1.8*
inflation	–0.964	****3.1*	0.015	*0.7*	–0.001	*0.3*	–0.009	***2.0*	–0.006	*1.3*
dep. rate*real gdp	–0.005	***2.5*	0.008	*0.1*	–0.043	***2.1*	–0.034	***2.1*	–0.190	****5.7*
dep. rate*inflation			–0.001	*0.4*	0.000	*0.2*				
dep. rate*gov. rate							–0.000	*0.4*	0.001	*0.7*
time trend									–0.022	****8.7*
Belgium	6.400	***2.0*								
France	13.495	***2.0*								
Germany	18.117	**1.7*								

(continued p. 193)

Table 1.1 (continued)

Netherlands	–	–								
Italy	–14.745	**1.8*								
Portugal	–1.898	*0.8*								
Spain	25.363	****3.8*								
Sweden	–43.757	***2.6*								
UK	19.837	****2.7*								
season (1)					–0.000	*0.1*				
season (2)					–0.023	****6.9*				
season (3)					–0.013	****3.6*				
dum-dep-de[b]							–0.153	****9.3*		
dum-gdp-de[b]							–0.003	*0.4*		
dum-unempl-de[b]							–0.028	***2.0*		
AR (1)	0.256	****3.2*							0.905	****20.1*
No. of obs.	774		75		108		86		63	
Adj. R^{2c}	0.72		0.96		0.76		0.98		1.00	
F test	***133.2		***230.3		***32.8		***448.5		***1,934	
F test on dummies	***20.9					–				
DW/Durbin's h[d]	2.03	–[e]	2.31		2.08	–0.45	1.61		1.82	
Breusch Godfrey[f]	–	1.6	*2.9	*3.1	0.2	*3.6	2.6	*3.1	–	0.0

[a] T-values are based on Newey and West's heteroscedasticity and autocorrelation-consistent covariances; One, two and three asterisks indicate a level of confidence of 90 %, 95 % and 99 %, respectively; The level of confidence is based on two-sided testing for all t-values; [b] Dum-dep-de reflects a break in the deposit rate of Germany and is 1 for 1970:2–90:1; dum-gdp-de indicates a break in the gdp of Germany and is 1 during 1970:1–90:4; and dum-unempl-de points to a break in unemployment in Germany and is 1 for 1970:1 91:4; [c] The adjusted R-squared is exclusive of the contribution to the explanation of the dependent variable by the fixed lagged dependent variable; [d] The DW test is 'valid' only for equations without a lagged dependent variable. In those cases, the Durbin's h test applies; [e] A hyphen means that the Durbin's h test statistic could not be calculated (see Green, 2000); [f] The F-test statistic and the number of observations times the R-squared (which has a χ^2 distribution), respectively. A hyphen reflects that the test statistic could not be calculated.

Table 1.1.a

Empirical Results for the Real Deposits Equation (Continuation)

	Netherlands		Portugal		Spain		Sweden		UK	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	–0.092	**1.7*	–0.515	*1.7*	–1.222	****3.1*	0.113	***2.1*	0.305	*1.2*
deposits, lagged	0.975	****29.9*			0.943	****11.3*	0.826	****13.9*	0.900	–
deposit rate	0.024	***2.3*	0.033	****2.8*	0.139	***2.6*	0.016	****3.2*	0.027	***2.1*
gdp, real	0.110	***2.4*	1.304	****6.8*	0.858	****3.3*	0.097	***2.3*	0.400	****4.4*
government rate			0.015	*1.2*	–0.002	*1.5*	–0.003	*1.0*	–0.002	*0.7*
money market rate	0.000	*0.2*								
unemployment	–0.002	*1.5*	0.030	*1.6*	0.005	***2.3*	0.000	*0.1*		
nonemployment									–1.048	***2.2*
inflation	0.003	*1.1*	–0.006	*0.5*	0.025	**1.9*	–0.007	****4.0*	0.002	*1.0*
consumer conf.					0.001	*1.3*				
dep. rate*real gdp	–0.019	***2.2*			–0.103	***2.2*			–0.027	***2.0*
dep. rate*inflation	–0.001	***2.5*	0.000	*0.1*	–0.003	***2.0*	0.001	****2.9*	–0.000	***2.3*
dep. rate*gov. rate			–0.002	***2.3*						
dep. rate*mm rate[a]							–0.001	****4.6*		
season (1)			0.019	*1.6*	0.001	*0.2*	–0.037	***2.2*		
season (2)			0.012	*1.6*	–0.003	*0.8*	–0.051	****5.3*		
season (3)			0.016	****3.7*	0.011	****3.1*	–0.027	***2.0*		
s1[b]	0.010	*1.7*								
s2	0.020	****4.3*								
s3	–0.002	*0.4*								
s4	–0.028	****4.4*								
AR (1)	–0.232	**1.7*	0.573	****3.8*	0.090	*0.7*	–0.450	****5.5*		
No. of obs.	83		46		49		110		91	
Adj. R^2	0.99		0.97		1.00		0.81		0.72	
F test	***1,226		***127.4		***890.3		***40.3		***33.8	
DW/Durbin's h	1.98	0.07	2.06		1.76	0.90	1.95	0.26	1.64	1.72
Breusch Godfrey	–	0.1	0.2	0.3	1.8	*3.5	0.1	0.3	*3.8	*3.1

Note: See Table 1.1.

[a] Money market rate; [b] s1–s4 indicate a deviating seasonal pattern for some series in the Netherlands during 1982:1–86:1;

Table 1.2

Empirical Results for the Deposit Rate Equation

	'EU-wide'		Belgium[a]		France		Germany		Italy	
	coeff.	t-value	coeff.	t-value	coeff.	t-value	coeff.	t-value	coeff.	t-value
intercept	0.577	0.9			2.195	*1.7	10.366	***2.7	6.860	**2.5
markdown $(-\lambda)$	–0.000	***5.2			–0.000	1.3	–0.001	**2.2	0.000	0.7
dep. rate, lagged	0.342	***5.5			0.947	***18.2			0.934	***16.7
deposits	–0.000	0.2			–0.400	1.3	–1.792	*1.9	0.371	1.1
wages, real	–0.001	0.1			–3.970	*1.7	–9.425	***2.7	–0.075	**2.5
inflation	0.043	1.5			0.050	***3.6	0.061	**2.0	–0.025	0.8
money market rate							0.803	***33.8		
government rate	0.423	***6.6			0.046	***2.8			0.186	***7.6
loan growth							31.033	***3.8	23.738	***3.5
Belgium	–0.970	**2.3								
France	–1.395	**2.0								
Germany	–0.595	0.4								
Netherlands	–	–								
Italy	–0.359	0.3								
Portugal	2.502	**2.3								
Spain	–1.422	***3.3								
Sweden	–0.168	0.4								
UK	0.225	0.2								
season (1)					0.054	0.5	–0.728	***2.4	–1.741	***3.4
season (2)					–0.049	0.7	–0.346	*1.7	–0.795	***3.1
season (3)					–0.102	**2.1	0.105	0.5	–0.887	***3.1
AR	0.872	***25.9					0.408	***2.8		
No. of obs.	774				109		84		64	
Adj. R^2	0.98				0.96		0.98		0.98	
F test	***2,342				***304.6		***331.4		***378.0	
F test on dummies	***9.0									
DW/Durbin's h	2.18	–2.54			2.17	–1.21	2.29		2.13	–0.51
Breusch Godfrey	***16.9	***20.3			0.8	0.4	–	2.5	–	0.8

Note: See Table 1.1.

[a] This equation has not been estimated, as we do not have a good measure of the 'markdown'.

Table 1.2.a

Empirical Results for the Deposits Rate Equation (Continuation)

	Netherlands		Portugal		Spain		Sweden		UK	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	2.321	*1.0*	–18.775	****4.7*	0.385	*0.3*	127.991	****2.7*	–2.047	**0.3*
markdown ($-\lambda$)	–0.000	*0.7*	0.000	*1.6*	–0.001	***2.6*	0.010	*1.3*	–0.000	*0.7*
dep. rate, lagged	0.481	****3.5*			0.886	****10.5*	0.543	****6.4*	0.226	***2.1*
deposits	–1.462	**1.9*	2.357	*1.1*	–0.421	*0.4*	2.096	*1.5*	–0.790	**1.7*
wages, real	–0.115	*0.1*	11.700	**1.8*	0.137	*0.1*	–0.469	*0.5*	0.558	*0.1*
inflation	0.063	*1.6*	0.575	****6.6*	0.033	*0.9*	0.102	**1.9*	–0.071	*1.9*
money market rate	0.319	****3.4*	0.700	****4.2*	0.037	***2.3*	0.241	***2.5*	0.930	****8.6*
real loans			0.001	***2.0*						
time trend							–0.065	****2.7*		
AR (1)	0.397	****3.4*			0.690	****5.4*	0.365	****3.1*	0.616	****3.8*
No. of obs.	83		80		82		110		90	
Adj. R^2	0.97		0.94		0.99		0.96		0.96	
F test	***412		***197.3		***1,087		***330.0		***310.5	
DW/Durbin's h	2.00	0.03	1.90		1.77	1.05	2.22	–1.14	1.91	0.43
Breusch Godfrey	–	0.0[a]	–	0.1	2.0	2.3	***10.2	***11.6	–	0.3

Note: See Table 1.1.

Appendix 2
Estimation Results of the Bresnahan Models for Loan Markets

Table 2.1

Empirical Results for the Real Loans Equation

	'EU-wide'		Belgium		France		Germany[a]		Italy	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	–11.587	*1.4*	24.094	***2.2*	23.248	*0.0*	7.542	****76.2*	33.223	****3.3*
loans, lagged	0.950	–			0.950	–				
lending rate	–4.208	****4.0*	–0.073	****3.2*	–41.972	***2.0*	–0.033	***2.6*	–2.502	****3.6*
gdp, real	0.279	****6.9*	1.554	****6.1*	90.744	*0.8*	–0.212	*1.6*	16.849	****10.0*
utilisation grade					7.688	***2.3*				
unemployment	–0.732	***2.1*	–0.082	****4.1*	–45.720	***2.3*	–0.003	*0.5*	–3.437	****4.3*
inflation	–1.778	****3.4*	0.030	*1.4*	–30.649	**1.9*	–0.026	***2.1*	–0.678	****3.2*
lending rate*rgdp							0.033	***2.5*		
lending rate*ut.gr.	0.053	****4.0*								
lending rate*infl.	0.060	****2.6*	0.002	*1.3*	1.883	*1.6*	0.002	*1.5*	0.034	****2.8*
lending rate*unem.			0.005	****3.0*	3.819	****2.4*			0.217	****3.6*
time trend			–0.012	***2.2*						
Belgium	3.331	*1.4*								
France	–32.526	***2.2*								

(continued p. 198)

Table 2.1 (continued)

	'EU-wide'		Belgium		France		Germany[a]		Italy	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
Germany	–25.929	*1.4*								
Netherlands	–	–								
Italy	–59.926	****4.3*								
Portugal	8.112	***2.4*								
Spain	15.887	****2.6*								
Sweden	–11.509	****4.4*								
UK	–11.531	*0.8*								
seas (1)	23.701	****6.1*			–79.664	****6.6*				
seas (2)	10.176	****3.5*			–48.536	****6.3*				
seas (3)	9.739	****4.5*			–56.694	****7.5*				
AR (1)							0.840	****11.1*		
No. of obs.	719		75		81		85		64	
Adj. R^2	0.83		0.73		0.69		1.00		0.88	
F test	***212.1		***30.4		***18.7		***1,127		***75.4	
F test on dummies	***35.6						–			
DW/Durbin's h	2.05	–	2.23		2.11	–	1.91		2.14	
Breusch Godfrey	*3.6	*3.2	–	1.5	0.4	0.3	0.2	0.1	0.5	0.6

Note: See Table 1.1.

[a] Dependent variable (loans) and real gdp are expressed in logarithms.

Table 2.1.a

Empirical Results for the Real Loans Equation (Continuation)

	Netherlands		Portugal		Spain		Sweden		UK	
	coeff.	t-value	coeff.	t-value	coeff.	t-value	coeff.	t-value	coeff.	t-value
intercept	0.635	**2.4	2.550	1.6	31.456	***3.3	0.668	**2.1	–3,808	***5.9
loans, lagged	0.950	–	0.888	***14.1	0.917	***13.3	0.950	–	0.900	–
lending rate	–0.058	***3.1	–0.243	***3.1	–1.496	***5.6	–0.067	***3.0	–1.893	*1.9
gdp, real	0.504	***9.3	1.158	**2.4	2.340	0.3	0.021	0.3	0.048	***3.1
labour share			0.035	1.5	–0.329	***3.7	–0.009	**2.5		
utilisation grade							0.002	1.1		
unemployment	–0.076	**2.2	0.020	0.8	–0.169	***5.9	–0.008	***3.9	–3.547	***3.7
inflation	–0.054	***2.8	–0.038	1.4	–0.191	***3.4	0.001	0.3	–0.509	*1.7
lending rate*ut.gr.					0.001	0.5			0.015	*1.9
lending rate*infl.	0.005	***2.9	0.001	1.1			–0.000	0.9		
lending rate*unem.	0.004	1.6							0.206	**2.2
lending rate*lab.sh			0.003	***2.7	0.019	***4.7	0.001	***2.9		
time trend									1.928	***5.8
seas (1)					–0.009	0.1	0.004	0.6		
seas (2)					–0.227	**2.2	–0.015	**2.0		
seas (3)					0.066	0.9	0.017	1.3		
s1	–0.029	1.1								
s2	0.104	***3.7								
s3	0.067	**2.2								
s4	–0.030	1.0								
AR (1)					0.510	***3.2			0.321	***3.0
No. of obs.	84		80		83		76		87	
Adj. R^2	0.75		0.99		1.00		0.47		0.95	
F test	***26.4		***707.2		***8,364		***7.4		***209.3	
DW/Durbin's h	2.0	–	2.09	–	1.96	–	1.84	–	2.08	–
Breusch Godfrey	0.1	0.3	–	0.3	–	0.2	–	0.4	1.7	1.6

Note: see Tables 1.1 and 1.1.a.

Table 2.2

Empirical Results for the Lending Rate Equation

	'EU-wide'		Belgium		France		Germany		Italy	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	1.624	***2.1*	–0.749	*0.8*	–8.903	***2.5*	0.281	*0.1*	2.529	*1.6*
markup ($-\lambda$)	–0.000	***2.5*	0.000	*1.4*	–0.000	*0.2*	–0.000	***2.3*	–0.000	*0.7*
lending rate lagged			0.821	****9.2*			0.658	****15.5*	0.478	****5.3*
loans, real	0.003	****3.7*	0.000	****3.1*	0.002	***2.4*	0.000	*1.1*	0.000	*0.1*
wages, real	0.103	**1.7*	–0.226	*0.4*	16.668	****2.3*	0.190	*0.1*	–0.010	*0.8*
deposit rate					0.668	***2.1*	0.313	****9.2*	0.379	****3.0*
money market rate			0.233	****2.7*	0.176	****2.7*			0.201	****4.3*
government rate	0.964	****8.9*					0.171	***2.5*		
inflation	0.035	*0.4*	–0.038	*1.1*	0.065	*1.0*	–0.002	*0.1*	–0.015	*0.5*
Belgium	0.012	*0.0*								
France	–4.225	****3.7*								
Germany	–3.953	*1.6*								
Netherlands	–	–								
Italy	–13.294	***2.0*								
Portugal	2.678	****4.0*								
Spain	–0.775	*0.7*								
Sweden	0.769	*1.3*								
UK	–5.058	****5.9*								
seas (1)					0.024	*0.2*				
seas (2)					0.061	*0.5*				
seas (3)					0.188	****2.9*				
dum-unempl-de							–0.464	****3.1*		
AR (1)					0.787	****8.8*	0.139	*1.1*		
No. of obs.	718		75		81		84		64	
Adj. R^2	0.91		0.97		0.96		0.99		0.99	
F test	***26.0		***353.5		***190.9		***657.2		***930.6	
F test on dummies	***3.7									
DW/Durbin's h	2.07		1.98	0.08	1.83		1.94	0.27	1.97	0.13
Breusch Godfrey	–	0.4	–	0.0	–	1.0	–	1.5	–	0.0

Note: see Table 1.1.

Table 2.2.a

Empirical Results for the Lending Rate Equation (Continuation)

	Netherlands		Portugal		Spain		Sweden		UK	
	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*	coeff.	*t-value*
intercept	–9.283	****3.1*	–5.163	*1.2*	–4.953	***2.1*	5.985	**1.7*	–235.03	*0.5*
markup $(-\lambda)$	–0.000	*0.1*	–0.001	***2.2*	–0.000	***2.5*	–0.000	***2.3*	–0.021	***2.4*
lending rate lagged	0.561	****5.1*	0.625	****5.8*	0.897	****12.4*	0.349	****3.1*		
loans, real	0.004	****2.8*	0.000	***2.4*	–0.000	*0.2*	0.001	*0.6*	–0.012	*1.1*
wages, real	6.751	****2.9*	1.034	*0.2*	4.180	**1.8*	–3.684	*1.2*	13.631	**1.9*
deposit rate					–0.190	*1.1*			0.679	****7.1*
government rate	0.637	****5.1*	0.525	****3.5*	0.244	****4.3*	0.337	****3.3*	0.029	*0.2*
inflation	–0.089	*1.3*	0.069	*1.5*	0.101	***2.1*	0.360	****4.9*	0.145	***2.6*
time trend									0.114	*0.5*
AR (1)	0.576	****4.0*	0.365	***2.4*	0.003	*0.0*	0.166	*1.2*	0.576	****7.0*
No. of obs.	83		79		82		76		87	
Adj. R^2	0.95		0.97		0.99		0.92		0.95	
F test	***218.2		***314.6		***780.1		***135.3		***206.7	
DW/Durbin's h	1.77	1.06	2.04	–0.18	1.63	1.69	2.01	–0.06	1.71	
Breusch Godfrey	2.3	2.5	–	0.6	*3.4		–	0.2	–	**4.7

Note: see Table 1.1.

Appendix 3
Data Sources

Table 3.1
Data Sources for Belgium

Time series	Definition	Source
Deposits	savings and time deposits in bef (nsa)	own calculations based on BIS data
Loans	claims of credit institutions on non-financial residents (nsa)	IFS
Deposit rate	deposit rate	IFS
Lending rate (1970:1–84:4)	interest rate on investment loans by national industry credit company (credits of 4 yr or more with rate flexibility every 5 yrs), end month data, disc.	BIS
Lending rate (1985:1–99:4)	prime lending rate	IFS
GDP	GDP, 1995 prices (nsa)	BIS
Money market rate	3-months treasury bill rate	OECD
Government bond rate	5 year central government bond	OECD
Unemployment rate	Unemployment rate	BIS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment, domestic (ECB def.) in 1000s pers., Q-av (sa)	BIS
Population	Population	IFS
Price deflator	CPI all items (nsa)	OECD
Wages	relative normalised unit labour costs (sa)	OECD
Labour share	labour share	Dutch central bank
Capital utilisation	capital utilisation in industry	BIS
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.2

Data Sources for France

Time series	Definition	Source
Deposits	other than demand deposits (national residency)	IFS
Loans	claims of banking institutions on other resident sectors; break 1978:1 corrected on the basis of yearly growth	IFS
Deposit rate	deposit rate; 1986:1 and 1986:2 non available (n.a.) – calculated by taking the average of period before and after	IFS
Lending rate	lending rate; 1986:1 and 1986:2 n.a. – calculated by taking the average of period before and after	IFS
GDP	GDP, 1995 prices (sa), 1970:1–77:4 calculated with GDP index	BIS (index: IFS)
Money market rate	treasury bill rate	IFS
Government bond rate	yield on long term (> 7 years) government bonds on secondary market	BIS
Unemployment rate	unemployment rate (sa)	IFS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment total (excl. conscripts) (ECB proxy) in 1000s pers., (sa-disc)	BIS
Population	Population	IFS
Price deflator	GDP total index, 1980 prices, (sa)	BIS
Wages	unit labour cost index, total economy (sa)	BIS
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.3

Data Sources for Germany

Time series	Definition	Source
Deposits	non-demand deposits of other resident sectors with banks	IFS
Deposit dummy	1970:2 until 1990:1 (time period where series includes only GDP of the western states)	
Loans	claims of banks on other resident sectors	IFS
Deposit rate	3 months deposits (<1 mio DM)	IFS
Lending rate	lending rate on CA credit (<1 mio DM)	IFS
GDP	GDP at 1995 prices, market prices (nsa), until 1990:4 GDP only for the western states	BIS
GDP dummy	1970:1 until 1990:4	
Money market rate	interest rates on 3-months loans (money market)	BIS
Government bond rate	redemption yield, 10 year benchmark bond	DS
Unemployment rate	unemployment rate, dependent labour (sa)	DS
Unemployment dummy	1970:1 until 1991:4 (time period where the unemployment series has been corrected)	
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment, domestic W and W+E (ECB def.) in 1000s pers., Q-av (nsa)	BIS
Population	Population	IFS
Price deflator	GNP implicit price deflator (nsa)	DS
Wages	unit labour cost index, temporarily discontinued (sa)	DS
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.4

Data Sources for Italy

Time series	Definition	Source
Deposits	savings and time deposits with banks (end-month) in M2 (nsa)	BIS
Loans	domestic loans by banks (nsa)	BIS
Deposit rate	interest rate on total deposits, quarterly average	BIS
Lending rate	interest rate on bank loans, quarterly average	BIS
GDP	GDP, 1995 prices, market prices, (nsa)	BIS
Money market rate	3-months treasury bill rate	IFS
Government bond rate	Italian government long-term bond yield (9–10 year)	IFS
Unemployment rate	unemployment rate (nsa)	BIS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment total (ECB def.) in 1000s pers., Q-beg (sa)	BIS
Population	Population	IFS
Price deflator	(GDP, current prices)/(GDP, 1995 prices)	BIS
Wages	unit labour costs in whole economy (sa)	BIS
Labour share	labour share	Dutch central bank
Consumer confidence	Consumer confidence indicator (sa)	DS

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Table 3.5

Data Sources for the Netherlands

Time series	Definition	Source
Deposits	other than demand deposits with banks from non-bank institutions with banks, discontinued	IFS
Loans	claims of banks on other resident sectors than government, discontinued	IFS
Deposit rate	rate on deposits 2 years (fixed)	DNB
Lending rate	lending rate	IFS
GDP	GDP, 1995 prices, purchaser's value (nsa)	BIS
Money market rate	3-months money market rate, discontinued, mean (nsa)	DS: Eurostat
Government bond rate	medium term (5–8 yr) central government bond yield, secondary market, month-end data	BIS
Unemployment rate		OECD
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment, domestic (ECB def.) in 1000s pers., Q-mid (nsa)	BIS
Population	Population	IFS
Price deflator	GDP price deflator, market prices (nsa)	BIS
Wages	hourly wage rates in private sector, dicontinued, completed with series hourly wage rates in manufacturing sector	DS: CBS
Utilisation grade	utilisation grade of industry	CBS
Labour share	labour share market sector	CPB
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.6

Data Sources for Portugal

Time series	Definition	Source
Deposits	time and savings deposits, (bln PE)	IFS database
Loans (loans_priv)	claims on private sector	IFS database
Deposit rate	average interest rate on time deposits	DS: IFS
Lending rate	average lending rate, excl. doubtful debt	DS: IFS
GDP (gdp_comp)	GDP, 1990=100, from 1998:1 completed on the basis of growth of data series 18299B.PYF	DS: IFS
Government bond rate	government bond yield	DS: IFS
Unemployment rate	unemployment rate, originally yearly data	OECD
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment total (nsa)	BIS
Population	Population	IFS
Price deflator	GDP price deflator, from 1998:4 completed	DS: IFS
Wages	unit labour cost index, total economy, originally yearly figures	OECD
Labour share		Dutch central bank
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.7

Data Sources for Spain

Time series	Definition	Source
Deposits	savings and time deposits, average of month-end data	BIS
Loans	total credit to private sector, month average (nsa)	BIS
Deposit rate	weighted average of rate on savings deposits and rate on time deposits	own calculations
Lending rate	interest rate on medium-term credit (1–3 yr), month-end	BIS
GDP	constant GDP, 1990 prices (sa); quarterly data calculated from quarterly data on yearly basis	DS: IFS
Money market rate	interest rate money market, 3 month inter-bank deposits, month average	BIS
Government bond rate	monthly average bond yield (bonds 2 yr maturity)	DS: IFS
Unemployment rate	unemployment rate, in % of total labour force (nsa)	BIS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment, domestic (ESA 95), Q-av	BIS
Population	Population	IFS
Price deflator	GDP implicit price deflator index, calculated from yearly data	DS: OECD
Wages	hourly wages (nsa)	DS: IFS
Labour share	labour share	Dutch central bank
Capital utilisation	capacity utilisation in industry, excl. construction (nsa)	BIS
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.8

Data Sources for Sweden

Time series	Definition	Source
Deposits	demand, time, savings and foreign currency deposits	IFS
Loans	claims of private banks on private sector	IFS
Deposit rate	deposit rate	IFS
Lending rate	lending rate	IFS
GDP	GDP, 1991 prices (nsa)	BIS
Money market rate	treasury bill rate	IFS
Government bond rate	central government bonds yield, 10 yr bonds	OECD
Unemployment rate	unemployment rate (nsa)	BIS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment total in 1000s pers., Q-av (sa)	BIS
Population	Population	IFS
Price deflator	CPI, all items, 1995=100 (nsa)	DS: OECD
Wages	hourly labour cost (nsa)	OECD
Capital utilisation	capital utilisation in economy (sa)	BIS
Labour share		Dutch central bank
Consumer confidence	Consumer confidence indicator (sa)	DS

Table 3.9

Data Sources for the UK

Time series	Definition	Source
Deposits	sterling deposits from public and private sectors with banks (nsa)	BIS
Loans	UK bank lending to residents – private sector, discontinued	IFS
Deposit rate	UK instant access savings accounts interest rate	IFS
Lending rate	UK minimum base rate of London clearing banks	IFS
GDP	GDP, 1995 prices, market prices (nsa)	BIS
Money market rate	interest rate money market, treasury bills, 91-day, average allotment rate, end-month	BIS
Government bond rate	medium-dated (10-year) government stock yield, secondary market, month-end	BIS
Unemployment rate	unemployment rate (nsa)	BIS
Nonemployment rate	Formula: 1– (employment/population)	
Employment	Employment total, Q-end (sa)	BIS
Population	Population	IFS
Price deflator	GDP price deflator, 1995=100, discontinued series, market prices (nsa)	BIS
Wages	unit wage and salary costs in whole economy (index) (sa)	BIS
Utilisation grade	utilisation grade, volume, mean of stock	BIS
Labour share	labour share firms	Dutch central bank
Consumer confidence	Consumer confidence indicator (sa)	DS

Summary

Testing for Imperfect Competition on EU Deposit and Loan Markets with Bresnahan's Market Power Model

Bresnahan and Lau developed a model of profit maximising oligopoly banks in order to determine the degree of market power of the average bank. The equilibrium price equation includes a mark up, which is not used at all under perfect competition, partly used under oligopoly or monopolistic competition and fully used under monopoly. The data requirements of the model allow testing of possible use of market power for submarkets. This article investigates the degree of competition on both the deposit and loan markets in nine EU countries, both apart and jointly. The hypothesis of perfect competition can be rejected for the deposit market of the "entire" EU, for the deposit markets of Germany and Spain and for the lending markets of Germany, Portugal, Spain, Sweden and the UK. Nevertheless, these markets are characterised as highly competitive, because the use or abuse of market power is very limited. (JEL E 43, E 51, F 36, G 21, L 1)

Zusammenfassung

Nachweis von unvollkommenem Wettbewerb auf den Depositen- und Darlehensmärkten der EU auf der Grundlage des Bresnahan-Modells für Marktmacht

Bresnahan und Lau haben ein Modell für die Gewinnmaximierung von Bankenoligopolen entwickelt, um den Grad der Marktmacht einer Durchschnittsbank zu bestimmen. Die Gleichung für den Gleichgewichtspreis beinhaltet einen Aufschlag, der bei vollkommenem Wettbewerb überhaupt nicht, bei Wettbewerb unter Oligopol- oder monopolistischen Bedingungen teilweise und bei Monopolen voll genutzt wird. Die Datenerfordernisse des Modells gestatten den Nachweis einer möglichen Nutzung von Marktmacht auf Teilmärkten. In diesem Beitrag wird der Wettbewerbsgrad auf sowohl den Einlagen- als auch den Darlehensmärkten von neun EU-Ländern getrennt und gemeinsam untersucht. Die Hypothese eines vollkommenen Wettbewerbs kann für den Depositenmarkt der „gesamten" EU, für die Depositenmärkte Deutschlands und Spaniens sowie für die Darlehensmärkte Deutschlands, Portugals, Spaniens, Schwedens und des Vereinigten Königreichs ausgeschlossen werden. Dennoch gilt für diese Märkte, dass sie von starkem Wettbewerb geprägt sind, da die Nutzung oder der Missbrauch von Marktmacht sehr begrenzt ist.

Résumé

Le test de la concurrence imparfaite sur les marchés européens des dépôts et des crédits avec le modèle du pouvoir de marché de Bresnahan

Bresnahan et Lau ont développé un modèle de maximisation de profits pour les banques oligopoles afin de déterminer le degré du pouvoir de marché de la banque moyenne. L'équation du prix d'équilibre inclut une majoration. Celle-ci n'est pas du tout utilisée lorsque la concurrence est parfaite, elle l'est en partie lorsqu'il y a concurrence oligopolistique ou monopolistique et entièrement en cas de monopole. Les exigences des données du modèle permettent de tester l'utilisation possible du pouvoir de marché pour les sous-marchés. Cet article examine, pour chaque pays et dans leur ensemble, le degré de concurrence sur les marchés des dépôts et des crédits de 9 pays de l'Union Européenne. L'hypothèse de la concurrence parfaite peut être rejetée pour le marché des dépôts de l'UE «dans sa totalité», pour les marchés des dépôts allemands et espagnols et pour les marchés des crédits de l'Allemagne, du Portugal, de l'Espagne, de la Suède et du Royaume-Uni. Cependant, ces marchés sont considérés comme hautement compétitifs parce que l'utilisation ou l'abus du pouvoir de marché y est très limité.