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**TITLE:**

The significance of service level on the new competitive environment of spanish banking industry: a theoretical study.

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## ABSTRACT

The spanish banking system has been involved in very important changes that made the situation move from stability in the 70's towards turbulence in the 90's.

These facts brought around a new managing style in banking, with differentiation strategies that are based on service level provided to the customers.

Given that situation, it's necessary to review the models that analyse the profitability determinants, adding variables reflecting service level that banks provide to their borrowers and depositors.

This work develops a theoretical model that studies the determinants of profit in banking companies operating in the spanish marketplace, adding a number of variables (interest rate that depositors are disposed to renounce in exchange for service level provided by the bank, interest rate that borrowers are disposed to pay in exchange for service level provided by the bank, loans demand elasticity for bank  $i$  related to its implicit price, and deposits offer elasticity for bank  $i$  related to its implicit price) that reflect the level of service that banks provide to their clients.

Furthermore, this model is more general and contains as particular cases the main theoretical models that explain profits margin of banking industry.

## 1. INTRODUCTION

The environment of Spanish Banking System shows the same characteristics as any other financial industry. We can assert that spanish banking has moved from stability to turbulence in the recent past. Let's see the main factors bringing around these changes.

During a first period, up to 1974, the activity of banking in Spain was strongly controlled by the Government by means of law, and that allowed banks (Ballarín, 1987) “to enjoy an exclusive government's concession on products, prices and markets”<sup>1</sup>, which involved serious limitations to the creation of new banks as well as to branch network growth of the established ones, the establishment of privileged financial circuits that addressed an important part of banks resources, strict control over interest rates to promote private investment and guarantee wide intermediate margins to banks, and banking specialisation of firms that created two kinds of institutions, “commercial banks” and “industrial banks”, except for a number of mixed banks which had limitations on long term investments.

From 1974 to 1987, the second period, the environment in which these firms develop their activity began to change with the steps taken by the Government to Financial System liberalization, which were based on<sup>2</sup>: progressive liberalization of interest rates, up to their full liberalization in 1987; progressive reduction of bank reserve ratios, affecting both commercial and savings banks; the choice of an universal banking concept, removing the traditional differences between commercial, industrial and mixed banking, as well as promoting operative equality between commercial banks and savings banks, and encouraging greater competitiveness making possible branch network growth and liberalizing foreign banks entry in Spain.

These steps hardly increased competitiveness among Spanish banks. Competitiveness focused on new branches openings rather than interest rates (Castelló, 1996), but it was the beginning of deep transformations that spanish banking industry went through from 1987 on.

The third period starts in 1987, with a lawful regulation about interest rates and bank commissions liberalization (except for interest rate of operations under bank reserve ratios), and the unsuccessful takeover bid of Banco de Bilbao over Banesto. In this period great changes took place in every tool that determine banking competitive structure, and a whole different banking industry appears, compared to previous decades (Gual, 1993; Gual y Vives, 1991).

The main factors that explain these changes and the new competitive scene for banking are: financial deregulation; financial disintermediation; innovation; markets globalization (currencies, debt and capital), and the internationalisation of banking systems; the creation of the financial services european market; technological advance of software and telecommunications, that allow and drive globalization; and the appearance of a new consumer, more educated and exigent, who looks for products more suitable for their needs, with good service and at a good price (Santesmases, 1992).

These deep changes moved banks to search for defensible competitive advantages in the recent past, by means of new products or services that provide higher value than competitors to the customers, so that performance is higher than market's average.

Specific characteristics of banking products (intangibility, indivisibility, heterogeneity and expiration) lead banks to increase the value of their products and services by means of service level provided to the clients, which becomes a key factor to get consumers loyalty and higher profitability.

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<sup>1</sup> Ballarín, E.(1987): "La transformación del negocio bancario". Suplementos sobre el Sistema Financiero- Papeles de Economía Española, 17, p. 39-50.

<sup>2</sup> Parejo, J.A., Rodríguez, L. y Cuervo, A. (1991): *Manual del Sistema Financiero Español*. Editorial Ariel, p. 61-62.

The significance of service level provided by banks to their customers, depositors and borrowers, demands to add variables reflecting that service level to the models that study profitability determinants, considering that higher service level gets customers loyalty and decreases consumers sensitivity to prices, therefore reflecting a strategy based on differentiation and oriented to highly competitive and uncertain markets.

Resting on these ideas, this paper focuses on the construction of a theoretical model that includes -unlike most models developed up to present- service level provided by banks to their customers as an explanatory variable of banks profitability, taking into account the relationship between the quantity of deposits captured by the bank and service level.

## 2. MODEL BASIC HYPOTHESIS

Resting on models that analyse market structure, competitive strategies and performance of Spanish banks (specially works developed by Fanjul and Maravall, 1985; Espitia, Polo and Salas, 1989 and 1991; Coello, 1994; Espitia and Santamaría, 1994), we developed a new theoretical model whose basic hypothesis are the following:

*HYPOTHESIS 1: Spanish market geographical segmentation by financial companies is recognised, considering the province as the geographical unit of analysis.*

The need of recognising geographical segmentation of Spanish deposits and loans markets is due to the fact that savings banks had their market areas geographically restricted by law until 1989, so that they were not able to compete with commercial banks expanding their markets out of their boundaries. This fact made geographic markets structure not to be homogeneous, since competitors and competition intensity were different in each one of them, and that makes geographical segmentation necessary.<sup>3</sup>

*HYPOTHESIS 2: Functional segmentation among commercial banks and savings banks is not recognised.*

In the past decades, savings banks focused on domestic economies and small companies, and commercial banks were not interested in these groups of customers due to the small margin provided by them (Serra, 1991). This fact used to be reflected on financial literature as a recognition of functional segmentation between both kind of entities.

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<sup>3</sup> This practice is common in research by Espitia, Polo and Salas (1991), Gual and Vives (1991), Lozano and Pajuelo (1993), Espitia and Santamaría (1994) and Fuentelsaz (1996).

Changes that happened during the 80's brought about a new national and international competition (Vives, 1991) that intensified market competition in deposits capture as well as loans lending (Canals, 1996), and that made the differences between commercial and savings banks tend to disappear.<sup>4</sup>

This new competitive environment makes traditional functional segmentation unappropriated, and we consider that commercial and savings banks compete in provincial markets, as Lloyd-Williams et al. (1994) do.

*HYPOTHESIS 3: Deposits supply function is not accepted to be perfectly elastic.*

To accept this hypothesis means that  $\Gamma_d$ , deposits supply elasticity in relation to deposits market interest rate, is not equal to infinity.

*HYPOTHESIS 4: Banks chance to fund borrowing and lending in the Interbank market is accepted.*

Our model reflects the existence of a pure competition interbank market, that financial intermediaries can turn to borrow and lend funds.

*HYPOTHESIS 5: Separation between deposits and loans markets is not accepted.*

To accept the separation between deposits and loans markets allows the independent analysis of each one of them, but in the Spanish case it's controversial, since research checking this hypothesis have concluded different findings. Thus, research by Gual (1993) and Hernández (1994) confirmed the existence of separation between deposits and loans markets, while Sastre (1991) and Tamarit (1992) came to the opposing conclusion.

These contradictory results prevent us from accepting the assumption of separation, and it seems more advisable to build the model without accepting this simplifying assumption.

*HYPOTHESIS 6: Existing differences among banks in relation to service provided to their depositors and borrowers are recognised.*

Firms operating in highly competitive environments look at the establishment of long term relationships with their customers as a key tool, obtaining their loyalty by means of satisfying their needs.

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<sup>4</sup> Freixas (1996) proves that a clear competition between commercial and savings banks can be seen in the spanish loans market from 1988 to 1994. Coello (1994) shows that competitive interaction between commercial and savings banks from 1990 on is equivalent.

So banks offer their customers a service level trying to satisfy their needs and to differ from competitors, by means of products and services, distribution channels, promotion activities, prices, human resources and technology.

Our model must take into account -in order to reflect reality- that products competing in the market are not homogeneous, since differentiation among offers provided by banks exist.

*HYPOTHESIS 7: Replaceability between service level provided by banks to their depositors and/or borrowers, and explicit interest rate that banks pay to their depositors and/or banks charge to their borrowers is substantiated.*

Heterogeneity of products and services that banks put in the market is reflected in our model through two different variables,  $v_i^d$  and  $v_i^p$ , which reflect the differences among banks in relation to service provided to their depositors ( $v_i^d$ ) and borrowers ( $v_i^p$ ).

We define these variables -following the studies by Michell (1979), Herffenan (1992) and Coello (1994)- as implicit interest rates reflecting respectively interest rate that depositors are disposed to renounce in exchange for service level provided by the bank, and interest rate that borrowers are disposed to pay in exchange for service level provided by the bank. This reflects the existence of replaceability between service provided by banks and interest rate of their products.

*HYPOTHESIS 8: Service level offered by a bank to its depositors and borrowers is regarded as depending upon the amount of deposits captured by itself.*

Banks, as services offering firms, face different challenges than companies producing tangible goods, due to the special characteristics that services show: intangibility, inseparability, heterogeneity and expiration.

These characteristics of banking business lead firms -in order to generate long term relationships with their customers- to develop interactive marketing, just to take advantage of direct and personal relations between the bank and its clients, getting a better and faster understanding of their needs, being able to satisfy them in an effective way (Santesmases, 1992). This reasoning, in addition to the inability of storing financial services, justifies that bank's level service is affected by the amount of deposits captured by the firm, since changes in the quantity of deposits will probably modify the number of customers, depositors and borrowers, and this will affect interactive marketing efficiency, therefore affecting service level.

Existing relationship between service level and amount of deposits is reflected into the model by means of considering that derivatives of service's price that the bank provides to its customers with respect to captured deposit can take values different from zero.

**HYPOTHESIS 9:** *Banks are assumed to operate with constant returns to scale.*

Our model assumes that banks operate with constant return to scale. This involves that average and marginal cost coincide, and margin calculated from total income and costs will be the same as if calculated from marginal costs.

### 3. THE MODEL

Our model is mainly based on banking industry competition model developed by Espitia, Polo and Salas (1991), adding the existence of interbank market and the differentiation hypothesis among banks established by Coello (1994).

We set by the name of  $D_i$  the amount of deposits captured by firm  $i$  in market  $j$ . The whole amount of deposits in this market will therefore be:

$$D = \sum_{i=1}^n D_i \quad (1)$$

We also define:  $r^d = g(D) \quad \text{con } g'(D) > 0 \quad (2)$

as the depositor's opportunity cost when investing his funds into the deposits market, that is, the profitability that depositors could get in alternative markets with the same risk and liquidity.

The cost of deposits caught by bank  $i$  is  $r_i^d = (g(D) - v_i^d)$ , where  $r_i^d$  represents explicit interest rate paid by banks for their deposits.

The variable  $v_i^d$  represents, in monetary terms, existing differences among firms in relation to subjects such as: segments addressed, variety of products and services offered to the different segments, information provided about products and services, solvency and security image, associated costs of deposits cancellation, variety and extent of distribution channels, courtesy and competence of staff, speed and effectiveness of firm's response to customers, ..., that is, this variable reflects distinctive attributes of competing banks into the market, attributes that determine service level

provided by firms to their depositors, which are defined as an implicit interest rate: the interest rate that depositors are disposed to renounce in exchange for service level offered by firm  $i$ .

The opportunity cost of depositor investing his funds in the deposits market,  $r^d$ , is equal for every competing firm in the market. We can therefore define  $r^d$  as the deposits market interest rate. This rate can be calculated for each firm by adding the values of implicit and explicit interest rates. These values will differ among banks, that is, each bank will have an specific combination of these two values, but the sum will be the same for every bank.

The different combinations of implicit and explicit interest rates will reflect the different competitive strategies followed by banks. Thus, financial companies with competitive cost advantages will have an explicit price close to the deposits market interest rate. On the other side, companies with competitive advantages based on differentiation, will show that their implicit price is a significant component of deposits market interest rate, since their depositors will be disposed to renounce a high percentage of their remuneration in exchange for provided service level.

We can therefore highlight that each firm  $i$  will remunerate the deposits with a  $r_i^d$  interest rate, which will depend on the adopted strategy.

But banks can capture deposits not only among individuals and companies. They can come to the interbank market to get deposits as well as to invest funds, paying or earning a  $r_i$  interest rate that is indirectly controlled and fixed by the Bank of Spain.

We define  $I_i^d$  as the sum of deposits taken from the interbank market by firm  $i$ , and  $I_i^p$  as the sum of funds lent in the interbank market by firm  $i$ . Thus, the net status of firm  $i$  in the interbank market will be:

$$I_i = I_i^d - I_i^p \quad (3)$$

Deposits captured by banks become loans for individuals and companies, and the sum of loans is given by the sum of deposits captured from individuals and companies plus the net status of the firm in the interbank market.

Thus, firm  $i$  can lend to individuals and companies the following sum:

$$P_i = \alpha D_i + I_i \quad (4)$$



where  $\alpha$  is a positive parameter,  $\alpha \leq 1$ , that reflects lawful duty on bank reserve ratios.

$$P = \sum_{i=1}^n P_i = \alpha D + I \quad (5)$$

where  $P$  represents the total sum of loans in the market, and  $I = \sum_{i=1}^n I_i$  reflects the net interbank status of every competing bank in the market.

We define, as we did in the deposits case, the profitability obtained by a borrower from the funds captured in the loans market.

$$r^P = h(P) \quad \text{con } h'(P) < 0 \quad (6)$$

Remuneration obtained from its loans by firm  $i$  is given by:  $r_i^P = (h(P) + v_i^P)$ , where  $r_i^P$  represents the explicit interest rate that a borrower pays for funds received from firm  $i$ , that is, the amount actually paid to the bank.

The variable  $v_i^P$  reflects, in monetary terms, the existing differences among the firms with respect to the service level provided to their borrowers, and we define it as an implicit interest rate, that is, the interest rate that the borrower is disposed to pay in excess in exchange for service offered by firm  $i$ . So, it's the increase in the sum that customers accept to pay for their loans in exchange for the service provided by firm  $i$ .

Notice that the value of  $v_i^P$  does not have to coincide with value of  $v_i^d$ , since these variables reflect -apart from image of reliability and solvency, treatment given to the customers- specific characteristics as variety of products and services offered to the different segments, information provided about products and services, and associated costs of cancellation, and this will make these variables take different values.

As we did with deposits market, we can define  $r^P$ , that is, borrower's profitability when getting his funds from loans market, as the interest rate for loans market. That rate will be obtained, for each firm, through the difference between the explicit and implicit interest rates. These values will be different for each bank, but the difference -loans market interest rate- will be the same for all of them.

The different combinations of explicit and implicit interest rates reflect the various competitive strategies adopted by banks. Firms with cost-based competitive advantages will probably show explicit prices close to interest rate of loans market, while firms with competitive advantages based on differentiation will show explicit prices higher than interest rate of loans market.

We can therefore highlight -as we did in deposits market- that each firm  $i$  will receive an interest rate  $r_i^p$  from loans lent to individuals and companies, and the value of  $r_i^p$  will depend upon the adopted strategy.

Looking at a firm  $i$ , profit of this firm will be:

$$\pi_i(D_i) = P_i r_i^p - D_i r_i^d - I_i r^l - C_i(D_i, v_i^d, v_i^p) \quad (7)$$

Where:

$P_i$  is the sum lent by firm  $i$  to individuals and companies.

$D_i$  is the sum of deposits captured by firm  $i$  from individuals and companies.

$I_i$  is the net status of firm  $i$  in the interbank market.

$C_i(D_i, v_i^d, v_i^p)$  is the cost function of firm  $i$ , which depends on the sum of deposits captured by the bank, and are formed by:

- costs associated with transformation of deposits into loans.
- costs associated with activities determining implicit price of deposits.
- costs associated with activities determining implicit price of loans.

$r_i^p$ , is the interest rate obtained by firm  $i$  from the lent sum to individuals and companies.

$r_i^d$ , is the interest rate that firm  $i$  remunerates deposits from individuals and companies.

$r^l$ , is the interbank market interest rate.

If we substitute in the equation  $P_i$ ,  $r_i^p$  and  $r_i^d$  with their expressions:

$$P_i = \alpha D_i + I_i \quad r_i^p = r^p + v_i^p \quad r_i^d = r^d - v_i^d$$

then we get the following equation:

$$\pi_i(D_i) = [\alpha D_i + I_i] [r^p + v_i^p] - D_i [r^d - v_i^d] - I_i r^l - C_i(D_i, v_i^d, v_i^p) \quad (8)$$

Firm  $i$  decides  $D_i$  maximizing its profit. First order condition of optimum for this problem can be written as:

$$\begin{aligned} \pi_i'(D_i) = & \left[ \alpha + \frac{dI_i}{dD_i} \right] [r^p + v_i^d] + [\alpha D_i + I_i] \left[ \frac{dr^p}{dD_i} + \frac{dv_i^p}{dD_i} \right] - [r^d - v_i^d] - \\ & - D_i \left[ \frac{dr^d}{dD_i} - \frac{dv_i^d}{dD_i} \right] - \frac{dI_i}{dD_i} r^l - C_i' = 0 \end{aligned} \quad (9)$$

And considering that:

$$\frac{dr^p}{dD_i} = \frac{dr^p}{dP} \cdot \frac{dP}{dD} \cdot \frac{dD}{dD_i} \quad (10)$$

$$\frac{dv_i^p}{dD_i} = \frac{dv_i^p}{dP_i} \cdot \frac{dP_i}{dD_i} = \frac{dv_i^p}{dP_i} \left[ \alpha + \frac{dI_i}{dD_i} \right] \quad (11)$$

$$\frac{dr^d}{dD_i} = \frac{dr^d}{dD} \cdot \frac{dD}{dD_i} \quad (12)$$

where:

$$\frac{dD}{dD_i} = 1 + \sum_{i \neq j} \frac{dD_j}{dD_i} = 1 + \mu_i = \delta_i \quad (13)$$

is the conjecture of firm  $i$ .

This conjectural variable reflects the competitor's reactions that are expected by firm  $i$  when this company changes its sum of deposits,  $D_i$ .

If we substitute the four preceding expressions (10), (11), (12) and (13) into equation (9) then we get the following expression:

$$\frac{\alpha r_i^p + \frac{dI_i}{dD_i} \left[ r_i^p - r^I \right] r_i^d - C'_i}{\left[ \alpha + \frac{dI_i}{dD_i} \right] r_i^p} =$$

$$\frac{1}{\left[ \alpha + \frac{dI_i}{dD_i} \right]} \left[ S_i^p \cdot \frac{\delta_i}{\Gamma_p} \cdot \frac{dP}{dD} \cdot \frac{r^p}{r_i^p} + S_i^d \cdot \frac{\delta_i}{\Gamma_d} \cdot \frac{r^d}{r_i^p} \right] - \frac{P_i}{v_i^p} \cdot \frac{dv_i^p}{dP_i} \cdot \frac{v_i^p}{r_i^p} - \frac{\frac{D_i}{v_i^d} \cdot \frac{dv_i^d}{dD_i} \cdot \frac{v_i^p}{r_i^p}}{\left[ \alpha + \frac{dI_i}{dD_i} \right]}$$

Where:

$\Gamma_p = -\frac{dP}{dr^p} \cdot \frac{r^p}{P}$ , is the elasticity of loans demand in relation to interest rate of loans market.

$\Gamma_d = \frac{dD}{dr^d} \cdot \frac{r^d}{D}$ , is the elasticity of deposits supply in relation to interest rate of deposits market.

$S_i^p = \frac{P_i}{P}$ , is the market share of firm  $i$  into the loans market, and

$S_i^d = \frac{D_i}{D}$ , is the market share of firm  $i$  into the deposits market.

The following expressions:

$$\frac{dv_i^p}{dP_i} \frac{P_i}{v_i^p} \text{ y } \frac{dv_i^d}{dD_i} \frac{D_i}{v_i^d}$$

are, respectively, the reciprocal of elasticity of loans demand of firm  $i$ , in relation to the implicit price  $v_i^p$ ;  $\Gamma_p \frac{P_i}{v_i^p}$ ; and the reciprocal of the elasticity of deposits supply of form  $i$  in relation to the implicit price  $v_i^d$ ,  $\Gamma_d \frac{D_i}{v_i^d}$ .

If we group terms, we get the following equation:

$$\frac{\alpha r_i^p + \frac{dI_i}{dD_i} [r_i^p - r^l] r_i^d - C'_i}{\left[ \alpha + \frac{dI_i}{dD_i} \right] r_i^p} = \frac{1}{\left[ \alpha + \frac{dI_i}{dD_i} \right]} \left[ S_i^p \cdot \frac{\delta_i}{\Gamma_p} \cdot \frac{dP}{dD} \cdot \frac{r^p}{r_i^p} + S_i^d \cdot \frac{\delta_i}{\Gamma_d} \cdot \frac{r^d}{r_i^p} + \frac{v_i^d}{r_i^p} \cdot \frac{1}{\Gamma_{D_i v_i^d}} \right] + \frac{v_i^d}{r_i^p} \cdot \frac{1}{\Gamma_{P_i v_i^p}} \quad (15)$$

We can see in that expression that the left part of the equation represents the Relative Margin of firm  $i$ , that is, total margin of firm  $i$  when it captures an additional unit of deposits divided by the total income associated to this additional unit captured. Equation (15) shows relative margin of firm  $i$  depending on three kind of variables:

- variables reflecting firm's size.
- variables reflecting deposits and loans market's structure.
- variables measuring service level provided by the firm to borrowers and depositors.

Variables that reflect bank's size are market share of loans  $S_i^p$ , and deposits markets  $S_i^d$ , both of them positively related to profit's margin.

Those reflecting market's structure are the conjectural variable  $\delta_i$ , interest rate of loans market  $r^p$ , interest rate of deposits market  $r^d$ , price elasticity of loans demand  $\Gamma_p$ , price elasticity of deposits supply  $\Gamma_d$ , changes in loans demand when the offer of deposits changes  $\frac{dP}{dD}$ , and changes in sum lent by firm  $i$  when captured deposits increases an additional unit  $\left[ \alpha + \frac{dI_i}{dD_i} \right]$ .

The three primary variables are positively related to profit's margin, the following two are inversely related to profit's margin, and the rest of variables appear in the equation due to the Hypothesis 5.

Variables reflecting service level provided by the firm to its customers are:

- interest rate that depositors renounce to, in exchange for the service level provided by the firm,  $v_i^d$ ;
- implicit interest rate of firm  $i$ 's loans,  $v_i^p$ , divided by the explicit interest rate paid by the borrower,  $r_i^p$ ;
- elasticity of loans demand of firm  $i$  in relation to service level offered to its borrowers  $\Gamma_{v_i^p}^p$ ;
- elasticity of deposits supply of firm  $i$  in relation to service level provided to its depositors  $\Gamma_{v_i^d}^d$ .

$v_i^p$  is a non negative variable, that is positively related to profit's margin.

The ratio between  $v_i^p$  and  $r_i^p$  is always positive, and that value will always be smaller than one. If the implicit interest rate increases (decreases), the ratio will increase (decrease).

Elasticities of loans demand and deposits supply of firm  $i$  in relation to its implicit prices are positive, since they are multiplied by -1. We can highlight that both of them are inversely related to profit margin.

We can therefore see that, unlike other models that study the determinants of profit margin, our model embodies variables that reflect service level provided by banks, variables that are outstanding in the new competitive environment that banking firms are facing.

#### 4. PARTICULAR CASES OF THE MODEL

Main models that analyse the determinants of profit margin in the Spanish banking industry embody restrictive hypothesis that allow an easier study of market structure, competitive behaviour and performance of banks.

Our theoretical model, instead, doesn't accept these simplifying hypothesis, so that our model has a more general character.

Our model holds as particular cases the results of the most relevant studies that analyse the relative margin of Spanish banking industry: the model developed by Espitia, Polo and Salas (1991), the model by Coello (1994), and the model by Espitia and Santamaría (1994). In this section we'd

like to show that these models can be obtained by adding different restrictive hypothesis to our model.

Thus, the model developed by Espitia, Polo and Salas doesn't accept the existence of the interbank market, and that involves adding two hypothesis to our model: firm  $i$  doesn't come to the interbank market (or its net status is zero,  $I_i = 0$ ), and joint net status of all the firms competing in the market is zero,  $I = 0$ .

Under this restrictions the total sum of loans of firm  $i$  depends on the sum of deposits captured by itself,  $P_i = \alpha D_i$  and the total sum of loans in the market is determined by the total sum of deposits,  $P = \alpha D$ . So,

$$\frac{dP_i}{dD_i} = \alpha, \quad S_i^p = S_i^d \quad y \quad \frac{dP}{dD} = \alpha$$

And the model becomes:

$$\frac{\alpha r_i^p - r_i^d - C'_i}{\alpha r_i^p} = S_i^d \cdot \frac{\delta_i}{\Gamma_p} \cdot \frac{r^p}{r_i^p} + S_i^d \cdot \frac{\delta_i}{\alpha \Gamma_d} \cdot \frac{r^d}{r_i^p} + \frac{v_i^d}{\alpha r_i^p} \cdot \frac{1}{\Gamma_{D_i v_i^d}} + \frac{v_i^d}{r_i^p} \cdot \frac{1}{\Gamma_{P_i v_i^p}}$$

The addition of this hypothesis simplifies our model, since relative margin is going to be defined through bank reserve ratios, costs structure and interest rate that firms charge on their loans/pays for their deposits. So, total sum of loans supplied to the market stops being a relevant variable in the model, and market share of a firm is the same in loans market as in deposits market.

Under this hypothesis, we can propose that products supplied by any competing firm in the market are homogeneous, that is, all the banks provide the same service level to their depositors and borrowers, and therefore:

$$v_i^d = 0 \quad y \quad v_i^p = 0$$

Since there is no difference in service provided by banks, customers will not be disposed to pay any kind of implicit interest rate in exchange for that service, so:

$$r_i^p = r^p \quad y \quad r_i^d = r^d$$

Considering all these conditions, we get the model developed by Espitia, Polo and Salas:

$$\frac{\alpha r^p - r^d - C'_i}{r^p} = S_i^d \cdot \frac{\delta_i}{\Gamma_p} + S_i^d \cdot \frac{\delta_i}{\alpha \Gamma_d} \cdot \frac{r^d}{r^p}$$

Models developed by Coello (1994) and by Espitia and Santamaría (1994), accept the separation between deposits and loans markets. To consider that point of view, we must introduce the following restriction in our model:

$$\frac{dP}{dD} = 0 \quad y \quad \frac{dP_i}{dD_i} = 0$$

Under these assumptions, profits of firm  $i$  will be:

$$\pi_i(D_i, P_i) = P_i r_i^p - I_i r^I - D_i r_i^d - C(D_i, P_i) - CF_i$$

where  $I_i = P_i - \alpha D_i$ .

First order conditions of optimum in order to maximize profits will be:

$$\frac{d\pi_i(D_i, P_i)}{dP_i} = r_i^p + \frac{dr_i^p}{dP} \frac{dP}{dP_i} \cdot P_i - r^I - C'(P_i)$$

$$\frac{d\pi_i(D_i, P_i)}{dD_i} = \alpha r^I \frac{dr_i^d}{dD} \frac{dD}{dD_i} \cdot D_i - r_i^d - C'(D_i)$$

Considering that  $r_i^p = r^p + v_i^p$  y  $r_i^d = r^d - v_i^d$ , operating and adding up both expressions we get:

$$\frac{r_i^p - r^I(1-\alpha) - r_i^d - C'(P_i, D_i)}{r_i^p} = \frac{S_i^p}{\Gamma_p} \cdot \delta_i(P_i) \cdot \frac{r^p}{r_i^p} + \frac{v_i^p}{r_i^p} \cdot \frac{1}{\Gamma_{P_i v_i^p}} + \frac{S_i^d}{\Gamma_d} \cdot \delta_i(D_i) \cdot \frac{r^d}{r_i^p} + \frac{v_i^d}{r_i^p} \cdot \frac{1}{\Gamma_{D_i v_i^d}}$$

We can see that including this hypothesis the relative margin of firm  $i$  is going to be define through costs structure, interest rate that the bank charge on its loans/pays for its deposits, interbank market interest rate and bank reserve ratios.



We must highlight that the incorporation of this hypothesis doesn't change very much the relevant variables that relative margin depends on, since only two of them are left aside: changes in loans demand when deposits supply varies, and changes in the sum lent by firm  $i$  when the sum of deposits captured by that firm increases an additional unit (which is equal to zero). A new variable appears, the conjecture of firm  $i$  in relation to its sum of loans, that is, the influence of firm  $i$ 's decision about loans level on the decisions of the rest of banks competing in the loans market.

If under these assumptions, we consider that:

1. There is no bank reserve ratio, so  $\alpha = 1$ .

2. Products supplied by any bank are homogeneous, that is, any bank provide the same service level to its customers.

$$v_i^d = 0 \quad y \quad v_i^p = 0$$

Then:

$$r_i^p = r^p \quad y \quad r_i^d = r^d$$

since customers -as we said before- will not be disposed to pay any implicit interest rate in exchange for service level.

Considering all these restrictions, we get the model by Espitia and Santamaría:

$$\frac{r^p - r^d - C'(P_i, D_i)}{r^p} = \frac{S_i^p}{\Gamma_p} \cdot \delta_i(P_i) + \frac{S_i^d}{\Gamma_d} \cdot \delta_i(D_i) \cdot \frac{r^d}{r^p}$$

Accepted the separation between loans and deposits markets, if we analyse just the deposits market, we can get to Coello's model including some restrictions.

We relate the costs of deposits capturing to the associated income from these deposits placed into the interbank market, and then we get the following expression of firm  $i$ 's profit:

$$\pi_i(D_i) = \alpha D_i r^l - D_i r_i^d - C(D_i) - CF_i$$

Where  $C(D_i)$  are the variable costs associated to the placement into the interbank market of the deposits that firm  $i$  captures from individuals and companies, and  $CF_i$  are the fixed costs.

First order conditions in order to maximize profits will be:

$$\pi'_i(D_i) = \alpha r^l - r_i^d - D_i \left[ \frac{dr^d}{dD_i} - \frac{dv_i^d}{dD_i} \right] - C'_i = 0$$

an then we get:

$$\frac{\alpha r_i^p - r_i^d - C'_i}{r_i^d} = S_i^d \cdot \frac{\delta_i}{\Gamma_d} \cdot \frac{r^d}{r_i^d} - \frac{v_i^d}{r_i^d} \cdot \frac{1}{\Gamma_d v_i^d}$$

We can see that, in this case, relative margin is equal to the margin obtained by firm  $i$  when it captures an additional unit of deposits and it is invested in the interbank market, divided by the remuneration paid to the depositors for this additional unit.

Under this hypothesis, we propose that,  $\frac{dv_i^d}{dD_i} = 0$ , that is, service level provided by the firm  $i$

to its depositors is not influenced by the sum of deposits captured by itself, and we substitute  $r^d$  for its value:  $r^d = r_i^d + v_i^d$ .

Then we get Coello's model:

$$\frac{\alpha r_i^p - r_i^d - C'_i}{r_i^d} = \left[ \frac{S_i^d}{\Gamma_d} \cdot \delta_i \right] \cdot \left[ 1 + \frac{v_i^d}{r_i^d} \right]$$